**Taos Valley Watershed Coalition**

# Landscape Restoration Strategy

**White Paper – July 2015**

Carson National Forest
James Duran, Forest Supervisor

El Salto de Agua Land Association
Erminio Martinez, President

El Salto FireWise Community
Martha Brown, President

Gallina Canyon FireWise Community
Virginia Clark, Chair

The Nature Conservancy
Ernie Atencio, Rio Grande Water Fund

NM Department of Game and Fish
Alexandra Sandoval, Director

New Mexico State Forestry
Ernie Lopez, District Forester

New Mexico Wildlife Federation
Garrett VeneKlasen, Executive Director

Pot Creek Candidate FireWise Community
Toni Hippeli, Chair

San Cristobal Candidate FireWise Community
Fran Reynolds, Chair

Taos Canyon FireWise Community
Natica Dahlkamp, Chair

Taos County
Stephen Archuleta, County Manager

Taos Pueblo
Robert Espinosa, Warchief

09 06 2015

Taos Ski Valley Inc.
Gordon Briner, CEO

Taos Soil and Water Conservation District
Peter Vigil, District Manager

Town of Taos
Rick Bellis, Town Manager

Trout Unlimited
Toner Mitchell, Public Lands Coordinator

Valle Escondido FireWise Community
Irene Neimeier, Chair

Village of Taos Ski Valley
Kathy Bennett, Councilor

## Introduction

This Landscape Restoration Strategy (LRS) was developed over seven months during 2014-2015 by the Taos Valley Watershed Coalition (TVWC). Coalition members manage or provide land use consultation on all of the adjoining jurisdictions within our focus area, which extends from the Rio Grande del Rancho on the south to the San Cristobal drainage on the north and also includes the Rio Fernando, Rio Pueblo, Rio Lucero, Rio Arroyo Seco, and Rio Hondo stream systems. Coalition members agree to focus on the goals of protecting, improving, and restoring the water quality, quantity, and ecological function of the forests and streams in the Rio Grande watershed within Taos County, to the benefit of both local and downstream water users. This LRS was developed by our membership to document our shared understanding of scientific data and community values, and to guide coordinated actions within our local watersheds.

## Executive Summary

**TVWC GOAL:** Protect, improve and restore the water quality, quantity, and ecological function of the forests and streams in the Rio Grande watershed within Taos County to the benefit of both local and downstream beneficiaries of the water supply arising from these watersheds.

**TVWC APPROACH:** The Coalition is using ecological reference conditions as a guide to develop a proactive landscape scale strategy that goes beyond the restoration of historical conditions. We seek to implement projects that increase forest and watershed resilience, where mega-fires and insects threaten long term impairment to ecological function. The Coalition recognizes that the current ecological conditions are highly departed from the reference conditions across the TVWC landscape. Our strategy will expand and connect recent projects that have improved forest structure and have mitigated threats in the wildland-urban interface and in the upland watersheds, to the benefit of regional communities, economies, and ecosystems.

**TVWC STRATEGY:**

1. Restore fire to frequent-fire forest types, such as ponderosa pine and some pinon-juniper and dry-mixed conifer, with treatments that include mechanical thinning, controlled burns, and natural fire ignitions when and where it is safe to do so.
2. Adaptively manage dry-mixed-conifer forests, seeking to retain and enhance ponderosa pine and Douglas fir where they are underrepresented, and to increase the percentage of open canopy seral stages toward the reference condition; treatments will include mechanical thinning, controlled burns, and management of natural fire ignitions to benefit the ecosystem when and where it is safe to do so.
3. Use the USDA Forest Service research report, *Restoring Composition and Structure in Southwestern Frequent Fire Forests (GTR-310)* (Reynolds et al. 2013) to guide our landscape management, coupled with the collaboratively-developed NM Forest Restoration Principles (Bradley 2009) where appropriate.
4. Learn more about the wet-mixed-conifer forests and the historical frequency and intensity of fire, in order to determine how to best restore and adaptively manage in this forest type; treatments are not determined yet, but may include mechanical thinning and fire management as appropriate.
5. In spruce-fir forest types we are seeking to learn more about historical aspen patch size and distribution, so that we might use aspen to break up fuel continuity and connect to natural anchor points, such as rocky outcrops. Our treatments in aspen may include tree cutting followed by controlled burning and managing natural fire ignitions as weather and fuel conditions allow.

6. Where natural landscape features lend themselves to project design, we will integrate the natural distribution of rocky ridges, talus slopes, and other landscape features as anchor points for breaking up fuel continuity.

## Landscape Restoration Strategy

Historically the landscape was a mosaic of seral stages (USFS 2015). Fire acted as a natural disturbance that shaped the structure of the forest and created the mosaic pattern. When the natural fire regime was disrupted, landscape-scale vegetation patterns were altered. Without fire, the mosaic pattern on the landscape shifted to large homogenous stands which have decreased ecosystem resilience by increasing the likelihood that disturbances will now affect large areas of forested watersheds.

When fires do burn in these altered landscapes they are more severe and more economically costly than historical fires. Recent events in the Taos Valley landscape include the 2003 Encebado fire at 5,382 acres and 1996 Hondo fire at 7,525 acres (Figure 2). More recent fires in the region were ignited during extreme fire weather and grew rapidly in the dry conditions that often lead to uncharacteristically high severity. For example the 2011 Las Conchas Fire (156,593 acres in the Jemez Mountains) and the 2003 Silver Fire (138,705 acres in the Black Range in southwest NM) were difficult to contain and destroyed huge swaths of forest.

Ecologically these large fires in New Mexico have increased spatial heterogeneity, thinned the forest fuels, and created diverse habitat, but also created large treeless patches whose size is far outside the historical reference conditions, and that could result in long-term conversion of forests to shrub lands. These fires have also threatened homes and infrastructure, and afterwards the burn scars discharged ash and sediment into streams and increased the risk of flooding with a dramatic decrease in the water-holding capacity of the hillsides. These water-related effects last for many years following a fire.

Under the right conditions, fires that start in the Taos Valley landscape could also reach that size and level of severity. These mega-fires would be devastating to communities of the Taos valley and could remove the forest canopy for centuries. In the context of climate change, some of these forests may never return.

## Ecological Context

Development of this strategy began with a landscape-wide assessment of current ecological conditions. Key concerns identified through the collaborative consensus-building process were: 1) departure from historical forest structure and 2) threats to community values from uncharacteristic fires and post-fire effects, including flooding erosion and debris flow.

#### Departure from Historical Conditions

Information about current forest condition including seral stage classifications was available for each Ecological Response Unit (ERU) from the Carson National Forest, which had prepared the data for their Draft Forest Assessment (USFS 2015). ERUs are areas that have the same general patterns of succession and are sometimes called biophysical settings or potential vegetation (Wahlberg 2013). Twenty-two ERUs are present in the TVWC landscape (Figure 3). Only the seven ERUs with potential forest restoration projects were analyzed for departure from historical conditions.

Seral stages are classifications of forest structure. For example ponderosa pine has six seral stages ranging from “A – grass, seedlings, and saplings” to “F – old forest, open canopy, uneven aged” (Figure 4). Stands of trees will transition between seral stages through growth and disturbance. A fire could be the disturbance

that causes a transition in a ponderosa pine stand in stage E to stage A. Full documentation of seral stages and transition models are included in Appendix A.

The proportion of the landscape in each seral stage was calculated from the Carson National Forest data (Table 1). Data describing historical distribution and proportion in each seral stage was also available for the area (USFS 2015). Historical reference conditions are based on vegetation models; fire-scar dates measured from trees, snags, stumps, and downed logs; dendrochronological stand reconstructions; repeat photography; and land survey records (Keane et al. 2009). For now, this landscape restoration strategy is based upon the best available data, however in the future, site-specific studies of historical conditions in the Taos Valley landscape would be useful to refine and improve the strategy.

Departure from historical seral stage occurrence was calculated for each ERU. Departure indicates which seral stages are under or over represented in the landscape (Figure 5). Patterns of departure vary between ERUs. For example, ponderosa pine forest has shifted entirely from mixed-age, open-canopy forest to single-aged, closed-canopy forest. Mixed-conifer forest with frequent fire (dry-mixed conifer) has transitioned from open uneven-aged forest to dense closed stands that favor growth of uncharacteristic shade tolerant species like white fir. Wet-mixed conifer has less "old-forest" and fewer stands of aspen and mixed-aspen forest. Throughout the landscape, recently burned areas have a higher occurance of the underrepresented seral stages.

**Other Threats**

The departed conditions observed in the landscape create additional problems. Overgrown, "out-of-whack" forests are more susceptible to insects and diseases which cause defoliation and mortality (Norlander 2012). Out-of-whack forests are one of the primary causes of large, uncharacteristic, high-intensity, stand-replacing wildfires (Stephens et al. 2014).

In addition to the damage caused by the direct effects of the uncharacteristic fires, the burn scars left by these fires continue to be a threat for years after the fire is extinguished (Long 2014). Flooding, erosion, debris flow, water pollution, and decreased water yields are some of the sources of damage that continue long after the fire.

The available data were compiled for each of these threats. Risk of mortality caused by disease and insects (Figure 6) was available from the USFS Forest Health Technology Enterprise Team (Krist et al. 2014). Crown fire activity (Figure 7) and fireline intensity (Figure 8) were modeled from national vegetation datasets. Crown fire activity and fireline intensity were modeled with FlamMap (Finney 2006).

Post-fire threats data were compiled from multiple sources. Post-fire erosion (Figure 9) was modeled as part of the Forest ERA development of landscape decision support tools for North-Central New Mexico (Sisk 2005). Post-fire debris-flow threat (Figure 10) was modeled by TNC under a contract with the New Mexico Department of Game and Fish using a model developed by the U.S. Geological Survey (Cannon et al. 2010).

## Community Context

The highly-departed forests pose a threat to the communities of the Taos Valley area. As forests are damaged, their ability to sustain the communities that have relied on them for centuries is diminished.

The forests of the Taos Valley provide clean water for agricultural, municipal and community use. They are working forests that provide jobs and resources on tribal lands, previous land grant lands, and national forests. They are a draw for recreational visitors and tourists to the area, seeking world class skiing, fishing

and hunting, biking, hiking, rafting, and ballooning experiences. They are essentially the working landscape and backyard playground of the community.

As with ecological context, the collaborative group used a consensus-based process to identify community values that are threatened by highly-departed forests. The values identified by the Coalition are:

- Healthy watersheds that supply water to acequias and communities, both locally and downstream
- Working forests that provide saw timber for local mills, building materials for traditional construction, and jobs for local residents
- Homes in and near the forest
- Essential infrastructure - highways, power lines, etc.
- Firewood gathering, livestock grazing, hunting & fishing, and other traditional land uses
- Recreational areas, skiing, hiking, camping
- Fish and wildlife habitat, biodiversity, rare and endangered species
- Sacred areas and cultural sites

The best available data were collected for these identified values. Maps were prepared from the data and discussed by the Coalition at a series of meetings in June and July 2015. Maps that were discussed included:

- Municipal and agricultural water sources and watersheds (Figure 11)
- Annual streamflow (Figure 12)
- Homes in the forest—developed and wildland urban interface (WUI) areas (Figure 13)
- Crucial habitat (Figure 14)
- Roadless Areas (Figure 15)

## Strategy Development Process

Members of our coalition have different responsibilities and jurisdictions, which means that individually we may have different priorities for activities that meet our big-picture, collective objectives. We have collaboratively developed this strategy to paint a broad picture of how our individual agencies, organizations, and stakeholders can coordinate and collaborate to leverage our resources and invest in compatible projects across jurisdictions that will amplify ecological and community benefits beyond the sum of the actions taken.

This Landscape Restoration Strategy was developed over a seven month period by the Taos Valley Watershed Coalition. Meeting facilitation, data analysis, and map making to support the development of this strategy was provided by The Nature Conservancy with support from the LOR Foundation. The Carson National Forest provided new and comprehensive data from their Forest Plan Revision draft assessment. Key steps in our multi-stakeholder process included:

- Meetings in January and February 2015 to identify common goals and the 280,000 landscape of the west slope of the Sangre de Cristo Mountains from Pot Creek to San Cristóbal Creek, and inclusive of Carson National Forest lands, Taos Pueblo, Town of Taos, Taos Ski Valley, El Salto Land Association, and the FireWise communities of Pot Creek, Valle Escondido, Taos Canyon, El Salto, and San Cristóbal (Figure 1). We identified priority projects to meet the shared goals through treatments on individual landscapes and we summarized the complete set of projects in our initial Statement of Interest to the Rio Grande Water Fund.
- Meeting in May 2015 of Coalition members and representatives of the Rio Grande Water Fund Technical Review Panel. We were also joined by fire ecologists Tom Swetnam, Craig Allen, and Collin Haffey. At this meeting we outlined our process to develop this Landscape Restoration Strategy.

- Data about ecological reference conditions, current conditions, and values at risk were compiled throughout May and June 2015 from existing sources, as described in the sections below.
- Meeting on June 9, 2015 of a Coalition working group comprised of staff from the Carson National Forest and Taos Pueblo, Taos County contractors, and The Nature Conservancy. This group reviewed the initial data and maps, and sketched out the first draft of an ecologically-based strategy for restoring the frequent- and mixed-fire regime forests across the landscape in order to address community and water source protection needs, and cultural and other key values.
- Meeting on June 25, 2015 of the full Coalition to discuss the first draft strategy for landscape restoration, including group review of all of the maps and work to articulate our strategy and collaboratively determine our priority actions.
- Revised the strategy through July 2015, met in person on July 30 and discussed revisions to the strategy, and then circulated to each organization for final review and signature.

## Restoration Strategy

The Coalition is using ecological reference conditions as a guide to develop our landscape strategy, with goals that go beyond restoring historical conditions to increasing forest and watershed resiliency to mega-fire, insects, and other disturbances, and to provide for the needs of people. The Coalition recognizes that the current ecological characteristics of our landscape are highly departed from historic reference conditions. The Coalition strategy will expand and connect recent projects that have improved forest structure and diversity and have mitigated threats in the wildland-urban interface and in the upland watersheds, to the benefit of regional communities, economies and ecosystems.

The Coalition strategy is based on a depth of local knowledge of forest conditions, as well as data and maps discussed at our meetings. We are actively working to increase our knowledge of historical vegetation structure and fire regimes in the TVWC landscape and believe this knowledge will allow the use of fire for resource benefit in more places in the future, including the possibility of managed fire in the Wilderness areas within our landscape—Blue Lake, Wheeler Peak, and Columbine Hondo. Fire history studies have been completed in neighboring forests with similar forest types but localized knowledge is needed to create regionally specific documentation of the historical ecological characteristics of the landscape.

Our landscape restoration strategy has these basic parts:

1. Restore fire to frequent-fire forest types, such as ponderosa pine and some pinon-juniper and dry-mixed conifer, with treatments that include mechanical thinning, controlled burns, and natural fire ignitions when and where it is safe to do so.
2. Adaptively manage dry-mixed-conifer forests, seeking to retain and enhance ponderosa pine and Douglas fir where they are underrepresented, and to increase the percentage of open canopy seral stages toward the reference condition; treatments will include mechanical thinning, controlled burns, and management of natural fire ignitions to benefit the ecosystem when and where it is safe to do so.
3. Use the USDA Forest Service research report, *Restoring Composition and Structure in Southwestern Frequent Fire Forests (GTR-310)* (Reynolds et al. 2013) to guide our landscape management, coupled with the collaboratively-developed NM Forest Restoration Principles (Bradley 2009) where appropriate.
4. Learn more about the wet-mixed-conifer forests and the historical frequency and intensity of fire, in order to determine how to best restore and adaptively manage in this forest type; treatments are not determined yet, but may include mechanical thinning and fire management as appropriate.

5. In spruce-fir forest types we are seeking to learn more about historical aspen patch size and distribution, so that we might use aspen to break up fuel continuity and connect to natural anchor points, such as rocky outcrops. Our treatments in aspen may include tree cutting followed by controlled burning and managing natural fire ignitions as weather and fuel conditions allow.
6. Where natural landscape features lend themselves to project design, we will integrate the natural distribution of rocky ridges, talus slopes, and other landscape features as anchor points for breaking up fuel continuity.

When we consider the spatial application of these approaches, we also factor in our restoration objectives and the values at risk. For example, the Pueblo Ridge area (described in detail below) is comprised largely of ponderosa pine and dry-mixed conifer and large-scale restoration of natural fire regimes is possible. Many of the communities in Taos Canyon have already created defensible space, and that community protection buffer is a useful enabling condition for future fire management. We are also concerned about water quality on both sides of Pueblo Ridge—the Rio Fernando through Taos Canyon and the Rio Pueblo through Taos Pueblo. These are major drinking water and agricultural water sources, and a severe burn and subsequent flooding could be devastating to the communities below.

For contrast, the Rio Hondo (described in detail below), provides a very different example of how we will apply the restoration strategy. In the Rio Hondo watershed, the management options are constrained by the close proximity of Wilderness boundaries on all sides of the watershed and the community and recreation area protection needs of the Taos Ski Valley, Valdez, and Arroyo Hondo. We will strive to be guided in the Rio Hondo watershed by the ecological needs of wet-mixed conifer and spruce-fir forests, and we recognize that the community protection and recreation area needs will help shape our choices.

## Collaborative Priorities for Restoration Treatments and Planning

Coalition members worked together to identify a set of priority places for restoration treatments and planning using all of the data previously described. We considered activities that are currently underway on federal and non-federal lands, and we integrated those into our priorities so that we can achieve greater leverage and landscape impact with the dollars available to our respective organizations. While each of these collaboratively developed priority activities is described separately, the priorities are interrelated and taken together comprise a critical set of first activities toward restoration of the entire landscape (Figure 16).

1. PUEBLO RIDGE – This area connects the Encebado Fire scar, where 7,000 acres are now in early seral, open-canopy condition, to the La Jara treatments on Carson National Forest land, which are mid-seral and have been restored to open-canopy condition, and that run to the west along the ridge and through Capulin and Lower Taos Canyon. Within Taos Canyon are several WUI areas, many of which have been recently treated to remove fuels, reduce the risk of running crown fire, and provide defensible space for homes, and that offer a buffer for future fire management within Pueblo Ridge. There is some existing road access and reasonable access for community or commercial fuelwood gathering to remove the larger wood pieces following mechanical treatment. On the north side of Pueblo Ridge is Taos Pueblo. Much of the land is within the boundary of the Blue Lake Wilderness. The ecological response unit maps of vegetation show that the area is mostly ponderosa pine and dry-mixed conifer, with scattered wet-mixed conifer. The current conditions are moderately to significantly departed from the reference condition. The Coalition identified both sides of the ridge as appropriate for restoration and critical to the Taos Valley communities. *This will be a priority activity in the August 2015 Statement of Interest and funding will be requested to support NEPA planning on both Carson National Forest and Taos Pueblo lands.*

A. Taos Pueblo needs a Comprehensive Forest Inventory (CFI) to start on the NEPA work for both the Wilderness and non-Wilderness lands. *The August 2015 Statement of Interest will include a request to fund a CFI on the Pueblo lands. Funding from the Rio Grande Water Fund could possibly leverage additional Pueblo funding.*
B. The Carson National Forest needs funding for archeological surveys and will eventually need funding for wildlife surveys once planning efforts are nearing completion. Taos Pueblo will seek Tribal Forest Protection Act funding for potential survey work and treatments on Carson National Forest lands within the Pueblo Ridge footprint. A decision specific to National Forest System (NFS) lands managed by the Carson National Forest is expected calendar year 2017. *The August 2015 Statement of Interest will include a request to fund archeological surveys on CNF land.*

Benefits of the PUEBLO RIDGE project are:

- Treatment activities will restore lands in the Rio Pueblo and Rio Fernando watersheds, which are the two major watersheds that supply the 1,900 residents of Taos Pueblo and the 4,700 residents of the Town of Taos. These watersheds provide Taos Pueblo surface water, flow into a majority of the 74 *acequias* in Taos Valley, and recharge shallow aquifers that serve as the water supply for the Town of Taos and numerous mutual domestic water associations.
- Using the natural anchor point of the Encebado Fire scar, the Pueblo Ridge restoration ties together the existing La Jara treatments at the head of Taos Canyon with the WUI treatments through the Capulin and Lower Taos Canyon areas. Mechanical treatments in these areas will provide important support to future use of managed fire in the Blue Lake Wilderness.
- La Jara Creek has a series of wetlands that are identified as "wetland gems" by Amigos Bravos and that, when functioning properly, provide critical natural infrastructure for water storage in the Rio Fernando watershed.
- The Carson National Forest lands are in Game Management Unit 49, a very productive elk hunting area important to sportsmen and providing critical revenue to the Taos-area economy.
- Parts of the area have existing road access and are suitable for community and commercial permit firewood gathering.

2. EL SALTO RESTORATION – The vegetation departure maps make clear that the areas from El Salto to Taos Pueblo and the Rio Hondo up to the Taos Ski Valley are all critical needs for restoration. The spatial pattern of overrepresented closed canopy cover in ponderosa pine and dry mixed conifer and wet classes presents an opportunity for restoration. On the El Salto property we found an existing natural pattern of rocky ridges and talus slopes that breaks up the fuel continuity and provides strong anchor points for restoration treatment areas. Using these existing patterns in the landscape, we drew priority project areas as follows:
    A. The Waterfall Treatment Block is located just upslope and east of El Salto Road, adjoins Wheeler Wilderness on the North, surrounds El Salto Falls and the adjoining rock outcrops in the central area, and adjoins the Arroyo Seco Creek on the south. The area is already roaded and has historically been a working forest for the community. The chainsaw thinning treatments will be anchored against existing roads and landscape features in combination with small group selection cutting methods to create a heterogeneous structure of rock outcrops, groups of trees, single trees, and open areas populated by grass, forbs, and shrubs. This restoration treatment block will be one of two top priorities for the resubmitted RGWF Statement of Interest in August 2015. See benefits to be achieved below. *The August 2015 Statement of Interest will include a request to treat about 100, or more, acres, depending on site conditions.*

B. The Canoncito Canyon Treatment Block runs east and west, and is adjacent to the Pueblo Lands on the southern boundary. Departures from historical species compositions, structures, and spatial patterns are typical in the ponderosa pine and dry mixed-conifer found in this area Mechanical thinning and pile burning is planned here to provide a buffer for managed fire on the Blue Lake Wilderness just to the south. *This is the second priority within the El Salto lands but funding will not be requested as part of the August 2015 Statement of Interest. .*

C. The Lucero Peak Treatment Block comprises the upper reaches of the Land Association's working forest, where vegetation includes dry mixed-conifer transitioning to wet mixed-conifer further upslope. Slopes are steep and heavily timbered and are punctuated with massive rock outcrops and talus fields. *This is a third priority within the El Salto lands, and funding will not be requested as part of the August 2015 Statement of Interest.*

Benefits of the EL SALTO RESTORATION project are:

- Restoring lands that are important to traditional communities and that supply water to several *acequias*.
- Provide fuelwood for El Salto Association members, continuing that age-old tradition.
- Given prevailing wind direction, treatments on the El Salto tract also offer significant wildfire protection to the well-traveled Rio Hondo drainage and the Taos Ski Valley.

3. RIO HONDO CORRIDOR – The Rio Hondo runs 8 miles west from Taos Ski Valley, along State Highway 150 to Valdez, within a narrow corridor of the Carson National Forest that is bordered on the south by the Wheeler Wilderness and on the north by the recently designated Hondo-Columbine Wilderness. The ecological response unit and departure maps show that the forest is ponderosa pine and dry-mixed conifer at lower elevations, transitioning to wet-mixed conifer and spruce-fir, with an aspen component in both forest types, as the elevation increases. Natural rocky ridges and talus slopes offer breaks in the forest continuity, as do the existing patches of aspen, ranging in size from small openings to stringers running in a SW-NE direction. The Rio Hondo is also a popular fishing area and has three designated campgrounds. Some of the tributary streams have small existing populations of Rio Grande cutthroat trout and will be targeted for reintroduction after fish barriers are constructed. West and north from the mouth of Rio Hondo is the Kiowa-San Cristóbal restoration area, under NEPA planning now for 10,000 acres to restore ponderosa pine and dry-mixed conifer in an area that is moderately departed from reference condition, and that supplies water to San Cristobal community and several *acequias*. *The Coalition collaboratively decided that the Rio Hondo is a priority for restoration, but a secondary project on a different timeframe from Pueblo Ridge and El Salto, and with possible funding contributed by Taos Ski Valley, Inc. and other sources.*

A. Using the natural breaks of ridges and talus slopes as anchors, restore and enhance the aspen patches and stringers to create a pattern of interrupted fuel continuity.

B. Restore and enhance aspen patches within the TSV permit area and thin the gladed areas in the mixed-wet conifer, as allowed by the current Master Development Plan, and stimulate aspen patches in spruce-fir.

C. Remove hazardous fuels from the campgrounds, and where they are in ponderosa pine or dry-mixed conifer, extend the thinning to the Wilderness boundary.

Benefits of the RIO HONDO project are:

- Restoring lands in the Rio Hondo watershed, which provides water to the Village of Taos Ski Valley, to the mutual domestic water systems in Valdez, Arroyo Seco, and Arroyo Hondo, and to several *acequias* downstream.

- The Rio Hondo has exceptionally high recreation and economic value to the community and County, with the ski area, vacation properties, campgrounds, hiking trails, access to Wilderness, and fishing.
- The Rio Hondo tributary streams can support reintroduction of Rio Grande cutthroat trout and provide a publically accessible area for education about native species.
- The Village of Taos Ski Valley is creating a detailed Community Wildfire Protection Plan and will integrate their protection strategy with the planned landscape restoration treatments.

4. MCGAFFEY RIDGE - The ecological reference condition for this area is ponderosa pine, and the current condition is moderate to low departure, making this an ideal area for restoration with natural fire management. Mid-seral closed canopy stands are overrepresented and open canopy stands are underrepresented. The first treatment will be mechanical to remove the ladder fuels and open the canopy. The area is bounded on the west side by the community of Pot Creek, which has completed some defensible space treatment on private lands, and just received non-federal lands funding for another 130 acres to protect the community. This buffer to the west will make fire management possible. The area is also the lower portion of the larger Ojos Ryan project area that has been a priority for the Carson National Forest for several years. *The Coalition collaboratively decided that McGaffey Ridge is a priority for restoration, but a secondary project on a different timeframe from Pueblo Ridge and El Salto, and with funding requested from other sources or from the RGWF at a later date.*

   Benefits of the MCGAFFEY RIDGE project are:
   - Restoring a primarily ponderosa pine forest with mechanical treatments and managed fire, and managing the area with fire into the future.
   - Maintaining a mountain biking recreation area.
   - Providing opportunity for community firewood gathering after the mechanical treatment in area that is close to the Ranchos de Taos, Talpa, and Pot Creek communities.
   - Strategically, McGaffey Ridge is perfectly positioned as the southwestern anchor point for the entire Taos Valley Watershed Coalition landscape restoration strategy.

Taken together, these four priority areas comprise the foundation of the Taos Valley Watershed Coalition landscape restoration strategy. Starting in the southwest corner, the restored McGaffey Ridge area will serve as the anchor for restoration in the direction of prevailing winds, and offering protection to the community of Pot Creek. Heading north, and across the predominantly wet-mixed conifer and spruce-fir watersheds of Pot Creek and Rio Chiquito, is the Rio Fernando, where slopes are again moderate and pine is more dominant. The Pueblo Ridge priority will tie together existing smaller treatments around the Taos Canyon communities, La Jara project area, and the Encebado Fire scar. The Pueblo Ridge priority will provide water source protection for two critical streams, Rio Fernando and Rio Pueblo, and the water supply for most of the Valley residents. The project will create a second large restored area across the ridge that separates Carson National Forest from Taos Pueblo lands, and along a Wilderness area boundary. On the other side of Taos Pueblo is the El Salto Land Association property, the third strategically located project will restore primarily in ponderosa pine and dry-mixed conifer forests, and will take advantage of the rocky terrain to break fuel continuity and restore diversity. Fourth, at the northern extent of the landscape area is the Rio Hondo corridor, where treatments will focus on aspen patches and stringers connected to natural rocky outcrops, and help protect the river and recreational community. At its base, the Rio Hondo corridor ties into another existing Forest Service project, Kiowa-San Cristobal, with piñon-juniper, ponderosa pine, and dry-mixed conifer restoration that will protect water for communities and *acequias*.

## Conclusion

Finally, we understand that environmental conditions change over time and that the best available science will be refined and likely improved. The Coalition is committed to updating this landscape restoration strategy when significant changes render this document outdated. This adaptive process will allow the framework developed in this plan to be used in the future.

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## Appendix A

Figures 1-16, documentation of seral stages and state-and-transition models used in this whitepaper, and other maps.

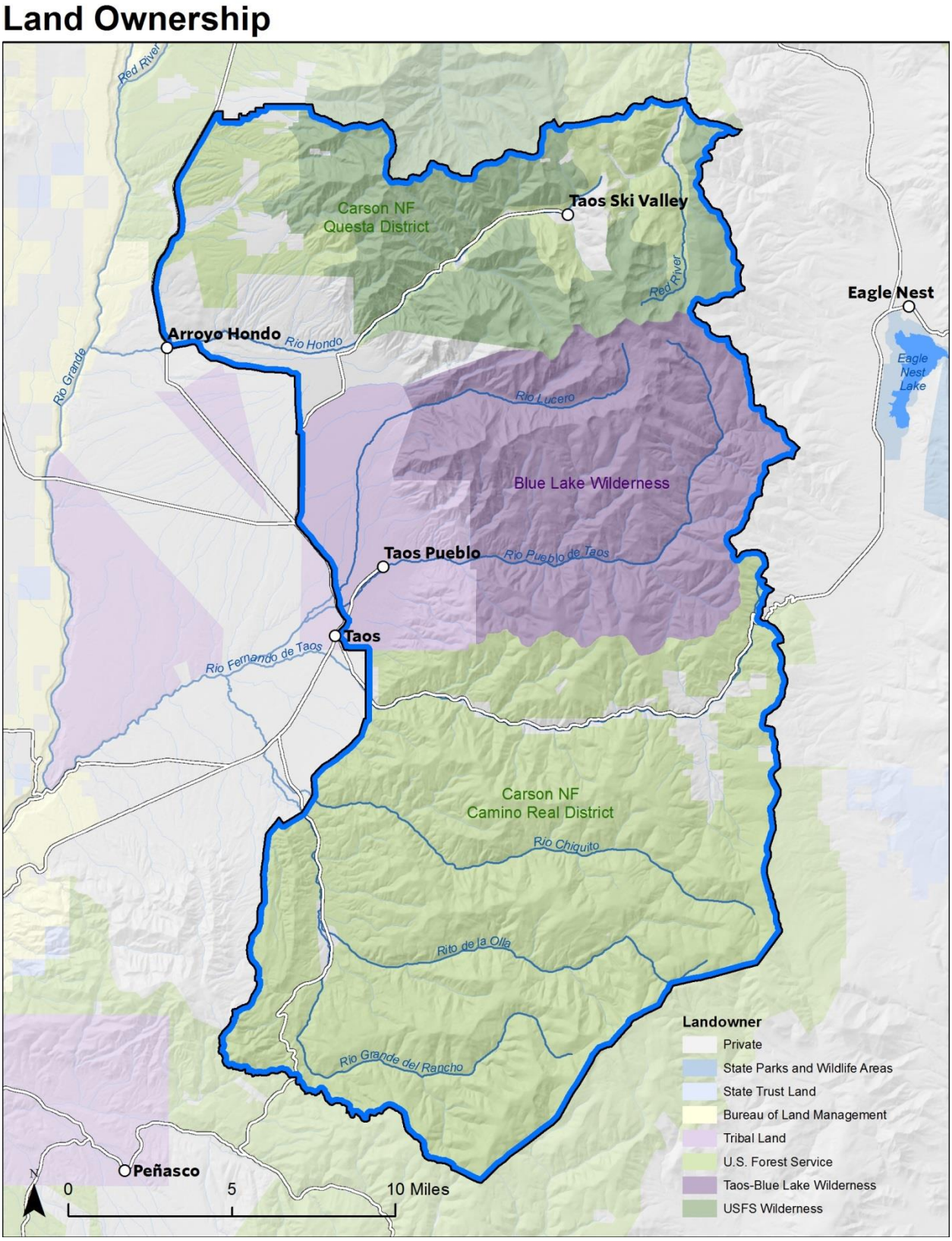



**Figure 1.** The Taos Valley Watershed Coalition is composed of many stakeholders from the Taos Valley area. Land managers, communities and forest and water users are represented.

# Recent Fires

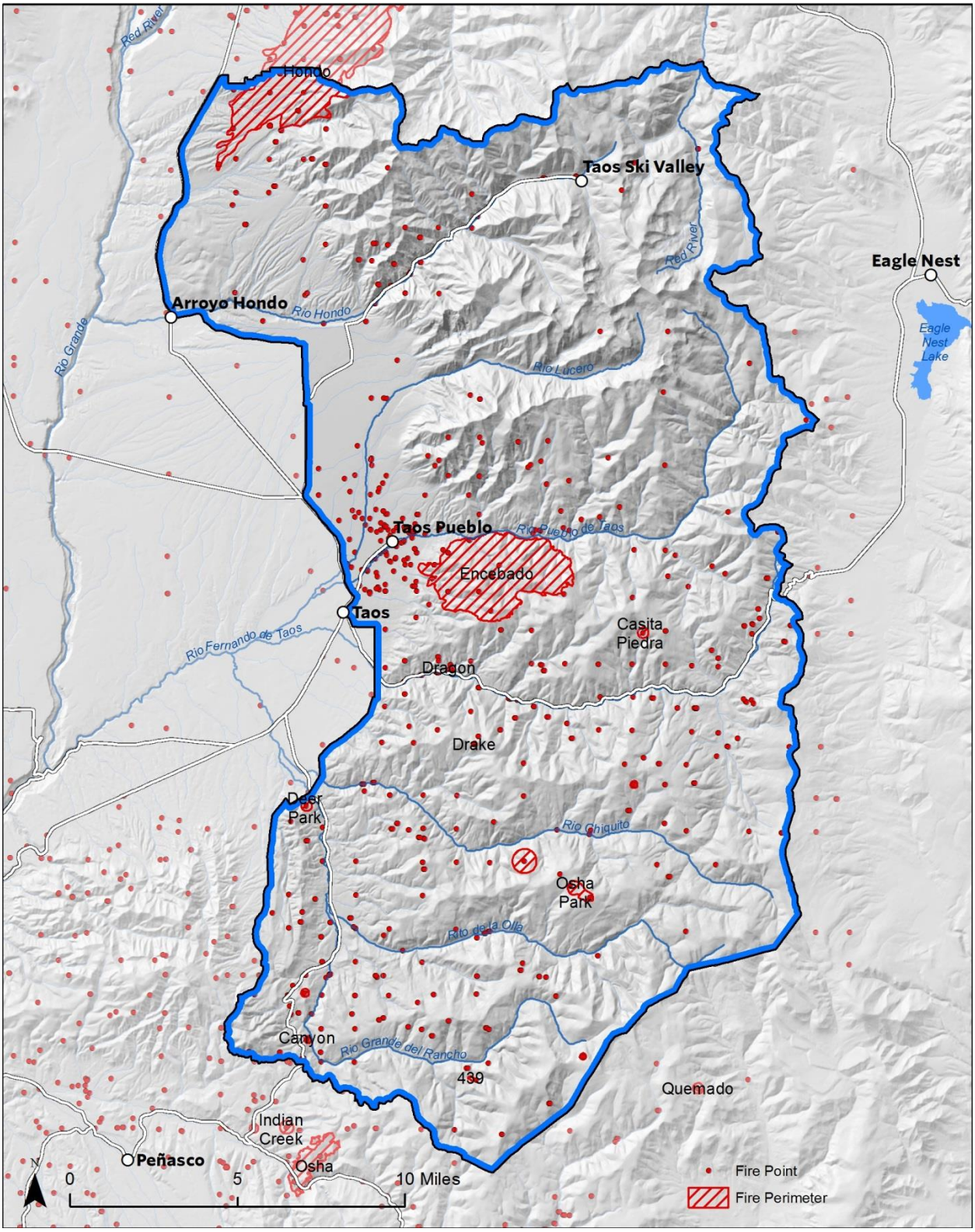



**Figure 2.** Recent fires have left visible scars on the landscape. Fires are expected to grow larger and more severe if forests are not restored to historical conditions. This map shows locations of previous fires. Large fires are shown with cross-hatch. The 2003 Encebado fire was 5,382 acres and the 1996 Hondo fire was 7,525 acres.

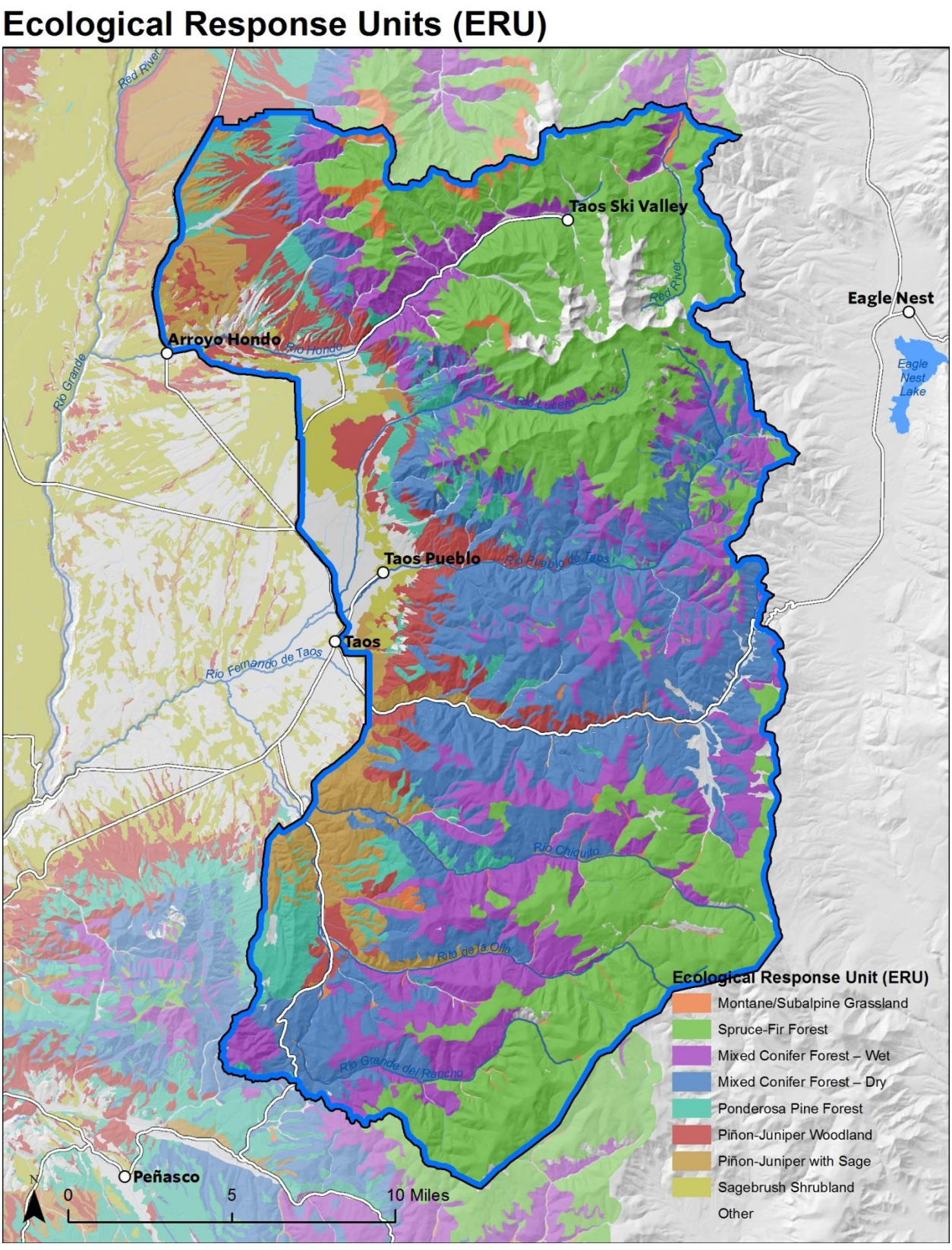



**Figure 3.** Ecological Response Units (ERUs) can be thought of as vegetation types that have the same successional states and response to disturbance. The ERUs are determined by biophysical setting which includes soil, precipitation, elevation, slope, aspect and other site characteristics.

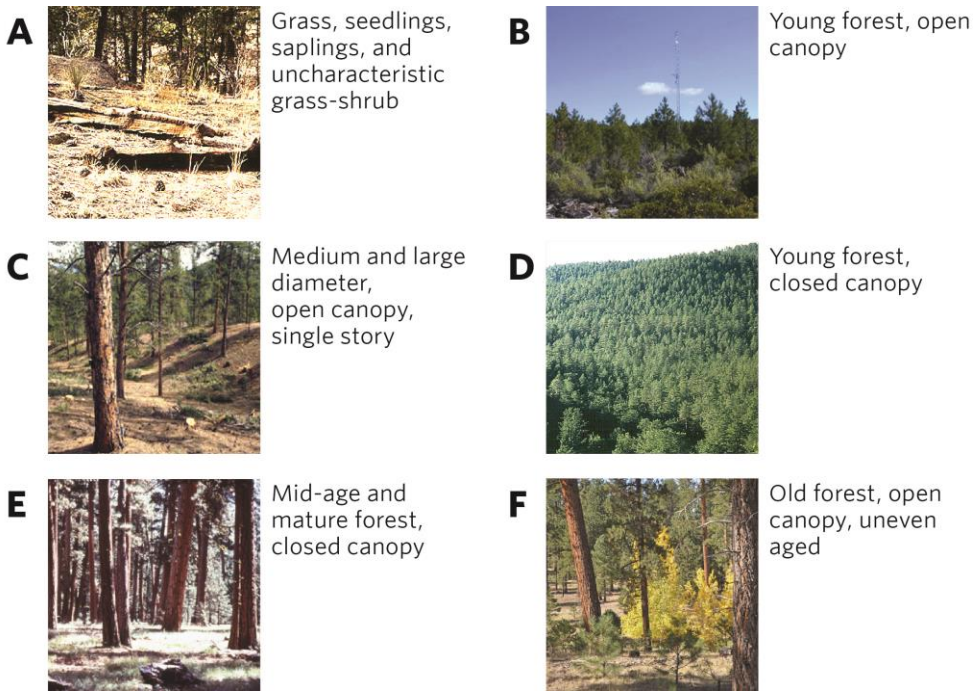



**Figure 4.** Ponderosa pine forest seral stages with example photographs. Full documentation of seral stages and transition models is available from http://nmconservation.org/downloads/data/historical_range_of_variation_for_potential_natural_vegetation_types/. The succession of seral stages will vary with each vegetation type. Images from USDA/DOI Landfire Program, Oak Ridge National Laboratory, and USFS Kaibab National Forest.

**Table 1.** Percent of Taos County in each ERU and Succession Class, for Reference and Current Conditions. A landscape is considered to be "out-of-whack" when there are substantial differences in the percent of the landscape in current versus reference conditions. These reference conditions were used by Carson National Forest Draft Assessment and were developed by USFS Region 3, Landfire, and The Nature Conservancy. Descriptions of each seral stage are available from http://nmconservation.org/downloads/data/historical_range_of_variation_for_potential_natural_vegetation_types/.

| | Reference | Current |
|---|---|---|
| **Spruce-Fir Forest** | | |
| A Grass/forb seedling/sapling w/ aspen, Douglas-fir, spruce, fir | 21% | 34% |
| B Young forest w/ regeneration | 33% | 64% |
| C Mature/old forest w/ regeneration | 46% | 2% |
| **Mixed Conifer Forest (Wet)** | R | C |
| A Grass/forb w/ aspen or oak ramets, 10-40% tree cover | 1% | 1% |
| B Aspen/mixed-aspen forest, >40% tree cover, dominated by aspen or oak, conifer understory | 21% | 13% |
| C Mixed conifer forest w/ regeneration, 20-60%+ tree cover | 29% | 82% |
| D Mixed conifer old forest w/ regeneration, 20-60%+ tree cover | 49% | 4% |
| E Very large-open | 0% | 1% |
| **Mixed Conifer Forest (Dry)** | R | C |
| A Early development, all structures | 20% | 1% |
| B Mid development, open | 10% | 2% |
| C Mid development, closed | 5% | 1% |
| D Uneven-aged forest, <30% cover | 60% | 16% |
| E Late development, closed | 5% | 80% |
| **Ponderosa Pine Forest** | R | C |
| A Grass seedling sapling and uncharacteristic grass-shrub | 0% | 4% |
| B Young forest, open | 0% | 5% |
| C Medium-large and very large, open, single story | 0% | 3% |
| D Young forest, closed | 0% | 11% |
| E Mid-aged and mature/old forest, closed | 0% | 76% |
| F Old forest, open, uneven aged | 100% | 2% |
| **Pinon-Juniper Woodland** | R | C |
| A Early 1 all structures | 10% | 12% |
| B Mid 1 open | 5% | 5% |
| C Late 1 open | 10% | 19% |
| D Mid 1 closed | 15% | 20% |
| E Late 1 closed | 60% | 43% |
| **Pinon-Juniper with Sage** | R | C |
| A Early 1 all structures | 10% | 29% |
| B Mid 1 open | 25% | 16% |
| C Late 1 open | 35% | 17% |
| D Mid 1 closed | 20% | 12% |
| E Late 1 closed | 10% | 26% |
| **Sagebrush Shrubland** | R | C |
| A Early development 1, all structures | 15% | 4% |
| B Late Development 1 Closed, >= 30% cover | 30% | 15% |
| C Mid and Late Development Open, 10-29.9% cover | 55% | 60% |
| D Invasive dominated, all structures | 0% | 30% |

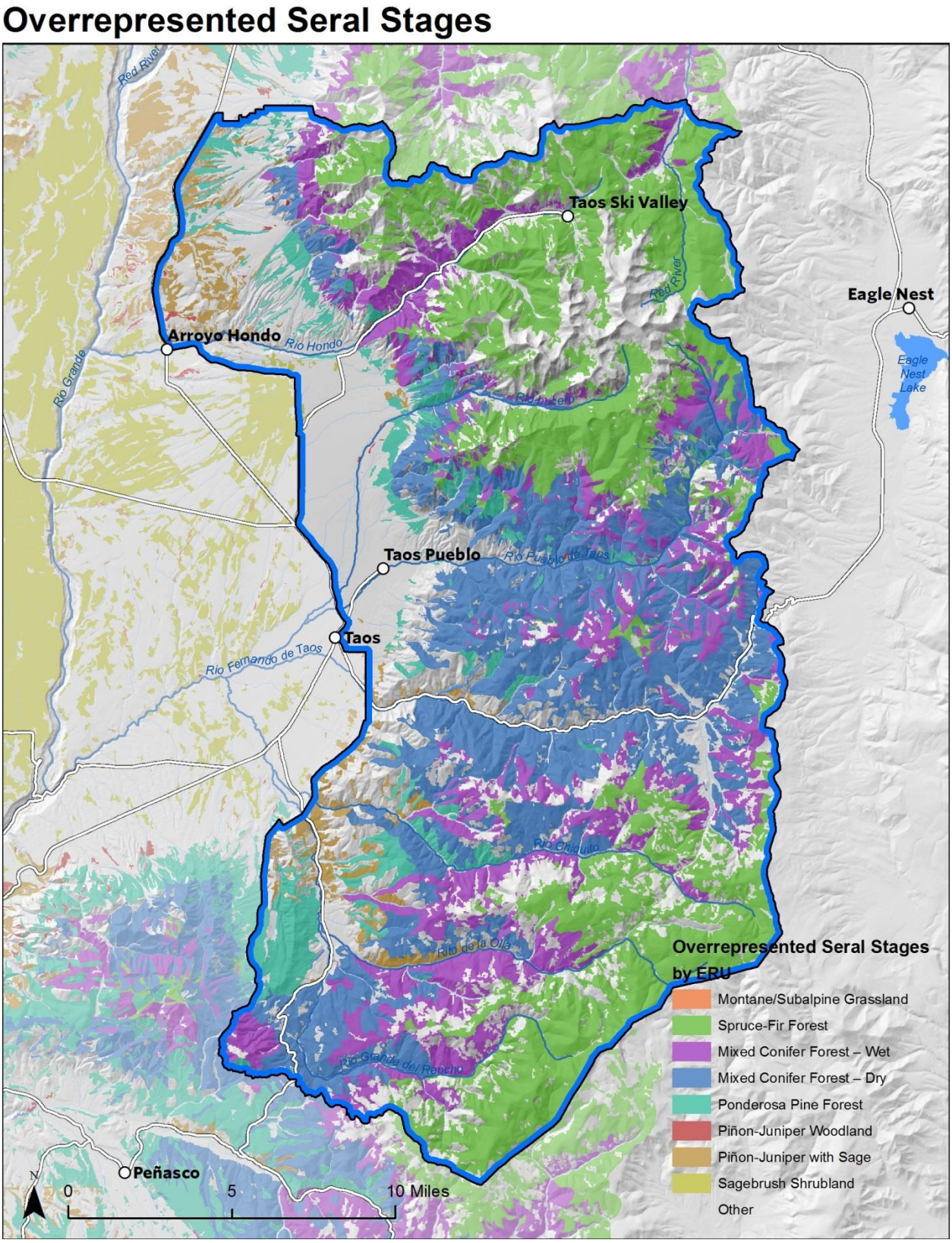



**Figure 5.** Areas with seral stages that occupy more of the landscape than they did historically. For example, the single-aged, closed canopy seral stage of ponderosa pine is overrepresented. In spruce-fir, past logging has removed the large trees, and now medium size and age trees are overrepresented.

# Disease and Insect Threat

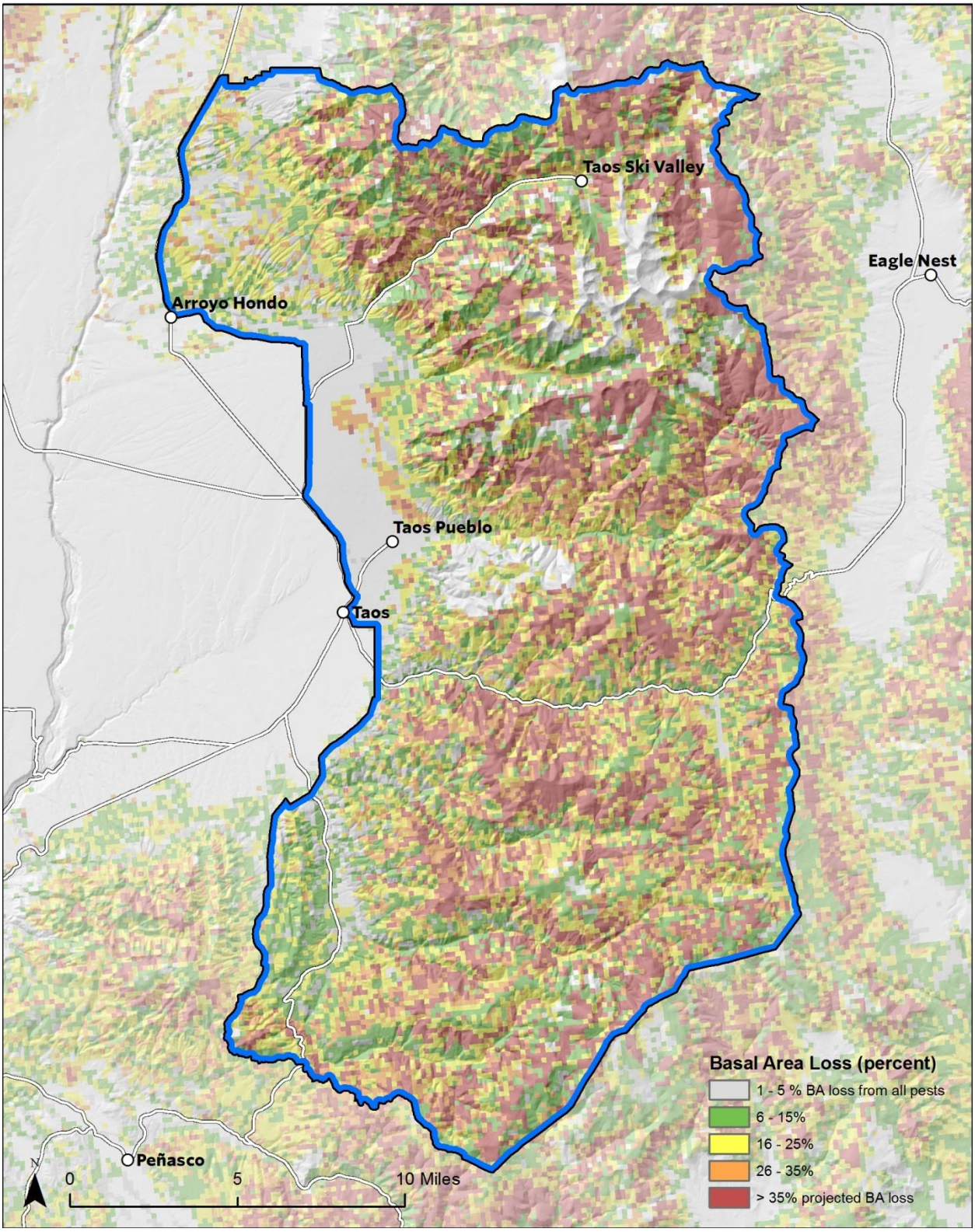



**Figure 6.** Risk of mortality caused by disease and insects between 2013 and 2027, under current conditions. Modeled by the USFS Forest Health Technology Enterprise Team. Mountain pine beetle and spruce budworm are two of the insects found in this landscape.

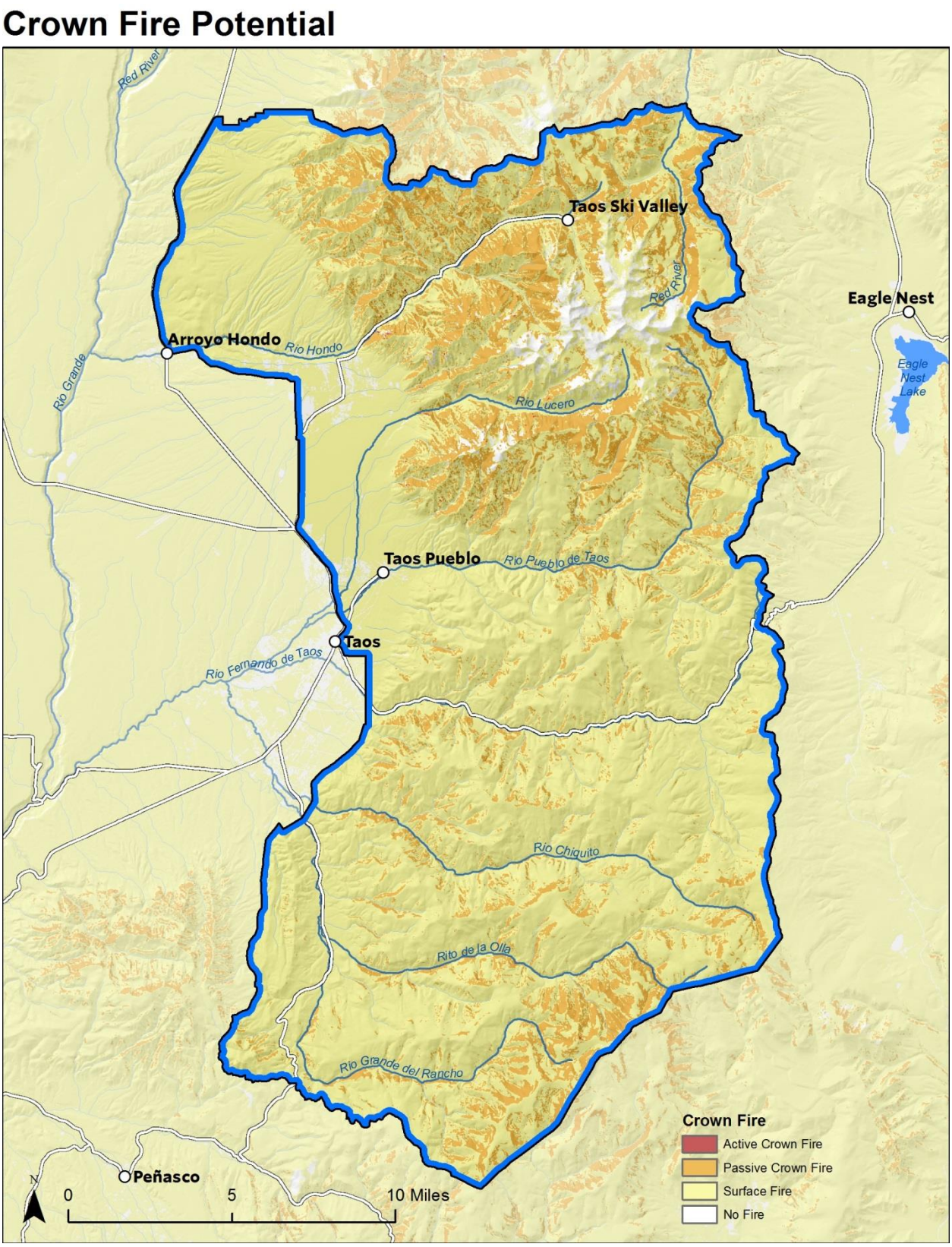



**Figure 7.** Crown fire activity was modeled with Flammap assuming dry fuels and low, uphill winds. Areas with active and passive crown fire will experience a higher burn severity than areas with only surface fire.

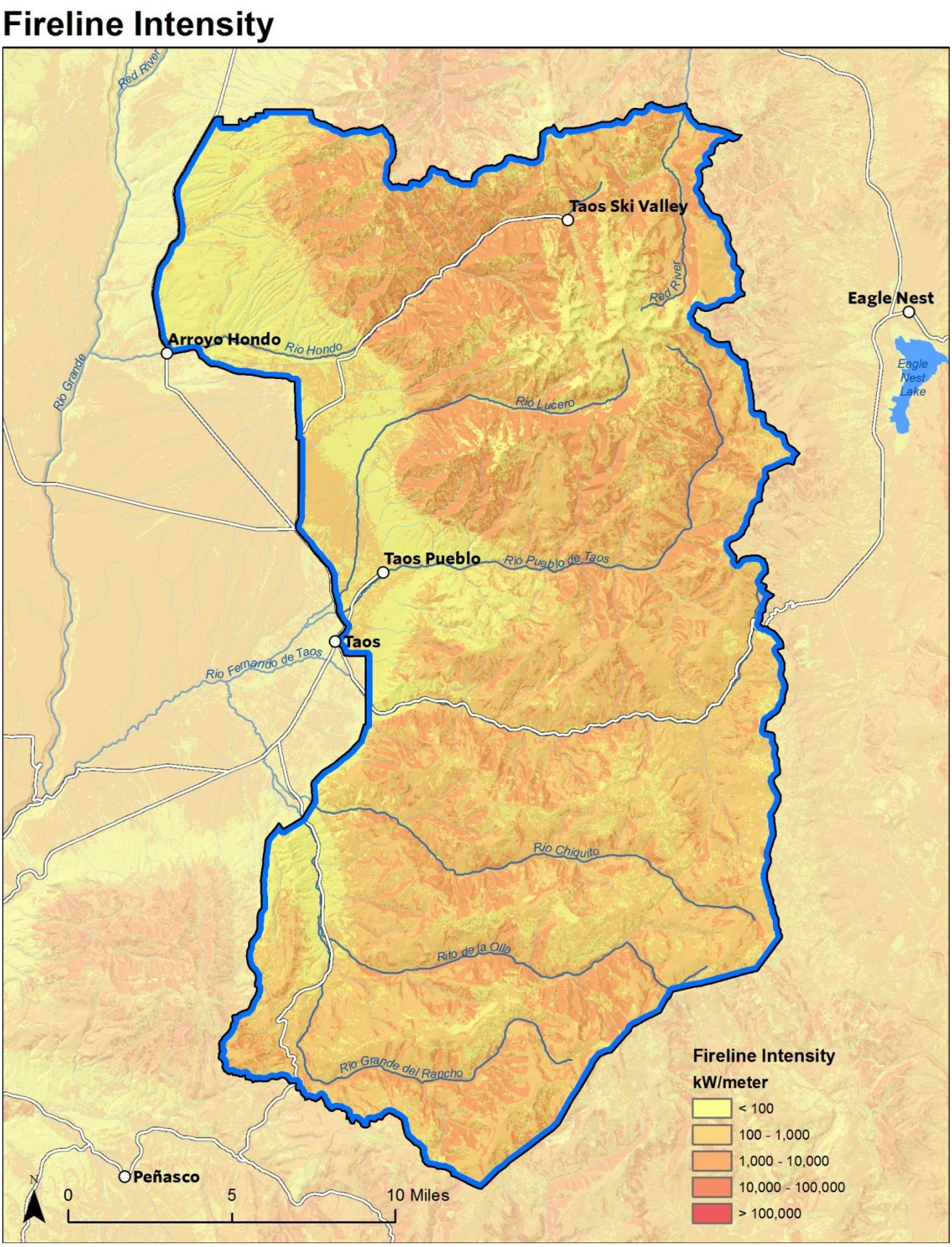



**Figure 8.** Fireline intensity is the rate of heat energy release per unit time per unit length of fire front. This model tells us where fires will be hardest to suppress given the current vegetation. The model was run with the assumptions of dry fuels and low, uphill winds.

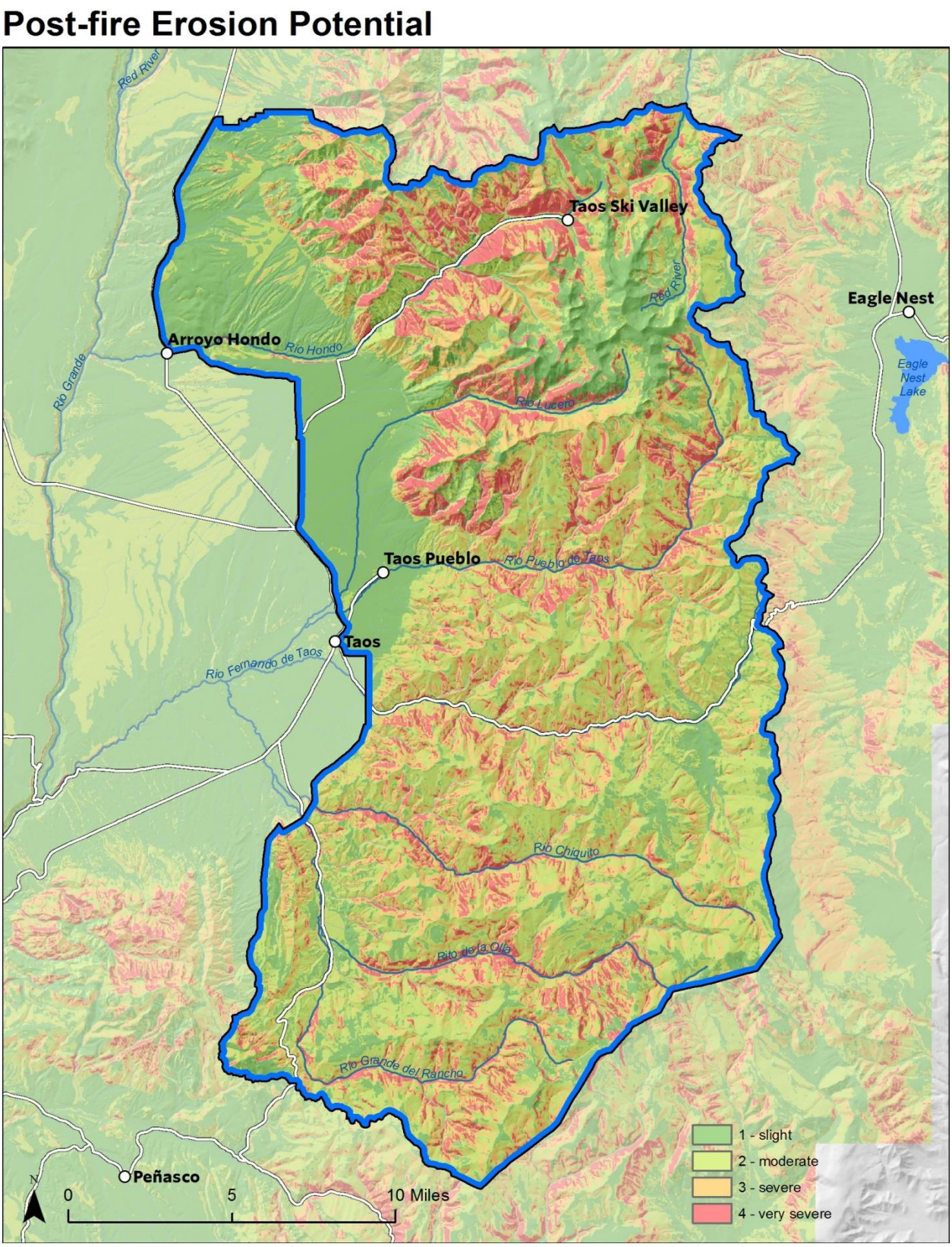



**Figure 9.** Post-fire erosion risk modeled from slope and soil erosivity during the Forest ERA process. This map shows the areas most prone to erosion after a fire.

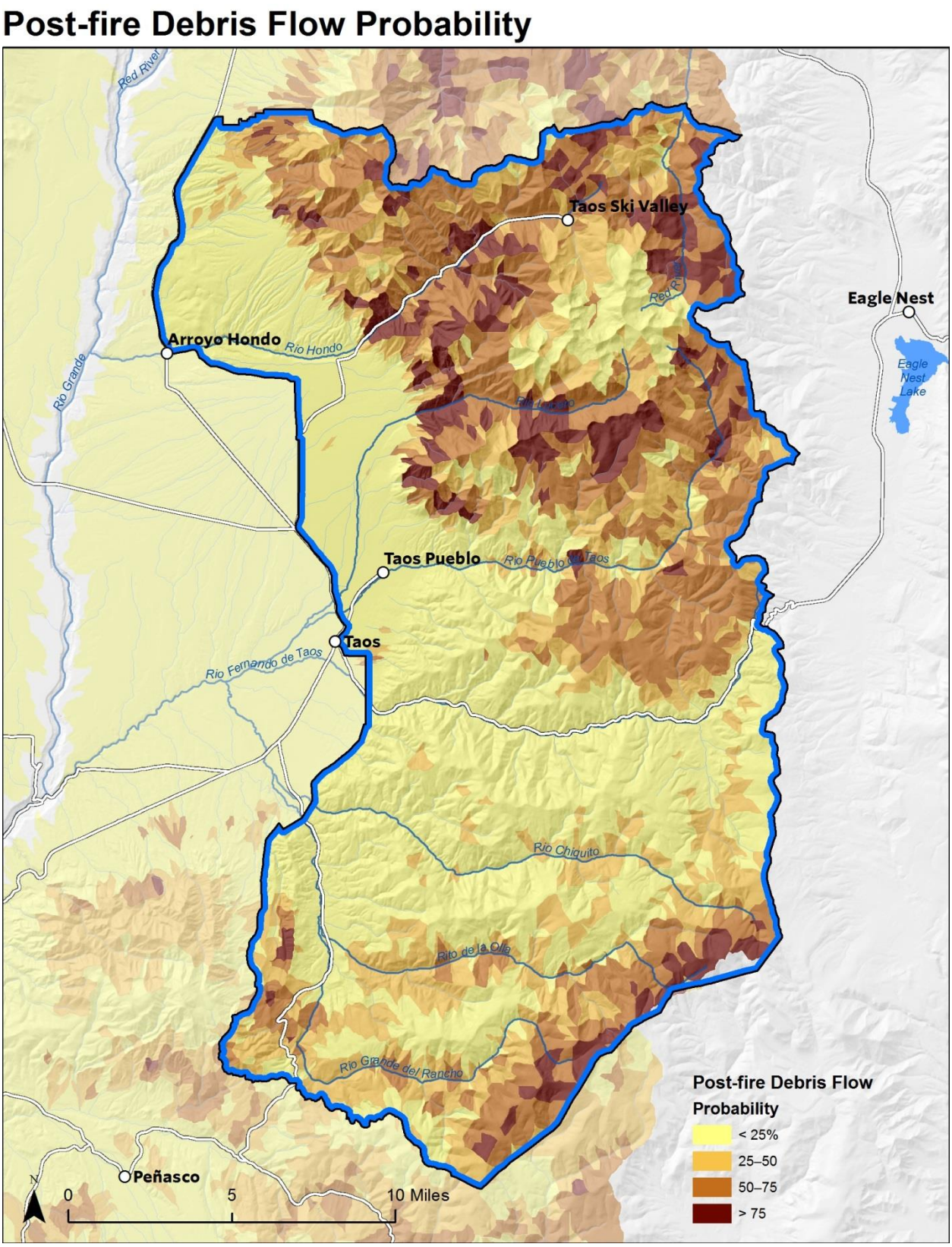



**Figure 10.** Post-fire debris flow probability estimated with a model developed by the USGS (Cannon et al. 2009) This map shows basins most likely to produce a debris flow after a fire. Post-fire debris flows can be very destructive and occur when rain falls on a severely burned area and a water-laden mass of soil, ash, rock, and other debris is produced.

# Water Users

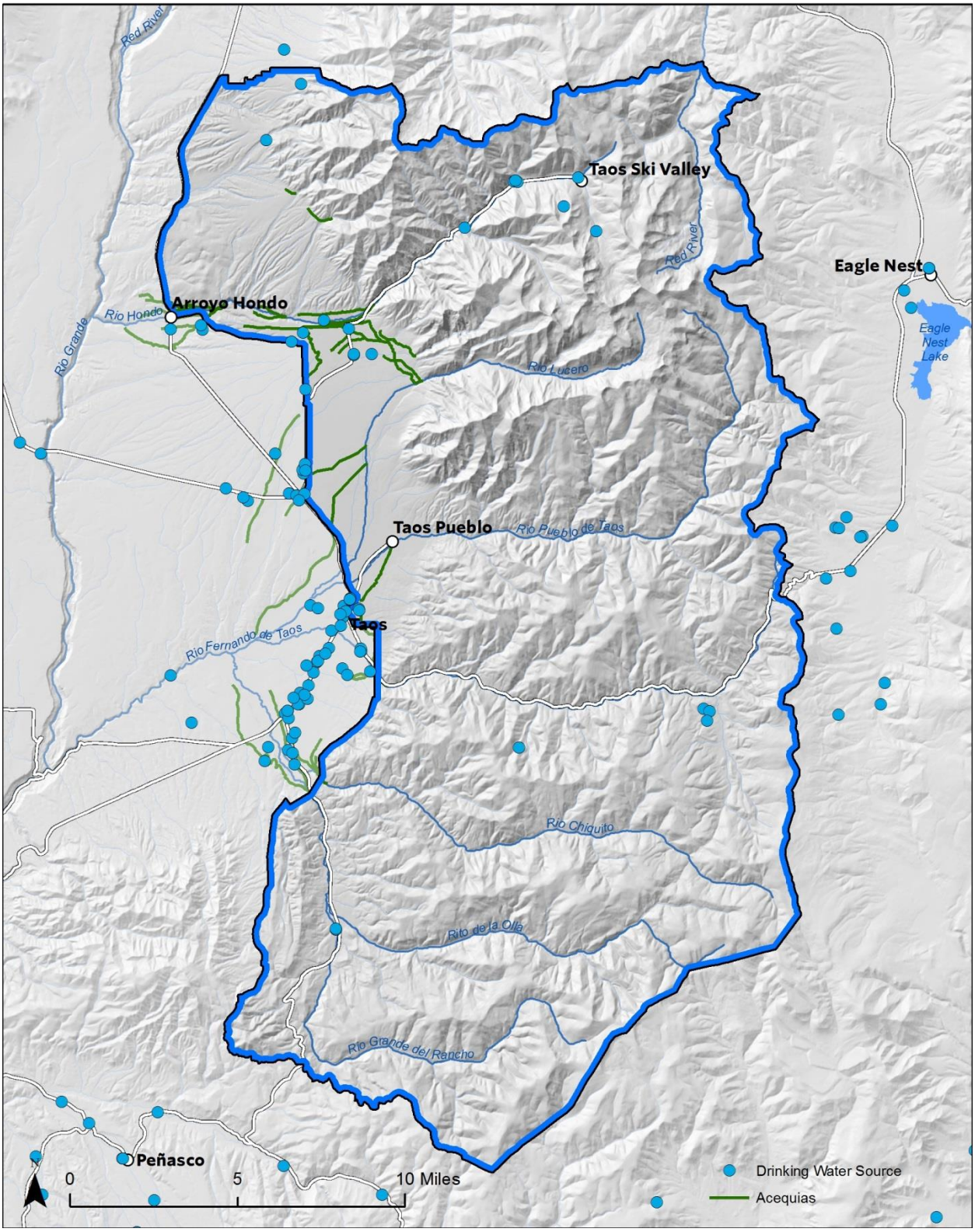



**Figure 11.** Water users in the Taos Valley area. Acequias and water sources for cities and mutual domestic associations are shown. Sources include diversions, infiltration galleries, and wells.

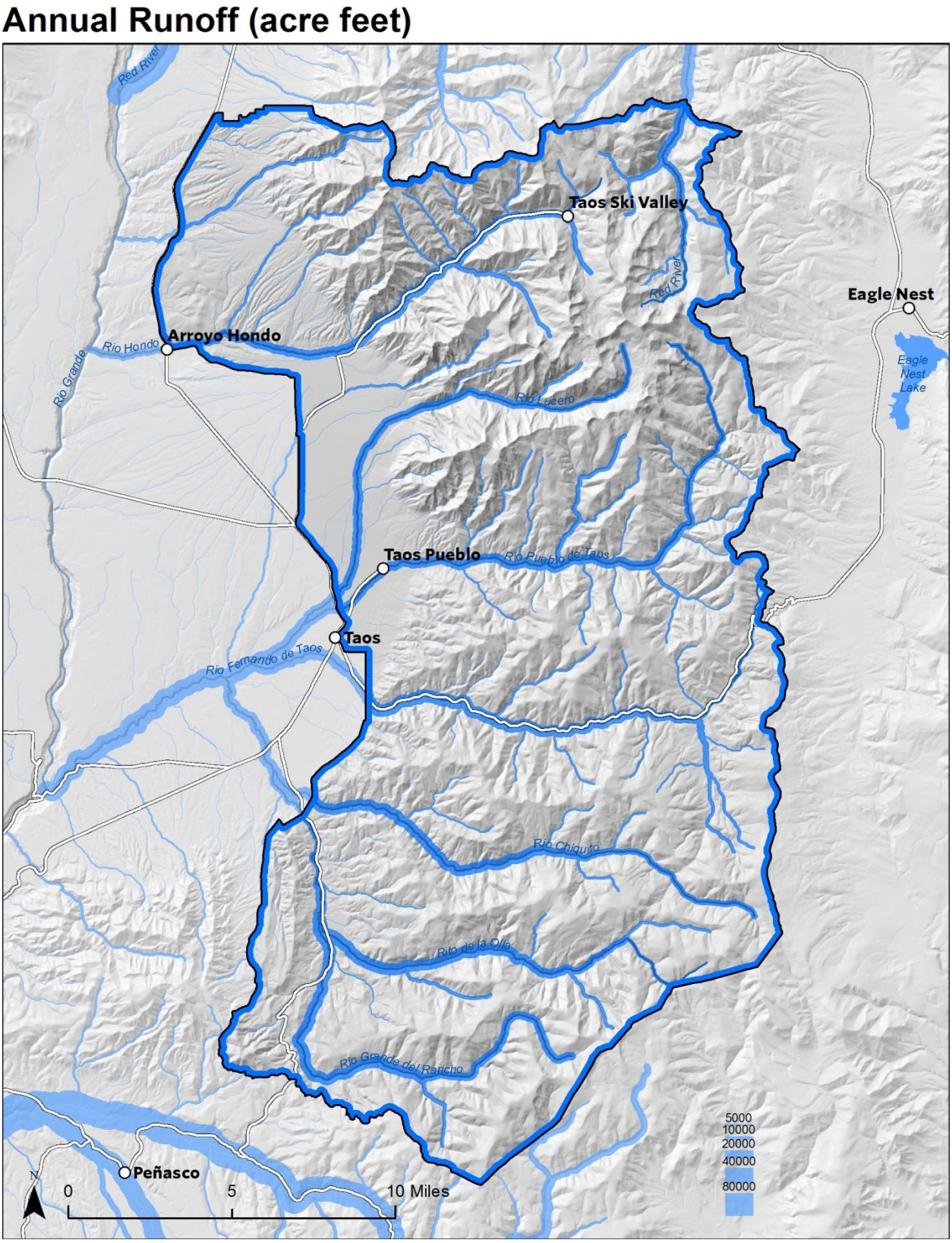



**Figure 12.** Average annual streamflow 1970–2000 modeled from flow observed at gauges using the Enhanced Runoff Model (EROM). Data from NHDplus v2. This map shows the relative surface water output from the watersheds that comprise this landscape.

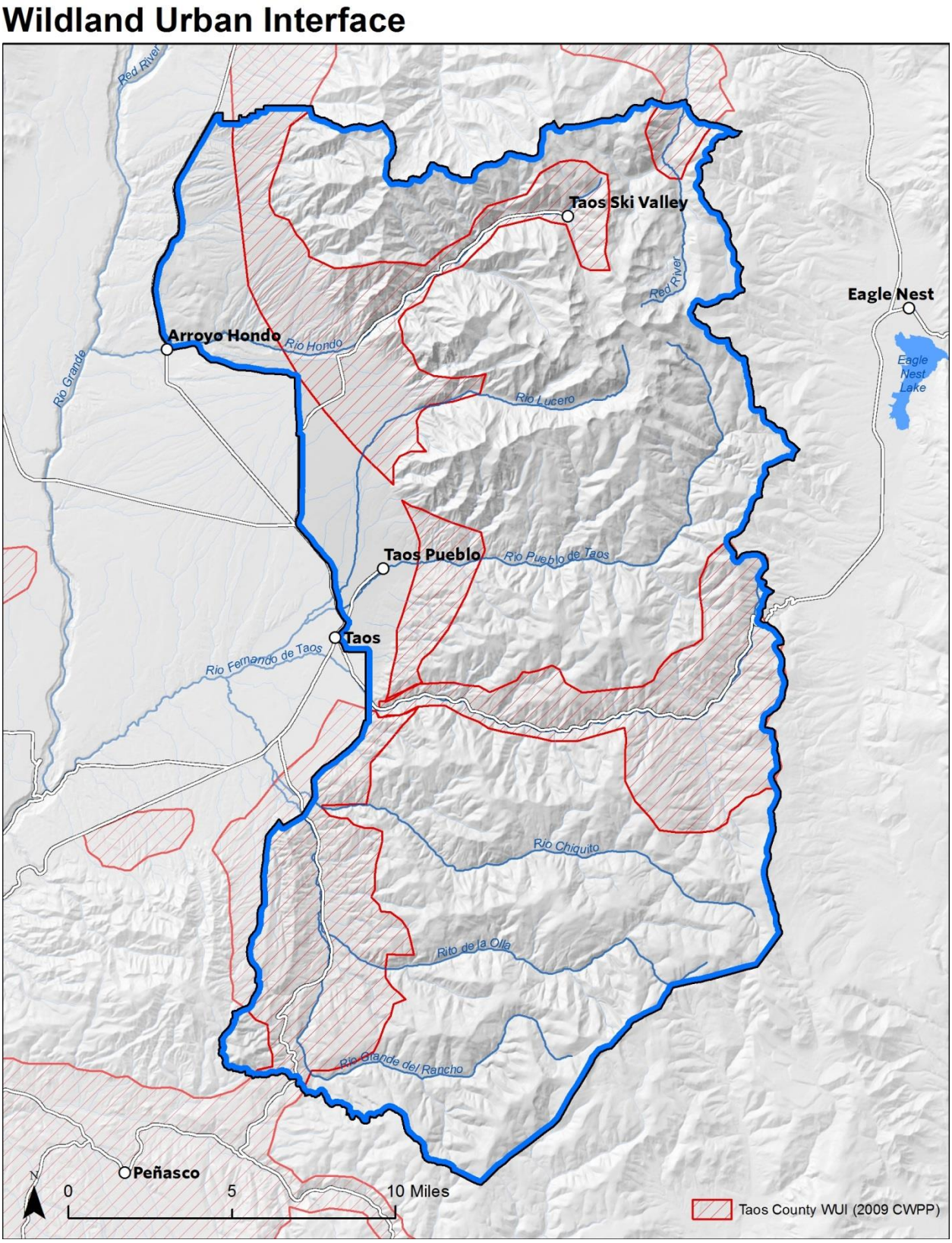



**Figure 13.** Homes in the forest—developed and wildland urban interface (WUI) areas. WUI delineated by experts during development of the 2009 Taos County Community Wildfire Protection Plan (CWPP). This plan will be update in 2015-2016.

# Wildlife Habitat

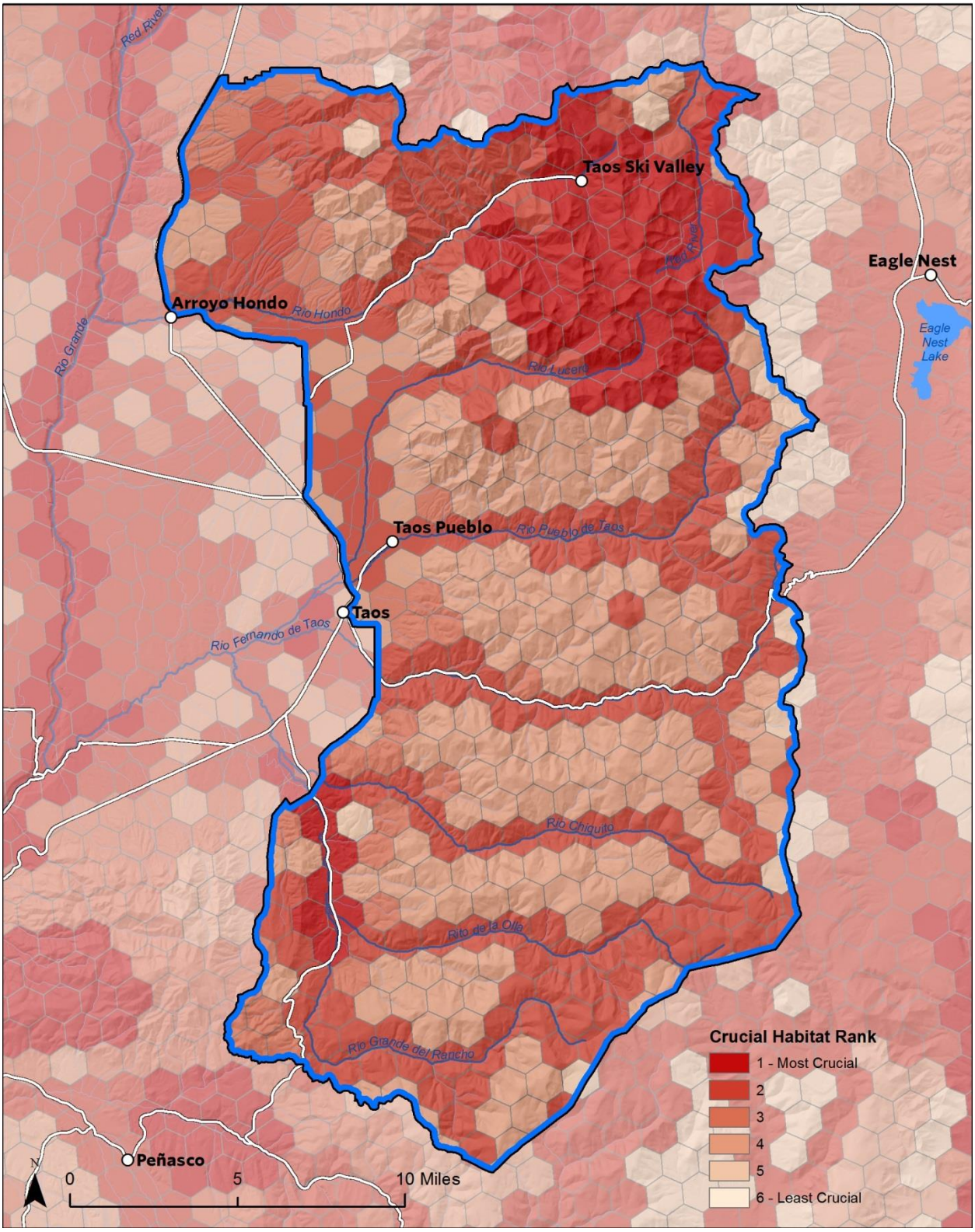



**Figure 14.** Crucial habitat rank from the New Mexico Crucial Habitat Assessment Tool (NMCHAT) http://nmchat.org/. NMCHAT is a collaboration of the New Mexico Dept. of Game & Fish and Natural Heritage New Mexico, Museum of Southwestern Biology at the University of New Mexico. Habitats include both fish and wildlife.

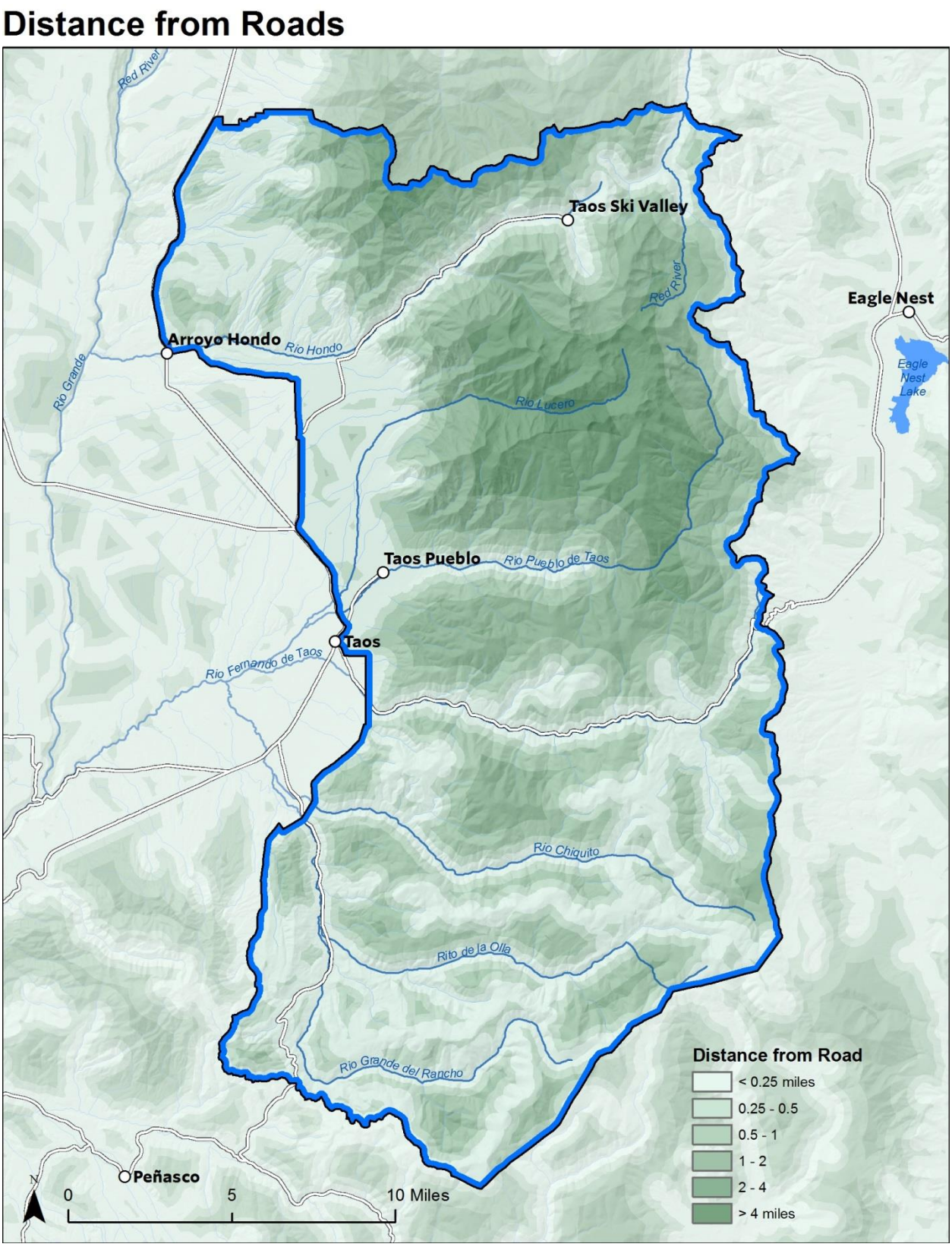



**Figure 15.** Distance from existing roads shows roadless areas and areas that are accessible for restoration treatments.

# Project Areas

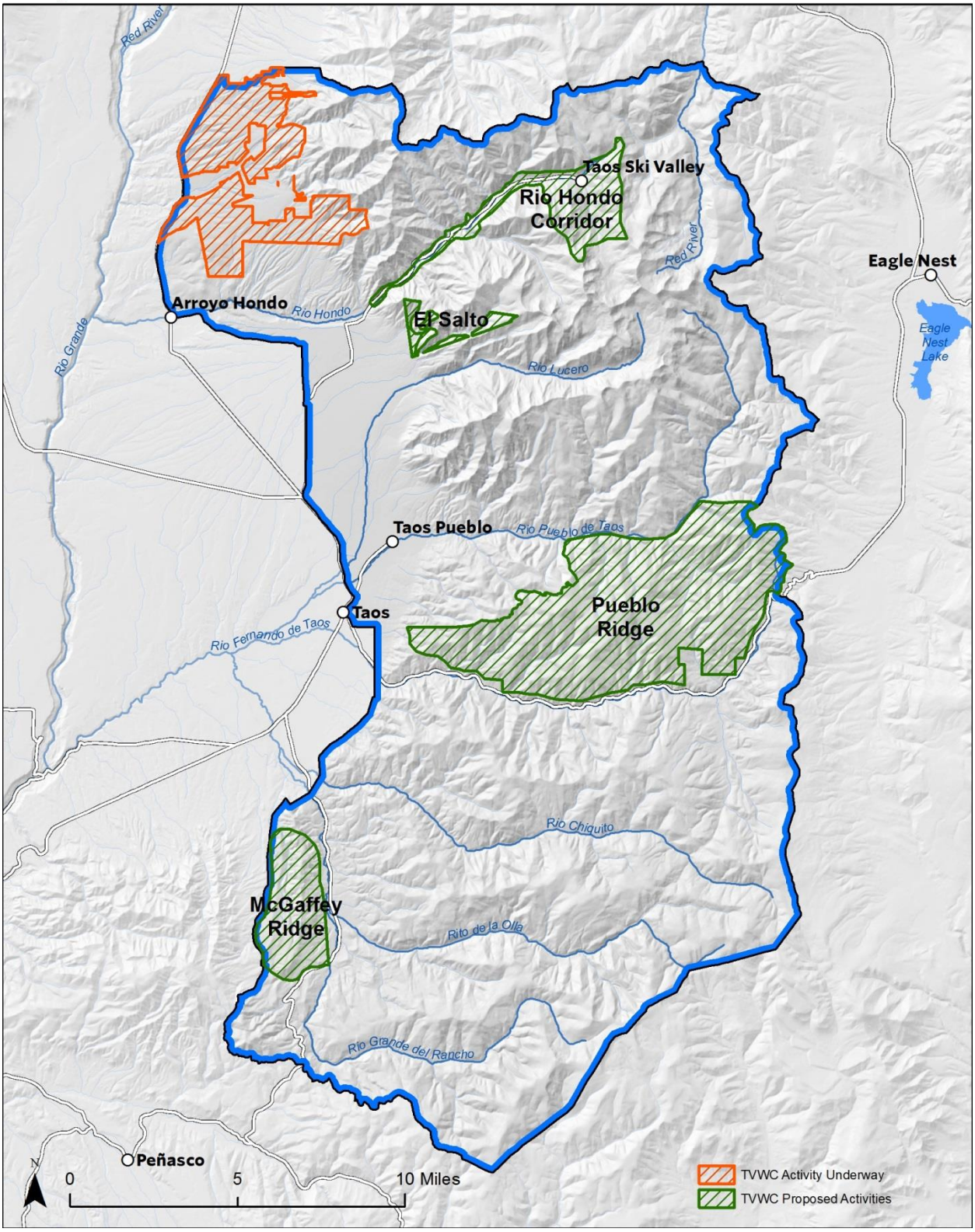
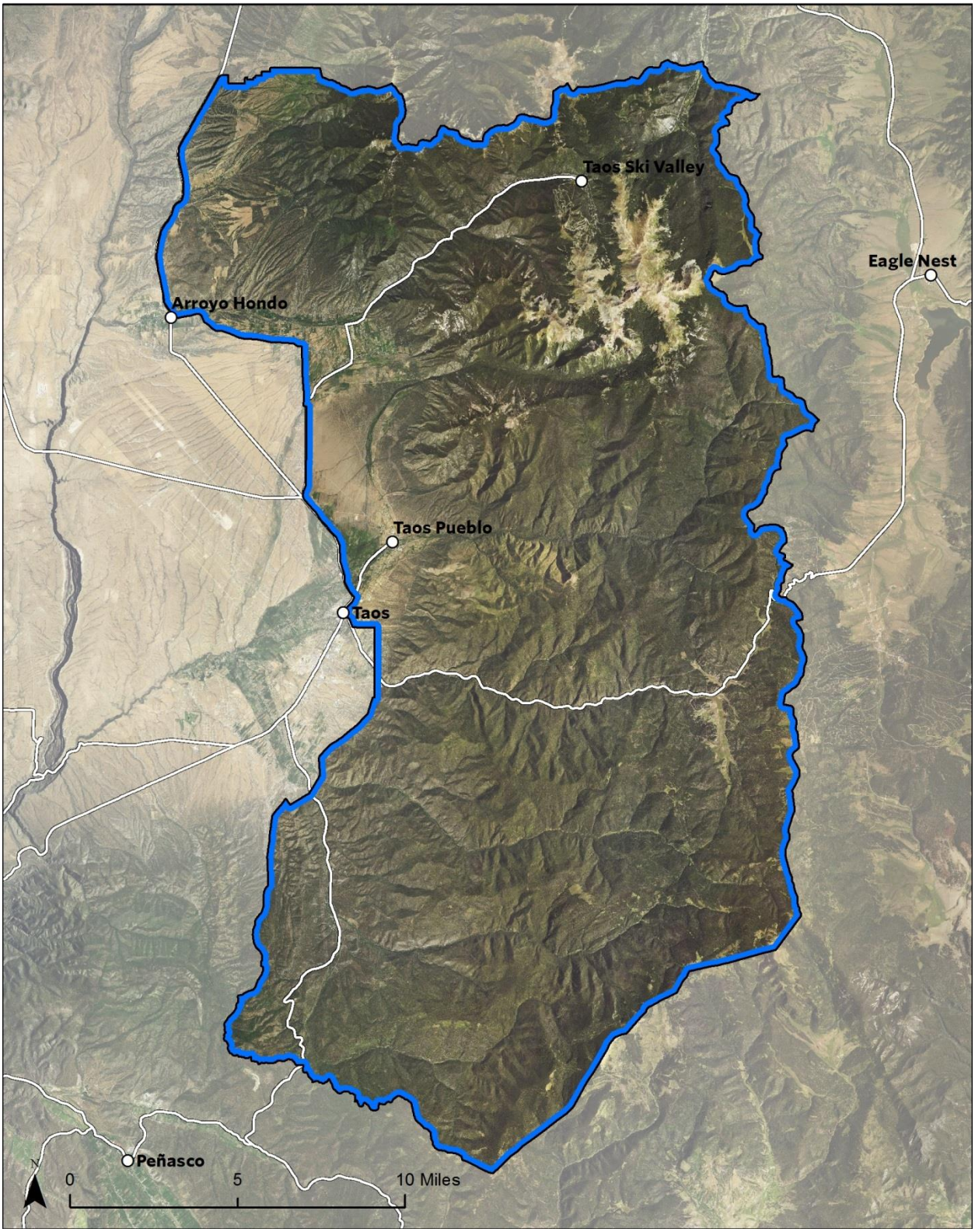
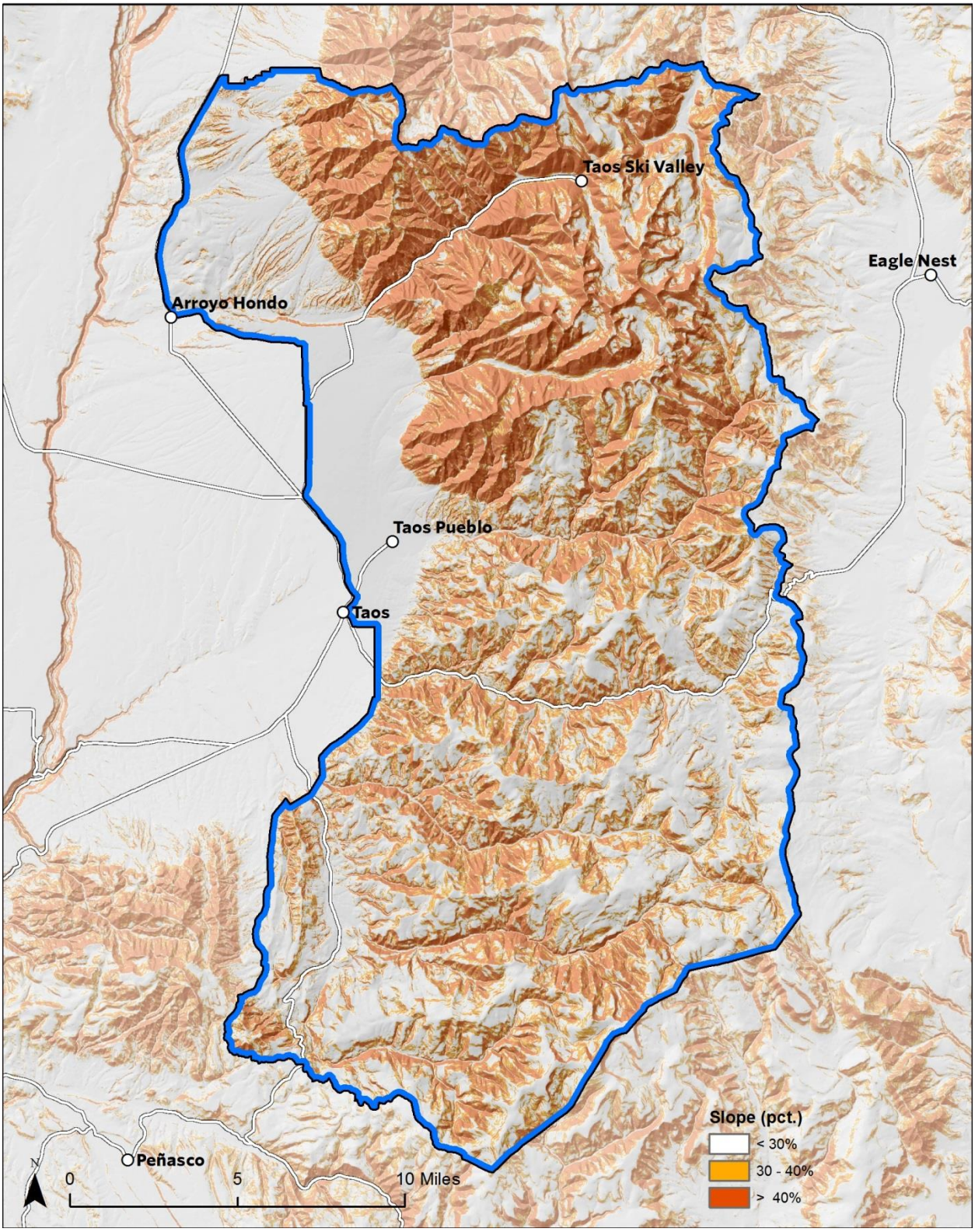



**Figure 16.** Priority project areas in the Taos Valley landscape.

# Aerial Photo 2014



# Slope




This map shows the areas most suited for thinning treatments with machinery. Slopes over 40% are difficult to restore except with managed fire.