Identifying Priority Treatment Areas Across the Apache-Sitgreaves National Forests

November 2013

Report prepared for:
Apache-Sitgreaves National Forests

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Project 1.6 — Identifying treatment priorities that may help reduce the impact of the next high severity fire and inform planning and Project 2.2a — GIS analysis of Wallow Fire landscape that remains vulnerable to uncharacteristic wildfire

Abstract

To address concerns regarding how to prioritize treatments across the forests, the Ecological Restoration Institute received funding from the USDA Forest Service to identify priority treatment areas across the Apache-Sitgreaves National Forests. In addition, Forest Service personnel stated a need to identify areas within the Wallow Fire perimeter that remain vulnerable to uncharacteristic wildfire.

Existing Forest Service spatial data layers (Mid-scale vegetation diameter class, species and canopy cover) were used to identify restoration opportunity areas. Additional data layers (topography, land management designation, Wildland Urban Interface) were added to the analysis to identify priority restoration areas on the landscape.

There are more than 133,000 acres within the Wallow fire perimeter that consist of priority restoration vegetation which experienced ≤50% basal area mortality and were thus deemed as continuing to be vulnerable to uncharacteristic wildfire. Less than half of this falls within the WUI boundary.

Introduction

Pine dominated and dry mixed conifer Western forests are uncharacteristically dense and have high fuel loadings (Fulé et al. 2012). In Arizona, these conditions, combined with more than a decade of below average precipitation (Hereford 2007) and projected increasingly common droughts (Seager et al. 2007), have made these forests particularly susceptible to large, catastrophic wildfires. The 538,049-acre Wallow fire burned 418,277 acres on the Apache National Forest in the summer of 2011. Greater than 50% basal area (BA) mortality occurred on nearly 240,000 acres (USFS 2011).

We began by identifying restoration opportunity areas based on vegetation type, canopy cover and tree diameter. Topography, watershed function, land management designations, and location relative to the Wildland Urban Interface were added to the analysis to identify more specific priority restoration areas. On the Wallow fire, all areas that fell within the restoration opportunity areas and had a basal area mortality of ≤50% were selected. Similar to the forest-wide analysis, areas within Wildland Urban Interface were identified.

Methods

Apache-Sitgreaves National Forests

The data layers used in this analysis were developed from the Mid-Scale Existing Vegetation Life Form data developed by USFS Region 3. The Mid-Scale data were developed from Landsat 5 and/or Landsat ETM+ satellite imagery and include the following layers: life form, dominance type, canopy cover, and tree size using methods outlined in Brohman and Bryant 2005.

The initial restoration opportunity areas were defined as being a dry conifer forest type having a canopy cover greater than 30% and with tree diameters <20" diameter at breast height (dbh). The dry conifer forest types selected from the Mid-Scale data included Ponderosa pine mix, Ponderosa pine-evergreen oak mix and Douglas-fir. The canopy cover and tree diameter criteria

were based on the existing Mid-Scale classifications. Total area on the Apache-Sitgreaves National Forest that meets all three criteria is 543,358 acres (Figure 1).

In order to refine the restoration needs with National Forest priorities and values-at-risk, the following designated areas were added to the analysis; 1) Wildland urban interface (WUI), 2) Watershed Condition Framework (WCF) data, 3) Mexican Spotted Owl (MSO) protected activity centers (PACs); and 4) Existing Plan land management designations. Finally, slopes >40%, that may not be suitable for treatment activities (USDA Forest Service, 1987), were identified in the restoration opportunity areas and were masked from the restoration opportunity landscape. All input data layers were clipped to only include Forest Service managed lands.

The WUI dataset was downloaded from the USFS Region 3 Geospatial Data website (http://www.fs.usda.gov/detail/r3/landmanagement/gis/?cid=stelprdb5202474). This was intersected with the restoration opportunity vegetation layer and the Ranger District boundary layer to determine acreage, by ranger district, of the restoration opportunity vegetation.

The WCF is a consistent method used to evaluate watershed condition at individual National Forest and national levels (USDA Forest Service 2011). Watersheds considered to be "functioning at risk" or having "impaired function" might be considered to have restoration priority. This dataset was acquired here: http://www.fs.fed.us/publications/watershed/. Similar to the WUI dataset, this layer was intersected with the restoration opportunity vegetation and ranger district data layers.

Mexican Spotted Owl data were acquired from the Lab of Landscape Ecology and Conservation Biology at Northern Arizona University. This dataset was originally developed for the Wood Supply Project (Hampton et al. 2011) using Forest Service data. The MSO layer was clipped to the forest boundary and was intersected with the priority vegetation and ranger district boundary layers to determine the acreage of restoration opportunity vegetation with the PACs.

The Existing Plan management areas dataset were downloaded from the USFS Region 3 Geospatial Data website. This dataset depicts the management areas of the existing Apache-Sitgreaves National Forests Plan, which was signed in 1987. Management designations that could potentially affect the implementation of restoration activities were selected and exported to create a new data layer. These designations include Demonstration Areas, Primitive Areas and Additions, Research Natural Areas, Special Management Areas, and Wilderness.

Areas that should be considered higher restoration priority were areas of the landscape with the combination of the restoration opportunity vegetation, with slopes of <40%, outside Mexican Spotted Owl PACs and not located within any of the selected Existing Plan designated management areas. The priority vegetation layer was intersected with the slope <40% layer, the ranger district boundary layer and the WCF dataset. The WUI dataset was used to clip the above described higher restoration priority layer to determine where restoration was required within the WUI. Finally, the Apache-Sitgreaves transportation layer was downloaded (http://www.fs.usda.gov/detail/r3/landmanagement/gis/?cid=stelprdb5202663) and the roads layer was buffered at 500 meters to determine the proximity of priority vegetation restoration areas to existing roads.

Wallow Fire Project 2.2a

Rapid Assessment of Vegetation Condition after Wildfire (RAVG) data were acquired (http://www.fs.fed.us/postfirevegcondition/index.shtml). RAVG data are developed for all fires that are >1,000 acres that occur on Forest Service lands. The data are available within 30 days of fire containment and are useful for identifying areas of concern by showing basal area mortality loss (USFS 2011).

To determine areas within the Wallow perimeter that remain vulnerable to uncharacteristic wildfire, we started by converting the RAVG layer from a raster to a vector format and clipping it with the most updated Wallow perimeter (downloaded from www.mtbs.gov), intersecting it with the restoration opportunity vegetation layer developed in Project 1.6 and then finally by selecting those areas that had ≤50% BA mortality. Finally, this final layer was intersected with the WUI boundary layer.

Results

Apache-Sitgreaves National Forests

The ponderosa pine mix type is dominant and, at 503,384 acres, occurs on 93% of the restoration opportunity landscape (Table 1). The greatest amount, comprising 63% of the landscape, falls into the 10–19.9-inch diameter class. On both the Black Mesa and Lakeside ranger districts, the ponderosa pine mix type makes up 100% of restoration opportunity areas. This vegetation type makes up 70% of the restoration opportunity vegetation on the Clifton Ranger District (RD), 91% on the Alpine RD and 96% on the Springerville RD. Ponderosa pine-evergreen oak mix is dominant on 20,215 acres, 3% of the area, and is most dominant on the Clifton RD. The dominant diameter class, at 14,481 acres, is 5–9.9 inches. Douglas-fir is found on 19,633 acres or roughly 3% of the area with the 10–19.9-inch diameter class being dominant. This type occurs on 15,786 acres, or 6% of the total, on the Alpine RD (Table 1).

Nearly 97,000 acres (17% of the high-risk landscape) occur on slopes >40% (Figure 2). The Ponderosa pine mix vegetation type, in the 5–9.9 and 10–19.9-inch diameter classes, makes up 78% of the steep slope vegetation with the greatest occurrences on the Alpine and Clifton ranger districts (Table 2).

There are a total of 522,846 acres of designated WUI within the Apache-Sitgreaves National Forests, with the largest area (90,370 acres) being on the Alpine RD. The vast majority of the forested portion of WUI (Figure 3) is comprised of the ponderosa pine mix vegetation type with an area of nearly 175,000 acres. The diameter distribution of this class has nearly 67,000 acres in the 5–9.9-inch class and 91,000 acres in the 10–19.9-inch class (Table 3). Eighteen percent (31,172) of the WUI occurs on slopes >40% with the vast majority, 20,423 acres, on the Alpine RD. As of April 2010, 35,166 acres have been treated (Sitko and Hurteau 2010). Only 6% of the restoration opportunity vegetation within the WUI falls on slopes > 40% (Table 4).

The WCF dataset shows that there are a total of 1,284,438 acres of designated "functioning at risk" watersheds (Figure 4). This comprises 61% of the forest. Twenty-two percent, 276,656 acres, of the "functioning at risk" landscape is comprised of the restoration opportunity vegetation types with the majority (100,515 acres) of this designation being on the Alpine RD (Figure 5). The ponderosa pine mix type is the most dominant at nearly 260,000 acres with

162,924 acres being in the 10–19.9-inch diameter class. Thirty-three percent, or 699,648 acres, of the watersheds on the forest have a "functioning properly" designation and only 1,691 acres have an "impaired function" designation (Note: The attribute table for the WCF data layer used for the analysis lists this area of "impaired function" on the Tonto NF but it does clearly fall within the boundary of the Black Mesa RD on the Sitgreaves NF). Thirty-eight percent (263,725 acres) of the "functioning properly" landscape is made up of the restoration opportunity vegetation types with nearly 62,000 acres on the Black Mesa RD. Eighty-two percent of the "impaired function" landscape is made up of these vegetation types with ponderosa pine mix being the dominant type in both designations (Table 5).

Eight percent, 45,324 acres, of the restoration opportunity vegetation types fall within Mexican Spotted Owl designated areas (Figure 6). Of this, 93% is made up of the ponderosa pine mix type. The majority, 68%, occurs in the 10–19.9-inch diameter class. Fifty-five percent occurs on the Alpine RD while only 2% is on the Lakeside RD (Table 6).

There are 284,132 acres of Existing Plan management areas (Demonstration Areas, Primitive Areas and Additions, Research Natural Areas, Special Management Areas, and Wilderness) on the forests (Figure 7). Nearly 80,000 acres of the restoration opportunity vegetation types occur within these management areas (Figure 8) with the majority being in the ponderosa pine mix vegetation type on the Alpine RD. Sixty percent, 34,507 acres, on this district has a Primitive Area designation and 5,641 acres are designated as Wilderness (Table 7). There are no Existing Plan designated management areas on the Lakeside RD.

The intersection of the restoration opportunity vegetation layer with the slopes <40% dataset and with the MSO and Existing Plan designated management areas excluded, produced a data layer, the priority restoration vegetation layer, representing a landscape of 380,992 acres (Figure 9). This layer represents 70% of the restoration opportunity vegetation on the forests. The WCF "functioning at risk" and "impaired function" classes from the WCF layer were intersected to the above dataset to further refine areas where restoration should be considered as a higher priority (Figure 10). Fifty-four percent (205,857 acres) are in the "functioning at risk" category, 46% is in the "functioning properly" category and <1% of the area has an "impaired function" designation. Thirty-eight percent (136,045 acres) occurs on the Alpine RD with 49% (66,952 acres) of this having a WCF "functioning at risk" designation. The Clifton RD has the least amount that falls into the priority restoration category with 16,658 acres. Of this, 74% (12,305 acres) has a "functioning at risk" designation (Table 8). Ninety-one percent (346,599 acres) of the restoration opportunity vegetation, on slopes <40% with the MSO and Existing Plan management areas excluded, falls within 500 meters of existing forest roads. Over 90% of the priority restoration vegetation occurs within 500 meters of existing roads on all ranger districts, with the exception of the Clifton RD where 39% is within 500 meters of existing roads.

The WUI was clipped from the priority restoration vegetation layer described above to produce a landscape of 121,941 acres (Figure 11). Forty-one percent (50,034 acres) occurs on the Alpine RD with the majority falling in the WCF "functioning at risk" designation in the ponderosa pine mix vegetation type. Less than 7,000 acres are present on both the Black Mesa and Clifton ranger districts with the majority found in the ponderosa pine mix vegetation type in WCF "functioning at risk" watersheds. The ponderosa pine mix vegetation type in combination with WCF "functioning at risk" watersheds are where, for all ranger districts, the majority of the priority restoration vegetation is found (Table 9). Ninety percent or more of the priority restoration

vegetation occurs within 500 meters of existing roads on three of the five ranger districts (Black Mesa, Lakeside, Springerville) with 84% meeting this criteria on the Alpine RD and 72% on the Clifton RD.

Wallow Fire

The RAVG data (Figure 12) show that a total of 418,277 acres burned with the majority of the fire (70%) occurring on the Alpine RD where a total of 292,089 acres burned. The Springerville RD had 113,482 acres burned (27% of total burned area) while the total area burned on the Clifton RD was 12,706 acres (3%). Nearly half of the area burned (239,349 acres or 48%) had a BA mortality of >50% with 159,159 acres occurring on the Alpine RD (Table 10).

The layer representing areas within the Wallow perimeter that are still vulnerable to uncharacteristic fire shows a total of 133,153 acres (Figure 13). This is 27% of the total area burned. Eighty percent of this is on the Alpine RD with 106,174 acres. Of that, 90% (96,043 acres) are in the ponderosa pine vegetation type with 66,932 acres in the 10–19.9-inch diameter class. The Clifton RD has the least amount of vulnerable vegetation with slightly over 4,720 acres. Ninety-three percent of this is in the ponderosa pine vegetation type with the majority being in the 10–19.9-inch diameter class. Across all ranger districts, roughly 1% is in the ponderosa pine-evergreen oak mix vegetation type and just 6% is in the Douglas-fir vegetation type (Table 11). Sixty-three percent (83,782 acres) of all the vulnerable vegetation is in the 10–19.9-inch diameter class and 122,187 acres (92% of the total) in the ponderosa pine mix vegetation type. There are a total of 109,845 acres still vulnerable to uncharacteristic fire located within the priority restoration area and 41,932 acres located within the WUI.

There are a total of 47,869 acres that are still vulnerable to uncharacteristic wildfire in the WUI, which is 36% of the total area burned (Figure 14). More than 46,000 acres (96%) of this is within the ponderosa pine mix vegetation type. Of this, 63% is in the 10–19.9-inch diameter class and 35% is in the 5–9.9-inch diameter class. Seventy-eight percent (37,157 acres) is located on the Alpine RD with 35,541 acres in the ponderosa pine mix vegetation type. Only 1,929 acres are located on the Clifton RD with all but 73 acres in the ponderosa pine mix type. Ninety-seven percent of the vulnerable vegetation on the Springerville RD is in the ponderosa pine mix type (Table 12).

Summary

The intersection of the restoration opportunity vegetation layer with the slopes <40% dataset and with the MSO and Existing Plan designated management areas excluded layer identified 380,992 acres as having a high restoration priority. This was further refined using WCF data to determine the restoration priority area. Roughly 55% of the high restoration priority landscape falls in the "functioning at risk" and "impaired function" categories. In the event that the WUI has a higher treatment priority, nearly 122,000 priority restoration vegetation acres were identified within the WUI boundary.

Approximately 133,000 acres within the Wallow fire perimeter consists of priority restoration vegetation, which experienced <50% basal area mortality and were thus deemed as continuing to be vulnerable to uncharacteristic wildfire. Less than half of this falls within the WUI boundary (Figure 14, Table 12).

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Figure 1. Restoration opportunity vegetation.

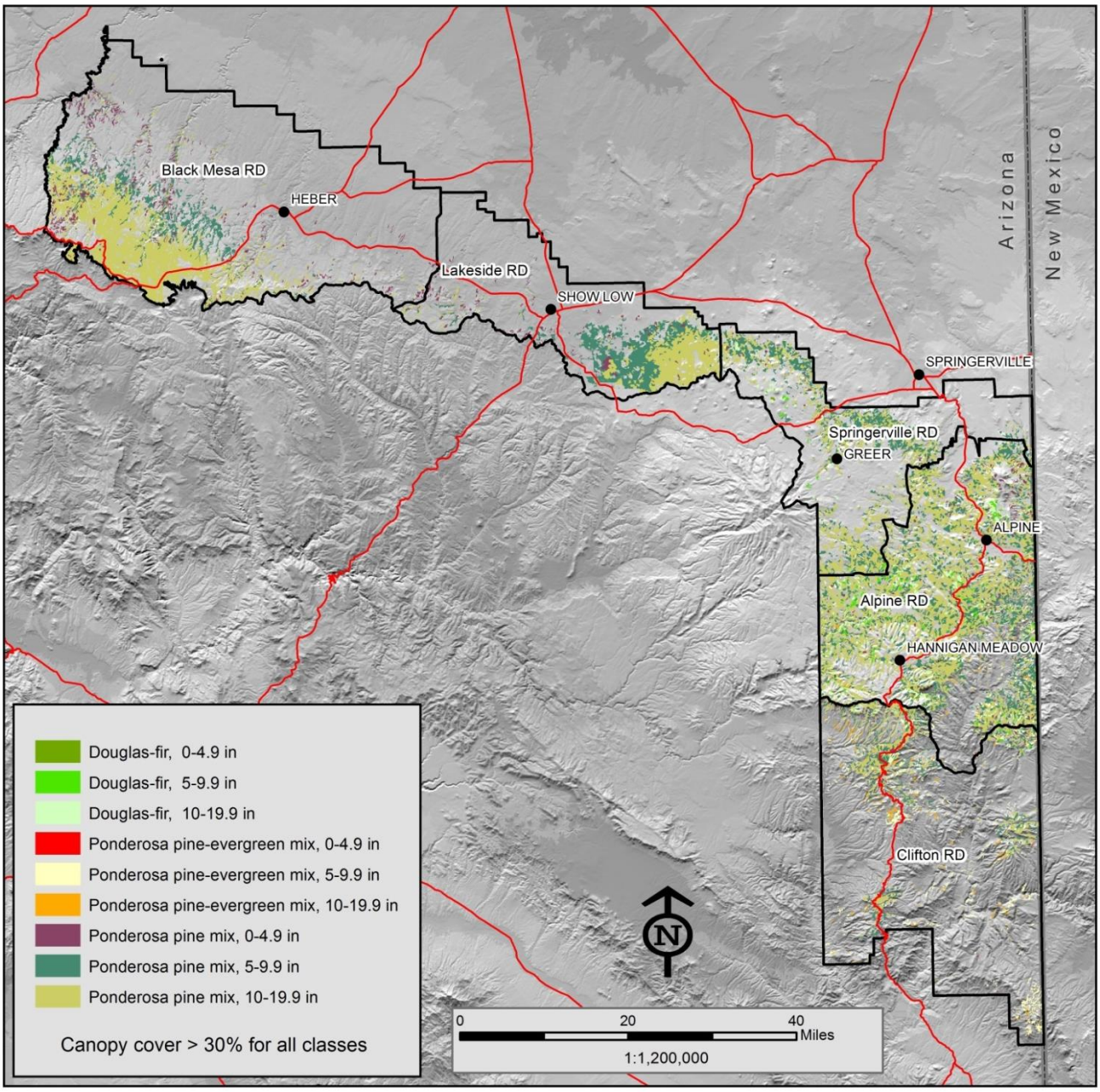

Figure 2. Slopes >40% in restoration opportunity areas.

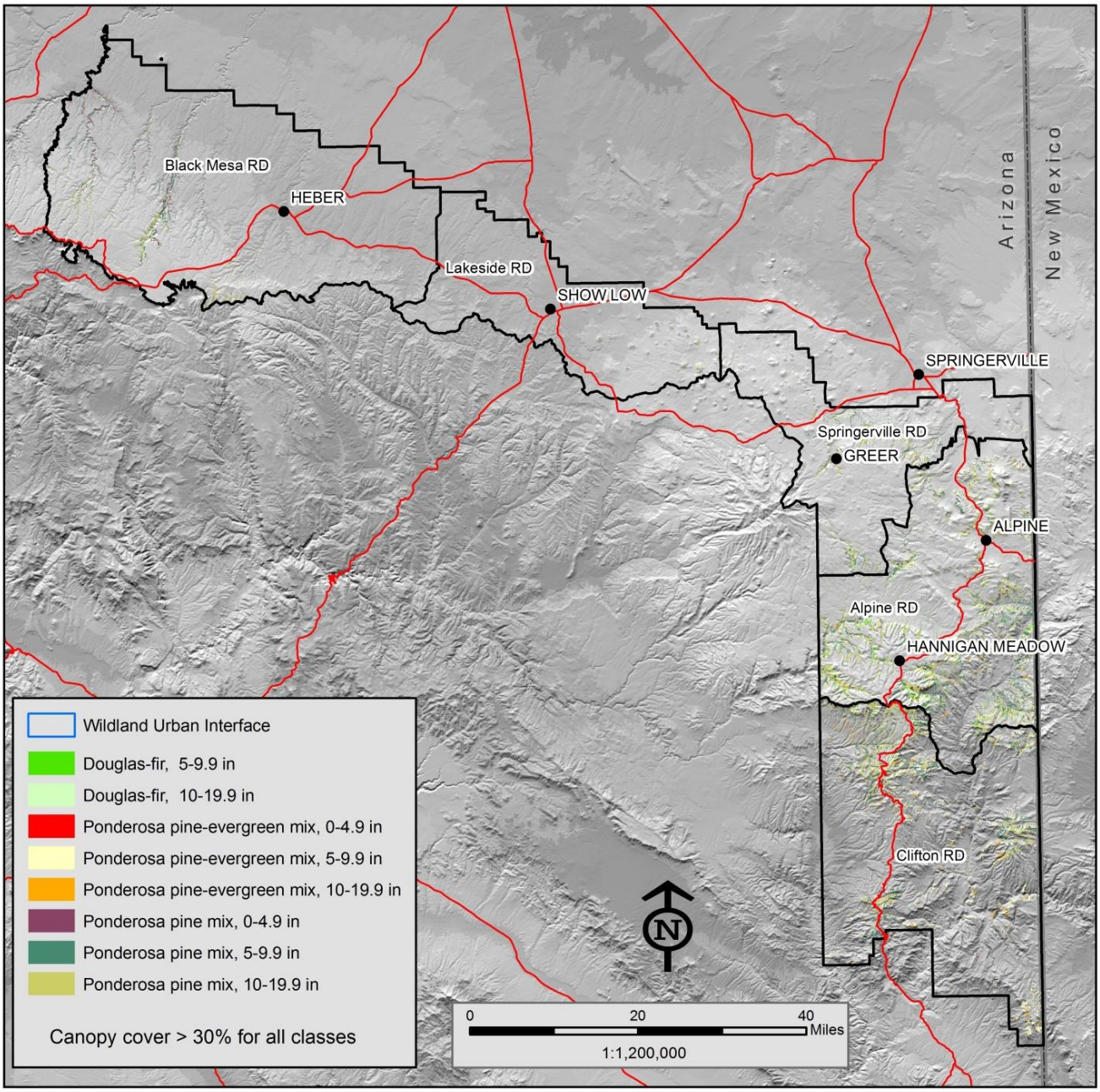

Figure 3. Restoration opportunity areas within designated Wildland Urban Interface.

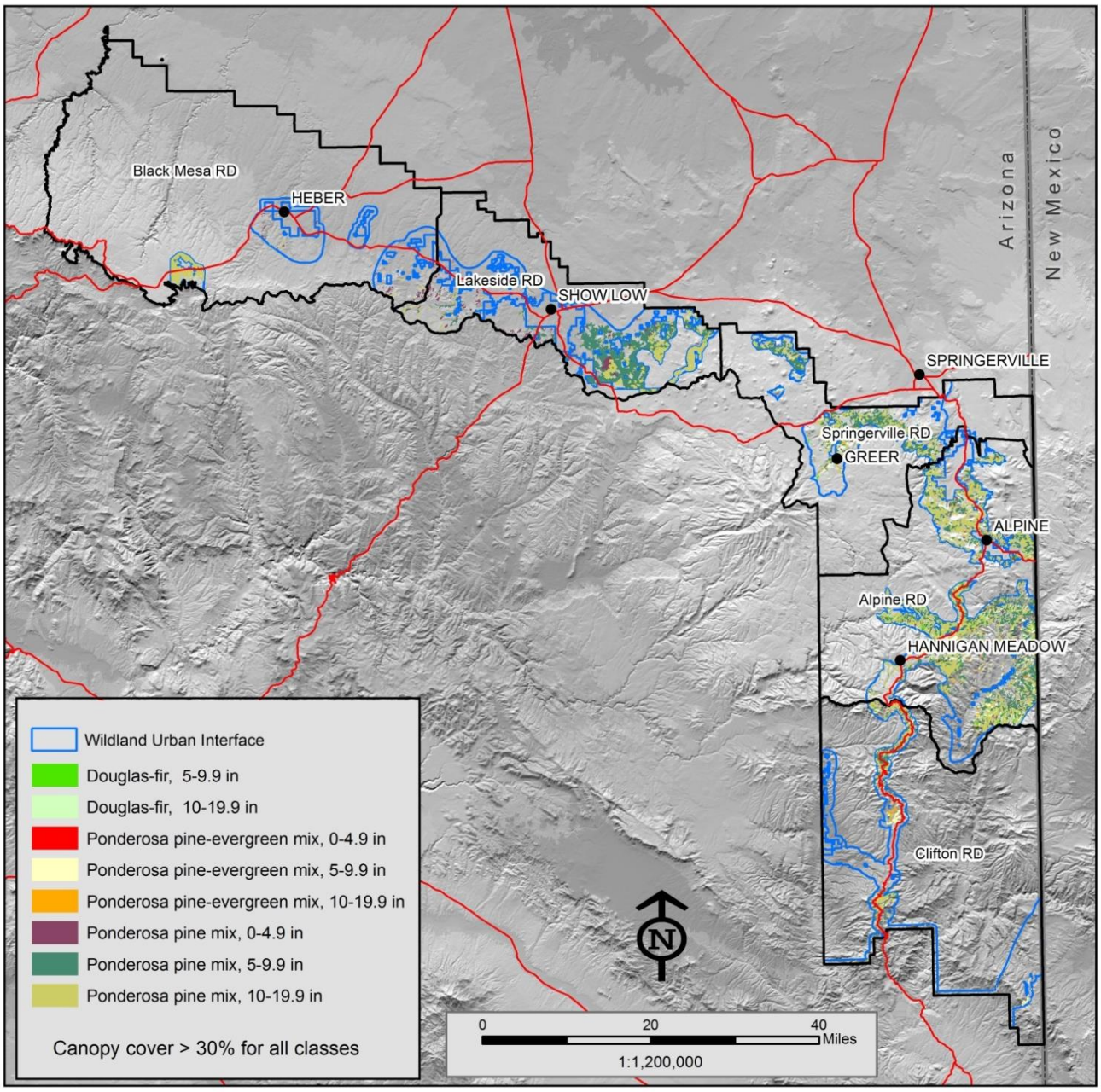

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Figure 4. Watershed Condition Framework designations.

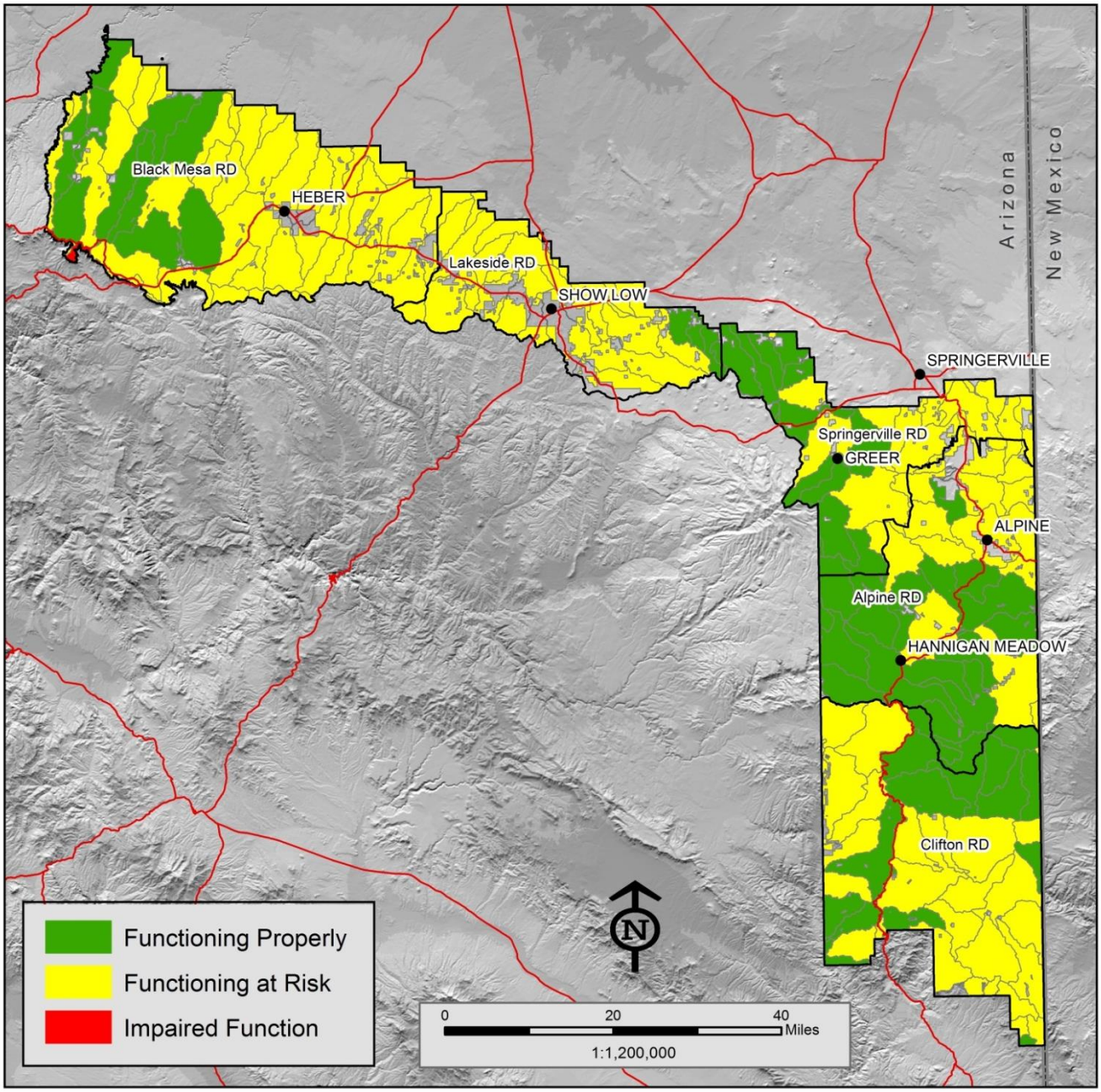

Figure 5. Watershed Condition Framework designations and restoration opportunity vegetation types.

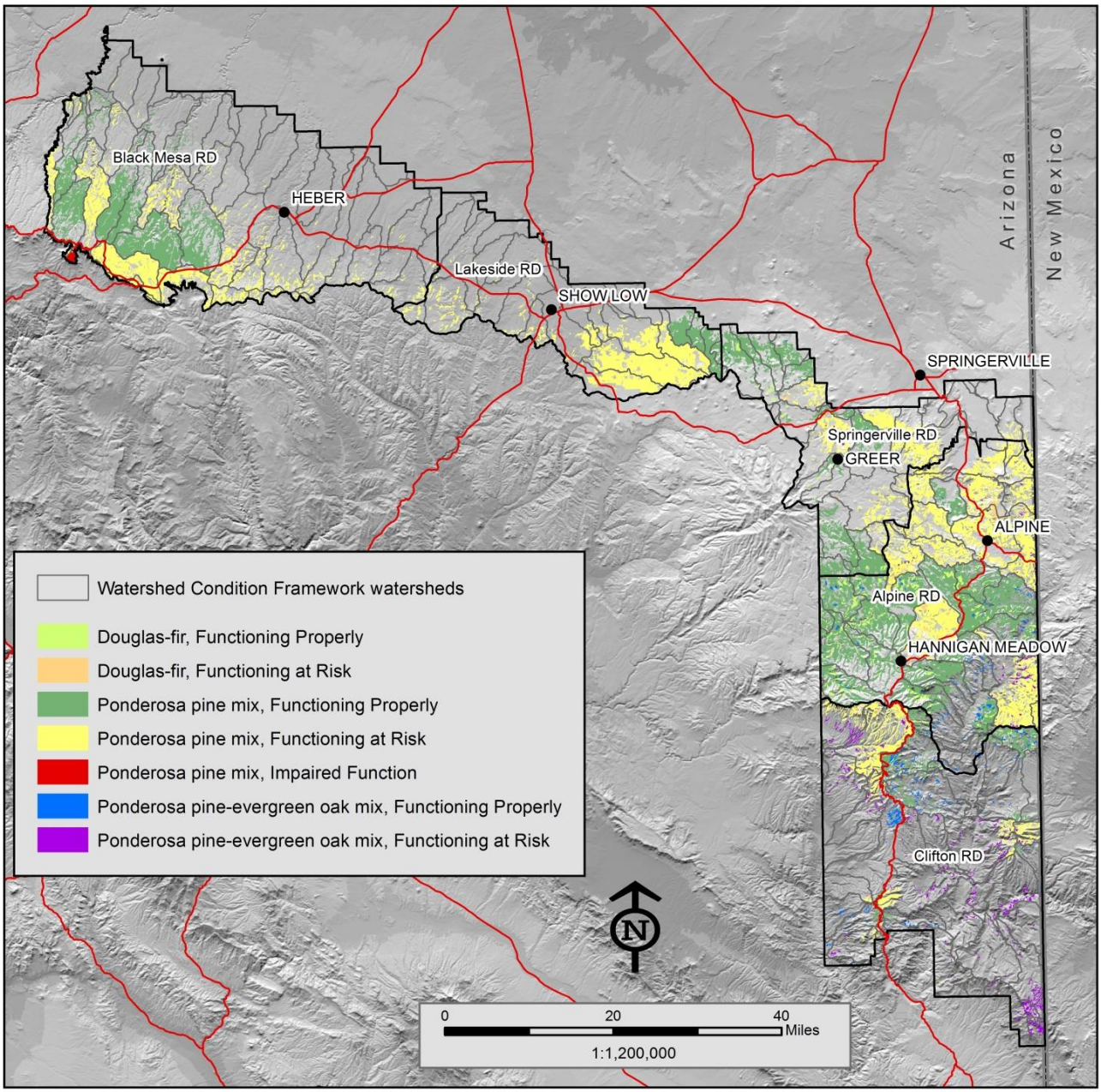

Figure 6. Mexican Spotted Owl habitat and restoration opportunity vegetation types.

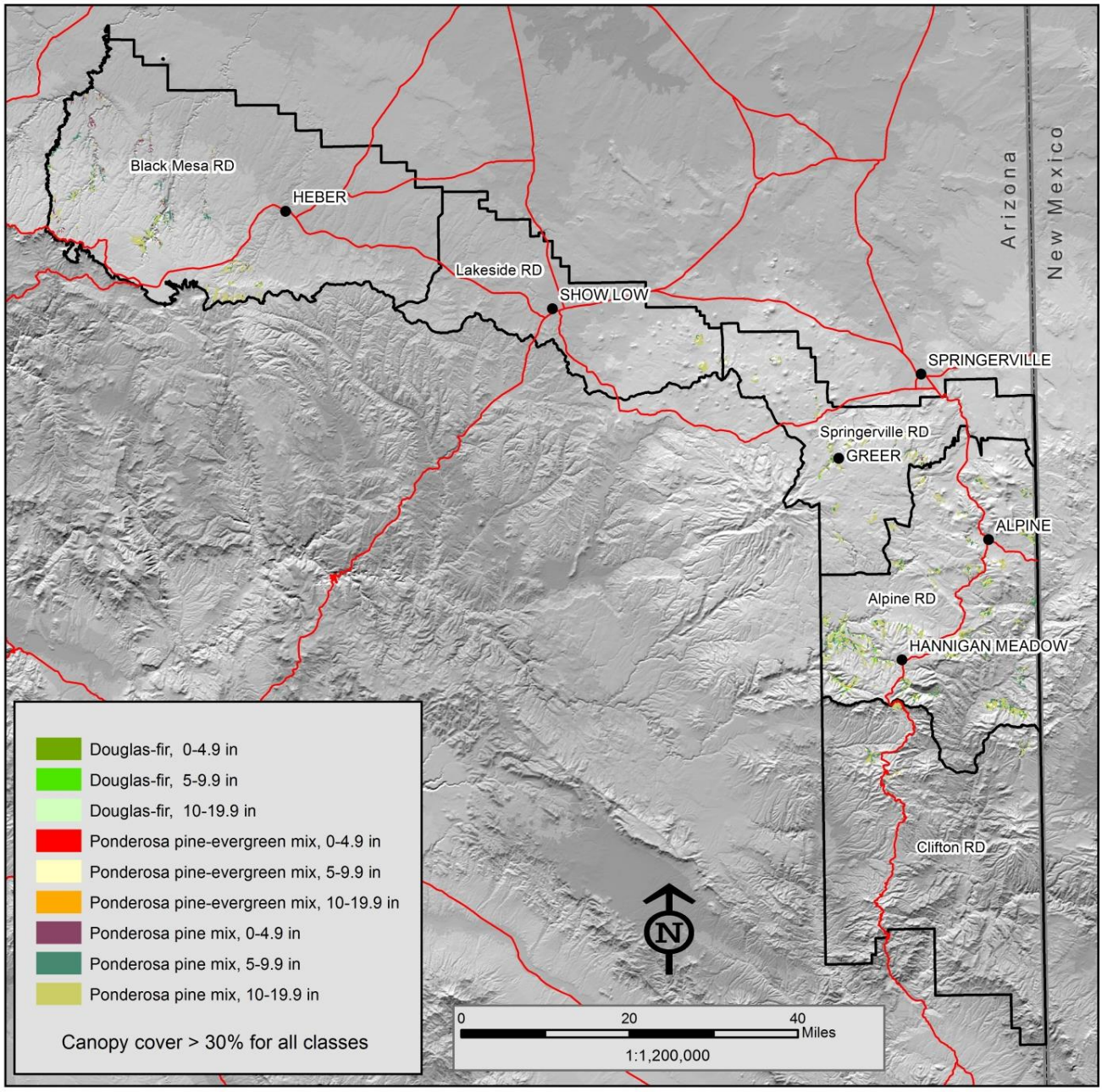

Figure 7. Existing plan designations.

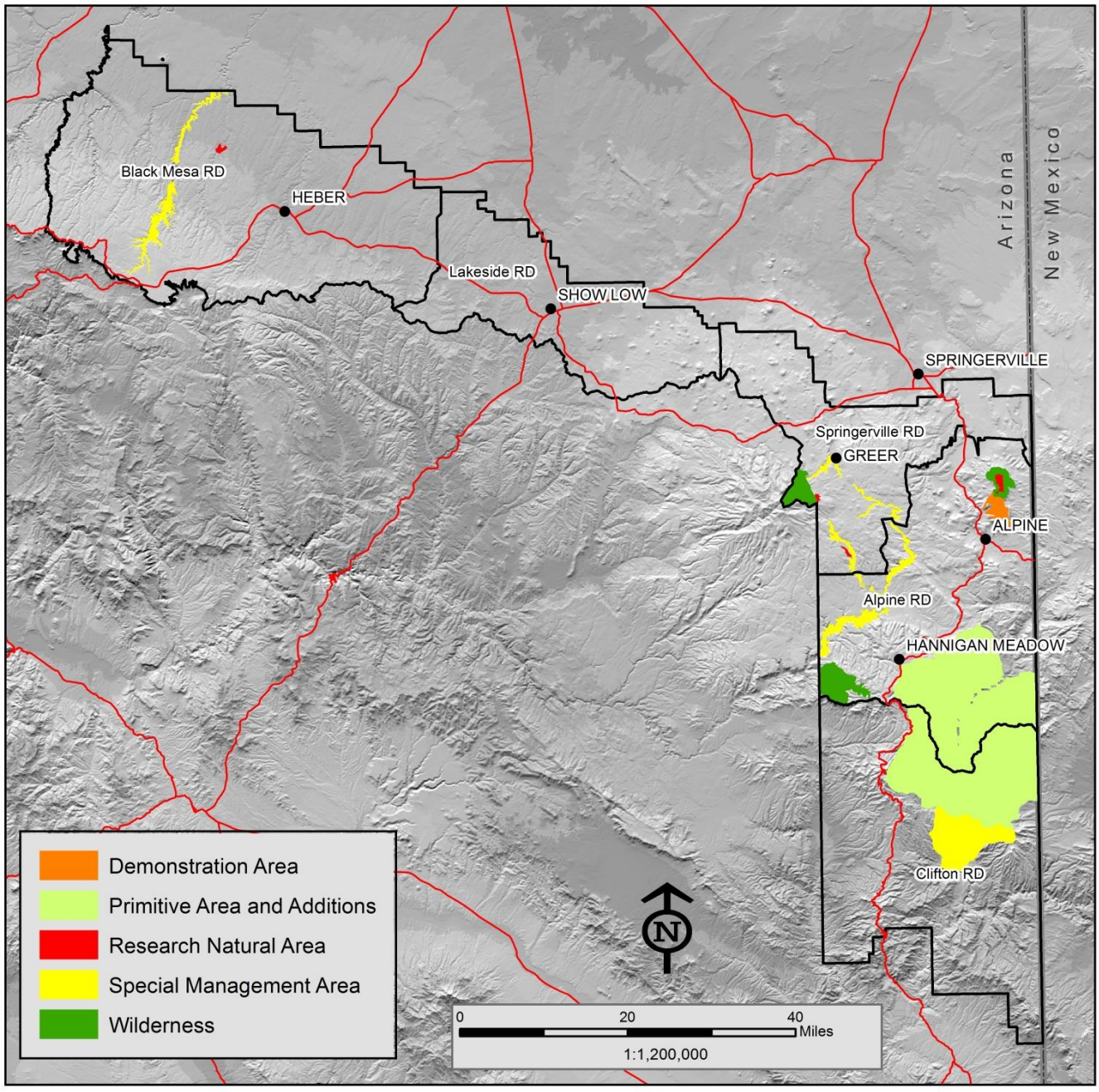

Figure 8. Restoration opportunity vegetation and existing plan.

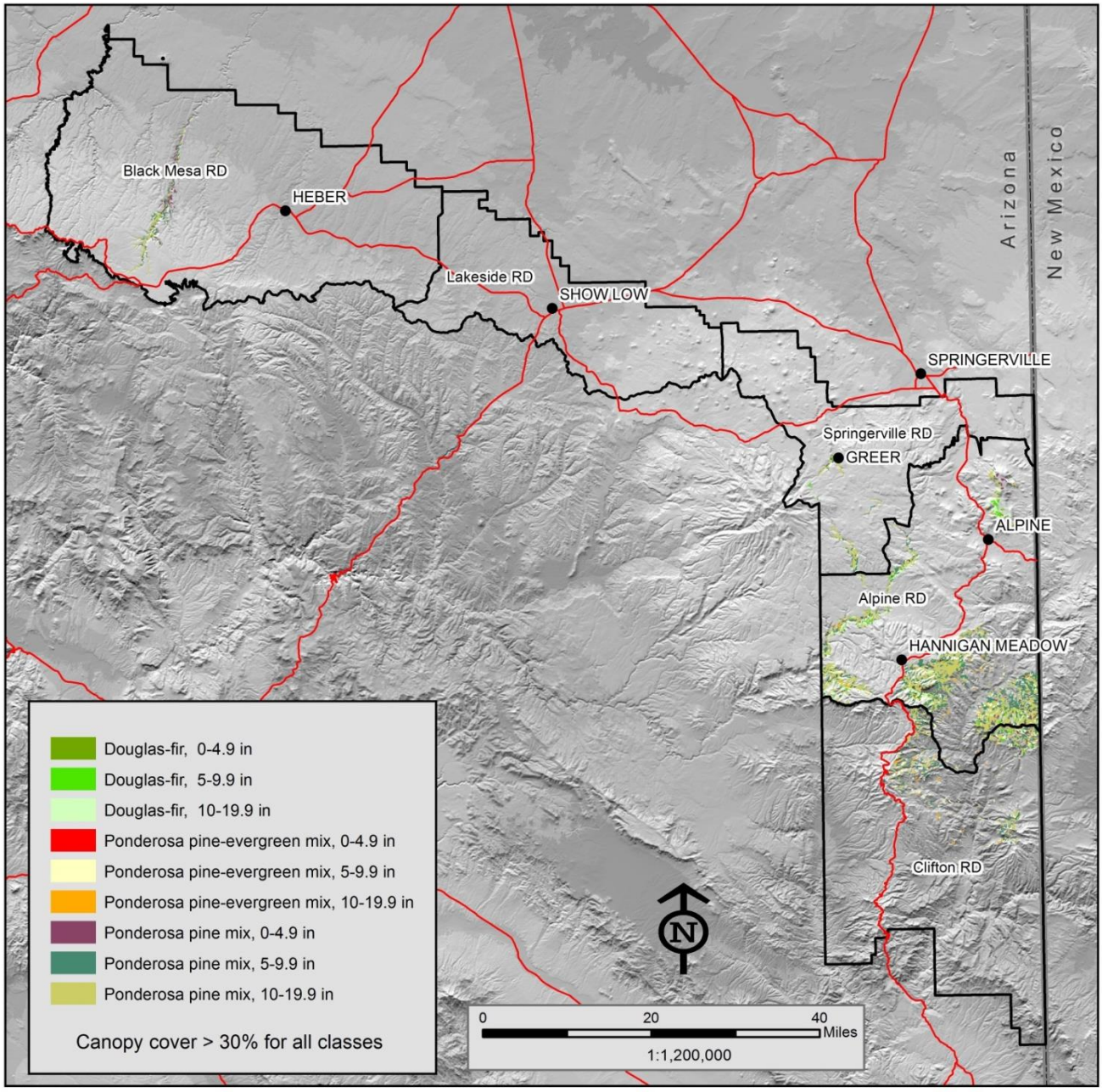

Figure 9. Priority restoration vegetation types on slopes <40% with Mexican Spotted Owl and Existing Plan management areas excluded.

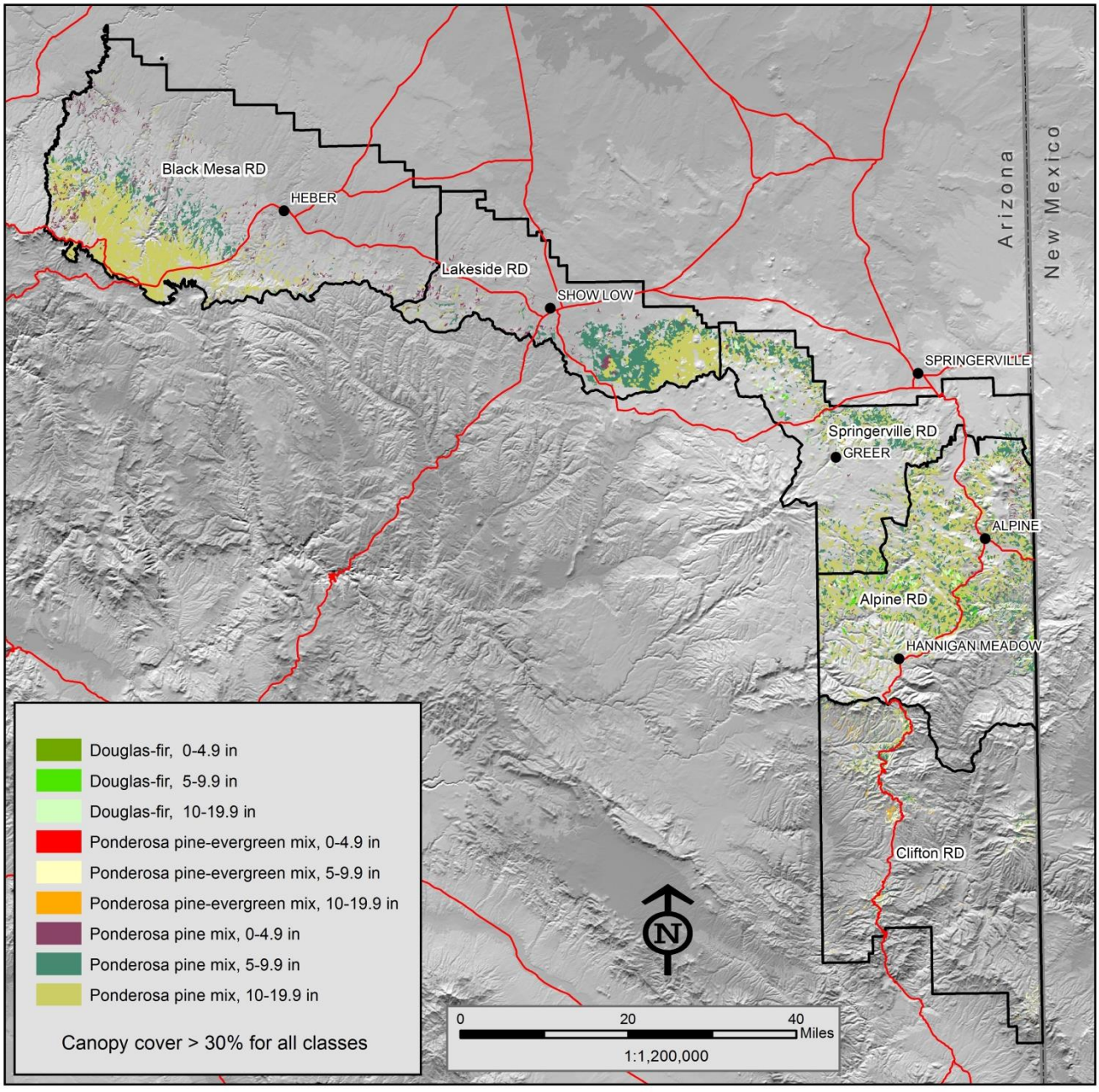

Figure 10. Priority restoration vegetation types in WCF “Functioning at Risk” and “Impaired Function" watersheds on slopes <40% with Mexican Spotted Owl and Existing Plan management areas excluded.

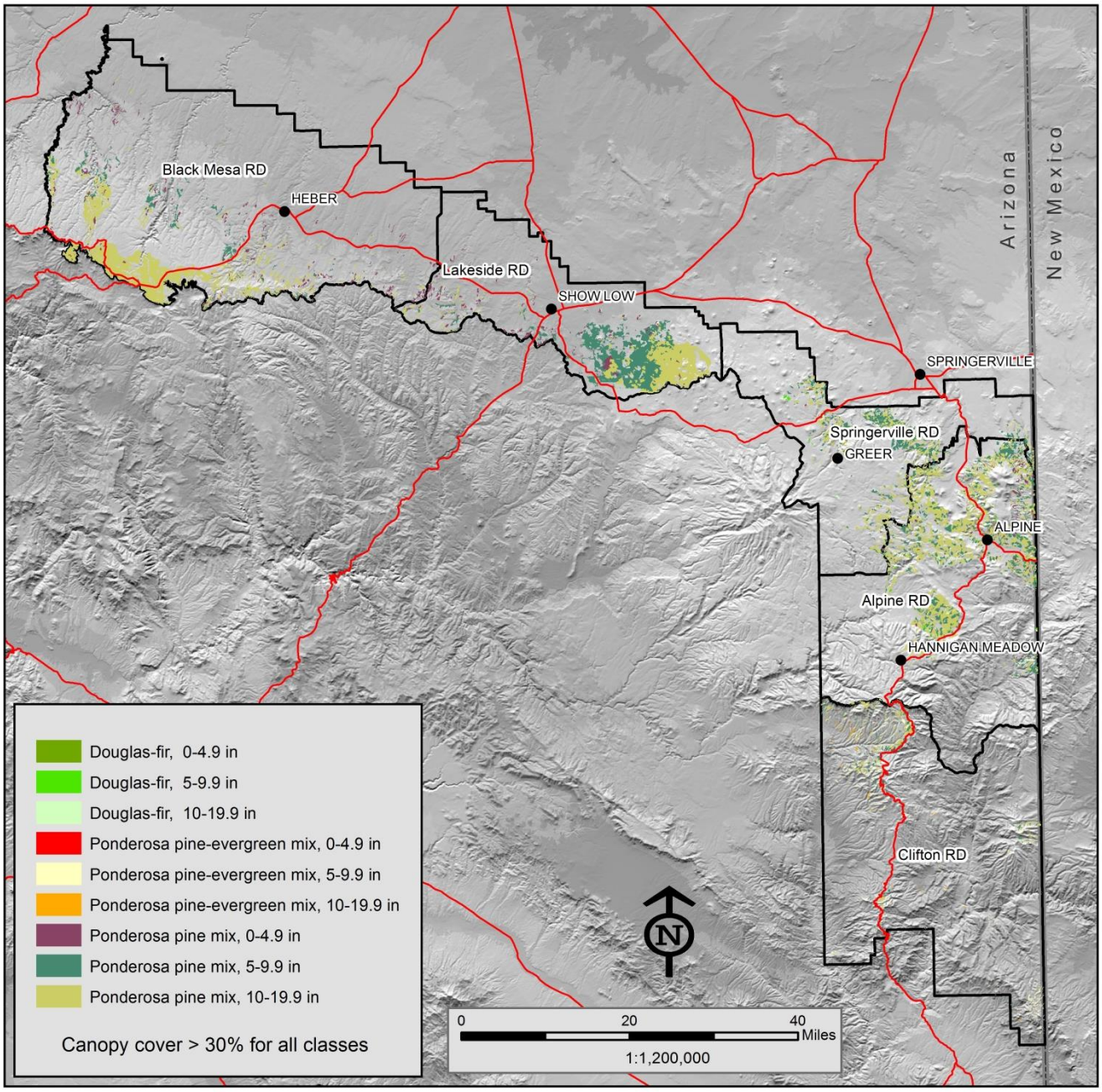

Figure 11. Priority restoration vegetation types in the WUI on slopes <40% with Mexican Spotted Owl and Existing Plan management areas excluded.

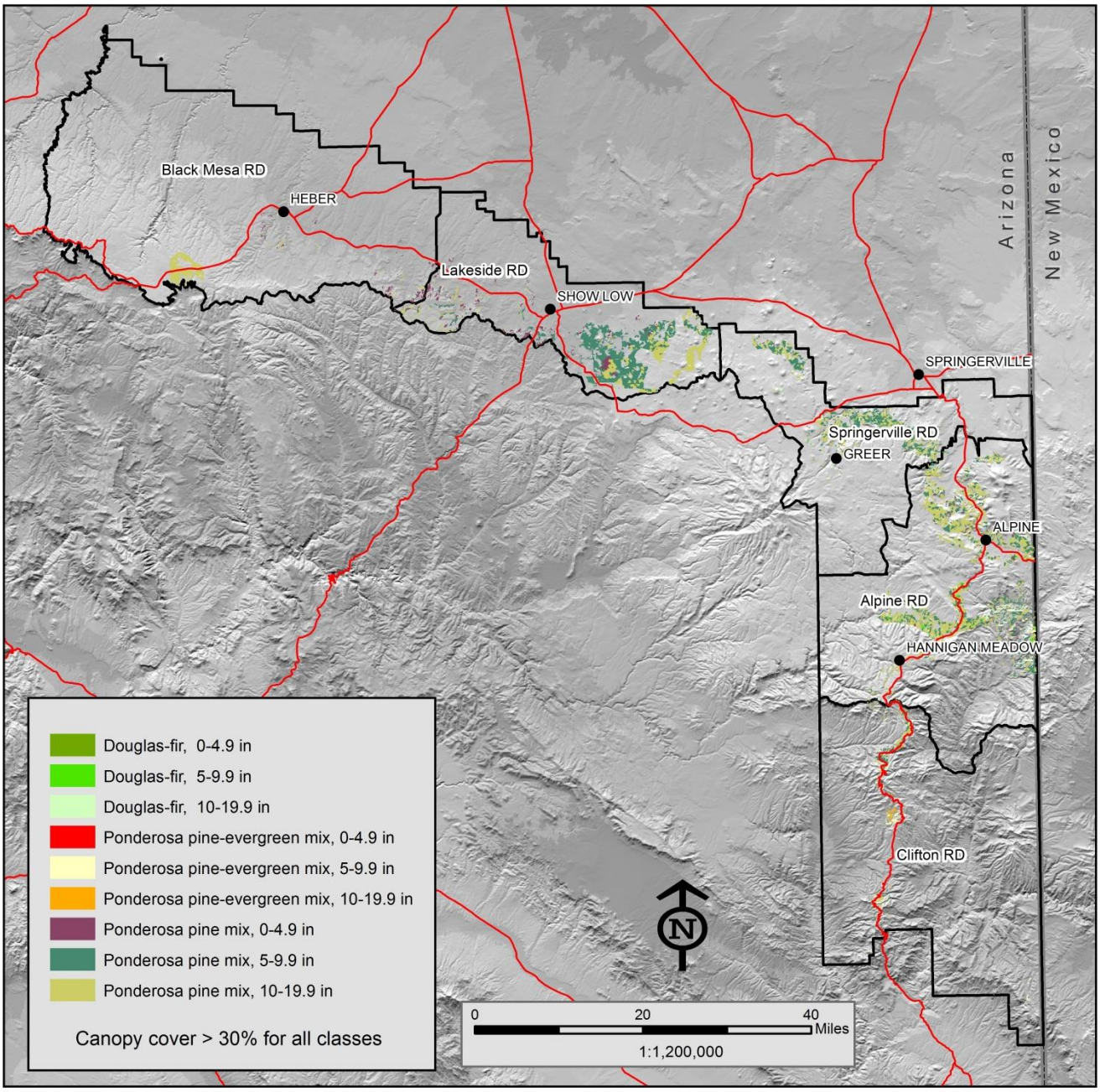

Figure 12. Wallow fire RAVG data.

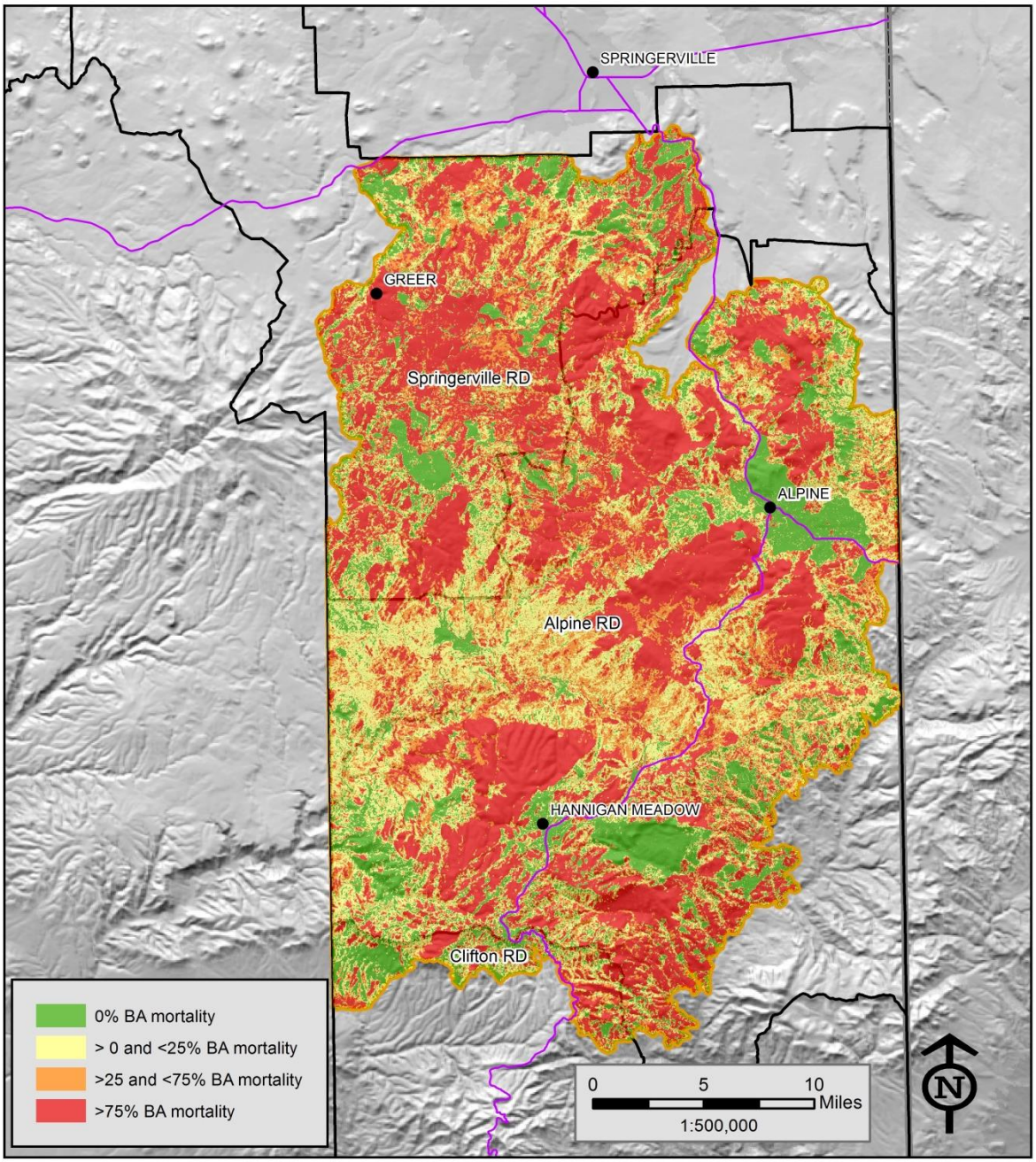

Figure 13. Forest types determined as being vulnerable to uncharacteristic wildfire.

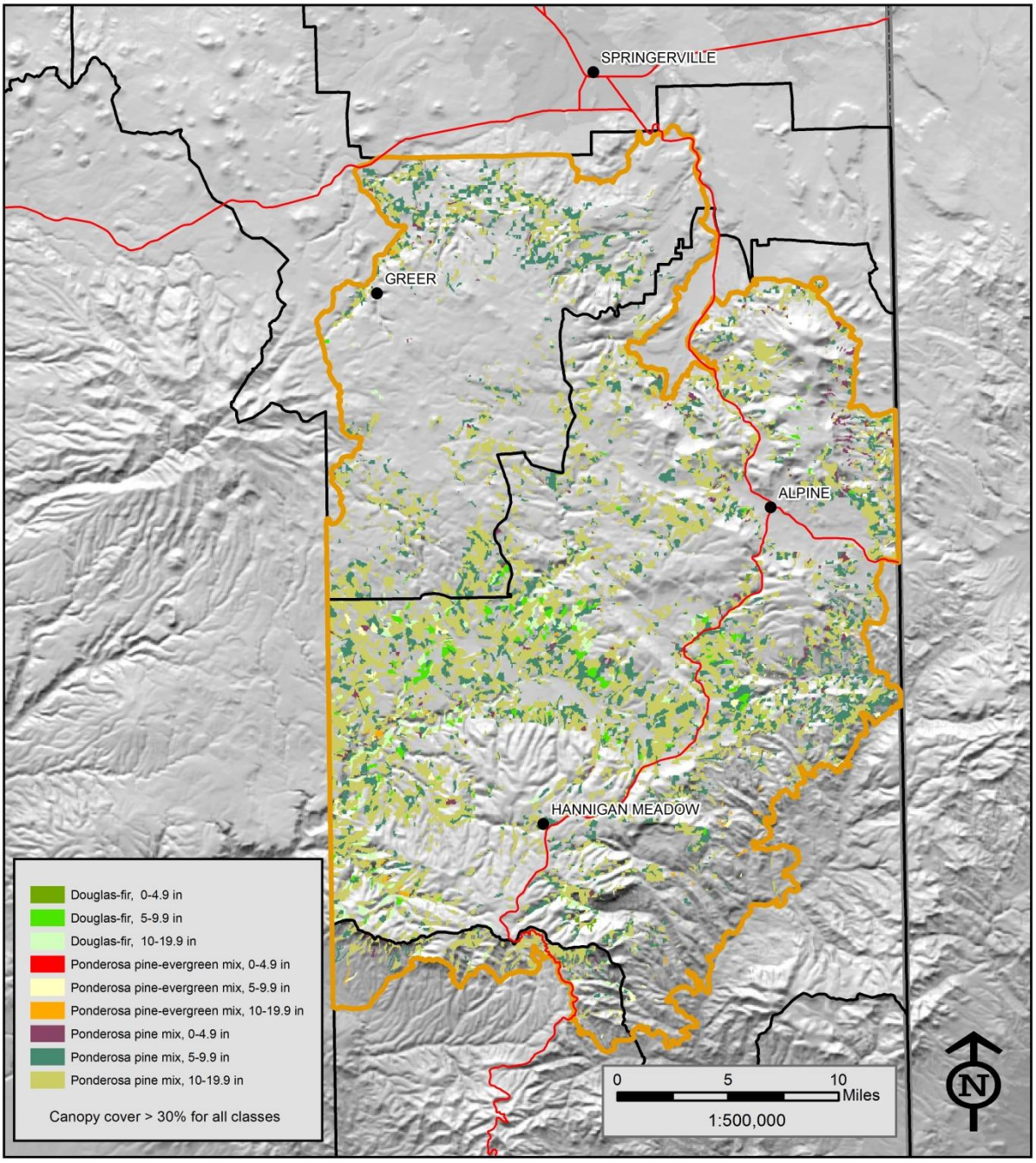

Figure 14. Forest types, located in the WUI, determined as being vulnerable to uncharacteristic wildfire.

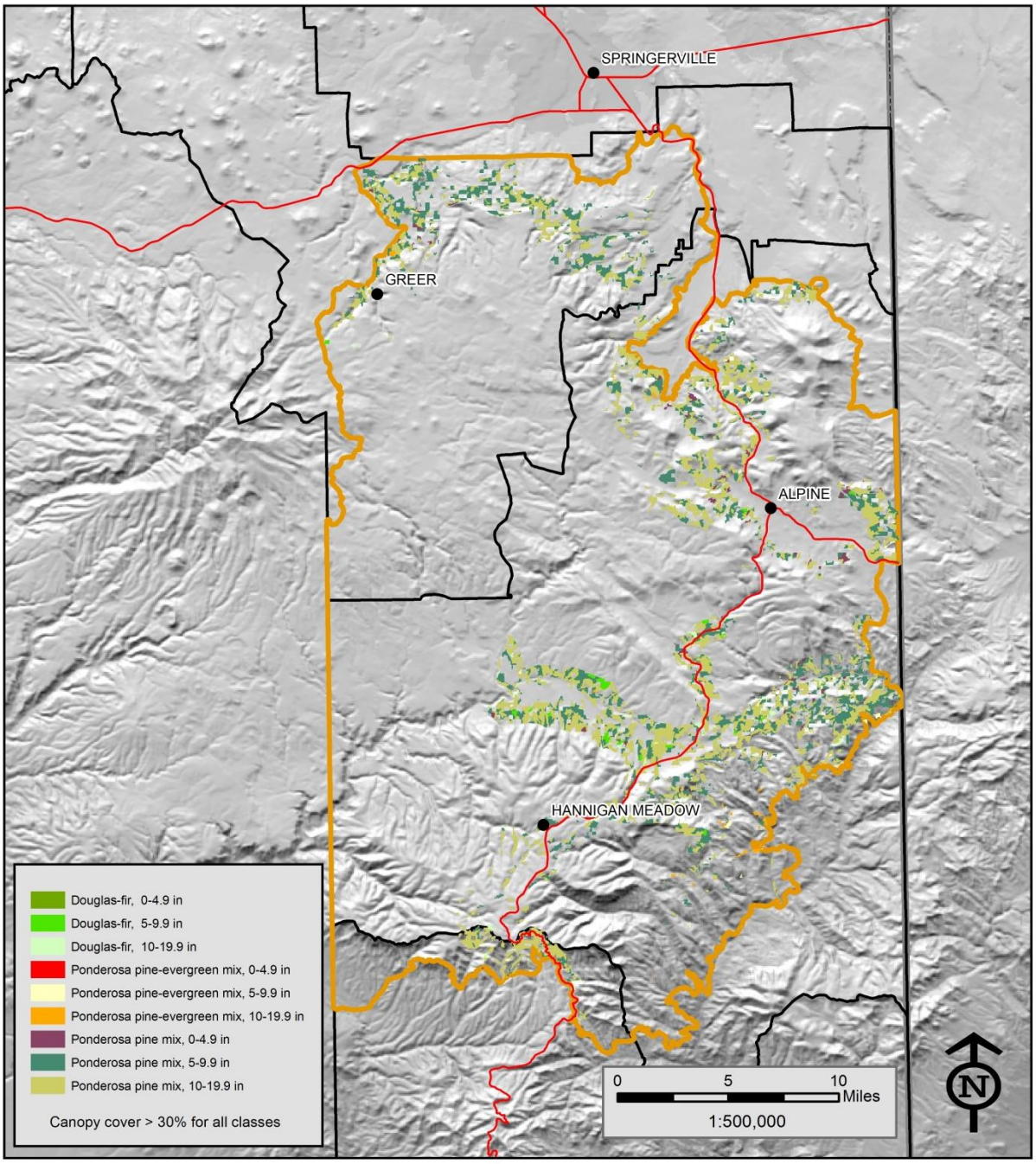

Table 1. Acres of restoration opportunity vegetation types and diameter distribution by ranger district

Ranger District	Vegetation Type	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	Douglas-fir	341	5,501	9,944	15,786
	Ponderosa pine mix	6,121	60,190	139,668	205,979
	Ponderosa pine-evergreen oak mix	22	3,718	1,312	5,052
	Total	**6,484**	**69,409**	**150,924**	**226,817**
Black Mesa					
	Douglas-fir	0	0	0	0
	Ponderosa pine mix	14,445	22,446	87,793	124,684
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**14,445**	**22,446**	**87,793**	**124,684**
Clifton	Douglas-fir	0	328	924	1,252
	Ponderosa pine mix	1,088	12,535	23,755	37,378
	Ponderosa pine-evergreen oak mix	38	10,685	4,229	14,952
	Total	**1,126**	**23,548**	**28,908**	**53,582**
Lakeside					
	Douglas-fir	0	0	0	0
	Ponderosa pine mix	4,362	28,817	30,824	64,003
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**4,362**	**28,817**	**30,824**	**64,003**
Springerville	Douglas-fir	149	834	1,612	2,595
	Ponderosa pine mix	1,408	27,429	42,503	71,340
	Ponderosa pine-evergreen oak mix	0	78	133	211
	Total	**1,557**	**28,341**	**44,248**	**74,146**
	TOTAL	**27,974**	**172,561**	**342,697**	**543,232**

Table 2. Acres of restoration opportunity vegetation types and diameter distribution on slopes >40%

Ranger District	Vegetation Type	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	Douglas-fir	139	1,084	4,079	5,302
	Ponderosa pine mix	1,382	12,138	27,507	41,027
	Ponderosa pine-evergreen oak mix	10	1,273	781	2,064
	Total	**1,531**	**14,495**	**32,367**	**48,393**
Black Mesa	Douglas-fir	0	0	0	0
	Ponderosa pine mix	2,050	2,901	5,085	10,036
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**2,050**	**2,901**	**5,085**	**10,036**
Clifton	Douglas-fir	0	71	626	697
	Ponderosa pine mix	518	6,126	13,316	19,960
	Ponderosa pine-evergreen oak mix	30	6,637	2,511	9,178
	Total	**548**	**12,834**	**16,453**	**29,835**
Lakeside	Douglas-fir	0	0	0	0
	Ponderosa pine mix	120	307	529	956
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**120**	**307**	**529**	**956**
Springerville	Douglas-fir	2	21	147	170
	Ponderosa pine mix	155	2,197	5,231	7,583
	Ponderosa pine-evergreen oak mix	0	9	2	11
	Total	**157**	**2,227**	**5,380**	**7,764**
	TOTAL	**4,406**	**32,764**	**59,814**	**96,984**

Table 3. Acres of restoration opportunity vegetation types and diameter distribution within the Wildland Urban Interface

Ranger District	Vegetation Type	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	Douglas-fir	0	1,340	1,534	2,874
	Ponderosa pine mix	2,031	29,196	53,221	84,448
	Ponderosa pine-evergreen oak mix	6	2,253	789	3,048
	Total	**2,037**	**32,789**	**55,544**	**90,370**
Black Mesa	Douglas-fir	0	0	0	0
	Ponderosa pine mix	1,191	74	5,535	6,800
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**1,191**	**74**	**5,535**	**6,800**
Clifton	Douglas-fir	0	0	399	697
	Ponderosa pine mix	422	3,478	7,416	19,960
	Ponderosa pine-evergreen oak mix	0	1,738	722	9,178
	Total	**422**	**5,216**	**8,537**	**14,175**
Lakeside	Douglas-fir	0	0	0	0
	Ponderosa pine mix	3,827	22,653	12,105	38,585
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**3,827**	**22,653**	**12,105**	**38,585**
Springerville	Douglas-fir	0	146	338	484
	Ponderosa pine mix	413	11,535	12,729	24,677
	Ponderosa pine-evergreen oak mix	0	75	40	115
	Total	**413**	**11,756**	**13,107**	**25,276**
	TOTAL	**7,890**	**72,488**	**94,828**	**175,206**

Table 4. Restoration opportunity vegetation types and diameter distribution within the Wildland Urban Interface on slopes >40%

Ranger District	Vegetation Type	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	Douglas-fir	0	299	718	1,017
	Ponderosa pine mix	451	6,501	11,112	18,064
	Ponderosa pine-evergreen oak mix	2	863	477	1,342
	Total	**453**	**7,663**	**12,307**	**20,423**
Black Mesa	Douglas-fir	0	0	0	0
	Ponderosa pine mix	44	4	65	111
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**44**	**4**	**65**	**111**
Clifton	Douglas-fir	0	0	254	254
	Ponderosa pine mix	117	1,351	4,017	5,485
	Ponderosa pine-evergreen oak mix	0	804	251	1,055
	Total	**117**	**2,155**	**4,522**	**6,794**
Lakeside	Douglas-fir	0	0	0	0
	Ponderosa pine mix	101	204	122	427
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**101**	**204**	**122**	**427**
Springerville	Douglas-fir	0	7	48	55
	Ponderosa pine mix	60	1,176	2,118	3,354
	Ponderosa pine-evergreen oak mix	0	8	0	8
	Total	**60**	**1,191**	**2,166**	**3,417**
	TOTAL	**775**	**11,215**	**19,182**	**31,172**

Table 5. Watershed Condition Framework designations and acres of priority restoration vegetation types.

Ranger District	Vegetation Type & WCF	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	*Douglas-fir*				
	Functioning properly	209	3,888	7,259	11,356
	Functioning at risk	132	1,614	2,561	4,307
	Ponderosa pine mix				
	Functioning properly	2,263	31,860	76,800	110,923
	Functioning at risk	3,858	28,184	62,620	94,662
	Ponderosa pine-evergreen oak mix				
	Functioning properly	9	2,506	991	3,506
	Functioning at risk	13	1,212	321	1,546
Black Mesa	*Douglas-fir*				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
	Ponderosa pine mix				
	Functioning properly	6,147	14,314	41,414	1,875
	Functioning at risk	8,166	8,131	44,819	61,116
	Impaired function	132	0	1,559	1,691
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
Clifton	*Douglas-fir*				
	Functioning properly	0	300	444	744
	Functioning at risk	0	28	479	507
	Ponderosa pine mix				
	Functioning properly	541	5,980	8,434	14,955
	Functioning at risk	547	6,555	15,321	22,423
	Ponderosa pine-evergreen oak mix				
	Functioning properly	24	3,576	1,634	5,234
	Functioning at risk	14	7,109	2,595	9,718

Lakeside	*Douglas-fir*				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
	Ponderosa pine mix				
	Functioning properly	272	3,468	8,096	11,836
	Functioning at risk	4,068	25,328	22,371	51,767
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
Springerville	*Douglas-fir*				
	Functioning properly	139	622	1,296	2,057
	Functioning at risk	0	212	316	528
	Ponderosa pine mix				
	Functioning properly	842	15,674	24,603	41,119
	Functioning at risk	566	11,630	17,793	29,989
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	32	85	117
	Functioning at risk	0	45	48	93

Table 6. Mexican Spotted Owl and priority restoration vegetation types

Ranger District	Vegetation Type	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine RD	Douglas-fir	114	559	1,350	2,023
	Ponderosa pine mix	464	5,936	15,931	22,331
	Ponderosa pine-evergreen oak mix	0	479	158	637
	Total	**578**	**6,974**	**17,439**	**24,991**
Black Mesa RD	Douglas-fir	0	0	0	0
	Ponderosa pine mix	2,181	3,046	6,493	11,720
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**2,181**	**3,046**	**6,493**	**11,720**
Clifton RD	Douglas-fir	0	22	16	38
	Ponderosa pine mix	2	438	1,300	1,740
	Ponderosa pine-evergreen oak mix	0	140	50	190
	Total	**2**	**600**	**1,366**	**1,968**
Lakeside RD	Douglas-fir	0	0	0	0
	Ponderosa pine mix	0	115	995	1,110
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**0**	**115**	**995**	**1,110**
Springerville RD	Douglas-fir	0	54	22	76
	Ponderosa pine mix	187	1,097	4,175	5,459
	Ponderosa pine-evergreen oak mix	0	0	0	0
	Total	**187**	**1,151**	**4,197**	**5,535**
	TOTAL	**2,948**	**11,886**	**30,490**	**45,324**

Table 7. Special designations and priority restoration vegetation

Ranger District	Vegetation Type & WCF	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	*Douglas-fir*				
	Demonstration Area	120	450	871	1,441
	Primitive Area and additions	127	400	1,397	1,924
	Research Natural Area	0	0	0	0
	Special Management Area	0	344	1,591	1,935
	Wilderness	0	197	1,078	1,275
	Ponderosa pine mix				
	Demonstration Area	8	287	710	1,005
	Primitive Area and additions	835	12,748	20,924	34,507
	Research Natural Area	137	7	174	318
	Special Management Area	89	1,497	4,101	5,687
	Wilderness	236	870	4,535	5,641
	Ponderosa pine-evergreen oak mix				
	Demonstration Area	0	0	0	0
	Primitive Area and additions	14	1,745	709	2,468
	Research Natural Area	0	0	0	0
	Special Management Area	0	79	102	181
	Wilderness	0	17	111	128
Black Mesa	*Douglas-fir*	N/A	N/A	N/A	N/A
	Ponderosa pine mix				
	Demonstration Area	0	0	0	0
	Primitive Area and additions	0	0	0	0
	Research Natural Area	4	0	37	41
	Special Management Area	826	1,351	2,511	4,688
	Wilderness	0	0	0	0
	Ponderosa pine-evergreen oak mix	N/A	N/A	N/A	N/A

Clifton	*Douglas-fir*				
	Demonstration Area	0	0	0	0
	Primitive Area and additions	0	300	340	640
	Research Natural Area	0	0	0	0
	Special Management Area	0	0	0	0
	Wilderness	0	0	0	0
	Ponderosa pine mix				
	Demonstration Area	0	0	0	0
	Primitive Area and additions	341	4,027	6,387	10,755
	Research Natural Area	0	0	0	0
	Special Management Area	20	403	279	702
	Wilderness	0	0	0	0
	Ponderosa pine-evergreen oak mix				
	Demonstration Area	0	0	0	0
	Primitive Area and additions	6	1,837	653	0
	Research Natural Area	0	0	0	3
	Special Management Area	0	359	272	104
	Wilderness	0	0	0	113
Springerville	*Douglas-fir*				
	Demonstration Area	0	0	0	0
	Primitive Area and additions	0	0	0	0
	Research Natural Area	0	0	3	3
	Special Management Area	0	3	101	104
	Wilderness	0	90	23	113
	Ponderosa pine mix				
	Demonstration Area	0	0	0	0
	Primitive Area and additions	0	0	0	0
	Research Natural Area	0	72	160	232
	Special Management Area	21	724	2,221	2,966
	Wilderness	24	16	24	64
	Ponderosa pine-evergreen oak mix	N/A	N/A	N/A	N/A

Table 8. Priority restoration vegetation types, by WCF type, on slopes <40% with Mexican Spotted Owl and Existing Plan management areas excluded.

Ranger District	Vegetation Type & WCF	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	*Douglas-fir*				
	Functioning properly	31	2,646	3,011	5,688
	Functioning at risk	13	754	741	1,508
	Ponderosa pine mix				
	Functioning properly	1,409	17,535	43,419	62,363
	Functioning at risk	2,303	18,757	43,869	64,929
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	951	91	1,042
	Functioning at risk	2	373	140	515
Black Mesa	*Douglas-fir*				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
	Ponderosa pine mix				
	Functioning properly	4,316	11,713	36,670	52,699
	Functioning at risk	6,192	5,608	39,154	50,954
	Impaired function	130	0	1,528	1,658
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
Clifton	*Douglas-fir*				
	Functioning properly	0	0	32	32
	Functioning at risk	0	3	159	162
	Ponderosa pine mix				
	Functioning properly	119	1,367	1,283	2,769
	Functioning at risk	285	2,841	5,890	9,016
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	1,011	541	1,552
	Functioning at risk	6	2,249	872	3,127

Lakeside	*Douglas-fir*				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
	Ponderosa pine mix				
	Functioning properly	263	3,271	7,456	10,990
	Functioning at risk	3,957	25,122	21,660	50,739
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
Springerville	*Douglas-fir*				
	Functioning properly	138	471	1,127	1,736
	Functioning at risk	0	201	276	477
	Ponderosa pine mix				
	Functioning properly	720	14,015	19,752	34,487
	Functioning at risk	350	10,120	13,880	24,350
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	30	83	113
	Functioning at risk	0	38	48	86

Table 9. Priority restoration vegetation types in the WUI, by WCF type, on slopes <40% with Mexican Spotted Owl PACs and Existing Plan Management areas excluded.

Ranger District	Vegetation Type & WCF	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine RD	*Douglas-fir*				
	Functioning properly	0	401	317	718
	Functioning at risk	0	451	248	699
	Ponderosa pine mix				
	Functioning properly	573	7,351	11,485	19,409
	Functioning at risk	554	8,204	19,838	28,596
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	272	58	330
	Functioning at risk	0	232	50	282
Black Mesa RD	*Douglas-fir*				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
	Ponderosa pine mix				
	Functioning properly	7	0	2,065	2,072
	Functioning at risk	1,140	73	3,405	4,618
	Impaired function	0	0	0	0
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
Clifton RD	*Douglas-fir*				
	Functioning properly	0	0	21	21
	Functioning at risk	0	0	91	91
	Ponderosa pine mix				
	Functioning properly	113	780	855	1,748
	Functioning at risk	192	1,211	2,129	3,532
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	607	423	1,030
	Functioning at risk	0	327	48	375

Lakeside RD	*Douglas-fir*				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
	Ponderosa pine mix				
	Functioning properly	63	1,790	1,746	3,599
	Functioning at risk	3,640	20,640	10,190	34,470
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	0	0	0
	Functioning at risk	0	0	0	0
Springerville RD	*Douglas-fir*				
	Functioning properly	0	41	220	261
	Functioning at risk	0	47	49	96
	Ponderosa pine mix				
	Functioning properly	143	3,891	2,995	7,029
	Functioning at risk	162	6,058	6,638	12,858
	Ponderosa pine-evergreen oak mix				
	Functioning properly	0	30	0	30
	Functioning at risk	0	37	40	77

Table 10. RAVG mortality, in acres, by ranger district.

Ranger District	0%	1-10%	11-25%	26-50%	51-75%	76-90%	>90%	Total
Alpine	48,816	52,243	38,841	41,846	27,250	16,062	115,847	340,905
Clifton	5,927	3,234	1,681	1,442	1,487	849	4,013	18,633
Springerville	21,814	14,405	11,008	14,228	11,363	8,236	54,242	135,296
Total	**76,557**	**69,882**	**51,530**	**57,516**	**40,100**	**25,147**	**174,102**	**494,834**

Table 11. Vegetation types and diameter classes of forest stands that remain vulnerable to uncharacteristic fire.

Ranger District	Species/BA Mortality	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	*Douglas-fir*				
	0%	26	313	1,118	1,457
	1-10%	31	1,029	1,424	2,484
	11-25%%	65	995	1,222	2,282
	26-50%	33	881	1,240	2,154
	Ponderosa pine mix				
	0%	847	5,628	13,927	20,402
	1-10%	624	7,642	20,127	28,393
	11-25%	573	6,512	16,224	23,309
	26-50%	599	6,686	16,654	23,939
	Ponderosa pine-evergreen oak mix				
	0%	0	292	229	521
	1-10%	0	472	144	616
	11-25%	0	206	104	310
	26-50%	4	187	116	307
Clifton	*Douglas-fir*				
	0%	0	0	12	12
	1-10%	0	3	99	102
	11-25%	0	0	25	25
	26-50%	0	0	67	67
	Ponderosa pine mix				
	0%	77	360	1,421	1,858
	1-10%	69	214	959	1,242
	11-25%	26	126	499	651
	26-50%	6	116	516	638
	Ponderosa pine-evergreen oak mix				
	0%	0	24	13	37
	1-10%	0	24	23	47
	11-25%	0	1	8	9
	26-50%	0	26	7	33

Springerville	*Douglas-fir*				
	0%	0	4	62	66
	1-10%	0	39	61	100
	11-25%	0	78	55	133
	26-50%	0	41	97	138
	Ponderosa pine mix				
	0%	141	2,059	3,564	5,764
	1-10%	39	2,290	3,716	6,045
	11-25%	27	1,590	2,917	4,534
	26-50%	33	2,121	3,258	5,412
	Ponderosa pine-evergreen oak mix				
	0%	0	14	33	47
	1-10%	0	0	16	16
	11-25%	0	1	1	2
	26-50%	0	0	1	1
	TOTAL	**3,220**	**39,974**	**89,959**	**133,153**

Table 12. Vegetation types and diameter classes of forest stands, in the WUI, that remain vulnerable to uncharacteristic fire.

Ranger District	Species/BA Mortality	0-4.9 in	5-9.9 in	10-19.9 in	Total
Alpine	*Douglas-fir*				
	0%	0	44	61	105
	1-10%	0	113	164	277
	11-25%%	0	135	120	255
	26-50%	0	256	229	485
	Ponderosa pine mix				
	0%	256	2,669	4,482	7,407
	1-10%	174	3,272	6,982	10,428
	11-25%	187	2,774	5,676	8,637
	26-50%	199	2,961	5,909	9,069
	Ponderosa pine-evergreen oak mix				
	0%	0	75	62	137
	1-10%	0	75	70	145
	11-25%	0	35	66	101
	26-50%	0	51	60	111
Clifton	*Douglas-fir*				
	0%	0	0	4	4
	1-10%	0	0	54	54
	11-25%	0	0	7	7
	26-50%	0	0	8	8
	Ponderosa pine mix				
	0%	5	97	680	782
	1-10%	5	70	419	494
	11-25%	0	42	207	249
	26-50%	0	25	306	331
	Ponderosa pine-evergreen oak mix				
	0%	0	24	13	37
	1-10%	0	24	23	47
	11-25%	0	1	8	9
	26-50%	0	26	7	32

Springerville	*Douglas-fir*				
	0%	0	1	33	34
	1-10%	0	0	0	0
	11-25%	0	0	1	1
	26-50%	0	25	7	138
	Ponderosa pine mix				
	0%	76	1,057	1,197	2,330
	1-10%	21	1,206	988	2,215
	11-25%	18	888	949	1,855
	26-50%	19	1,155	1,088	2,262
	Ponderosa pine-evergreen oak mix				
	0%	0	14	22	36
	1-10%	0	0	16	16
	11-25%	0	1	1	2
	26-50%	0	0	0	0
	TOTAL	**960**	**17,041**	**29,868**	**47,869**

This research was funded by a grant from the USDA Forest Service.