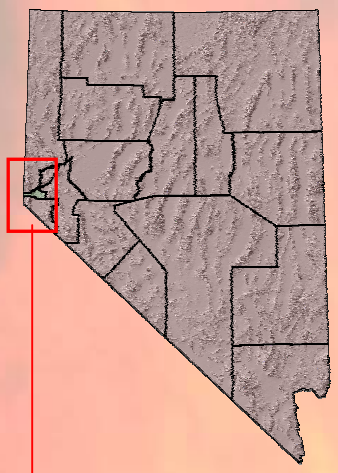
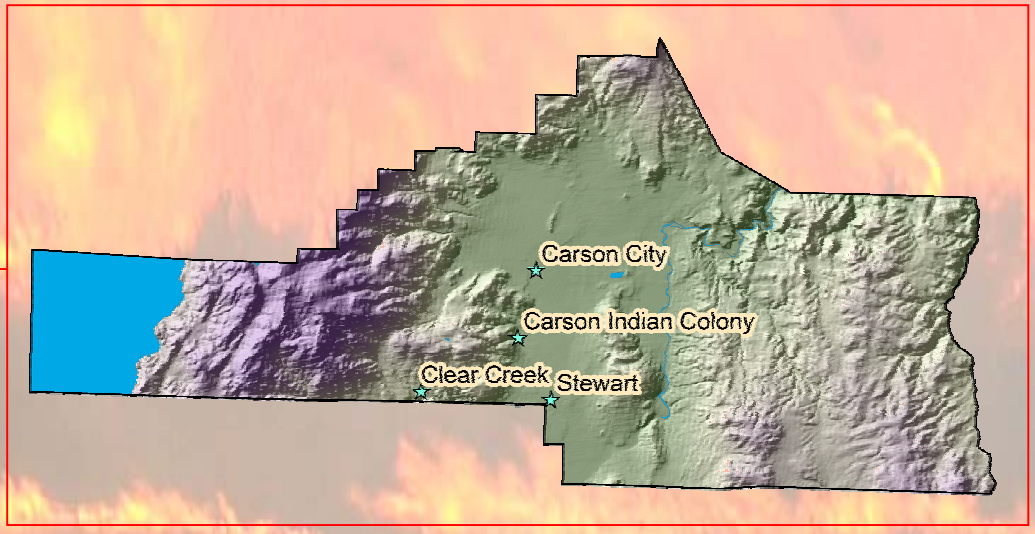
Nevada Community Wildfire

Risk/Hazard Assessment Project

CARSON CITY

January 2005





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This project was administered by the Nevada Fire Safe Council and funded through National Fire Plan grants from the Bureau of Land Management, the US Forest Service, and the Nevada Division of Forestry.

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Executive Summary

The Healthy Forests Initiative was announced by the White House in 2002 to implement the core components of the *National Fire Plan Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-year Comprehensive Strategy.* The Plan calls for more active forest and rangeland management to reduce the threat of wildland fire in the wildland-urban interface, the area where homes and wildland meet.

This report was prepared specifically for the communities within the Carson City Consolidated Municipality that were identified in the 2001 Federal Register list of communities at risk within the vicinity of federal lands that are most vulnerable to the threat of wildfire. The communities assessed in Carson City are listed in Table 1-1.

The Nevada Fire Safe Council contracted with Resource Concepts, Inc. (RCI) to assemble a project team consisting of experts in the fields of fire behavior and suppression, natural resource ecology, and geographic information systems (GIS) to complete the assessment for each Carson City community listed in the Federal Register. The RCI Project Team spent several days inventorying conditions in Carson City and completing the primary data collection and verification portion of the risk assessment.

This report describes in detail the data and information analyzed and considered during the assessment of each community. The general results for each community in the Carson City Consolidated Municipality are summarized in Table 1-1. Four primary factors that affect potential fire hazard were assessed to arrive at the community hazard rating. These factors include community design, defensible space, construction materials, availability of fire suppression resources, and physical conditions such as the vegetative fuel load and topography. Information on fire suppression capabilities and responsibilities for Carson City communities was obtained through interviews with the local Fire Chief and local agency Fire Management Officers.

The RCI Project Team Fire Specialist assigned an ignition risk rating for each community of low, moderate, or high. The rating is based upon historical ignition patterns, opinions of local, state, and federal fire agency personnel, community field visits, and professional judgments based on experience with wildland fire ignitions in Nevada.

Existing Bureau of Land Management fuel hazard data for the wildland-urban interface was evaluated and field-verified by the RCI Project Team Wildfire Specialists and Natural Resource Specialists. The interface fuel hazard condition was determined to be low, moderate, high, or extreme based upon vegetation composition and structure, slope, and aspect.

Table 1-1. Community Risk and Hazard Assessment Results

Community	Interface Condition	Interface Fuel Hazard Condition	Ignition Risk Rating	Community Hazard Rating
Carson City	Classic/Intermix	Low to High	High	Moderate
Carson Indian Colony	Classic	Low to High	High	Moderate
Clear Creek	Intermix	Extreme	High	High
Stewart	Classic	Moderate	High	Low

Existing Situation

There is high potential for a catastrophic fire event in the wildland-urban interface area of the Clear Creek community. This elevated hazard rating can be primarily attributed to the extreme fuel hazards and the topographical features present within the community that are associated with potentially dangerous fire behavior. A moderate potential for catastrophic fire exists for the Carson City community and the Carson Indian Colony. The Stewart community was rated with a low potential for a wildland-urban interface fire. Implementation of defensible space and availability and short response time of fire suppression resources partially mitigate the potential for damage and loss of structures due to wildfire throughout the wildland-urban interface areas of the Carson City Consolidated Municipality.

Many homeowners in Carson City and Clear Creek have been aggressive in establishing and maintaining appropriate defensible space around their residences. Numerous agencies have also been proactive in reducing the fuel loads adjacent to many wildland-urban interface areas of the Municipality. Projects completed under the supervision of the Nevada Fire Safe Council Clear Creek Chapter provide an example of collaborative efforts for hazardous fuel reduction involving both homeowners and agencies.

Recommendations

Recommendations in this report focus primarily on efforts that homeowners can initiate and implement to enhance the fire safe nature of their communities. Recommendations prescribed within this report for creating defensible space are the first priority for each community who has not yet reduced fuels on their private property. Defensible space is the homeowner's responsibility and it is an essential and effective treatment for saving lives and minimizing damage or loss of property during a catastrophic wildland fire.

In the future, Carson City Consolidated Municipality must take a proactive stance on residential development in the wildland-urban interface areas, especially those surrounded by high and extreme fuel hazards. As development continues in the wildland-urban interface, Carson City should revise their existing interface ordinance to require fuel reduction treatments on all planned subdivisions prior to building permit approval and they should create provisions to assure maintenance of the fuel reduction treatments. Revisions should also include mandatory fuel reduction on vacant lots in existing wildland-urban interface subdivisions.

SPECIFIC RECOMMENDATIONS FOR FUEL REDUCTION TREATMENTS

Recommendations within this report were formulated to mitigate the hazardous conditions for each identified problem area. The recommendations for widely needed treatments to reduce the vegetative fuel load in the interface areas are directed to the Carson City Fire Department, the Bureau of Land Management, the U.S. Forest Service, the Nevada Division of Forestry, the Nevada Division of State Lands, the Washoe Tribe of Nevada and California, local Fire Safe Council chapters, and individual property owners. The recommended approach, known as "thinning from below," involves removal of smaller trees, brush, and dead and down materials to achieve the desired tree densities that would effectively minimize the hazardous ladder fuels that often lead to crown fires. Implementation of the prescribed treatments will also reduce competition among the residual trees for sunlight, water, and space, thus improving forest health. Encouraging the reestablishment of native grasses in order to combat the invasion of cheatgrass, a highly ignitable and combustible fuel, will also mitigate the fire hazard in specific areas.

Excessive amounts of biomass (vegetative fuel) generated from fuel reduction treatments in the Carson City communities will need to be chipped, burned, or removed from the treated areas to achieve the required fuel load reduction.

Carson City Community:

- Pursue funding for and implement the planned and scheduled fuelbreaks and fuel reduction treatments for the Carson City community in the areas of Pinyon Hills, Mexican Dam, North Carson, West Carson, and C-Hill. Fuel reduction specifications include using mechanized mastication equipment and hand crews to thin and remove brush, prune trees, and seed grass species adapted to the area in linear areas between 100 and 300 feet wide. In total, the estimated area recommended for treatment in Carson City is 220 acres.

Clear Creek Community:

- Coordinate with each property owner, the Carson City Fire Department, the Nevada Division of Forestry, and the responsible administrative agency to implement landscape-wide treatments to reduce tree stands to a basal area of 80 square feet per acre as well as reduce and remove brush ladder fuels from beneath all tree crowns in the proposed 1,690-acre treatment area (see Figure 7-1). The existing Clear Creek chapter of the Nevada Fire Safe Council can facilitate agency coordination and help identify funding opportunities. *(Recommendations from Dynamac 2003)*
- Create a shaded fuelbreak 100 to 150 feet wide and 1.2 miles in length on both US Forest Service land and private land in T14N, R19E, Section 4 and T15N, R19E, Section 33. Trees should be thinned to a crown spacing of at least twenty feet with trees limbed to fifteen feet from the ground and brush cover reduced to thirty percent or less. The fuelbreak should be seeded with perennial bunch grasses to reduce weed invasions, fire threats, and erosion potential.
- Create a fuelbreak 150-feet wide and 1.2 miles long in T14N, R19E, Section 2. The shaded fuelbreak should extend from the east to west across Section 2, running along the slope at the base of the ridge parallel to Clear Creek. The RCI Project

Team recommends that any fuel reduction treatments in this area be evaluated on a site-specific basis due to slope, access, and riparian concerns.

To be most effective, fire safe practices, including evacuation planning, need to be implemented on a community-wide basis. There is no guarantee that a wildfire will not occur in any of these communities, even if all of the recommendations in this report are implemented. Nonetheless, public awareness, neighbors helping neighbors, and concerned, proactive individuals setting examples for others to follow are just some of the approaches necessary to reduce the risk of wildfire ignition and the hazards inherent in wildland-urban interface areas.

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[May 17, 2005]

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

A key element of the Healthy Forests Initiative, announced by the White House in 2002, is the implementation of core components of the *National Fire Plan Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-year Comprehensive Strategy.* Federal agencies and western state governors adopted the Plan in the spring of 2002, in collaboration with county commissioners, state foresters, and tribal officials. The Plan calls for more active forest and rangeland management to reduce the threat of wildfire in the wildland-urban interface.

The Healthy Forest Restoration Act (H.R. 1904) was signed into law in December of 2003. The act creates provisions for expanding the activities outlined in the National Fire Plan. In this same year the Nevada Fire Safe Council received National Fire Plan funding through the Department of Interior Bureau of Land Management to conduct a Community Risk/Hazard Assessment in at risk communities across Nevada. The communities included in the Community Wildfire Risk/Hazard Assessment project are among those named in the 2001 Federal Register list of Communities at Risk within the vicinity of Federal lands (66 FR 160). The list identifies Nevada communities adjacent to Federal lands that are most vulnerable to wildfire in Nevada.

Resource Concepts, Inc. (RCI), a Carson City-based consulting firm, was selected to conduct the Community Risk/Hazard Assessments. During 2004, The RCI Project Team visited over 250 communities in Nevada's sixteen counties and one consolidated municipality (Carson City) to assess both the risk of ignition and the potential fire behavior hazard. Procedures accepted by Nevada's wildland fire agencies were used to reach consistent and objective evaluations of each community.

The specific goals of the Nevada Community Risk/Hazard Assessment Project are to:

- Assess wildfire hazards present in each community on the Federal Register list of Communities at Risk in Nevada.
- Identify firefighting resource needs (equipment and infrastructure).
- Conduct fuel hazard mapping for high and extreme fuel hazard communities.
- Describe proposed risk and hazard mitigation projects in enough detail to aid communities in applying for future implementation funds.
- Distribute assessment results and proposed mitigation project descriptions to each County in an easily updated and useful form for use in public meetings and other public education activities.

The community risk/hazard assessments were conducted systematically for each community. The RCI Project Team observed and recorded the factors that significantly influence the risk of wildfire ignition along the wildland-urban interface and inventoried features that may influence hazardous conditions in the event of a wildfire. Interviews with local fire agency and emergency response personnel were completed to assess the availability and capability of suppression resources and identify opportunities for increased community preparedness. A description of the existing fuel hazard and potential fire

behavior potential are discussed for each community. Photo points and fuel hazard maps are presented for the Carson City community, Carson Colony, and Clear Creek where the fuel hazard in the interface area is high or extreme.

The results of each community assessment are formatted to facilitate ease of reference and reproduction for individual communities. Each community is mapped and ignitions risks, fire hazards, and recommended mitigation projects are described for each community. The recommendations are summarized in table form and presented on a map, if the proposed mitigation project can be graphically represented. These tools will aid local, state, and federal agencies in strategic planning, raising public awareness, and securing funding to implement risk and hazard reduction projects. Mitigating the risks and hazards identified by these assessments is not only crucial to the long term goals of the National Fire Plan, but also to the short and long-term viability of Nevada's communities, natural resources, infrastructures, and watersheds.

Numerous agencies and individuals were involved in the planning and implementation of this effort. Special thanks and acknowledgement is given to:

- Nevada Fire Safe Council (NFSC)
- USDI Bureau of Land Management (BLM)
- USDA Forest Service (USFS)
- Nevada Division of Forestry (NDF)
- University of Nevada Cooperative Extension (UNCE)
- Nevada Association of Counties (NACO)
- Nevada's Counties
- Fire chiefs and firefighters statewide

1.2 COMMUNITIES ASSESSED

The Federal Register (66 FR 160) identified four communities within the Carson City Consolidated Municipality as being at risk of wildfire and within proximity to Federal Lands. Three of these are included in this assessment: Carson City Community, Clear Creek, and Stewart. The Carson Indian Colony was also included separately in the assessment, as it is part of the Washoe Tribe of Nevada and California.

1.3 COMMUNITIES NOT ASSESSED

1.3.1 Spooner State Park

The Spooner Lake Unit of Lake Tahoe State Park appears on the Federal Register list; however, no residential homes or commercial properties exist within the State Park. The Spooner Lake Unit of the park is located in the western portions of both the Carson City Consolidated Municipality (hereafter referred to as the Municipality) and Douglas County along US Highway 50 in the southern portion of Lake Tahoe State Park. Because there is no permanent community, very few structures, and no features listed in the National Register of Historic Places within the State Park, the risk/hazard assessment was not completed; however, the Spooner Lake Unit of the State Park is listed as a critical feature potentially at risk and described further in Section 3.3.3.

2.0 METHODOLOGY

2.1 PROJECT TEAM

The RCI Project Team was composed of experts in the fields of fire behavior and suppression, geographic information systems (GIS), natural resource ecology, and forest health who collaborated to complete a Community Risk/Hazard Assessment for each community. The RCI Project Team included a Fire Specialist with extensive wildland fire suppression and prevention experience in Nevada, and a Resource Specialist experienced in the natural resource environment of the Great Basin.

The RCI Project Team used standardized procedures developed from the *Draft Community Wildland Fire Assessment For Existing and Planned Wildland Residential Interface Developments in Nevada* (Nevada's Wildland Fire Agencies, Board of Fire Directors, April 2001; revised 2002). This approach incorporates values for fuel hazards, structural hazards, community design and preparedness, and fire protection capabilities into an overall community rating. A glossary of wildland fire terms used frequently in describing assessment results and recommendations is included in Appendix A.

2.2 BASE MAP DATA COLLECTION

The RCI Project Team Geographic Information System Specialists compiled and reviewed existing statewide geospatial data to create maps for recording baseline data and data verification. Data sources for the maps were the Nevada Fire Safe Council, the Nevada Department of Transportation, the Natural Resource Conservation Service, the US Forest Service, and the Bureau of Land Management. Datasets and sources utilized are summarized in Table 2-1.

Table 2-1. Primary Datasets and Sources Utilized in the Carson City Consolidated Municipality Wildfire Risk/Hazard Assessment.

SPATIAL DATASET	DATA SOURCE
Land ownership	BLM Nevada State Office Mapping Services
Vegetation communities	Nevada Gap Analysis Program Data, Utah Cooperative Fish and Wildlife Research Unit, Utah State University
Topography	US Geological Survey Digital Elevation Models and Topographic Maps
Fire suppression resources and critical features	Carson City GIS
Roads	Nevada Department of Transportation 'TIGER' Census data (2000)
Current aerial photographs	US Geological Survey Digital Orthophoto Quadrangles (1994, 1996, or 1998)
Fuel hazard classes	BLM Nevada State Office Fire Hazard Potential Data
Fire history	BLM Nevada State Office Mapping Services BLM Carson City Field Office USFS Humboldt-Toiyabe Supervisor's Office Carson City GIS National Interagency Fire Center – Boise, Idaho

2.2.1 Wildfire History

Wildfire history was mapped using BLM and USFS datasets and GIS databases that identify wildfire perimeters on federally administered lands covering the past 24 years. This database was compiled by agency personnel using Global Positioning System (GPS) data and screen digitizing from source maps with a minimum detail level of 1:250,000. This dataset has been updated at the BLM Nevada State Office and Humboldt-Toiyabe Supervisors Office at the end of each fire season from information provided by each Nevada BLM Field Office and Humboldt-Toiyabe Ranger District. The datasets are the central source of historical GIS fire data to support fire management and land use planning on federal lands.

In addition to the fire perimeter information, point data for all fire ignitions within Nevada from 1980 to 2003 was obtained from the National Interagency Fire Center (NIFC) database in Boise, Idaho. This dataset includes an ignition point coordinate and an acreage component as reported to NIFC through a variety of agencies. This data is summarized in Table 3-2, and provides the ignition point locations for the maps in this report. In many cases, the ignition point location is only accurate to within the section; in such cases, the point coordinate is located in the section center on the maps.

The wildfire history and ignition history data were used to formulate risk ratings and develop recommendations specific to areas that have been repeatedly impacted by wildland fires. Observations made by the RCI Project Team and comments from local fire agencies were used to develop recommendations for areas without recent wildfire activity, where accumulations of fuels or expansion of urban development into the interface area represents a growing risk.

2.3 COMMUNITY RISK/HAZARD ASSESSMENT

The wildland-urban interface is the place where homes and wildland meet. This project focused on identifying hazards and risks in the wildland-urban interface areas throughout the municipality. Site-specific information for each community was collected during field visits conducted between May 12 and May 19, 2004. The predominant conditions recorded during these site visits were used as the basis for the Community Risk and Hazard Assessment ratings. The assessment ratings were updated and revised to reflect the recent changes to the fuel hazard following the 2004 Waterfall Fire.

2.3.1 Ignition Risk Assessment Criteria

The RCI Project Team Fire Specialists assigned an ignition risk rating of low, moderate, or high to each community assessed. This rating is based on interpretation of the historical record of ignition patterns and fire polygons provided by National Interagency Fire Center (NIFC), BLM, and USFS databases, interviews with local fire department personnel and local area Fire Management Officers, field visits to each community, and the professional judgment of the RCI Project Team Fire Specialists based on their professional experience with wildland fire ignitions in Nevada.

2.3.2 Hazard Assessment Criteria

The Community Risk/Hazard Assessments were completed using methodology outlined in the *Draft Community Wildland Fire Assessment For Existing and Planned Wildland Residential Interface Developments in Nevada*. This system assigns hazard ratings of low through extreme based on the following scoring system given in Table 2-2 and detailed in Appendix B.

Table 2-2. Hazard Rating Point System Utilized in the Nevada Community Wildfire Risk Assessment Project

HAZARD CATEGORY	SCORE
Low Hazard	< 41
Moderate Hazard	41-60
High Hazard	61-75
Extreme Hazard	76+

To arrive at a score for the community, five primary factors affecting potential fire hazard were assessed: community design, construction materials, defensible space, availability and capability of fire suppression resources, and physical conditions such as fuel loading and topography. A description of each of these factors and their importance in developing the overall score for the community is provided below. Individual community score sheets presenting the point values assigned to each element in the hazard assessment score are provided at the end of each community assessment. Photographs of representative fuel types for each community are provided in Appendix C.

Community Design

Aspects of community design account for 26 percent of the total assessment score. Many aspects of community design can be modified to improve community fire safety. Factors considered include:

- **Interface Condition**. Community safety is affected by the density and distribution of structures with respect to the surrounding wildland environment. Four condition classes are used to categorize the wildland-urban interface: *Classic Interface, Intermix, Occluded*, and *Rural*. Definitions for each Condition Class are included in the glossary of wildfire terms in Appendix A.
- **Access.** Design aspects of roadways influence the hazard rating assigned to a community. A road gradient of greater than five percent can increase response times for heavy vehicles carrying water. Roads less than twenty feet in width often impede two-way movement of vehicles and fire suppression equipment. Hairpin turns and cul-de-sacs with radii of less than 45 feet can cause problems for equipment mobility. Adequately designed secondary access routes and loop roads in a community can lower a hazard rating. Visible, fire-resistant, street and address identification and adequate driveway widths also reduce the overall community hazard rating.
- **Utilities.** Poorly maintained overhead power lines can be a potential ignition source for wildfires. It is important to keep power line corridors clear of flammable vegetation, especially around power poles and beneath transformers, as fires have been known to start from arcing power lines

during windy conditions. Keeping flammable vegetation cleared from beneath power lines and around power poles also reduces potential hazards from damaged power lines. Energized power lines may fall and create additional hazards for citizens and firefighters, including blocked road access. Power failures are especially dangerous to a community without a backup energy source. Many communities rely on electric pumps to provide water to residents and firefighters for structure protection and fire suppression.

Construction Materials

Construction materials account for sixteen percent of the total assessment score. While it is not feasible to expect all structures in the wildland-urban interface area to be rebuilt with fire-resistant materials, there are steps that can be taken to address specific elements that strongly affect structure ignition potential in the interface area. Factors considered in the assessment include:

- **Building Materials.** The composition of building materials determines the length of time a structure could withstand high temperatures before ignition occurs. Houses composed of wood siding and wood shake roofing are usually the most susceptible to ignitions. Houses built with stucco exteriors and tile, metal, or composition roofing are able to withstand higher temperatures and heat durations when defensible space conditions are adequate.
- **Architectural Features.** Unenclosed or unscreened balconies, decks, porches, eaves, or attic vents on homes provide areas where sparks and embers can be trapped, smolder, and ignite, rapidly spreading fire to the house. A high number of houses within a wildland-urban interface with these features implies a greater hazard to the community.

Defensible Space

Defensible space accounts for sixteen percent of the total assessment score. Density and type of fuel around a home determines the potential for fire exposure and damage to the home. A greater volume of trees, shrubs, dry weeds, grass, woodpiles, and other combustible materials near the home will ignite more readily, produce more intense heat during a fire, and increase the threat of losing the home. Defensible space is one of the factors that homeowners can most easily manipulate in order to improve the chances that a home or other property avoids damage or complete loss from a wildfire.

Suppression Capabilities

Suppression capabilities account for sixteen percent of the total assessment score. Knowledge of the capabilities or limitations of the fire suppression resources in a community can help municipality officials and residents take action to maximize the resources available. Factors considered in the assessment include:

- **Availability, Number, and Training Level of Firefighting Personnel**. When a fire begins in or near a community, having the appropriate firefighting personnel available to respond quickly is critical to saving structures and lives. Whether there is a local paid fire department, volunteer

department, or no local fire department affects how long it takes for firefighters to respond to a reported wildland fire or to a threatened community.

- **Quantity and Type of Fire Suppression Equipment**. The quantity and type of available fire suppression equipment has an important role in minimizing the effect of a wildfire on a community. Wildland firefighting requires specialized equipment.
- **Water Resources**. The availability of water resources is critical to fighting a wildland fire. Whether there is a community water system with adequate fire flow capabilities, or whether firefighters must rely on local ponds or other drafting sites affects how difficult it will be for firefighters to protect the community.

Physical Conditions

Physical conditions account for 26 percent of the total assessment score. Physical conditions include slope, aspect, topography, typical local weather patterns, fuel type, and fuels density. With the exception of changes to the fuel composition, the physical conditions in and around a community cannot be altered to make the community more fire safe. Therefore, an understanding of how these physical conditions influence fire behavior is essential to planning effective preparedness activities such as fuel reduction treatments. Physical conditions considered in the assessment include:

- **Slope, Aspect, and Topography.** In addition to local weather conditions, slope, aspect, and topographic features are also used to predict fire behavior. Steep slopes greatly influence fire behavior. Fire usually burns upslope with greater speed and longer flame lengths than on flat areas. Fire will burn downslope; however it usually burns downhill at a slower rate and with shorter flame lengths than in upslope burns. East aspect slopes in the Great Basin may experience afternoon downslope winds that may rapidly increase downhill burn rates. West and south facing aspects are subject to more intense solar exposure, which preheats vegetation and lowers the moisture content of fuels. Canyons, ravines, and saddles are topographic features that are prone to higher wind speeds than adjacent areas. Fires pushed by winds grow at an accelerated rate compared to fires burning in non-windy conditions. Homes built mid-slope, at the crest of slopes, or in saddles are most at risk due to wind-prone topography in the event of a wildfire.
- **Fuel Type and Density.** Vegetation type, fuel moisture values, and fuel density around a community affect the potential fire behavior. Areas with thick, continuous, vegetative fuels carry a higher hazard rating than communities situated in areas of irrigated, sparse, or non-continuous fuels. Dry weather conditions, particularly successive years of drought, in combination with steep slopes or high winds can create situations in which the worst-case fire severity scenario can occur.

2.3.3 Fuel Hazard Mapping

Fuel hazard maps were initially generated by the BLM Nevada and Utah State Offices using wildfire hazard delineations derived from vegetation data from the Nevada GAP Analysis Program satellite dataset at 30-meter resolution. A total of 65 vegetation types were mapped statewide and reclassified into four wildfire hazard categories (low, moderate, high, and extreme) based on the anticipated fire behavior for each vegetation cover type. For example, pinyon-juniper cover types were generally rated as extreme fuel hazards, while low sagebrush cover types were rated as low fuel hazards.

The RCI Project Teams visited high and extreme fuel hazard communities and verified the BLM hazard information by comparing the hazard ratings on the existing fuel hazard map to vegetation, slope, and aspect conditions directly observed in the field. Where necessary, changes to the ratings were drawn on the maps and used to update the wildfire hazard potential layer of the project database. Photo points were established in high and extreme fuel hazard areas to monitor future changes in the fuel hazard conditions. Fuel hazard mapping was completed for the Carson City Community, Carson Indian Colony, and Clear Creek Community within the municipality.

2.3.4 Fire Behavior Worst-Case Scenario

The RCI Project Team Fire Specialists described the worst-case scenarios included in this evaluation based on their analyses of the severe fire behavior that could occur given a set of weather conditions, observed fuel load conditions, and minimal fire suppression resources. Drought conditions and dry vegetation in combination with steep slopes or high winds can create situations in which the worst-case wildfire scenario can occur. The worst-case scenario does not describe the most likely outcome of a wildfire event in the interface, but illustrates the potential for damage if a given set of conditions were to occur simultaneously. The worst-case scenarios are described in this document for public education purposes and are part of the basis for the fuel reduction recommendations.

2.4 INTERVIEWS WITH FIRE PERSONNEL

The RCI Project Team interviewed local fire department personnel and local area Fire Management Officers to obtain information on wildfire training, emergency response time, personnel and equipment availability, evacuation plans, pre-attack plans, and estimates of possible worst-case scenarios. Local fire personnel reviewed maps showing the history of wildfires to ensure that local information on wildland fires was included. A list of fire agency personnel contacted for information used in the assessments is included in Appendix D.

2.5 RECOMMENDATION DEVELOPMENT

A wide variety of treatments and alternative measures can be used to reduce ignition risks, mitigate fire hazards, and promote fire safe communities. Proposed recommendations typically include physical removal or reduction of flammable vegetation, increased community awareness of the risk of fires and how to reduce those risks, and coordination among fire suppression agencies to optimize efforts and resources. The RCI Project Team met repeatedly to analyze community risks, treatment alternatives, and treatment benefits. Treatment recommendations to reduce existing risks and hazards were formulated based

upon professional experience, the community hazard score, and information developed in conjunction with the "*Living With Fire"* publications, National Fire Plan, and FIREWISE resources (National Fire Plan website; FIREWISE website; and Nevada Cooperative Extension publications).

3.0 DESCRIPTION OF THE COUNTY

3.1 DEMOGRAPHICS, LOCATION, TOPOGRAPHY, AND CLIMATIC DATA

The Carson City Consolidated Municipality is located in western Nevada and is approximately 97,920 acres in size, one of the country's largest state capitals. A jurisdictional summary of land management administration and coverage including water is provided in Table 3-1 and presented in Figure 3-1. The majority of land within the municipality is administered and managed by federal agencies. The federal agency policies and decisions on lands located near the wildland-urban interface areas may have direct effects on private landowners within the municipality.

Table 3-1. Land Management Acreage within the Carson City Consolidated Municipality

LAND ADMINISTRATOR	BLM	USFS	State of NV	Private	Bureau of Indian Affairs	Carson City	Water
APPROXIMATE ACREAGE	41,070	10,000	3,920	31,590	480	5,050	7,510

Approximate values derived from BLM land ownership GIS and Carson City Assessor's Office databases.

The 2003 population estimate for the municipality was 55,220 persons (Nevada State Demographer). The municipality economy is based primarily in government, trade, and services. The State Demographer's Office lists Chromalloy Nevada, Harley-Davidson Credit Corporation, Mission Industries, Thys Company, and Weddell, R.P. & Sons as the largest private employers in the municipality.

The majority of residential development in the municipality is located in Eagle Valley and the foothill areas that surround the historic town. The highest elevation within the municipality is 9,214 feet at Snow Valley Peak. The lowest elevation is 4,480 feet along the Carson River near the Lyon County border. The major mountain ranges and mountain features in the municipality include the Carson Range, C-Hill, Virginia Range, Pine Nut Mountains, and Prison Hill. The average annual precipitation is 10.4 inches (Western Regional Climate Center website).

3.2 WILDFIRE HISTORY

Significant wildland fires have occurred in the municipality over the last 24 years. Table 3-2 summarizes the fire histories and fire ignitions by year recorded for public lands in the Carson City Consolidated Municipality. Figure 3-2 illustrates the fire history in the vicinity of Carson City. Several wildland fires have occurred on private lands within the municipality that are not reflected in Table 3-2 and Figure 3-2.

Table 3-2. Summary of Available Fire History Data 1980-2003

YEAR	NUMBER OF FIRE IGNITIONS	TOTAL FIRE ACREAGE	YEAR	NUMBER OF FIRE IGNITIONS	TOTAL FIRE ACREAGE
1980	7	161	1992	3	1
1981	2	356	1993	3	1
1982	2	3	1994	1	35
1983	8	2,670	1995	2	<1
1984	8	600	1996	8	225
1985	10	7	1997	3	5
1986	8	81	1998	1	40
1987	10	485	1999	14	1,027
1988	14	1,798	2000	13	101
1989	2	1	2001	8	55
1990	8	NA	2002	6	9
1991	9	4	2003	6	691
			TOTAL	**156**	**8,356**

Source: National Interagency Fire Center, Boise, Idaho, Bureau of Land Management, and US Forest Service. NA - either no acreage was reported in the databases, or the acreage was too small to be recorded in the database.

Ignition risks for wildfires fall into two categories – lightning and human caused. Human caused ignitions can come from a variety of sources: fires started along highways and roads from burning material thrown out of vehicle windows or ignited during auto accidents, off-road vehicles, arcing power lines, agricultural fires, ditch burning, debris burning in piles or burn barrels, unextinguished matches, target shooting, and fireworks. Database records indicate that 131 of the 156 ignitions were recorded according to ignition source. Of these ignitions, 47 percent were due to natural causes and 53 percent were human caused.

3.2.1 2004 Waterfall Fire

At 3:15 a.m. on Wednesday July 14, 2004, the Waterfall Fire started in Kings Canyon just west of the Carson City Community. It was human-caused from an illegal, abandoned campfire. In the seven days until containment, 8,799 acres burned and the total suppression cost was estimated at eight million dollars. Within the first three days of the fire, over 98,300 gallons of retardant were dropped, three fire apparatus were lost, and five firefighters and one civilian were injured. Over 1,075 homes and businesses were threatened, 66 structures and outbuildings were lost or damaged, and over 1,000 homes evacuated. Fortunately, there were no fatalities.

3.2.2 Fire Ecology

The science of fire ecology is the study of how fire contributes to plant community structure and species composition. A 'fire regime' is defined in terms of the average number of years between fires under natural conditions (fire frequency), in combination with the severity of fires on the dominant vegetative species. Natural fire regimes have been affected throughout most of Nevada by twentieth century fire suppression policies. Large areas that formerly burned with high frequency but low intensity (fires more amenable to control, suppression, and rehabilitation) are now characterized by large accumulations of unburned fuels, which once ignited, will burn at higher intensities.

Some plant communities have evolved to burn frequently with low intensity, for example mature Jeffrey pine forests. Under a native fire regime, low-intensity surface fires reduce fuel loading from grasses and shrubs, suppress regeneration of shade-tolerant white fir seedlings, and leave the adult Jeffrey pine trees unaffected, protected by thick, fire-resistant bark. Forests with frequent fire occurrence often have an open, "park-like" appearance with an understory of grass or low shrubs. Though shaded by large, mature trees, spacing between trees is sufficient to allow sunlight to reach the forest floor and encourage regeneration of shade-intolerant species like Jeffrey pine. Pockets of heavy fuels exist in these conditions, but their discontinuous nature reduces the likelihood that a fire will burn with enough intensity to negatively impact mature trees. In the absence of frequent surface fires, accumulated dead-and-down woody fuels and the green "ladder fuels" can carry flames into the coniferous overstory, potentially provoking a catastrophic, stand-destroying crown fire.

Big sagebrush communities are the most common vegetation types in Nevada with an altered fire regime, now characterized by infrequent, high-intensity, catastrophic fires. Sagebrush requires ten to twenty or more years to reestablish on burned areas, and most often these areas provide the conditions for establishment and spread invasive species before sagebrush reestablishment can occur. The most common invasive species to reoccupy both sagebrush and pinyon-juniper burned areas in northern Nevada is cheatgrass (*Bromus tectorum*).

Effect of Cheatgrass on Fire Ecology

Cheatgrass is a common, introduced annual grass that aggressively invades disturbed areas, especially burns. Replacement of a native shrub community with a pure stand of cheatgrass increases the susceptibility of an area to repeated wildfire ignitions, especially in late summer when desiccating winds and lightning activity are more prevalent. The annual production, or volume of cheatgrass fuel produced each year, is highly variable and dependent on winter and spring precipitation. Plants can range from only a few inches tall in a dry year to over two feet tall on the very same site in wet years. In a normal or above normal precipitation year, cheatgrass can be considered a high hazard fuel type. In dry years, cheatgrass is generally sparse and low in stature and poses a low fire behavior hazard because it tends to burn with a relatively low intensity. Nevertheless, in every year dried cheatgrass creates a highly flammable fuel bed that is easily ignited with the propensity to rapidly burn into adjacent cover types that may be characterized by more severe and hazardous fire behavior. The ecologic risk of a fire spreading from a cheatgrass stand into adjacent, unburned native vegetation is that additional disturbed areas are thereby opened and vulnerable to cheatgrass invasion. Associated losses of natural resource values such as wildlife habitat, soil stability, and watershed functions are additional risks.

Eliminating cheatgrass is an arduous task. Mowing defensible space and fuelbreak areas annually before seed maturity is effective in reducing cheatgrass growth. In areas where livestock may be utilized, implementing early-season intensive grazing up to and during flowering may aid in depleting the seed bank and reduce the annual fuel load (BLM 2003, Davison and Smith 2000, Montana State University 2004)[1]. It may take years and intensive treatment efforts to control cheatgrass in a given area,

[1] Proposed changes to livestock grazing on public lands for cheatgrass control must be approved by the appropriate land management agency prior to implementation.

but it is a desirable conservation objective in order to revert the landscape to the natural fire cycle and reduce the occurrence of large, catastrophic wildfires. Community-wide efforts in cooperation with county, state, and federal agencies are necessary for successful cheatgrass reduction treatments.

Effect of Fire on Russian Knapweed

Following the 2004 Waterfall fire, Russian knapweed, a state-listed noxious weed, was discovered in Kings Canyon, both on private property and lands owned by Carson City. Observations of Russian knapweed in Kings Canyon indicate that the species is stimulated by fire. The plant resprouted within days following the burn and its distribution is believed to be increasing rapidly. The University of Nevada Cooperative Extension, in cooperation with the Carson City Consolidated Municipality, has initiated specific treatments to control and hopefully eradicate this noxious weed in the affected areas. If not dealt with expediently, it will continue to spread and displace desired plant species. More information on Russian knapweed is included in Appendix E.

3.3 NATURAL RESOURCES AND CRITICAL FEATURES POTENTIALLY AT RISK

Critical features at risk of loss during a wildfire event can be economic assets such as agricultural and industrial resources or cultural features, such as historic structures, archaeological sites, and recreation-based resources.

3.3.1 Municipal Watershed

Approximately 5,705 acres (or 63 percent) of the 9,041-acre Carson City municipal watershed (includes Kings Canyon, Ash Canyon, and Vicee Canyon subwatersheds) burned in the 2004 Waterfall Fire. Significant risks, hazards, and costs to the City's municipal water system are likely to be incurred due to the large percentage of the watershed that burned. Erosion and sedimentation are likely to affect the performance and maintenance of the Quill water treatment facility. Water storage capacity reductions of 15 percent in the summer and up to 67 percent in the winter are expected to occur at the Quill facility. Estimated damage costs associated with the occurrence of moderate to catastrophic runoff events range from $10,000 to $5 million for repair and increased maintenance of the facility (Forest Service FSH 2509.13, 2004). Additionally, mudslide hazards will be present until vegetation establishes in the burned areas, which leaves homes, roads, pipelines, and other municipal infrastructure at risk of loss.

3.3.2 Historical Registers

Two Historic Registers were researched for this report. There are 41 sites listed on the National Register of Historical Places for the Carson City Consolidated Municipality. The Nevada State Register of Historical Places lists seventeen sites. The historic buildings that lie in the wildland-urban interface and could be negatively impacted (damaged or destroyed) by wildfire are summarized in Table 3-3 and shown on Figure 5-1.

Table 3-3. At-Risk Historical Places in the Carson City Consolidated Municipality

SITE NAME	LOCATION	SOURCE REGISTER
Stewart Indian School	South Carson City	National Register of Historic Places
Wabuska Railroad Station	South Carson Street	National Register of Historic Places

3.3.3 Recreation

Spooner Lake Unit of the Lake Tahoe State Park is located within both the Carson City Consolidated Municipality and Douglas County; it is managed by the Carson-Tahoe Region Headquarters of the Nevada Division of State Parks. There are several structures within the 2,800 acre park including a maintenance building, well house, restroom, cross-country ski lodge, fee booth and entrance station, historic sheepherder's cabin, water tender's cabin, and two rental cabins. None of the structures are inhabited year-round, and all structures within the Park are constructed of either wood siding or logs and have composite, asphalt, or metal roofs. No hydrants or water storage drafting sources are available for structure fire protection; however, water can be drafted out of nearby Spooner Lake.

Approximately 120,000 people visit the park annually and the estimated daily summer weekend visitation is 525 persons. The Park management has developed an informal evacuation plan that they used to evacuate the Park during the 2004 Waterfall Fire. The Nevada Division of Forestry is the primary fire suppression agency responsible for the State Park. The Parks Division has received some funding for fuel reduction treatments along corridors outside of the Lake Tahoe Basin and plans on implementing the projects in the fall of 2004. They have also received funding from the Environmental Improvement Program for fuels reduction and forest health treatments for the areas of the park within the Lake Tahoe Basin (Kosch pers. comm.).

The Humboldt-Toiyabe National Forest, Carson Ranger District (USFS) has completed several fuels reduction treatments south of the Spooner Lake State Park. Approximately 400 acres were treated approximately ten years ago through a salvage timber sale and hand crew treatments of cut, pile, and burn.

Riverview Park is located on the east side of the Carson City community along the Carson River (Figure 3-2). The park features trails, exercise signs, wildlife viewing, and restroom facilities. Wildfires would potentially damage wildlife habitat and could reduce recreational interest.

The Silver Saddle Ranch is owned and operated by the Bureau of Land Management. The Silver Saddle Ranch features trails, historic buildings, restrooms, and corrals. Wildfires would damage wildlife habitat and could reduce recreational interest.

3.3.4 Flora and Fauna

There is one federally listed endangered species with potential habitat in the municipality. Projects implemented to protect habitat for this species require formal consultation with the US Fish and Wildlife Service. An additional fourteen species are protected by Nevada state legislation and are identified in Table 3-4. The Nevada Natural Heritage Program, the Nevada Division of Forestry, and the Nevada Department of Wildlife should be

consulted regarding specific concerns and potential mitigation to minimize impacts to these species when implementing fuel hazard reduction activities prior to the event of a catastrophic wildfire.

Table 3-4. Federal and State Listed Flora and Fauna At Risk in the Carson City Consolidated Municipality

SCIENTIFIC NAME	COMMON NAME	REGULATORY PROTECTION
Plants		
Rorippa subumbellata	Tahoe yellowcress	NRS 527.260.300
Insects		
Pseudocopaeodes eunus ssp. *obscurus*	Carson wandering skipper	ESA-Listed Endangered
Mammals		
Aplodontia rufa ssp. *californica*	Mono Basin mountain beaver	NRS 501
Euderma maculatum	Spotted bat	NRS 501
Lontra canadensis	River otter	NRS 501
Martes americana	American marten	NRS 501
Birds		
Accipiter gentilis	Northern goshawk	NRS 501
Athene cunicularia ssp. *hypugaea*	Western burrowing owl	NRS 501
Buteo regalis	Ferruginous hawk	NRS 501
Buteo swainsoni	Swainson's hawk	NRS 501
Chlidonias niger	Black tern	NRS 501
Gavia immer	Common loon	NRS 501
Oreortyx pictus	Mountain quail	NRS 501
Otus flammeolus	Flammulated owl	NRS 501
Strix occidentalis ssp. *occidentalis*	California spotted owl	NRS 501

3.4 PREVIOUS FIRE HAZARD REDUCTION PROJECTS

The Carson City Fire Department, US Forest Service Carson Ranger District, Bureau of Land Management Carson City Field Office, Nevada Division of Forestry, Clear Creek chapter of the Nevada Fire Safe Council, and the Washoe Tribe of Nevada and California have implemented several fuel hazard reduction projects for the wildland-urban interface areas of the Carson City Municipality (Figure 3-3). Additional projects have been planned in the Carson City, Carson Indian Colony, Clear Creek, and Stewart communities. Information on these projects is included in each community section.

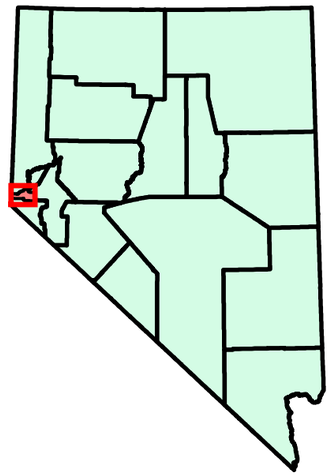

Figure 3-1. Community and Land Ownership Carson City Consolidated Municipality

Legend

- Carson City Community
- Carson City Municipality
- Highways and State Routes

Land Ownership

- Nevada State (NVST)
- Bureau of Indian Affairs (BIA)
- Bureau of Land Management (BLM)
- Forest Service (FS)
- Private (PVT)
- Water (WTR)

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Nevada Community Wildfire Risk/Hazard Assessment

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

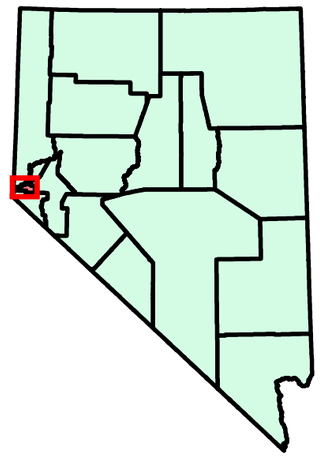

Figure 3-2. Fire History and Critical Features Potentially At-Risk
Carson City
Consolidated Municipality

Lake Tahoe State Park
Sand Harbor Unit

Lake Tahoe State Park
Spooner Lake Unit

Carson Indian Colony

Wabuska
Train
Station

Riverview Park

Silver Saddle Ranch

Stewart Indian School

Legend

- Carson City Community
- Carson City Municipal Watershed
- Recreation Areas
- Carson City Municipality
- Fire Ignition
- Past Fires (1980-2003)
- Waterfall Fire (2004)
- Highways and State Routes

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Nevada Community Wildfire Risk/Hazard Assessment

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Storey County
Washoe County
Carson City
Lyon County
Carson City
531
525
50
516
395
50
520
Carson City
529
Carson Indian Colony
518
50
Clear Creek
Stewart
395
Carson City
Douglas County

Legend

- Carson City Community
- County Boundary
- Community Boundary
- Highways and State Routes

Completed Fuel Reduction Projects

- Defensible Space - 80% of lots treated
- Tree Thinning
- Partial Brush Thinning
- Fuelbreak
- Handline

Figure 3-3. Carson City Municipality
Completed Wildland-Urban Interface Fire Mitigation Projects

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Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Nevada Community Wildfire Risk / Hazard Assessment Project

4.0 MUNICIPALITY-WIDE ASSESSMENT RESULTS

4.1 MUNICIPALITY-WIDE RISK AND HAZARD ASSESSMENT OVERVIEW

During May of 2004, the RCI Project Team evaluated the four communities listed below. The inventory of community design aspects (access, signage, utility infrastructure), defensible space conditions, construction materials, architectural features, wildland-urban interface characteristics, fuel type, and fuel density resulted in an overall hazard rating for each community. The key components of these assessments are summarized in Table 4-1.

Table 4-1. Assessment Results Summary

COMMUNITY	INTERFACE CONDITION	INTERFACE FUEL HAZARD CONDITION	IGNITION RISK RATING	COMMUNITY HAZARD RATING
Carson City	Classic/Intermix	Low to High	High	Moderate
Carson Indian Colony	Classic	Low to High	High	Moderate
Clear Creek	Intermix	Extreme	High	High
Stewart	Classic	Moderate	High	Low

4.1.1 Wildfire Protection Resources

The Carson City Fire Department (CCFD) and the Nevada Division of Forestry Sierra Forest Fire Protection Districts are the primary agencies responsible for wildfire protection in the private land areas of the Municipality. The CCFD is a 63-member career department that works closely with the ten-member Warren Engine Company No. 1 Volunteer Fire Department. The Sierra Forest Fire Protection District was established according to NRS 473 to provide wildfire suppression services and procure federal aid for wildfire suppression within the District boundary. The District includes the Sierra front portions of the Municipality, Douglas County, and Washoe County. The Sierra Forest Fire Protection District has one fire station in Carson City that is staffed with up to eleven seasonal Nevada Division of Forestry personnel from May through October. Three Nevada Division of Forestry career personnel are staffed through the Sierra Forest Fire Protection District in offices in Carson City and Washoe County year round and are available to respond to wildfires.

The BLM Carson City Field Office is the primary agency responsible for wildland fire suppression on BLM administered lands (41,000-acres) within the Municipality and has an agreement with the Bureau of Indian Affairs (BIA) to provide suppression on BIA lands (480) acres in the Municipality. The USFS Carson Ranger District of the Humboldt-Toiyabe National Forest is the primary agency responsible for wildland fire suppression on the 10,000-acres of USFS lands within the Municipality. The USFS usually provides three seasonal positions in the municipality annually. The Sierra Front Interagency Dispatch Center in Minden, Nevada dispatches both BLM and USFS suppression resources through a computer-aided dispatch system.

Wildfire suppression resources are also available to private land portions of Carson City through mutual aid agreements with the Bureau of Land Management Carson City Field Office, USFS Carson Ranger District, East Fork Fire and Paramedic District, Reno Fire Department, Central Lyon County Fire Protection District, Bureau of Indian Affairs, and the Lake Tahoe Regional Fire Chief's Association. Carson City Fire Department is also a member of the Sierra Front Wildfire Cooperators. See the glossary of wildfire terms in Appendix A for more information on the Lake Tahoe Regional Fire Chief's Association and the Sierra Front Wildfire Cooperators. Tables 4-2 and 4-3 summarize the types of wildfire suppression resources, cooperating partners, and equipment available for first alarm and initial attack of wildland-urban interface fires in the Carson City Consolidated Municipality.

The availability of the listed resources varies depending on time of year and whether resources have been previously dispatched to other incidents. The Carson City Fire Department reduces the response listed in Tables 4-2 and 4-3 to a single Type III brush truck for the months excluded from the fire season.

Table 4-2. Carson City Fire Department Wildfire Resources and Equipment Available for First-Alarm Response to a Wildland-Urban Interface Fire

TYPE OF EQUIPMENT	AMOUNT OF EQUIPMENT	COOPERATING PARTNER (RESOURCE LOCATION)
Type I Engine	1	Carson City Fire Department (Carson City)
Type III Brush Truck	1	
Battalion Chief	1	
Rescue Ambulance	1	

Source: Personal Communication with Stacey Giomi Carson City Fire Department Battalion Chief.

Table 4-3. Carson City Consolidated Municipality Wildfire Resources, Cooperating Partners, and Equipment Available for Initial Attack Response to a Wildland-Urban Interface Fire (during a high hazard day)

TYPE OF EQUIPMENT	AMOUNT OF EQUIPMENT	COOPERATING PARTNER (RESOURCE LOCATION)
Type III Engine	5	Sierra Front Interagency Dispatch, Minden - closest available resources from the following agencies: Sierra Forest Fire Protection District (NDF), BLM, USFS (Air suppression response only if smoke is visible)
Battalion Chief/Duty Officer	2	
Water Tender	1	
Dozer	1	
Hand Crew	1	
Single Engine Air Tanker (SEAT) or Air Tanker and Lead Plane	1	
Air Attack	1	
Helicopter	1	

Source: Personal Communication with Rich Riolo Nevada Division of Forestry Fire Prevention Chief, Leonard Wehking BLM Carson City Field Office Fire Management Officer, Steve Heinrich BIA Hot Shot Crew Superintendent, and Mike Polovina Sierra Front Interagency Dispatch Center Manager.

4.1.2 Water Sources and Infrastructure

Water availability for fire suppression resources for Carson City include:

- Community wells;
- 500 gpm hydrants within 500 feet of structures for about 70 percent of residences;
- Helicopter dip spots;
- 14 water storage tanks:
  - (1) 4 million gallons
  - (4) 3 million gallons
  - (1) 2.6 million gallons
  - (1) 2 million gallons
  - (1) 400,000 gallons
  - (2) 300,000 gallons
  - (4) 250,000 gallons

The water system is pressurized by a gravity system, except in two areas where pressure is generated by pumps. None of the pressure pumps or wells have emergency back-up generators. The City does have two portable generators for use during power outages. The existing infrastructure for the water delivery system meets the 1997 Uniform Fire Code standards.

Hydrants are not available for three homes in Ash Canyon and in the areas of Pinyon Hills, Mexican Dam, Rabe Way, Clear Creek, and Kings Canyon. There are several helicopter dip spots located around the municipality including the Carson River and ponds near Stewart and Ash Canyon. The Silver Oak and Empire Ranch golf courses also have water hazards that could be used for dip sites. Homeowner pools may also be used as dip sites when permission is obtained.

4.1.3 Detection and Communication

Fires are reported in the municipality through 911 calls and calls directly to the Carson City Sheriff's Office. Fires are communicated to Carson City Fire Department fire response personnel through Carson City Sheriff's Office emergency dispatch, radios, pagers, and telephones. Carson City uses a computer-aided dispatch system and assumes communication and dispatch responsibilities for all fires within the municipality or involving Carson City Fire Department Equipment. The Sierra Forest Fire Protection District (NDF), Bureau of Land Management, and US Forest Service fire personnel and equipment are dispatched through the Sierra Front Interagency Dispatch Center in Minden, Nevada.

The Carson City Sheriff's Office, Carson City Fire Department, and Sierra Forest Fire Protection District have access to the state mutual aid frequencies. The radio system is compatible with neighboring agencies. The radio coverage does not include the areas around Spooner Lake, Clear Creek, and Pinyon Hills.

4.1.4 Fire Protection Personnel Qualifications

The Carson City Fire Department firefighters have been trained to National Fire Protection Association Firefighter II standards. Entry-level wildland firefighter training is scheduled

annually with BLM or USFS instructors. A Red Card certification is used for all management level positions with the CCFD. The Red Card certification is part of a fire qualifications management system used by many state and all federal wildland fire management agencies that indicates an individual's qualifications to fight wildland fires. NDF Sierra Forest Fire Protection District personnel are trained to State Fire Marshal Firefighter I and II standards and have completed the National Wildfire Coordinating Group Wildland Firefighter Qualifications (310-1). A Red Card certification is required for all seasonal and career personnel.

4.1.5 Work Load

The Carson City Fire Department reported the annual number of wildland fires they respond to within the municipality as 175 fires. The Sierra Front Interagency Dispatch Center, which dispatches for the USFS, BLM, and NDF in Carson City, Douglas, Lyon, and Washoe Counties, reported responding to 234 wildfires in 2004 (Polovina pers. comm.). The Nevada Division of Forestry estimated that on average they respond to approximately six wildfires each year within the municipality (Riolo pers. comm.).

4.1.6 Financial Support

Funding for the Carson City Fire Department is provided primarily from the Carson City General Fund. The Fire Department also pursues grant funding when available for fuel reduction projects around the community. Funding for the Sierra Forest Fire Protection District is provided through *ad valorem* property tax and CTX sales tax revenue.

4.1.7 Community Preparedness

The Carson City Municipality has an active Local Emergency Planning Committee and has adopted an emergency plan, a disaster plan, and an emergency evacuation plan. The emergency plan is updated annually. The Carson City Federal Emergency Management Agency plan covers wildland fires, earthquakes, and floods. The Sierra Front Wildfire Cooperators has a pre-attack plan that is updated annually prior to the start of each fire season and primarily covers dispatch run cards for initial attack. A pre-attack plan was developed for Carson City in the 1980's that provided travel maps, topography maps, facility locations for incident command posts, water supply locations, basic fuel maps, and aerial photos. The pre-attack plan was designed to be used by incident management teams after initial attack and was originally intended to be stored at the Sierra Front Interagency Dispatch Center. It is unknown where the plan is currently located and when it was last updated.

New development plans for the Municipality are reviewed by the Carson City Fire Department. The Municipality has also adopted an ordinance for homes in the wildland-urban interface that addresses access, water supply, construction materials, defensible space, spark arrestors, placement and storage of propane tanks, and storage of firewood and other combustible material.

The BLM Carson City Field Office has sponsored and provided the Carson City Fire Department with a Student Conservation Association – Fire Education Corp team during the summers of 2002 through 2004. These teams evaluated over 300 individual properties for defensible space implementation; they also educated homeowners about defensible space, and provided recommendations on how to improve structure survivability. These assessments were conducted in seven areas of the Municipality: Pinyon Hills, Mexican

Dam, Carson Indian Colony, north of Arrowhead Drive, Clear Creek, Kings Canyon, and Timberline. The 2003 team, in conjunction with the Warren Engine Company, completed a fuel reduction project on one property in the Kings Canyon area, which subsequently survived the 2004 Waterfall Fire.

Both the Carson City Street Department and the Nevada Department of Transportation perform right-of-way clearance on public streets in the Municipality. The Carson City Fire Department also holds activities regarding fire safety during the annual Fire Prevention Week. The Carson City Street Department also conducts noxious weed abatement.

4.2 MUNICIPALITY-WIDE RECOMMENDATIONS

The Carson City risk and hazard reduction recommendations address the primary concern regarding protection of existing and future development in the wildland-urban interface areas within the municipality. Other recommendations pertain to community coordination and public education efforts that could be undertaken to enhance fire safety in Carson City communities.

4.2.1 Fire Suppression Capability

Proper maintenance, storage, and acquisition of fire suppression equipment along with regular and appropriate firefighter training increases fire suppression capability for those areas where fire protection is available.

Carson City Fire Department

- Train and certify Carson City Fire Department engine captains to the level of Engine Boss as defined in the National Wildfire Coordinating Group's publication 310-1.
- Train and certify Chief officers to the level of Strike Team Leader and Incident Commander Type 3.

4.2.2 Fuel Reduction Treatments

In conducting the risk and hazard assessment for the Carson City communities, the RCI Project Team Fire Specialists reviewed the fuelbreaks proposed and previously implemented by Carson City Fire Department, Bureau of Land Management, US Forest Service, Nevada Division of Forestry and Dynamac, Inc. RCI concurs with the need for the planned and scheduled fuelbreaks in both the Carson City and Clear Creek communities. These planned fuelbreaks will reduce fire spread rates and increase firefighter safety in the event of a wildland-urban interface fire.

Carson City Fire Department, Bureau of Land Management, Nevada Division of Forestry, US Forest Service, and Washoe Tribe Responsibilities

- Pursue funding for and implement the planned and scheduled fuelbreaks and fuel reduction treatments for the Carson City and Clear Creek communities (see Figures 5-1, 5-4, 5-5, 7-1, and 7-4).

Nevada Department of Transportation and Carson City Street Department

- Reduce vegetation in wildland-urban-interface areas of the municipality and continue vegetation maintenance along road shoulders for a distance of twenty feet from the edge of the roadway on both sides. Vegetation should be mowed to a height of no more than four inches. The biomass should be removed and disposed of at an appropriate site.

Utility Company Responsibilities

- Clear all shrubs and maintain a minimum clearance distance of thirty feet from the fence around transformer stations in the municipality. Reduce vegetation to maintain a minimum clearance distance of fifteen feet from all utility poles.

4.2.3 Public Education

Increased public education on fire safety is also critical in communities that have rapidly growing populations, especially when many of the areas being developed are on larger lots scattered throughout wildland fuels. People moving into the area may be unaware of fire prone environments and the inherent threats associated with them.

Carson City Fire Department Responsibilities

- Coordinate with the Bureau of Land Management, University of Nevada Cooperative Extension, and Nevada Division of Forestry to conduct public education and fire awareness programs.
- Incorporate wildland fire awareness and defensible space education into the annual Fire Prevention Week activities.
- Distribute copies of the publication *"Living with Fire"* to all property owners who live in wildland-urban interface subdivisions in the municipality. This publication is free of charge and copies can be requested from the University of Nevada Cooperative Extension.

4.2.4 Fire Safe Community Enforcement

Property Owner Responsibilities

- Form local chapters of the Nevada Fire Safe Council in areas of the Municipality such as Timberline, Lakeview, Pinyon Hills, Mexican Dam, North Carson, Carson Indian Colony, and Stewart. The Nevada Fire Safe Council proposes to work on solutions that reduce the risk of loss of lives and property from wildfires in Nevada's communities. Through establishment of a local Chapter, communities become part of a large information-sharing network that receives notifications of programs and funding opportunities for fire mitigation projects such as those listed in this report. The Nevada Fire Safe Council will accept and manage grants and contracts on the Chapter's behalf through its non-profit status. The Nevada Fire Safe Council provides assistance and support to communities to complete fire safe plans, set priorities, educate and train community members, and promote success stories of its members. For more information on forming a chapter, contact:

The Nevada Fire Safe Council
1187 Charles Drive
Reno, Nevada 89509
www.nvfsc.org

Carson City Supervisor Responsibilities

- Require all future development in the municipality to comply with 2003 International Fire Code standards with regards to structure construction, road construction, and water supply systems.
- Revise the local ordinance regarding fuel reduction and defensible space requirements for wildland-urban interface areas (Carson City Municipal Code Chapter 14.10). The revisions to the ordinance should provide the City authority to require defensible space implementation on all developed and undeveloped lots within interface areas. If landowners do not complete defensible space treatments within an allotted time frame, the landowner should be charged for defensible space services through property tax levies. The ordinance should also be expanded to include provisions requiring fuel reduction treatments prior to approval of new wildland-urban interface subdivisions and for continued maintenance of the fuel reduction treatments.

Carson City Fire Department

- Locate and update the Carson City pre-attack plan, or complete a new plan if the old one cannot be located. The pre-attack plan should be made available to mutual aid fire suppression resources when assisting local resources during an emergency.
- Continue to conduct annual defensible space inspections for homeowners to evaluate the adequacy of defensible space treatments and assure compliance with the defensible space requirements in the wildland-urban interface areas.

5.0 CARSON CITY

5.1 RISK AND HAZARD ASSESSMENT

The Carson City community encompasses all private residential lands within the municipality excluding the Clear Creek subdivision, the Carson Indian Colony, and Stewart. The City is situated in the Eagle Valley basin with hills facing all aspects. Carson City is bordered to the north by Washoe County, to the east by the Pine Nut Mountains and Lyon County, and to the south by Douglas County. The City is dissected north-south by US Highway 50 and east-west by US Highway 395. The Carson City Municipality has an estimated population of 55,220 persons (Nevada State Demographer 2003).

The risk/hazard assessment resulted in classifying the Carson City community in the **Moderate Hazard** category (53 points). A summary of the values that affect the hazard rating is included in Table 5-2. The moderate hazard condition is attributed primarily to the relatively flat terrain around most homes in the community, the availability of fire suppression resources in the event of a wildfire, multiple access routes around the community, fuel reduction treatments around some subdivisions, and defensible space around structures in many interface areas. However, Carson City is a large community and some of the smaller neighborhoods and subdivisions would likely fall into the high or extreme hazard categories if assessed separately. The specific findings for each of the wildland fire assessment factors are discussed below.

5.1.1 Community Design

The area surrounding the Carson City community was considered both classic interface and intermixed wildland-urban interface conditions. The classic interface condition occurs where there is a clear line of demarcation between structures and wildland fuels and wildland vegetation typically does not continue into the developed areas. The intermix condition includes structures scattered throughout the wildland area with no clear line of demarcation between wildland fuels and residences in the community.

Within the Carson City community interface, approximately 68 percent of the homes are on lots less than one acre in size, and 32 percent of the lots are between one and ten acres in size. As such, most structures are spaced close together, though a few structures are surrounded by sizeable expanses of vacant land (see Figure 5-1).

Access: US Highway 50 and US Highway 395 are the major transportation routes linking the Carson City community to surrounding communities. There are several other State Routes and major secondary roads that provide access to developed areas. These primary access roads are all at least 24 feet wide, paved and have adequate turnaround space for fire suppression equipment. No dead-end roads pose turn around hazards for fire suppression equipment in the interface areas. A majority of roads in the community have less than a five percent gradient. Only one access road serves each of the Timberline, Kings Canyon, and Mexican Dam neighborhoods.

Signage: Street signs were present and visible for all streets. Residential addresses were generally visible except in the Lakeview and Pinyon Hills areas where the larger

lots make it difficult to see addresses from the roads. Clear and visible signage throughout the Carson City community assists fire suppression personnel in locating residences during poor visibility conditions that may occur during a wildland fire.

Utilities: The utilities serving the Carson City community are a combination of above ground and below ground utilities. Most of the power line rights-of-ways have been properly maintained to minimize the potential of either ignitions from sparks during windstorms or exploding transformers during peak electricity use periods. The Pinyon Hills area is in need of vegetation clearing and thinning around power lines.

5.1.2 Construction Materials

Of the 1,244 homes observed in the interface area, almost all were built with treated wood siding materials, stucco, vinyl, brick or other fire resistant siding materials. Most homes had fire resistant roofing materials such as composite roofing, metal, or tile. Less than ten percent of the homes observed had an unenclosed balcony, porch, deck, or other architectural features that create drafts and provide areas where sparks and embers can lodge, smolder, and ignite, rapidly spreading fire to the home.

5.1.3 Defensible Space

Approximately 75 percent of homes observed had landscaping that would meet defensible space guidelines to protect the home from damage or minimize loss during a wildfire. Areas of the Carson City community where defensible space was not always adequate included lots in the Pinyon Hills area and lots larger than one acre east of Edmonds Drive.

5.1.4 Suppression Capabilities

The Carson City Fire Department and Sierra Forest Fire Protection District are responsible for wildfire and structure fire protection within the Carson City community. The Bureau of Land Management and US Forest Service also provide fire protection to the Carson City community for the publicly administered lands surrounding the community. See Tables 4-2 and 4-3 for more information on fire suppression capabilities for initial attack of wildland-urban interface fires.

5.1.5 Factors Affecting Fire Behavior

Vegetation, fuels, and topography contribute to the potential fire hazard around wildland-urban interface communities. The fuel hazards were mapped for the Carson City community and fuel hazard photos were taken to illustrate the relationship between vegetation types, slope, aspect, and overall fuel hazard (see Figures 5-2 and 5-3). The fuel hazards in the vicinity of the Carson City community were mapped prior to the 2004 Waterfall Fire and subsequently revised to reflect the most recent fuel hazard conditions. The fuel hazard is low in the burned areas following the Waterfall Fire due to the lack of vegetation. Rehabilitation and revegetation treatments have been proposed for treating the burned areas, and if successful, will result in low to moderate vegetative fuel density within the next five to ten years.

The vegetative fuel density ranged from moderate to heavy in the Carson City community interface areas. Dominant vegetation types around The Carson City community included sagebrush/bitterbrush, sagebrush/perennial grass, sagebrush/pinyon/juniper, and Jeffrey Pine/bitterbrush associations. Fuels in the unburned southwest portions of the Carson City

community from Voltaire Canyon north to Kings Canyon consisted primarily of bitterbrush, big sagebrush, desert peach, and cheatgrass. Shrub heights ranged between two and five feet, the fuel load was four to five tons per acre and was considered a high fuel hazard.

In the unburned areas near Kings Canyon, the dominant vegetation consisted of a Jeffrey pine and white fir tree canopy with an understory of big sagebrush and bitterbrush. The fuel load was classified as heavy with shrub heights between five and six feet, an estimated fuel load of eight tons per acre, which is a high fuel hazard. However, due to the Waterfall Fire, the fuels were no longer continuous across the landscape in this area.

The unburned vegetation in the interface areas of upper Vicee Canyon and the Timberline and Lakeview subdivisions were considered heavy density fuels with dominant species including a tree canopy of Jeffrey pine and mountain mahogany. Understory species included big sagebrush, bitterbrush, rabbitbrush, perennial grasses, and cheatgrass. Shrub heights ranged from three to five feet, and fuel loads in the area were estimated to be eight tons per acre. Fuels are not continuous in these areas, but still present a high hazard if an ignition occurred within the subdivisions.

On the north side of the community, north of Bonanza Lane, the moderate density fuels were predominantly composed of bitterbrush, big sagebrush, Mormon tea, rabbitbrush, and desert peach with a cheatgrass understory. The distance between shrubs was approximately three feet with shrub height ranging from two to four feet. The fuel load in this area was estimated at two tons per acre and considered a high fuel hazard.

On the northeast side of the community, north of Arrowhead Road, the fuel density was light dominated by short and widely spaced sagebrush, rabbitbrush, and desert peach shrubs. Previous fires have burned in this area and there was an understory of cheatgrass. The fuel load was estimated at one ton per acre and considered a low fuel hazard.

Fuel density was heavy on the east side of the Carson City community near the Pinyon Hills subdivision. Pinyon and juniper trees were spaced ten to thirty feet between crowns with an understory of sagebrush, bitterbrush, Mormon tea, rabbitbrush, and spiny hopsage. Indian ricegrass, cheatgrass, and pinyon and juniper duff comprised the ground fuels in the area. Fuel loads were estimated to range between six and thirteen tons per acre depending upon tree density. The variable tree densities resulted in a fuel hazard of moderate to high in the areas of close proximity to homes.

Fuels in the southeast area of the community near the large parcels in the Mexican Dam area consisted of bitterbrush, big sagebrush, Mormon tea, desert peach, and rabbitbrush with an understory of cheatgrass. A few scattered pinyon pine trees were present on the east side of this area. Fuel height generally ranged between two and four feet with moderate density fuel loads of three to four tons per acre. The fuel hazard in the area ranged from low to moderate depending upon the presence of riparian vegetation (low hazard) and the shrub density.

Fuels around the Prison Hill area east of Edmonds Drive were dominated by big sagebrush and rabbitbrush with an understory of cheatgrass, annual mustard, and Russian thistle (tumbleweeds). The average fuel load in the area was three to four tons per acre and was considered a moderate fuel hazard.

The terrain along the west, north, and east sides of the Carson City community is fairly steep (20 to 40 percent slopes) with several east/west directional canyons along the hillsides. Slopes on the south side of the community are slightly less steep ranging from five to twenty percent. The predominant wind direction is from the south-southwest in the late afternoon, with occasional strong downslope winds in the late afternoons during the summer months. There is a history of lightning strikes west, north, and east of the community.

5.1.6 Previous Fire Hazard Reduction Projects

Efforts have been made by various agencies to create defensible space and implement fuel reduction projects throughout the Carson City community. Figures 3-3, 5-1, 5-4, and 5-5 illustrate the locations of various wildland-urban interface projects that have either been implemented, are scheduled to be completed in 2005, or are planned and awaiting future funding. Fuels treatment projects completed to date have been 100 to 300 feet wide; have been drill or broadcast seeded with grass species adapted to the area; and have included (Plateau®) herbicide treatment where allowed and necessary to reduce competition from cheatgrass. The fuels reduction treatment areas were created utilizing mechanized mastication equipment and hand crews to thin and remove brush and prune trees.

The Nevada Division of Forestry has awarded grants to the Carson City Fire Department, Fire Prevention Division to implement fuel reduction and defensible space projects. With the assistance of NDF Conservation Camp crews, defensible space treatments have been completed on approximately 80 percent of the homes in the Lakeview subdivision and on about 80 percent of the exterior lots in the Timberline subdivision. Other agencies cooperating with Carson City Fire Department include the USFS Carson Ranger District, BLM Carson City Field Office, and the Nevada Fire Safe Council (Giomi pers. comm.).

The USFS Carson Ranger District completed two fuelbreaks in 2004 on the west side of the Lakeview subdivision. These 400-foot wide fuelbreaks were approximately 25 acres in size and involved reducing brush cover to levels between twenty and fifty percent. The USFS also thinned trees in a five acre plantation near the southwest corner of the Lakeview subdivision.

The BLM Carson City Field Office completed a 2.5-mile, 100-foot wide wildland-urban interface fuel reduction treatment on the east side of homes in the Prison Hill Area in June 2002 (east of Edmonds Drive) (see Figure 3-3). The BLM Carson City Field Office and Carson City Fire Department are cooperatively planning a four mile, 150 to 200-foot wide fuel reduction treatment on the east side of the Pinyon Hills area (Deer Run treatment area) of Carson City for January 2005 (Figure 5-4). Both agencies are also planning to complete 43 acres of fuel reduction treatment for the northeast and south portions of the Mexican Dam area in January 2005 (Figure 5-5). The BLM Carson City Field Office also maintains several small fuel reduction treatments around structures at the Silver Saddle Ranch (Roide pers. comm.).

The University of Nevada Cooperative Extension (UNCE) received a grant to implement a fuelbreak along C-Hill on the west side of Carson City in 1999. The project involved utilizing concentrated sheep grazing to reduce the grass fuels and create a 2.5-mile fuelbreak, 150 to 200 feet wide. Fine fuels were reduced by 0.75 to 2.75 tons per acre. The fine fuels were significantly reduced for two growing seasons, but grazing would need to be repeated every two to three years to maintain the fuelbreak. On the ground implementation, combined with

public education, resulted in high homeowner acceptance and approval for this fuel reduction method.

5.1.7 Fire Behavior Worst-Case Scenario

The worst-case wildfire scenario for a major wildland fire in the area surrounding the Carson City community would likely occur in the event of a dry lightning storm with numerous ignitions on the east side of the City. Fire agencies could be faced with several major fires being pushed by erratic winds toward residential areas on the east side of Carson City. A fire ignition located either south of the Mexican Dam area or south of the Pinyon Hills area on the west-facing slope of the Pine Nut Range, pushed by strong 25 to 30 mile per hour south or southwest winds, could spread rapidly toward either the Mexican Dam or Pinyon Hills areas of the community. The intermix interface condition and moderate to heavy fuel density in this area could increase the difficulty of controlling a wildfire threatening homes. The scenario would be worsened if mutual aid resources were unavailable or limited due to assignment of an emergency situation elsewhere.

5.1.8 Ignition Risk Assessment

The Carson City community has a high ignition risk rating. There is a significant history of wildfire and fire ignitions in the public lands surrounding the community. High ignition rates are due to the moderate density fuel in and around the community, the tendency for lightning storms during the summer, and number of recreationists using the wildlands near the community. Ignition risks fall into two categories – lightning and human caused. Human caused ignitions can come from a variety of sources: fires started along highways and roads from burning material thrown out of vehicle windows, ignitions from auto accidents, off-road vehicles, faulty power lines, ditch burning, debris burning in piles or burn barrels, matches, target shooting, and fireworks. In Carson City, ignitions have been caused almost equally by both human causes and lightning.

5.2 RISK AND HAZARD REDUCTION RECOMMENDATIONS, ROLES, AND RESPONSIBILITIES

The Carson City community risk and hazard reduction recommendations address the primary concern regarding protection of existing and future development in the wildland-urban interface area. Other recommendations pertain to community coordination and public education efforts that would enhance fire safety in the Carson City community.

5.2.1 Defensible Space Treatments

Defensible space is an essential first line of defense for residential structures. Significantly reducing or removing vegetation within a prescribed distance from structures (a minimum of 30 feet to 200 feet depending upon slope and vegetative fuel type) reduces fire intensity and improves firefighter and homeowner chances for successfully defending a structure against oncoming wildfire.

Property Owner Responsibilities

- Remove, reduce, and replace vegetation to create defensible space around homes according to the guidelines in Appendix F. This area should be kept:

  Lean – There are only small amounts of flammable vegetation, and

Clean – There is no accumulation of dead vegetation or other flammable debris, and

Green – Existing plants are healthy and green during the fire season.

- Remove debris and flammable materials from within the defensible space area.
- Store firewood a minimum distance of thirty feet from structures.
- Mow or remove brush growing against wood fences in the community.
- Pine needles, leaves, and debris should be removed from roofs and rain gutters.
- Maintain areas under wood decks and porches free of weeds and other flammable debris.
- Clear all vegetation and combustible materials around propane tanks for a minimum distance of ten feet.
- Spark arrestors should be installed on chimneys.
- Maintain a minimum clearance of thirty feet from the crown of trees that remain within the defensible space zone. Keep this area free of smaller trees, shrubs, and other ladder fuels.
- Trim and remove tree branches a minimum of five feet or one-third the height of the tree from the ground for Jeffrey Pine and other large conifers and a minimum of two feet (or one-third the height) from the ground for pinyon and juniper trees to reduce ladder fuels within the defensible space zone. Prune all dead and diseased branches. Remove flammable material including duff from beneath crowns of retained trees.
- Prune trees so that the branches are at least fifteen feet away from chimneys and or structures.
- Immediately dispose of cleared vegetation when implementing defensible space treatments. This material dries quickly and poses a fire hazard if left on site.
- Maintain defensible space as needed to keep the area lean, clean, and green.

5.2.2 Fuel Reduction Treatments

In conducting the risk and hazard assessment for the Carson City community, the RCI Project Team Fire Specialists reviewed the fuelbreaks proposed and previously implemented by Carson City Fire Department, Bureau of Land Management, US Forest Service, and Nevada Division of Forestry. RCI concurs with the need for the planned fuelbreaks in the community. These planned fuelbreaks will reduce fire spread rates and increase firefighter safety in the event of a wildland-urban interface fire.

There are several areas within the Carson City community in which reducing vegetation along roadways and driveways could reduce the likelihood of wildfire spreading across roads, as well improve firefighter access and safety for protecting homes. The areas of most concern for removing vegetation along roads include the Pinyon Hills, Mexican Dam, Lakeview, Kings Canyon, Timberline, and Voltaire Canyon areas.

Carson City Fire Department, Bureau of Land Management, Nevada Division of Forestry, US Forest Service, and Washoe Tribe Responsibilities

- Pursue funding for and implement the planned and scheduled fuelbreaks and fuel reduction treatments for the Carson City community (Figures 5-1, 5-4 and 5-5).

Nevada Department of Transportation and Carson City Street Department Responsibilities

- Reduce vegetation in wildland-urban-interface areas of the Carson City community, and continue vegetation maintenance along road shoulders for a distance of twenty feet from the edge of the roadway on both sides. Vegetation should be mowed to a height of no more than four inches. The biomass should be removed and disposed of at an appropriate site.

Property Owner Responsibilities

- Reduce fuels at least ten feet along both sides of private driveways that are longer than 200 feet. Flammable fuels should be replaced with fire-resistant species such as crested wheatgrass, irrigated deciduous shrubs, wildflowers, and lawn or by seeding with an approved pre-suppression seed mix. Refer to Appendix F for approved seed mixes, planning guidelines, and seed sources.

Nevada Department of Transportation and Carson City Street Department

- For the areas of Lakeview, Pinyon Hills, Kings Canyon, Voltaire Canyon, and Timberline, reduce vegetation and continue vegetation maintenance along road shoulders for a distance of twenty feet from the edge of roadway on both sides of the road. Vegetation should be mowed to a height of no more than four inches. The biomass should be removed and disposed of at an appropriate site.
- Avoid grading road shoulders to expose bare soils and create conditions conducive to invasion of cheatgrass and other noxious weeds.
- Maintain a minimum clearance of fifty feet along existing fences in the undeveloped freeway bypass right-of-way.

Mexican Dam Homeowner's Association Responsibilities

- Reduce vegetation and continue vegetation maintenance along road shoulders within the Mexican Dam neighborhood for a distance of twenty feet from the edge of roadway on both sides. Vegetation should be mowed to a height of no more than four inches. The biomass should be removed and disposed of at an appropriate site approved by the Carson City Fire Department.

Electric Utility Company Responsibilities

- Clear all shrubs and maintain a minimum clearance distance of thirty feet from the fence around the transformer station in Voltaire Canyon. Reduce vegetation to maintain a minimum distance of fifteen feet from all utility poles.

5.2.3 Community Coordination

Many of the most effective activities aimed at reducing the threat of wildfire for the Carson City community require that individual property owners coordinate with each other and with local fire authorities. Defensible space, for example, is more effective in small communities when applied uniformly throughout entire neighborhoods. Public education and awareness, neighbors helping neighbors, and proactive individuals setting examples for others to follow are just a few of the approaches that will be necessary to meet the fire safe goals in the

community. Disposal of biomass generated from defensible space and fuel reduction treatments can sometimes be most efficiently handled through community programs.

Property Owner Responsibilities

- Form local chapters of the Nevada Fire Safe Council in areas of the Municipality such as Timberline, Lakeview, Kings Canyon, Pinyon Hills, Mexican Dam, and North Carson. The Nevada Fire Safe Council proposes to work on solutions that reduce the risk of loss of lives and property from wildfires in Nevada's communities. Through establishment of a local Chapter, communities become part of a large information-sharing network that receives notifications of programs and funding opportunities for fire mitigation projects such as those listed in this report. The Nevada Fire Safe Council will accept and manage grants and contracts on the Chapter's behalf through its non-profit status. The Nevada Fire Safe Council provides assistance and support to communities to complete fire safe plans, set priorities, educate and train community members, and promote success stories of its members. For more information on forming a chapter, contact:

  The Nevada Fire Safe Council
  1187 Charles Drive
  Reno, Nevada 89509
  www.nvfsc.org

- Assure that residential addresses are visible from the road. Address characters should be at least four inches high, reflective, and composed of non-flammable material. Improving visibility of addresses will make it easier for those unfamiliar with the area to navigate an area under smoky conditions in the event of a wildland fire.

5.3 SUMMARY OF RECOMMENDATIONS

Table 5-1. Carson City Community Risk/Hazard Reduction Priority Recommendations

RESPONSIBLE PARTY	RECOMMENDED TREATMENT	RECOMMENDATION DESCRIPTION
Property Owners	Defensible Space Treatments	Remove, reduce, and replace vegetation around homes according to the guidelines in Appendix F. Maintain defensible space as needed to keep the space lean, clean, and green.
	Fuel Reduction Treatments	Reduce fuels at least ten feet along both sides of private driveways that are longer than 200 feet.
	Community Coordination	Form local chapters of the Nevada Fire Safe Council. Improve address visibility.
Carson City Fire Department, Bureau of Land Management, Nevada Division of Forestry, US Forest Service, and Washoe Tribe	Fuel Reduction Treatments	Pursue funding for and implement the planned and scheduled fuelbreaks and fuel reduction treatments for the Carson City community (Figures 5-1, 5-4 and 5-5).
Nevada Department of Transportation	Fuel Reduction Treatments	Reduce vegetation and continue vegetation maintenance along road shoulders for the Lakeview, Pinyon Hills, Kings Canyon, Voltaire Canyon, and Timberline areas of the Carson City community.
Mexican Dam Homeowners Association	Fuel Reduction Treatments	Reduce vegetation and continue vegetation maintenance along shoulders on both sides of the road within the Mexican Dam neighborhood.
Electric Utility Company	Fuel Reduction Treatments	Clear all shrubs and maintain a minimum clearance of thirty feet from the fence around the transformer station in Voltaire Canyon. Reduce vegetation to maintain a minimum distance of fifteen feet from all utility poles.

Table 5-2 Carson City Wildfire Hazard Rating Summary

A. Urban Interface Condition ***2***

B. Community Design

1. Ingress / Egress	1	/5
2. Width of Road	1	/5
3. Accessibility	1	/3
4. Secondary Road	1	/5
5. Street Signs	1	/5
6. Address Signs	3	/5
7. Utilities	1	/5

C. Construction Materials

1. Roofs	5	/10
2. Siding	1	/5
3. Unenclosed Structures	1	/5

D. Defensible Space

1. Lot Size	5	/5
2. Defensible Space	1	/15

F. Fire Behavior

1. Fuels	3	/5
2. Fire Behavior	10	/10
3. Slope	4	/10
4. Aspect	10	/10

E. Suppression Capabilities

1. Water Source	1	/10
2. Department	3	/10

TALLIES

1244 Total Houses **123 Residential Streets**

B5. Street Signs

0 not visible | 123 visible | 100% visible

B6. Address Signs

232 not visible | 1012 visible | 81% visible

C1. Roofs

137 combust | 1107 not combust | 89% not combust

C2. Siding

5 combust | 1239 not combust | 100% not combust

C3. Unenclosed Structures on Lot

75 not enclosed | 1169 enclosed | 6% not enclosed

D1. Lot Sizes

852 <1ac | 392 >1ac <10ac | 0 >10ac

D2. Defensible Space

329 not adequat | 915 adequate | 74% adequate

Score **53** /128

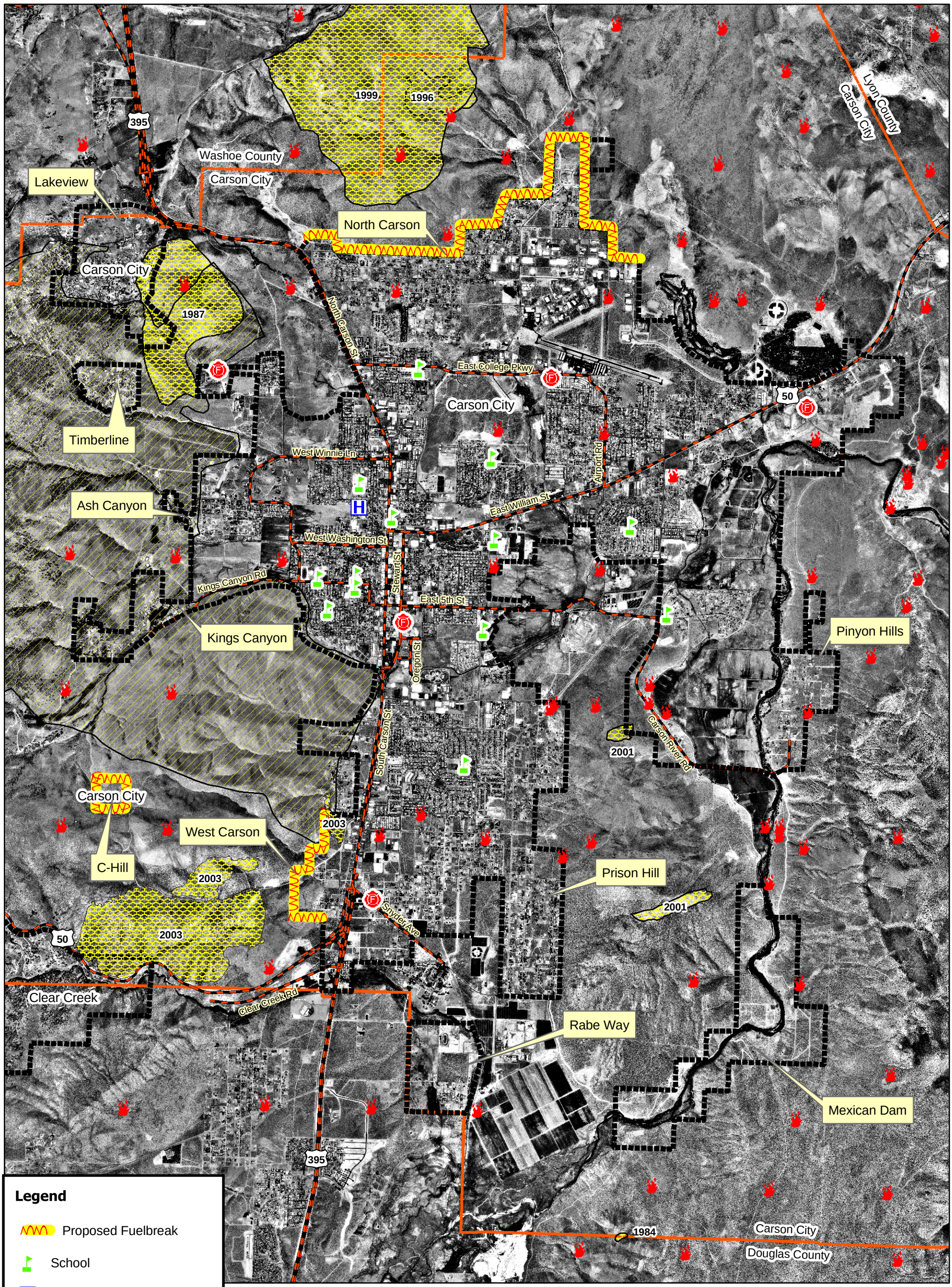
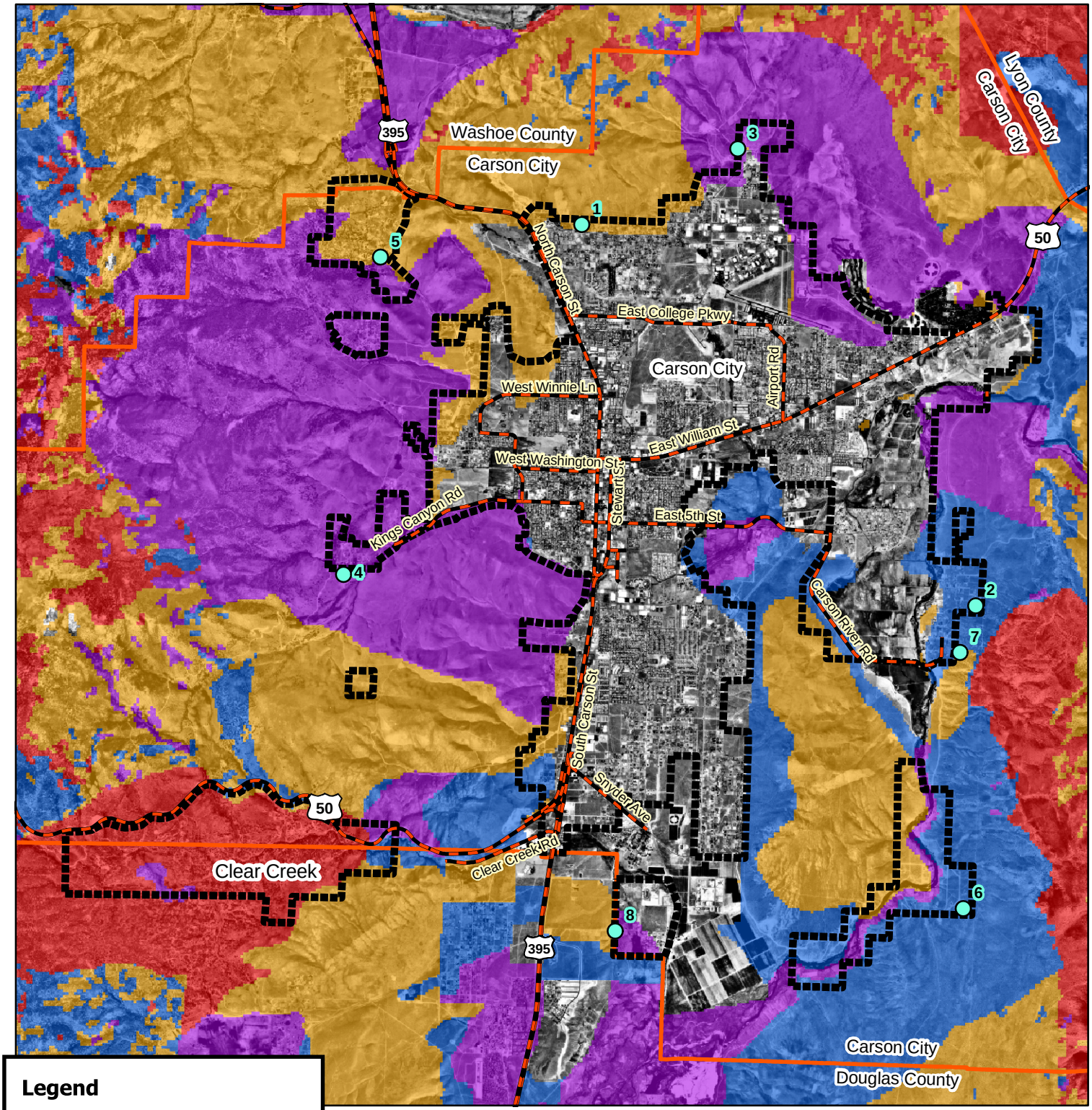


Figure 5-1. Carson City Community Suppression Resources, Critical Features, Fire History, and Proposed/Planned Mitigation Projects

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Nevada Community Wildfire Risk / Hazard Assessment Project



Legend

- Community Boundary
- County Boundary
- Highways and State Routes

Fuel Hazard

- Extreme
- High
- Moderate
- Low
- Photo Point

Figure 5-2. Carson City Community Classification of Fuel Hazard

N
W E
S

0 0.5 1 2
Miles

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Nevada Community Wildfire Risk / Hazard Assessment Project

Figure 5-3. Carson City Community Fuel Hazard Photo Points

Photo 1. Carson City Fuel Hazard Photo Point. 4343040N, 260709E, 20°NE. The fuels north of Bonanza Road in northern Carson City were primarily sagebrush, bitterbrush, Mormon tea, rabbitbrush, and desert peach. Shrubs were spaced about three feet apart, fuel loads estimated at two tons per acre, and considered a high fuel hazard.

Photo 2. Carson City Fuel Hazard Photo Point. 4336992N, 266958E, 95°SE. In the Pinyon Hills area of Carson City, the fuels were characterized by a pinyon-juniper tree layer with a sagebrush and bitterbrush understory. The fuel load was estimated at six tons per acre and considered a moderate fuel hazard.

Photo 3. Carson City Fuel Hazard Photo Point. 4344241N, 263185E, 60°NE. On the northeast side of Carson City near Goni Road, previous fires in the area have reduced the fuel load to one ton per acre or less. Fuels included sagebrush, rabbitbrush, and desert peach, spaced three feet apart, and considered a low fuel hazard.

Photo 4. Carson City Fuel Hazard Photo Point. 4337488N, 256930E, 300°NW. Prior to the 2004 Waterfall fire, the fuel load in the King's canyon area was estimated at eight tons per acre. Vegetation was composed of sagebrush, bitterbrush, Jeffrey pine, and white fir. The photo point represents pockets of remaining unburned vegetation in the area, which are considered a high fuel hazard.

Photo 5. Carson City Fuel Hazard Photo Point. 4342525N, 257516E, 274°NW. Vegetation in the Vicee Canyon and Timberline areas prior to the Waterfall Fire consisted of Jeffrey pine, bitterbrush, sage, rabbitbrush, and some cheatgrass. Fuels were estimated at eight tons per acre and considered a high fuel hazard.

Photo 6. Carson City Fuel Hazard Photo Point. 4332186N, 266763E, 0°N. In the Mexican Dam area of Carson City, fuels consisted primarily of sparse pinyon-juniper, with two to four foot tall sagebrush and rabbitbrush in the understory. The fuel load was estimated between three and four tons per acres and considered a moderate fuel hazard.

Photo 7. Carson City Fuel Hazard Photo Point. 4336251N, 266709E, 45°NE. The moderate to high density pinyon and juniper canopy cover represents a high fuel hazard in the area east of Pinyon Hills. In these areas the fuel load was estimated to be 13 tons per acre.

Photo 8. Carson City Fuel Hazard Photo Point. 4331833N, 261240E, 345°N. In the Rabe Way area of Carson City, fuels consisted primarily of sagebrush, bitterbrush, rabbitbrush, desert peach, and Mormon tea. The fuel hazard in this area was high.

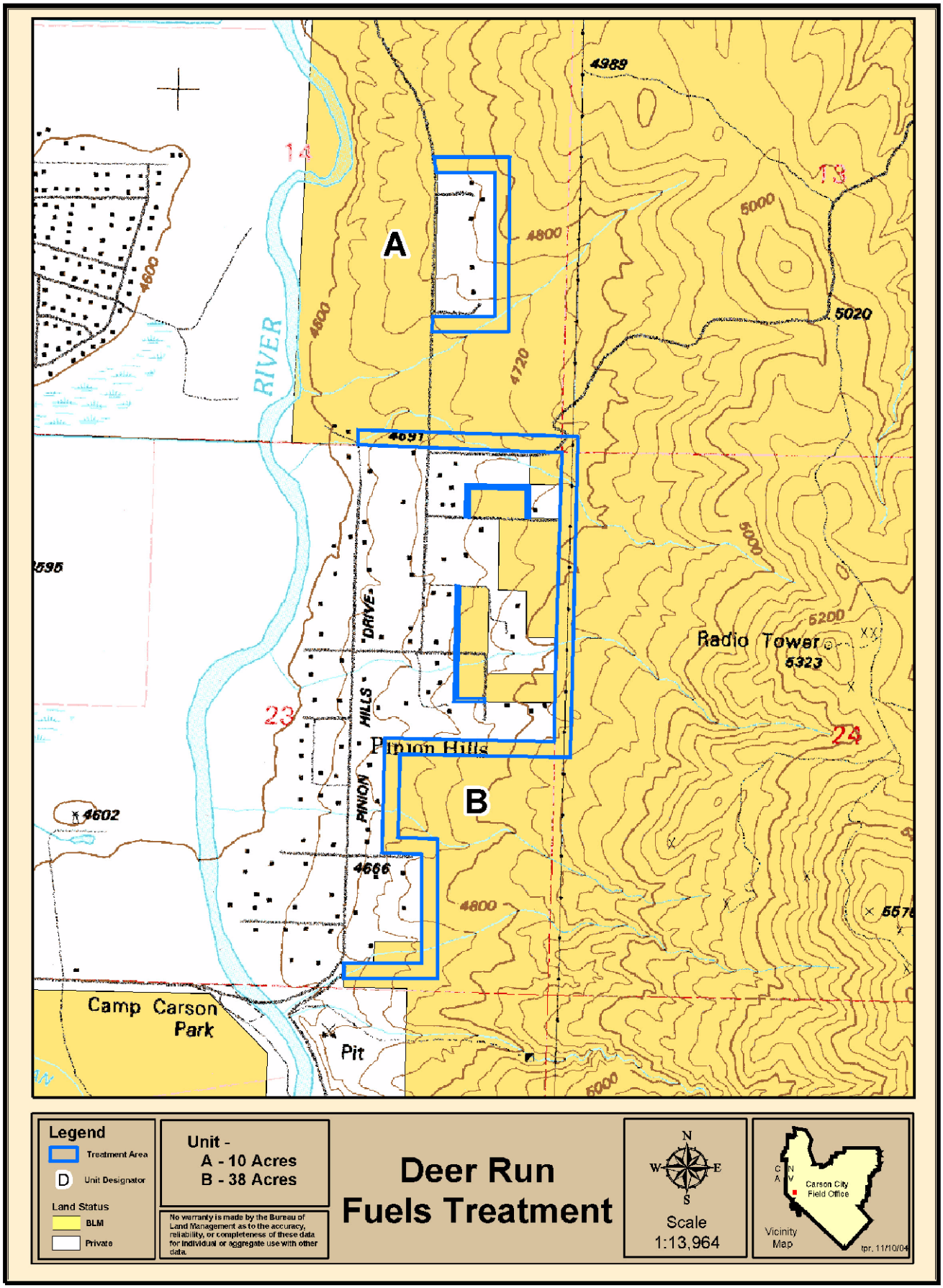


Figure 5-4. BLM Carson City Field Office and Carson City Fire Department Scheduled Fire Mitigation Projects for the Pinyon Hills Area

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Source: Bureau of Land Management Carson City Field Office

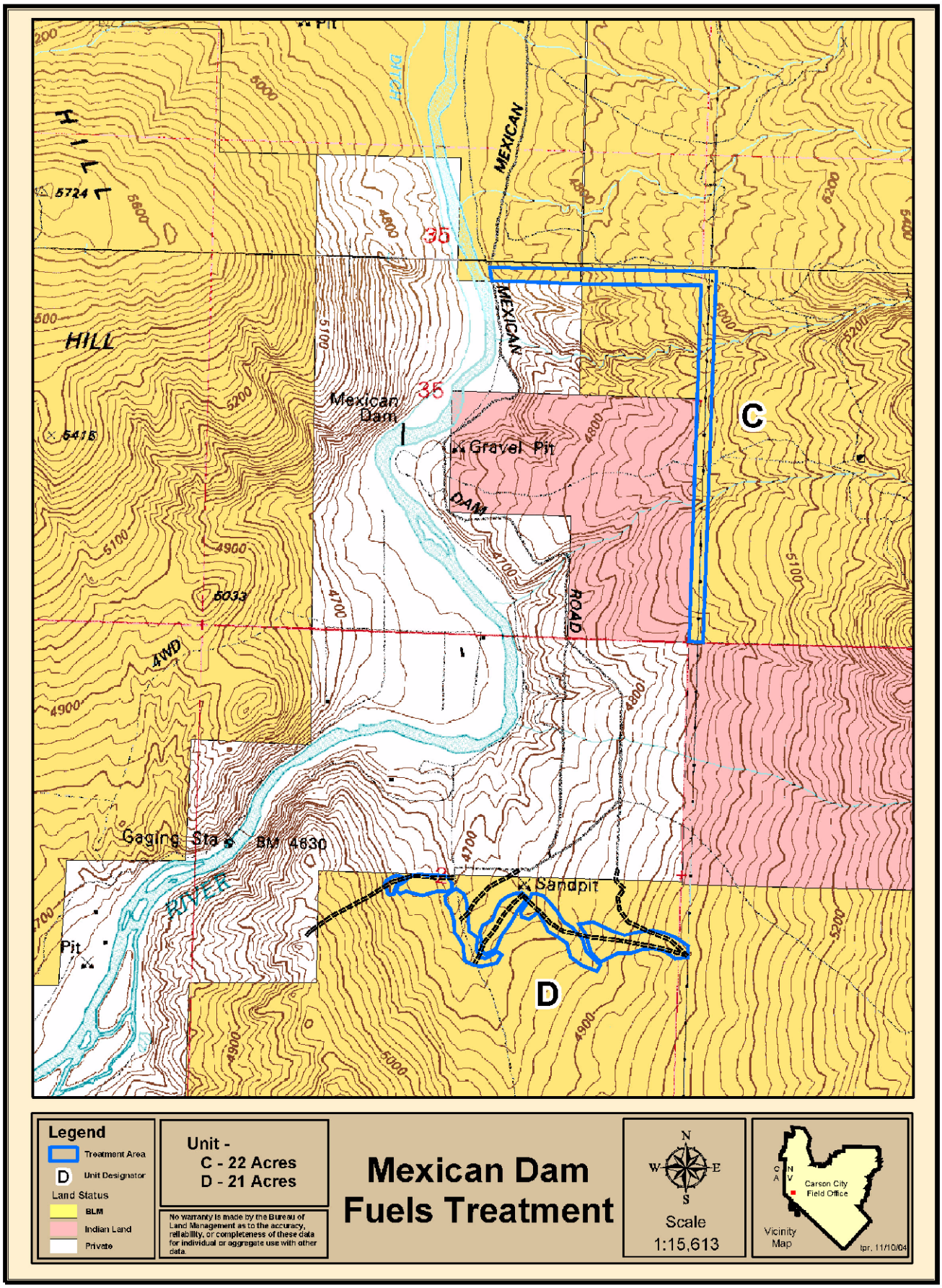


Figure 5-5. BLM Carson City Field Office and Carson City Fire Department Scheduled Fire Mitigation Projects for the Mexican Dam Area

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Source: Bureau of Land Management Carson City Field Office

6.0 CARSON INDIAN COLONY

6.1 RISK AND HAZARD ASSESSMENT

The Carson Indian Colony, part of the Washoe Tribe of Nevada and California, is located along the western edge of Carson City just west of Curry Street. The Colony is situated at the base of the east slope of the Carson Range between C-Hill and Voltaire Canyon. The Colony is situated on both the valley floor and the piedmont slope. Approximately fifty residences were evaluated within the Carson Indian Colony that resulted in classifying the Tribal community in the **Moderate Hazard** category (46 points). A summary of the values that affect the hazard rating is included in Table 6-2. The primary wildfire hazard conditions in the Carson Indian Colony were limited signage on residences and vegetation or debris around some of the structures in the interface area.

6.1.1 Community Design

The Carson Indian Colony is characterized by a classic interface condition with some characteristics of an occluded interface condition. Throughout most of the Carson Indian Colony, there is a clear line of demarcation between structures and wildland fuels. However undeveloped vacant lots are also interspersed throughout the community with natural vegetative fuels. All of the lots assessed were on parcels of one acre or less and typically had more than three structures per acre. As such, most structures are spaced close together (see Figure 6-1).

Access: Curry Street is the major transportation route to and from the Colony, though Boyle Street can be used to exit the community to the north. Curry Street is paved and is at least 24 feet in width. Only one dead-end road in the community limits the ability for fire suppression equipment to maneuver or turn around. All secondary roads in the community have road grades less than five percent.

Signage: Street signs were present and visible along all streets. Residential addresses were visible on a little more than half of the homes surveyed. Clear and visible residential addresses are important to aid firefighting personnel in locating homes during low visibility conditions that may occur during a wildland fire.

Utilities: All utilities were noted to be above ground, and power lines were properly maintained to minimize the potential for sparking power lines that could start fires in nearby vegetation during windstorms. Some propane tanks were in need of vegetation clearance.

6.1.2 Construction Materials

A great majority of the homes in the interface were built with fire-resistant siding and fire resistant composite roofing materials. Less than ten percent of homes had an unenclosed features such as a porch, balcony, or deck that create drafty places where firebrands and embers can be trapped, smolder, and ignite, readily spreading fire to the home.

6.1.3 Defensible Space

Only 38 percent of the homes assessed had landscaping that would meet the minimum defensible space requirement to help protect the home and minimize the potential for damage or loss during a wildfire. However, the majority of residences had excess

vegetation and debris in close proximity to structures. There were also several abandoned structures and mobile homes identified, which can create a fire hazard for adjacent residences in the community.

6.1.4 Suppression Capabilities

Wildfire Protection Resources

The Carson City Fire Department provides wildfire and structure protection for homes in the Carson Indian Colony, however no formal agreement exists between the Washoe Tribe and the Carson City Fire Department. The Bureau of Land Management has a formal agreement with the Bureau of Indian Affairs to provide wildfire suppression resources to the 480 acres of BIA land in the municipality. The US Forest Service and the Nevada Division of Forestry also provide fire protection to the Carson City Municipality for wildland-urban interface fires. See Tables 4-2 and 4-3 for more information on fire suppression capabilities for initial attack of wildland fires.

Water Sources and Infrastructure

Water availability for fire suppression in the Carson Indian Colony includes 500 gpm hydrants within 500 feet of structures. The water system operates on gravity and electrical pumps. There is an emergency backup generator to run the pumps in the case of a power failure. The existing infrastructure for the water delivery system meets the 1997 Uniform Fire Code standards.

Community Preparedness

The Carson Indian Colony is included in the Carson City emergency plan and disaster plan. Development plans in the Colony are not reviewed by the Carson City Fire Department for fire safe design and construction.

6.1.5 Factors Affecting Fire Behavior

Vegetation, down fuels, and topography contribute to the potential fire hazard around wildland-urban interface communities. The fuel hazards were mapped for the Carson Indian Colony as shown in Figure 6-2. Photo points were established to document the current condition of the vegetative fuel hazard as shown in Figure 6-3. The fuel hazards mapped for the Carson Indian Colony were revised following the Waterfall Fire and reflect the most recent fuel hazard conditions.

The vegetative fuel density in and around the Carson Indian Colony interface area was generally classified as moderate. Both the Voltaire 2 Fire in 2003 and the Waterfall Fire in 2004 burned the area just west of Cason Colony residences. Vegetation density was greatly reduced in the burned areas and currently provides an effective fuelbreak from west or southwest fires. Rehabilitation and revegetation treatments have been proposed or implemented for the burned areas. If successful, the rehabilitated areas will result in maintaining low to moderate vegetative fuel density over the next ten to twenty years. Cheatgrass has a high potential of dominating the burned areas if the seeding efforts fail. The cheatgrass fuel hazard is predicted to range from low to high depending upon the amount and timing of annual precipitation.

Unburned fuels within the community are moderately dense, consisting primarily of big sagebrush, rabbitbrush, and bitterbrush ranging from three to four feet tall. Cheatgrass ground fuels provide horizontal and vertical continuity between the shrubs. The fuel loading within the Colony was estimated at two tons per acre and was considered a high fuel hazard.

The terrain around the residences is gently sloping with slopes less than 20 percent. Slopes increase from 20 to 35 percent or more just west of the residences. The predominant winds are from the south-southwest in the late afternoon. Strong downslope winds can occur during summer afternoons and evenings.

6.1.6 Previous Fire Hazard Reduction Projects

The Washoe Tribe Environmental Protection Department has completed some brush thinning within the Carson Indian Colony including chipping and removal of a portion of the large pile of brush biomass located in the center of the colony. The Environmental Protection Department is currently working with homeowners to enforce yard and community removal of flammable debris and it is planning additional brush thinning projects throughout the Colony.

6.1.7 Fire Behavior and Worst-Case Scenario

The worst-case wildfire scenario for the Carson Indian Colony would occur as a dry lightning ignition or a human caused fire started within the community. A fire started in the unburned fuels within the community could immediately threaten nearby homes.

6.1.8 Ignition Risk Assessment

The Carson Indian Colony has a high ignition risk rating. Many wildfires and ignitions have been recorded in the area adjacent to the Carson Indian Colony. There is a history of lightning strikes in the area. Ignitions are likely due to the moderate fuel load in the community, the tendency for lightning storms during the summer, and the number of wildland recreational users within the Carson City Municipality and near the Carson Indian Colony.

6.2 RISK AND HAZARD REDUCTION RECOMMENDATIONS, ROLES, AND RESPONSIBILITIES

The Carson Indian Colony risk and hazard reduction recommendations focus on improving defensible space and promoting homeowner responsibilities. Other recommendations pertain to community coordination efforts that would enhance the fire safe nature of the Carson Indian Colony. Recommendations are detailed below.

6.2.1 Defensible Space Treatments

Defensible space is an essential first line of defense for residential structures. Significantly reducing or removing vegetation within a prescribed distance from structures (a minimum of 30 feet to 200 feet depending upon slope and vegetative fuel type) reduces fire intensity and improves firefighter and homeowner chances for successfully defending a structure against oncoming wildfire. Improving address identification improves firefighters' ability to locate structures during smoky conditions.

Property Owner Responsibilities

- Remove, reduce, and replace vegetation to create defensible space around homes according to the guidelines in Appendix F. This area should be kept:

  Lean – There are only small amounts of flammable vegetation,

  Clean – There is no accumulation of dead vegetation or other flammable debris, and

  Green – Existing plants are healthy and green during the fire season.
- Remove debris and flammable materials from within the defensible space area.
- Store firewood a minimum distance of thirty feet from structures.
- Mow or remove brush growing against wood fences in the community.
- Maintain areas under wood decks and porches free of weeds and other flammable debris.
- Clear all vegetation and combustible materials around propane tanks for a minimum of ten feet.
- Spark arrestors should be installed on chimneys.
- Immediately dispose of cleared vegetation when implementing defensible space treatments. This material dries quickly and poses a fire hazard if left on site.
- Maintain this defensible space as needed to keep the space lean, clean, and green.
- Windows and doors in abandoned buildings should be boarded up. Abandoned trailers should be removed, or the windows and doors boarded up and the underneath skirted to reduce the potential for ignition from sparks or firebrands.

6.2.2 Fuel Reduction

Washoe Utilities Management Authority Responsibilities

- Continue to remove or mow vegetation within three feet of all fire hydrants to improve visibility and access to fire personnel.

Washoe Tribe Responsibilities

- Continue to promote the program for clearing weeds and debris from around structures and fences.
- Require fuel reduction on vacant lots.

6.2.3 Community Coordination

Many of the most effective activities aimed at reducing the threat of wildfire for the Carson Indian Colony require that individual homeowners coordinate with each other, the Washoe Tribe, and with local fire authorities. Defensible space, for example, is more effective in small communities when applied uniformly throughout entire neighborhoods. Public education and awareness, neighbors helping neighbors, and proactive individuals setting examples for others to follow are just a few of the approaches that will be necessary to meet the fire safe goals in the community. Disposal of biomass generated from defensible space and fuel reduction treatments can sometimes be most efficiently handled through community programs.

Property Owner Responsibilities

- Form a local chapter of the Nevada Fire Safe Council in conjunction with the Washoe Tribe of Nevada and California. The Nevada Fire Safe Council proposes to work on solutions that reduce the risk of loss of lives and property from wildfires in Nevada's communities. Through establishment of a local Chapter, communities become part of a large information-sharing network that receives notifications of programs and funding opportunities for fire mitigation projects such as those listed in this report. The Nevada Fire Safe Council will accept and manage grants and contracts on the Chapter's behalf through its non-profit status. The Nevada Fire Safe Council provides assistance and support to communities to complete fire safe plans, set priorities, educate and train community members, and promote success stories of its members. For more information on forming a chapter, contact:

  The Nevada Fire Safe Council
  1187 Charles Drive
  Reno, Nevada 89509
  www.nvfsc.org

- Assure that residential addresses are visible from the road. Address characters should be at least four inches high, reflective, and composed of non-flammable material. Improving visibility of addresses will make it easier for those unfamiliar with the area to navigate under smoky conditions caused by of a wildland fire.

6.3 SUMMARY OF RECOMMENDATIONS

Table 6-1. Carson Indian Colony Risk/Hazard Reduction Priority Recommendations

RESPONSIBLE PARTY	RECOMMENDED TREATMENT	RECOMMENDATION DESCRIPTION
Property Owners	Defensible Space Treatments	Remove, reduce, and replace vegetation around homes according to the guidelines in Appendix F. Maintain defensible space as needed to keep the space lean, clean, and green. Remove abandoned trailers. Board up windows and doors of abandoned structures.
	Fuel Reduction Treatments	Reduce fuels at least ten feet along both sides of private driveways that are longer than 200 feet.
	Community Coordination	Form a local chapter of the Nevada Fire Safe Council. Improve address visibility.
Washoe Utilities Management Authority	Fuels Reduction	Remove or mow vegetation within three feet of all fire hydrants to improve visibility and access to fire personnel.
Washoe Tribe	Fuel Reduction Treatments	Continue program to promote and facilitate cleaning weeds and debris from around structures and fences. Require property owners to reduce fuels on vacant lots in the Carson Indian Colony.

Table 6-2 Carson Indian Colony Wildfire Hazard Rating Summary

A. Urban Interface Condition ***1***

B. Community Design

1. Ingress / Egress	3	/5
2. Width of Road	1	/5
3. Accessibility	1	/3
4. Secondary Road	1	/5
5. Street Signs	1	/5
6. Address Signs	5	/5
7. Utilities	1	/5

C. Construction Materials

1. Roofs	1	/10
2. Siding	1	/5
3. Unenclosed Structures	1	/5

D. Defensible Space

1. Lot Size	5	/5
2. Defensible Space	7	/15

F. Fire Behavior

1. Fuels	3	/5
2. Fire Behavior	7	/10
3. Slope	1	/10
4. Aspect	3	/10

E. Suppression Capabilities

1. Water Source	1	/10
2. Department	3	/10

TALLIES

50 Total Houses **8 Residential Streets**

B5. Street Signs

0	not visible	8	visible	100%	visible

B6. Address Signs

19	not visible	31	visible	62%	visible

C1. Roofs

4	combust	46	not combust	92%	not combust

C2. Siding

4	combust	46	not combust	92%	not combust

C3. Unenclosed Structures on Lot

3	not enclosed	47	enclosed	6%	not enclosed

D1. Lot Sizes

50	<1ac	0	>1ac <10ac	0	>10ac

D2. Defensible Space

31	not adequat	19	adequate	38%	adequate

Score **46** /128

Figure 6-1. Carson Indian Colony
Fire History

N
W E
S

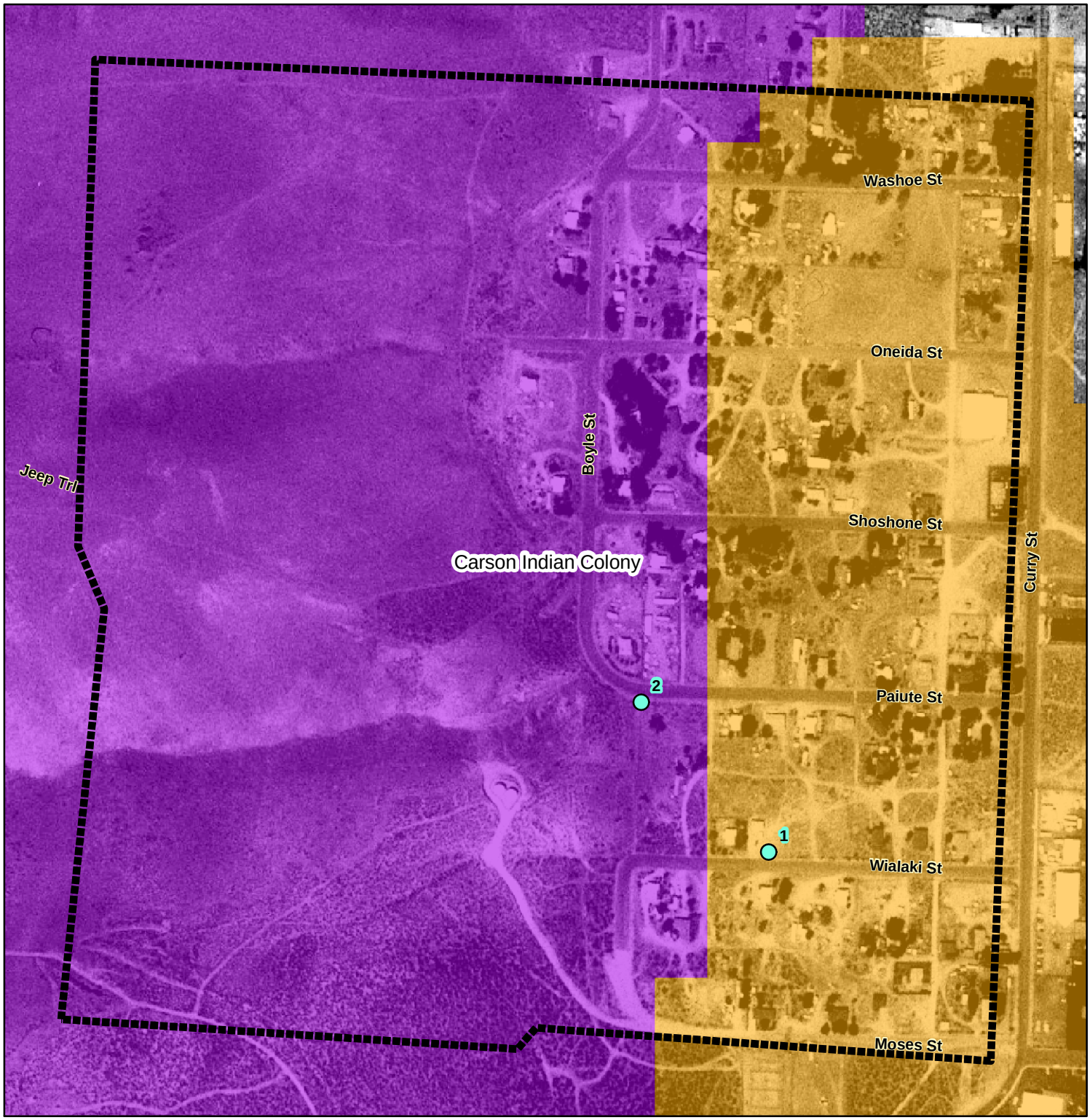
Legend

- Community Boundary
- Waterfall Fire (2004)
- Past Fires (1980-2003)

0 250 500 1,000
Feet

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Nevada Community Wildfire Risk / Hazard Assessment Project



Legend

- Community Boundary

Fuel Hazard

- Extreme
- High
- Moderate
- Low
- Photo Point

Figure 6-2. Carson Indian Colony
Classification of Fuel Hazard

N
W E
S

0 250 500 1,000
Feet

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Nevada Community Wildfire Risk / Hazard Assessment Project

Figure 6-3. Carson Indian Colony Fuel Hazard Photo Points

Photo 1. Carson Indian Colony Fuel Hazard Photo Point. 260333E, 4335652N, 352°NW. Within the Carson Indian Colony sagebrush and bitterbrush were interspersed between structures throughout the community. Fuel loads were estimated at two tons/acre and considered a high fuel hazard.

Photo 2. Carson Indian Colony Fuel Hazard Photo Point. 4335780N, 260224E,183°S. The Waterfall and Voltaire two fires in 2004 and 2003 have reduced the fuel hazard to low west of the Carson Indian Colony.

7.0 CLEAR CREEK

7.1 RISK AND HAZARD ASSESSMENT

Clear Creek is located in the southwestern portion of Carson City, three miles west of US Highway 395, and south of US Highway 50 on Clear Creek Road. The Clear Creek community is situated in a canyon on a south- facing slope in the Carson Range. There are about 23 full-time residences in the Clear Creek area. The risk/hazard assessment resulted in classifying Clear Creek in the **High Hazard** category (77 points). A summary of the values that affect this hazard rating is included in Table 7-2. The primary wildfire hazards for Clear Creek were limited road access into and out of the community, lack of defensible space around many structures, and the potential severe fire behavior due to topography and fuel loading.

7.1.1 Community Design

The Clear Creek community was characterized by intermix wildland-urban interface conditions. Structures are scattered throughout the wildland area with no clear line of demarcation between wildland fuels and the buildings in the community. In Clear Creek, most homes are situated on lots between five and ten acres in size. These scattered structures are widely spaced and interspersed with wildland fuels. The Clear Creek Youth Center is located at the west end of the community.

Access: Clear Creek has one paved road in and out of the community. This road is listed as State Route 705 for the first mile west of U.S. Highway 395 and as Old Clear Creek Road further west. Old Clear Creek Road is between 20 and 24 feet and allows adequate room for fire suppression equipment to maneuver. The road gradient on primary and secondary roads is steeper than five percent. Steep roads and limited access to the community could limit fire suppression and evacuation activities during a wildland fire.

Signage: All streets had visible street signs, however approximately one-fourth of the homes had inadequate address visibility. Most homes were easily visible from the three residential roads in the small community. There would be little chance of fire suppression personnel being unable to locate a particular structure that needed protection, except during smoky conditions often present during wildland fires.

Utilities: Underground electrical and above ground propane tanks were the primary utilities serving Clear Creek. The underground electrical service reduces any potential ignition risk from utilities. Vegetation clearance around propane tanks was generally in need of improvement.

7.1.2 Construction Materials

All of the structures in the community were built with heat or flame resistant siding materials. Almost all of the structures had fire resistant roofing materials such as composition roofing, metal, or tile. Five of the homes observed had architectural features such as an unenclosed balcony, porch, or deck that create drafty areas where embers and firebrands can be trapped, smolder, and ignite, rapidly spreading fire to the home.

7.1.3 Defensible Space

Approximately fifty percent of the structures in the Clear Creek Community had adequate defensible space of 100 feet or greater in areas surrounded by shrubs, and 30 feet in areas without brushy fuels.

7.1.4 Suppression Capabilities

Wildfire Protection Resources

The Carson City Fire Department and the NDF Sierra Forest Fire Protection District provide wildland and structure fire protection to the Clear Creek Community. See Tables 4-2 and 4-3 for additional information on fire protection resources available for initial attack of wildland fires near Carson City communities.

Water Sources and Infrastructure

Water availability for fire suppression in the Clear Creek community includes a limited drafting source from Clear Creek, one pond, and two residences with water storage facilities. Two underground water tanks support the hydrant system at the Clear Creek Youth Facility. Fire suppression water tenders can refill at a source near the intersection of U.S. Highway 395 and Old Clear Creek Road in the event of a wildfire (ten to twenty minute round trip) (Dynamac, 2003).

Community Preparedness

Clear Creek is included in the Carson City emergency and disaster plans. The residents of the community have formed a chapter of the Nevada Fire Safe Council. There is currently no evacuation plan for residents of the community, nor do the emergency and disaster plans provide information on safe zones within the community. Development plans for the community are reviewed by the Carson City Fire Department.

7.1.5 Factors Affecting Fire Behavior

Vegetation, down fuels, and topography contribute to the potential fire hazard around wildland-urban interface communities. Fuel hazards were mapped for Clear Creek as shown in Figure 7-2. Fuel hazard photo points were established to document current fuel hazard conditions around the community and are provided in Figure 7-3.

Clear Creek is situated in an east-west directional canyon with most of the homes located on the south-facing slope, surrounded on three sides by mountains. The prevailing winds are from the west-southwest. Slopes vary from five to greater than forty percent. The fuel density is heavy in the area surrounding structures, estimated at five tons per acre. Fuels consisted primarily of Jeffrey pine with manzanita, big sagebrush, bitterbrush, and snowbrush in the brush layer. Perennial grass, cheatgrass, squaw carpet, and pine needle duff comprise the ground fuels in the area. The brush density varied from moderate to heavy and was rated as an extreme fuel hazard.

7.1.6 Previous Fire Hazard Reduction Projects

In 2003, the Nevada Fire Safe Council funded a wildfire risk/hazard assessment and hazard mitigation plan for the Clear Creek community. Dynamac, Inc. of Oregon conducted the risk/hazard assessment and proposed defensible space and fuel reduction treatments for the area that are summarized below and shown on Figure 7-4. Projects 2 and 3 have been completed, and Project 1 is scheduled to be completed in 2005. The Clear Creek chapter of the Nevada Fire Safe Council is also planning to complete a north-south fuelbreak in T15N, R19E, Section 34, in 2005 (Arnold pers.comm.).

1. Create a shaded fuelbreak 100 to 150 feet wide and 1.2 miles in length on both USFS and private land in T14N, R19E, Section 4 and T15N, R19E, Section 33. Trees should be thinned to a crown spacing of at least twenty feet with trees limbed to fifteen feet from the ground and brush cover reduced to thirty percent or less. The fuelbreak should be seeded with perennial bunch grasses to reduce weed invasions, fire threats, and erosion potential.
2. Implement fuel reduction treatments on all areas of continuous fuels larger than two to three acres throughout both the private property in Section 35 and the Schulz private property in T15N, R19E, Section 35. Create shaded fuelbreaks along the west and south edges of the Schulz property.
3. Create a firebreak [fuelbreak] between Highway 50 and Old Clear Creek Road 200 to 250 feet wide and 0.5 miles long on T15N, R19E, Sections 34 and 35. Remove all ladder fuels, prune all remaining trees, and increase degree of shrub thinning toward the most eastern fifty feet of the break where no trees or brush should remain.
4. Create a fuelbreak 150-feet wide and 1.2 miles long in T14N, R19E, Section 2. The shaded fuelbreak should extend from the east to west across Section 2, running along the slope at the base of the ridge parallel to Clear Creek.

7.1.7 Fire Behavior Worst-Case Scenario

A worst-case wildfire scenario for Clear Creek would likely occur in late afternoon on a high hazard day during a dry lightning storm with numerous ignitions along the Carson Range. Downslope and erratic winds would push a fire, or numerous fires, toward existing structures. The scenario would be worsened if mutual aid resources were delayed due to assignment to an emergency situation elsewhere. If a wildfire were to block Old Clear Creek Road, evacuation and fire suppression would be greatly jeopardized.

7.1.8 Ignition Risk Assessment

Clear Creek has a high ignition risk rating due in part to the large number of fire ignitions that have occurred in the last twenty years along the Eastern Sierra Front. Wildfire and ignitions have been recorded for the areas both north and southwest of Clear Creek (see Figure 3-2).

7.2 RISK AND HAZARD REDUCTION RECOMMENDATIONS, ROLES, AND RESPONSIBILITIES

The Clear Creek risk and hazard reduction recommendations address the primary concern regarding protection of existing and future development in the wildland-urban interface area. Other recommendations pertain to community coordination and public education efforts that could be undertaken to enhance fire safety in Clear Creek.

7.2.1 Defensible Space Treatments

Defensible space is an essential first line of defense for residential structures. Significantly reducing or removing vegetation within a prescribed distance from structures (a minimum of 30 feet to 200 feet depending upon slope and vegetative fuel type) reduces fire intensity and improves firefighter and homeowner chances for successfully defending a structure against oncoming wildfire. Improving address identification improves firefighters' ability to locate structures during smoky conditions.

Property Owner Responsibilities

- Remove, reduce, and replace vegetation around homes according to the guidelines in Appendix F. This area should be kept:

  Lean – There are only small amounts of flammable vegetation,

  Clean – There is no accumulation of dead vegetation or other flammable debris, and

  Green – Existing plants are healthy and green during the fire season.
- Maintain this defensible space as needed to keep the space lean, clean, and green.
- Clear all vegetation and combustible materials around propane tanks for a minimum distance of ten feet.
- Store firewood a minimum distance of thirty feet from structures.
- Spark arresting screens should be installed on chimneys.
- Maintain areas under wood decks and porches free of weeds and other flammable debris.
- Pine needles, leaves, and debris should be removed from roofs and rain gutters.
- Prune trees so that branches are at least fifteen feet away from chimneys and/or structures.
- For trees remaining within the defensible space zone, homeowners should limb branches a minimum of five feet from the ground (or up to one-third of the tree height) to reduce ladder fuels. Remove flammable material including shrubs and duff from beneath crowns of retained trees.
- Immediately dispose of cleared vegetation when implementing defensible space treatments. The material dries quickly and poses a fire hazard if left on site.
- Irrigate all trees and large shrubs in close proximity to structures to increase their fire resiliency. This is especially important during drought conditions.
- Consider purchasing a fire suppression product for their homes such as fire blocking gels. These gels/foams can be applied to structures and vegetation to create an added layer of flame resistance in the event of a fire.
- Assure that residential addresses are visible from the road. Address characters should be at least four inches high, reflective, and composed of non-flammable

material. Improving visibility of addresses will make it easier for those unfamiliar with the area to navigate an area under smoky conditions in the event of a wildland fire.

Nevada Division of State Lands Responsibilities – Clear Creek Youth Center

- Remove, reduce, and replace vegetation around Youth Center structures according to the guidelines in Appendix F. This area should be kept:

  Lean – There are only small amounts of flammable vegetation,

  Clean – There is no accumulation of dead vegetation or other flammable debris, and

  Green – Existing plants are healthy and green during the fire season.
- Remove or properly board up abandoned or unused structures in the Clear Creek Youth Center to prevent sparks from entering and igniting structures.

7.2.2 Fuel Reduction Treatments:

Fuel reduction treatments are applied on a larger scale than defensible space treatments. Fuel reduction treatments are most effective when implemented on large blocks of land to permanently change the fuel structure to create a condition of lower fuel volume and lower ignition potential.

There are several areas within Clear Creek where reducing vegetation along roads and driveways could reduce the likelihood of wildfire spreading across roads, and improving firefighter safety, and improving evacuation routes in the event of a wildfire. The areas of most concern are along Old Clear Creek Road and residential driveways greater than 200 feet in length.

Property Owners, Nevada Division of State Lands, Nevada Division of Forestry, US Forest Service, Washoe Tribe, and Carson City Fire Department Responsibilities

- Coordinate with each property owner, responsible administrative agency, the Carson City Fire Department, and the Nevada Division of Forestry to implement landscape-wide treatments to reduce tree stands to a basal area of 80 square feet per acre as well as reduce and remove brush ladder fuels from beneath all tree crowns in the proposed 1,690-acre treatment area (see Figure 7-1). The existing Clear Creek chapter of the Nevada Fire Safe Council can facilitate agency coordination and help identify funding opportunities.
- Coordinate with each property owner, Clear Creek chapter of the Nevada Fire Safe Council, responsible administrative agency, the Carson City Fire Department, and the Nevada Division of Forestry to pursue funding for and implement all remaining projects specified in the Dynamac (2003) report and summarized in section 7.1.6 and shown in Figure 7-4. The RCI Project Team recommends that any fuel reduction treatments in the area adjacent to the creek be evaluated on a site-specific basis due to slope, access, and riparian concerns.
- Carry out an ongoing maintenance program for all fuel reduction treatments.
- Reduce fuels within a minimum distance of twenty feet along both sides of private driveways longer than 200 feet. Trees should be thinned to a spacing of thirty feet between crowns and shrubs should be thinned to two times the height of the shrubs. Flammable vegetation should be replaced with fire-resistant species such as crested

wheatgrass, irrigated deciduous shrubs, wildflowers, and lawn, or it can be replaced by seeding with a pre-suppression seed mix. Refer to Appendix F for a recommended seed mixture, planning guidelines, and seed sources.

US Forest Service Responsibilities

- Pursue funding for and implement the brush thinning project planned for northwest portion of the Clear Creek community (Figure 7-1). Shrubs should be thinned to a cover of no more than fifty percent on the interior of the project and no more than twenty percent along the project boundaries.

Carson City Street Department Responsibilities

- Reduce vegetation and continue vegetation maintenance along road shoulders for a distance of fifty feet in both directions from the edge of Old Clear Creek Road. Vegetation should be thinned to a fuel load of one ton per acre or less. The biomass should be removed and disposed of at an appropriate site approved by the Carson City Fire Department.

7.2.3 Community Coordination and Public Education

Many of the most effective activities aimed at reducing the threat of wildfire for the Clear Creek community require that individual property owners coordinate with each other and with local fire authorities, as they have through the Clear Creek chapter of the Nevada Fire Safe Council. Public education and awareness, neighbors helping neighbors, and proactive individuals setting examples for others to follow are just some of the approaches that will be necessary to meet the fire safe goals in the community.

Property Owner Responsibilities

- Read and become fully knowledgeable of evacuation procedures, fire safety zones, and safety procedures for sheltering in place in the event that evacuation is not possible.
- Assure that residential addresses are visible from the road. Address characters should be at least four inches high, reflective, and composed of non-flammable material. Improving visibility of addresses will make it easier for those unfamiliar with the area to navigate under smoky conditions in the event of a wildland fire.

Carson City Fire Department Responsibilities

- Complete and distribute copies of the Clear Creek emergency evacuation plan to all residents. Conduct public workshops annually, prior to the fire season, to assure that all residents are fully knowledgeable of evacuation routes, evacuation procedures, designated fire safe zones, and procedures for sheltering in place in case evacuation becomes infeasible during a fast moving fire storm. Post evacuation information on a sign along Old Clear Creek Road near the entrance of the community.
- Distribute copies of the publication "*Living with Fire"* to all property owners. This publication is free of charge. Copies can be requested from the University of Nevada Cooperative Extension.

- Enforce or develop county laws, regulations, and ordinances that support implementation and maintenance of defensible space and address fuel reduction responsibilities for absentee homeowners and vacant lots.
- Contact the University of Nevada Cooperative Extension and the BLM Carson City Field Office for assistance with public education.

7.2.4 Fire Suppression Capability

Proper maintenance, storage, and acquisition of fire suppression equipment, along with regular and appropriate firefighter training and development of water drafting sources increases the fire suppression capability for those areas where fire protection is available.

Nevada Division of State Lands

- Install an above ground water storage facility (5,000 to 10,000 gallon) at the Youth Center to service the Youth Center and the upper Clear Creek area.

Carson City Fire Department and Nevada Division of Forestry

- Install at least one community water storage facility (5,000 to 10,000 gallon) within the Clear Creek community.

7.3 SUMMARY OF RECOMMENDATIONS

Table 7-1. Clear Creek Risk/Hazard Reduction Priority Recommendations

RESPONSIBLE PARTY	RECOMMENDED TREATMENT	RECOMMENDATION DESCRIPTION
Property Owners	Defensible Space Treatments	Remove, reduce, and replace vegetation around homes according to the guidelines in Appendix F. Maintain defensible space as needed to keep the space lean, clean, and green.
	Fuel Reduction Treatments	Coordinate with the Carson City Fire Department and Nevada Division of Forestry to implement landscape-wide fuel reduction treatments in the Clear Creek community. Reduce fuels a minimum of twenty feet along both sides of private driveways that are longer than 200 feet.
	Community Coordination and Public Education	Read and review community evacuation plan when it becomes available. Improve address visibility.
Carson City Fire Department **Sierra Forest Fire Protection District (NDF)**	Fuel Reduction Treatments	Participate in planning and implementation of landscape-scale fuel reduction treatments in the Clear Creek community. Maintain fuel reduction treatments as necessary. Participate in planning and implementation of landscape-scale fuel reduction treatments and proposed fuelbreaks in the Clear Creek community (Figures 7-1 and 7-4).
	Community Coordination	Develop a community evacuation plan with input from property owners. Distribute copies of the plan to all homeowners in the community and post along Old Clear Creek Road.
	Suppression Capability	Install at least one community water storage facility (5,000 to 10,000 gallon) within the Clear Creek community.
Nevada Division of State Lands	Defensible Space Treatments	Remove, reduce, and replace vegetation around the Clear Creek Youth Center according to the guidelines in Appendix F. Maintain defensible space as needed to keep the space lean, clean, and green.
	Fuel Reduction Treatments	Participate in planning and implementation of landscape-scale fuel reduction treatments and proposed fuelbreaks in the Clear Creek community (Figures 7-1 and 7-4).
	Suppression Capability	Install an above ground water storage facility (5,000 to 10,000 gallon) at the Youth Center.
Carson City Street Department	Fuel Reduction Treatments	Reduce vegetation and continue vegetation maintenance along road shoulders for a distance of fifty feet on both sides of Old Clear Creek Road. Take care not to leave exposed bare areas that would be vulnerable to cheatgrass invasion.
US Forest Service	Fuel Reduction Treatments	Participate in planning and implementation of landscape-scale fuel reduction treatments and proposed fuelbreaks in the Clear Creek community (Figures 7-1 and 7-4).
Washoe Tribe of Nevada and California	Fuel Reduction Treatments	Participate in planning and implementation of landscape-scale fuel reduction treatments in the Clear Creek community (Figure 7-1).

Table 7-2 Clear Creek Wildfire Hazard Rating Summary

A. Urban Interface Condition ***2***

B. Community Design

1. Ingress / Egress	3	/5
2. Width of Road	3	/5
3. Accessibility	3	/3
4. Secondary Road	3	/5
5. Street Signs	1	/5
6. Address Signs	3	/5
7. Utilities	3	/5

C. Construction Materials

1. Roofs	1	/10
2. Siding	1	/5
3. Unenclosed Structures	1	/5

D. Defensible Space

1. Lot Size	5	/5
2. Defensible Space	7	/15

F. Fire Behavior

1. Fuels	5	/5
2. Fire Behavior	10	/10
3. Slope	10	/10
4. Aspect	10	/10

E. Suppression Capabilities

1. Water Source	5	/10
2. Department	3	/10

TALLIES

23 Total Houses **3 Residential Streets**

B5. Street Signs

0 not visible | 3 visible | 100% visible

B6. Address Signs

5 not visible | 18 visible | 78% visible

C1. Roofs

1 combust | 22 not combust | 96% not combust

C2. Siding

0 combust | 23 not combust | 100% not combust

C3. Unenclosed Structures on Lot

5 not enclosed | 18 enclosed | 22% not enclosed

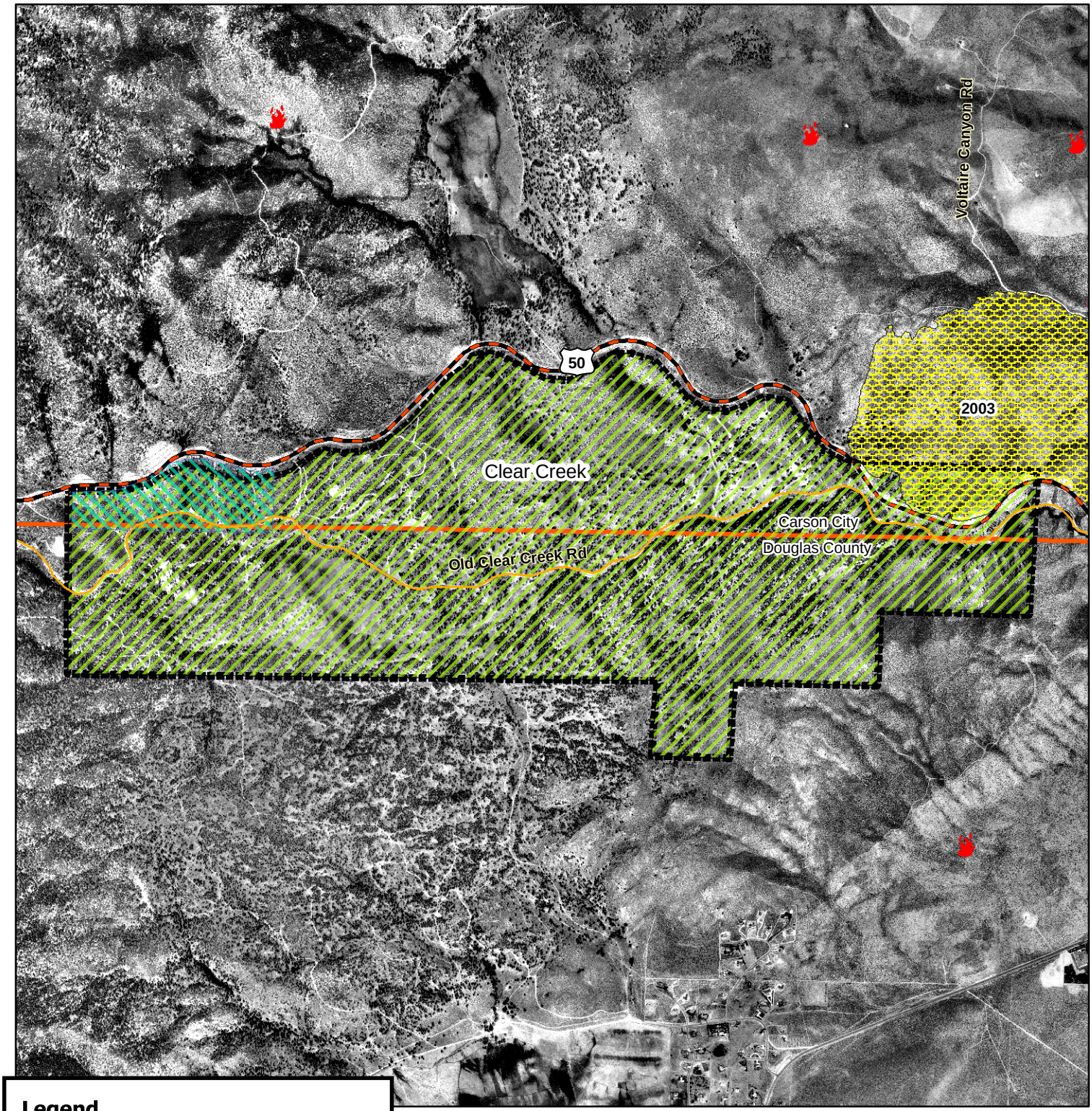
D1. Lot Sizes

21 <1ac | 2 >1ac <10ac | 0 >10ac

D2. Defensible Space

12 not adequat | 11 adequate | 48% adequate

Score **77** /128



Legend

- Community Boundary
- Fire Ignition
- Past Fires (1980-2003)
- County Boundary
- Highways and State Routes
- Secondary Road
- Proposed Brush Thinning
- Proposed Fuel Reduction Treatment

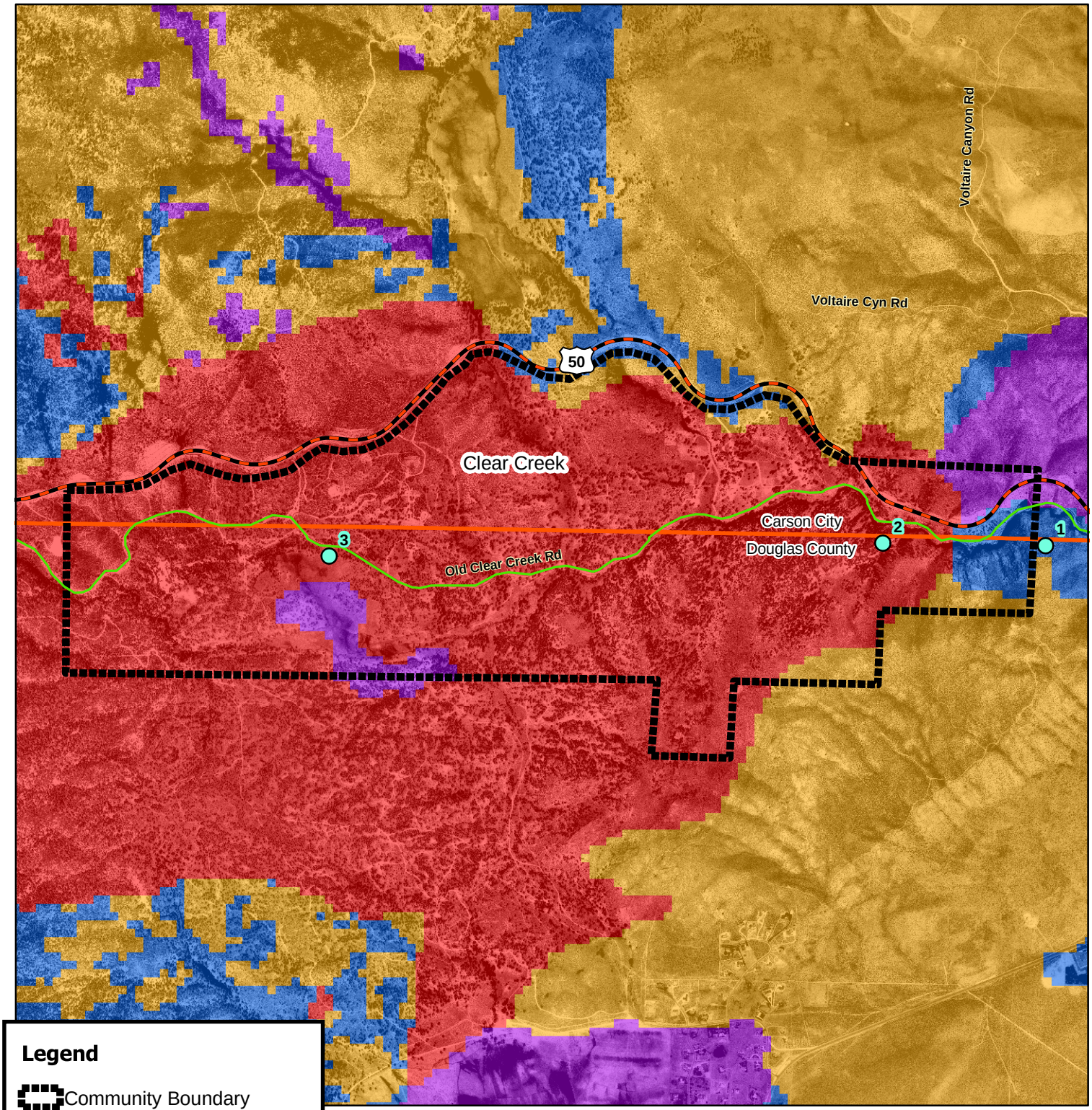
Figure 7-1. Clear Creek
Fire History and Proposed/Planned
Mitigation Projects

N
W E
S

0 1,000 2,000 4,000
Feet

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Nevada Community Wildfire Risk / Hazard Assessment Project



Legend

- Community Boundary
- County Boundary
- Highways and State Routes
- Secondary Road

Fuel Hazard

- Extreme
- High
- Moderate
- Low
- Photo Point

Figure 7-2. Clear Creek
Classification of Fuel Hazard

N
W E
S

0 1,000 2,000 4,000
Feet

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

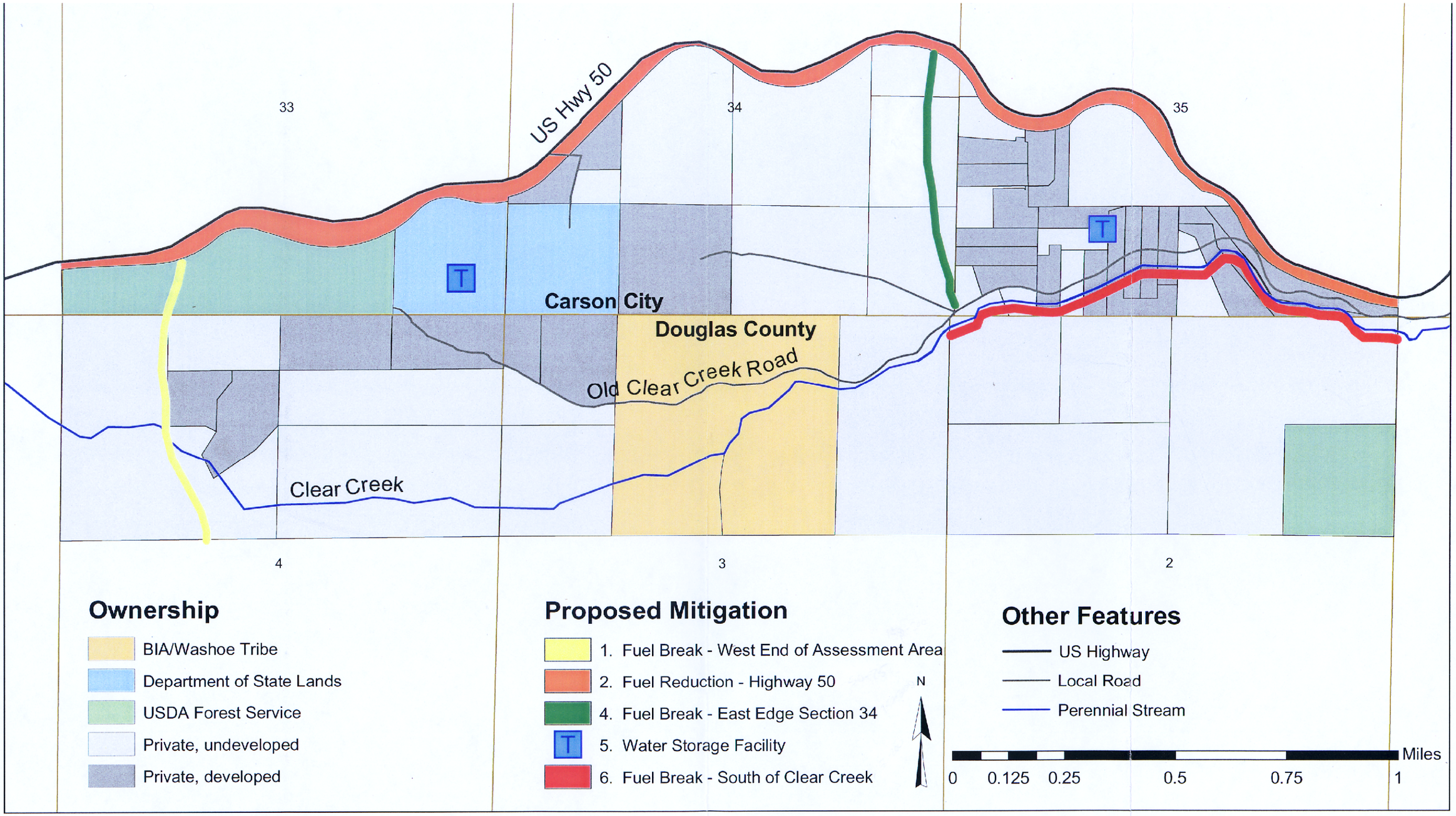
Nevada Community Wildfire Risk / Hazard Assessment Project

Figure 7-3. Clear Creek Fuel Hazard Photo Points

Photo 1. Clear Creek Fuel Hazard Photo Point. 4333111N, 257799E, 270°W. Fuels on the east side of the Clear Creek area, southwest of Carson City, consisted of high density sagebrush, bitterbrush, and rabbitbrush. The tree canopy consisted of moderate density Jeffrey pine stands in the uplands and willow and cottonwoods in the riparian areas. Fuel loads were estimated at eight tons per acre and considered a high fuel hazard.

Photo 2. Clear Creek Fuel Hazard Photo Point. 4333125N. 2569212E. 110°SE Typical vegetation in the Clear Creek area consisted of dense Jeffrey pine stands with an understory of four to six-foot high sagebrush. Fuel loads were estimated at fourteen tons per acre and considered an extreme fuel hazard.

Photo 3. Clear Creek Fuel Hazard Photo Point. 4333055N. 253932E. 90°E. Near the Youth Center in the Clear Creek area, fuels consisted of high density Jeffrey Pine and continuous canopy brush fields of four-foot tall manzanita, sagebrush, and bitterbrush. Both the brush and tree dominated areas were considered extreme fuel hazards.



Map 4. Clear Creek- Recommended Mitigation Projects

Figure 7-4. Clear Creek Planned Fire Mitigation Projects

Source: Dynamac Inc., 2003

8.0 STEWART

8.1 RISK AND HAZARD ASSESSMENT

Stewart is located in the southeastern portion of Carson City on Snyder Road, approximately 0.5 miles east of U.S. Highway 395. The Stewart community is the site of housing for the Washoe Tribe. Thirteen residences were evaluated during the community hazard assessment, which resulted in classifying Stewart in the **Low Hazard** category (36 points). A summary of the values that affect this hazard rating is included in Table 8-2. The wildfire hazards identified in Stewart were the limited address signage on residences and vegetation or debris around some structures in the interface.

8.1.1 Community Design

The wildland-urban interface around Stewart is a classic interface condition. There is a clear line of demarcation between structures and wildland fuels. Wildland vegetation typically does not continue into the development areas, and there are typically more than three structures per acre. All of the lots assessed are on parcels of one acre or less (see Figure 8-1).

Roads: Clear Creek Road and Snyder are the two main access roads to the Stewart community. These roads are between 20 and 24 feet in width and provide adequate access for fire suppression vehicles. No dead-end roads limit the ability for fire suppression equipment to maneuver or turn around. All roads in the community have a grade less than five percent.

Signage: Residential addresses were visible on most of the homes assessed. Clear and visible residential addresses are important to aid firefighting personnel in locating homes during low visibility conditions that occur during a wildland fire.

Utilities: All of the utilities were above ground. Power line right-of-ways were properly maintained, which minimizes the possibility of power lines sparking during windstorms and starting fires in nearby vegetation.

8.1.2 Construction Materials

All of the homes assessed in the interface area were built with fire resistant siding materials and non-combustible roofing materials, mainly composition type roofing. None of the homes observed had an unenclosed balcony, porch, deck or other architectural feature that could create drafts and provide areas where sparks and embers can be trapped, smolder, ignite, and rapidly spread fire to the home.

8.1.3 Defensible Space

A majority of the homes in the interface had landscaping that would meet the minimum defensible space requirement to help protect the home and minimize the potential for damage or loss during a wildfire.

8.1.4 Suppression Capabilities

Wildfire Protection Resources

Stewart is provided wildland and structure fire protection by the Carson City Fire Department. The BLM Carson City Field Office also has wildland fire suppression responsibility for Bureau of Indian Affairs lands in Stewart. See Tables 4-2 and 4-3 for additional information on fire protection resources available to Carson City communities.

Water Sources and Infrastructure

Water availability for fire suppression in Stewart includes 500 gpm hydrants within 500 feet of structures. The water system operates on gravity and electrical pump, with portable backup generators available to run the pumps in an emergency. The existing infrastructure for the water delivery system meets the 1997 Uniform Fire Code standards.

Community Preparedness

Stewart is included in the Carson City emergency plan and disaster plan. Development plans for the Nevada State Land are reviewed by the Carson City Fire Department.

8.1.5 Factors Affecting Fire Behavior

Vegetation, vegetative litter, and topography contribute to the potential fire hazard around wildland-urban interface communities. The vegetative fuel density in the Stewart interface area is moderate, estimated at four tons per acre. Fuels around the community consist primarily of big sagebrush rabbitbrush, desert peach, and Mormon tea with a cheatgrass understory. Typical shrub heights range between four and five feet. The terrain is mostly flat (five percent or less slope). The fire behavior potential in Stewart is considered moderate due to the moderate fuel hazard, flat terrain, and high wind exposure. There is a significant wildfire history in the area adjacent to Stewart, due to both lightning and man-caused fires. The predominant wind direction is from the south-southwest in the late afternoon.

8.1.6 Previous Fire Hazard Reduction Projects

The Washoe Tribe Environmental Protection Department has completed two 20 to 30-foot wide fuelbreaks by mowing sagebrush to a six-inch height along Clear Creek Road from the cemetery to Center Street, and south of the cemetery along the Washoe Tribe property boundary. The department has been chipping brush piles remaining from previous brush removal projects and is in the process of planning additional fuel reduction treatments for the Stewart community.

8.1.7 Fire Behavior Worst-Case Scenario

The worst-case wildfire scenario for Stewart would be a wind driven wildland fire starting south or southwest of the community or on one of the large undeveloped open space areas within the community, in the mid-afternoon on a high hazard day. In high wind conditions, a

fire could rapidly spread through the moderately dense sagebrush and quickly threaten some of the residences in the community.

8.1.8 Ignition Risk Assessment

Stewart has a high ignition risk based on the ignition history reported for the area (Figure 3-2).

8.2 RISK AND HAZARD REDUCTION RECOMMENDATIONS, ROLES, AND RESPONSIBILITIES

The Stewart risk and hazard reduction recommendations address the primary concern regarding protection of existing and future development in the wildland-urban interface area. Other recommendations pertain to community coordination and public education efforts that could be undertaken to enhance fire safety in Stewart.

8.2.1 Defensible Space Treatments

Defensible space is an essential first line of defense for residential structures. Significantly reducing or removing vegetation within a prescribed distance from structures (a minimum of 30 feet to 200 feet depending upon slope and vegetative fuel type) reduces fire intensity and improves firefighter and homeowner chances for successfully defending a structure against oncoming wildfire. Improving address identification improves firefighters' ability to locate structures during smoky conditions.

Homeowner Responsibilities and Nevada Division of State Lands – Stewart Buildings and Grounds

- Remove, reduce, and replace vegetation around homes according to the guidelines in Appendix F. This area should be kept:

  Lean – There are only small amounts of flammable vegetation,

  Clean – There is no accumulation of dead vegetation or other flammable debris, and

  Green – Existing plants are healthy and green during the fire season.
- Remove debris and flammable materials from within the defensible space area.
- Where cheatgrass has become dominant within the defensible space area, it should be mowed prior to seed set or treated with an application of a pre-emergent herbicide. Treatments may need to be repeated for several years to ensure that the bank of unwanted grass seed has been depleted. Refer to Appendix F for a recommended seed mixture and planting guidelines that can be used for cheatgrass removal.
- Store firewood a minimum distance of thirty feet from structures.
- Spark arresting screens should be installed on chimneys.
- Immediately dispose of cleared vegetation when implementing defensible space treatments. The material dries quickly and poses a fire hazard if left on site.
- Maintain this defensible space as needed to keep the space lean, clean, and green.

8.2.2 Fuel Reduction Treatments

Electric Utility Company Responsibilities

- Reduce vegetation a minimum distance of fifteen feet from all utility poles.
- Reduce vegetation a minimum distance of thirty feet from the transfer station located near the corner of Bigelow and Snyder.

Carson City Fire Department Responsibilities

- Reduce vegetation a minimum distance of three feet around all fire hydrants to improve visibility for firefighters.

8.2.3 Community Coordination

Many of the most effective activities aimed at reducing the threat of wildfire for the Stewart community require that individual homeowners coordinate with each other, the Washoe Tribe, and with local fire authorities. Defensible space, for example, is more effective in small communities when applied uniformly throughout entire neighborhoods. Public education and awareness, neighbors helping neighbors, and proactive individuals setting examples for others to follow are just a few of the approaches that will be necessary to meet the fire safe goals in the community. Disposal of biomass generated from defensible space and fuel reduction treatments can sometimes be most efficiently handled through community programs.

Property Owner Responsibilities

- Form a local chapter of the Nevada Fire Safe Council in conjunction with the Washoe Tribe of Nevada and California. The Nevada Fire Safe Council proposes to work on solutions that reduce the risk of loss of lives and property from wildfires in Nevada's communities. Through establishment of a local Chapter, communities become part of a large information-sharing network that receives notifications of programs and funding opportunities for fire mitigation projects such as those listed in this report. The Nevada Fire Safe Council will accept and manage grants and contracts on the Chapter's behalf through its non-profit status. The Nevada Fire Safe Council provides assistance and support to communities to complete fire safe plans, set priorities, educate and train community members, and promote success stories of its members. For more information on forming a chapter, contact:

  The Nevada Fire Safe Council
  1187 Charles Drive
  Reno, Nevada 89509
  www.nvfsc.org

- Assure that residential addresses are visible from the road. Address characters should be at least four inches high, reflective, and composed of non-flammable material. Improving visibility of addresses will make it easier for those unfamiliar with the area to navigate an area under smoky conditions in the event of a wildland fire.

8.3 SUMMARY OF RECOMMENDATIONS

Table 8-1. Stewart Risk/Hazard Reduction Priority Recommendations

RESPONSIBLE PARTY	RECOMMENDED TREATMENT	RECOMMENDATION DESCRIPTION
Property Owners	Defensible Space Treatments	Remove, reduce, and replace vegetation around homes according to the guidelines in Appendix F. Maintain defensible space as needed to keep the space lean, clean, and green.
	Community Coordination	Form a local chapter of the Nevada Fire Safe Council. Improve address visibility.
	Fuel Reduction Treatments	Reduce fuels at least ten feet along both sides of private driveways that are longer than 200 feet.
Nevada Division of State Lands	Defensible Space Treatments	Remove, reduce, and replace vegetation around homes according to the guidelines in Appendix F. Maintain defensible space as needed to keep the space lean, clean, and green. Improve address visibility.
Electric Utility Company	Fuel Reduction Treatments	Reduce vegetation a minimum distance of fifteen feet from all utility poles. Reduce vegetation a minimum distance of thirty feet from the transfer station located near the corner of Bigelow and Snyder.
Carson City Fire Department	Fuel Reduction Treatments	Reduce vegetation a minimum distance of three feet around all fire hydrants to improve visibility for firefighters.

Table 8-2 Stewart Colony Wildfire Hazard Rating Summary

A. Urban Interface Condition ***1***

B. Community Design

1. Ingress / Egress	1	/5
2. Width of Road	1	/5
3. Accessibility	1	/3
4. Secondary Road	1	/5
5. Street Signs	1	/5
6. Address Signs	3	/5
7. Utilities	1	/5

C. Construction Materials

1. Roofs	1	/10
2. Siding	1	/5
3. Unenclosed Structures	1	/5

D. Defensible Space

1. Lot Size	5	/5
2. Defensible Space	7	/15

F. Fire Behavior

1. Fuels	3	/5
2. Fire Behavior	3	/10
3. Slope	1	/10
4. Aspect	1	/10

E. Suppression Capabilities

1. Water Source	1	/10
2. Department	3	/10

TALLIES

5 Total Houses **2 Residential Streets**

B5. Street Signs

0 not visible | 2 visible | 100% visible

B6. Address Signs

1 not visible | 4 visible | 80% visible

C1. Roofs

0 combust | 5 not combust | 100% not combust

C2. Siding

0 combust | 5 not combust | 100% not combust

C3. Unenclosed Structures on Lot

0 not enclosed | 5 enclosed | 0% not enclosed

D1. Lot Sizes

5 <1ac | 0 >1ac <10ac | 0 >10ac

D2. Defensible Space

2 not adequat | 3 adequate | 60% adequate

Score **36** /128

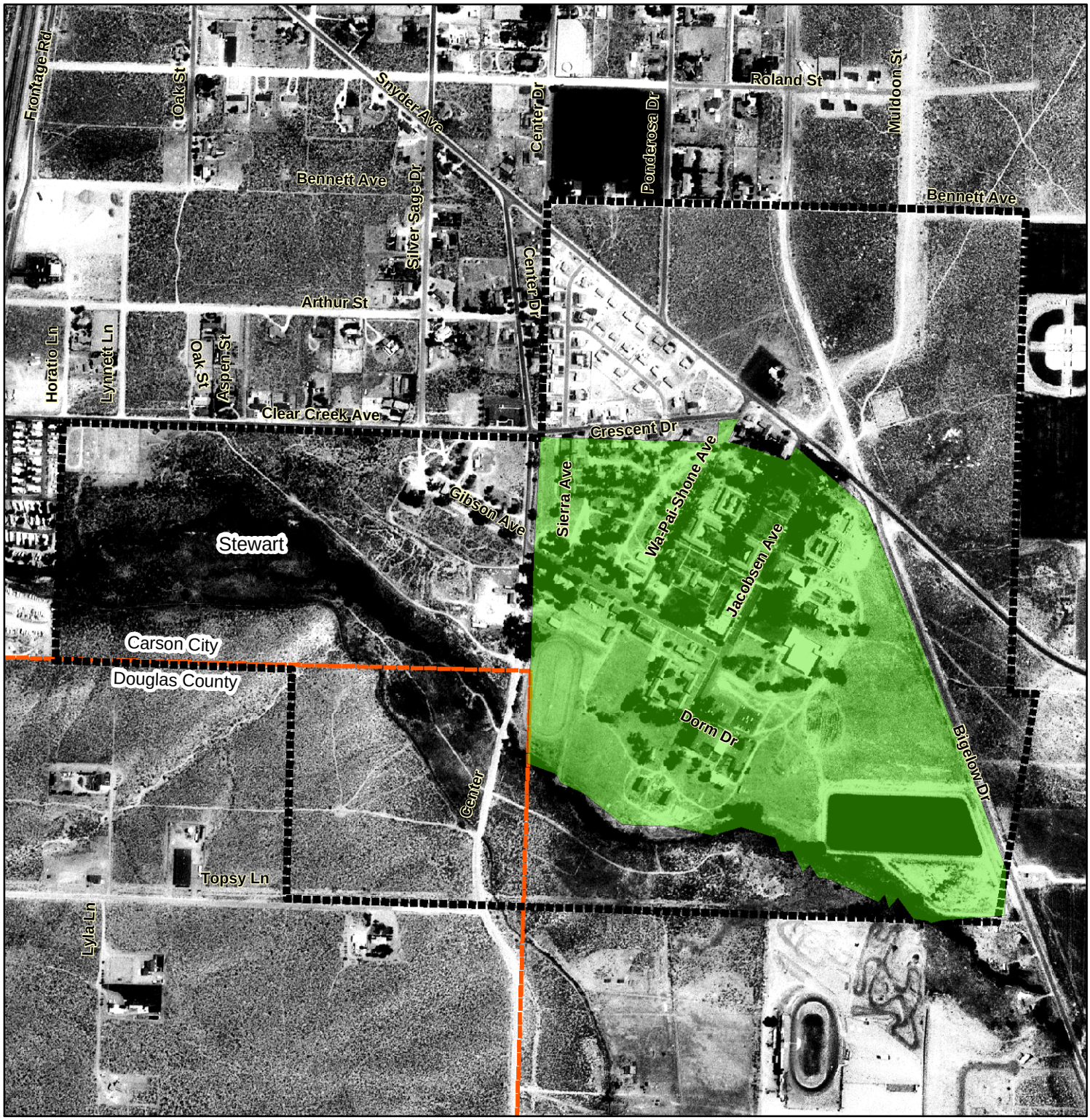


Figure 8-1. Community of Stewart

N
W E
S

Legend

- Community Boundary
- Nevada State Land
- County Boundary

0 500 1,000 2,000
Feet

Resource Concepts, Inc.
340 N. Minnesota St.
Carson City, NV 89703
(775)-883-1600

Nevada Community Wildfire Risk / Hazard Assessment Project

9.0 CARSON CITY RISK/HAZARD ASSESSMENT CONCLUSIONS

The recommendations in this report have been developed based on site-specific conditions observed during the fire risk/hazard assessments performed by the RCI Project Team. General and specific recommendations provide a starting point so each community described in this report can take a proactive approach in formulating projects to reduce the likelihood of loss of life, property, and natural resources from a wildland fire.

The communities in Carson City are generally at moderate to high risk for catastrophic fire in the wildland-urban interface areas surveyed. The moderate to high density vegetation surrounding the communities, steep topography, and typical weather patterns during fire season creates a situation prone to wildfire. The moderate and low hazard ratings for the Carson Indian Colony and Stewart, respectively, reflect the observations that most fire hazards in these communities are due to a build up of fuels and combustible debris around structures. Removal of debris and excess vegetation in accordance with the defensible space guidelines in Appendix F will remedy many of the hazards and provide a greater level of fire safety to these communities.

The Carson City community has a moderate hazard rating for wildland fire due, in part, to vegetation structure and density changes along the west side of the Carson City community as a result of the 2004 Waterfall Fire. While the fuel hazard and ignition risk has been reduced on the west side of the community, the fuel hazard north, east, and south of the community remains moderate to high. The moderate hazard rating is also attributed to the defensible space treatments that have been implemented by fire agencies in the Timberline and Lakeview areas. This rating is also the result of combining small areas of the community with high or extreme hazards with other areas of the community with low or moderate hazards. Continuation of the fuel mitigation work that has been planned by the Carson City Fire Department will increase protection to homes and mitigate the fuel hazards present in some residential areas of the Carson City community. Revision of the Carson City Wildland Interface Ordinance requiring defensible space treatments on undeveloped lots would decrease the likelihood of losing homes if the worst-case scenario should occur.

Clear Creek received a high hazard rating for wildfire primarily due to the fuel hazard, access limitations, and distance to water sources. Clear Creek residents are also located in a canyon with topographical features and weather conditions that are conducive to extreme fire behavior. Continuing implementation of the recommended fuel mitigation projects and defensible space treatments in conjunction with installation of water drafting sources will help to reduce the hazard to the Clear Creek community.

All of the recommended fuel reduction projects in the Carson City and Clear Creek communities will require cooperation between the U.S. Forest Service, Bureau of Land Management, Nevada Division of State Lands, Nevada Division of Forestry, Washoe Tribe of Nevada and California, and the Carson City Fire Department to ensure proper planning, funding, and eventual implementation. The following table summarizes the previously planned and proposed fuel reduction projects with the landowners who will need to be involved.

Table 9-1. Community Proposed Fuel Reduction/Mitigation Projects and Landowners and/or Agencies Involved

COMMUNITY	PROJECT DESCRIPTION AND ESTIMATED ACREAGE	PROJECT PROPOSAL	STATUS	PRIVATE	USFS	BLM	CARSON CITY	NVST	WASHOE TRIBE
Carson City	Deer Run fuelbreak – 48 ac.	BLM CCFD	Scheduled	X		X	X		
	Mexican Dam fuelbreak – 43 ac.	BLM CCFD	Scheduled	X		X	X		X
	North Carson fuelbreak – 87 ac.	CCFD	Proposed	X		X	X		
	West Carson fuelbreak – 25 ac.	CCFD	Proposed	X			X		
	C-Hill fuelbreak – 18 ac.	CCFD	Proposed	X			X		
Clear Creek	West Side Fuel/firebreak – 15 ac.	Dynamac	Proposed	X	X				
	Highway 50 fuel reduction – 32 ac.	Dynamac	Proposed	X	X			X	
	Section 34 fuelbreak – 12 to 15 ac.	Dynamac	Proposed	X					
	South of Clear Creek fuelbreak – 25 ac.	Dynamac	Proposed	X					
	Community-wide fuel reduction – 1,690 ac.	RCI	Proposed	X	X			X	X

To be most effective, fire safe practices need to be implemented on a community-wide basis. There is no guarantee that a wildfire will not occur in any of these communities, even if all of the recommendations in this report are implemented. Nonetheless, public awareness, neighbors helping neighbors, and concerned, proactive individuals setting examples for others to follow are just some of the approaches necessary to reduce the risk of wildfire ignition and the hazards inherent in wildland-urban interface areas.

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Spatial database information used in this report is listed by source in Section 2.2.

APPENDICES

Appendix A

Glossary of Terms used in Wildfire Management and Scientific Plant Names

Appendix A Glossary of Terms used in Wildfire Management

Agency: Any federal, state, or county government organization with jurisdictional responsibilities.

Air Attack: The deployment of fixed-wing or rotary aircraft on a wildland fire to drop retardant or suppressant, shuttle and deploy crews and supplies, or perform aerial reconnaissance of the overall fire situation. Can also refer to the person functioning as air attack officer and directing aerial operations.

All-Risk County Plan: Similar to a pre-attack (pre-fire) plan but encompasses action plans for responding to all types of natural and human caused emergencies such as earthquakes, floods, structure fires, hazardous materials situations, terrorism, train and vehicle accidents.

Annual grass treatment: The purpose of this treatment is to reduce the volume of flashy fuels associated with annual grass growth (e.g. cheatgrass and red brome). Fuel reduction can be accomplished by chemical treatment or mechanical removal of plant biomass. Pre-emergent herbicides can be applied near residential areas at the proper rates and following all label instructions to inhibit seed germination. After plants have started growth, mowing annual grasses before seed maturity reduces the amount of fine fuels during the summer fire season, limits seed production, and reduces the potential for annual grass in the following year. Repeated mowing over several years should reduce the density of the annual grass in the long term.

Aspect: Direction toward which a slope faces.

Biomass Utilization and Disposal: Biomass utilization is an alternative to open pile burning or landfill disposal. It results in the use of the natural resource for beneficial purposes such as firewood, wood chips, compost, and other products. If residents cannot find an alternative to burning, then proper burning procedures should be followed.

Brush Fire: A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.

Buffer Zones: An area of reduced vegetation that separates wildland areas from vulnerable residential or business developments. This barrier is similar to a greenbelt in that it is often used for another purpose such as agriculture or recreation, or parks or golf courses.

Classic Interface: Structures abut native vegetation with a clear line of separation between structures and the wildland vegetation along roads and fences. The fuels do not extend into the developed areas.

Contain a Fire: A fuel break around the fire has been completed. This break may include natural barriers such as a river or road, and/or fireline built by hand, and/or fireline constructed mechanically.

Control a Fire: The complete extinguishment of a fire, including spot fires. Fireline has been strengthened so that flare-ups from within the perimeter of the fire will not break through the line.

Crown Fire: The movement of fire through the crowns or tops of trees or shrubs more or less independently of the surface fire. A fire is said to be crowning when the flames get up into the tops of trees and spreads.

Defensible space: Defensible space is defined as a *minimum of a 30-foot area* around houses and other structures where vegetation has been significantly modified or removed. The purpose of creating defensible space is to reduce the risk of losing homes and other property improvements to a wildfire (Smith and Adams, 1991).

Defensible space is especially important in communities with structures directly adjacent to wildland vegetation, as in the intermix or rural interface conditions, where wildfires can spread quickly through the wildland fuels, threatening homes and lives.

Dispatch Center: A facility from which resources are directly assigned to an incident.

Dry Lightning Storm: Thunderstorm in which negligible precipitation reaches the ground. Also called a dry storm.

Duff: The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil.

Extreme Fire Behavior: "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following are usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, a strong convection column. Predictability is difficult because such fires often exercise influence on their environment and behave erratically, sometimes dangerously.

Fine Fuels: Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than ¼-inch in diameter and have a timelag of one hour or less. These fuels ignite readily and are rapidly consumed by fire when dry.

Fire Behavior: The manner in which a fire reacts to the influences of fuels, weather, and topography.

Firebrands: Pieces of burning material carried on the wind ahead of an advancing wildfire that, in extreme cases, can ignite spot fires up to a mile removed from the flame front.

Firebreak: A strip of land cleared of brush and trees down to the mineral soil.

Fire Front: The part of a wildland fire in which continuous flaming combustion is taking place. Unless otherwise specified the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

Fire hazard: As used in this report, vegetative factors that affect the intensity and the rate a fire spreads as well as urban factors that can facilitate or inhibit public safety and the containment of a fire in an interface area.

Fire Perimeter: The entire outer edge or boundary of a fire, which may contain within it substantial areas of unburned fuels.

Fire Regime: A term used by fire ecologists to describe the recurrence and intensity of fire relative to a specific plant community.

Fire Risk: Potential ignition sources and factors that facilitate ignition of wildfires.

Flash Fuels: Fuels such as grass, leaves, pine needles, ferns, tree moss, and some types of slash, flash fuels or flashy fuels ignite readily and are consumed rapidly when dry. Also called fine fuels.

Fuel Bed: In a research setting, an array of fuels usually constructed with specific loading, depth, and particle size to meet experimental requirements; also commonly used to describe the fuels composition in natural settings.

Fuelbreaks: A fuelbreaks are constructed in strategic locations where a cover of dense, heavy, or flammable vegetation has been permanently changed to one of lower fuel volume or reduced

flammability. Fuelbreak construction may include removing, controlling and possible replacing highly flammable vegetation with more fire resistant species. Ridge top fuelbreaks should have continuous length and width, which requires long-range planning.

A fuelbreak network system could be used to protect critical watersheds while more remote areas might have narrower fuelbreaks that might serve as anchor points for prescribed fires. A fuelbreak strategy can be effective even if fuelbreaks are not connected.

Fuel Loading: The amount of fuels present expressed quantitatively in terms of weight per unit area.

Fuel Reduction Treatment: This treatment involves strategically locating blocks of land near communities where flammable vegetation has been permanently changed to one of lower fuel volume or reduced flammability.

Fuel Type: An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

Greenstrips: Greenstrips are usually non-irrigated linear bands of open space on private or public land (usually a minimum of 300 feet wide) that serve as a buffer zone between wildland and adjacent urban development to promote safer environments. These areas are usually seeded to establish vegetation that is relatively fire resistant or slow burning and with shortened flame lengths. Seedings also decrease soil erosion and prevent invasion of noxious weeds and other aggressive plants such as cheatgrass and Russian knapweed.

Ground Fuels: All combustible materials below the surface litter, including duff, tree or shrub roots, punky wood, peat, sawdust, and other materials that can support a glowing combustion without flame.

High Hazard Day: Also known as a "red flag day", a combination of conditions such as low humidity (<15 percent), high winds (>25 mph), and low fuel moisture create a high probability of ignition and subsequent increased fire intensity. Various agencies have different trigger points to establish a "high hazard day".

Initial Attack: The actions taken by the first resources upon arrival at a wildfire to protect lives and property and prevent further expansion of the fire.

Interface Condition: The density and distribution of structures with respect to the surrounding wildland environment. The four Interface Conditions are Rural, Intermixed, Occluded, and Classic.

Intermix Interface: Structures are scattered throughout the wildland, with no clear boundary between the wildland vegetation and the community.

Ladder Fuels: Fuels which provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help start and continue crowning on a fire.

Lake Tahoe Regional Fire Chief's Association: A regional mutual aid agreement between signatories and the Lake Tahoe Regional Fire Chief's Association provides for the activation of pre-assigned task forces and strike teams with multiple suppression apparatus to participating fire departments and fire protection districts under a "good neighbor" policy of free assistance for a predetermined period of time. This agreement is directed by an operating plan and mobilization guides updated annually by each participating force. These guides set forth the commitments made in local agreements, the regional plan, and assistance for hire predicated on closest resource and the dispatch level of the request: Initial attack (nearest on-duty crews respond),

immediate need (crews respond within 30 minutes), or planned need beyond initial attack. While state agencies are members of the Lake Tahoe Regional Chief's Association, the mutual aid agreements does not include state or federal resources.

Mutual Aid Agreement: Written agreement between agencies and/or jurisdictions in which they agree to assist one another upon request by furnishing personnel and equipment.

Occluded Interface: This condition is usually within towns and cities where there are small islands of wildland fuels such as parks or open space. There is a clear boundary between the community and the wildland vegetation.

Pre-Attack Plan: Also known as a pre-fire plan. A plan written in anticipation of a fire in a given community or specific area. This plan is made readily available to all local agencies and typically lists expected need and availability of initial and extended attack resources, includes radio frequencies, name and number of contact person for each agency, and identifies the staging base, incident command post, evacuation center, location of water resources, and additional details unique to the locality being described.

Red Card Certification: A fire qualifications management system used by many state and all federal wildland fire management agencies to ensure that individuals are qualified to fight wildland fires.

Rural Interface: Clusters of structures such as ranches or summer homes are widely spaced, sometimes more than a mile apart. The rural homes are surrounded by the wildland vegetation, with no clear line of separation between the fuels and homes.

Shaded fuelbreaks: A shaded fuelbreak is created by altering surface fuels, and increasing the height of the base of the live crown, and opening the canopy by removing a portion of the woody plants in the treatment area. This type of fuelbreak spans a wide range of understory and overstory prescriptions. Construction methods include mechanical thinning, manual biomass removal, and the use of prescribed fires.

Sierra Front Wildfire Cooperators: Membership in the Sierra Front Wildfire Cooperators is composed of more than 25 federal, state and local entities. Fire suppression agencies, state and local law enforcement agencies and special organizations such as the Natural Resources Conservation Service, and the U.S. Weather Service comprise the membership of the Sierra Front Wildfire Cooperators. By pooling their resources, these agencies take a more efficient approach to the common goal of fire protection and a quicker response to wildland fires and other emergencies. The Sierra Front area of responsibility extends north from Reno to Susanville, California and south to Bridgeport, California, including the Tahoe Basin and east to Fallon, Nevada.

Structure Fire: Fire burning any part or all of any building or structure.

Volunteer Fire Department (VFD): A fire department of which some or all members are unpaid.

Water Tender: A ground vehicle capable of transporting water in the field, generally used to supply engines.

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

Wildland-Urban Interface: The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

SOURCES:

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DOMINANT VEGETATION OF THE WILDLAND-URBAN INTERFACE, CARSON CITY CONSOLIDATED MUNICIPALITY

Common Name	Scientific Name*
Trees	
Cottonwood	*Populus fremontii*
Jeffrey pine	*Pinus jeffreyi*
Single-leaf pinyon pine	*Pinus monophylla*
Utah juniper	*Juniperus osteosperma*
White fir	*Abies concolor*
Shrubs	
Bitterbrush	*Purshia tridentata*
Desert peach	*Prunus andersonii*
Low sagebrush	*Artemisia arbuscula*
Manzanita	*Arctostaphylos* sp.
Morman tea	*Ephedra nevadensis or Ephedra viridis*
Mountain mahogany	*Cercocarpus* sp.
Mountain sagebrush	*Artemisia tridentata* ssp. *vaseyana*
Rabbitbrush	*Chrysothamnus* sp.
Snowberry	*Symphoricarpos* sp.
Spiny hopsage	*Grayia spinosa*
Squaw carpet	*Ceanothus prostratus*
Willow	*Salix* sp.
Wyoming sagebrush	*Artemisia tridentata* ssp. *wyomingensis*
Grasses / Forbs	
Annual mustard	*Brassicaceae*
Cheatgrass	*Bromus tectorum*
Indian rice grass	*Achnatherum hymenoides*
Russian knapweed	*Acroptilon repens*
Russian thistle	*Salsola tragus*

*All scientific names taken from: Hickman, J.C. editor. 1993. *The Jepson manual: Higher plants of California.* University of California Press, Berkely, CA.

Appendix B

Community Wildfire Assessment Rating System

Community Design	Score
1. Ingress/Egress	
Two or more primary roads	1
One Road	3
One-way road in, one way out	5
2. Width of Primary Road	
>24 feet	1
>20 feet and <24 feet	3
<20 feet	5
3. Accessibility	
Road grade 5% or less	1
Road grade more than 5%	3
4. Secondary Road Terminus	
Loop roads, cul-de-sac w/outside turning radius of 45' or greater	1
Dead-end roads 200' or less in length	3
Dead-end roads greater than 200'	5
5. Street Signs	
Present 90-100%	1
Present 75-89%	3
Present <75%	5
6. Address Signage	
Present 90-100%	1
Present 75-89%	3
Present <75%	5

Existing Building Materials	Score
1. Roofing Materials	
Non-combustible covering 90-100%	1
Non-combustible covering 80-90%	5
Non-combustible covering 70-80%	8
Non-combustible <70%	10
2. Siding Materials	
Non-combustible siding >75%	1
Non-combustible siding <75%	5
3. Unenclosed Features	
Less than 25%	1
25 - 50%	3
>50%	5

Utilities	Score
Low risk of ignition	1
Moderate risk of ignition	3
High risk of ignition	5

Defensible Space	Score
1. Average Lot Size	
10 acres or larger	1
1 to 10 acres	3
<1 acre	5
2. Defensible Space	
70% or more adequate	1
30-70% adequate	7
<30% adequate	15

Fire Protection	Score
1. Water Source	
500 gpm hydrants within 500' of structures	1
500 gpm hydrants or draft source within 1000 feet of structures	2
Water source 20 minutes away roundtrip	5
Water source > 45 minutes away roundtrip	10
2. Fire Department Protection Within 5 Miles	
Career Department	1
Combination Career / Volunteer	3
Volunteer with Seasonal Staffing	5
All Volunteer Department	7
No Organized Department	10

Fire Behavior	Score
1. Slope	
8% or less	1
8% - 20%	4
20% - 30%	7
>30%	10
2. Aspect	
North or <8% slope	1
East	3
West	7
South	10
3. Fuels	
Light density	1
Medium density	3
High density	5

Fire Behavior *(continued)*	Score
Situation #3 – Fine and/or sparse fuels surround structures; infrequent wind exposure; flat terrain with little slope and/or north aspect. No large wildland fire history and/or moderate fire occurrence.	3
Situation #2 – Moderate slopes; broken moderate fuels; some ladder fuels; composition of fuels is conducive to torching and spotting; conditions may lead to moderate suppression success; some fire history and/or moderate fire occurrence.	7
Situation #1 – Continuous fuels in close proximity to structures; composition of fuels is conducive to crown fires or high intensity surface fires; steep slopes; predominately south aspects; dense fuels; heavy duff; prevailing wind exposure and/or ladder fuels that may reduce suppression effectiveness; history of some large fires and/or moderate fire occurrence.	10

Appendix C

Photographs of Representative Fuel Types in Carson City Communities

Photo 1. Recently installed shaded fuelbreaks around the Lakeview subdivision aided fire protection efforts around homes during the Waterfall fire of July 2004.

Photo 2. The Waterfall fire left areas of unburned vegetation, which will continue to present a fuel hazard, however, that hazard has been reduced due to the mosaic pattern of the remaining fuels.

Photo 3. This photo corresponds with Carson City Fuel Hazard Photo Point 4, post Waterfall Fire. Note the almost complete combustion of sagebrush and bitterbrush fuels due to the high temperatures associated with the fire.

Photo 4. Extensive tree thinning (80 sq.ft. basal area) and brush control throughout the community of Clear Creek in conjunction with proposed fuelbreaks will reduce the likelihood of a crown fire occurring within the community. The fire scar from the 2003 Highway 50 Fire is visible on the hillside northeast of the Clear Creek community.

Photo 5. Brush should be removed within 30 feet of all transformer stations in Carson City and Stewart. Utility poles should also have 15 feet of vegetative clearance to reduce the likelihood of pole loss during a fire and to reduce the risk of power lines igniting adjacent vegetation.

Photo 6. The community of Stewart is located south of Carson City. Four to six-foot high sagebrush and three-foot high rabbitbrush, with a cheatgrass understory, characterizes the typical vegetation in the northeast part of the Colony. Fuel loads are estimated at four tons per acre.

Photo 7. The northeast part of Stewart has fuel loading estimated at four tons per acre, composed of a dominant layer of four to five-foot high bitterbrush with desert peach and Mormon tea.

Appendix D

List of Persons Contacted

Appendix D – List of Persons Contacted

CONTACT NAME	POSITION	DATE CONTACTED	TELEPHONE
Ray Masayko	Mayor	Dec. 4, 2003	(775) 887-2100
Shelly Aldean	City Supervisor	Dec. 4, 2003	(775) 887-2100
Pete Livermore	City Supervisor	Dec. 4, 2003	(775) 887-2100
Richard Staub	City Supervisor	Dec. 4, 2003	(775) 887-2100
Robin Williamson	City Supervisor	Dec. 4, 2003	(775) 887-2100
Ronan Thornhill	Fire Management Officer Western Region Nevada Division of Forestry	Jan. 27, 2004	(775) 849-2500
Kelly Martin	Fire Management Officer U.S. Forest Service Humboldt-Toiyabe National Forest Carson Ranger District	Jan. 29, 2004	(775) 882-2766
Stacey Giomi	Fire Marshall Carson City Fire Department	Jun. 11, 2004	(775) 887-2210
Lee Ann Horton	Fire Inspector Carson City Fire Department	Jun. 11, 2004	(775) 887-2210
Jerry Pieretti	Fuels Management Coordinator Carson City Fire Department	Jun. 11, 2004	(775) 887-2210
Leonard Wehking	Fire Management Officer Bureau of Land Management Carson City Field Office	Jan. 26, 2004	(775) 885-6000
Brad Kosch	Regional Manager Nevada State Parks	Aug. 6, 2004	(775) 687-4384

CONTACT NAME	POSITION	DATE CONTACTED	TELEPHONE
Mike Polovina	Center Manager Sierra Front Interagency Dispatch Center in Minden, NV	Jan. 10, 2005	(775) 883-5995
Rich Riolo	Fire Prevention Chief Nevada Division of Forestry	Nov. 5, 2004	(775) 849-2500
Steve Heinrich	Hot Shot Crew Superintendent Bureau of Indian Affairs	Nov. 19, 2004	(775) 887-3521
Tim Roide	Prescribed Fire and Fuels Specialist BLM Carson City Field Office	Dec. 10, 2004	(775) 885-6000
Sharon Arnold	Clear Creek Chapter of the Nevada Fire Safe Council	Jan. 10, 2005	(775) 883-8141

Appendix E

Russian Knapweed Fact Sheets

Nevada Project WEEDS

Fact Sheet 98-73

WANTED— Dead, Not Alive!

This outlaw weed is hiding out! Find it. Eradicate it.

Russian Knapweed

Alias: *Centaurea repens*

Russian knapweed, like other knapweeds, is native to Eurasia. It is a perennial in Nevada and can be found in cultivated fields, orchards, pastures, roadsides, and rangelands. It prefers areas where the water table is within 20 feet of the surface. It can easily dominate cultivated fields and rangelands where its deep roots penetrate to free water. Transporting infested soils and moving contaminated equipment spreads this weed. Russian knapweed is listed as a noxious weed by Nevada Administrative Code.

This deep-rooted perennial can easily dominate cultivated fields and rangelands.

Distinguishing features:

- Grows 18 inches to 3 feet tall.
- Stems are erect and multi-branched.
- Leaves are blue-green, toothed, and covered with fine hair.
- Showy pink flowers bloom from June to September. The pearly bracts at the base of the flower head are rounded with papery margins. Flowers are small, ¼ to ½ inch, cone shaped, and usually pink, but can be white to purple.
- Dense colonies can form from adventitious roots.

Take action:

- Report its location to the land owner, gardener, manager or park ranger.
- Avoid walking on, driving on, or camping in Russian knapweed-infested areas and remove all weed seeds before moving out of an infested area.
- Dispose of the seeds, shoots, and roots in a sealed garbage bag through the trash. Herbicides may be available to kill this plant.
- Do not purchase, move, or use contaminated soil.

Your reward:

A cleaner, healthier environment and the satisfaction that you have helped make the difference!

For more information about controlling this and other invasive weeds, contact:

Nevada Cooperative Extension
775-784-1334;
Nevada Division of Agriculture
Bureau of Plant Industry,
775-688-1180; or
Your local Weed District manager or Conservation District:

University of Nevada, Reno Cooperative Extension
A County-State-Federal Partnership

Weed Profile: Russian Knapweed

COMMON NAME: Russian Knapweed
BOTANICAL NAME: *Acroptilon repens*
FAMILY: Asteraceae (Sunflower family)
DESCRIPTION / IDENTIFICATION : Grows 18 to 36" tall. Deeply lobed leaves are 2 to 4" long with gray pubescence. Flowers are pink, lavender, or white, and are produced from June to September. Rosettes have toothed leaves covered with fine hair.

NATIVE TO: Ukraine, S.E. Russia, Iran, and Kazakh to Mongolia.

CURRENT DISTRIBUTION: Found in most western states in cultivated fields, pastures, disturbed sites, roadsides, waste areas, and dry rangelands.

LIFE CYCLE CLASSIFICATION : Perennial; emerges in early spring.

MOST COMMONLY REPRODUCES ITSELF BY: Seed and rhizomes.

NUMBER OF SEEDS/ PLANT: 50 to 500 per shoot.

Control Methods

MECHANICAL: Use mowing in combination with herbicide treatments and then tilling to overcome allelopathic effects. Continuous tillage is somewhat effective, especially when combined with an herbicide program. Hand-pull only while wearing gloves.

CULTURAL: A good management program is essential. Seed competitive perennial grasses after control measures. Avoid overgrazing pastures and range. Use proper irrigation and fertilization.

BIOLOGICAL: Russian knapweed gall nematode.

CHEMICAL: Picloram (Tordon®, restricted use) should be applied after the first killing frost. Till the following spring to remove leaves, then treat again as needed with picloram. Control may be achieved in 2 to 4 years. Clopyralid (Stinger®; Transline®; Curtail® (includes 2,4-D)) works well during flowering, but is not yet registered for use in Nevada. Use chlorsulfuron (Telar®), 2,4-D, and/or dicamba (Banvel®) with cultural practices.

ADDITIONAL COMMENTS: Exhibits allelopathy. Toxic to horses, with irreversible damage resulting in the inability of the horse to pick up and chew food. Does not appear to affect cattle and sheep.

Appendix F

Homeowner Guidelines

DEFENSIBLE SPACE GUIDELINES
HOMEOWNER'S ANNUAL CHECKLIST
FUELBREAKS AND FUEL REDUCTION TREATMENTS AND SEED MIXES

DEFENSIBLE SPACE GUIDELINES

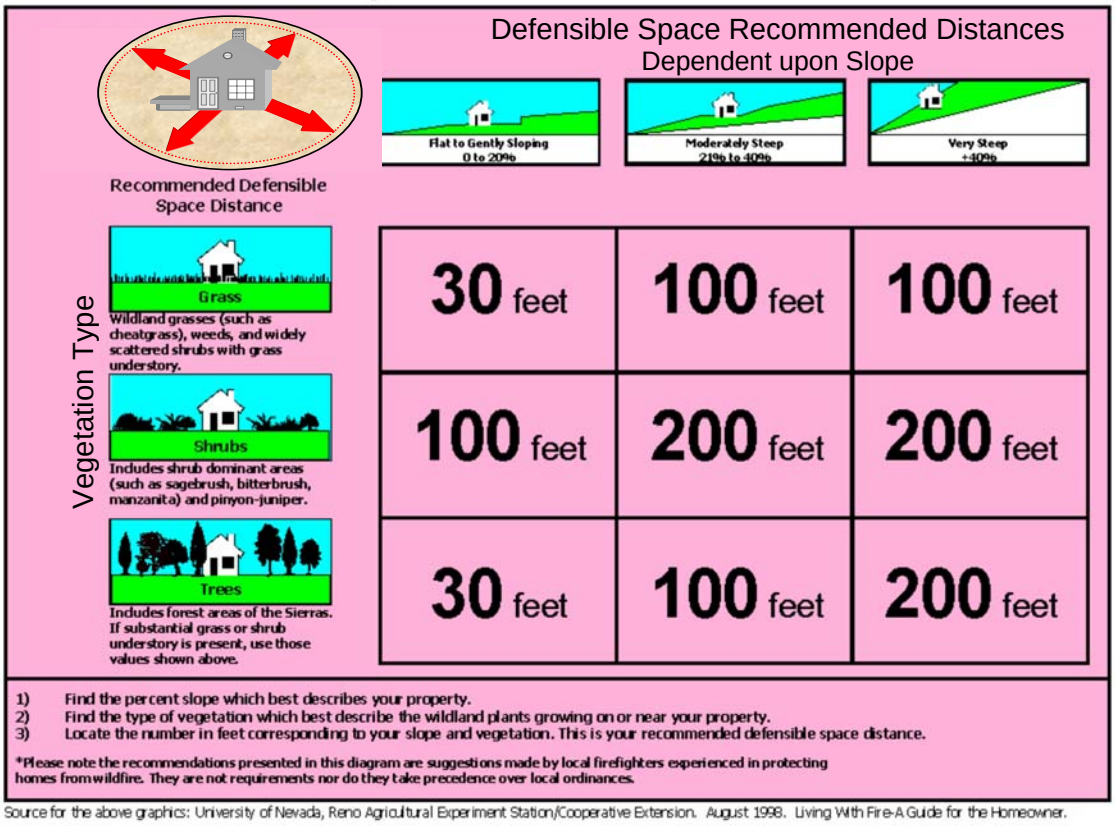
A FACT SHEET FOR CARSON CITY HOMEOWNERS

Defensible space refers to a **minimum** 30-foot area around houses and other buildings where vegetation has been significantly reduced or removed. The purpose of creating defensible space is to reduce the risk of losing homes and other property improvements to a wildfire.

HOW TO CREATE DEFENSIBLE SPACE

STEP 1 **DETERMINE DEFENSIBLE SPACE DISTANCE.** Use the table below to determine the minimum distance for defensible space, dependent upon slope and native vegetation type surrounding homes.

Standard Defensible Space Guidelines



Source for the above graphics: University of Nevada, Reno Agricultural Experiment Station/Cooperative Extension. August 1998. Living With Fire-A Guide for the Homeowner.

STEP 2 **REMOVE.** Cut and remove all dead, diseased or dying trees and shrubs from within the defensible space area. Remove selected trees and shrubs to eliminate continuous fuels extending up to the house. Also remove any flammable debris and firewood piles from within the minimum defensible space distance. Weeds or other dry vegetation should be removed from underneath porches and decks. Eliminate any flammable vegetation or debris within 10 feet of propane tanks. Remove leaves and debris from rain gutters.

STEP 3 **REDUCE.** Reduce vegetation height of shrubs under mature trees to decrease "ladder" fuels. Prune low tree branches to a minimum height of four feet and prune branches within 15 feet of structures and chimneys. Reduce accumulations of annual grasses (cheatgrass) through mowing or pre-emergent selective herbicide treatments in the fall. Reduce the accumulation of vegetation around wood fences through mowing or plant removal.

STEP 4 **REPLACE.** Substitute flammable vegetation such as juniper, sagebrush, and rabbitbrush with fire resistant plants. Replacement plantings may include low stature shrubs, decorative rock, lawn, flowerbeds, and succulent vegetation. Irrigation of vegetation throughout the fire season will decrease plant flammability.

STEP 5 **DISPOSE.** It is essential that all tree branches, shrubs, and other plant biomass be removed from the site immediately to a safe disposal area. This material dries rapidly and can contribute to the fire hazard problem if allowed to remain on the premises.

STEP 6 **MAINTAIN.** Maintenance of the defensible space area requires an annual review of fuel reduction guidelines around the home. Action should be taken to maintain an effective defensible space area.

Remember, good defensible space is –

Lean – There are only small amounts of flammable vegetation
Clean – There is no accumulation of dead vegetation or flammable debris
Green – Existing plants are healthy, green, and irrigated during fire season

(Source: Living With Fire…In the Big Sagebrush/Bitterbrush Environment. Nevada State Bureau of Land Management. Produced by Ed Smith and JoAnne Skelly.)

HOMEOWNERS' ANNUAL CHECKLIST

A FACT SHEET FOR CARSON CITY HOMEOWNERS

This checklist includes actions homeowners can perform annually to help create a fire safe home and community.

- ❑ Check all address signs for ease of visibility. Metal signs with four-inch high reflective numbers are recommended for visibility by emergency responders.

- ❑ Continue clearing of all trees underneath and adjacent to overhead power lines and poles. This includes the poles and lines to individual parcels. Trees that can touch or blow into the power lines can easily be trimmed or removed, and maintained to reduce fire hazard.

- ❑ Remove shrubs and trees for a distance of 10 feet from propane tanks.

- ❑ Remove all tree limbs within at least 15 feet of chimneys, decks, and open overhangs.

- ❑ Remove woodpiles, obvious accumulations of trash, pine needles or other debris from defensible space areas.

- ❑ Remove all dead and diseased branches. After initial emergency treatments, it is recommended that tree limbing occur during late fall and winter to prevent disease and attacks by pests.

- ❑ Harvested vegetation and trimmings must be immediately removed from the premises to assure that fuel reduction treatments are effective. All harvested biomass should be moved to a predetermined disposal area or safe zone approved by the Fire Department.

- ❑ All soil disturbances including those during biomass removal should be broadcast seeded according to the recommended species and rates provided in the "pre-suppression seeding" section.

- ❑ Where possible, improve driveway access to assure an adequate turning radius for firefighting apparatus.

- ❑ Clear rain gutters of leaves, needles and other debris. Screen vents to prevent any embers from entering attics in the event of a wildfire.

- ❑ Check hoses, valves, and other water equipment to assure operability should a fire occur.

- ❑ During high precipitation years, when growing conditions produce exceptional amounts of weeds, care should be taken to reduce the height of fire-prone vegetation, particularly weeds and grasses that carry fire to the adjacent shrubs. Implements such as weed-eaters work well for this job.

FUELBREAKS and FUEL REDUCTION TREATMENTS

A FACT SHEET FOR CARSON CITY HOMEOWNERS

DEFINITIONS:

A **fuelbreak** is a strategically located strip of land, on which a cover of dense, heavy, or flammable vegetation has been drastically changed to one of lower fuel volume or reduced flammability. Fuelbreak construction may include removing, controlling, and possibly replacing highly flammable vegetation with more fire resistant species. Ridgetop fuelbreaks generally have continuous length and width, which requires long-range planning. Fuel density is reduced, ladder fuels removed, and canopy closure reduced in fuelbreak treatments.

Shaded fuelbreaks are created by altering surface fuels and increasing the height of the base of the live crown and opening the canopy by removing trees. This type of fuelbreak spans a wide range of understory and overstory prescriptions and methods of creation through manual, mechanical, and prescribed fire treatments.

GENERAL RULES FOR FUEL MODIFICATION:

- Thin Jeffrey pine and white fir trees to a minimum spacing of ten feet (spacing increases with slope) between tree crowns. Pinyon and juniper trees should be thinned to a canopy spacing two times the height of the trees. Remove all shrubs from beneath tree crowns (ladder fuels).
- Thin shrubs so that canopies are spaced at least two times the height of the adjacent shrubs.
- For Jeffrey pine trees, remove limbs within a minimum of five feet from the ground and up to a distance one-third the height of the tree. For pinyon and juniper trees, prune limbs up a minimum of four feet and up to one-third the height of the tree.
- If possible, prune/limb trees in the winter to avoid insect infestations. If pruning in other seasons, the tree should be sprayed with approved products to protect tree from insects and disease.
- Contact your local Nevada Division of Forestry (NDF) forester for additional recommendations regarding tree health and extensive tree removal projects.

When applying thinning and pruning treatments it is essential that all tree branches, shrubs, pine needle litter, and other plant biomass be removed from the site immediately to a safe disposal area. This material dries rapidly and can contribute to the fire hazard problem if allowed to remain on the premises.

SEED MIX AND PLANTING SPECIFICATIONS

COMMON NAME	SCIENTIFIC NAME	DRILL SEEDING RATE (PLS[1] LBS./ACRE)	BROADCAST SEEDING RATE (PLS LBS./ACRE
'Sodar' Streambank wheatgrass	*Elymus lanceolatus* ssp. *psammophilus*	1.50	4.00
'Roadcrest' Crested wheatgrass*	*Agropyron cristatum*	2.25	3.50
'Secar' Bluebunch wheatgrass	*Pseudoroegneria spicata* ssp. *spicata*	1.00	2.00
Blue flax	*Linum lewisii*	0.25	0.50
'Immigrant' forage kochia	*Kochia prostrata***	2.00	
Total PLS pounds per acre		**7.00**	**12.00**

***Kochia prostrata* should always be broadcast seeded on the soil surface in all cases.

This seed mixture is for treating all disturbed areas and areas cleared for fuel reduction purposes. Seeding application rates are specified on a **"pure live seed"** (PLS) basis. All seeds should be thoroughly mixed and seeded together at the same time. Drill seeding is recommended where feasible. Drill rows should be spaced 12 inches apart and seed should be planted at a depth of 1/2 inch. Broadcast seeding is recommended for rocky, steep, or small treatment areas. The seed can be broadcast using hand held seeders such as a "Whirlybird" or a broadcast seeder mounted on an ATV. Continually mix the seed while seeding to equally distribute the small seeds throughout the mix. Following the broadcast seed application, seeded areas should be lightly raked to assure seed placement at an average depth of 1/2 inch. This can be done with hand held rakes, or by pulling a drag or piece of chain link fence behind a truck or ATV in areas that are less rocky.

These guidelines are provided as overall recommendations. However, site-specific evaluation of the treatment areas by a specialist from a land management agency, the Natural Resources Conservation Service, or the University of Nevada Cooperative Extension will provide even greater assurance for success.