II. PIMA COUNTY CWPP COMMUNITY ASSESSMENT AND ANALYSIS

The community risk assessment is an analysis of the potential for catastrophic wildland fire to Pima County communities. This risk analysis incorporates the current fire regime-condition class, wildfire fuel hazards, risk of ignition, local preparedness and protection capabilities, and at-risk community values. In addition, the Arizona State Forester's *Identifying Arizona's Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers* (2007), *Arizona Forest Resource Assessment* (ASFD 2010a), *Arizona Forest Resource Strategy* (ASFD 2010b) and the *National Cohesive Wildland Fire Management Strategy* (USDA and USDI 2011) were reviewed and incorporated as appropriate to ensure that the Pima County CWPP is compatible with and complementary to national and statewide CWPP planning efforts. This analysis includes all risk factors required by the Arizona State Forester for a compliant CWPP. The areas of concern for wildland fuel hazards, risk of ignition and wildfire occurrence, local preparedness, and protection capabilities and loss of community values are evaluated to determine areas of highest wildland fire risk within Pima County. The initial analysis area included all of Pima County, including tribal trust lands. The initial analysis depicted all areas within the county at risk for unwanted wildland fire. Subsequent to the initial analysis, the Core Teams identified each Pima County community WUI in accordance with the Arizona State Forester's guidance. The initial analysis area comprises 5,877,578 acres of land, of which 1,579,699 acres are designated as community WUI (Table 2.1; Figures 2.1a–2.1c).

Table 2.1. Land Management within the Pima County Community WUIs

Ownership Type	WUI Acres	% of WUI Acres
Barry M. Goldwater Air Force Range	538	0
Buenos Aires National Wildlife Refuge (BANWR)	20,131	1
Bureau of Land Management (BLM)	94,969	6
Bureau of Reclamation (BOR)	2,992	0
Coronado National Forest (CNF)	75,129	5
Davis Monthan Air Force Base	10,728	1
Arizona Game and Fish Department	1,556	0
Military Reservation	40	0
Organ Pipe Cactus National Monument	1,389	0
Other/Unclassified	22	0
Parks and Recreation	11,192	1
Pascua Yaqui Tribe	557	0
San Xavier Indian Reservation	71,227	5
Tohono O'odham Nation	24,256	2
Private Land	727,999	46
Saguaro National Park	33,302	2
State Trust Lands	503,672	32
Total	1,579,699	100

*Actual total may not add to 100 because of rounding.

The Pima County CWPP planning area primarily includes private lands (46%), state trust lands (32%), BLM (6%), and CNF (5%) lands, and SNP (2%). Tribal trust lands consisting of Pascua Yaqui, San Xavier, and Tohono O'odham lands collectively compose over 7 percent of the Pima County CWPP WUI.

Outside tribal trust lands, primary landownership in the Pima County CWPP planning area is a mosaic of privately owned lands and lands administered by the ASLD, BLM, and CNF (Figures 2.1a–2.1c). Private lands within the Pima County CWPP planning area include urban areas with associated adjacent urban development in proximity to undeveloped public and state lands (such as Oro Valley), rural communities with minimal development (such as Arivaca), and undeveloped land parcels.

Of the publicly owned lands within the analysis area, Arizona State Trust lands (state lands) compose the largest acreage—503,672 acres, or 32 percent—of land within the analysis area. State lands were established in 1912 under the terms of the Arizona Enabling Act. With statehood, Arizona was granted ownership of four sections per township. The ASLD manages state lands to produce revenue for the Arizona State Trust beneficiaries, including the state's school system. Within the Pima County CWPP area, State lands are managed primarily for recreation, natural resource protection, and livestock grazing.

There are several large county, state, and national parks within the analysis area. These include Tucson Mountain Park, Catalina State Park, and Saguaro National Park. There are a large number of popular hiking trails within these designated parks as well as within the CNF, such as the Sabino Canyon Recreation Area. Designated parks and recreation areas adjacent to the major communities of the Tucson Basin can increase potential wildfire fire risk due to human-caused ignitions.

Of the remaining publicly owned lands within the analysis area, CNF lands compose 75,129 acres, or approximately 5 percent, of the analysis area. CNF lands within the WUI include recreational residences such as Greater Soldier Camp and Willow Canyon, organizational recreational areas such as the Camp Lawton Boy Scout Camp and the Whispering Pines Girl Scout Camp, as well as the First Southern Baptist Church, Sycamore Canyon Academy-Rite of Passage, Camp Zion, Amphi Camp, St. Marks Presbyterian Church, Pima County Sheriff's Department, as well as communications sites, observatories, and University of Arizona research sites. These federal lands provide extensive popular hiking, hunting, and recreational areas within or adjacent to the analysis area.

Private land within the analysis area composes the largest ownership within the CWPP at 727,999 acres, or roughly 46 percent, of the analysis area. Private lands are mostly clustered near the communities, with some scattered private in-holdings located throughout the analysis area. The municipalities/unincorporated communities of Ajo, Catalina, Green Valley, Marana, Oro Valley, Sahuarita, Sells/Tohono O'odham, Summerhaven, South Tucson, Tucson, and Vail contain the majority of private land acreage within the analysis area. Commercial structures are clustered along state and federal highways and community centers, and they are assumed to remain as the principal commercial corridors within the Pima County at-risk communities.

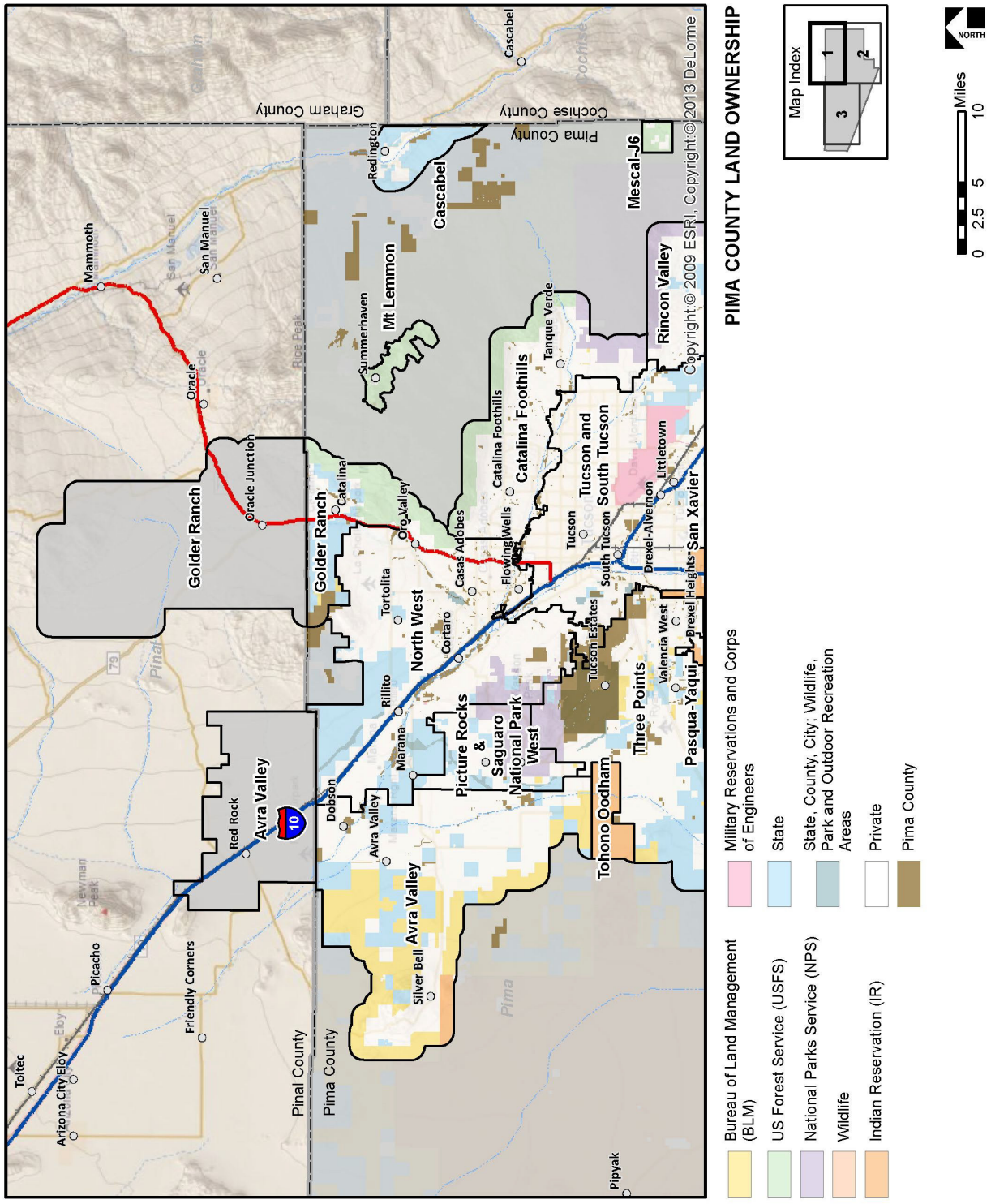

Figure 2.1a. Pima County CWPP Landownership, North

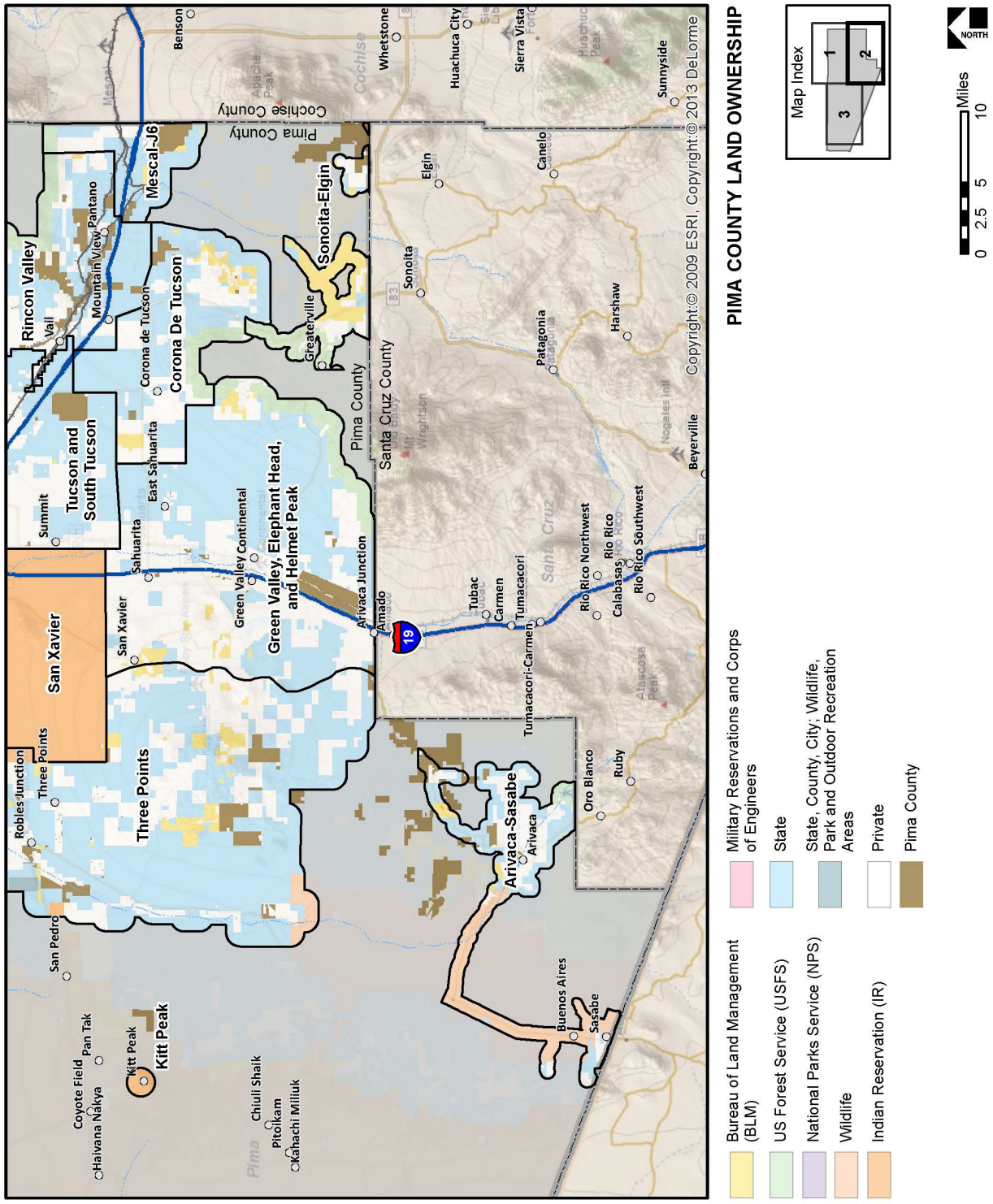

Figure 2.1b. Pima County CWPP Landownership, South

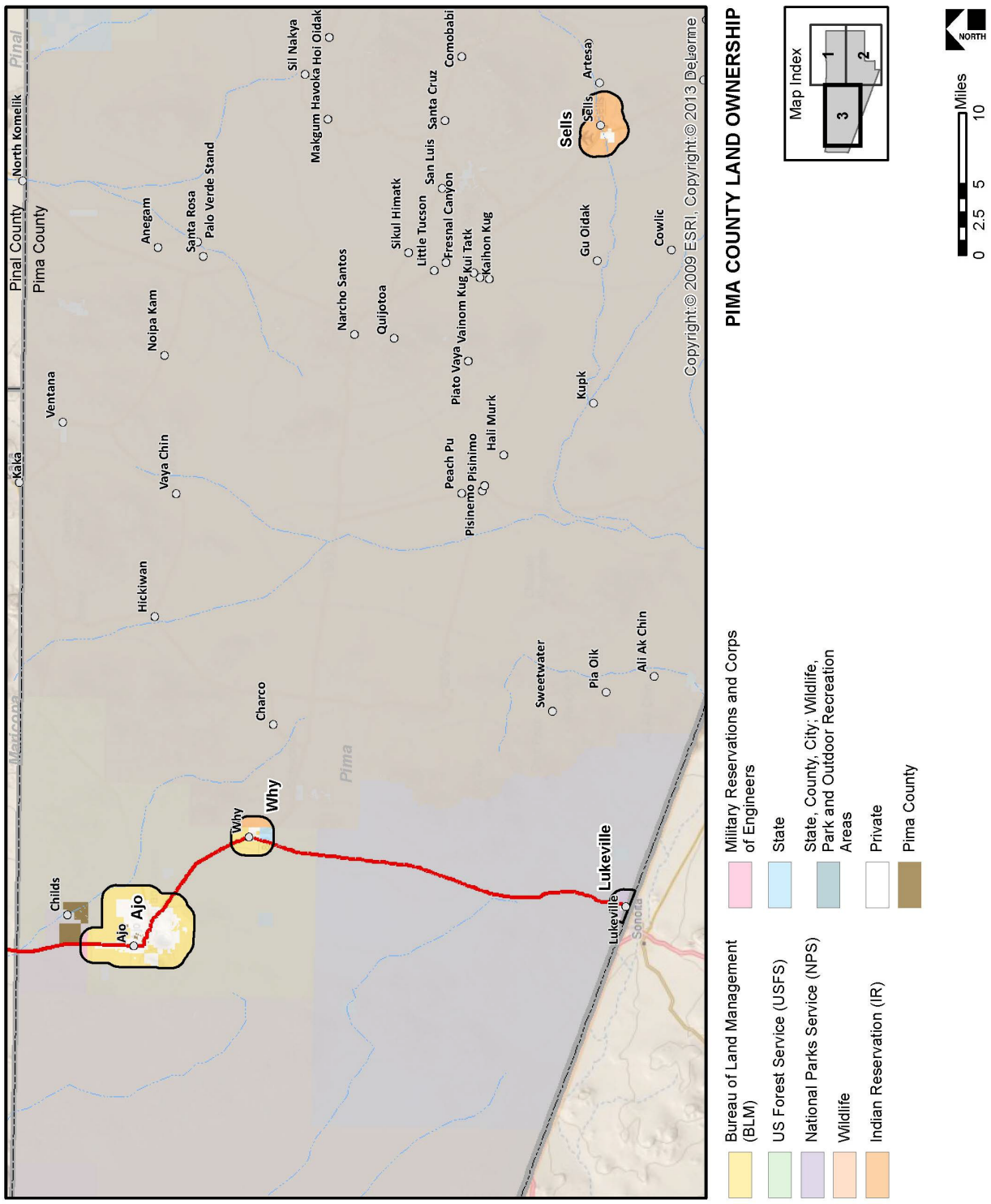

Figure 2.1c. Pima County CWPP Landownership, West

Pima County has experienced considerable growth in population and housing during past decades. The 1900 decennial census recorded 14,689 residents in Pima County. In 2010, the population center moved southwest, closer to the intersection of South Park Avenue and East Aviation Parkway. The earlier north-south pattern of expansion appears to be recurring, and future development in Pima County is expected to be oriented around I-10 and I-19 corridors. The majority of the population lives in the eastern half of the county, which contains all of the five incorporated jurisdictions, the Tohono O'odham Nation, Pascua Yaqui Tribe, San Xavier District, and a large, urbanized unincorporated area. Approximately 85 percent of the county's land is federal, state or Native American owned (http://www.pagnet.org/RegionalData/Demographics/).

The 2010 population estimate for Pima County was reported as 980,263 residents living in 442,484 housing units. This represents an approximate 48 percent increase in population over the 666,880 residents reported in the 2000 census. Growth is anticipated to continue in both urban and rural settings in Pima County (http://quickfacts.census.gov/qfd/states/04/04019.html).

Some portions of the Pima County analysis area are included within the *Statewide Strategy for Restoring Arizona's Forests* (Governor's Forest Health Councils 2007), which distinguishes nine forested landscapes. A portion of one of these identified forested landscapes, the Sky Islands, occurs in Pima County.

The Sky Islands region is located at the confluence of four major bioregions—the southern Rocky Mountains, the northern Sierra Madre Mountains, the Sonoran Desert, and the Chihuahuan Desert. The Sky Islands region of the *Statewide Strategy for Restoring Arizona's Forests* is circumscribed by the Gila Mountains to the north, the Baboquivari Mountains to the west, and the Mexican border to the south. Landscape vegetation within the Sky Islands ranges from cold, wet, spruce-fir forests above 8,000 feet to mixed conifer and ponderosa pine forest occurring at 6,500 to 8,000 feet to the Madrean encinal oak woodlands at elevations occurring from 3,600 to 6,500 feet (Governor's Forest Health Councils 2007:109). Due to high levels of topographical complexity and gradient within the portion of the Sky Islands landscape within the Pima County analysis area, fire characteristics are variable. Single fires can cross multiple vegetation associations. Unnaturally high fuel loads and drought continue to contribute to high wildland fire risk. Recommendations for "Future Restoration Needs" (Governor's Forest Health Councils 2007:115) of the Sky Islands landscape applicable to the analysis area include (1) conducting educational outreach to stakeholders that will highlight the ecological and socioeconomic benefits of ecological restoration; (2) providing incentives and assistance for restoration of privately owned forests (or lands within the Pima County CWPP); (3) integrating restoration planning with long-term planning and zoning processes, which will require outreach and education to planning and zoning commissions; (4) encouraging Firewise landscaping and building in communities; and (5) encouraging the restoration-based harvesting of firewood as opposed to importing firewood from Mexico.

Wildland fire is identified as a critical issue within the *Arizona Forest Resource Assessment* (ASFD 2010a). Higher elevations of the Santa Catalina, Rincon, and Baboquivari mountains are focus landscapes for wildland fire, as derived from two primary datasets: (1) the 2004 *Arizona Wildland Urban Interface Assessment* report and (2) communities identified as at-risk by the Arizona State Forester. The analysis includes all risk components and is constructed to be compatible with all influencing factors identified in the *Arizona Forest Resource Assessment* (ASFD 2010a).

The climate of Pima County is varied—ranging from semiarid desert shrub-scrub vegetative associations with relatively low precipitation, low humidity, and high summer temperatures to vegetative communities associated with the oak, pinyon-juniper, ponderosa pine, and mixed conifer woodlands with mild summers and cool winters. Precipitation averages 12 inches per year in Tucson but is variable throughout the county and occurs primarily during two rainy periods—summer rainfall, which usually occurs in local torrential convection showers, and winter rainfall, which is usually slow and can occur over several days. The average maximum annual air temperature ranges from a high of 99 to a low of 64 degrees Fahrenheit, while minimum annual temperatures range from 38 to 73 degrees Fahrenheit.

The majority of federally managed public lands outside tribal trust lands, national parks and monuments, and national wildlife refuges in Pima County are administered by the BLM and locally managed through the BLM, Gila District, Tucson Field Office. In accordance with the *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record* and the *Wildland Fire Suppression (Including Wildland Fire Use) and Rehabilitation in Riparian and Aquatic Habitats* (USDI BLM 2004a and USDI BLM 2004b), BLM-administered public lands are assigned to one of two land use allocations for fire management. Allocation 1 lands include areas where fire is desired and there are few or no constraints for its use. Wildland fire may be used to achieve resource objectives, such as improved watershed or wildlife habitat. Where fuel loading is high and conditions are not initially suitable for wildland fire, fuel loads may be reduced by mechanical, chemical, or biological means to acceptable levels and to meet resource objectives. Allocation 2 lands include areas where mitigation and suppression are required to prevent direct threats to life or property. It also includes areas where fire never played a large role in ecosystem management and where unplanned ignitions would have negative effects on resources. In these areas BLM will implement programs to reduce unwanted ignitions and emphasize prevention, detection, and rapid suppression. The *Gila District Fire Management Plan* (USDI BLM 2010) refers to these two land use allocations and identifies areas where wildland fires can be managed for than one fire management objective and that mechanical, biological, or chemical means may be used to maintain nonhazardous levels of fuels to reduce the hazardous effects of unplanned wildland fires and meet resource objectives. The Fire Management Plan will also identify areas for exclusion from fire (through fire suppression), chemical, mechanical, and/or biological treatments. In addition to both land use allocations, BLM will undertake education, enforcement, and administrative fire-prevention measures to reduce human-caused fire.

National forest lands are administered by the CNF and consist of two FMUs: FMU 1–FS lands, except southwestern desert scrub vegetation type, and FM2–southwestern desert scrub vegetation type (USDA FS 2005, 2010):

> **FMU 1** – Forest-wide, except within in the southwestern desert scrub (Upper Sonoran Desert) vegetation type. This FMU includes a full range of responses, from aggressive initial attack to managing natural ignitions to achieve desired Land and Resource Management Plan objectives when risk is within acceptable limits.
>
> **FMU 2** – Generally, this FMU is located at elevations less than 4,500 feet on the Santa Catalina, Santa Rita, Galiuro and Tumacacori Ecosystem Management Areas (EMAs). In this FMU, resource protection is the only objective, as it contains non-fire adapted vegetation. The vegetation type on

the Coronado this applies to is the Southwestern Desert scrub, which contains the following species: saguaro (*Carnegiea gigantea*), palo verde (*Cercidium* spp.), creosote bush (*Larrea tridentata*), ocotillo (*Fouquieria splendens*), and brittle bush (*Encelia* spp.). Due to the limitations of accurate mapping, on-scene resources will need to identify the vegetation type at both the point of ignition and in the direction of likely spread, prior to making resource objective decisions

NPS suppresses all fires in desert vegetation types because they are not adapted to fire, and fires cause unacceptable resource damage. Saguaro National Park fire management goals include giving primary consideration to firefighter, employee, and public safety; managing fire to minimize threats of unacceptable effects of fire to property outside the park and sensitive cultural and natural resources; and restoring and maintaining fire-adapted ecosystems through the ecologically appropriate use of fire. In the WUI, Saguaro National Park can use herbicides and manually remove invasive plant species (especially buffelgrass) to protect park resources and private property.

Organ Pipe Cactus National Monument fire management goals involve protecting human life and property and employing strategies to suppress all wildland fires within monument boundaries that minimize costs and resource damage consistent with values at risk. The monument is currently undergoing a planning effort to potentially broaden and increase fuel treatment possibilities.

A. Fire Regime and Condition Class

Before European settlement of North America, fire played a natural (historical) role in the landscape. Five historical fire regimes have been identified based on the average number of years between fires (fire frequency) combined with the severity (amount of overstory replacement) of fire on the dominant overstory vegetation (Table 2.2).

Table 2.2. Fire Regime Information

	Frequency	Severity[a]
Regime I	0–35 years	Low
Regime II	0–35 years	High
Regime III	35–100 years	Low
Regime IV	35–100 years	High
Regime V	200+ years	High

Source: *FRCC Guidebook*, Version 3.0 (FRCC Interagency Working Group 2010:15). http://www.fire.org/niftt/released/FRCC_Guidebook_2010_final.pdf.

[a]Low = less than 75% of the dominant overstory vegetation replaced. High = greater than 75% of the dominant overstory vegetation replaced (stand replacement).

The condition class of wildland habitats describes the degree to which the current fire regime has been altered from its historical range, the risk of losing key ecosystem components, and the vegetative attribute changes from historical conditions. The following descriptions of condition classes are provided by the Arizona State Forester (2007:3):

Condition Class 1:

Fire regimes are within a historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within the historical range.

Condition Class 2:

Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range.

Condition Class 3:

Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

The Pima County analysis area covers 5,877,578 acres, including 142,917 acres of land classified as developed and low-density open space and barren landscape (<3% of analysis area acres), 32,573 acres of unclassified lands (<1% of analysis area), and 24,680 acres of agricultural land (<1% of analysis area acres). The analysis area includes 4,007,788 acres (69% of analysis area acres) of Fire Regime Condition Class (FRCC) I lands, 850,206 acres (15% of analysis area acres) of FRCC II lands, and 814,480 acres (14% of analysis area acres) of FRCC III lands, as described in *Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management* (Schmidt et al. 2002).

Because condition-class categories are based on coarse-scale data that are intended to support national-level planning, any interpolation of national data for localized conditions may not be valid (FRCC Interagency Working Group 2005a, 2005b) due to invasive perennial and annual grasses, exotic forbs, and woody-species encroachment in native habitats altering local fire regimes. Therefore, local agencies are asked to provide data for localized vegetative conditions that reflect an accurate, current FRCC (USDA FS 2000). In addition to effects of invasive grasses and perennial woody species, the Southwest has experienced widespread and intense drought in recent years (Karl et al. 2009). Record wildfires occurring in the last decade are being driven by rising temperatures and related reductions in spring snowpack and soil moisture (Westerling et al. 2006). If the Southwest becomes warmer and drier, as projected by many climate models, the wildland fire season is anticipated to increase in length and severity driven by rising spring and summer temperatures and related reductions in spring snowpack and soil moisture (Karl et al. 2009; Westerling et al. 2006). If periods of extended drought and warmer temperatures become more common in Pima County, increases in wildland fire occurrences—particularly in higher-elevation vegetation associations and severity can be anticipated. The amount of land disturbance causing the growth of flammable annuals (pigweed [*Amaranth* spp.], mustards, and thistles) and invasive grasses (such as buffelgrass [*Pennisetum ciliare*], red brome [*Bromus rubens*], and Mediterranean grass [*Schismus*

barbatus]) in the analysis area can rapidly alter the potential of a vegetation association to support unwanted wildland fire. In addition, increasing woody-species invasions, especially saltcedar (*Tamarix* spp.) within the riparian corridors, indicate that the perennial and ephemeral riparian, upland, and desert grassland habitats no longer conform to components of Condition Class 1 lands. Invasive nonnative plants have severe ecological impacts on vegetative structure (Arizona Wildlands Invasive Plant Working Group [AZ-WIPWG] 2005). Therefore, local conditions indicate that the majority of wildland habitats within the analysis area may actually fall within Condition Classes 2 and 3.

As reported in the *Statewide Strategy for Restoring Arizona's Forests* (Governor's Forest Health Councils 2007:46), the majority of the Sky Islands landscape (92%) has been classified as Condition Classes 2 and 3 in which there is a "moderate to high risk of losing key ecosystem components to fire." Within the Sky Islands landscape, fire exclusion combined with recent drought has exacerbated heavy fuel loading in some areas that in turn increases the probability of uncharacteristic wildfire.

The desired future condition of federal land within the Pima County CWPP area is to return to or maintain wildland within Condition Class 1, as described in *Fire Regime and Condition Class (FRCC) Interagency Handbook Reference Conditions* (2005a):

> Open park-like savanna grassland, or woodland, or shrub structures maintained by frequent surface or mixed severity fires . . . Surface fires typically burn through the understory removing fire-intolerant species and small-size classes and removing less than 25 percent of the upper layer, thus maintaining an open single-layer overstory of relatively large trees . . . Mosaic fires create a mosaic of different-age, postfire grassland, savannah woodlands, or open shrub patches by leaving greater than 25 percent of the upper layer (generally less than 40 hectares [100 acres]). Interval[s] can range up to 50 [years] in systems with high temporal variability.

Desired future conditions for Sonoran Desert habitats "are for an adequate cover and mix of natural plant species that have good vigor" and for riparian habitats the "Desired Future Condition are that annual weeds cover and density is controlled and ladder fuels and downed woody debris are limited or not present. Disturbances such as livestock grazing, mining and off road vehicle travel, that can potentially reduce natural vegetation cover and vigor, are managed to maintain adequate cover and mix of natural plant species" (USDI BLM. 2004a).

However, a growing body of evidence shows that climate has changed substantially since 1900, that this change is accelerating, and that even greater change is likely to occur in the next 100 years (USDA 2012) and such climate change will alter natural ecosystems and affect their ability to provide goods and services (USDA 2012). Additionally, post wildfire conditions and fire management activities can create ideal opportunities for invasions by nonnative plants undermining the benefits of fire management actions (Brooks and Lusk. 2008). While it may be possible to maintain or revert some areas to historical fire regimes during the life of this plan, land management agencies recognize that due to the effects of climate change, urbanization, increasing human use, increasing distribution and abundance of invasive plant species, and continued expansion of the wildland interface, currently described historical fire regimes and plant communities may not be achievable in the larger landscape in both fire- and non-fire-adapted vegetation associations in the future.

B. Fuel Hazards

The arrangement of vegetative fuel, relative flammability, and potential of vegetation to support wildland fire varies throughout the analysis area. Wildland fuel hazards depend on a specific composition, type, arrangement, or condition of vegetation such that if the fuel were ignited, an at-risk community or its infrastructure could be threatened. Table 2.3 identifies the vegetative associations in the analysis area that were evaluated for vegetative fuel hazards. Historically, fire played an important role in keeping woody species in check and light ground fuels low (USDI BLM 2004b:3–8; Gori and Enquist 2003). However, with the suppression of natural wildfires within the last century, fire return intervals have increased, increasing fuel loading. In addition, invasions by nonnative plant species (such as saltcedar, buffelgrass, red brome, and Mediterranean grass) have introduced fire into desert areas that were formerly nearly fire-proof and converted them into grasslands (Schmid and Rogers 1988; Stevens and Falk 2009), and saltcedar is invading riparian areas and increasing fuel load and volatility (Brooks 2008).

The vegetation associations within the analysis area were identified and mapped using Southwest Regional Gap Analysis Project (SWReGAP) data (USGS 2005; NatureServe 2004) (Figures 2.2a–2.2c). These datasets provide the level of landscape description and vegetative landcover detail necessary for aligning wildland fuel flammability with existing vegetation. The major distinguishing types for each Pima County vegetation association were field verified.

Vegetation data for the community of Summerhaven and the Mt. Lemmon WUI was derived from the Catalina Rincon FireScape program. The current vegetative landscape of the Catalina Mountains has been mapped in great detail according to several different criteria. The recent work by the FireScape program allows for much greater detail and fire behavior modeling based on current landcover, geology, topography, and land form. The Core Teams incorporated the data from ecological units, which are patches of the landscape that share similar vegetation cover (http://www.azfirescape.org/catalina/landscape_types), into the risk assessment of the Mt. Lemmon WUI. This detailed data allows for site-specific fire behavior modeling within each ecological unit. Each separate ecological unit then may show several fuel models based on these varying biophysical conditions. The data used to map FireScape products (for example, fuel models, fire behavior models) were obtained from the Catalina Rincon FireScape program and are embedded in Table 2.3 to be comparable with SWReGAP landcover data used for other community WUI landcover descriptions, fire behavior models, and vegetative fuel risk ratings.

The existing arrangement and flammability of vegetation associations largely determine wildland fire behavior. Areas at risk from wildland fire were determined by evaluating vegetative fuels on federal and nonfederal land in the analysis area through spatial analysis using geographic information system (GIS) technology in a series of overlays. For the analysis area, the vegetation type, density, and distribution were analyzed to help categorize areas at highest risk for fire intensity and spread from wildland fuels.

Vegetative data for predicting wildfire behavior was quantified by developing descriptions of associated fuel properties that are described as fuel models. The fuel model (as described by Anderson 1982; Scott and Burgan 2005) and vegetation fuel fire-risk rating within the analysis area are shown in Table 2.3.

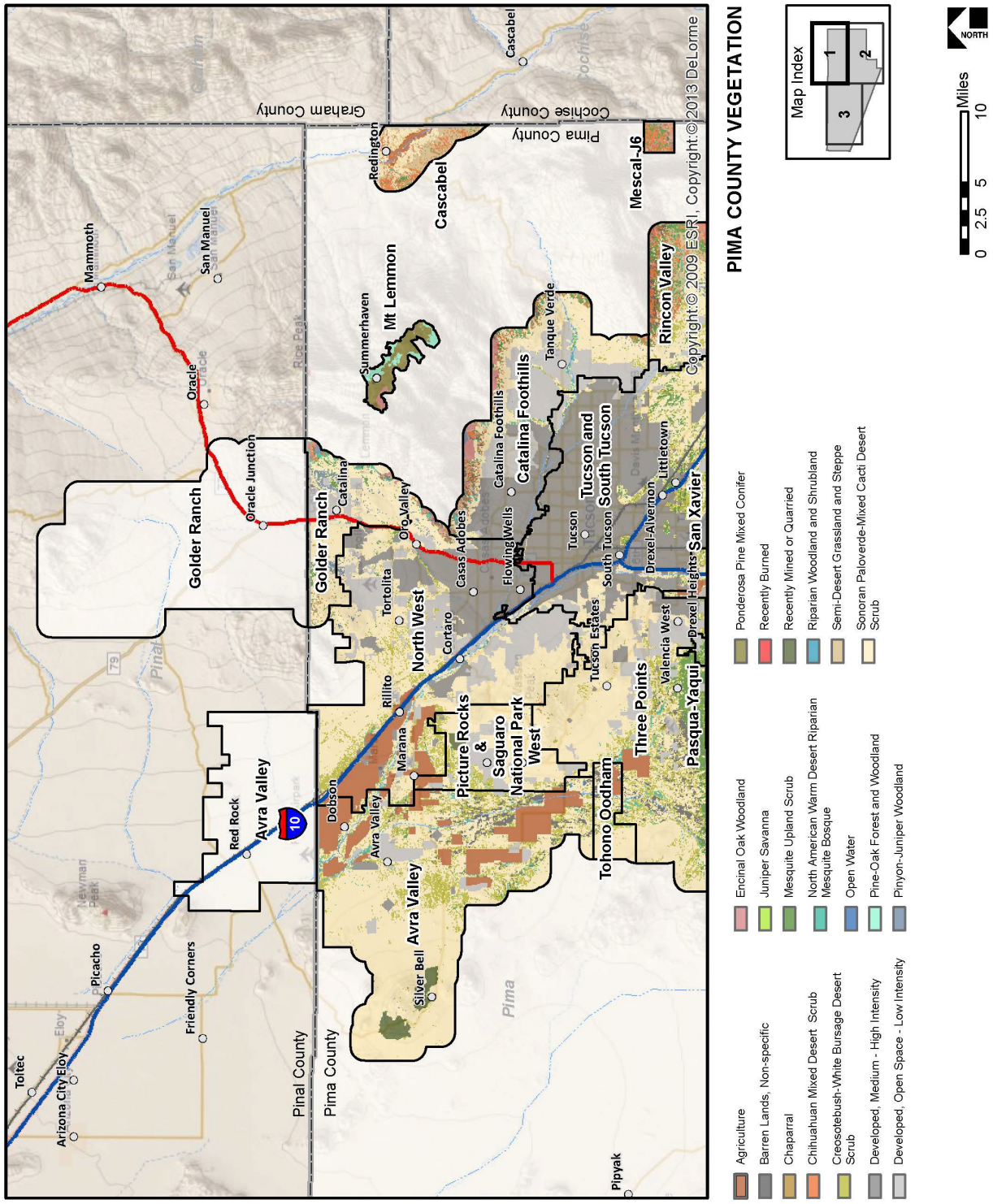

Figure 2.2a. Landcovers of the Pima County WUI, North

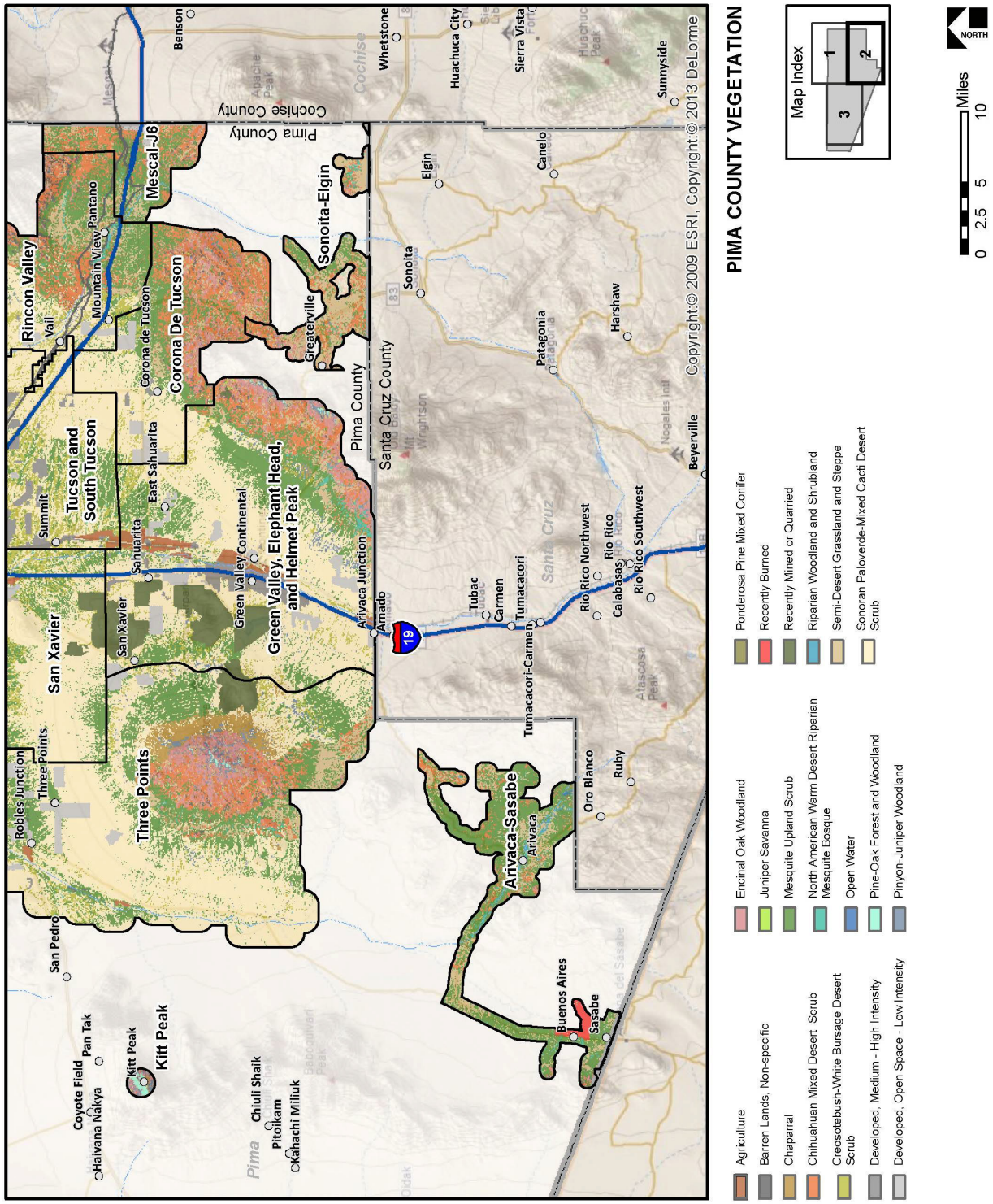

Figure 2.2b. Landcovers of the Pima County WUI, South

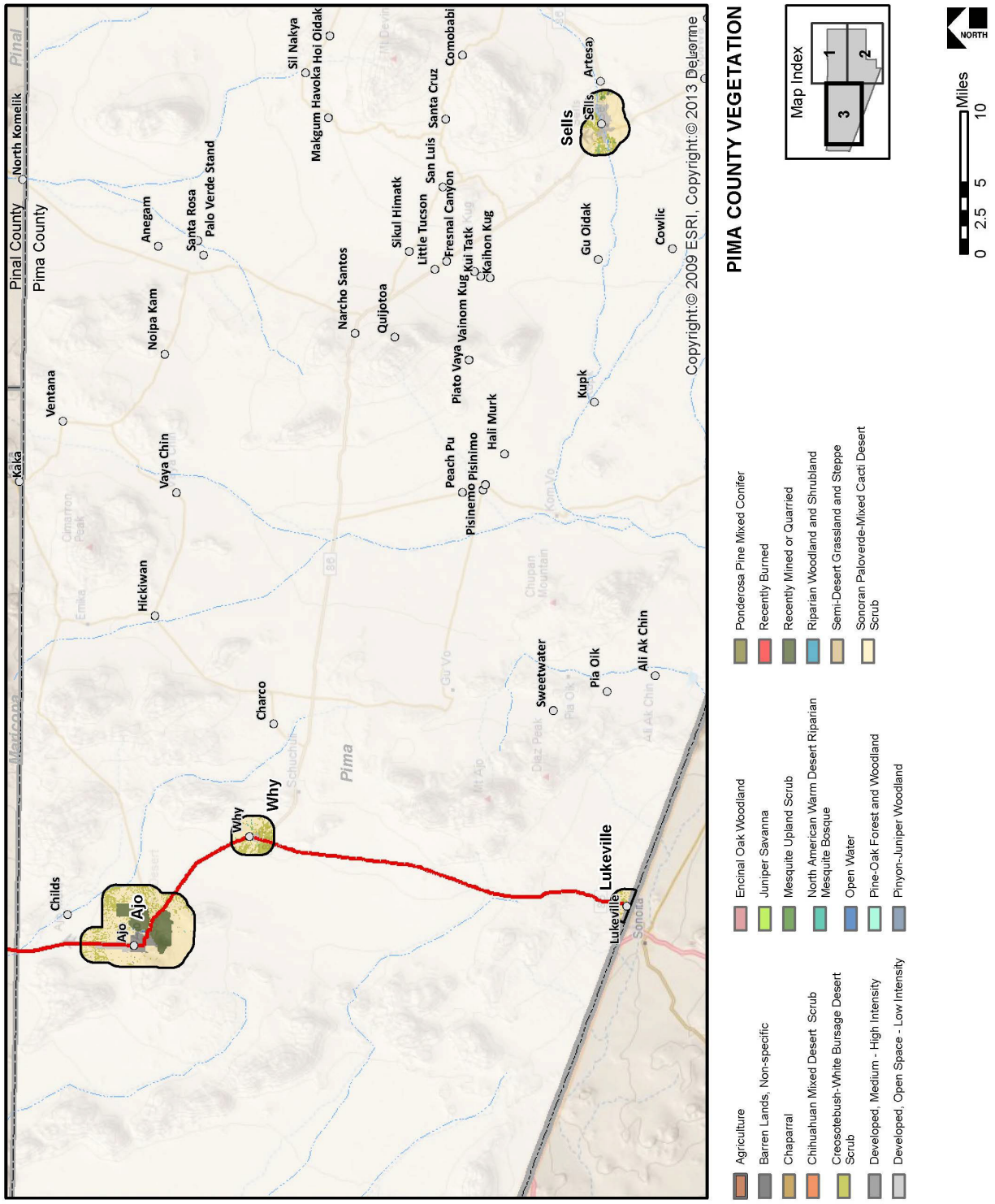

Figure 2.2c. Landcovers of the Pima County WUI, West

Table 2.3. Fuel Model, Fire-Danger Ratings, and Intensity Levels on Vegetative Associations in the WUI

Fuel Type	Vegetation Association	Wildfire Risk Rating[a]	Anderson Fuel Model	Fire-Danger Rating Model[b]	Flame Length (ft)	Fire Intensity Level from Fire-Danger Rating Model[e]	Rate Of Spread ft/hr (ch/hr)	Fire Behavior Fuel Model[c]	Flame Length (ft) Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model[e]	Rate of Spread ft/hr (ch/hr)—Low Dead Fuel Moisture	Acre (%)
Desert Shrub-Scrub	Creosotebush, mixed desert, and thorn scrub	L	1,2	T	4–6	4	2310–5150 (35–78)	GR1 GR2 SH1	0.5–1.7 1.0–8.0 0.2–0.7	GR1, 1 GR2, 1–4 SH1,1	GR1, 0–990 (0–15) GR2, 0–7920 (0–15) SH1, 7–132 (0– 2)	80,250 (5%)
	Sonoran paloverde-mixed cacti desert scrub (25, 26, 27, 28, 29)[d]	M	1,3	L and T	4–6	3	2310–5150 (35–78)	GR1 GR2 GR4 GS1 GS2 SH1 SH4 SH5 SH7 TL2 TL6 TU2	0.5–1.7 1.0–8.0 1.0–22 1.0–6.0 1.5–>10.0 0.2–0.7 1.0–16 4.0–>25.0 4.0–>25.0 4.0–>25.0 1.0–7.0 1.0–8.0	GR1,1 GR2, 1–4 GR4, 1–4 GS1, 1–3 GS2, 1–5 SH1, 1 SH4, 1–6 SH5, 2–6 SH7, 2–6 TL2, 2–6 TL6, 1–4 TU2, 1–5	GR1, 0–990 (0–15) GR2, 0–7920 (0–120) GR4, 0–33,000 (0–500) GS1, 0–3960 (0–60) GS2, 0–>6600 (0–100) SH1, 7–132 (0– 2) SH4, 0–11880 (0–180) SH5, 0–16500 (0–250) SH 7, 0–11889 (0–180) TL2, 0–132 (0–2) TL6, 2–1650 (2–25) TU2, 0–5,280 (0–80)	641,402 (41%)
	Creosotebush-white bursage desert scrub	L	1	L and T	4–6	3	2110–5150 (32–78)	GR1 SH1	0.5–1.7 0.2–0.7	GR1, 1 SH1, 1	GR1, 0–990 (0–15) SH1, 7–112 (0.1–1.7)	99,170 (6%)
	Chihuahuan Mixed-desert scrub (1,2,3)[d]	L	1,2	L and T	4–6	3	2310–5150 (35–78)	GR1 GR2 GS1 GS2 SH1 SH5 SH7	0.5–1.7 1.0–8.0 1.0–6.0 1.5–>10.0 0.2–0.7 4.0–>25.0 4.0–>25.0	GR1, 1 GR2, 1–4 GS1, 1–3 GS2, 2–5 SH1, 1 SH5, 3–6 SH7, 3–6	GR1, 0–990 (0–15) GR2, 0–7920 (0–120) GS1, 0–3960 (0–60) GS2, 0–>6600 (0–100) SH1, 7–112 (0.1–1.7) SH5, 0–16500 (0–250) SH 7, 0–11889 (0–180)	

Continued

Table 2.3. Fuel Model, Fire-Danger Ratings, and Intensity Levels on Vegetative Associations in the WUI

Fuel Type	Vegetation Association	Wildfire Risk Rating[a]	Anderson Fuel Model	Fire-Danger Rating Model[b]	Flame Length (ft)	Fire Intensity Level from Fire-Danger Rating Model[e]	Rate Of Spread ft/hr (ch/hr)	Fire Behavior Fuel Model[c]	Flame Length (ft) Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model[e]	Rate of Spread ft/hr (ch/hr)—Low Dead Fuel Moisture	Acre (%)
Shrublands	Mesquite upland scrub Mesquite grasslands (9, 10, 11, 12, 13, 14, 15) [d]	M	1,3	B and T	4–12	6	5150–6860 (78–104)	GR1 GR2 GR4 GR7 GS1 GS2 SH1 SH2 SH4 SH5 SH7 TL2 TU2	0.5–1.7 1.0–8.0 1.0–22 5.0–45 1.0–6.0 1.5–>10.0 0.2–0.7 1.0–4.5 1.0–16 4.0–>25.0 4.0–>25.0 4.0–>25.0 1.0–8.0	GR1, 1 GR2, 1–4 GR4, 1–6 GR7, 3–6 GS1, 1–3 GS2, 1–5 SH1, 1 SH2, 1–3 SH4, 1–6 SH5, 3–6 SH7, 3–6 TL2, 3–6 TU2, 1–4	GR1, 0–990 (0–15) GR2, 0–7920 (0–120) GR4, 0–33,000 (0–500) GR7, 1–33,000 (0–500) GS1, 0–3960 (0–60) GS2, 0–6600 (0–100) SH1, 7–112 (0– 2) SH2, 0–1188 (0–18) SH4, 0–11880 (0–180) SH5, 0–16500 (0–250) SH 7, 0–11889 (0–180) TL2, 0–132 (0–2) TU2, 0–5,280 (0–80)	230,189 (15%)
Grasslands	Semi-desert grassland and steppe	L	1,2	F and T	4–6	3	2310–5150 (35–78)	GS1 GR1 GR2 GR4	1.0–6.0 0.5–1.7 1.0–8.0 1.0–22	GS1, 1–3 GR1, 1 GR2, 4 GR4, 1–6	GS1, 0–3960 (0–60) GR1, 0–990 (0–15) GR2, 0–7920 (0–120) Gr4, 0–33,000 (0–500)	70,377 (4%)
Woodlands	Chaparral (19) [d]	H	4,6	B and T	6–19	4–6	2110–4950 (32–75)	GR1 GR2 GS2 SH1 SH4 SH5 SH7 TL8 TU2	0.5–1.7 1.0–8.0 1.5–>10.0 0.2–0.7 1.0–16 4.0–>25.0 4.0–>25.0 1.0–8.0 1.0–8.0	GR1, 1 GR2, 1–4 GS2, 1–5 SH1, 1 SH4, 1–6 SH5, 3–6 SH7, 3–6 TL8, 1–4 TU2, 1–4	GR1, 0–990 (0–15) GR2, 0–7920 (0–120) GS2, 0–6600 (0–100) SH1, 7–112 (0– 2) SH4, 0–11880 (0–180) SH5, 0–16500 (0–250) SH7, 0–11889 (0–180) TL8, 0–2640 (0–40) TU2, 0–5,280 (0–80)	12,299 (1%)
	Encinal Oak Woodland Desert oak transition (4, 5, 6, 9) [d]	M	1,3	B and T	2.6–6	4	495–2310 (7.5–35)	GR1 GR2 GS1 GS2 SH1 SH5 SH7 TL2 TL3	0.5–1.7 1.0–8.0 1.0–6.0 1.5–>10.0 0.2–0.7 4.0–>25.0 4.0–>25.0 0.3–1.0 0.4–1.3	GR1, 1 GR2, 1–4 GS1, 1–3 GS2, 1–5 SH1, 1 SH5, 3–6 SH7, 3–6 TL2, 1 TL3, 1	GR1, 0–990 (0–15) GR2, 0–7920 (0–15) GS1, 0–3960 (0–60) GS2, 0–6600 (0–100) SH1, 7–112 (0.– 2) SH5, 0–16500 (0–250) SH 7, 0–11889 (0–180) TL2, 0–132 (0–2) TL3 0–198 (0–3)	34,453 (1%)

Continued

Table 2.3. Fuel Model, Fire-Danger Ratings, and Intensity Levels on Vegetative Associations in the WUI

Fuel Type	Vegetation Association	Wildfire Risk Rating[a]	Anderson Fuel Model	Fire-Danger Rating Model[b]	Flame Length (ft)	Fire Intensity Level from Fire-Danger Rating Model[e]	Rate Of Spread ft/hr (ch/hr)	Fire Behavior Fuel Model[c]	Flame Length (ft) Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model[e]	Rate of Spread ft/hr (ch/hr)—Low Dead Fuel Moisture	Acre (%)
	Pinyon-juniper Woodland	H	2,3	F	6–19	4–6	2110–4950	GR1	0.5–1.7	GR1, 1	GR1, 0–990 (0–15)	12,815
	Oak-pinyon-juniper woodlands						(32–75)	GR2	1.0–8.0	GR2, 1–4	GR2, 0–7,920 (0–15)	(1%)
	(20, 21, 22, 23) [d]							GS1	1.0–6.0	GS1, 1–3	GS1, 0–3960 (0–60)	
								GS2	1.5–>10.0	GS2, 1–5	GS2, 0–6600 (0–100)	
								SH1	0.2–0.7	SH1, 1	SH1, 7–112 (0–2)	
								SH4	1.0–16.0	SH4, 1–6	SH4, 0–11880 (0–180)	
								SH5	4.0–>25.0	SH5, 3–6	SH5, 0–16500 (0–250)	
								SH7	4.0–>25.0	SH7, 3–6	SH 7, 0–11889 (0–180)	
								TL1	0.0–0.5	TL1, 1	TL1, 0–66 (0–1)	
								TL2	0.3–1.0	TL2, 1	TL2, 0–132 (0–2)	
								TL3	0.4–1.3	TL3, 1	TL3, 0–198 (0–3)	
								TL8	1.0–8.0	TL8, 1–5	TL8. 0–2640 (0–40)	
								TU1	1.0–4.0	TU1, 1–3	TU1, 0–990 (0–15)	
	Juniper savanna	M	2,6	F	6–8	4	2110–2310	GR1	0.5–1.7	GR1, 1	GR1, 0–990 (0–15)	639
	Juniper mesquite grasslands						(32–75)	GR2	1.0–8.0	GR2, 1–4	GR2, 0–7,920 (0–15)	(0%)
								GS1	1.0–6.0	GS1, 1–3	GS1, 0–3960 (0–60)	
								GS2	1.5–>10.0	GS2, 1–5	GS2, 0–6600 (0–100)	
								SH1	0.2–0.7	SH1, 1	SH1, 7–112 (0–2)	
								SH4	1.0–16.0	SH4, 1–6	SH4, 0–11880 (0–180)	
								SH5	4.0–>25.0	SH5, 3–6	SH5, 0–16500 (0–250)	
								SH7	4.0–>25.0	SH7, 3–6	SH 7, 0–11889 (0–180)	
								TL1	0.0–0.5	TL1, 1	TL1, 0–66 (0–1)	
								TL2	0.3–1.0	TL2, 1	TL2, 0–132 (0–2)	
								TL3	0.4–1.3	TL3, 1	TL3, 0–198 (0–3)	
								TU1	1.0–4.0	TU1, 1–3	TU1, 0–990 (0–15)	

Continued

Table 2.3. Fuel Model, Fire-Danger Ratings, and Intensity Levels on Vegetative Associations in the WUI

Fuel Type	Vegetation Association	Wildfire Risk Rating[a]	Anderson Fuel Model	Fire-Danger Rating Model[b]	Flame Length (ft)	Fire Intensity Level from Fire-Danger Rating Model[e]	Rate Of Spread ft/hr (ch/hr)	Fire Behavior Fuel Model[c]	Flame Length (ft) Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model[e]	Rate of Spread ft/hr (ch/hr)—Low Dead Fuel Moisture	Acre (%)
Timber	Ponderosa Pine	H	2,9	E and T	2.6–>8	4–5	495–2310	GR1	0.5–1.7	GR1, 1	GR1, 0–990 (0–15)	4,624
	Mixed conifer						(7.5–35)	GR2	1.0–8.0	GR2, 1–4	GR2, 0–7,920 (0–15)	(0.2%)
	(16, 17, 24)[d]							GS2	1.5–>10.0	GS2, 1–5	GS2, 0–6600 (0–100)	
								SH1	0.2–0.7	SH1, 1	SH1, 7–112 (0– 2)	
								SH4	1.0–16.0	SH4, 1–6	SH4, 0–11880 (0–180)	
								SH5	4.0–>25.0	SH5, 3–6	SH5, 0–16500 (0–250)	
								SH7	4.0–>25.0	SH7, 3–6	SH 7, 0–11889 (0–180)	
								TL1	0.0–0.5	TL1, 1	TL1, 0–66 (0–1)	
								TL3	0.4–1.3	TL3, 1	TL3 0–198 (0–3)	
								TL6	1.0–7.0	TL6, 1–4	TL6 0–1650 (2–25)	
								TL8	1.0–8.0	TL8, 1–5	TL8, 0–2,649 (0–40)	
								TU1	1.0–4.0	TU1, 1–3	TU1, 0–990 (0–15)	
								TU2	1.0–8.0	TU2, 1–4	TU2, 0–5,280 (0–80)	
								TU5	2.0–13.0	TU5, 2–6	TU5, 0–2,772 (0–42)	
	Pine-oak Forest and Woodland	M	2,9	F and E	2.6–8	4–5	495–2310	GR1	0.5–1.7	GR1, 1	GR1, 0–990 (0–15)	3,323
	(7, 8)[d]						(7.5–35)	GR2	1.0–8.0	GR2, 1–4	GR2, 0–7,920 (0–15)	(0.2%)
								GR4	1.0–22.0	GR4, 1–6	GR4, 0–33,000 (0–500)	
								GS1	1.0–6.0	GS1, 1–3	GS1, 0–3960 (0–60)	
								GS2	1.5–>10.0	GS2, 1–5	GS2, 0–6600 (0–100)	
								SH1	0.2–0.7	SH1, 1	SH1, 7–112 (0– 2)	
								SH4	1.0–16.0	SH4, 1–6	SH4, 0–11880 (0–180)	
								SH5	4.0–25.0	SH5, 3–6	SH5, 0–16500 (0–250)	
								SH7	4.0–>25.0	SH7, 3–6	SH 7, 0–11889 (0–180)	
								TL1	0.0–0.5	TL1, 1	TL1, 0–66 (0–1)	
								TL2	0.3–1.0	TL2, 1	TL2, 0–132 (0–2)	
								TL3	0.4–1.3	TL3, 1	TL3, 0–198 (0–3)	
								TL8	1.0–8.0	TL8, 1–4	TL8, 0–2,649 (0–40)	
								TU1	1.0–4.0	TU1, 1–3	TU1, 0–990 (0–15)	
								TU5	2.0–14.0	TU5, 2–6	TU5, 0–2,772 (0–42)	

Continued

Table 2.3. Fuel Model, Fire-Danger Ratings, and Intensity Levels on Vegetative Associations in the WUI

Fuel Type	Vegetation Association	Wildfire Risk Rating[a]	Anderson Fuel Model	Fire-Danger Rating Model[b]	Flame Length (ft)	Fire Intensity Level from Fire-Danger Rating Model[e]	Rate Of Spread ft/hr (ch/hr)	Fire Behavior Fuel Model[c]	Flame Length (ft) Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model[e]	Rate of Spread ft/hr (ch/hr)—Low Dead Fuel Moisture	Acre (%)
Deciduous Southwest Riparian	North American Warm Desert Riparian Mesquite Bosque	H	6,9	E and T	2.6–12	6	495–2110 (7.5–32)	GR1	0.5–1.7	GR1, 1	GR1, 0–990 (0–15)	10,319 (0.6%)
								GR2	1.0–8.0	GR2, 1–4	GR2, 0–7,920 (0–15)	
								GR4	1.0–22.0	GR4, 1–6	GR4, 0–33,000 (0–500)	
								GS2	1.5–>10.0	GS2, 1–5	GS2, 0–6600 (0–100)	
								SH1	0.2–0.7	SH1, 1	SH1, 7–112 (0–2)	
								SH4	1.0–16.0	SH4, 1–6	SH4, 0–11880 (0–180)	
								SH5	4.0–25.0	SH5, 3–6	SH5, 0–16500 (0–250)	
								TL1	0.0–0.5	TL1, 1	TL1, 0–66 (0–1)	
								TL2	0.3–1.0	TL2, 1	TL2, 0–132 (0–2)	
								TL3	0.4–1.3	TL3, 1	TL3, 0–198 (0–3)	
								TL8	1.0–8.0	TL8, 1–4	TL8, 0–2,649 (0–40)	
								TU1	1.0–4.0	TU1, 1–3	TU1, 0–990 (0–15)	
	Invasive Southwest Riparian Woodland and Shrub (18)[d]	H	4	G and T	19	6	4950 (75)	GR1	0.5–1.7	GR1, 1	GR1, 0–990 (0–15)	1,944 (0.1%)
								GR2	1.0–8.0	GR2, 1–4	GR2, 0–7,920 (0–15)	
								GR4	1.0–22	GR4, 1–6	GR4, 0–33,000 (0–500)	
								GS1	1.0–6.0	GS1, 1–3	GS1, 0–3960 (0–60)	
								GS2	1.5–>10.0	GS2, 1–5	GS2, 0–6600 (0–100)	
	Riparian Woodland and Shrubland (18)[d]	H	8 and 9	E and T	2.6–6	4–6	495–2110 (7.5–32)	SH1	0.2–0.7	SH1, 1	SH1, 7–112 (0– 2)	
								SH4	1.0–16.0	SH4, 1–6	SH4, 0–11880 (0–180)	
								SH5	4.0–25.0	SH5, 3–6	SH5, 0–16500 (0–250)	
								SH7	4.0–>25.0	SH7, 3–6	SH 7, 0–11889 (0–180)	
								TL1	0.0–0.5	TL1, 1	TL1, 0–66 (0–1)	
								TL2	0.3–1.0	TL2, 1	TL2, 0–132 (0–2)	
								TL3	0.4–1.3	TL3, 1	TL3 0–198 (0–3)	
								TL6	1.0–7.0	TL6, 1–4	TL6, TL6 0–1650 (2–25)	
								TL8	1.0–8.0	TL8, 1–4	TL8, 0–2,649 (0–40)	
								TU1	1.0–4.0	TU1, 1–3	TU1, 0–990 (0–15)	
								TU2	1.0–8.0	TU2, 1–4	TU2, 0–5,280 (0–80)	

Continued

Table 2.3. Fuel Model, Fire-Danger Ratings, and Intensity Levels on Vegetative Associations in the WUI

Fuel Type	Vegetation Association	Wildfire Risk Rating[a]	Anderson Fuel Model	Fire-Danger Rating Model[b]	Flame Length (ft)	Fire Intensity Level from Fire-Danger Rating Model[e]	Rate Of Spread ft/hr (ch/hr)	Fire Behavior Fuel Model[c]	Flame Length (ft) Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model[e]	Rate of Spread ft/hr (ch/hr)—Low Dead Fuel Moisture	Acre (%)
Other	Agriculture	L	NA	NA	NA	NA	NA	NB3	NA	NA	NA	45,269 (3%)
	Developed, Open Space–Low Intensity	L	NA	NA	NA	NA	NA	NB1	NA	NA	NA	117,627 (8%)
	Developed, Medium–High Intensity	L	NA	NA	NA	NA	NA	NB1	NA	NA	NA	157,603 (10%)
	Barren Lands, Non-Specific	L	NA	NA	NA	NA	NA	NB9	NA	NA	NA	18,745 (1%)
	Recently mined or quarried	L	NA	NA	NA	NA	NA	NB9	NA	NA	NA	36,186 (2%)
	Recently Burned	L	NA	NA	NA	NA	NA	NB9	NA	NA	NA	1,847 (0%)
	Open water	L	NA	NA	NA	NA	NA	NB9	NA	NA	NA	513 (0%)
												Total 100%

Source: National Fire Danger Rating System (USDA FS 1983; Burgan 1988).

[a]L = low, M = moderate, H = high, NA = not applicable.

[b]See Appendix B for the National Fire Danger Rating System definitions.

[c]Fire behavior fuel models are designed for wildland vegetation and do not accurately predict fire behavior when structures are involved.

[d]Ecological unit map legends included in vegetation associations from http://www.azfirescape.org/catalina/ecounit_map.

[e]Fire Intensity Level (FIL) an expression of fireline intensity based on flame length as an indicator of fire intensity, FIL1 = 0–2′ Flame length (FL in feet): FIL2 = 2.1–4′ FL; FIL3 = 4.1–6′ FL; FIL4 = 6.1–8′ FL; FIL5 = 8.1–12′ FL, FIL6 > 12′ FL

The Arizona State Forester (2007:1) defines the term *at-risk community* as follows:

> **EVALUATE RISK TO COMMUNITIES:** Not all structures and/or communities that reside in an "interface" area are at significant risk from wildland fire. It is a combination of factors, including the composition and density of vegetative fuels, extreme weather conditions, topography, density of structures, and response capability that determines the relative risk to an interface community. The criteria listed below are intended to assist interagency teams at the state level in identifying the communities within their jurisdiction that are at significant risk from wildland fire. The application of these risk factors should allow for greater nationwide consistency in determining the need and priorities for Federal projects and funding.

Wildland fire behavior potential in the analysis area is consistent with the Risk Classification Situations 1, 2, and 3 as described by the Arizona State Forester (2007:1–2):

> Risk Factor 1: Fire Behavior Potential
>
> Situation 1: In these communities, continuous fuels are in close proximity to structures. The composition of surrounding fuels is conducive to crown fires or high intensity surface fires. Likely conditions include steep slopes, predominantly south aspects, dense fuels, heavy duff, prevailing wind exposure and/or ladder fuels that reduce fire fighting effectiveness. There is a history of large fire and/or high fire occurrence.
>
> Situation 2: In these communities, intermittent fuels are in proximity to structures. Likely conditions include moderate slopes and/or rolling terrain, broken moderate fuels, and some ladder fuels. The composition of surrounding fuels is conducive to torching, spotting, and/or moderate intensity surface fires. These conditions may lead to moderate fire fighting effectiveness. There is a history of some large fires and/or moderate fire occurrence.
>
> Situation 3: In these communities, fine and/or sparse fuels surround structures. There is infrequent wind exposure and flat terrain to gently rolling terrain. The composition of surrounding fuels is conducive to low intensity surface fires. Fire fighting generally is highly effective. There is no large fire history and/or low fire occurrence.

Pima County is composed of three major land resource areas (Natural Resources Conservation Service [NRCS] 2011): Southeast Arizona Basin and Range, Sonoran Basin and Range, and Mogollon Transition. The Southeastern Arizona Basin and Range division is composed of mountain ranges that trend southeast to northwest and has relatively smooth valleys between the mountains extending to the Continental Divide in New Mexico. The Sonoran Basin and Range region is in the Sonoran Desert section of the Basin and Range province of the Intermontane Plateaus and is characterized by many short, fault-block mountain ranges trending southeast to northeast that rise abruptly from the smooth, gently sloping desert valley floors. Elevation ranges from 980 to 3,600 feet in most areas, with mountains reaching 4,590 feet. The Mogollon Transition region is within the Mexican Highland section of the Basin and Range province of the Intermontane Plateaus. The area is characterized by canyons and structural troughs and valleys with elevations ranging from 3,000 to 5,500 feet in most areas, with mountains reaching 5,100 to 7,500 feet.

Vegetative production within these major land resource areas ranges from over 4,000 lb per acre in highest-elevation sites in the >12-inch precipitation zone during favorable precipitation years to <50 lb per

acre in lower desert scrub–mudstone hills range sites in the <7-inch precipitation zone during unfavorable precipitation years. Precipitation ranges from 7 to 14 inches annually though as much as 20 inches of precipitation may occur in highest elevations. More than half of the precipitation occurs as high-intensity convective thunderstorms during July, August and September producing a winter-summer rainfall ratio of 40:60. Warm-season rains (July–September) originate in the Gulf of Mexico and are usually brief and intense. Cool-season rains (December–March) originating in the Pacific Ocean are generally frontal, widespread, long, and less intense. May and June are the driest months of the year, with many natural fire ignitions occurring before the monsoon rains. Humidity is generally low, with mostly mild winters and hot summers in lower elevations to mild summers and cold winters in higher elevations. During May and June temperatures can exceed 100 degrees Fahrenheit. Cool-season vegetation growth begins in early spring and matures in early summer. Warm-season vegetation initiates growth after the summer rains and may remain green throughout the year in lower elevations.

The analysis area includes 6 major vegetative fuel types composed of 20 major vegetation associations (including agricultural lands), 3 mostly nonvegetation associations, and 2 open-space residential developed landcovers, recently burned lands, as well as open water (NatureServe 2004, http://www.azfirescape.org/catalina/landscape_types). Each vegetative community is assigned to an array of fuel models that predicts the rate of spread, flame length, and fire-intensity levels possible for each vegetation association during an average fire season under average weather conditions. Assigning a fuel model to each vegetation association within the analysis area will help predict wildfire behavior and thus proper suppression response (for detailed fuel model descriptions, see Anderson 1982; Scott and Burgan 2005).

The mean fire return interval is highly variable among vegetation associations across the analysis area. Habitat or stand replacement wildfires or wildfires resulting in a major loss of habitat components, in conjunction with drought, will be reduced in frequency and intensity in lower desert habitats. However, moist periods may increase fire frequency and intensity in desert habitats due to increased production of annual grasses and forbs and increased annual growth of perennial grasses and shrubs (FRCC Interagency Working Group 2005b), in synergy with increased production of invasive grasses and forbs. Total wildland fuel load ranges from less than 500 lb per acre in desert and scrub/shrub types to over 20 tons/acre in dense woodland habitats. Buffelgrass fuel loads have been documented to reach 4 tons per acre in undisturbed desert in Saguaro National Park and over 5 tons per acre in old agricultural fields in Avra Valley (McDonald 2009).

Vegetation Associations

The Desert Shrub-Scrub vegetation association is the largest natural landcover within the analysis area; it occurs on drier upland sites and includes areas of bare ground and rock habitats supporting a variety of grass, herbaceous, scrub, and shrub species (Photo 2.1). This major vegetative fuel type ranges from lower desertscrub-creosotebush-bursage associations to mixed desert scrub types to paloverde-mixed cacti desertscrub association. The Desert Shrub-Scrub association constitutes 820,822 acres (52%) of WUI acres. During normal rainfall years and the typical fire season, the majority of the lowest-elevation associations (mixed desert scrub and creosotebush-white bursage associations) do not support high-intensity wildfires with high rates of spread, and many wildfires self-extinguish from a lack of contiguous

ground or aerial fuels. However, during periods of extraordinary rainfall in the fall, winter, and spring months, the growth of winter annuals and forbs, in synergy with the presence of invasive grasses and forbs (for example, buffelgrass, Mediterranean grass, red brome, and mustards), can produce areas with the potential for extreme rates of spread and enough intensity to ignite overstory vegetation. Buffelgrass is increasing at an exponential rate in Sonoran Desert habitats, and it responds mostly to precipitation received in summer months (Olsson et al. 2012).

Photo 2.1. Desert Shrub-Scrub Vegetation Association

The Shrublands vegetation association includes the mesquite upland scrub and mesquite grasslands occurring in the upland vegetative type within the analysis area, accounting for 230,189 acres (15%) of WUI acres (Photo 2.2). The xeroriparian area within this association provides movement corridors and foraging areas for a variety of wildlife species. Adjacent vegetation associations are often a mix of semidesert grassland and desert scrub. The understory of the shrub types will vary from a mix of nonnative grass with some areas of native grasses, depending on canopy closure. Areas of higher canopy closure (>60%) support little herbaceous and perennial grass cover, which limits fine fuels needed for fire laddering and limits rate of spread. Stands of mature upland mesquite habitats can include trees with trunks and limbs greater than 6 inches diameter at breast height, providing habitat for a variety of cavity-nesting bird species. This shrubland association also provides recreational use, day use, and camping areas. Plant communities dominated by mature mesquites may include native or invaded grass understory, creating areas of open woodlands and savannas to areas of high canopy.

A major vegetative association of shrubland fuel types includes Mogollon chaparral. This ecological system occurs across central Arizona, western New Mexico, southwestern Utah, and southeast Nevada. It often dominates along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts. It occurs on foothills, mountain slopes, and canyons in drier habitats below the encinal woodlands. Stands are often associated with more xeric and coarse-textured substrates such as limestone, basalt, or alluvium, especially in transition areas with more mesic woodlands. The moderate to dense shrub canopy includes

species such as oak, sumac, and ceanothus. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Substrates are normally shallow/rocky and shaley soils at lower elevations.

Photo 2.2. Shrublands Vegetation Association

The Woodlands vegetation association includes the chaparral, pinyon-juniper, oak-pinyon-juniper, Madrean pine-oak, juniper savannas, juniper mesquite grasslands, transitional desert oak, encinal oak, and desert oak woodlands (Photo 2.3). The Madrean pine-oak forest and woodland are composed of Madrean pines including Arizona pine (*Pinus arizonica*), Apache pine (*Pinus engelmannii*), and Chihuahua pine (*Pinus leiophylla)* with an understory of chaparral species. Fires in the Madran Pine-oak forest and woodlands may be more frequent than ponderosa pine forests and woodlands (NatureServe 2004).The woodland association fuel type covers 60,206 acres (4%) of WUI acres and is the third largest upland vegetative fuel type within the analysis area.

The woodland vegetation associations include Madrean encinal oak woodlands, which are the defining feature of the Sky Islands mountains (Governor's Forest Health Councils 2007: 107) occurring on foothills, canyons, bajadas, and plateaus in Mexico, extending north into sub-Mogollon Arizona. These woodlands are dominated by Madrean evergreen oaks along a low-slope transition normally occurring at higher elevations and within moister habitats than Mogollon chaparral (Photo 2.4). Lower-elevation stands are typically open woodlands or savannas where they transition into desert grasslands, chaparral, or, sometimes, desertscrub. Common evergreen oak species include Emory, Arizona white, and scrub live oak. Other species include Manzanita, chaparral species, and, at higher elevations, pinyon and juniper species. The grass layer usually prominent between trees is grassland or steppe that is dominated by warm-season grasses typical of semidesert grasslands. This association can also be composed of stands dominated by shrubby Madrean oaks, typically with a strong grass layer and, in some instances, invasive grasses and forbs. In transition areas with drier chaparral systems, stands of chaparral are not dominated by the Madrean encinal association; however, it may extend down along drainages.

Photo 2.3. Woodlands Vegetation Association

Photo 2.4. Madrean Oak/Conifer/Manzanita on Hills with Extensive Rock Outcrops

(http://www.azfirescape.org/content/madrean_oakconifermanzanita_hills_and_mountains_extensive_rock_outcrops)

The Deciduous Southwest Riparian vegetation association consists of the North American warm-desert riparian mesquite bosque, southwest invasive riparian woodland and shrub, and riparian woodland and shrubland associations (Photo 2.5). This vegetative association covers 12,263 acres (less than 1%) of WUI acres. The Pima County analysis area includes the riparian corridor of the Santa Cruz and a small section of the San Pedro River near the community of Redington. This ecological system consists of low-elevation riparian corridors along intermittent streams in valleys of southern Arizona into adjacent New Mexico and Mexico. Dominant trees include mesquite species, and dominant shrubs include desert broom and desert willow. Vegetation, especially the mesquites, tap groundwater below the streambed when surface flows stop with high local densities of mesquites being dependent on an annual rise in the water table for growth and reproduction. This association can be intermixed with an understory of grasses and shrubs and often includes areas of near monocultures of saltcedar. This vegetation association may be underrepresented because of some xeroriparian association acres included with the shrubland associations. In general, riparian areas have characteristics that reduce the frequency and severity of fire relative to the surrounding uplands. These characteristics include less steep slopes, surface water, saturated soils, shade, fewer lightning ignitions, cooler air temperatures, lower daily maximum temperature, higher relative humidity, higher fuel moisture content, and lower wind speed. However, there tend to be more human-caused ignitions in these areas. Late seral-stage riparian vegetation supports wildland fire similar to the surrounding potential natural vegetation group (PNVG) when a stand replacement fire occurs in surrounding PNVG during extreme drought and wind events. Late seral-stage riparian and bosque habitats can support nonreplacement fire in greater proportion of total fire frequency than surrounding PNVGs (FRCC Interagency Working Group 2005b: PNVG Code RIPA).

Photo 2.5. Deciduous Southwest Riparian Vegetation Association

The Timber-Type vegetation association is found only in the Mt. Lemmon WUI but does occur in higher elevations of the Sky Islands throughout Pima County. The timber fuel type is composed of the mixed conifer and ponderosa pine vegetation associations (Photo 2.6). The mixed conifer vegetation group is a transitional forest and therefore best thought of as a continuum that follows a moisture gradient driven by elevation and aspect. The mixed conifer associations will have less ponderosa pine than the warm/dry slopes and exposures; however, ponderosa pine will occur in small groups or isolated places usually in open areas, at the edges of meadows, and along ridges (LFRA_Region_SW_Model_Descriptions_Aug08). The mixed conifer association is found along the summit of the Santa Catalina Mountains ranging from 7,500 feet elevation to the summit at 9,157 feet. About two-thirds of the mixed conifer association occurs on 18 percent or steeper north-facing slopes dominated by Douglas fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), and southwestern white pine (*Pinus strobiformis*). South-facing slopes and flats make up the remaining one-third of the mixed conifer association and include areas of primarily Ponderosa pine (*Pinus ponderosa*) and white pine with silverleaf oak (*Quercus hypoleucoides*). Many of these drier stands burned during the 2003 Aspen fire, including the southern aspects of Marshall Gulch, Carter Canyon, and Upper Sabino Canyon along the highway from Summerhaven to Ski Valley, as well as the slopes below Sykes Knob and Inspiration Rock (http://www.azfirescape.org). Ponderosa pine associations will have a dominant overstory of ponderosa pine with mixed co-dominant and understory vegetation associations such as silverleaf oak, netleaf oak (*Quercus rugosa*), Arizona white oak (*Quercus arizonica*), and Emory oak (*Quercus emoryi*) or a grassy understory of bunchgrasses such as Arizona fescue (*Festuca arizonica*), mountain muhly (*Muhlenbergia montana*), and June grass *(Koeleria macrantha)*. The ponderosa vegetation associations range from approximately 4,875 feet to over 8,600 feet in elevation on a variety of topographic features, including mountains, mesas, and canyons. In the Catalinas the ponderosa pine association includes the town of Summerhaven and upper Sabino Canyon.

Photo 2.6. Timber-Type Vegetation Association

The Desert Grasslands vegetation association is primarily represented by the semi-desert grassland and steppe association (Photo 2.7). This is the smallest of the naturally occurring vegetative associations, covering 70,377 acres (4%) of WUI acres. This ecological system consists of a broadly defined desert grassland, mixed shrub-succulent, or tree savannas that are typical of the borderlands of Arizona, New Mexico, and northern Mexico, but it extends west to the Sonoran Desert, north into the Mogollon Rim, and throughout much of the Chihuahuan Desert. It is found on gently sloping bajadas that supported frequent fire throughout the Sky Islands and on mesas and steeper piedmont and foothill slopes in the Chihuahuan Desert. Diverse perennial grasses typically characterize this association. Common grass species include grama grasses*, Eragrostis intermedia, Muhlenbergia porteri, Muhlenbergia setifolia,* and succulent species of *Agave,* and *Yucca*, and tall shrub/short tree species of mesquite and various oaks. Many of the historical desert grassland and savanna areas have been converted, some to mesquite upland scrub types from woody species invasions through intensive grazing and other land uses.

Photo 2.7. Desert Grasslands Vegetation Association

Included within the total analysis area are residential and open-space community lands occurring in the developed areas of the community. As depicted in Figures 2.2a–2.2c, the SWReGAP landcover shows that within the CWPP approximately 275,230 acres (18%) of lands evaluated for wildland fire potential are "developed," with at least 20 percent of the landcover consisting of nonpervious surfaces. However, private lands within the analysis area account for approximately 46 percent of all WUI lands. Therefore, much of the analysis area lands analyzed include private lands that are predominantly naturally landscaped. Developed, Open Space–Low Intensity lands include areas with some constructed surfaces, but mostly consist of native vegetation associations. Impervious surfaces account for less than 20 percent of total cover and most commonly include large-lot single-family housing units or multiple-acre private lands in single ownership, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. These areas most commonly include single-family housing units. Developed, Medium–High Intensity lands include areas with a mixture of constructed materials and

vegetation. Impervious surface accounts for 50 to 79 percent of the total cover. These areas most commonly include single-family housing units, including highly developed areas where people reside or work in high numbers—examples include apartment complexes, and commercial/industrial areas. These lands are generally considered at low risk for wildland fire. However, the threat of fire (structural or wildland ignition) spreading from developed lands to wildlands has been considered in determining risk within the analysis area. In addition, wildland fires can ignite areas with high-density homes, and the structures themselves can then carry a fire, especially in strong winds (Rehm et al. 2002).

Several fuel hazard components, including vegetation type and density, previously burned areas, and slope and aspect, were analyzed for wildland fire potential. For example, some areas of the WUI can be heavily dissected, with some areas having slopes exceeding 20 percent that are heavily vegetated. Slopes greater than or equal to 20 percent and areas with south-, southwest-, or west-facing slopes in areas of high wildland fuels were identified as having greater risks because of fuel-ladder fire effects and convectional preheating of vegetative fuels associated with steep terrain and decreased humidity associated with the microclimates created by southerly exposed aspects. Areas with moderate fuel hazards on slopes greater than or equal to 20 percent are considered a high fuel hazard, while the same fuel type on slopes less than 20 percent is still considered a moderate fuel hazard. During extraordinary rainfall years, when rainfall is above average during the fall, winter, and spring months, increased germination and growth of Mediterranean grass, and other invasive annual grasses and forbs, can result in more continuous fine fuel cover. The areas within the WUI that are heavily infested with invasive perennial grasses such as buffelgrass can have altered fire behavior from increased fuel loading from less than one ton per acre to over 5 tons per acre. This change in fine-fuel continuity can result in increased flame heights, faster rates of spread and increased intensity levels in desert shrub-scrub and shrubland habitats that do not normally sustain wildland fire. These areas of low-risk vegetation associations, including lower-elevation desert shrub-scrub associations in combination with “thermic semiarid soils” (Hendricks 1985:93), will be favored by some invasive grasses (Hauser 2008; Rogstad 2008) and will, under these extraordinary circumstances, become areas of extremely high wildfire risk.

During a normal fire season, low-risk vegetative associations will be enhanced to a moderate level by influencing effects of slope and aspect; in a similar manner, moderate-risk vegetative associations will increase to high risk from these same influencing factors. (Figures 2.3a–2.3c). Other untreated or unburned areas that fall under the category of moderate ground fuels and that do not overlap areas with steep slopes or with south, southwest, or west aspects are considered a moderate risk from fuel hazards. All other areas have a low risk from fuel hazards, including the areas that have been treated or burned within the last decade. The wildland fuel hazards component influence was compiled to depict areas of high, moderate, and low wildland fire potential based on vegetation type, density, and arrangement and to show areas with high wildfire risk and therefore of greater wildland fire risk during years of extraordinary rainfall and enhanced fire conditions creating extreme fire behavior. Visual representations of these fuel hazard components during extreme fire seasons are mapped in Figures 2.4a–2.4c. Table 2.4 identifies these various fuel hazards components and their assigned values.

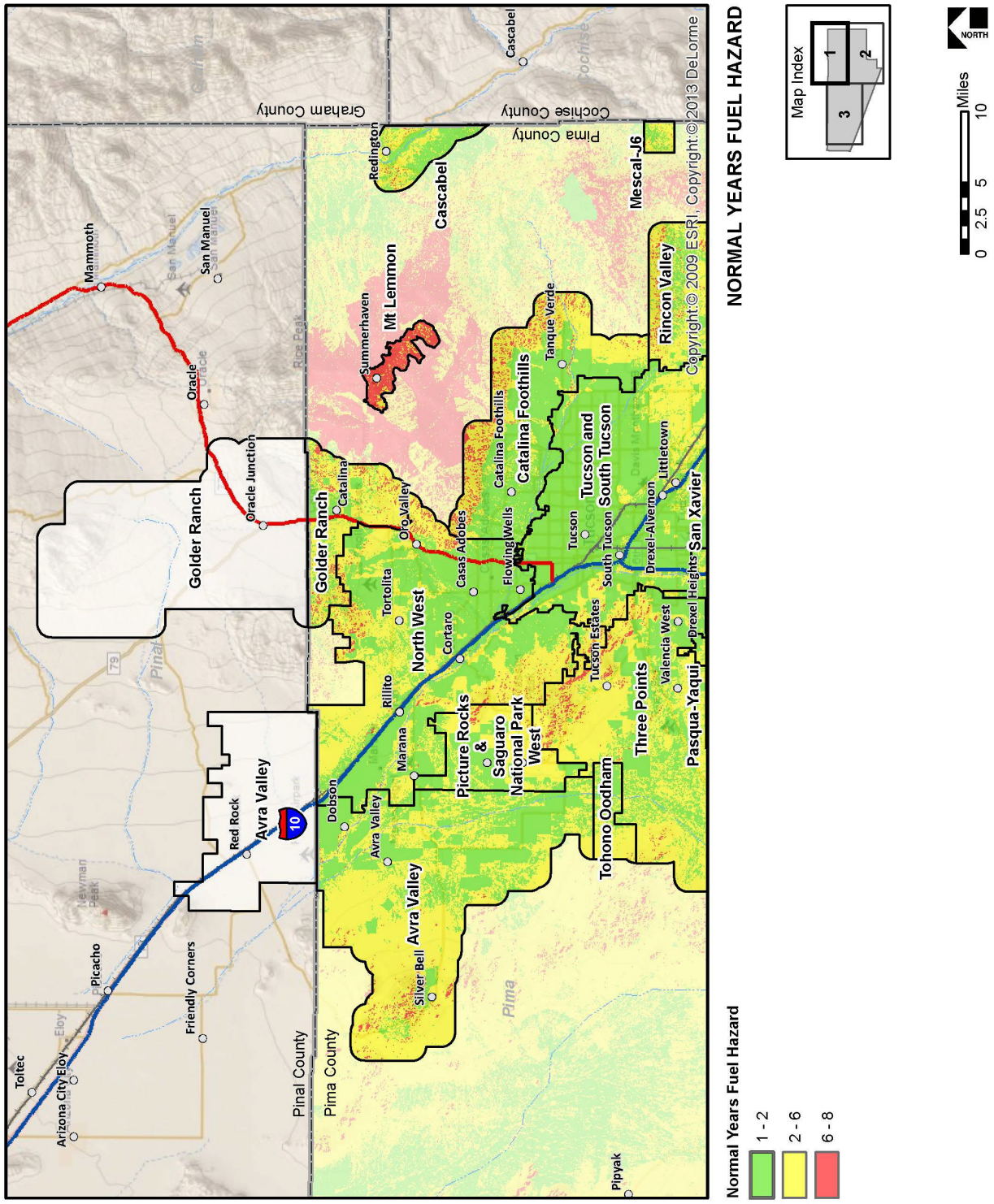

Figure 2.3a. Normal-Year Fuel Hazard of the Pima County WUI, North

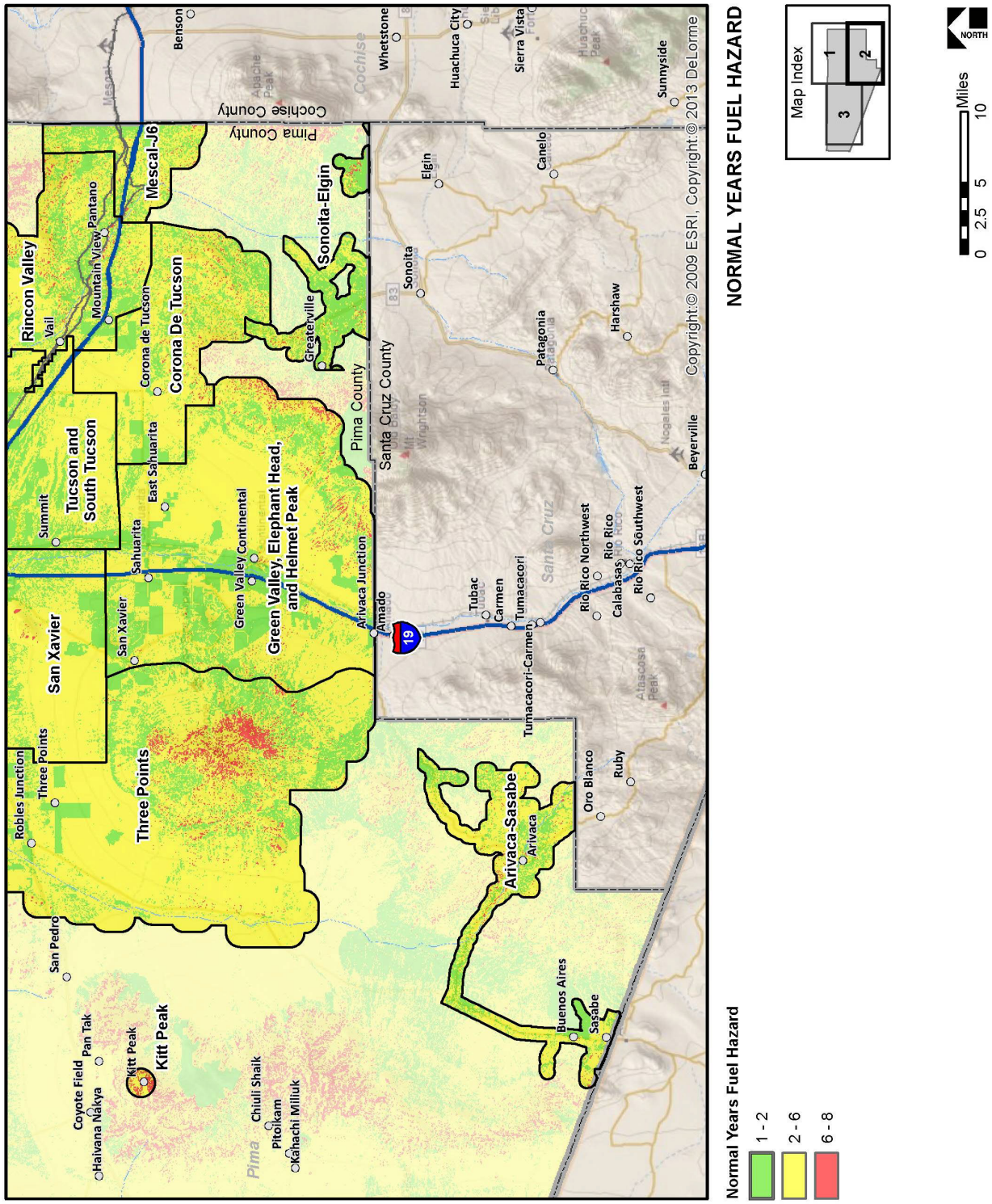

Figure 2.3b. Normal-Year Fuel Hazard of the Pima County WUI, South

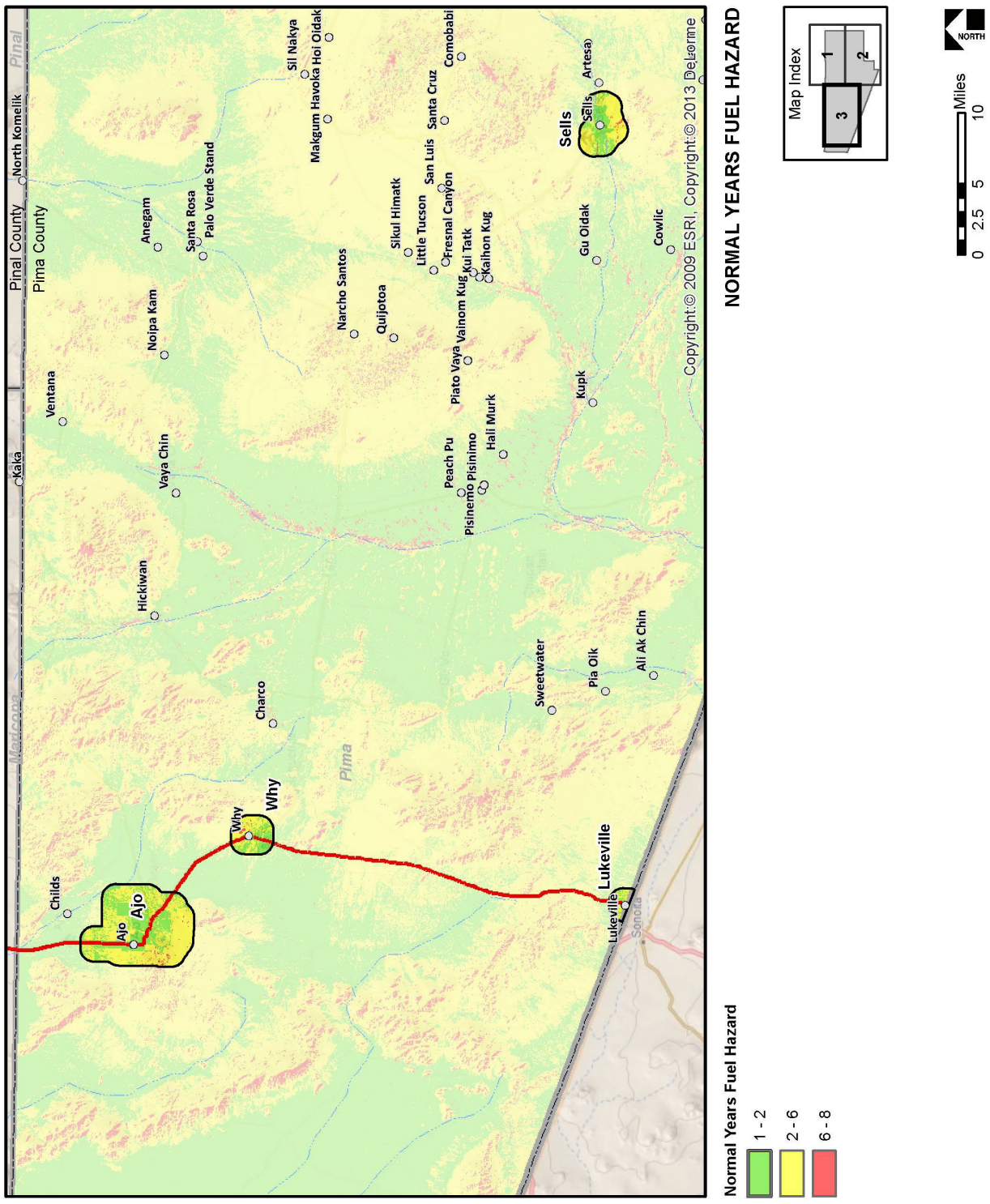

Figure 2.3c. Normal-Year Fuel Hazard of the Pima County WUI, West

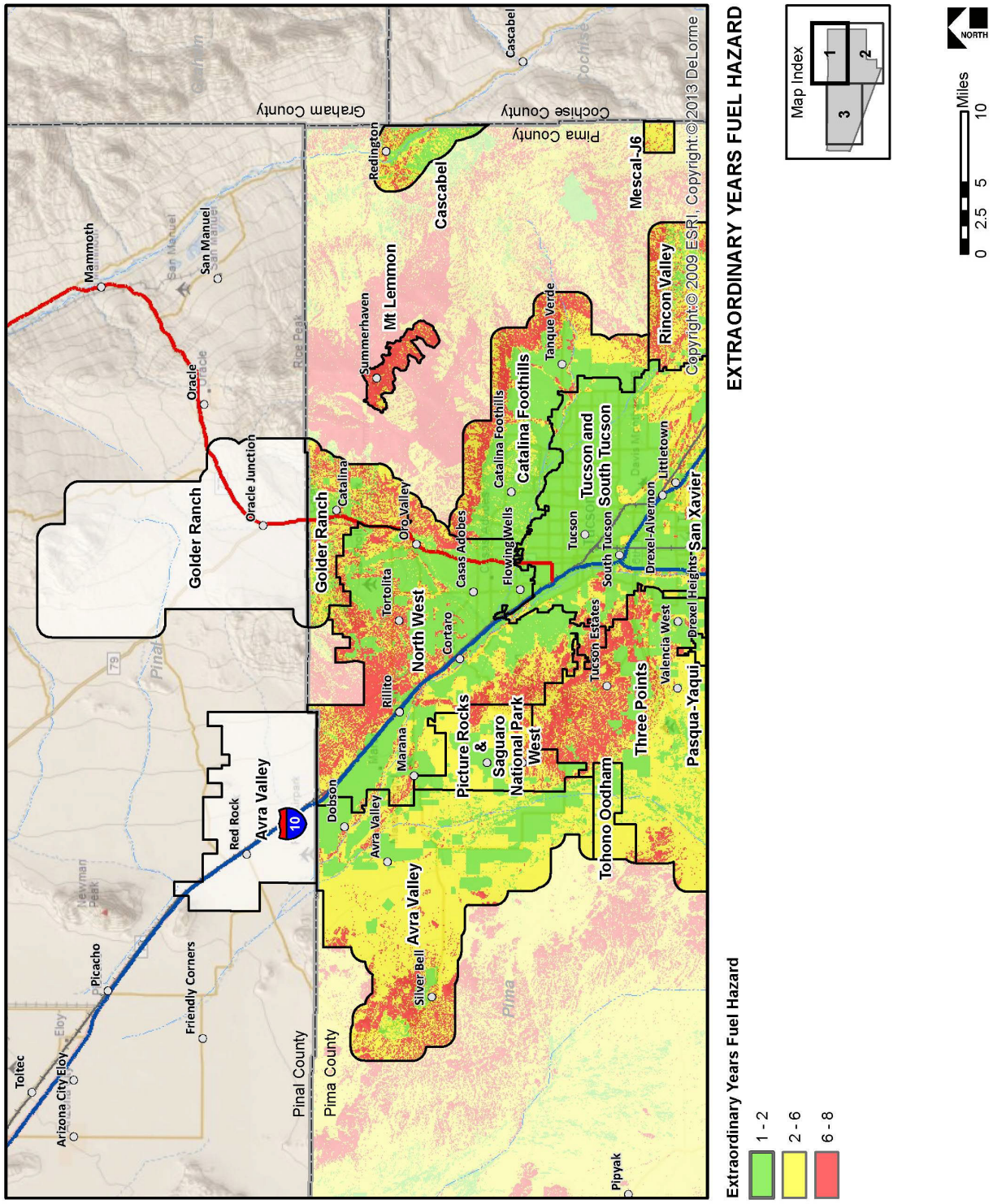

Figure 2.4a. Extraordinary-Year Fuel Hazard of the Pima County WUI, North

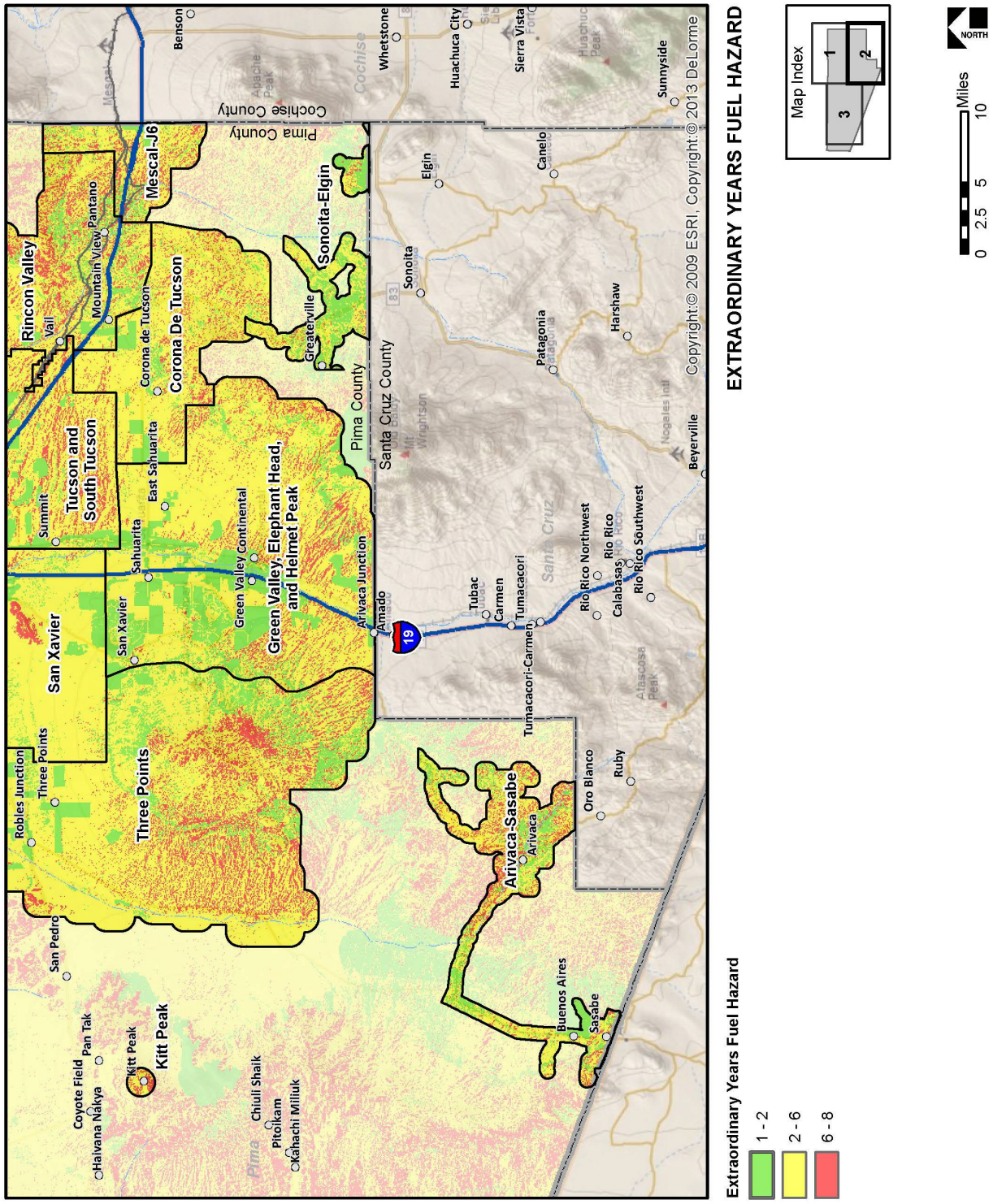

Figure 2.4b. Extraordinary-Year Fuel Hazard of the Pima County WUI, South

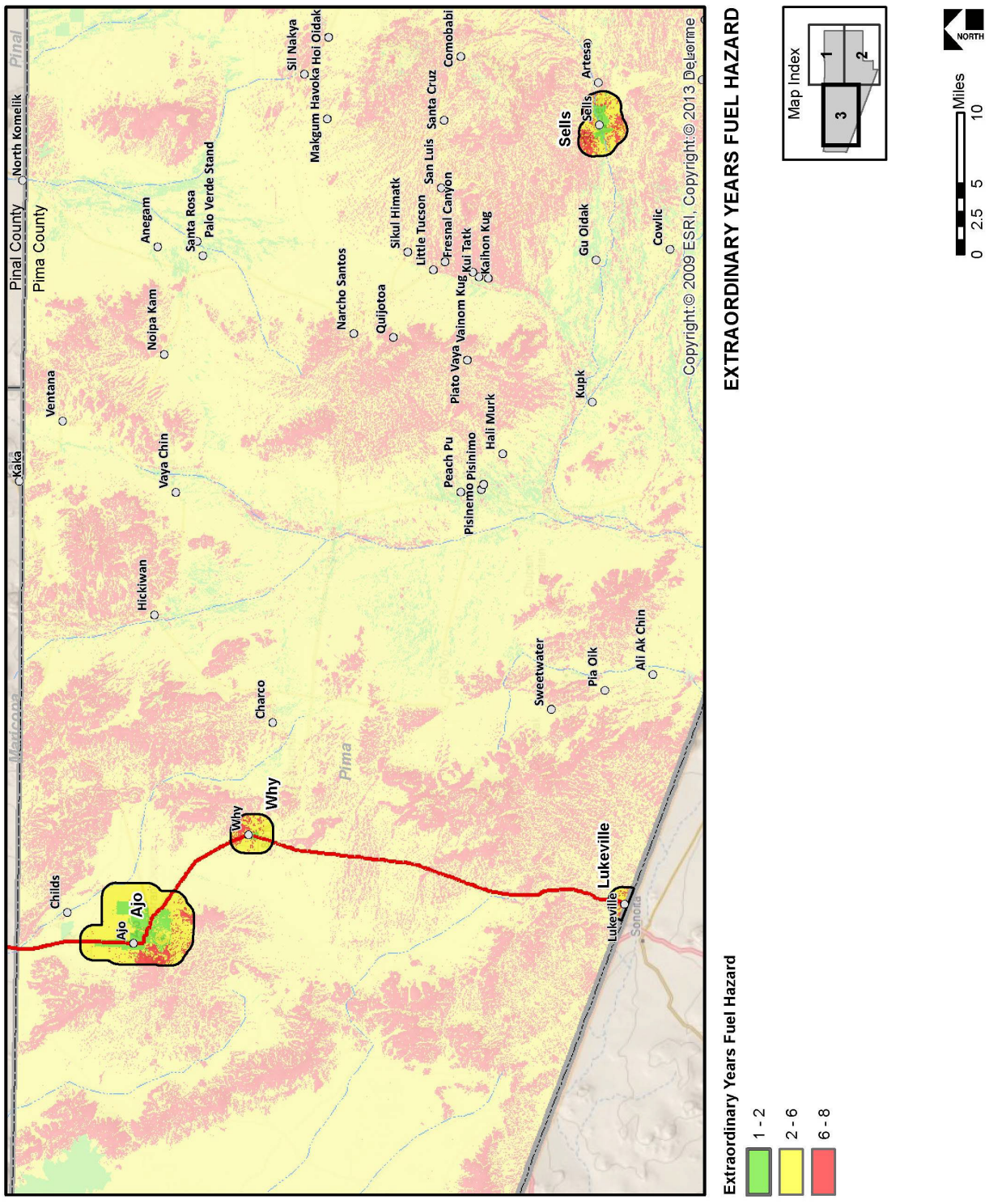

Figure 2.4c. Extraordinary-Year Fuel Hazard of the Pima County WUI, West

Table 2.4. Fuel Hazard Components

Component	Influence[a]
Vegetation type and density	
Woodlands and timber in Fuel Models 2,3 4,6, and 9; Deciduous Riparian >100 stems/acre; or moderate fuel types in slopes ≥20%	H
Upland Shrubland associations in Fuel Models 1 and 3 and desert shrublands and grasslands 2, 3, and 6	M
Desert Scrub associations, barren land types, and agriculture and developed areas	L
Burned areas	L
Slopes ≥20%	H
Aspect (south-, southwest-, or west-facing slopes)	M

Source: Logan Simpson Design Inc.
[a] H = high, M = moderate, L = low.

Riparian corridors, shrublands, and vegetation associations occurring in steep slopes with a south or southwest aspect are the greatest wildland fuel hazards within the CWPP. Saltcedar-invaded and early-seral-stage riparian habitats constitute a second major wildland fire risk vegetative association. Shrubland areas constitute the next greatest wildland fire risk, in relation to high slopes and south or southwest aspects. In invaded riparian vegetation associations where riparian deciduous tree species are located, total wildland fuels can exceed 20 tons per acre and produce flame lengths greater than 6 feet above the overstory with a rate of spread of over 525 feet (8 chains) per hour. In addition, some shrublands with heavy invasions of nonnative grasses can produce wildfires of high intensity and high rates of spread that are capable of igniting adjacent overstory vegetation. Buffelgrass infestations that comprise a 25 percent landcover will produce approximately 1 ton of fuel; at 50 percent landcover, infestations can produce up to 3 tons of fuel, and at 80 percent landcover, they can produce over 5 tons of fuel that can produce flame lengths in excess of 25 feet and rates of spread in excess of 700 chains per hour with a mid-flame wind speed of 15 mph (Grissom 2010). Buffelgrass readily invades disturbed habitats such as trails, roadways, utility easements and desert washes and also invades undisturbed desert (Photo 2.8). Areas with heavy infestations of buffelgrass will significantly alter wildland fire behavior increasing severity with high rates of spread and flame heights from native vegetation. This potentially leads to devastating fires that can convert the ecologically rich Sonoran Desert into a more monotypic exotic grassland environment. Buffelgrass fires are highly detrimental to cacti and native trees and can eliminate them from the landscape. The occurrence of fire in ecosystems that evolved in the absence of fire often can lead to species loss and future restructuring of plant and animal interactions, favoring fire-adapted exotic species over natives (Hobbs and Huenneke 1992). Such wildfires do not significantly impact the buffelgrass stands which can come back more vigorously than before the fire (Cox et al. 1990). Areas of known buffelgrass invasions in 2009 for the Tucson Basin are shown in Figure 2.5 (SABCC 2010). As additional investigations into buffelgrass invasions are completed, areas of buffelgrass infestations where landcover is 50 percent or higher should be defaulted to high wildland fire risk.

Moderate wildland fuel risk is associated with the ecotone of the riparian and desert upland vegetation associations. In areas where shrub canopy exceeds 35 percent, light fuels produced by the herbaceous understory are reduced because of overstory shading and competition from overstory shrub species. Under extreme fire conditions, upland shrub communities can carry crown fires with moderate intensities and high rates of spread. Lower wildland fire risk occurs in desert scrub communities in which total fuel loading is low with no continuous arrangement of ground or aerial fuels. Desert upland vegetation associations are not fire-dependent communities, and wildfires within desert vegetation associations will be suppressed during years of above-normal rainfall when wildfires occurring in these vegetative associations may not self-extinguish.

Photo 2.8. Roadway with Heavy Buffelgrass Infestation

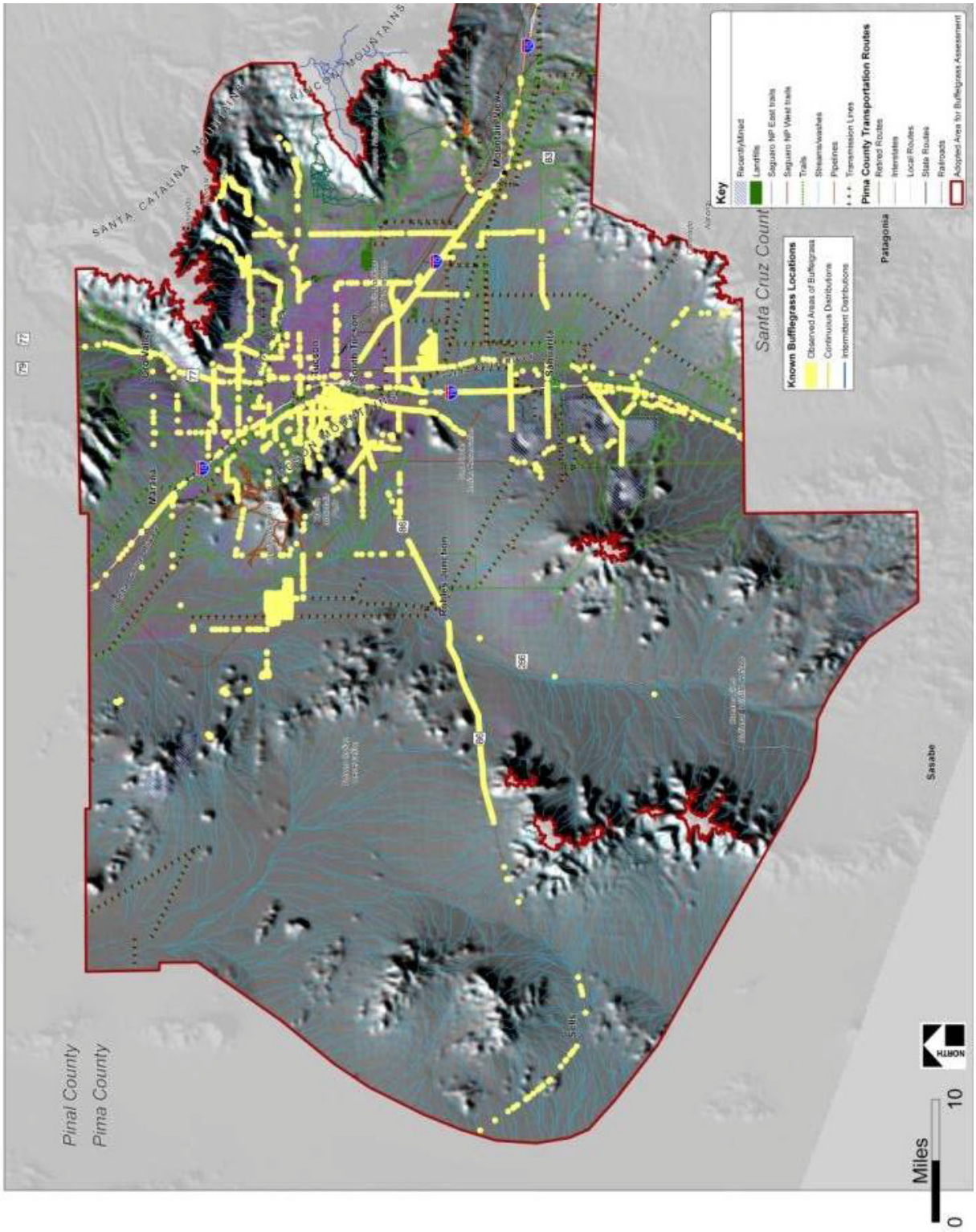

Figure 2.5. Areas of Known Buffelgrass Invasions (2009) in the Tucson Basin

C. Conditions of Ignition and Past Fire Occurrence

Past regional wildfire events are important for determining the potential of an area to support wildland fire. Because of the combination of current drought conditions and a regional history of fires, there will be wildland fire ignitions within the CWPP planning area that must be suppressed. The fire history of the CWPP, including recent large wildfires that have occurred within or close to the analysis area, has been included in this analysis to determine the most likely areas for either natural or human wildland fire ignition. Table 2.5 details the high, moderate, and low positive-influence values assigned to fire-start incidents. These include concentrated areas of lightning strikes and human-caused ignitions. High-potential areas have the greatest number of fire starts per square mile. Wildland fire ignition data is obtained from the Federal Wildland Fire Occurrence Internet Mapping Service (IMS) Web site and database (http://wildfire.cr.usgs.gov/firehistory/) and from the Arizona State Forester's Office. The Federal Fire Occurrence IMS is an interactive GIS for use in the wildland fire and GIS community. The datasets used in this GIS are based on official fire occurrence data collected from five federal and state agencies that have been merged into one fire history point layer. According to these data, 3,226 wildfire ignitions have been reported within the analysis area since 1980. There were nine large fires which burned approximately 137,000 acres in the 6-year period of 2002 through 2007. The areas with the greatest potential for fire ignition, either from natural or human (though unplanned) causes, are found within the communities of Sells and Summerhaven and along the eastern edge of Pima County. Visual representations of these large wildfire and ignition-point locations are mapped in Figures 2.6a–2.6c.

Table 2.5. Ignition History and Wildfire Occurrence

Wildfire Occurrence	Value	Sum of Acres
0–2 fire starts/square mile	L	1,377,947
2–4 fire starts/ square mile	M	174,781
>4 fire starts/square mile	H	26,964

D. Community Values at Risk

Valued at-risk community resources include private and community structures, communication facilities, power lines, local recreation areas, cultural and historic areas, sensitive wildlife habitat, watersheds, natural resources, and air quality. The community values were determined based on the sum of five components: housing density, Insurance Services Office (ISO) ranks, vacant lands, preserve lands, and sensitive species habitats as derived from Pima County Map Guide data (http://gis.pima.gov/maps/mapguide/). High community values include areas where more than three of these influencing factors occur collectively on the landscape. Areas where at least one but less than three of these factors occur on the landscape were assigned moderate values, and areas where these factor do not appear on the landscape were not assigned values.

Risk-influencing factors of developed land and other infrastructures within the area of highest flammability were given the highest priority for protection. In areas where community values occur within or adjacent to areas of high risk due to the fuel hazards of vegetation associations, a cumulative risk from catastrophic

wildland fire was created. These areas of cumulative risk are of greatest concern to Pima County. In accordance with "Risk Factor 2: Risk to Social, Cultural and Community Resources" identified by the Arizona State Forester (2007:2), the Pima County analysis area does include lands consistent with Risk Factor 2, Situations 1, 2, and 3, as follows:

> Risk Factor 2: Risk to Social, Cultural and Community Resources
>
> Situation 1: This situation most closely represents a community in an urban interface setting. The setting contains a high density of homes, businesses, and other facilities that continue across the interface. There is a lack of defensible space where personnel can safely work to provide protection. The community watershed for municipal water is at high risk of being burned to other watersheds within the geographic region. There is a high potential for economic loss to the community and likely loss of housing units and/or businesses. There are unique cultural, historical or natural heritage values at risk.
>
> Situation 2: This situation represents an intermix or occluded setting, with scattered areas of high-density homes, summer homes, youth camps, or campgrounds that are less than a mile apart. Efforts to create defensible space or otherwise improve the fire-resistance of a landscape are intermittent. This situation would cover the presence of lands at risk that are described under state designations such as impaired watersheds or scenic byways. There is a risk of erosion or flooding in the community of vegetation burns.
>
> Situation 3: This situation represents a generally occluded setting characterized by dispersed single homes and other structures that are more than a mile apart. This situation may also include areas where efforts to create a more fire-resistant landscape have been implemented on a large scale throughout a community or surrounding watershed.

1. Housing, Businesses, Essential Infrastructure, and Evacuation Routes

The analysis identifies high-risk areas—including the major community cores and portions of I-10, I-19, US 60, State Route (SR) 77, SR 86, SR 83, SR 85, and SR 286,—as the focus of commercial development. Residential community development is occurring throughout the analysis area in a mix of high-density, single-family, and multi-acre parcels. Parcel data developed by Pima County was reviewed to determine the distribution of private lands and lands uses within the analysis area. These data were then portioned into risk categories depending on the level of development and presence of natural landcover types. This includes areas of highly developed lands that lack significant open space or natural landcovers; moderately developed private lands where an intermingling of public and private lands occur and the major portion of the landscape comprise natural landcover types; and lightly developed private lands where the majority of landcover is composed of natural landcover. Areas of highest development were considered at moderate risk of wildfire, areas of moderate development are considered at high risk of wildfire, and areas of light or no development are considered at low risk of structure/infrastructure loss due to wildfire. Therefore, structures associated with housing and commercial development located in isolated subdivisions and in more dispersed areas of the analysis area with higher ISO ratings are at highest risk.

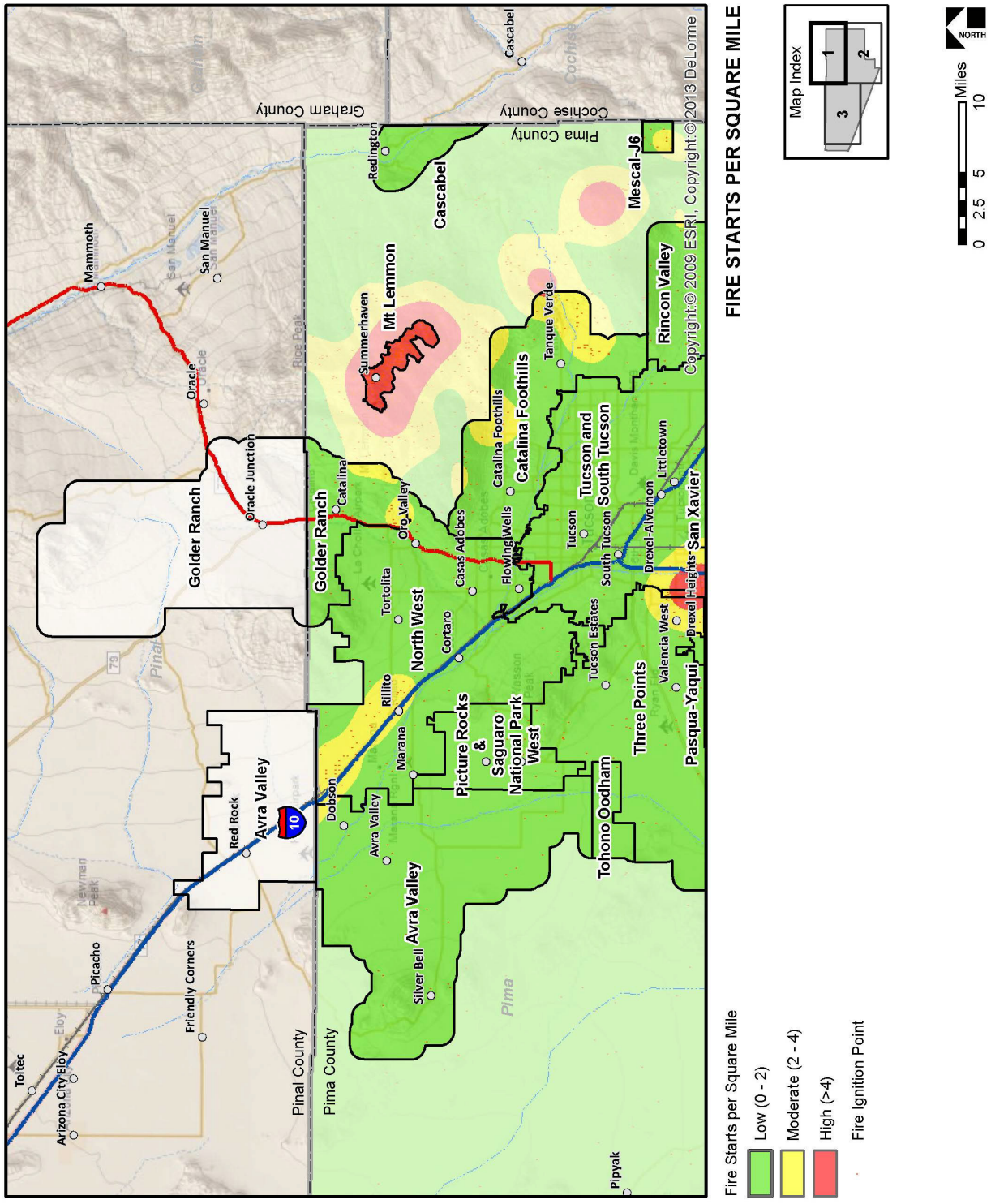

Figure 2.6a. Wildland Fire Ignition History, North

(http://wildfire.cr.usgs.gov/firehistory and ASFD 2009)

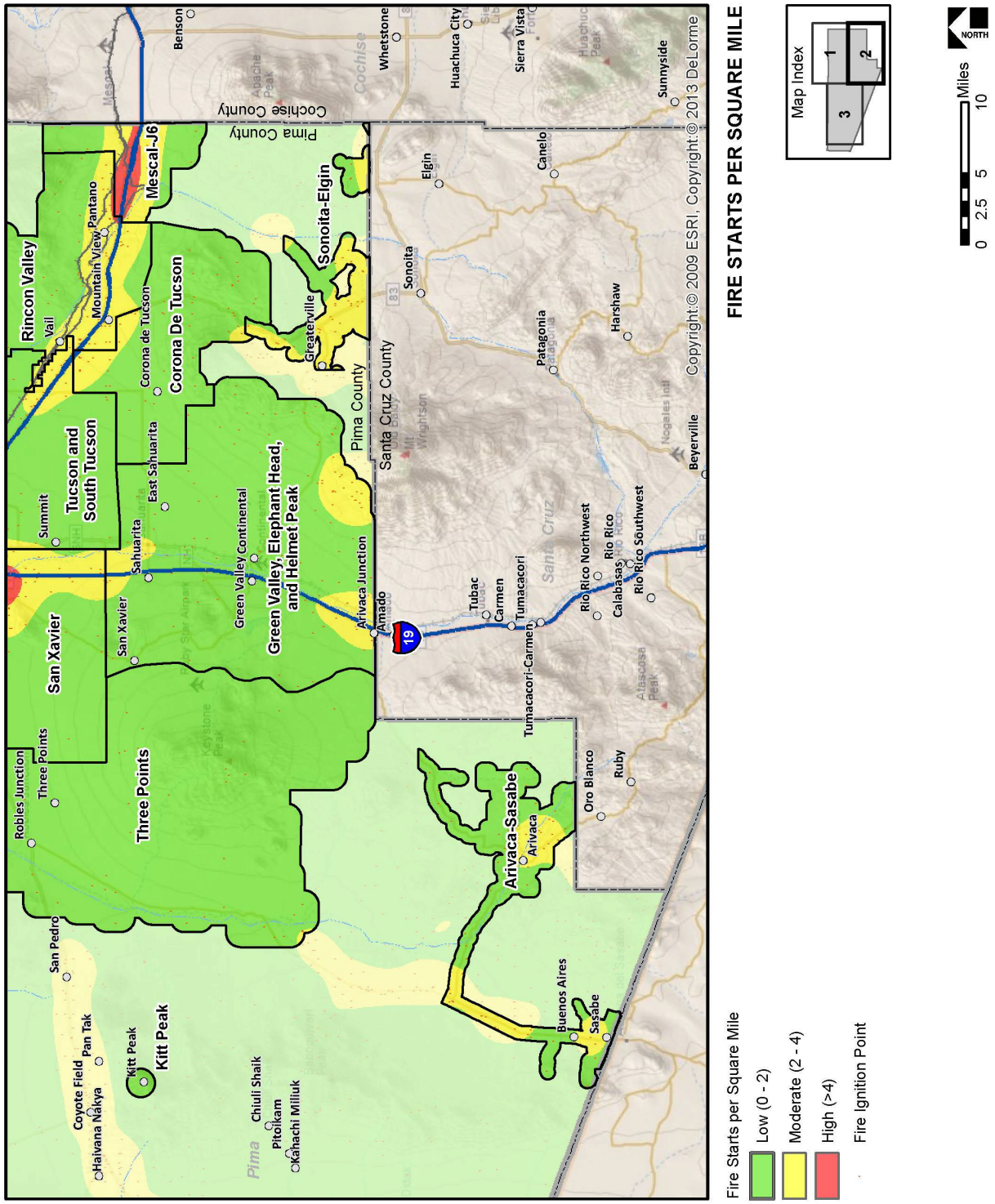

Figure 2.6b. Wildland Fire Ignition History, South

(http://wildfire.cr.usgs.gov/firehistory and ASFD 2009)

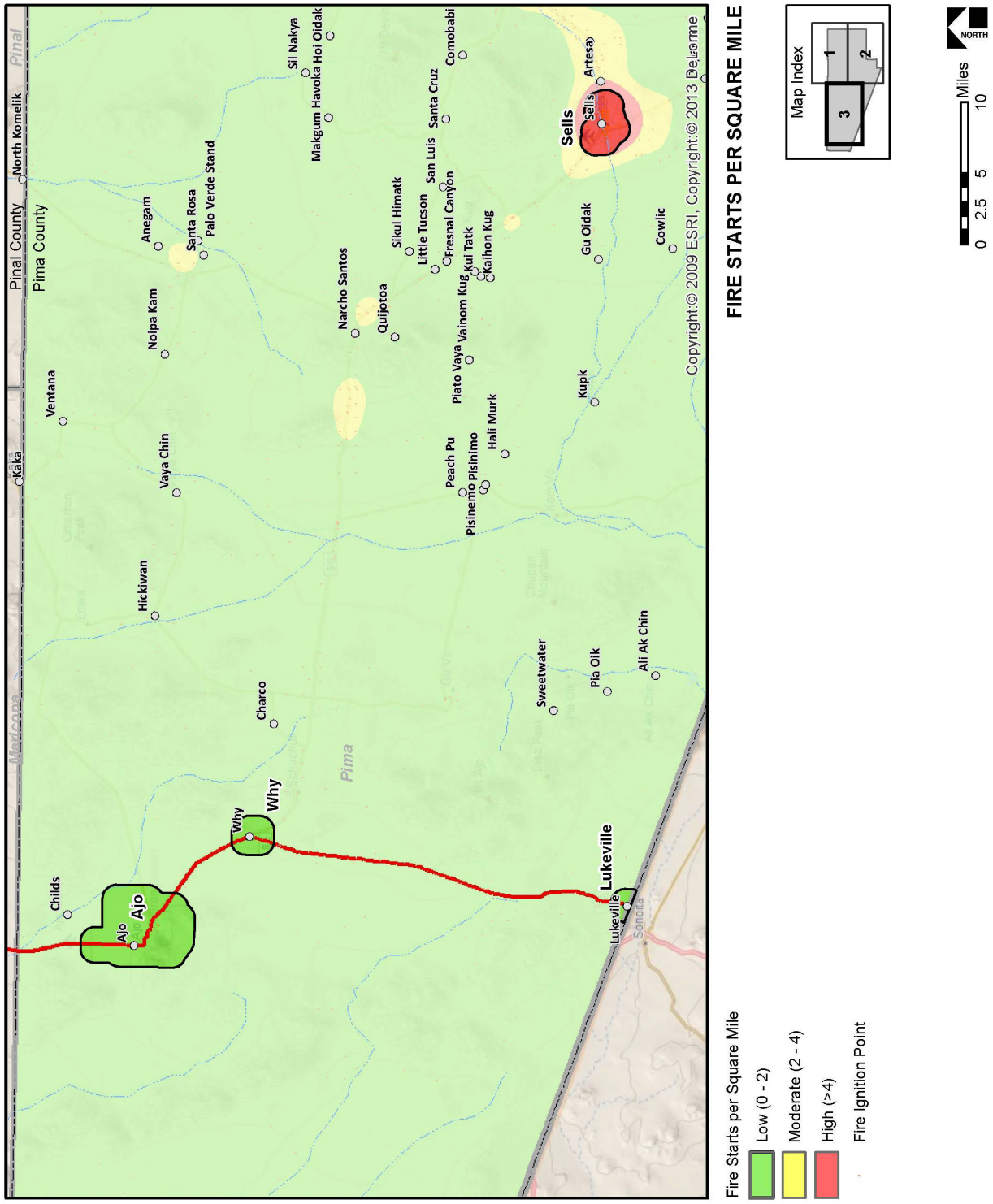

Figure 2.6c. Wildland Fire Ignition History, West

(http://wildfire.cr.usgs.gov/firehistory and ASFD 2009)

2. Preserve and Sensitive Lands

Recreational features within and adjacent to the analysis area—including camping and recreation areas associated with several regional parks; designated camping and recreation areas in Saguaro National Park, on the CNF, and on BLM-managed public lands; wildlife areas; and major FS trailheads—are located throughout Pima County. These parks and recreational areas provide scenic vistas of deep canyons, dry washes, sheer cliffs, distant mountain ranges, colorful soils and rock formations, and mosaics of different vegetation, particularly of the iconic saguaro cactus.

These features are environmental, economic, and aesthetic resources for the surrounding communities and provide year-round recreational opportunities. Because of the benefits that these recreation areas provide to local citizens and community visitors and the potential for increased human-caused wildfire ignitions with increased recreational use, these areas have been analyzed as community values and have an increasing influence factor on wildland fire risk.

The analysis area also includes known and potential habitat areas for several threatened, endangered, and sensitive species and lands acquired by the City of Tucson and Pima County in support of their proposed habitat conservations plans currently under review by the USFWS. The land-management agencies use accepted conservation strategies to mitigate risk to these species by implementing programs that meet natural resource management goals and objectives and to maintain conservation values. Wildland fuel and vegetative restoration treatments within sensitive species habitat may require additional site-specific analysis due to the extraordinary circumstances created by the presence of sensitive species or their habitats. Before any vegetation treatment by the NPS, BLM, or CNF, an assessment will be conducted by the appropriate agency biologist. Site-specific evaluations of individual recommended wildland fuel mitigation projects will determine whether sensitive wildlife species and habitats would benefit from habitat-enhancing treatments that would lessen the threat of catastrophic wildland fire in the vegetative communities of the analysis area while also protecting the recreational values that local residents and visitors associate with the community. The presence of sensitive wildlife and botanical species habitats, in conjunction with areas of high recreational value and human use, have an increasing influence factor on wildland fire risk.

3. Local Preparedness and Protection Capability

For many years, the ISO has conducted assessments and rated communities on the basis of available fire protection. The rating process grades each community's fire protection on a scale from 1 to 10 (1 is ideal and 10 is poor) based on the ISO's Fire Suppression Rating Schedule. Five factors make up the ISO fire rating: water supply—the most important factor—accounts for 40 percent of the total rating, while type and availability of equipment, personnel, ongoing training, and the community's alarm and paging system account for the remaining 60 percent of the rating. Some areas within the Pima County analysis area are not within a fire district; the ISO rating for these areas is 10. Other communities and municipalities within the analysis area are within a fire department or district and have ISO ratings ranging from 1 to 9; these areas are included in the overall risk analysis as reducing the potential of catastrophic wildland fire. ISO ratings will vary within each fire department's or district's service area, depending on housing densities and distance of structures isolated (usually 3 to 5 miles) from a fire station.

The wildland and structural fire response within the analysis area is provided by local fire departments and districts. BLM, CNF, ASFD, BANWR, Tohono O'odham, Pascua Yaqui, and local fire departments and districts provide support for initial wildland fire attack for areas within the Pima County analysis area. Initial-attack response from additional local fire departments and districts can occur under the authority of automatic-aid system and mutual-aid agreements between individual departments or under the intergovernmental agreements (IGAs) that individual fire departments and districts have with the Arizona State Forester and adjacent fire departments and districts.

Land use in the planning area consists primarily of residences; military ranges and airfields; agriculture; livestock production; community businesses; and community services, such as hospitals, schools, organized-sports facilities, and airports. Surrounding areas are dominated by state lands; NPS, BLM, and CNF lands; and private properties. Land uses within or close to the analysis area include fuelwood cutting, hunting, and other recreational activities (for example, hiking, bird watching, nature study, photography, and off-road-vehicle use). State lands occur on the periphery of the communities and often surround developed private land parcels. State lands are administered by ASLD, are managed for a variety of uses, and account for 15 percent (861,623 acres) of the analysis area. State lands within and adjacent to the analysis area could be identified for sale for residential and commercial development or leased for commercial land development.

The primary block of federal land in the Pima County CWPP area consists of portions of BLM lands located throughout the analysis area, with NPS and CNF lands located in the northern, eastern, and southern portions of the analysis area. Pima County provides extensive outdoor recreational opportunities. The open space provided by federal lands and recreational opportunities, in association with the significant wildlife habitats found within the county, provide the quality-of-life amenities that many county residents desire to protect and enhance.

Table 2.6 identifies the different values given to these community value components. Visual representations of these community value components are mapped in Figures 2.7a–2.7c.

Table 2.6. Community Values

Component	Value[a]	WUI Acres (% of WUI)
Recreation areas and infrastructure in the analysis area ≥500 and <1,000 households/square mile	H	289,526 (18)
Housing and business structures and infrastructure in the analysis area ≥1,000 households/square mile	M	859,858 (54)
All other areas	L	430,162 (27)

Source: Logan Simpson Design Inc.

[a]H = high; M = moderate; L = low

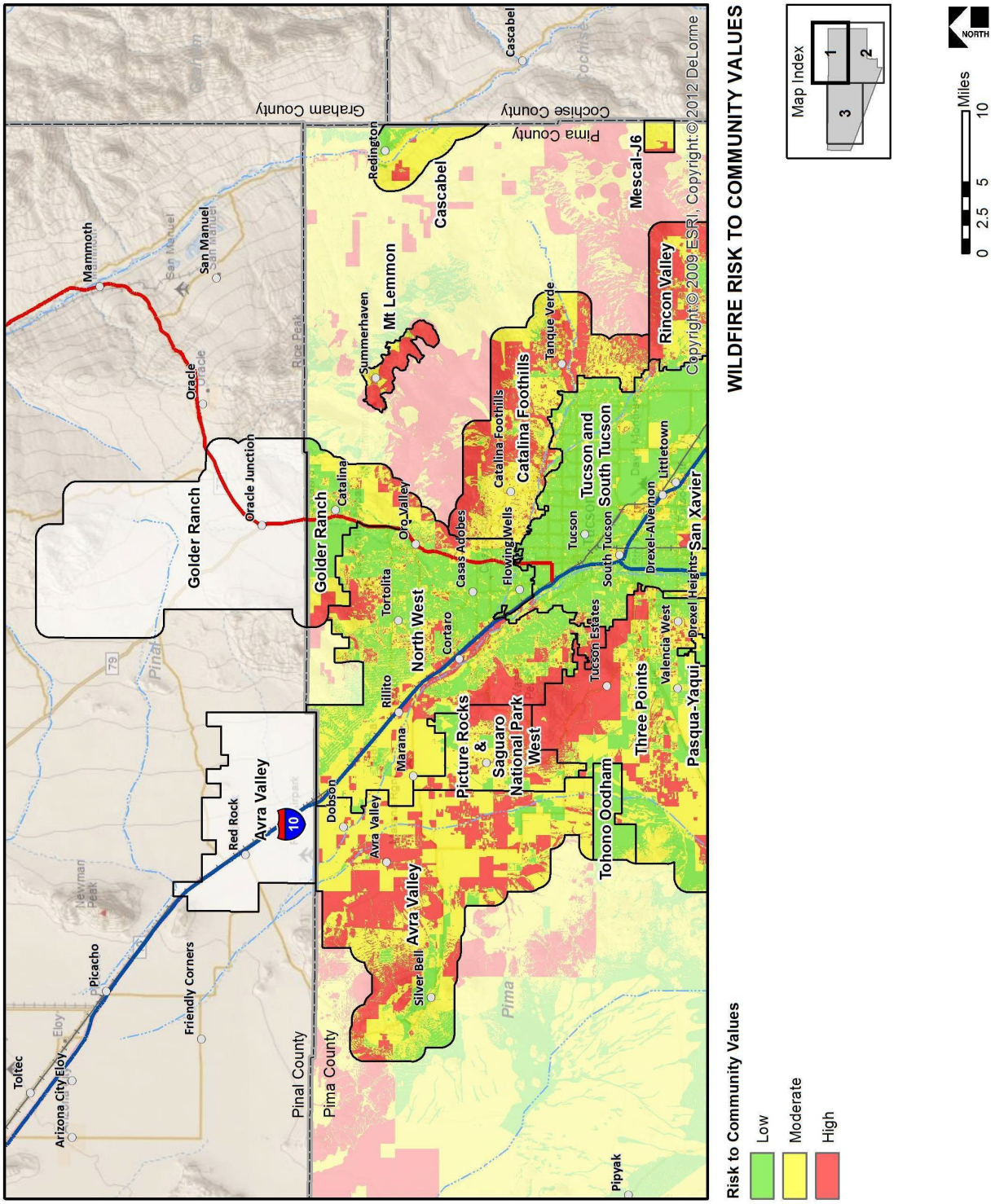

Figure 2.7a. Wildfire Risk to Community Values, North

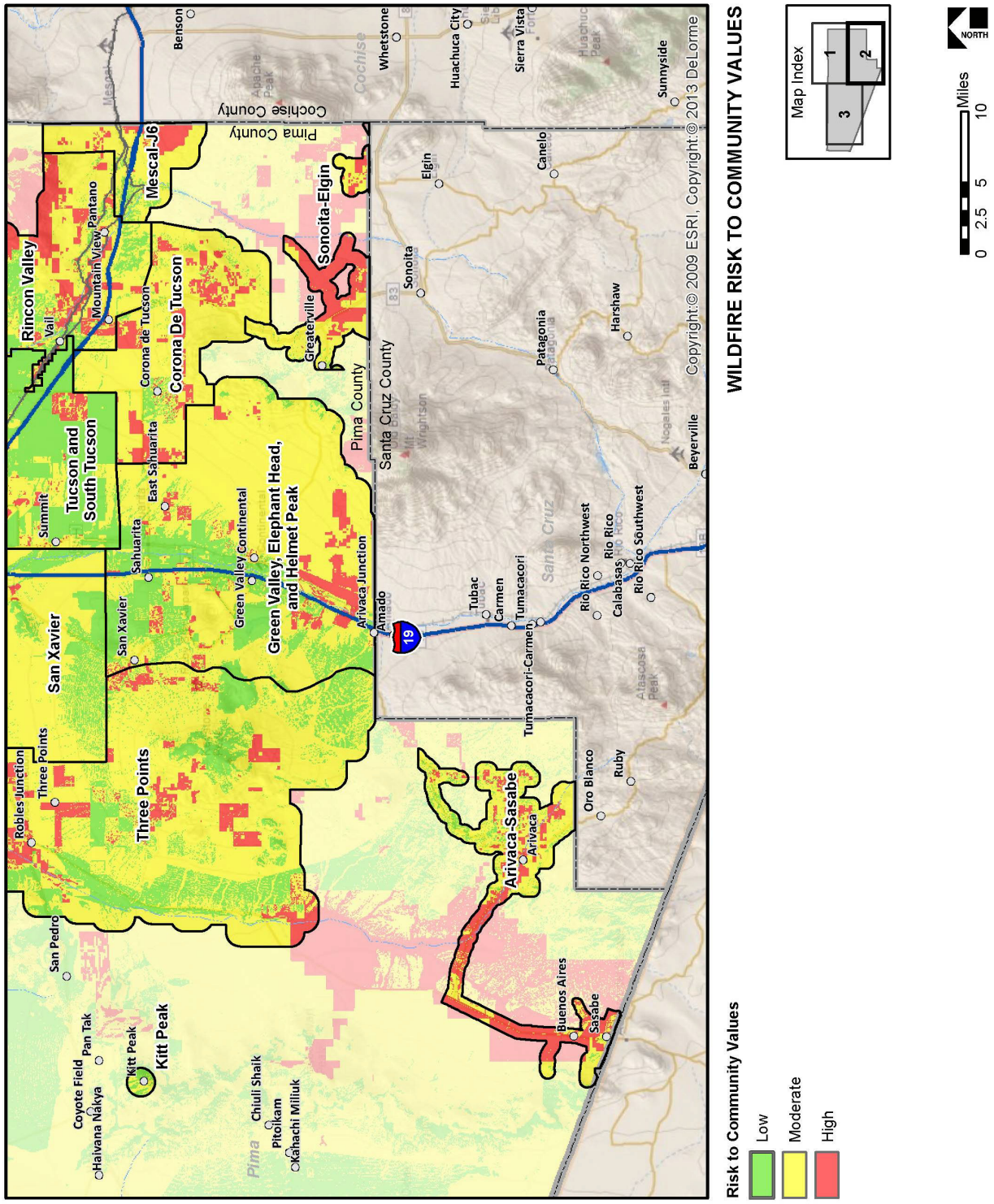

Figure 2.7b. Wildfire Risk to Community Values, South

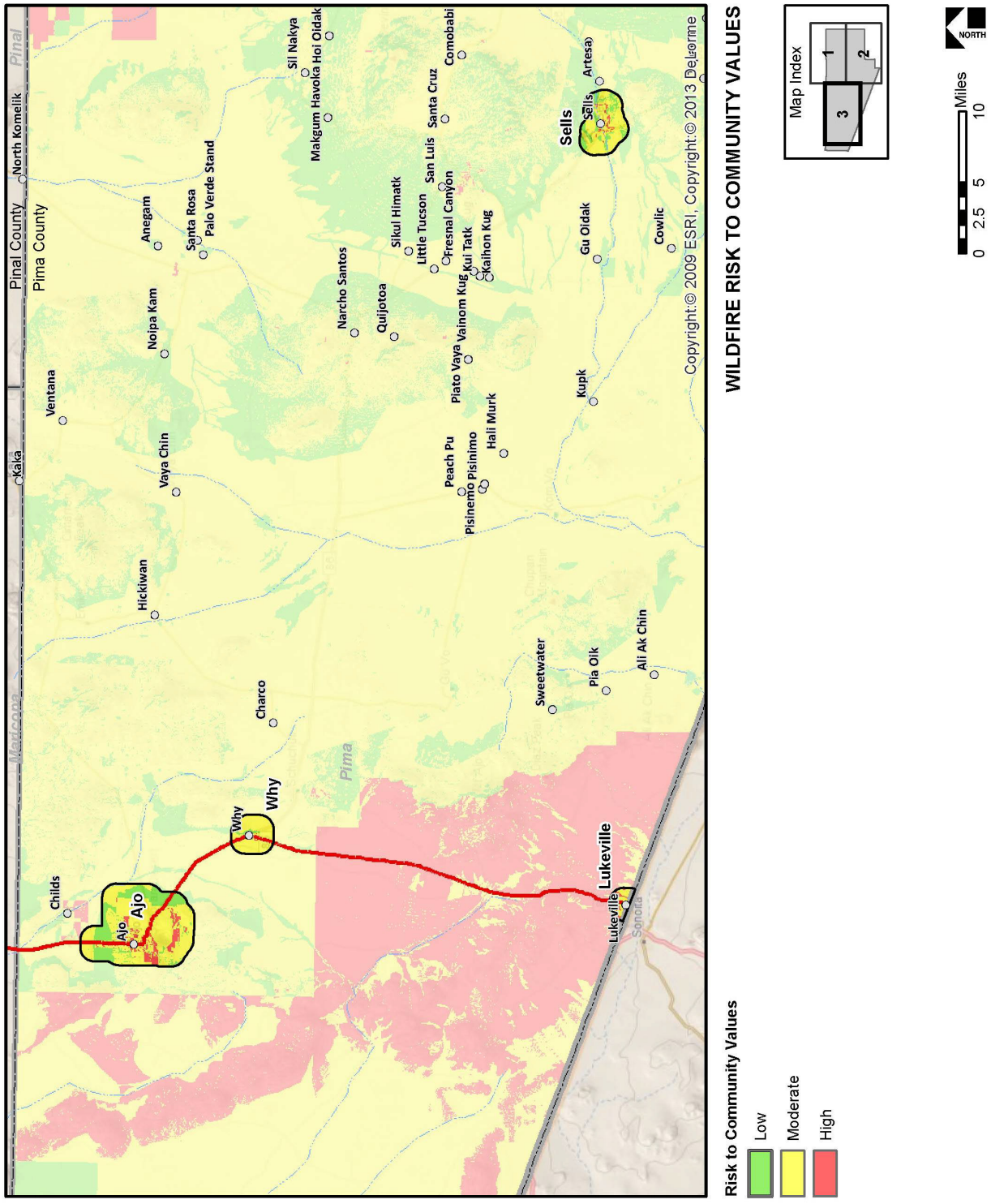

Figure 2.7c. Wildfire Risk to Community Values, West

E. Summary of Community Assessment and Cumulative Risk Analysis

Pima County and local jurisdictions recognize the consequences of disasters and the need to reduce the impacts of natural and human-caused hazards. The County and jurisdictions also know that with careful selection, mitigation actions in the form of projects and programs can become long-term, cost-effective means for reducing the impact of natural and human-caused hazards.

In addition, largely unincorporated areas of the analysis area that are not under the jurisdiction of a fire department or fire district and that may or may not be serviced by individual fire protection are included with the nearest community sub-analysis area and potential wildland fire risk rating.

Community WUI Descriptions and Risk Rating

Arivaca Community WUI

The Arivaca Community WUI is composed of lands within and immediately adjacent to the Arivaca Fire District boundary, the community of Sasabe, lands immediately adjacent to SR 286, Arivaca Road, and Ruby Road that serve as emergency evacuation and fire response corridors. In 2007 the PCOEM and the Arivaca Fire District completed the *Arivaca-Sasabe Community Wildfire Protection Plan*. The Arivaca Fire District provides structural and wildland fire protection to the community, while the BANWR provides wildland fire protection to the community of Sasabe through an agreement with the ASLD. The 2007 Arivaca-Sasabe CWPP analyzed 50,752 acres for wildfire risk. The BANWR is a signatory to the *Arivaca-Sasabe Community Wildlife Protection Plan* and continues to support implementation of priority recommendations of the Arivaca-Sasabe CWPP and those of the Pima County CWPP. The Pima County CWPP incorporates by reference the 2007 Arivaca-Sasabe CWPP. The Arivaca-Sasabe CWPP area has an estimated population in 2010 of 695 residents in Arivaca occupying 492 housing units. The 2010 population estimate for the community of Sasabe is 545 residents occupying 50 housing units. The 2010 population residing within the census tract which includes these communities is estimated at 3,600 residents in approximately 1,800 housing units. (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml/Census tract 43.16). The Arivaca Fire District has an ISO rating of 10. The Pima County CWPP estimates that 14 percent of the 2013 Arivaca Community WUI is at high risk and 71 percent is at moderate risk for unwanted wildland fire. The majority of wildfire starts around the communities of Arivaca and Sasabe have occurred within the riparian corridor of Arivaca Creek in and adjacent to the community of Arivaca. Wildland fire also occurs in the vicinity of Sasabe within the upland vegetative types primarily within the vicinity of Altar Wash and SR 286.

This Arivaca Community WUI does include areas of high risk in lower elevations and in grassland and mesquite vegetation associations during extreme rainfall years. Wildfire ignitions within the Arivaca Community WUI are low. Public use within the WUI is considered moderate in undeveloped areas and high within the BANWR. The risk to community values is considered high due to proximity of the BANWR. The WUI is mostly composed of large developed private land parcels and residential lots within the communities. The combination of low housing density on large private land parcels intermixed with invaded vegetative associations and a high ISO rating creates areas of high risk to community values. Due to areas of high wildfire risk, a low ignition history, and a relatively high density of community values, the overall wildland fire risk rating of the sub-WUI is high.

The Arivaca Fire District and CWPP cooperators are not recommending revisions to the CWPP goals and objectives or fuel mitigation and fire prevention strategies and priorities. The Pima County CWPP signatories support the priority recommendations of the Arivaca-Sasabe CWPP. The Pima County CWPP assimilates by reference the Arivaca-Sasabe CWPP and recommends reviewing that CWPP for detailed risk assessment and mitigation recommendations.

Avra Valley Community WUI

The Avra Valley Community WUI is composed of lands within the Avra Valley Fire District boundary and public and private lands immediately adjacent the fire district boundary, including portions of the community of Marana.

The primary transportation corridors in the Avra Valley Community WUI include I-10 east of the WUI; Sandario, Anway, Trico, and Sanders Roads from the south and north; and Avra Valley Road and Trico Marana Road from the east. The Union Pacific Railroad parallels I-10 traversing the Avra Valley Community WUI from east to west. These roadways include the major business corridors in the WUI. Fire protection services in the Avra Valley Community WUI are provided by the Avra Valley Fire District. The Avra Valley Fire District is capable of responding to structure fires, wildland fires, emergency medical calls, motor vehicle accidents, and hazardous material calls. The Avra Valley Community WUI has an estimated population of 12,450 residents occupying approximately 4,500 housing units (http://factfinder2.census.gov census blocks 44.19 and 44.25) over a 325-square-mile area. The fire district is composed of 3 fire stations that are staffed 365 days a year and is currently building their fourth fire station which estimated to be completed in November 2013. The Avra Valley Fire District has a current ISO rating of 5/9. Subsequent to the 2013 ISO re-rating the Avra Valley Fire District ISO rating will change to 3/8B in July 2013.

Major vegetation associations include desert wash/xeroriparian corridors, creosote bush-bursage desert scrub types with paloverde-mixed cacti desert scrub, and mesquite upland associations occurring in higher elevations of the Silver Bell, Waterman, and Roskruge mountains. The areas of highest wildfire risk are located along the foothills of the Silver Bell, Waterman, and Roskruge mountains and along the Brawley Wash xeroriparian corridor. This portion of the WUI does include areas of high risk in lower elevations during extreme rainfall years from increased light fuels produced from winter annual and perennial invasive grasses such as Mediterranean grass, red brome, and buffelgrass. Wildfire ignitions within the Avra Valley Community WUI are low. Public use within the WUI is considered low to moderate in undeveloped areas. The WUI is mostly composed of large developed private land parcels. The combination of low housing density on large private land parcels, intermixed with invaded vegetative associations, and a high ISO rating creates areas of high community value risk. The Avra Valley Community WUI analyses found that 4 percent of the WUI is at high risk and 74 percent of the WUI at moderate risk for wildland fire. Due to a moderate wildfire risk, a low ignition history, and a relatively high density of community values, the overall wildland fire risk rating of the sub-WUI is moderate.

Ajo Community WUI

The Ajo Community WUI is composed of private and public lands within 1 mile of developed areas of the community of Ajo, including the Ajo Municipal Airport. The Cabeza Prieta National Wildlife Refuge is adjacent to the Ajo Community WUI. The Organ Pipe Cactus National Monument lies south of the WUI;

however, Ajo provides many services to the visitors of this national monument. The Pima County CWPP analyzed 23,957 acres within the Ajo Community WUI for the potential risk to wildland fire. The Ajo-Gibson Volunteer Fire Department provides fire protection services to the community of Ajo and to portions of western Pima County. The primary transportation corridor in the community of Ajo is SR 85 from the north and south. The SR 85 corridor is the major business corridor in the WUI. The 2010 estimated population of the Ajo census-designated place is 3,304 residents occupying 2,175 housing units.

Major vegetation associations include desert wash/xeroriparian corridors and creosote bush-bursage desert scrub types with paloverde-mixed cacti desert scrub occurring in higher elevations of the Little Ajo Mountains. The areas of highest wildfire risk are located along the foothills of the Little Ajo Mountains to the south of the community of Ajo. This portion of the WUI does include areas of high risk in lower elevations to the north and east of the community during extreme rainfall years from increased light fuels produced from winter annual and perennial invasive grasses such as Mediterranean grass, red brome, and buffelgrass. Wildfire ignitions within the Ajo Community WUI are low. Public use within the WUI is considered moderate due to the adjacent Cabeza Prieta National Wildlife Refuge. The WUI is mostly composed of large developed private land parcels with traditional home lots found in the community center. The combination of low housing density on large private land parcels, intermixed with invaded vegetative associations, and areas with a high ISO rating creates areas of high risk to community values. The Pima County CWPP analyses determined that 2 percent of the Ajo Community WUI is at high risk and 55 percent is at moderate risk for wildland fire. Due to areas of moderate to high wildfire risk, a low ignition history, and a moderate density of community values, the overall wildland fire risk rating of the Ajo Community WUI is moderate.

Cascabel Community WUI

The Cascabel Community WUI is composed of private lands along the San Pedro River riparian corridor, including the community of Cascabel and developed lands in the vicinity of Redington. In 2006 the *Cascabel Community Wildfire Protection Plan* was developed and approved by the Pima County Board of Supervisors. The 2006 Cascabel CWPP was a cooperative effort between the citizens of Cascabel, the Cascabel Fire Department, The Nature Conservancy in Arizona, Redington Natural Resources Conservation District, ASFD, BLM, and Cochise County in Arizona. The 2006 CWPP was restricted to developed lands within the San Pedro River riparian corridor within the Cascabel Fire Department boundary in Cochise County. The Pima County CWPP expands the community WUI along the San Pedro River riparian corridor into Pima County, including developed lands in the vicinity of Redington approximately 12 miles north of the community of Cascabel. The 2006 CWPP wildfire risk assessment found areas of high risk associated with invaded vegetation within the San Pedro riparian corridor. The 2006 Cascabel CWWP analyzed 16,350 acres within Cochise County for the risk of wildfire. The Pima County CWPP analyzed an additional 13,599 acres, beginning immediately north of the 2006 CWPP and extending north along the San Pedro River riparian corridor to developed lands north of the Redington area. The 2006 Cascabel CWWP found that 34 percent of the Cascabel WUI is at high risk for wildland fire. The Pima County CWPP found 3 percent of the Pima County Cascabel Community WUI to be at high risk and 51 percent to be at moderate risk for wildland fire. With the exception of the WUI boundary, revised vegetative landcover descriptions, and associated fuel models, the goals and objectives of the 2006 CWPP are still valid; therefore, they have been included in the Pima County CWPP by reference and have been

expanded to include the Cascabel Community WUI within Pima County. The primary transportation corridor in the Cascabel Community WUI is San Pedro Road, which provides access from the south through the community of Pomerene and from SR 77 through San Manuel from the north. There are no retail businesses within the WUI; the closest amenities are located in San Manuel approximately 12 miles north of Redington. The Cascabel Volunteer Fire Department provides fire protection (both structure and wildland) to the southern portion of the community WUI including Pima County and to the area immediately south of Redington. The northern portion of the community WUI is not within a fire district and is assigned an ISO rating of 10. Major vegetation associations within the Cascabel Community WUI area include the warm-desert riparian mesquite bosque and warm-desert riparian woodland and shrublands within the riparian corridor, with mesquite uplands and Sonoran paloverde-mixed cacti shrub associations occurring in adjacent uplands. The major wildfire risk within the Cascabel WUI is within the invaded areas of the San Pedro riparian corridor, though there are areas of high vegetation risk associated with upland associations during years of extraordinary rainfall. Wildfire ignitions within the Cascabel Community WUI are low. Public use within the WUI is considered moderate from off-highway-vehicle use, hiking trails, and undeveloped areas of the WUI. The WUI has an overall low community value rating. Due to the complexity of wildland fuels, limited access, intermixed recreation sites, the Cascabel Community WUI is rated at moderate risk to wildland fire.

Catalina Foothills Community WUI

The Catalina Foothills Community WUI is composed of private and public lands that are mostly north and east of the City of Tucson Fire Department boundary and southeast to about the northern border of Saguaro Park East, including the Hidden Valley, Tanque Verde, Sabino Vista Volunteer, and Tucson Country Club Estates fire districts. Actual fire services with the Catalina Foothill Community WUI, is provided under contact to the Rural Metro Fire Department. The Sabino Canyon Trail, one of the heaviest recreational use trails in the CNF, is located in the WUI, along with Saguaro National Park East bordering the WUI to the southeast. The Pima County CWPP analyzed 72,529 acres within the Catalina Foothills Community WUI for the potential risk to wildland fire. The Rural Metro Fire Department maintains eight fire stations staffed by firefighters and emergency medical personnel. Rural Metro Fire Department is the sole fire protection agency for the Catalina Foothills, including the fire districts of Mountain Vista, Hidden Valley, Sabino Vista, Tanque Verde, and Tucson Country Club Estates. The Rural Metro Fire Department maintains three fire stations and an administrative office within the Catalina Foot hills Community WUI. Unlike fire-district residents who pay for their fire protection services through property taxes, residents, business owners, and property owners in the unincorporated areas of Pima County are responsible for setting up an account directly with Rural Metro. This means that fire protection and emergency services are not paid for through taxes and that residents are responsible for establishing fire service directly with Rural Metro Fire Department. The fire department maintains an ISO rating of 4 in the Sabino Vista Fire District, a rating of 3 in the Tucson Country Club Estates Fire District, and a rating of 3 in the Mountain Vista Fire District. The Tanque Verde Fire District has not yet been rated.

The primary transportation corridors in the WUI communities are River Road, an east-west corridor at the southern end of the WUI, and Skyline/Sunrise Road, an east-west corridor in the central portion of the WUI. Sunrise/Skyline and River road corridors are the major business corridors in the WUI. The 2010 estimated

population for the Catalina Foothills Community WUI includes 22 census tracts with a total estimated population of approximately 75,000 residents occupying approximately 36,000 housing units. The Catalina Foothills Community WUI analysis area includes approximately 115 square miles.

Major vegetation associations include desert wash/xeroriparian corridors and paloverde-mixed cacti desert scrub in lower elevations, with desert oak transition associations occurring in higher elevations toward the foothills of the Santa Catalina Mountains. The areas of highest wildfire risk are located along the numerous desert washes originating from the foothills of the Santa Catalina and terminating at Tanque Verde and Rillito creeks. The northern portion of the WUI does include areas of high risk in the foothills of the Santa Catalina Mountains due to heavy fuel loads, invasive grasses, and winter annuals occurring in areas of steep slopes. Wildfire ignitions within the Catalina Foothills Community WUI are moderate to low, with high wildfire ignitions occurring above the WUI. Public use within the WUI is considered high due to the high use of Sabino Canyon and other community and CNF trails in the WUI. The WUI is mostly composed of large developed private land parcels of high assessed value. The combination of low housing density on large private land parcels, intermixed with invaded vegetative associations, and some areas with a high ISO rating and some with moderate wildfire ignition history creates areas of high risk to community values. The Pima County CWPP analyses determined that 22 percent of the Catalina Foothills Community WUI is at high risk and 47 percent is at moderate risk for wildland fire. Due to areas of high wildfire risk, a moderate ignition history, and a high density of community values, the overall wildland fire risk rating of the Catalina Foothills Community WUI Community WUI is high.

Corona de Tucson Community WUI

The Corona de Tucson Community WUI is composed of lands within the Corona de Tucson Fire District boundary and public and private lands immediately adjacent the fire district boundary. The Corona de Tucson Community WUI lies immediately north of the Santa Rita Mountains within the CNF and adjacent to the north boundary of the Santa Rita Experimental Range managed by the University of Arizona. The primary transportation corridors in the Corona de Tucson Community WUI are Houghton Road connecting to I-10 to the north and Sahuarita Road connecting to SR 83 to the east and to I-19 to the west. The major retail businesses within the WUI are located at or near the intersection of Houghton and Sahuarita roads. Fire protection services in the Corona De Tucson Community WUI are provided by the Corona De Tucson Fire Department. The Corona De Tucson Fire Department was established approximately 35 years ago and provides 24-hour, 7-day staffing with employees who have advanced-life-support training and employees who have Firefighter II certification from the Arizona state fire marshal. The Corona De Tucson Fire Department provides a wide range of services—including fire protection, emergency medical services, desert pest removal, vehicle/home lock-out, child car-seat installation assistance, CPR training, wildland firefighting, residential sprinkler program services, and many others. The Corona De Tucson Fire Department is supported by the taxpayers of Corona De Tucson, Arizona. Fire protection service is provided when available to the nearby un-incorporated areas of Vail, Arizona, for a fee and/or subscription.

The 2010 estimated population of the Corona de Tucson census-designated place is 5,675 residents occupying 2,165 housing units. The Pima County CWPP analyzed 125 square miles as the Corona de Tucson Community WUI. The 2010 census block for the Corona de Tucson Community WUI analyzed for the Pima County CWPP is composed of 8,521 residents occupying 3,307 housing units. The Corona de

Tucson Fire District has an ISO rating of 5 in proximity to the Fire Stations 180 and 182. Outlying areas of the district have an ISO rating of 8.

Major vegetation associations include desert wash/xeroriparian corridors, semi-desert grassland, mesquite uplands, paloverde-mixed cacti desert scrub, and mid-elevation desert shrub associations occurring in higher elevations of the foothills of the Santa Rita Mountains. The areas of highest wildfire risk are located along the foothills of the Santa Rita Mountains and within the numerous xeroriparian areas flowing to the northwest and terminating in the Santa Cruz River. This portion of the WUI does include areas of high risk in lower elevations during extreme rainfall years from increased light fuels produced from winter annual and perennial invasive grasses such as Mediterranean grass, red brome, Lehmann lovegrass, and buffelgrass. Wildfire ignitions within the Corona de Tucson Community WUI are generally low, though high ignition history is present immediately north of the WUI along the I-10 corridor. Public use within the WUI is considered low in undeveloped areas. The WUI is mostly composed of large developed private land parcels with more traditional home lots present in the community core. The combination of low housing density on large private land parcels, intermixed with invaded vegetative associations, and some areas of low ignition history and some with a high ISO rating creates areas of moderate risk to community values. The Pima County CWPP analyses determined that 3 percent of the Corona de Tucson Community WUI is at high risk and 87 percent is at moderate risk for wildland fire. Due to areas of moderate wildfire risk, a low ignition history, and a relatively low density of community values, the overall wildland fire risk rating of the Corona de Tucson Community WUI is moderate.

Green Valley–Elephant Head–Helmet Peak Community WUI

The Green Valley–Elephant Head–Helmet Peak Community WUI is composed of private and public lands within and adjacent to the Green Valley, Elephant Head, and Helmet Peak fire districts, located mostly south of the city of Tucson generally adjacent to the I-19 corridor including the communities of Sahuarita, and Green Valley, and south along I-19 to Arivaca junction. The Helmet Peak Fire Department provides fire protective services to developed lands immediately south of the San Xavier Indian Reservation. Fire services within the Green Valley–Elephant Head–Helmet Peak Community WUI are provided by the Green Valley–Elephant Head–Helmet Peak Fire Departments. The 2010 population of Green Valley is estimated to be 21,391 residents occupying 17,322 housing units. The estimated population of the Helmet Peak area from the 2010 census (census block 43.27) is 4,815 residents occupying 2,446 housing units. The 2010 population of Sahuarita is estimated to be 25,259 residents occupying 10,615 housing units. The 2010 population estimate of the Arivaca junction area is 1,090 residents occupying 388 housing units (http://factfinder2.census.gov/, accessed March 2013). The Green Valley Fire Department was established in 1975, and provides fire protection and emergency services to more than 40,000 constituents residing in a 40-square-mile area within Green Valley and portions of the town of Sahuarita. The Green Valley Fire Department operates out of 4 stations, covering both residential and commercial areas, and maintains an ISO rating of 4 and 6. The Helmet Peak Fire Department covers about 35 square miles in the area of South Mission and Helmet Peak roads, east of I-19 and south of the San Xavier Indian Reservation. The Helmet Peak Fire Department maintains 30 members and answers about 130 calls per year, mainly brush fires and emergency services. The Helmet Peak Fire Department portion of the WUI is considered to have an ISO rating of 10. The Elephant Head Fire Department was established in 1994 and provides fire protection

services to approximately 5,800 residents in the Arivaca Junction, Lakewood, Half-way Trailer Park, and Elephant Head communities. The Elephant Head Fire Department has 33 volunteers serving in various roles with 14 firefighters trained in structure fires, 10 emergency medical technicians (EMTs), 5 first responders trained in basic life-saving techniques, and 7 support personnel who are board members. The Elephant Head Fire Department volunteers respond to an average of about 350 calls per year, including structure fires, brush fires, vehicle fires, and medical emergencies. The Elephant Head portion of the WUI is considered to have an ISO rating of 10. The Pima County CWPP analyzed 208,440 acres within the Green Valley–Elephant Head–Helmet Peak Community WUI for the potential risk to wildland fire.

The primary transportation corridors in the WUI communities are I-19 and South Mission Road, providing a north-south corridor, and Sahuarita Road, providing access from the east. The I-19 and Sahuarita Road corridors are the major business corridors in the WUI.

Major vegetation associations include desert wash/xeroriparian corridors, creosotebush-white bursage desert scrub, and paloverde-mixed cacti desert scrub in lower elevations, with desert juniper transition associations occurring in higher elevations toward the foothills of the Santa Rita Mountains to the east and Sierrita Mountains to the west of the WUI. The areas of highest wildfire risk are located along the numerous desert washes originating from the mountain foothills. A moderate history of wildfire ignitions occurs along I-19 immediately north of Sahuarita; all others areas of the WUI have a low ignition history. Public use within the WUI is considered low; however, access to the west slopes of the Santa Rita Mountains and to the CNF originates from I-19 in this WUI. The WUI is composed of a mix of large developed private land parcels and traditional housing subdivisions of varied assessed value. The combination of mixed housing density, intermixed with areas of vegetative associations with low fire potential, and some areas with a high ISO rating and some with low wildfire ignition history creates areas of low risk to community values. The Pima County CWPP analyses determined that 3 percent of the Green Valley–Elephant Head–Helmet Peak Community WUI is at high risk and 66 percent is at moderate risk for wildland fire. Due to areas of low-moderate wildfire risk, areas of moderate ignition history, and a low density of community values, the overall wildland fire risk rating of the Green Valley–Elephant Head–Helmet Peak Community WUI Community WUI is moderate.

Golder Ranch Community WUI

The Golder Ranch Community WUI is composed of lands within and immediately adjacent to the Golder Ranch Fire District boundary. In 2007 the PCOEM and the Golder Ranch Fire District completed the Catalina Community Wildfire Protection Plan. In 2009 the Pinal County Office of Emergency Management and Golder Ranch Fire District participated in the development and approval of the Pinal County Community Wildfire Protection Plan. These two CWPPs encompass the Golder Ranch Fire District boundary and adjacent lands within both Pima and Pinal counties. The Golder Ranch Fire District serves a 210-square-mile area with a population of nearly 65,000 residents. Included in this district are the communities of Oro Valley, Catalina, and SaddleBrooke and southern Pinal County.

The 2007 Catalina CWPP planning area analyzed 22,504 acres of land including Catalina State Park, Pima County, CNF, ASLD, and private lands. The 2009 Pinal County CWPP includes that portion of Golder Ranch Fire District north of Pima County, including Oracle Junction, developed lands in Falcon Valley, and SaddleBrooke Estates 2. The Pima County CWPP Golder Ranch Community WUI has expanded the

Catalina analysis area to 31,095 acres through the addition of a 1-mile buffer along the CNF boundary and the lands adjacent to the Tortolita Mountain Park. The Pima County CWPP analyses confirm a wildland fire threat to the WUI from the heavily vegetated upland habitats along the foothills of the Catalina Mountains, the xeroriparian corridor of Cañada del Oro, and the associated drainages where heavy xeroriparian vegetation associations occur in relation to higher slopes and southerly and southwesterly exposures increase wildfire risk. The Pima County CWPP determined that 8 percent of the Golder Ranch WUI is at high risk and 49 percent is at moderate risk for unwanted wildland fire. The lands within the Golder Ranch Community WUI that are located within 5 miles of a Golder Ranch fire station have an ISO rating of 3.

The Catalina and Pinal County CWPPs outlined vegetative fuel reduction priorities, as well as wildfire prevention priorities. The Golder Ranch Fire District, community members, and the CNF have been working to complete fuel-reduction priorities within the WUI. The Golder Ranch Fire Department and CWPP cooperators are not recommending revisions to the CWPPs' goals and objectives or fuel mitigation and fire prevention strategies and priorities. The Pima County CWPP signatories support the priority recommendations of the Catalina and Pinal County CWPPs.

The Pima County CWPP assimilates by reference the Catalina CWPP and that portion of the Pinal County CWPP which includes the Golder Ranch Fire District and adjacent lands.

Kitt Peak WUI

The Kitt Peak WUI is identified as a "community at risk" with a "moderate WUI risk rating" in the 2009 Arizona State Forester's Arizona-Identified Communities at Risk for Pima County (http://www.azsf.az.gov/). The Kitt Peak WUI includes the National Observatory, visitor center, and picnic areas. Kitt Peak is located 56 miles southwest of Tucson, Arizona, in the Schuk Toak District on the Tohono O'odham Nation. The Kitt Peak National Observatory is part of the National Optical Astronomy Observatory and supports the most diverse collection of astronomical observatories on Earth for nighttime optical and infrared astronomy and daytime study of the Sun (http://www.noao.edu/kpno).

Kitt Peak has an elevation of 6,875 feet and is the highest point in the Quinlan Mountains. Major vegetation associations include desert wash/xeroriparian corridors and paloverde-mixed cacti desert scrub within the lower elevations of the Quinlan Mountains. The higher elevations of Kitt Peak are composed of the Madrean pine-oak woodlands. The areas of highest wildfire risk are located within the higher vegetative fuel loads of the pine-oak woodlands. Wildfire ignitions within the Kitt Peak WUI are low but there have been several large fires nearby. Public use within the WUI is considered high due to the high public visitation and significant scientific values of the observatory. There is no formal fire protection for Kitt Peak; therefore, the WUI is assigned an ISO rating of 10. The Pima County CWPP analyses of the 2,009-acre Kitt Peak WUI determined that 63 percent is at moderate risk for wildland fire. Due to areas of moderate wildfire risk, a low ignition history, and a high density of community values, the overall wildland fire risk rating of the Kitt Peak Community WUI is moderate.

Lukeville Community WUI

The Lukeville Community WUI is composed of private and public lands within 1-mile of developed areas of the community of Lukeville, including the Lukeville Port of Entry border crossing into Sonoyta, Sonora, Mexico. Lukeville is the terminus of SR 85 and is located entirely within the Organ Pipe Cactus National

Monument. SR 85 provides access to the community and existing services are located along the SR 85 corridor. The town of Ajo provides most services to the visitors of the Organ Pipe National Monument and residents of Lukeville. The 2010 US census estimated a population of 39 residents occupying 24 housing units within the community WUI. The Pima County CWPP analyzed 1,741 acres within the Lukeville Community WUI for the potential risk to wildland fire. The Lukeville Community is not within a fire district and is assigned an ISO rating of 10.

Major vegetation associations include desert wash/xeroriparian corridors, creosote bush-bursage desert scrub types, with paloverde-mixed cacti desert scrub occurring in higher elevations to the west of the community in the Sonoyta Mountains. The Lukeville Community WUI does include areas of high risk in lower elevations to the north and east of the community during extreme rainfall years from increased light fuels produced from winter annual and perennial invasive grasses such as Mediterranean grass, red brome, and mustards. Wildfire ignitions within the Lukeville Community WUI are low. Public use within the WUI is considered moderate due to the adjacent Organ Pipe National Monument and traffic associated with the port of entry. The WUI is mostly composed of small developed private land parcels with traditional home lots found in the community center. The combination of low housing density, intermixed with invaded vegetative associations, and areas with a high ISO rating create areas of moderate risk to community values. The Pima County CWPP analyses determined that 3 percent of the Lukeville Community WUI is at high risk and 87 percent is at moderate risk for wildland fire. Due to areas of moderate wildfire risk, a low ignition history, and a moderate density of community values, the overall wildland fire risk rating of the Lukeville Community WUI is moderate.

Mescal-J6 Community WUI

The Mescal-J6 Community WUI is composed of private and public lands within and adjacent to the Mescal-J6 Fire District, located in eastern Pima County adjacent to I-10 at the Pima County–Cochise County border. The Mescal-J6 Fire District provides fire, rescue, and emergency services to the Mescal, J6, Skyline, Empire Acres, and Salcido Acres communities. The Mescal-J6 Fire District also covers the Titan and Dark Star road areas just west of the Benson City limits and I-10 from Mileposts 302 to 289 for fire response. The Mescal-J6 Fire District covers approximately 14 square miles with a total response area of approximately 225 square miles. The Mescal-J6 Fire District responds to wildland fires throughout Southern Arizona in accordance with requests from ASLD, FS, and BLM. The Mescal-J6 Fire District still operates in a strictly volunteer capacity with no full-time personnel employed. The Mescal-J6 Fire District responded to 365 calls for service in 2011 and has responded to 288 calls for service as of September 4, 2012. The 2010 population of the Mescal-J6 Community WUI is estimated to be 9,464 residents occupying 5,049 housing units (http://factfinder2.census.gov/, accessed March 2013). The Mescal-J6 Community WUI is considered to have an ISO rating of 10. The Pima County CWPP analyzed 30,378 acres within the Mescal-J6 Community WUI for the potential risk to wildland fire.

The primary transportation corridors in the WUI communities are I-10 traversing the WUI from the east and west, Mescal Road to the north, and South J6 Ranch Road to the south providing a north-south corridor in the WUI. The Union Pacific Railroad parallels I-10 to the north. The major business and community services are located adjacent to the I-10 frontage road or to Mescal and South J6 Ranch roads.

Major vegetation associations include desert wash/xeroriparian corridors, Apacherian-Chihuahuan mesquite upland scrub, Apacherian-Chihuahuan semi-desert grasslands and steppe, and Chihuahuan-creosotebush mixed desert and thorn scrub vegetations in lower elevations, with desert-oak transition associations occurring in higher elevations toward the foothills of the Rincon Mountains to the northwest of the WUI. The areas of highest wildfire risk are located along the numerous desert washes and grassland fan terraces originating from the mountain foothills. This portion of the WUI does include areas of high risk in lower elevations during extreme rainfall years within the desert grasslands, particularly from increased light fuels produced from winter annual and perennial native and invasive grasses. Areas with a high and moderate history of wildfire ignitions occur along I-10 and within the northern portion of the WUI in the eastern foothills of the Rincon Mountains within the vicinity of Happy Valley. Public use within the WUI is considered low. The WUI is composed of a mix of large developed private land parcels and traditional housing subdivisions of varied assessed value. The combination of mixed housing density, intermixed with areas of vegetative associations with high fire potential, and some areas with a high ISO rating and high wildfire ignition history create areas of high risk to community values. The Pima County CWPP analyses determined that 23 percent of the Mescal-J6 Community WUI is at high risk and 71 percent is at moderate risk for wildland fire. Due to areas of high-moderate wildfire risk, areas of high ignition history, and a low density of community values, the overall wildland fire risk rating of the Mescal-J6 Community WUI is high.

Mt. Lemmon Community WUI

The Mt. Lemmon Community WUI is composed of private lands within the Mt. Lemmon Fire District boundary and within FS lands managed by the CNF adjacent to and within the fire district boundary. The community of Summerhaven, which includes the Loma Sabino Pines tract, comprises a majority of the private land. The WUI portion on FS land includes Mt. Lemmon Ski Valley, recreation residence tracts (Fern Ridge, Soldier Camp, Bear Wallow, Willow Canyon), organization camps (Organization Ridge), observatories and communications sites (Radar Base/Radio Ridge, Mt. Bigelow), and CNF administrative sites (Palisades, Sollers Point). There are also numerous national forest recreation areas along the General Hitchcock Highway. The Mt. Lemmon Community WUI lies adjacent to and includes part of the 56,933-acre Pusch Ridge Wilderness area. In 2004 the Mt Lemmon Wildland-Urban Interface Plan for Forest Health Wildland Fire Management was developed and approved by the Pima County Board of Supervisors.

The 2004 WUI Plan was a cooperative effort between the citizens of Mt. Lemmon, Mt. Lemmon Fire Department, Trees for Mount Lemmon, Pima County, ASLD, and CNF. Subsequent to the adoption of the 2004 WUI Plan, Pima County adopted and has continued to adopt revised editions of the International WUI Code that is applicable to a Rural Forest Village which under the Pima County Comprehensive Plan included Summerhaven in this special land use designation. The goal of the 2004 WUI Plan “to create a healthy, vigorous forest and simultaneously reduce potential for a return of catastrophic wildlife fire” remains current. With the exception of the WUI boundary, revised vegetative landcover descriptions, and associated fuel models, the goals and objectives of the 2004 WUI Plan are still valid have been included in the Pima County CWPP by reference.

The primary transportation corridor in the Mt. Lemmon Community WUI is the General Hitchcock (Mt. Lemmon) Highway, which connects Summerhaven to the Tucson Basin. The major retail businesses within the WUI are located in the community of Summerhaven. TRICO Electric Cooperative is the utility provider for the community of Summerhaven and is included as a cooperator in the Mt Lemmon Community WUI. The Pima County CWPP cooperators are supportive of the revision of the 2004 Mt. Lemmon CWPP boundary that has been collaboratively developed by the 2004 Cooperators and the Arizona FireScape project. The 2013 WUI is modified to follow topographic features and trails encircling the community at approximately the 8,000-foot mean sea level contour. The 2013 proposed Mt. Lemmon WUI boundary is more logical because it follows the topography and developed features instead of a straight line through rugged country. It follows access for firefighters and fuel maintenance crews so they can enter the area and start action to more readily identify, suppress, or manage wildland fire. It also defines an area for preventive treatment to better protect lives and property. Portions of the revised boundary are adjacent to and within the northern and eastern sections of the Pusch Ridge Wilderness boundary. The approval and concurrence of the Pima County CWPP will serve as revising the 2004 Mt. Lemmon WUI boundary to the 2013 WUI boundary as depicted in Figure 2.8. The Pima County CWPP analyzed 12 square miles as the Mt. Lemmon Community WUI, as depicted in Figure 2.8. The Mt. Lemmon Fire District provides fire protection (both structure and wildland), emergency medical services, rescue, and public assistance to the community WUI centered in the community of Summerhaven. Established in 1979 as a fully volunteer agency, the district has grown into a combination department with a fire chief and a full-time staff of officers, firefighters, and paramedics, as well as over a dozen volunteers. The 2010 estimated population of the Mt. Lemmon census-designated place is 40 full-time residents; however, the community is estimated to have 259 housing units. The Mt. Lemmon Fire District has an ISO rating of 5. Major vegetation associations within the Mt. Lemmon WUI are derived from the ecological units developed by the FireScape program (http://www.azfirescape.org/catalina/landscape_types). Major vegetation associations include the Madrean pine-oak, ponderosa pine, and mixed conifer forest. The Mt. Lemmon Community WUI is the only Pima County community WUI which includes the ponderosa pine, mixed conifer, and Madrean pine-oak forest vegetation associations. As evidenced by previous wildfires, these vegetation types can support extreme fire behavior. Wildfire ignitions within the Mt. Lemmon Community WUI are common, with an average of 13 fires per year. Public use within the WUI is considered high in residential areas, recreation sites, and undeveloped areas of the WUI. The wildland fire risk influencing factor of housing density may not accurately reflect community values risk due to the high recreation capacity, recreational development, communication towers, and research facilities. Due to the complexity of wildland fuels, limited access, intermixed recreation sites, communication and research facilities, and private residents, the Mt. Lemmon Community WUI is rated at high risk for wildland fire.

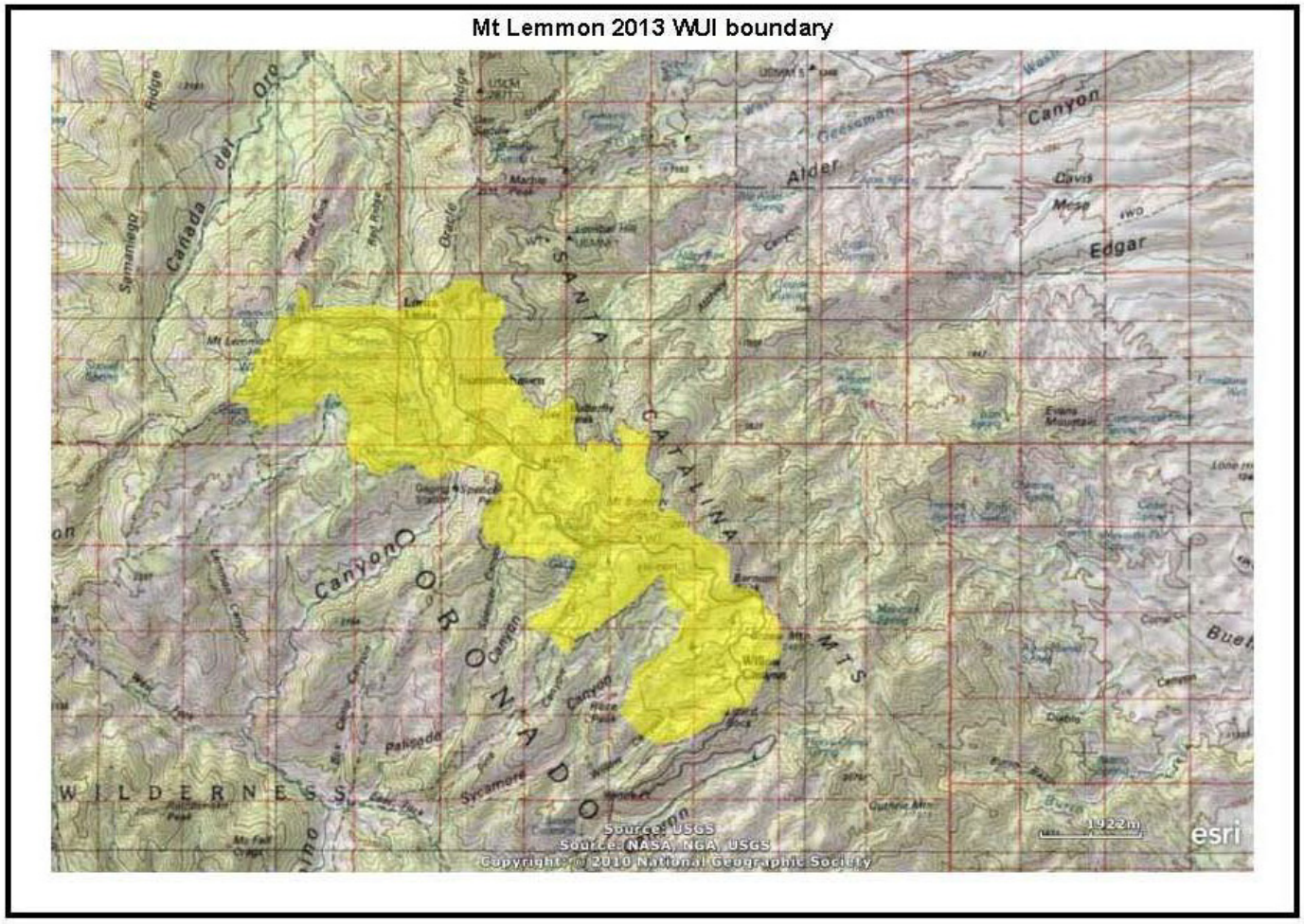

Figure 2.8. Mt. Lemmon Community WUI Analysis Area

Northwest Community WUI

The Northwest Community WUI is composed of lands within the Northwest Fire District boundary and public and private lands immediately adjacent the fire district boundary, including portions of the communities of Oro Valley and Marana.

The primary transportation corridors in the Northwest WUI include I-10 from the northwest to southeast; Tangerine Road in the northeast; Silver Bell Road paralleling I-10; and Avra Valley, Sanders, and Trico-Marana roads in the west. These roadways include the major business corridors in the WUI. The Northwest Community WUI is composed of 236 square miles and includes private and public lands that are located within a fire district. Fire protection services in the Northwest Community WUI are provided by the Northwest Fire District. The district currently provides emergency and community services to 110,000 residents and 3,300 commercial occupancies over a 140-square-mile area. The district is composed of 10 fire stations that are staffed 365 days a year with 192 firefighters who are paramedics or EMTs, along with a seasonal wildland team which responds locally as well as nationally to wildland fires. Full staffing for the in-district brush trucks normally begins in April each year and is staffed through August or when sufficient monsoon moisture has occurred. The wildland team has one or two trucks staffed daily, with at least one full-time person and one or two seasonal employees. The wildland team responds to fires in the CNF, as

well as other agencies in southern Arizona if requested. In 2009, the in-district brush trucks responded to 42 public-assistance calls and 20 brush-fire calls and have assisted, when possible, with some of the district's structure fires.

Major vegetation associations within the WUI community include the paloverde-mixed cacti desert scrub, with mesquite upland and chaparral associations occurring in higher elevations to the north of the community. Portions of the riparian corridors of Cañada de Oro, Rillito, and Santa Cruz rivers occur in the WUI. The areas of highest wildfire risk are located along xeroriparian corridors and the foothills of the Tucson, Catalina, and Tortolita mountains. These areas of highest wildfire risk include desert wash/xeroriparian corridors and creosote bush-bursage desert scrub types, with paloverde-mixed cacti desert scrub and mesquite upland associations occurring in higher elevations of the Tucson, Catalina, and Tortolita mountains. Parts of the Santa Cruz River riparian corridor and the Canada del Oro are heavily infested with the highly flammable, nonnative tree saltcedar. This portion of the sub-WUI does include areas of high risk along I-10 from Cortaro Road north to the Pima-Pinal county boundary, and the foothills of the Tucson, Catalina, and Tortolita mountains have a moderate wildfire risk during extraordinary rainfall years. Wildfire ignitions within the Northwest Community WUI are low with the exception of the area adjacent to I-10 at the Pima-Pinal county boundary. However, the adjacency of the Northwest Community WUI to the Ironwood National Monument and public use along the Santa Cruz River corridor is considered as moderate to high human use in undeveloped areas of the sub-WUI. The Pima County CWPP analyses classified 10 percent of the Northwest Community WUI at high risk and 44 percent at moderate risk for wildland fire. Due to a moderate to high wildfire risk, a moderate ignition history, and a moderate to high density of community values, the overall wildland fire risk rating of the sub-WUI is moderate.

Pascua Yaqui Community WUI

The Pascua Yaqui Tribe is located in Pima County on less than 2 square miles in the southwestern part of the Tucson metropolitan area. Private lands within the communities of Drexel Heights and Valencia West border the Pascua Yaqui Tribe on the north, east, and west, and the San Xavier Indian Reservation borders the tribe on the south. The 2010 population estimate for the Pascua Yaqui Tribe is 4,247 residents occupying 939 housing units (http://factfinder2.census.gov/census tract 9410). On September 18, 1978, the Pascua Yaqui Tribe of Arizona became a federally recognized Indian tribe. The tribe has a status similar to other Indian tribes of the United States, making it eligible for specific services due to the federal trust responsibility that exists between the United States and American Indian tribes. Fire protection services for the tribe are provided by the Pascua Pueblo Fire Department. The Pascua Yaqui Tribe maintains one fire station with three engines, consisting of two Type 1 engines and one Type 6 engine, for response to wildland fires. In 2012, the BIA Salt River Agency developed a fire management plan (2012a) and a fuels management plan (2012b) that included analyses of the Pascua Yaqui Tribe. The 2012 *Fuels Management Plan* shows the Pascua Yaqui Tribe to be an intermix of variable housing density primarily in the northern portion of the Pascua Yaqui Tribe and open lands composed of native vegetation in the southern portion. Major vegetation associations within the Pascua Yaqui Tribe include desert wash and North American warm-desert riparian systems (32 acres), Apacherian-Chihuahuan mesquite upland scrub (14 acres), Sonoran mid-elevation desert scrub (10 acres), and Sonoran paloverde-mixed cacti desert scrub associations (665 acres). The 2012 *Fuels Management Plan* shows three fire-behavior fuel models that

represent the majority of predicted fire behavior within the Pascua Yaqui Tribe. These include Northern Forest Fire Lab Fuel Model 1 (GR1), which is composed of grass and grass forb fuels; Fuel Model 2 (GS1), which is composed of a mix of grass and shrubs; and Fuel Model 4 (SH5), which consists of dead and down woody fuels under a tree canopy within the riparian corridors. All wildland fires on the Pascua Yaqui Tribe are subject to initial-attack response with the desired tactics and strategies employed to meet land-management direction. The Pima County CWPP analyzed 1,392 acres of WUI lands within and adjacent to the Pascua Yaqui Tribe for the potential for wildland fire. The Pima County CWPP found that portions of the WUI do include areas of high risk in lower elevations during extreme rainfall years from increased light fuels produced from winter annual and perennial invasive grasses such as Mediterranean grass, red brome, and buffelgrass. Wildfire ignitions within the Pascua Yaqui Tribe WUI are low. Public use within the WUI is considered low to moderate in undeveloped areas. The combination of low to higher housing density on large land parcels, intermixed with invaded vegetative associations, and proximity to expanding private land developments creates areas of high risk to community values. The Pascua Yaqui Tribe WUI analyses found 33 percent of the WUI to be at moderate risk for wildland fire. Due to a moderate wildfire risk, a low ignition history, and a relatively moderate density of community values, the overall wildland fire risk rating of the sub-WUI is moderate to low.

Picture Rocks Community WUI

The Picture Rocks Community WUI is composed of lands within the Picture Rocks Fire District boundary and public and private lands immediately adjacent to the fire district boundary, next to the west and north boundaries of Saguaro National Park.

The primary transportation corridor in the Picture Rocks Community WUI is Belmont and Twin Peaks roads west of Silverbell Road. Sandario, Anway, Trico, and Sanders roads provide north-south access to the WUI, while Orange Grove and Twin Peaks roads provide east-west access. These roadways include the major business corridors in the WUI. Fire protection services in the Picture Rocks Community WUI are provided by the Picture Rocks Fire District. The 2010 estimated population of the Picture Rocks census-designated place is 9,563 residents. However, the district currently provides emergency and community services to these residents over a 33-square-mile area (http://picturerocksfire.org) including providing fire protection services to Saguaro National Park via an IGA. In 2001 the Picture Rocks Fire Department began staffing five personnel per shift. The Picture Rocks Fire District serves a population estimated to be over 9,000 residents and has an ISO rating of 5 in proximity of Station 120 and an ISO rating of 8 in outlying areas of the district.

Major vegetation associations include desert wash/xeroriparian corridors and creosote bush-bursage desert scrub types, with paloverde-mixed cacti desert scrub and mid-elevation desert shrub associations occurring in higher elevations of the Tucson, Waterman, and Roskruge mountains. The areas of highest wildfire risk are located along the foothills of the Tucson and Waterman mountains and along the Brawley Wash xeroriparian corridor. This portion of the WUI does include areas of high risk in lower elevations during extreme rainfall years from increased light fuels produced from winter annual and perennial invasive grasses such as Mediterranean grass, red brome, and buffelgrass. Wildfire ignitions within the Picture Rocks Community WUI are low. Public use within the WUI is considered moderate in undeveloped areas and high within the Saguaro National Monument. The WUI is mostly composed of large developed private

land parcels. The combination of low housing density on large private land parcels, intermixed with invaded vegetative associations, and areas with a high ISO rating creates areas of high risk to community values. The Pima County CWPP analyses determined that 10 percent of the Picture Rocks Community WUI is at high risk and 53 percent is at moderate risk for wildland fire. Due to areas of moderate to high wildfire risk, a low ignition history, and a relatively high density of community values, the overall wildland fire risk rating of the Picture Rocks Community WUI is high.

Rincon Valley Community WUI

The Rincon Valley Community WUI is composed of lands within the Rincon Valley Fire District boundary and public and private lands immediately adjacent the fire district boundary. The Rincon Valley Community WUI lies mostly north of I-10, to the south and west of the Rincon Mountain Wilderness within the CNF and adjacent to the south boundary of Saguaro National Park. The Rincon Valley Community WUI includes the communities of Vail and Mountain View. The Rincon Valley Community WUI also includes the 2,000-acre Colossal Cave Mountain Park, which is administered for Pima County by the Pima County Parklands Foundation and receives substantial public visitation. The primary transportation corridors in the Rincon Valley Community WUI are I-10, which provides east-west access to the WUI, and Wentworth/Colossal Cave Road leading north from I-10. The major retail businesses within the WUI are located in or near the community of Vail. Fire protection services in the Rincon Valley Community WUI are provided by the Rincon Valley Fire District. The Rincon Valley Fire District Wildland Fire Program is designed to promote wildland fire safety within the district, while equipping and preparing fire crews for responding to wildland fires. Every Rincon Valley Fire District firefighter has basic wildland firefighter training, as established by the National Wildfire Coordinating Group. Rincon Valley Fire District maintains a cooperative agreement with the ASFD. This agreement allows Rincon Valley Fire District to call upon additional local, state, and federal firefighting resources, including aircraft and firefighting hand crews, should a large wildfire threaten the district. This agreement also obligates Rincon Valley Fire District to respond when requested to wildland fires across Arizona and the United States, provided the district has adequate staffing. Rincon Valley maintains a team of specialized firefighters who respond to these incidents on fire engines, water tenders, and ambulances. Rincon Valley Fire District was formed in 1985 by residents of the southeast metropolitan Tucson area to ensure that the community received consistent, high-quality emergency services at a reasonable cost. The Rincon Valley Fire District currently provides emergency and community services to 20,000 residents over a 50-square-mile area. The two stations are staffed 24 hours a day and 365 days a year with 37 full-time state-certified firefighters who are paramedics or EMTs. The 2010 estimated population of the Rincon Valley Community WUI is 21,753 residents occupying 8,308 housing units, with 10,208 of these residents and 3,754 of these housing units located within the community of Vail (http://factfinder2.census.gov/, accessed March 2013). The Rincon Valley Fire District has an ISO rating of 5. The Pima County CWPP analyzed 150 square miles as the Rincon Valley Community WUI.

Major vegetation associations include desert wash/xeroriparian corridors, Sonora-Mohave creosote bush-white bursage desert scrub, semi-desert grassland, mesquite uplands, paloverde-mixed cacti desert scrub and mid-elevation desert shrub associations occurring in the foothills of the Rincon Mountains. The areas of highest wildfire risk are located along the foothills of the Rincon Mountains and within the numerous xeroriparian areas flowing to the northwest and terminating in the Santa Cruz River, including Rincon

Creek, Aqua Verde Creek, and Cienega Creek. Many of the major xeroriparian corridors in the Rincon Valley Community WUI have at least locally become infested with saltcedar. The addition of saltcedar to wildland fuels greatly increase fire intensity and behavior, increasing risk to public and fire fighters, and may result impacts to native vegetation associations. Additionally portions of the WUI include areas of high risk in lower elevations during extreme rainfall years from increased light fuels produced from winter annual and perennial invasive grasses such as Mediterranean grass, red brome, and buffelgrass. Areas of high and moderate wildfire ignitions are found adjacent to I-10 at the Wentworth/ Colossal Cave Road intersection and I-10 at SR 83 in the vicinity of Mountain View. Public use within the WUI is considered high in the vicinity of Colossal Cave Mountain Park and in undeveloped areas of SNP and CNF. The WUI is mostly composed of a mix of large developed private land parcels and traditional home lots present in the community of Vail and Mountain View. The combination of mixed housing density, intermixed with invaded vegetative associations, and areas of high ignition history with some areas of high ISO rating creates areas of moderate risk to community values. The Pima County CWPP analyses determined that 17 percent of the Rincon Valley Community WUI is at high risk and 66 percent is at moderate risk for wildland fire. Due to areas of high and moderate wildfire risk, areas of high ignition history, and a relatively high density of community values, the overall wildland fire risk rating of the Rincon Valley Community WUI is high.

Sonoita-Elgin Community WUI

The Sonoita-Elgin Community WUI is composed of lands within and immediately adjacent to the Sonoita Fire District boundary; the communities of Sonoita, Elgin, and Canelo; and lands immediately adjacent to SR 83, SR 82, and the Elgin-Canelo Road. In 2007 the Sonoita-Elgin Firewise Team produced the *Sonoita-Elgin Community Wildfire Protection Plan*, which the Pima County Board of Supervisors signed on July 5, 2007. The Pima County CWPP incorporates the 2007 Sonoita-Elgin CWPP by reference. The Sonoita-Elgin CWPP was a collaborative effort of the communities of Sonoita, Elgin, Canelo, Santa Cruz, and PCOEM, Sonoita-Elgin Fire District, BLM Gila District, CNF, ASFD, National Audubon Society Appleton-Whittell Research Ranch, Las Cienegas National Conservation Area, and local interested citizens. The 2007 CWPP analyzed 118,711 acres for potential risk to wildland fire and found that 57 percent of WUI lands are at high risk of wildland fire. The 2007 CWPP identified 25,596 acres in Pima County, of which 93 percent is at high or moderate risk for wildland fire. The 2007 CWPP cooperators are not recommending amendments to goals, objectives, analyses or the WUI boundary of the Sonoita-Elgin CWPP. Therefore, the Pima County CWPP adopts the 2007 CWPP by reference without amendments. The Sonoita-Elgin Fire District provides structural and wildland fire protection to the communities. The Sonoita-Elgin Fire District is a combination department comprising about 54 volunteer, career, and auxiliary personnel serving a 350-square-mile district. The Sonoita-Elgin Fire District holds a Certificate of Necessity to provide ambulance service that covers a 725 square miles of east Santa Cruz County. The Sonoita-Elgin Fire District provides wildland firefighters, structural firefighters, rescue, prevention, emergency medical services, and hazardous material first responders to the residents within the CWPP analysis area.

The 2010 estimated population of the Sonoita area is 1,268 residents occupying 719 housing units. The 2010 population estimate for the community of Elgin is 965 residents occupying 503 housing units. The 2010 population estimate of residents within the census tract which includes these communities is 5,304 residents occupying 2,107 housing units. (http://factfinder2.census.gov/faces/nav/jsf/

pages/index.xhtml/Census tract 46.09). The Sonoita-Elgin Fire District has an ISO rating of 8 for residents within 5 miles of the fire station, an ISO rating of 9 for residents within 10 miles of the station, and an ISO rating of 10 for those greater than 10 miles from the fire station. The Pima County CWPP estimates that 18 percent of the Pima County WUI acres are at high risk and 75 percent at moderate risk of wildland fire. An area with a history of moderate wildfire ignitions is located along SR 83 north of the community of Sonoita within Pima County. This Sonoita-Elgin Community WUI does include areas of high risk in lower elevations and in grassland and mesquite vegetation associations during extreme rainfall years. Public use within the WUI is considered high due to access roads leading to popular outdoor recreation sites (Box Canyon, Gardner Canyon) on the CNF and visitors to the Sonoita Creek Preserve and the Las Cienegas National Conservation Area. The WUI is mostly composed of large developed private land parcels and residential lots within the communities. The combination of low housing density on large private land parcels, intermixed with high risk vegetative associations, and areas with a high ISO rating creates areas of high risk to community values. Due to areas of high wildfire risk, areas of moderate ignition history, and a relatively high density of community values, the overall wildland fire risk rating of the Sonoita-Elgin WUI is high.

Three Points–Drexel Heights Community WUI

The Three Points–Drexel Heights Community WUI is composed of private and public lands that are mostly south and east of the city of Tucson, including the communities of Drexel Heights, Valencia West, Robles Junction, and Three Points. The BANWR borders the WUI to the south. The Pima County CWPP analyzed 335,259 acres within the Three Points–Drexel Heights Community WUI for the potential risk for wildland fire. The Three Points and Drexel Heights fire departments provide fire protection services to the communities of the Three Points–Drexel Heights Community WUI. The primary transportation corridors in the WUI communities are SR 86 and SR 286, which provide north, south and west access. The SR 86 and SR 286 corridors are the major business corridors in the WUI. The 2010 estimated population of the Drexel Heights census-designated place is 27,749 residents occupying 9,684 housing units. The 2010 estimated population of the Three Points-Robles Junction area is 5,581 residents occupying 2,487 housing units (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml/). The Drexel Heights Fire Department's present boundary includes 90 square miles of Tucson's southwest side; the department provides fire protection services to approximately 50,000 residents from five stations, responding to more than 6,000 incidents a year. Drexel Heights maintains an ISO rating of 5. The department also participates in automatic regional response agreements with other local fire departments. The Three Points Fire Department provides fire protection services from three stations to approximately 10,000 people living in an area of 209 square miles. The Three Points Fire Department maintains an ISO rating of 5 in areas adjacent to the fires stations and an ISO rating of 8 in outlying areas.

Major vegetation associations include desert grasslands, desert wash/xeroriparian corridors, and creosote bush-bursage desert scrub types, with paloverde-mixed cacti desert scrub and upland mesquite associations occurring in higher elevations toward the foothills of the Sierrita Mountains. The areas of highest wildfire risk are located along the numerous desert washes originating from the Sierrita Mountains in the east and the Coyote mountains in the west that drain to the Altar Valley Wash. Altar Valley Wash bisects the WUI, draining to the north and terminating at the Santa Cruz River. The southeast portion of the

WUI does include areas of high risk in the foothills of the Sierrita Mountains during extreme rainfall years. Wildfire ignitions within the Three Points–Drexel Heights Community WUI are low. Public use within the WUI is considered moderate due to the adjacent BANWR. The WUI is mostly composed of large developed private land parcels with traditional home lots found in the community center. The combination of low housing density on large private land parcels, intermixed with invaded vegetative associations, and outlying areas with a high ISO rating creates areas of high risk to community values. The Pima County CWPP analyses determined that 5 percent of the Three Points–Drexel Heights Community WUI is at high risk and 64 percent is at moderate risk for wildland fire. Due to areas of moderate to high wildfire risk, a low ignition history, and a moderate density of community values, the overall wildland fire risk rating of the Three Points–Drexel Heights Community WUI Community WUI is moderate.

Tohono O'odham Nation (Sells and San Xavier District Communities WUIs)

The Tohono O'odham Nation is located in western Pima County with the community of Sells serving as the Nation's capital. The San Xavier District is located just south of Tucson. Fire protection services are provided to these communities by the Tohono O'odham Fire Department. The Tohono O'odham Nation has a fully staffed and operational wildland fire management program which meets national interagency standards in all aspects of operations, training, qualifications, and safety. The Tohono O'odham Nation is a participating agency in the Southeast Arizona Management Zone under a joint-powers agreement with the BLM, CNF, NPS, and USFWS. The 2010 population estimate for the Tohono O'odham Nation within Pima County is 10,201 residents occupying 3,677 housing units (Tohono O'odham Nation. No Date). The 2010 population estimate for the community of Sells is 2,495 residents occupying 760 housing units (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml/). The *Tohono O'odham Nation Fire Management Plan* (Tohono O'odham Nation 2004) defines the WUI zone as:

> . . . a one-mile zone surrounding all major communities and on either side of State Highways 86 or 15. Kitt Peak Observatories, support structures and facilities are also designated as being within the Wildland Urban Interface FMU. The WUI FMU delineation on the Tohono O'odham Nation is based upon several factors. One of the most important factors is the concentration of structures in a single area (community) such that a single fire could damage or destroy multiple structures. The second factor is that areas around communities and along highways are areas where a large percentage of human caused fires occur. Although fire occurrence statistics are incomplete, Tohono O'odham Nation Fire Management Staff indicate that more than 60% of all fires occurring on the Nation are located within the WUI. The third factor is the prolific amount of invasive grass species that create hazardous fuel conditions around structures, communities and along highways.

The Tohono O'odham Nation Fire Management Plan lists 66 community WUIs, which include the community of Sells and the entire San Xavier District. The major transportation corridors for the Tohono O'odham Nation include SR 86 from Tucson, and Indian Reservation Route 15 south from I-8. Major retail businesses are located within the San Xavier District and the community of Sells. Major vegetation associations within the Tohono O'odham Nation include desert wash/xeroriparian corridors and creosote bush-bursage desert scrub types, with paloverde-mixed cacti desert scrub associations occurring in foothills and bajadas. The Tohono O'odham Nation WUIs do include areas of high risk in lower elevations within and adjacent to communities during extreme rainfall years from increased light fuels produced from

winter annual and perennial invasive grasses such as Mediterranean grass, red brome, and mustards. In some instances the presence of invasive winter annuals and perennial grasses is heavier in the communities than in adjacent lands, creating greater potential risk for wildland fire occurring in the WUIs. Areas of high wildland fire ignition history are found in the vicinity of Sells, and moderate ignition history occurs within the communities of Artesa, Ali Molina, and Haivana Nakya. Public use within the WUIs is considered moderate due to the vastness of the Nation's land and the number of connecting Indian reservation routes that provide access to the Tohono O'odham Nation's communities. The Pima County CWPP analyzed 7,820 acres for the potential risk of wildland fire within and adjacent to the community of Sells and found that 6 percent of the WUI is at high risk and 34 percent of the WUI at moderate risk for wildland fire. The Pima County CWPP analyses determined that the Sells Community WUI includes areas of high community values, has a history of high wildland fire ignitions, areas of high wildfire risk, and areas of limited fire response access. The overall wildland fire risk rating of the Sells community WUI is high. The Pima County CWPP analyzed 69,965 acres within the San Xavier Community WUI for potential risk to wildfire. The Pima County CWPP analyses determined that the San Xavier Community WUI contains areas of high community values due to the number of visitors to the San Xavier del Bac Mission. The San Xavier Community WUI has a low history of wildfire ignitions and includes areas of high wildfire risk. The Pima County CWPP analyses determined that 3 percent of the WUI is at high risk and 75 percent is at moderate risk for wildland fire. Due to the high community values and areas of high wildland fire risk, the overall wildland fire risk rating of the San Xavier Community WUI is moderate.

Tucson–South Tucson Community WUI

The Tucson–South Tucson Community WUI is composed of private and public lands within the Tucson and South Tucson Fire Department boundaries and includes the cities of Tucson and South Tucson and some unincorporated lands. Tucson is the 32nd largest city in the United States, covering an area of 227 square miles. Tucson sits at an elevation of 2,389 feet and is surrounded by five mountain ranges: the Tucson, Santa Catalina, Rincon, Santa Rita, and Tortolita mountains. Fire protection is provided by the Tucson and South Tucson fire departments. The Tucson Fire Department started in 1881 as an all volunteer force and today is Arizona's second largest Fire Department. The Tucson Fire Department is organized into five divisions: Headquarters, Operations, Code Administration, Support Services, and Training. The Tucson Fire Department maintains an ISO rating of 2. The 2010 census estimated population for the city of Tucson is 520,116 residents occupying 231,883 residential units (http://factfinder2.census.gov/ accessed, March 2013). The city of South Tucson covers an area of about 1.2 square miles and is completely surrounded by the city of Tucson. It is located at the junction of I-19 and I-10 about 1 mile south of downtown Tucson and is bounded by I-10, I-19, and the Union Pacific railroad tracks. The city of South Tucson incorporated in 1940; it is referred to as the "Pueblo within a City." The city of South Tucson is located within zones designated by the U.S. Department of Housing and Urban Development—the Empowerment Zone and Tucson Pima Enterprise Zone, both of which are dedicated to revitalizing dilapidated areas in the greater Tucson metropolitan area. The city of South Tucson has also been designated a rural 'Colonia' by the United States Department of Agriculture. A fire protection service is provided to residents by the City of South Tucson Fire Department. The 2010 census estimated population for the City of South Tucson is 5,652 residents residing in 2,191 residential units (http://factfinder2.census.gov/, accessed March 2013). The Pima County CWPP included the cities of Tucson and South Tucson because they border open lands

and are near mountain ranges that are composed of areas of high risk for wildland fire. Additionally, wildfire threats within the municipalities include large riparian corridors such as the Santa Cruz River, Rillito, and Tanque Verde creeks; Pantano Wash; and the Canada del Oro confluence at Rillito Creek. These riparian corridors are heavily vegetated and include areas of infestations of nonnative heavy vegetation fuels such as saltcedar and invasive perennial grasses such as buffelgrass. The potential spread of vegetative-driven fires within the city of Tucson escalates with increasing spread of invasive woody and grass species, particularly within the riparian corridors and neighboring open lands.

Although the major landcover within the cities of Tucson and South Tucson is classified as "impervious," areas of moderate and high wildland fire risk are found in the vicinity of open lands adjacent to the Tucson International Airport, to I-10 in the area of the Houghton Road intersection, and to areas of high risk in and near the Pima County Fairgrounds. The major vegetation associations in these open areas include desert wash/xeroriparian corridors, creosotebush-white bursage desert scrub, and paloverde-mixed cacti desert scrub associations. The cities of Tucson and South Tucson are composed of a complex of interspersed wildland interfaces at their borders; heavily vegetated municipal riparian corridors provide cover and shelter for homeless persons and continued colonization of invasive woody and grass species. The complex of vegetative fuels has created conditions that require Tucson Fire Department to response to an average over 1,200 brush fires annually since 2000. Brush fires that are driven by invasive species such as buffelgrass can spread, under some conditions, at a speed of 770 feet per minute, which equates to over 8 miles per hour (Grissom 2010). Vegetative-driven fires under these conditions have severe risk to public and firefighter safety, property and loss of natural habitats prior to the arrival of firefighters. Although areas of significant threat to public and firefighter safety exist within the cities of Tucson and South Tucson, the overall wildland fire risk rating is low.

Why Community WUI

The Why Community WUI is composed of private and public lands within 1 mile of developed areas of the community of Why. It lies near the western border of the Tohono O'Odham Nation and is due north of Organ Pipe Cactus National Monument in southern Arizona. It is approximately 30 miles north of the Mexican border near Lukeville, Arizona, and Sonoita, Sonora, Mexico, and 10 miles south of Ajo, Arizona. The major transportation corridors in the Why Community WUI are SR 85 south from the community of Ajo and SR 86 from the east from the Tohono O'Odham Nation and the Tucson Basin. The community of Why provides retail services to individuals traveling to Sonora, Mexico—especially to the resort town of Puerto Peñasco—and to the Organ Pipe Cactus National Monument. The Pima County CWPP analyzed 4,619 acres within the Why Community WUI for the potential risk of wildland fire. The Why Fire District provides fire protection services to the community of Why. The Why Community WUI is assigned an ISO rating of 10. The SR 85/SR 86 intersection is the major business corridor in the WUI. The 2010 estimated population of the Why census-designated place is 167 residents occupying 102 housing units (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml/Census tract 46.09.

Major vegetation associations include desert wash/xeroriparian corridors and creosote bush-bursage desert scrub types, with paloverde-mixed cacti desert scrub occurring in higher elevations of the Pozo Redondo and Gunsight hills. The areas of highest wildfire risk are located along the foothills of the Pozo Redondo and Gunsight hills to the east of the community of Why. This portion of the WUI does include

areas of high risk in lower elevations to the north and east of the community during extreme rainfall years from increased light fuels produced from winter annual and perennial invasive grasses such as Mediterranean grass, red brome, and buffelgrass. Wildfire ignitions within the Why Community WUI are low. Public use within the WUI is considered moderate due to the adjacent Organ Pipe Cactus National Monument and holiday traffic to the resort community of Puerto Peñasco. The WUI is mostly composed of mobile home and traditional home lots found in the community center. The combination of high housing density on small private land parcels, intermixed with invaded vegetative associations, and areas with a high ISO rating creates areas of high risk to community values. The Pima County CWPP analyses determined that 91 percent of the Why Community WUI is at moderate risk for wildland fire. Due to areas of moderate wildfire risk, a low ignition history, and a moderate density of community values, the overall wildland fire risk rating of the Why Community WUI is moderate.

F. Cumulative Risk Analysis

The cumulative risk analysis synthesizes the risk associated with fuel hazards, wildfire ignition points, wildfire occurrence, and community values. These different components were analyzed spatially, and an overall cumulative risk for the analysis area was calculated. Table 2.7 displays the results of the cumulative risk analyses, identifying the areas and relative percentages of high, moderate, and low risk. Visual representations of cumulative wildfire hazard are mapped in Figures 2.9a–2.9c.

Table 2.7. Cumulative Risk Levels, by Percentage of the WUI Area

Pima County CWPP Community Sub-Analysis Area	High Risk (%)	Acres	Moderate Risk (%)	Acres	Low Risk (%)	Acres	Total Acres
Ajo	2	561	55	13,096	43	10,300	23,957
Arivaca-Sasabe	14	7,901	71	38,916	15	8,001	54,818
Avra Valley	4	5,926	74	103,228	22	30,476	139,630
Three Points–Drexel Heights	5	18,421	64	216,106	30	100,728	335,255
Golder Ranch	8	2,561	49	15,355	42	13,171	31,095
Catalina Foothills	22	15,970	47	33,979	31	22,580	72,529
Corona de Tucson	3	2,204	87	69,642	10	8,034	79,880
Mt. Lemmon	99	7,408	1	51	0	0	7,459
Cascabel	2	340	51	6,961	46	6,295	13,599
Lukeville	3	200	11	1,516	0	3	1,741
Green Valley–Elephant Head–Helmet Peak	3	6,525	66	137,134	31	64,765	208,440
Kitt Peak	0	0	63	1,262	37	748	2,009
Mescal-J6	23	6,860	71	21,638	6	1,842	30,378
Pascua Yaqui	0	3	33	463	66	926	1,392
San Xavier	3	1,841	75	52,590	22	15,534	69,965
Picture Rocks	10	3,114	53	15,982	36	10,926	30,022
Rincon Valley	17	16,186	66	63,649	17	16,217	96,052
Tohono O'odham	0	0	10	1,052	90	9,049	10,101
Northwest	10	14,613	44	65,693	46	70,871	151,188
Sells	66	5,178	34	2,643	0	0	7,820
Tucson–South Tucson	1	1,078	23	42,753	76	138,191	182,022
Why	0	0	91	4,209	9	410	4,619
Sonoita-Elgin	18	4,623	75	19,105	7	1,856	25,596
Total WUI Acres	8	121,511	59	926,760	34	531,189	1,579,572

Source: Logan Simpson Design Inc.

*Treatment areas not equal to area risk assessment due to data-rounding errors.

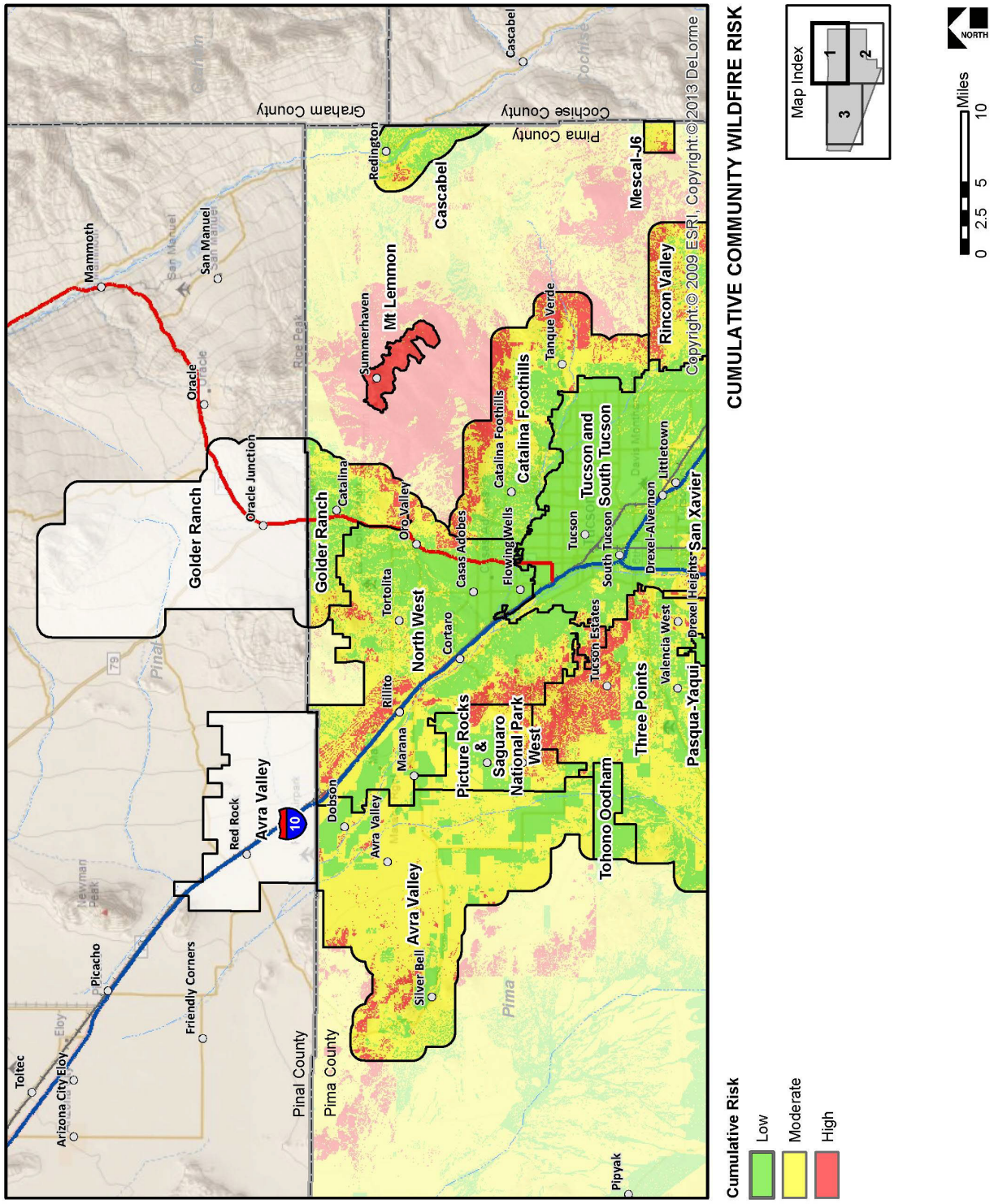

Figure2.9a. Cumulative Community Wildfire Risk, North

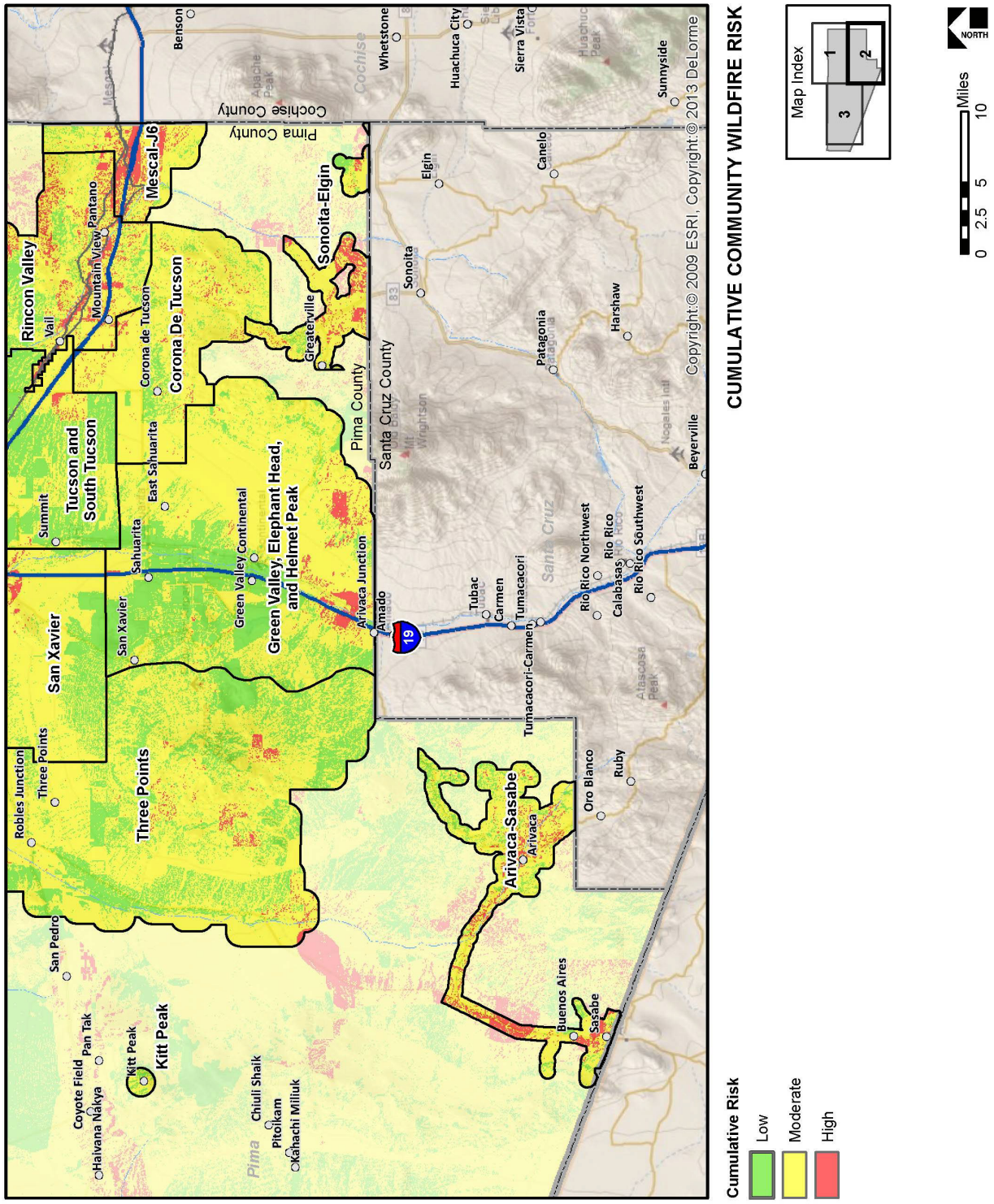

Figure2.9b. Cumulative Community Wildfire Risk, South

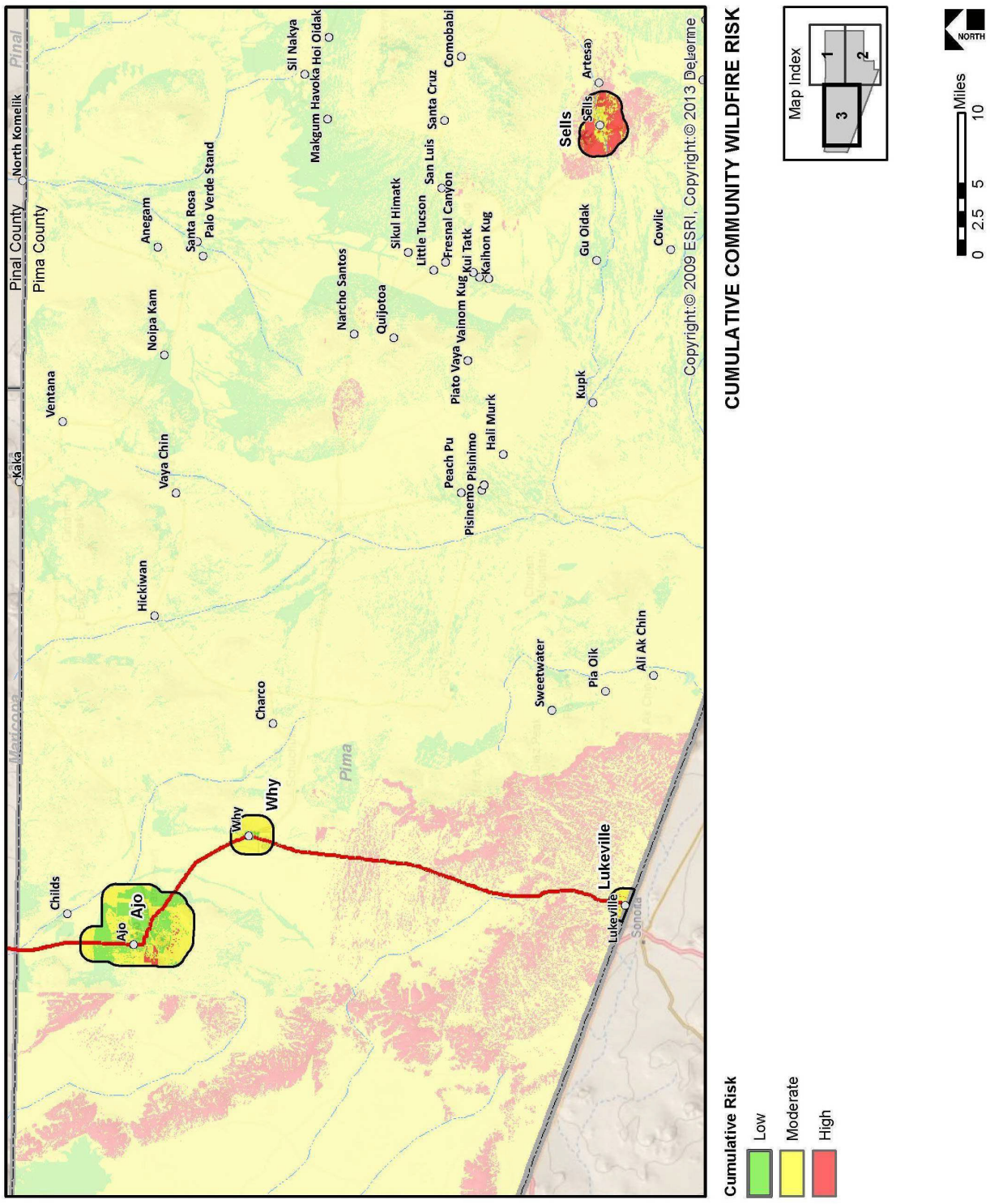

Figure2.9c. Cumulative Community Wildfire Risk, West

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