COMMUNITY WILDFIRE PROTECTION PLAN

PREPARED FOR

TAOS PUEBLO

NEW MEXICO

Division of Natural Resources
N.M. Association for Counties

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EXECUTIVE SUMMARY

The Taos Pueblo Community Wildfire Protection Plan (CWPP) outlines hazards and risks of unwanted wildland fire throughout Taos Pueblo and surrounding lands, and provides recommendations for fuels reduction projects, public outreach and education, structural ignitability reduction, and wildland fire response preparedness.

Recommendations for this plan are prioritized by level of overall risk to life and property, and are summarized here:

#1 (HIGH RISK/HAZARD): Rio Bosque Community
#2 (HIGH RISK/HAZARD): South Community
#3 (HIGH RISK/HAZARD): North Community
#4 (HIGH RISK/HAZARD): North Pueblo Mountain Watershed
(Note: Fuels treatment priorities are listed in Table 9, pages 25-26)

Recommendations and strategies are included for wildland and structural firefighters that will serve to improve their capabilities via communications and professional training, and provide up to date equipment; and the reduction of structural ignitability by providing public education to homeowners on creating defensible space.

The Taos Pueblo CWPP meets the requirements of the *2003 Healthy Forests Restoration Act* by:

- Being collaboratively developed by stakeholder organizations at the state and local level in consultation with federal agencies and other interested parties.
- Identifying existing and planned fuel reduction treatments and recommending the types and methods of treatments to protect at-risk communities and associated infrastructure.
- Recommending general, industry-standard mitigation, monitoring, and outreach strategies.
- Recommending measures and action items that residents and communities can take to reduce the ignitability of structures.
- Facilitating public information meetings to educate and involve the community to participate in and contribute to the development of the CWPP.

Included are sections that address background of Taos Pueblo; community outreach and collaboration efforts; vegetation, fuels and potential fire behavior; fire risk and hazard assessment; mitigation recommendations; and an action plan for accomplishing prioritized projects.

It is important to note that this document does NOT direct the implementation of any recommendations listed; nor does this document represent any final recommendations for action to mitigate risks. The CWPP instead is a dynamic document that will be periodically revised as conditions on the ground, through the actions of homeowners and protection agencies, change through time.

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1.0 INTRODUCTION & BACKGROUND

This Community Wildfire Protection Plan (CWPP) meets the requirements of the Healthy Forest Restoration Act (HFRA) of 2003 by following the eight steps recommended in the handbook "Preparing a Community Wildfire Protection Plan" which was jointly developed by: Communities Committee of the Seventh American Forest Congress, National Association of Counties, National Association of State Foresters, Society of American Foresters, and Western Governor's Association. The eight steps are: 1) convene decision makers, 2) involve federal agencies, 3) engage interested parties, 4) establish a community base map, 5) develop a community risk assessment, 6) establish community priorities and recommendations, 7) develop an action plan and assessment strategy, and 8) finalize community wildfire protection plan.

The purpose of this Community Wildfire Protection Plan is to identify and prioritize, through analysis of hazard, risk and human values, areas for fuel reduction treatments and make recommendations on the types and methods of treatments to protect the community and other values at risk for Taos Pueblo. Recommendations on measures to reduce the ignitability of structures within the areas of concern, and analysis of wildfire response and community preparedness are also addressed within this CWPP.

The project area is represented on the Wildland Urban Interface (WUI) basemap for Taos Pueblo (see Appendix A) as required in the HFRA.

1.1 Wakeup Call: The Encebado Fire

The 2003 Encebado Fire, for the members of the Pueblo, was an attention getter. Consuming over 5,300 acres of valued watershed and forest resources, this lightning-caused event remains as a grim reminder of what effects wildfires could have on communities that may not be prepared should the fire have encroached on the Taos Pueblo community area.

This lightning caused fire was fueled not only by overstocked trees and overloaded accumulations of dead and down materials, but also severe drought conditions. The fire advanced to within about a quarter mile from the heart of the community.

Fortunately, this fire did not result in fatalities nor serious injuries to firefighters or the public. However, localized soil erosion from the burned area into the Rio Pueblo drainage resulted in high volumes of sediment, ash, and other debris being deposited. Water quality suffered. Other negative effects were felt for several years post-burn.

A future stand replacing fire such as the Encebado in the watershed could result in some of the following impacts: heavy flooding; movement of soil, mud, and woody debris into the canyons; damage to or loss of homes, habitats, and water supply; spread of fire into residential areas; smoke infiltration into urban areas; and associated public health problems.

1.2 Regional Climate & Drought

New Mexico's climate is generally characterized by a mild, arid to semi-arid, continental type weather pattern with abundant sunshine, light total precipitation, low relative humidity, and relatively wide annual and diurnal temperature ranges. July is generally the warmest month of the year in New Mexico, with average monthly maximum temperatures ranging from 90 degrees Fahrenheit (ºF) at lower elevations to 75ºF to 80ºF at higher elevations. Winter is the driest season in New Mexico, when precipitation is primarily a result of frontal activity associated with Pacific Ocean storms that move across the country from west to east. Much of this precipitation falls as snow in mountain areas. Wind speeds across New Mexico are usually moderate. However, relatively strong and unpredictable winds can accompany frontal activity during the late winter and spring. Wind direction is typically from the southwest (SWCA 2008).

In recent years, a region-wide and persistent drought has affected the Pueblo. This lack of moisture has diminished stream flows and has even led to the Rio Pueblo (Tuahtah bahnah) drying up during 2002 (World Heritage Site Report). This drought has also affected the Pueblo's standing forest and bosque (arroyo) vegetation by decreasing foliar fuel moisture and increasing tree crown flammability. Further discussion of vegetation condition and fuels can be found below.

1.3 Governmental Structure

Taos Pueblo is a self- governing sovereign community that has resided at its present location and in its surrounding aboriginal area of occupation since time immemorial. The Village of Taos Pueblo is the spiritual and physical core of the people. Individual components of the Pueblo structures may be owned by or assigned to families or individuals but in its entirety, is owned by the community as a whole. The Pueblo's governing and cultural structure determines and makes decisions that affect the village, the facilities, the activities, and way of life in order to preserve the spiritual and physical integrity of the place as a whole.

Governmental administration is composed of the Governor's Office and its ten appointed officials, the War Chief's Office and its 12 appointed officials, and the Tribal Council of over fifty cultural leaders and former tribal officials. The Governor and War Chief's Office staffs are appointed for one-year terms and Tribal Council membership is for life. Specifically, the Governor's Office is responsible for the day-to-day management and protection of the property. The cultural importance of the village and structures and their use for such purposes obligates the people and its governing body to ensure proper management.

Although the property is under the direct management of the Pueblo governing body, its protection is supported by its status as a National Historic Landmark, a World Heritage Site (WHS), and as a site listed on the National Register of Historic Places with protective measures outlined by the National Historic Preservation Act of 1966, as amended (WHS Periodic Report, Pueblo De Taos 2005).

The protection of tribal lands is the responsibility of the Taos Pueblo War Chief's Office, who traditionally has the responsibility for the physical protection of Taos Pueblo, its lands, resources and people. Individual and family property owners maintain the historic structures on a yearly basis, as is customary. The tribal government has overall responsibility to maintain historic and customary standards, but individuals are responsible for the maintenance of individual homes. Full time residents number approximately 2,500 individuals that live within the boundary of the Pueblo. The community's popularity is reflected in numbers of visitors to the Old Plaza, which in past years has exceeded 90,000 from all over the world.

2.0 COMMUNITY OUTREACH, COLLABORATION AND ONGOING WORK

In 2003 the U.S. Congress passed and President Bush signed into law the Healthy Forest Restoration Act (HFRA) (Public Law 108148). The HFRA directs the planning and implementation of hazardous fuels reduction projects on private, state, and federal land and emphasizes the need for agencies to work collaboratively with communities. A key component of the HFRA is the development of CWPPs, which facilitates the collaboration between agencies and communities in order to develop hazardous fuels reduction projects and place priorities on treatment areas identified by communities. A CWPP also allows communities to establish their own definition of the WUI. Communities with an established CWPP will be given priority for funding of hazardous fuels reduction projects carried out in accordance with the HFRA.

2.1 Core team and Community Involvement

A core team for Taos Pueblo was convened to direct the CWPP development process and to solicit public input (see below). The core team consists of representatives of the Natural Resources Division, the Warchief's Office, the Environment Department, Bureau of Indian Affairs (Northern Pueblos Agency), New Mexico State Forestry Cimarron District, and the contractor and GIS specialist who prepared the CWPP and thematic maps which support this document.

It is important to note that invitations to both the core team and community meetings were sent either by email or phone message by the incumbent Taos Pueblo DNR Wildland Fire Coordinator (documentation is not available). Included were the U.S. Forest Service Carson NF, Bureau of Land Management Taos Field Office, and the New Mexico State Forestry Cimarron District (whom attended several meetings). Unfortunately, the Taos Pueblo Volunteer Fire Department was without an incumbent Fire Chief during the planning process. It is not known whether an invitation was sent to the Taos Volunteer FD.

A meeting of primarily tribal members and leadership and several other individuals was held on March 6, 2008.

The meeting started with an open house period during which members of the Tribe and general public had an opportunity to view maps on the wall. A PowerPoint presentation outlined the goals and objectives of the Taos Pueblo CWPP and provided details of the

steps involved in the planning process. A facilitated discussion about existing fire protection status, values at risk, and needs of the public followed. Notes from the meeting were recorded for later analysis. A questionnaire was handed out to those attending, seeking feedback on attitudes towards wildfire threats to their homes, adequacy of suppression resources locally, and other issues related to individual community members' well being with respect to the fire threat. Responses have been incorporated into the plan.

A second public meeting which also included core team meeting was held on Feb. 19, 2009 at the Department of Natural Resources building, Taos Pueblo.

A third, follow-up meeting with community members, homeowners, and collaborating agencies was held on March 16, 2009 at the DNR Building, Taos Pueblo. This meeting was preceded by a core team session to review and discussion of the revised draft CWPP.

Requests for comments and participant sign-up sheets were circulated at all meetings. These are now on file in the Taos Pueblo DNR office, Taos, New Mexico.

2.2 Relationship to Other CWPP's and Plan Update

This plan, when approved, will become part of a series of CWPP's that are intended to provide close coordination and collaboration on dealing with issues of wildfire risk facing area communities and towns.

Enchanted Circle Regional Community Wildfire Protection Plan (2006): The planning area for this Protection Zone overlays and incorporates parts of Colfax and Taos Counties, and the incorporated municipalities of Angel Fire, Eagle Nest, Taos, Taos Ski Valley, Questa and Red River. It also includes the Pueblos of Taos and Picuris Pueblo. As of this writing, there are no fuels modification projects planned per this CWPP near or on Taos Pueblo boundary.

Colfax County CWPP: east of the Taos Pueblo is the Taos Pines Unit, located within approximately one mile east of the boundary with the Pueblo. BLM is the major management agency. There are no listed projects in this Plan that would affect Taos Pueblo lands at this time; however, the potential for future joint fuels mitigation work exists.

2.3 Existing Fuels Treatment Projects

There are two existing fuels mitigation projects located within and/or on the Pueblo boundaries:

Fuelbreak Name	Location	Description	Status
Goat Springs	South Boundary Taos	Approx. 0.75 mi.	Partially

	Pueblo; borders Carson National Forest	length; width varies with tree canopy height; pinyon-juniper/shrub fuel type	completed; will be connected with proposed fuelbreak (see Table 12)
White Rock Road	North Community Taos Pueblo (from Plaza northward, following eastern edge of White Rock Road	Approx. 2.5 mi. length; width averages 2 chains (120 ft.); pinyon-juniper fuel type	Partially completed; will be connected with proposed fuelbreak (see Table 12)

Goat Springs Pile burn 2008

Goat Springs South Boundary

Vegetation and other tree species bordering South Community

3.0 VEGETATION TYPES, FIRE HISTORY, FUELS AND FIRE BEHAVIOR

3.1 Vegetation Types

The following is a general discussion of major vegetation types and how fire helped shape them at various elevational gradients on Pueblo lands. It is only an introduction to plant cover types, and provides a foundation for later discussion of fuels and fire behavior.

Pinyon-pine and/or one-seed juniper (*J. monosperma*) dominate much of the existing forestland at the lower to mid-elevations. Rocky Mountain juniper (*J. scopulorum*) may co-dominate or replace one-seed juniper in higher elevations. Understory vegetative layers are variable and may be dominated by shrubs or graminoids, or may be absent. Species may include blue grama, James's galleta, Arizona fescue (*F. arizonica*), Bigelow sage (*A. biglovii*), mountain mahogany (*Cercocarpus montanus*), and Gambel oak (*Quercus gambelii*).

Ponderosa pine forests occur in areas on all slopes and aspects in all watersheds above an elevation of approximately 9,000 feet in the transition from pinyon-juniper woodlands to ponderosa pine communities. Ponderosa pine is the predominant conifer in these forests; however, Douglas-fir (*Pseudotsuga menziesii*), pinyon pine, one-seed and Rocky Mountain juniper may also be present in the sub-canopy. The understory of most conifer forest is usually shrub type and usually includes species such as big sagebrush, mountain mahogany, wild rose (*Rosa* spp.), Gambel oak, and snowberry (*Symphoricarpos* sp.). Common graminoids including needle and thread grass, fescue, muhly, and grama grass species. The higher elevations or north-facing slopes are a combination of aspen and mixed conifer, primarily Douglas fir, Englemann spruce, and sub-alpine fir.

Much of the lower elevation, grassland-dominated landscape has been altered from early history by tilling land for crops such as maize and squash; homes, corrals, and other structures constructed from wood and bark; and collecting plant materials for crafts, utensils, and tools. In the past, many tribes used fire as a tool to open land for agricultural use, hunting, or travel; to drive game for hunting; to promote desirable post-fire herbaceous vegetation; or for managing the land for habitat protection and resource use (Scurlock 1998).

Where early land use activities have not occurred, much of the plant cover consists of sagebrush and grasses, with exception of Rio Pueblo bosque, bordered on the northwest by Hail Creek Road and Veteran's Highway. Bosque vegetation is primarily riparian, and consists of cottonwood, willow, New Mexico locust, tamarisk ("saltcedar"), New Mexico olive, and an assortment of small shrubs, forbs, and grasses in the understory.

3.2 Fire History

Numerous fire history studies show conclusively that frequent and periodic fires have shaped and influenced vegetative succession throughout the southwest. The ponderosa

pine forests, fire-adapted and fire dependent, have been slowly and steadily declining in vigor and health since natural fire regimes were interrupted over 100 years ago. Without periodic, low-intensity fires to cycle nutrients back into soils and keep the forests open and park-like, wildfires today are much more destructive (see section 2.4 below). Dog-haired thickets of stagnate pines and other species now present stand-replacement crownfire conditions during high fire danger periods. The fire histories of pinyon-juniper woodlands and pinyon-juniper savannah are more complex. Trees in these woodlands and savannahs are generally increasing in density and expanding into adjoining sagebrush shrublands and grasslands. It is suspected that a combination of fire exclusion, livestock grazing, and climatic fluctuations may be causal factors.

Reported and recorded wildland fires within a ten-year period (1994-2003) are outlined in the table below (data from BIA, Northern Pueblos Agency).

Table 1. Fire History, Taos Pueblo (1994-2003).

Year	Name	Legal Description	Remarks
1994	Deerpond	T25N R15E	
1994	Antifreeze	Unk	
1994	Lumber	T25N R13E	
1994	Big Tree	T26N R13E	
1994	Dry Creek	Unk	250 ac. in WUI
1995	Two Car	T26N R13E	
1995	Newfield	T26N R15E	
1995	Winters	T26N R15E	
1995	Mirabal	T25N R12E	
1996	Jimmy	T25N R12E	
1996	Lookout	Unk	53 ac. in WUI
1998	Cane	T26N R13E	Natural Out
1998	Forester	T26N R13E	
2000	Rocky	T25N R13E	
2001	Rio Pueblo	Unk	
2002	Snowflake	T25N R15E	
2003	Toenail	Unk	
2003	Aspen	Unk	
2003	Ditch	Unk	
2003	Encebado	Unk	5,373 ac. in WUI

3.3 Fuels and Fire Behavior Overview

An overview of fire behavior begins with a discussion of wildland fuels, defined here as any combustible vegetation. The term fuel refers to the live and dead vegetation available to burn that can carry a fire across the landscape. Determinants of fire behavior and combustibility include the horizontal and vertical continuity of the fuel bed, percent live

versus dead, amount and distribution of fuels, dead fuel loading (amount in pounds or tons per acre), and fuel moistures of both live and dead vegetation.

Wildland fire managers recognize three general types of wildland fire behavior, depending on the strata of fuel (i.e., ground, surface, aerial) in which the fire is burning.

A *ground fire* is one that burns in litter, duff, organic soils, roots, and rotten buried logs. Ground fires burn with very low spread rates but can be sustained at relatively high moisture contents. Fuel consumption can be of concern due to significant injury to trees and shrubs. Although ground fuels can be ignited directly, they are most commonly ignited by a passing surface fire. Typical fire behavior under pinyon-juniper canopy is creeping ground and surface fire due to the tight needle litter compaction.

A *surface fire* is one that burns on the surface fuel layer, which lies immediately above ground fuels but below the canopy, or aerial, fuels. Surface fuels include needles, leaves, grass, dead and down branch wood and logs, shrubs, low brush, and understory trees. Surface fire behavior varies widely depending on the type, continuity, loading, and arrangement of fuels. Most prescribed fires are of the low to moderate intensity surface fire with occasional torching of individual or small tree groups.

A *crown fire* is one that burns in the elevated canopy (aerial) fuels. Aerial fuels normally consist of the live and dead foliage, lichen, and fine live and dead branch wood found in a forest canopy. Crown fires generally have higher moisture content than surface fuels. Three types of crown fire are generally recognized: passive, active, and independent.

During a **passive crown fire**, also called torching or candling, individual or small groups of trees torch out, but solid flame is not consistently maintained in the canopy. Embers lofted during passive crowning can start new fires (spot fires) downwind, which makes containment more difficult and increases the overall rate of fire growth or spread.

During an **active crown fire**, also called a running or continuous crown fire, surface and aerial fuels become involved. However, the crowning phase remains dependent on heat from the surface fuels for continued spread. Active crown fires are characterized by flame that extends from the fuel bed surface through the top of the canopy. Greatly increased radiation (i.e., pre-heating of unburned fuels) and short-range spotting (ignitions from blowing embers/fire brands ahead of the flaming front of the fire) lead to spread rates much higher than would occur if the fire remained on the surface. Medium- and long-range spotting associated with active crowning leads to even greater rates of fire growth.

An **independent crown fire** is one that burns in aerial fuels without the aid of a supporting surface fire. Independent crown fires rarely occur and are commonly short lived. They require a combination of steep slope, high wind speed, closed vegetation canopy, and low foliar moisture content.

A **spot fire** ("spotting") is one that ignites outside and downwind or upslope of the main fire. Embers that lift from burning vegetation, normally consisting of tree bark, cone bracts, needle and leaf segments, and other materials that can carry heat, provide the ignition source. Another required condition is that of a receptive fuel bed for the ember to

ignite. Punky (rotten) log material, dense grass, needle/leaf litter, and ignitable materials (e.g., wood shake roofs) are examples. Long-range spotting can extend well over 1 mile, but normal spotting distances are within 0.5 mile from the main fire.

Fire behavior overall has changed during the last 10 to 20 years. As noted above, historical wildland fires were generally low-intensity surface fires in which surface fuels were lighter and occasional torching and short duration crown fire runs occurred in dense thickets. Today, however, extreme fire behavior with very high surface intensities, rates of spread, profuse spotting, and stand-replacement crown fires are considered the norm. A consequence of these changes is that firefighters are increasingly being injured and killed and homes ignited in large numbers.

Fuels and Fuel Models Influencing Fire Behavior

Wildland fuels are considered to be the most critical element in the fire hazard assessment process. As such, fire managers have a number of tools available to quantify various fuels into groups (ie, grass, brush, timber litter, and slash), each having unique fire behavior responses under a given set of environmental conditions.

Fuels were described using the 13 National Forest Fire Laboratory (NFFL) fire behavior fuel models. The assessment assumes that fuels are burning under "worst case" conditions, and thus has the highest negative impact to human safety and property. The models observed in WUI Assessment are described in Table 1 below.

Grassland and sagebrush fuels (NFFL Models 1, 5): fires occurring in the Pueblo lowlands and sagebrush steppe have the potential to move quickly under dry, windy and steep conditions and can easily spread at a surprisingly rapid rate, often reaching over 300 feet per minute. Resistance to control is high under extreme fire behavior conditions. These type fires can easily encroach on the community before sufficient suppression resources can control them.

Bosque fuels (NFFL 1, 5, 6 and 4 (with dense fuels and high winds)): fires that burn in surface grasses, forbs, shrubs, and trees can suddenly increase in intensity with wind alignments and low humidity conditions. If ladder fuels are present, crownfires can quickly establish and control efforts severely hampered. Each year the Rio Grande bosque ignites and high spread rates with flame-lengths exceeding 40-60 feet, spotting and crowning can give firefighters problems with control until nightfall when conditions calm down. Similar conditions could exist along the Rio Pueblo bosque.

Pinyon pines and junipers (NFFL 8 & 4 ((closed canopy w/high winds, steep slopes)): fuels occur on the lower slopes east of the community produce relatively small volumes of litter; thus understory fuels, either living or dead, must be sufficiently contiguous to carry a low-intensity surface fire. Fires that spread beyond individual trees are most likely wind-driven on steep slopes and spread from crown to crown often with profuse medium to long range spotting.

Ponderosa pine (NFFL 2, 9 and 10 ((dense, stagnating stands w/heavy surface dead/down surface fuels)) are scattered throughout the watershed in the mid to higher elevations and occur in areas that have steeper topography. These stands can exist as dense stands "doghair thickets") with an understory of younger trees and grasses, increasing the likelihood for a fire to be lifted into the canopy. In areas where the forest canopy is continuously spaced less than 20 feet apart, the hazard of a sustained crown fire with long-range spotting has a high potential to develop.

Mixed conifer forests (NFFL 8, 9, & 10): those near timberline, can exhibit high fire behavior only under extreme conditions. The generally moist fuels under typical fire season conditions when ignited burn somewhat slowly, carry inconsistently, and often self-extinguish into rock outcroppings or other natural fuelbreaks.

Table 2. NFFL Fuel Model Descriptions and Potential Fire Behavior.

Fuel Group / NFFL Fuel Model	Description	Potential Fire Behavior
Light—NFFL 1, 2, 5, 8	1=grass 2=timber/grass/litter understory (i.e., ponderosa pine) 5=low shrubs 8= short-needled conifer litter (i.e., open pinyon-juniper stands)	Surface fire, low to moderate intensity depending on fuels characteristics (see Section 3.2); some spot fires under high wind conditions
Medium—NFFL 6, 9	9=long-needle conifer/needle litter (i.e., ponderosa pine) 6=dormant shrub (i.e., bosque)	Surface fire to intermittent crown fire (torching) to moderate to high intensity with spot fires and ember wash
Heavy—NFFL 4, 10	4=large dense brush; closed-canopy stands, dense bosque (high wind) or closed pinyon-juniper (high wind, steep slope) 10=heavy dead-down woody material under conifer canopy (decadent ponderosa stands)	Low to high intensity surface fire to sustained crown fire with numerous spot fires and heavy ember wash with high winds

4.0 FIRE RISK AND HAZARD ASSESSMENT

Risk refers to the potential and frequency with which wildfire ignitions might occur; this is determined by looking at historical ignitions over the past 10 years, both on the record and from local knowledge. Increasing encroachment of the built environment into the natural environment is another important consideration.

Hazard refers to those conditions of fuels, topography, and other environmental conditions, as well as the relative degree of defensibility that often affect the behavior of fires within the interface.

There are other significant community values at risk aside from homes and community infrastructure. Among these are: forest health, emotional and spiritual attachments, wildlife habitat, cultural resources, recreational areas and corridors, public health, and

citizen confidence in the capabilities of the fire services and in government. Additionally, there are social factors such as community/fire department fire prevention programs, water sources, firefighter training and readiness, safety zones, public education/training, and economic impacts. Many of these factors fall beyond the scope of this assessment, but will be addressed in recommendations for public education and awareness, improving fire response capabilities and reduction of structural ignitability (SWCA & WFA 2008).

The Encebado fire gave rise to a larger and persistent concern among local fire managers; a growing concern over recent years that fires under high severity conditions have become larger, more intense, and more resistant to control. Hence, downwind assets are increasingly vulnerable to destruction.

Lightning ignitions have been common throughout monsoon season, and typically occur from July through August and often into September. Most of these fires are detected early and suppressed before they grow large. However, depending on fire environment conditions and initial attack response times, they may spread rapidly across a sizable area, becoming difficult to suppress before they are effectively controlled. Moreover, an increasing concern of residents in the Taos Pueblo WUI is a growing number of human ignitions, particularly along roads and in and around residences.

The following section describes the assessment approach and methodology used at Taos Pueblo to determine priority hazardous areas.

4.1 Hazard Assessment Methodology

The methodology employed for the Taos Pueblo risk assessment is a combination of 1) Completion of a field inspection utilizing an established hazard assessment form that involves a numerical rating system of fire environment and defensibility of values at risk; 2) from discussions with core team members, primarily tribal members' long-term "institutional" knowledge of hazards and risks within the Pueblo; 3) various reports and documents provided to the author, and 4) the author's technical expertise. Maps were generated that denote the WUI boundary (see Appendix A) and other information relating to existing hazards.

4.1.1 Hazard Assessment Form – Part 1

Much of the following description of the Hazard Assessment Form was taken from the Draft CWPP for Santa Fe County (2008).

Part 1 of the hazard assessment is wildland *fire environment*, defined for purposes here as the interaction of fuels, weather, and topography. However, the weather component of the fire environment was not included in the assessment due to its wide variation and changeability. The assumption used in the ratings were for average worst fire weather conditions in northern New Mexico; typically April, May, June, and July, prior to summer monsoons.

Part 1 consists of the following rating criteria:

Fuel Hazard. Wildland fuels are considered the variable most critical to the fire hazard assessment process, but are also often the most difficult to describe. The assessment assumes these fuels burning under "worst-case" conditions, or in terms of the highest negative impact to human safety and property resulting from a wildland fire. Refer to Table 1 above, which describes the fuel models selected for this assessment.

Slope. Wildland fires tend to spread faster uphill due to factors such as pre-heating of fuels upslope by bending flames. Therefore, steepness of slope was expressed in percent and described generally as flat to mild (0-9.9%), mild to medium 10-19.9%), medium to moderate (20-39.9%), and moderate to extreme (40 % +).

Special Hazards. Condition of the vegetation (drought, diseased, or insect-killed trees) was rated along with special topographical features affecting fire behavior such as steep canyons, chutes and chimneys (very steep and narrow drainages). Note here that insect-killed trees (pinyon and ponderosa pine) have dropped needles, and therefore may represent a varying degree of <u>decreased</u> fuel hazard on the landscape.

4.1.2 Hazard Assessment Form – Part 2

Part 2 of the form considers *Defensibility*, which describes the relative ease or difficulty that firefighters would encounter while attempting to defend a house or group of houses.

Four conditions considered as key to defensibility, and were rated as follows:

Access. This criteria describes the relative length of dead-end road encountered by responding fire department or agency, ranging from less than 600 ft. to greater than 1,320 ft., and incorporates such special factors as road/driveway width and slope, turnouts, turnarounds, bridge conditions, etc.

Structure Type. This criteria includes a general overview of roof and siding flammability, averaged for different locations within the Pueblo community.

Defensible space (see section 4.2). Subjective ratings were assigned based on the question: is there adequate clearance between structures and flammable vegetation? Defensible space provides room for the firefighters to do their jobs.

Water Availability. This factor relates to types and amounts of water available to adequately defend a structure and suppress wildland fire in the WUI. Well water is generally not as efficient nor plentiful as the Taos Pueblo Community water system. Also, water tanks can be helpful if they are plumbed to support engines and have adequate clearance from flammable fuels.

Other assessment factors can exist, such as a working community/fire department fire prevention partnership and programs, continued fire protection resource development, firefighter training and readiness, established safety zones, public education/training, and possible economic impacts. Many of these factors fall beyond the scope of the assessment

but will be addressed in recommendations for public education and awareness, improving fire response capabilities and structural ignitability reduction. However, information on empirical (experience based) knowledge of existing hazards from wildfire came from core team members and comments made at the community meetings. This information was also factored in to the final analysis below.

This analysis assumes no resource benefits from wildfire and equates exposure with a combination of public safety and property.

4.2 CVAR: Community Values at Risk

CVAR comprise elements of the Pueblo that are of value, which could suffer damage or loss during a wildfire. These could include, but are not limited to, natural resource (includes wildlife) values, cultural values, spiritual values, infrastructure, watershed and wilderness, businesses, and internal tribal concerns.

During the community meetings and core team meetings, most of the CVAR listed above and included in Tables 3 – 7 below were mentioned as being important to protect. Thus, CVAR also served to drive recommended treatments found in Section 5.0.

4.3 Hazard/Risk Assessment Results and Narration.

This section and Tables 3-7 denotes priority community and/or other WUI hazard areas on Taos Pueblo lands, along with fuels and fire behavior narratives presented for each.

Note that the adjective ratings (High, Medium) were determined from the Hazard score for each area assessed. Note that there were no ratings of "low" assigned. Any extenuating circumstances were factored in with explanations to arrive at a total. The two parts were totaled and each was assigned a hazard class rating. The highest rating, determined by rating score, was selected to represent the community group.

The following points and corresponding hazard class rating system is shown here:

Table 3. Adjective Ratings determined from Risk Assessment points.

HAZARD/RISK ASSESSMENT "ADJECTIVE RATING"	PART 1 – FIRE ENVIRONMENT (Rating Points)	PART 2 – DEFENSIBILITY (Rating Points)	TOTAL HAZARD SCORE
Moderate	<8	<7	<15
High	≥8	≥7	≥15
Total Points Possible	20	16	36

The following tables (Table 4-7) are intended to show levels and types of hazard/risk for each area assessed and scored according to the criteria outlined in the table above; and below each table, a narrative of conditions observed in the field.

Table 4. Hazard Rating HIGH (#1): **Rio Pueblo Bosque Community**

Hazard/Risk Assessment "Priority & Adjective Rating"	Area & Community Values at Risk (CVAR)	Location, Area & Map Reference	Hazard Score & Remarks
#1 **HAZARD: HIGH**	***Rio Pueblo Bosque Community*** CVARS: • Water resources (Rio Pueblo) • Mature cottonwoods • Riparian corridors along Rio Pueblo • Native species • Wildlife habitat • Habitat for endangered species • Air quality • Utilities (power and communication • Water supply and treatment sites • Bridges • Roads and trails • Bosque/riverine infrastructure • Residential housing • Community facilities • Agricultural land • Livestock • Security and privacy • Historic churches • Historic plaza buildings recognized on the National Register and as a WHS • Traditional irrigated agricultural lands and their corresponding acequia systems and acequia components and structures • Pre-historic and historic Pueblo sites	From SW Pueblo boundary/Hail Cr. Rd to Star Rd., width varies, thence northeast along Rio Pueblo to Old Pueblo Plaza; thence northeast along Rio Pueblo to canyon mouth (vegetation type change) **Map: Appendix A-3**	***Score: 21*** Structure density (approximately 76 homes), high-extreme continuous fuel hazard, potential for human-caused wildfire & exposure rating highest on the Pueblo; defensibility poor to fair most structures; observed fuels (ie, grasses, shrubs, trees, woodpiles) against the sides of houses. Roofs of over half the houses are of flammable construction materials; leaf and needle litter accumulations on roofs and eaves observed. Many homes and yards under extreme fire behavior conditions present entrapment situations. Driveways are narrow or have heavy fuels both sides. Powerlines could fail and fall as poles are burned.

The following narrative is from field observations performed within each rated community or area, noting vegetation, special conditions, fuels (including NFFL Fuel Model[s]), expected fire behavior, slope and other terrain features, and defensibility.

Table 4a. Narrative #1 – Rio Pueblo Bosque Community

#1: RIO PUEBLO BOSQUE COMMUNITY (HIGH)
NARRATIVE
Vegetation: cottonwood, willow, & exotic tree & shrub density heavy (over 6 ft. tall) in bosque; grass-shrub understory continuous throughout bottomland; dead-down woody materials also present *Fuels/Expected Fire Behavior*: in extreme fire weather conditions NFFL Model 4 (involving live, dead, and fine woody fuels) would represent greatest threat; where alignment of all strata of bosque fuels with high wind (>15 mph) and low fine fuel moistures (<5%) occur, fire behavior produced could reach independent and sustained crownfire conditions. Otherwise, under "normal" fire weather conditions, Fuel Models 1, 5, or 6 (low to high resistance to control depending on fuel moisture and wind conditions) are considered. Without winds or higher fine fuel moisture, resistance to control decreases dramatically in bosque fuels. *Slope/Aspect:* slopes range from 0-5%; aspect mainly west. *Defensibility:* fair to poor depending on fire behavior; access can be difficult to impossible due to few turnouts, narrow surfaces, and no turnaround space; entrapment potential exists on driveways and roads; without defensible space, several structures may be passed up by fire crews under high severity conditions. (See also Table 4 above)

Bosque Residence

Table 5. Hazard Rating HIGH (#2): **South Community**

Hazard/Risk Assessment "Priority & Adjective Rating"	Area & Community Values at Risk (CVAR)	Location, Area & Map Reference	Hazard Score & Remarks
#2 **Hazard: HIGH**	***South Community*** CVAR: • Native vegetation • Wildlife habitat in Bosque at risk • Air quality • Utilities (power and communication • Water supply and treatment sites in and around Bosque • Bridges • Roads/social trails • Residential housing • Community facilities • Agricultural plots in the Bosque and adjacent areas • Livestock • Security and privacy • Traditional irrigated agricultural lands and their corresponding acequia systems and acequia components and structures • Pre-historic and historic Pueblo sites • Natural resource values, roads, and wilderness	Community and associated Infrastructure from Rio Pueblo bosque southeast to Spider Rock and Grinding Stone Roads; thence into wildlands to Pueblo boundary Map, Appendix A-3	***Score: 19*** Continuous brush/grass fuels over large area in lower portions, grading into P-J woodland and mixed conifer forest with wilderness values beyond; secondary fuelbreak in planning stage Pre-CWPP (see map A-3).

The following narrative is from field observations performed within each rated community or area, noting vegetation, special conditions, fuels (including NFFL Fuel Model[s]), expected fire behavior, slope and other terrain features, and defensibility.

Table 5a. Narrative #2 – South Community

#2: SOUTH COMMUNITY (HIGH)
NARRATIVE
Vegetation: hardwoods, pinon-juniper, grasses, shrubs, and forbs. *Fuels/Expected Fire Behavior*: fuels (NFFL 1, 5, & 6 w/high winds) are flashy and discontinuous in areas; resistance to control low to moderate, except higher under windy conditions (>10 mph midflame); low wind conditions would result in creeping spread to short intermittent surface runs with low flamelengths (<2 ft.) *Slope/Aspect:* slopes range from 0-5%; aspect mainly west to slightly northwest. *Defensibility:* where yards are not made defensible, structures are at greater risk of ignition; access is fair in most areas. Escape routes for homeowners and general public may be blocked in some locations; fuels around homes/defensible space is variable from no defensible space to fully cleared to 30+ ft. from structure; many structures are at risk from dead trees falling on rooftops during fire, heavy winds, or post-fire weakened trees failing. Residents south of Plaza could become entrapped due to road congestion, panic, or those that choose to stay in homes as wildfire approaches from south or southeast forested lands.

South Community

Table 6. Hazard Rating HIGH (#3): **North Community**

Hazard/Risk Assessment "Priority & Adjective Rating"	Area & Community Values at Risk (CVAR)	Location & Map Reference	Hazard Score & Remarks
#3 **Hazard: HIGH**	***North Community*** CVAR: (See Above)	South and west of White Rock Rd. to western WUI boundary; north and east to watershed Map, Appendix A-3	***Score: 18*** Homes along Rio Lucero Rd., Pasture Rd., Dry Creek Rd., and Sunny Lane & Rabbit Lane to western boundary, with infrastructure, ditches, powerlines; thence east into P-J woodland and conifer forest/watershed values beyond.

The following narrative is from field observations performed within each rated community or area, noting vegetation, special conditions, fuels (including NFFL Fuel Model[s]), expected fire behavior, slope and other terrain features, and defensibility.

Table 6a. Narrative #3 – North Community

#3: NORTH COMMUNITY (HIGH)
NARRATIVE
Vegetation: P-J, sagebrush, grasslands, agricultural, Bosque *Fuels/Expected Fire Behavior*: where fuels are continuous in NFFL Models 1 & 5 or 6 (high wind), fire could carry into developed areas rapidly with sustained wind >10 mph midflame and low fuel moistures could increase spread rates significantly; otherwise fire would drop to surface litter with light winds. *Slope/Aspect:* slopes range from 0-5%; aspect mainly west. *Defensibility:* access to most structures is fair to good in most areas; with yard cleanup and fuels work in the local area, defensibility should be effective in most cases except where resources are limited under extreme conditions (wooden ditch structures and other outlier values may be difficult to defend). See also Table 6 above.

North Community (Hidden springs, Gato, North rock rd.)

North Community residential (estimated 30 – 40 homes along base of mountain)

Table 7. Hazard Rating HIGH (#4): **North Pueblo Mountain Watershed**

Hazard/Risk Assessment "Priority & Adjective Rating"	Area & Community Values at Risk (CVAR)	Location & Map Reference	Hazard Score & Remarks
#4 **Hazard: HIGH**	***North Pueblo Mountain Watershed*** CVAR: • Native vegetation • Wildlife habitat • Air quality • Water supply • Bridges • Roads/social trails • Residential housing • Community facilities • Agricultural plots • Livestock • Security and privacy • Traditional irrigated agricultural lands and their corresponding acequia systems and acequia components and structures • Pre-historic and historic Pueblo sites	Infrastructure east of Plaza to 1½ miles beyond WUI boundary and watershed north of North Pueblo Canyon Rd.) Map, Appendix A-3	***Score: 17*** Homes and infrastructure east of Old Plaza, ditches, and Pueblo Canyon watershed at risk (Includes North Pueblo Mountain Watershed and Blue Lake Wilderness; infrastructure/cultural sites east of Plaza)

The following narrative is from field observations performed within each rated community or area, noting vegetation, special conditions, fuels (including NFFL Fuel Model[s]), expected fire behavior, slope and other terrain features, and defensibility.

Table 7a. Narrative #4 – North Pueblo Mountain Watershed

#4: NORTH PUEBLO MOUNTAIN WATERSHED (HIGH)
NARRATIVE
Vegetation: predominate overstory cover is pinyon-juniper with some pure juniper stands at the toe of slopes. P-J woodland grades into sagebrush, grassland, and agricultural vegetation west of White Rock Road. *Fuels/Expected Fire Behavior*: resistance to control rises sharply under high winds and drought conditions where sustained crownfire is likely in dried out, dense tree foliage (fire

behavior similar to an NFFL Model 4 brush). Where fire drops out of crowns, behavior is mostly creep in needle litter and dead-down woody branchwood. Otherwise, moderate to low spread rates and flamelengths can generally be expected on the sagebrush flats where fire is confined to surface fuels.

Slope/Aspect: slopes range from 5-30+%; aspect mainly west on lower portions of watershed

Defensibility: fair to good along White Rock Road with moderate fire behavior; Hidden Springs Lane similar once fuels work is accomplished; ditches with wooden structures may become vulnerable to spot fires, and defensibility would be difficult under extreme conditions.

5.0 MITIGATION RECOMMENDATIONS

Recommended fuels reduction and mitigation need to have clear and attainable objectives. There should also be clear differentiation between fuels treatments that are designed to reduce fire impact on the community and associated values at risk, and forest restoration treatments. The number one priority and focus of the Taos Pueblo fuels treatment and mitigation program is the protection of life and property.

5.1 Mitigation Objectives

1. To reduce the frequency and intensity of bosque wildfires;

2. To remove live, and dead and down exotic and invasive trees to the extent possible.

3. Thin trees to prevent development of and sustained crownfire in the pinyon-juniper woodland that can threaten watershed and wilderness values.

4. Where feasible, create an irregular woodland patch mosaic with relatively large, interspersed open spaces (to encourage native understory grasslands and shrublands).

5. Encourage use of citizen volunteers to assist with mitigation of the Rio Pueblo bosque community from wildfire threat.

6. Conduct all mitigation projects and followup treatments in an integrated and ecosystem-based manner, and monitor changes over the long-term.

In addition to ecological benefits of fuels reduction work, residents (and visitors to the Pueblo) will recognize positive changes in landscape appearance. For example, as thinning opens the dense and often stagnating forest and bosque canopy and allows sunlight to reach the surface, many native species of grasses, shrubs, and flowering plants will begin to appear. Thus, while fuels treatments provide for long-term protection of life and other values at risk, there would be the added value of enhancing the appearance of the Pueblos' vegetative communities.

5.2 What is Defensible Space?

Recommendations for creating defensible space are available online at www.firewise.com. Typically, defensible space width will vary by slope steepness and fuel type. For example, remove and/or reduce fuels and dead materials to approximately 30 feet (minimum) of clearance away from the eaves of residential structures. This clearance can likely increase as slope steepness increases.

Heavier fuels may require additional work to chunk and dispose of woody materials, periodic weed-eating by machine, raking of leaf and needle litter, and pruning of selected trees in the yard and along driveways. Remove all dead vegetation and other flammable materials a minimum of five feet from the exterior of the structure.

Another critical preventive measure in defensible space is to store firewood a minimum of thirty feet distance from any structure.

Mow or remove brush growing against fences in the community. The minimum distance for clearance should be ten feet in grass and 25 feet in brush.

Maintain areas under wood decks and porches free of weeds and other flammable debris. Enclose these areas when possible. Box in eves and cover attic and other ventilation openings with very fine metal wire mesh to prevent embers from entering the attic or crawl space.

Immediately dispose of cleared vegetation when implementing defensible space treatments. This material dries quickly and poses a fire hazard if left on site.
Clear all vegetation and combustible materials around propane tanks for a minimum distance of ten feet.

Where brush and Russian thistle (tumbleweed) have accumulated in vacant lots or agricultural fields, mow or burn (consult War Chief's Office first) to remove the fuel load. Mowing and/or burning will need to be repeated in the following years to ensure that the seed bank has been depleted.

5.3 What is a fuelbreak?

A fuel break is a linear opening in the vegetation, of varying width, often with interconnected areas of partially thinned and/or removed fuels that give firefighters a relatively safe location to defend from an approaching wildfire. Generally, the width of a fuel break must be, at a minimum, 1½ times the height of adjacent fuel; and near residential areas with flammable roofs, a 100-ft break is a rule of thumb. Also, "Feathering" fuels near the break (progressively reducing fuel density toward the break) makes the break functionally wider.

A fuelbreak can be utilized as either a direct or indirect fireline. However, burning out from a fuelbreak close to residential areas or on steep slopes is not recommended but in the most extreme emergency situations where few options remain.

There has been much confusion between the terms “fuelbreak” and “firebreak”. A firebreak is a strip of land, 20 feet to several hundred feet wide (or more), in which all vegetation is removed down to bare, mineral soil each year prior to fire season.

Within fuelbreaks, brush, heavy surface fuels, and selected dead trees (snags) are disposed of, creating a more open and park-like appearance. Note that fuelbreaks created without consideration of appearance can be visually undesirable. Fuelbreak construction and maintenance must occur with this in mind.

5.3.1 Fuelbreak Guidelines: How Wide?

Under the Healthy Forest Restoration Act (HFRA) a fuelbreak may, under certain conditions in the Act, extend out from the WUI boundary ½ to 1½ miles. The Natural Resources Office would determine actual buffer (fuelbreak) width, given conditions of fuels, terrain, and values at risk on the proposed project area.

Table 8. General Fuelbreak Guidelines

Percent Slope	Typical Minimum Width (ft) -- Uphill	Typical Minimum Width (ft)--Downhill	Total Width of Fuel Treatment (ft)
0 – 10%	150	150	300
10 – 20%	135	180	315
20 – 30%	120	200	320
30 – 40%	110	210	320
40 – 50%*	100	230	330
50% & above*	100	250+	350+

(*Note: Use extreme caution when defending from oncoming fire in heavy fuels with closed canopy)

Access routes and rights-of-way clearance are also important inputs to the overall fuels mitigation strategy. The Office of Natural Resources specialists should consider how much clearance along roadways is adequate to allow for safe evacuation, and to allow fire apparatus unimpeded movement, turnaround space, turnouts, and access to available water.

It is recommended that fuelbreak maintenance in this typically dry environment be considered every 7 to 15 years, depending on the individual site conditions and original treatment intensity. Monitoring data/photos will support the decision-making process.

5.3.2 Existing and Recommended Future Fuelbreaks – Taos Pueblo

The following table outlines ALL existing and future fuelbreaks for Taos Pueblo. Please note that distances are approximate, as are fuelbreak widths. Specific dimensions and condition of existing fuelbreaks will be better defined as individual funding grant requests are prepared from field surveys. The map at the end of Table 9 shows fuelbreak locations.

Table 9. Action Plan for Fuels Treatments, Taos Pueblo.

Project Name & Priority	Location	Project Size	Start Date	Methods, Dimensions & Purpose
RIO PUEBLO BOSQUE COMMUNITY THINNING (H) PRIORITY #1	From SW Pueblo boundary/Hail Cr. Rd to Star Rd., width varies, thence northeast along Rio Pueblo to Old Pueblo Plaza; thence northeast along Rio Pueblo to canyon mouth (vegetation type change) **(Map: Appendix A-3)**	750 acres	2010	• Thinning (700 acres) • Pruning (around infrastructure/values at risk) • Chipping & burning Reduce crown fire potential; provide firefighter safety and access
NORTH PUEBLO MOUNTAIN WATERSHED THINNING (H) PRIORITY #2	From White Rock Rd. & Gato Rd. junction, thence south along White Rock Rd. to Plaza; thence east along northern bndry. of Rio Pueblo Bosque Community Project to WUI boundary; thence north along WUI boundary to Gato Rd.	1,700 acres	2011	• Thinning Reduce crownfire potential; provide protection of watershed within WUI east of community; also, protect community from wildfires on the mountain (ties into fuelbreak Project Priority #6 and fuelbreak Priority #10)
SOUTH COMMUNITY PRIMARY FUELBREAK (H) PRIORITY #3	From South Boundary, thence northward to tie into existing Encebado dozer line	45 acres	2011	Approximately 3 miles long x 60-120 ft. wide; provide firefighter defensible space & prevent continuous crownfire (ie, drop fire to surface to increase controllability)
SOUTH COMMUNITY SECONDARY FUELBREAK (H) PRIORITY #4	From South Boundary tie to existing Goat Springs fuelbreak, thence northeast tie to Encebado dozer line	50 acres	2012	3.5 miles long x 60-120 ft. wide; provide final defensible space should the primary fuelbreak (noted above) be compromised
SOUTH COMMUNITY GOAT SPRINGS EXISTING FUELBREAK MODIFICATION PRIORITY #5	South Boundary	15 acres new construction	2012	Maintain approximately 0.75 mile fuelbreak to original standards; add approx. 0.25 mile length x 60-120 ft width to tie into the South Community Primary/secondary fuelbreaks (listed above); purpose to provide defensible space from wildfires crossing Pueblo boundary to or from Carson National Forest.
NORTH PUEBLO MOUNTAIN	From the east end of Rio Pueblo Bosque			• Fuelbreak Construction 4.0 miles long x 120-180 ft.

WATERSHED FUELBREAK (H) PRIORITY #6	Community project, thence northerly 1.25 mi. to intersect the old Gato (or Hidden Springs Rd.) Rd.; thence westerly for 2.75 miles along Hidden Springs Rd. to tie into White Rock Rd. fuelbreak.	85 acres	2011	wide. This fuelbreak is the final defensive line for fires threatening to enter the watershed & beyond to Blue Lake Wilderness (Caution: firefighter safety may be compromised here during extreme fire behavior periods)
NORTH COMMUNITY FUELBREAK PRIORITY #7	From Rio Lucero mouth (southwest of gaging station), thence southwest along Rd. 3.5 miles; thence west crossing Rio Lucero 0.5 mile; thence southwesterly along North Rd. 1.75 miles to WUI boundary; thence S-SE along WUI 1.25 miles; thence S-SE along the Taos Pueblo western boundary 1.75 mi. to end at Hail Creek Road; approximately 8.75 miles total.	185 acres	2013	Approximately 185 acres & 8.75 miles long x 60-90 ft. wide; provides defensible space for wildfire entering or leaving Pueblo lands (note: fuel type varies widely along proposed fuelbreak)
NORTH COMMUNITY FUELBREAK (H) PRIORITY #8	From Rio Lucero mouth, thence southwest along Rio Lucero bosque approximately 3.5 miles to intersect with junction of primary fuelbreak and Rio Lucero Rd.	85 acres	2013	Approximately 85 acres; 3.5 miles long x 60-100 ft. wide, bosque vegetation. Provides a secondary defensible space for wildfire threat to cross Rio Lucero.
WHITE ROCK ROAD EXISTING FUELBREAK MODIFICATION (H) PRIORITY #9	From Plaza, following White Rock Rd. Northerly for approximately 2.5 miles	15 acres	2014	This partially completed fuelbreak averages 120 ft. wide x 2.5 miles long. To be extended 0.25 mi. north to tie into No. Community primary fuelbreak. Provides defensible space from wildfire crossing White Rock Rd. into/out of north community or watershed
NORTH PUEBLO MOUNTAIN WATERSHED PRIMARY FUELBREAK (H) PRIORITY #10	From north bank of Rio Pueblo and east end of Rio Bosque project area, thence westerly for approximately 2 miles to tie into White Rock Rd. fuelbreak	50 acres	2014	2.0 miles long x 120-180 ft. wide. This fuelbreak would serve to provide defensible space from wildfire entering or leaving the watershed.

5.4 Treatment methods Described

Fuel reduction treatments are applied on a larger scale than defensible space treatments. Permanently changing the fuel characteristics over large blocks of land to one of a lower volume and one of altered distribution reduces the risk of a catastrophic wildfire in the treated area. Reducing vegetation along roadways and driveways could reduce the likelihood of blocking access and escape routes, help contain the fire perimeter, and improve firefighter access and safety for protecting homes.

Table 10. Vegetation Treatment Options, Taos Pueblo

TREATMENT TYPE	SERVES TO:	DESCRIPTION	RESPONSIBLE PARTY	REMARKS
1.Raking	Prevent spread of surface fire; creates defensible space around home to protect firefighters	Remove surface needle and leaf litter to minimum of 30 ft. from buildings	Homeowner (defensible space)	Yards should be raked once or twice per each growing season
2.Mowing	Keep fire-carrying grasses cut low to ground; create defensible space	Use of weed-eater, lawn mower, or hand sickle to keep grasses cut to several inches high; defensible space 30+ ft from buildings	Homeowner (defensible space)	Yards should be mowed where grasses are continuous to the building; maintain low cut grasses throughout fire season
3.Pruning (brush and trees)	Prevent fire from climbing into crowns (laddering) and developing into uncontrollable crownfire	Use of shears, hand or chainsaw & clippers to prune up to approximately 6+ ft.; defensible space to 30+ ft. from buildings	Homeowner (create defensible space); used often with raking and mowing or create fuelbreak with brush/tree removal	Pruning should be done just prior to growing season in early spring each year as needed; consider use of goats to browse branches
4.Brush Removal (thin)	Prevent laddering and drop crownfires to surface; reduce or eliminate exotic species; allow sunlight to soil, encourage herbaceous native plant establishment & growth	Thinning intensity varies by stem densities, laddering potential, and proximity to values at risk; consider "feathering" to vary the width and thinning intensity; spacing of plants range 10 to 20+ ft.; consider use of goats in specific areas	Homeowner around immediate yard area; contractor, fire department, or Pueblo wildland fire organization for fuelbreak work beyond yards	Fuelbreak effectiveness requires maintenance at approximately 3 – 5 year intervals, especially in fast growth sites such as bosque; they should also be tied into other constructed or natural/manmade (ie, roads, streams, cultivated fields, etc) fuelbreaks
5. Tree Removal (thin)	Prevent laddering and drop crownfires to	Thinning intensity varies by species type, density,	(Same as above)	(Same as above)

	surface; reduce or eliminate exotics; open the canopy to reduce competition and stagnation in dense groups; create uneven-aged stands	ladddering potential, and proximity to values at risk; consider feathering; crownfire prevention spacing should be minimum 20 ft. or twice the average crown diameter		

Notes:

1. **Defensible space** around structures should be "lean" (ie, only small amounts of flammable vegetation), "clean" (ie, no accumulations of dead/flammable material), and "green" (ie, existing plants are green and healthy during fire season).
2. All hazard reduction options above require periodic **maintenance** to remain effective.

For pruning, community members can follow these guidelines:

Pines, deciduous trees, and other flammable tree branches can be removed up to a minimum of six (6) feet and a maximum of eight (8) feet or to three times the height of flammable vegetation (dry grasses, brush) remaining within 3 feet of tree driplines. For pines and other flammable trees shorter than twenty (20) feet, only the branches from the lower one-third 1/3 of the tree can be removed. All trees should be maintained substantially free of deadwood. Dead branches shall be removed to a minimum height of ten (10) feet, especially within the dense bosque vegetation.

Community members may be encouraged to thin dense stands of flammable landscaping plants if they a fire hazard. Branches flammable trees that rest on or near a roof or wall should be removed creating a clearance of at least five (5) feet. Tree branches within fifteen (15) feet of the outlet of a chimney and/or chimney outlet should be removed. Roofs, gutters and the area under decks should be maintained free of accumulated needles and other flammable debris. Needles draped over brush shall be removed.

Accumulations of dry grass out from structure to 30 ft. minimum should be maintained to an average height of less than four (4) inches during the fire season (approximately May through July). Bunchgrasses and other short or sporadic grasses scattered over the area can be left untreated.

Firewood is a dangerous ignition source that may create a hazard and an obstruction for fire fighters. Firewood shall be stored thirty (30) feet from the structure, or at the property line, whichever is closer.

Herbicide treatments for fuels reduction purposes are neither desirable nor recommended.

5.5 Debris Disposal Options

Once treatment has occurred in a given area, something must be done to remove leftover debris and slash; if not, this material becomes dangerous fuels that can greatly increase fire intensity should one occur.

The following table describes several options available to the community and fire managers for dealing with debris. It is important to remember that these may be used singly or in combination(s).

Table 11. Debris Disposal Options, Taos Pueblo.

Option	Description	Serves to:	Remarks
1. Removal	Hauling debris to an approved disposal site or community burn location	Prevents debris from becoming fuel for fires; improves appearance of yard and surrounding area	Homeowners, fire organizations, and/or contractors can remove debris, based on size of project
2. Chip and scatter on site, mastication	Small diameter wood, limbs, etc can be chipped and scattered in immediate area or hauled out; mastication is where thinned materials are ground and left on the site. This does not remove the biomass, but cuts it into smaller pieces leaving the material distributed on the ground, adding to the surface fuel load. If the masticated material exceeds 2 or 3 inches, there is a potential to alter the soil moisture regime	Provides mulch to retain soil moisture; is low flammability when scattered	Chipper unit requires high initial funding outlay; over time becomes cost-effective
3. Pile and burn on site or designate a community burn pile	Varies by location and fuel type; piles can be lit in winter or under favorable weather conditions; piles should be kept relatively small (<4 ft. high x 8 ft. diameter); community burn pile is ignited periodically to prevent heavy debris accumulation	Option to hauling away or chipping; recycles some ash and nutrients to soil; community burn pile limits soil damage to single location; keeps costs down	Smoke dispersal is a consideration; soil sterilization under burning piles is possible; homeowners should not be burning independently; can be labor intensive; a pick-up and delivery schedule can be developed for community burn pile
4. Broadcast burn scattered debris on site	Thinning and pruning debris, dead & down fuels are consumed with low intensity surface fire under favorable weather	Provide a less costly way of recycling ash and nutrients back into soil to feed new and existing plants; improve wildlife habitat and overall appearance	Not feasible within community areas; very effective for perimeter fuelbreaks or open wildland areas; optimal for periodic fuelbreak maintenance

5.6 Monitoring the Treatment Work

The monitoring of each fuels reduction project would be site specific, and decisions on timelines for monitoring and the type of monitoring to be used would be selected by individual project. There are several levels of monitoring activities that meet different objectives, have different levels of time intensity, and are appropriate for different individuals. They include the following:

- Minimum: Pre- and post-project photos

Appropriate for many individual homeowners who conduct fuels reduction projects on their properties.

- Higher Level: Multiple permanent photo points

Permanent photo locations are established using rebar or wood posts, and photos are taken on a regular basis. Ideally, this process would continue over several years. This approach might be appropriate for more enthusiastic homeowners or for Natural Resources personnel conducting small-scale, general treatments.

- Highest: Basic vegetation plots

A series of plots can allow monitors to evaluate vegetation characteristics such as species composition, percent cover, and frequency; monitors then can record site characteristics such as slope, aspect, and elevation. Parameters would be assessed pre- and post-treatment. The project manager should establish plot protocols based on the types of vegetation present and the level of detail needed to analyze the management objectives.

6.0 ACTION PLAN TO REDUCE HAZARDS AND RISK

The following sections contain tables of action plans for: fuels treatments, reducing structural ignitibility, public education and outreach, and improving fire response capability for Taos Pueblo.

6.1 Action Plan #1: Prioritized Projects to Reduce Hazards and Risk

This table outlines recommended treatment options to reduce each hazard/risk identified for the four Areas in Tables 4-7, Section 4.3 (Hazard/Risk Assessment tables) above. Note that treatment methods should be selected as conditions on the ground change; ie, there is no "one size fits all" treatment method. Also note that any fuel breaks constructed on adjacent areas under separate projects may provide additional protection from encroaching wildfires.

Table 12. Prioritized Project and Recommended Methods

Project Name & Priority	**Method(s)**							
		T	**F**	**P**	**R**	**B**	**C**	**M**
Rio Pueblo Bosque Community **High #1**		**X**		X	X	**X**	X	
South Community (2,320 ac) **High #2**		**X**	**X**	**X**	X	**X**	X	
North Community (3,022 ac) **High #3**		**X**	**X**	**X**	**X**	**X**	**X**	
North Pueblo Mountain Watershed (1,700 ac) **High #4**		**X**	**X**	**X**		**X**	**X**	**X**

Key:
T= Thinning (spacing varies; use clumping, hand or mechanical)
F= Fuelbreak construction (thinning intensity & width fuel & topography dependent; see HFRA criteria)
P= Pruning (break up laddering potential, about 25% of tree height
R= Raking surface debris
B= Burn (piles or broadcast)
C= Chip on/off-site
DS= Defensible space (homeowner should rake, prune, dispose of debris within 30 ft. of structure minimum for firefighter safety)
M= Masticate debris (chop or crush)

Monitoring of all mitigation work should be a combination of photo documentation and periodic on-site inspections by a designee from the War Chief's Office, Taos Pueblo.

6.2 Action Plan #2: Reducing Structural Ignitability

The following table outlines steps to take to reduce structural ignitability, defined as how vulnerable or prone any structure is to ignite and burn.

Table 13. Reducing Structural Ignitibility, Taos Pueblo.

Project	Responsibility	Guidelines Available	Remarks
Assess the vulnerability of structures within the community to ignition from firebrands, radiation, and convection	Natural Resources Division	Firewise Communities USA; NFPA guidelines on web	Should be conducted with individual community member/homeowner; Start: 2009, ongoing
Establish Fire Codes for homes/structures	Warchief Office/Natural Resources	International WUI Code; Santa Fe County Code; NMSF	ICC code enforces building codes and ordinances for new development in the WUI; information on web: Firewise Communities Meets HFRA funding requirements Start: 2009
Construct defensible space	All residents encouraged to participate by Natural Resources Division and Pueblo Emergency Services	Firewise Communities USA (web); NMSF; local fire department liaison	Educate homeowners in defensible space practices; Remove all but scattered trees within 30 feet of structure; Keep any grass mowed and green within 100 feet of structure; Keep flammable materials at least 30 feet away from structure;

Community chipper days and Community debris pile	All residents would be encouraged to participate; Natural Resources Division to implement	N/a	Rim structure's foundations with rocks or gravel to a width of 1 foot. Start: 2008 A chipper and operator, and community debris pile would be provided in a location for community members to bring small trees and brush. Chips could remain at chipper location or be utilized by participants. Debris would be burned periodically Meets HFRA funding requirements Start: 2008 or 2009

This is a convenient table of information that can be included in community education efforts:

FOR AN INVESTMENT OF $50 -$150, COMMUNITY MEMBERS CAN:
1) Check fire extinguisher in home; purchase a 100-ft. garden hose to wet roof, yard 2) Maintain defensible space to 30-ft around house; work with neighbor 3) Use weed-eater to keep weeds and grass trimmed to 4-6" ht. 4) Screen vents on house with ¼" mesh 5) Keep gutters clean of leaves and remove combustibles from around propane tank 6) Install skirting around mobile home to prevent sparks from igniting underneath 7) Clear edges of driveway to allow fire equipment adequate space to turnaround or pullover

6.3 Action Plan #3: Improving Fire Response Preparedness & Public Education

The Natural Resource office would normally staff two, Type 6 engines stationed at the Office on Spider Rock Road. During fire season, the Taos Pueblo Emergency Services (Fire) can staff an engine with community volunteers to assist. Additional resources from BLM Taos Field Office, USFS Carson NF, and New Mexico State Forestry Cimarron District resources could be made available. A local Type 2 handcrew would be an additional needed resource as project work intensifies and for suppression and prescribed fire assignments.

Most homes are saved or lost during initial attack and extended attack. Well qualified and experienced overhead personnel are critical to achieving good outcomes. There is a relative shortage of overhead personnel within the Zone. Continued emphasis at the single resource level (ENGB, CRWB) and ICT4 is well justified. However, additional

effort should be directed towards developing ICT3 and SOF3 qualified personnel over the long term.

Table 14. Improving Fire Response Preparedness and Public Education, Taos Pueblo.

Recommended Action Item by Priority & Start Year	Description	Serves to:
#1 (2010) Bring Wildland Fire Organization (Natural Resources) to Adequate Preparedness Level	• Acquire PPE for all qualified fire personnel • Acquire minimum fire cache tool /equipment complement (NWCG standards) • Provide Training FF, FFT1, ICT4, ENGB • Mentoring wildland fire personnel (fire assignments, work with journeyman firefighters)	• Ensures FF safety • Provides suppression tools, supplies for IA and extended attack • Safety, knowledge, skills and abilities to ensure successful suppression and prescribed fire operations • Meets HFRA funding requirements
#2 (2009-2010) Educate Community to increase Understanding of Risk and Prevention Measures they can Act Upon	• Workshops in Wildfire Risk and Hazards • "Show and Tell" sessions in prevention and defensible space in neighborhoods • Training in fire suppression • Workshops in ecological role of fire	• Gets community involved in own protection· • Save lives & property • Increases FF safety margin· • Enhance survivability of homes or businesses· • Meets HFRA funding requirements • Public education leads to more efficient protection readiness
#3 (2010) Increase Effectiveness of Taos Pueblo FD	• Acquire PPE where necessary (see above) • Replace old or unsafe tools • Provide volunteer and leadership training	• FF Safety • Enhances public safety • Can save property damage or destruction • Establishes sense of pride in community • Meets HFRA funding requirements
#4 (2009) Assist Community with Developing Adequate Defensible Space	• Workshops in defensible space, evacuation procedures • Training w/chainsaws • Inspections	
#5 (2012) Develop Defensible Space Handbook for Taos Pueblo	• Include specifications, "how-to's", and other information for each community family	• Meets HFRA funding requirements
#6 (2011) Provide Community Outreach	• Continuation of #3 above	• Reduce number of human-caused ignitions within WUI • Meets HFRA funding requirements

6.4 Potential Benefits Expected From Action Plan Implementation

Benefits from ongoing fuels mitigation work and the Action Plan detailed in this section would positively affect many neighbors, including agencies and other cooperators.

The Bureau of Land Management would benefit in terms of safety of agency firefighters and supporting resources should a fire that originated on Pueblo lands cross the western boundary and race toward the west through private and BLM lands covered with sagebrush and other flashy fuels. These types of fires often have a high resistance to control, and well-placed fuelbreaks would serve to provide Pueblo firefighters a defensible space from which fires may be more easily contained. Also, training and equipment provided under the Action Plan to Taos Pueblo for engine/hand crew(s), the BLM would have additional qualified resources to assist with wildfire suppression on lands for which the agency has responsibility.

The U.S. Forest Service, Carson National Forest would benefit from fires potentially threatening to cross the southern Pueblo boundary. The proposed fuelbreak described herein would also provide an advantage to firefighters, enhancing safety and minimize resource loss on National Forest lands. As with the BLM, the USFS would also benefit from the additional fire-ready resources created under the Action Plan.

The potential exists for the New Mexico State Forestry, Cimarron District, to benefit from this action plan. Specifically, mutual training, wildfire prevention work, and ultimately state and Pueblo firefighter safety during wildland fire incidents would all be enhanced as work progresses under the plan. Payoffs would also be seen in educated landowners on or near the Pueblo, and potentially increased levels of protection for values now deemed at risk.

Private lands that border the Pueblo to the west, particularly where the Rio Pueblo Arroyo meets the Pueblo boundary with private property in the city (and county) of Taos, would benefit from the proposed project that mitigates fuels hazards within the Rio Pueblo Bosque Community (See Map, Appendix). Benefits to be realized would be providing for public safety and protection of infrastructure within these private lands; and, the potential for trained and qualified wildland fire personnel from Taos Pueblo to provide similar training and education for municipal and private individuals as needed, all within the spirit of cooperation—a fundamental principle of the Community Wildfire Protection Plan.

References

Council of Western State Foresters (CWSF). 2006. Community Wildfire Protection Planning in the West: A Status Report. Publication Date, March 2006. Available online at http://www.wflccenter.org/news_pdf/168_pdf.pdf. Accessed February 2007.

International Code Council. 2006. International Wildland Urban Interface Code. Available at http://www.iccsafe.org/dyn/prod/3850S06.html. Accessed February 29, 2008.

Ref: Site Report and Nomination Form, World Heritage Listing, Taos Pueblo, New Mexico. http://www.WHSPeriodicRpt.PuebloDeTaos.doc. J. Putnam 2005.

National Fire Protection Association (NFPA) 299. 2000 ed. Standard for Protection of Life and Property from Wildfire. National Fire Protection Association.

New Mexico State Forestry (NMSF). 2007. 2007 New Mexico Communities at Risk Assessment Plan. Energy, Minerals and Natural Resources Department, Forestry Division, December 2007. Available online at http://www.emnrd.state.nm.us/FD/FireMgt/documents/2007_CARplan2.pdf. Accessed February 2007.

Scurlock, D. 1998. An Enviornmental History of the Middle Rio Grande Basin. USDA Forest Service. Ft. Collins, Colorado. General Technical Report RMRS-GTR-5. 440 pp. http://www.fs.fed.us.rm/pubs/rmrs.gtr005.pdf.

SWCA Environmental Consultants. 2007. Santa Clara Pueblo Community Wildfire Protection Plan. SWCA, Albuquerque.

SWCA Environmental Consultants and Wildland Fire Associates, LLC. 2008. Santa Fe County Community Wildfire Protection Plan. In draft. Albuquerque, NM.

USDA Forest Service (USFS). 2007. Santa Fe National Forest, Santa Fe, NM. Available online at http://www.fs.fed.us/r3/sfe/. Accessed November 2007.

Western Governors' Association. 2006. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: A 10-year Comprehensive Strategy. Available online at http://www.westgov.org/wga/publicat/TYIP.pdf. Accessed February 2007.

Western Regional Climate Center (WRCC). 2008. *Climate of New Mexico*. NM State Climatologists, published by National Climatic Data Center, Reno, Nevada. Available online at www.wrcc.dri.edu. Accessed November 2007.