SACRAMENTO MOUNTAINS SALAMANDER

Aneides hardii

2015 INVENTORY AND MONITORING ANNUAL REPORT

LINCOLN NATIONAL FOREST

SMOKEY BEAR RANGER DISTRICT

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The Sacramento Mountains salamander (*Aneides hardii*) is a state-listed threatened species in New Mexico. It is considered to be a forest sensitive species that is rated as a G3 globally. It is one of two species of plethodontid salamanders endemic to the state; The Sacramento Mountains salamander and the Jemez Mountains salamander (*Plethodon neomexicanus*). Unlike many other salamanders in North America, these species are geographically isolated from other species in the Plethodon and Aneides genus. The Sacramento Mountains salamander is restricted to three mountain ranges that it shares with the tiger salamander: Capitan, Sacramento, and the White mountains. The majority of salamander habitat is located on federally managed USFS and tribal lands.

The Plethodontidae family is distinguished from other salamanders by their breathing. They diffuse oxygen across the epidermis and the mucosa in their mouths since they do not have lungs. It is essential that they live in moist areas that allow them to breathe and avoid desiccation. Adult lengths are approximately 70-100 mm in length and males are larger than females (Degenhardt et al. 1996). Males can be distinguished from females by having a more pronounced triangular head, a gland located under their bottom jaw, and teeth that can be felt by placing a fingertip under the jaw.

Primary constituent elements of the Sacramento Mountains salamander habitat consist of: (1) larger trees with increased canopy cover (2) north-facing slopes (3) litter and fine woody debris cover (4) 7900+ feet in elevation. Trees increase soil moisture,

provide shade, and assist in keeping higher humidity closer to the ground. The following tree species contribute to the Sacramento Salamanders habitat in combination or alone in aspen or mixed conifer forests: Douglas fir (*Pseudotsuga menziesii*), White fir (*Abies concolor*), Gambel oak (*Quercus gambelii*), Quaking aspen (*Populus tremuloides*) and Ponderosa pine (*Pinus ponderosa*).

Areas containing suitable salamander habitat and historical presence were surveyed to determine occupancy. Forest treatments, such as thinning and prescribed fires that reduce stand density, result in decreased suitable habitat, increasing soil temperatures, and lowering moisture content. It is essential to complete thorough surveys to preserve protected sites.

Post Wildfire Habitat Conditions

Due to the 2012 Little Bear Fire, habitat conditions have been altered in much of the historical range of the Sacramento Mountain salamander on the Smokey Bear Ranger District. Approximately 8,500 acres of habitat burned at high severity, with an additional 3,670 acres in moderate severity. Of the 20,800 acres of suitable habitat, 15,350 acres were affected in the Upper Rio Bonito watershed, with 9,000 acres in high or moderate severity burn areas (Parsons 2012). The survey efforts of the 2013 and 2014 field seasons suggest that severe habitat disturbances significantly impacted salamander populations. In burn areas that were moderate - low severity, populations also were impacted significantly. In some areas where fire intensities were labeled as moderate or low, much of the large decadent downed woody debris was lost, resulting in an overall loss of suitable habitat. Habitat alterations due to direct and indirect fire effects have changed the composition of these communities. The 2013 and 2014 field seasons surveyed post burn sites where limited canopy cover and disturbed soils remained evident. Further monitoring is needed to fully assess the impacts of fire on Sacramento Mountains salamander populations on the Smokey Bear Ranger District.

Methods

Surveys were conducted in July, August and September of 2015 during the monsoon season. Surveys took place during day light hours in historic monitoring and inventory survey areas. The habitat consisted of moist areas with tall canopy coverage, rocky and moderately burned areas. Monitoring surveys were conducted in the 2015 monsoon season to confirm presence in burned areas that were previously inhabited. Techniques included flipping over rocks, peeling over soft and decayed bark from logs, searching under woody debris and visual searches in moist soil. Habitat components were restored after rocks were flipped and bark removed.

A Garmin GPS unit was used to record salamander locations using the North American Datum of 1983 UTM. During each survey the following data was collected: 1) start time 2) end time 3) weather conditions 4) survey area 5) habitat type 6) presence or absence of salamander 7) individual surveyors and 8) survey route. Salamander presence including the following documentation in addition to the survey data: 1) UTM coordinates, 2) elevation, 3) distance to drainage, 4) slope facing, 5) canopy coverage, 6) log type, 7) dominant tree species.

Survey Area

Five salamander surveys were completed during the 2015 field season on the Smokey Bear Ranger District, in the Lincoln National Forest. Presence was established in three of the five areas that were surveyed. The optimal habitat for the Sacramento Mountains salamander is moisture rich north facing slopes with plentiful amounts of fallen, decomposing timber. Sacramento Mountains salamanders were found under rocks and woody debris with moderate amounts of ground moisture in the areas that they were

present. Sacramento Mountains salamanders were also located in moderately burnt areas where the forest floor contained rocks and/or semi burnt fallen woody debris.

Due to alterations of viable Sacramento Mountain Salamander habitat, the 2015 survey effort was dedicated to intensify surveys in historical habitat that has recently been impacted by fire. Monitoring sites are areas where historically salamanders have been documented and their continued occupation is determined. Inventory sites are areas where salamanders have not been documented before. Survey efforts in 2015 sites consisted of historical sites, with the exception of Capitan Peak, which was surveyed September 1st through the 3rd.

Table 1. 2015 Site Survey Summary

Location	Mixed conifer forest	Aspen grove	Oak grove	Pine	Rock	% Canopy coverage	Slope facing (N,S,E,W)
Argentina			**X**	**X**		**30%**	**N**
Big Bear Canyon	**X**					**70%**	**N**
Capitan Peak	**X**				**X**	**70%**	**N**
Little Bonito	**X**					**60%**	**N**
Ski Apache	**X**	**X**				**10%**	**N**
Inventory	**Low intensity burn**	**Moderate intensity burn**	**High intensity burn**				

Results

Sacramento Mountains salamanders were present in 3 of the 5 surveyed areas. The elevation range of salamanders ranged between 7901 ft and 10,100 ft. Habitat consisted of Gamble's oak, mixed conifer, and pine. Habitat with salamander presence consisted of aspen, mixed conifer, pine trees with some sites consisting of rocky terrain. Surveys were conducted in areas where slash burn piles were completed in April 2014. Despite disturbed soils and the absence of canopy cover, presence was still established. Slash piles were utilized by the salamanders.

Moisture levels appeared to impact presence in the surveyed areas. Argentina trail and Little Bonito were exceptionally dry at the time that surveys were conducted, which may have influenced salamander absence. Moisture levels and salamander presence were abundant in Big Bear Canyon, Capitan Peak, and the Ski Apache area. Future survey efforts in Argentina trail and Little Bonito in the 2016 season should be performed during a time period where there has been recent rainfall.

Table 2. 2014 Results Survey Summary

Area	Status	Elevation (Ft.)	Slope Facing (N,S,E,W)	Location: UTM 13 S	Location (Log type/Rock)
Argentina	Absence	9,200	N	0430218 3695623	Rock
Big Bear Canyon	Presence	7,900	N	N/A	N/A
Capitan Peak Trail	Presence Between Points	9,600	N	437782 3716253 475017 3716585	Log
Little Bonito	Absence	8,220	N	0426630 3695878	
Ski Apache	Presence	10,050	N	N/A	N/A
Inventory*					

Historical Data

Table 3. Historical and current salamander Presence (P) and Absence (A) data. Highlighted areas indicate 2014 surveyed locations. Not all locations were surveyed each year.

Location	93	96	97	99	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Anan Canyon														A	A				
Argentina Canyon											A	A	A		A		A		A
Aspen Canyon											A	A			P		A		
Axel Bend																	A		
Big Bear										P	P	P	P		P				P
Bluefront					A						A	A			A				
Big Bonito Canyon																	A		
Bonito Lake			A																
Buck Mountain			P													A	P		
Capitan Peak																			P
Carrizo Mountain																A		A	
Carlton Canyon		P	P														P	P	
Church Mountain																		A	
Dark Betsy															P				
Eagle Creek			P		P	A					P	P	P				P		
Encinoso Canyon								P									P		
Flume Canyon						A	A										A		
George Canyon										A	A								
Great Western Mines									A		P	P	P						
Iron Canyon													A						
Johnson			P		A												P		
Kraus															A				
Kraut Canyon														P					
Last Curve/Sierra Blanca																	P	P	
Littleton Canyon								P		A		A	A	P	A				
Little Bear Canyon												A			P		P		
Little Creek							A												
Loma Grande									A	A							A	A	
Lower South Fork					A							A			A				
Mineral Farms										A		A							
Monjeau Lookout					A										A		A		
Oak Grove Campground			A												P		P		
Pennsylvania																		A	
Perk/Brady/Cedar Creek									P	A			A						
Phillips Canyon						A	A										A		
Rodamaker Canyon												A			A		A		
Sierra Blanca					P												P	P	
Ski Apache Power Line																	A		P

Skyline Campground					A	A									A		A		
Spring Curve																	P		
Summit Trail/East Mountain				P								P			A	P	P		
Telephone Canyon					A														
Texas Bend																	A		
Three Rivers Canyon																	P		
Turkey Canyon	P		A					A		A	A		A		A		A		A
Upper Cedar Creek													A				A		
Upper George Washington											A	A		A					
Upper South Fork					P							A			A				
Walt Smith Canyon											A	A	A		A				
Water Canyon				A													A		
West Mountain								A						P		A	P		
Wet Mills/Schoolhouse												A							

University of New Mexico: Sacramento Mountains Salamander Genetic Analysis

A team of researchers from University of New Mexico came to Lincoln national forest to obtain samples of genetic material from Sacramento Mountains salamanders. Data was collected from the Ski Apache power line area and Big Bear canyon. The genetic information gathered from the salamanders at each site will be compared with each other to evaluate for potential differences in genotype between collection sites. The team is planning on collecting data from the Capitan mountain range in the future because it is so isolated from the rest of the forest.

New Mexico Salamander Team Meeting

The New Mexico salamander team came to Ruidoso to discuss future approaches and objectives regarding the protection of Sacramento Mountains salamanders. Salamander presence in Ski Apache area was shown to team as an example of a burned area with current salamander presence. The team discussed the importance of surveying

these burned areas to learn how Sacramento Mountains salamanders respond to habitat disturbances. Further studies are planned for 2016 in these burned areas.

Recommendations for 2016 Season

Data suggests that Sacramento Mountains salamanders thrive in habitat that has been exposed to fire. The continuation of surveys in each burn site is necessary to determine if fire has any long term effects on future populations. Survey sites need to be expanded more to the north and made a priority. Slash burn piles should not be ignited during the monsoon period when salamander activity is near the ground surface. Prescribed burns should be performed after September when the Sacramento Mountains salamanders move deeper underground. Salamander depth should also be studied. It is not known how far they travel underground. This information should be analyzed to determine if the heat from the burning of slash piles will adversely affect the salamander populations beneath the surface.

Carrizo Peak should be monitored in the 2016 season. Carrizo peak is an important area because only two cursory surveys have been performed in the past. In addition, if there is presence, there could be significant genetic deviation from other populations due to its isolation. Carrizo peak could also be a link between the White Mountain range and the rest of the Capitan range. The surveys conducted on Carrizo peak in the past suggested absence, although this could have been the result of dry conditions or lack of an intensive survey of all the suitable habitat on the mountain.

More specific habitat data should be acquired in the future. This data would include moisture content, microclimate, habitat preference, and ground pH. This type of data can help identify possible trends that may reveal environmental impacts on salamander populations. Additional data that would strengthen the research of this species would include determining sex, length measurements in mm, and the use of a soil moisture meter in areas where salamanders were present.

Future surveys should be conducted at least one week after the onset of monsoon season to ensure higher moisture content exists within the soils. There are some areas, i.e. Big Bear and Little Bear that have a high percentage of overstory tree canopies and can

be surveyed upon the arrival of monsoon season due to the retention of a higher amount of moisture content for longer periods of time. Argentina trail and Little Bonito are also areas that should be surveyed soon after rainfall. Additional mountain ranges such as Tucson, Carrizo Peak, Patos, and the northern slopes of Nogal peak should be surveyed in areas above 7900 ft. during the 2016 field season.

Literature Cited

Degenhardt WG, Painter CW and Price AH. 1996. Amphibians and Reptiles of New Mexico. University of New Mexico Press, Albuquerque, NM. 431 pp.

Zack Parsons U.S. Forest Service, Little Bear Fire BAER report.

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Appendix 1: SMS Data Sheet

Sacramento Salamander Data Sheet

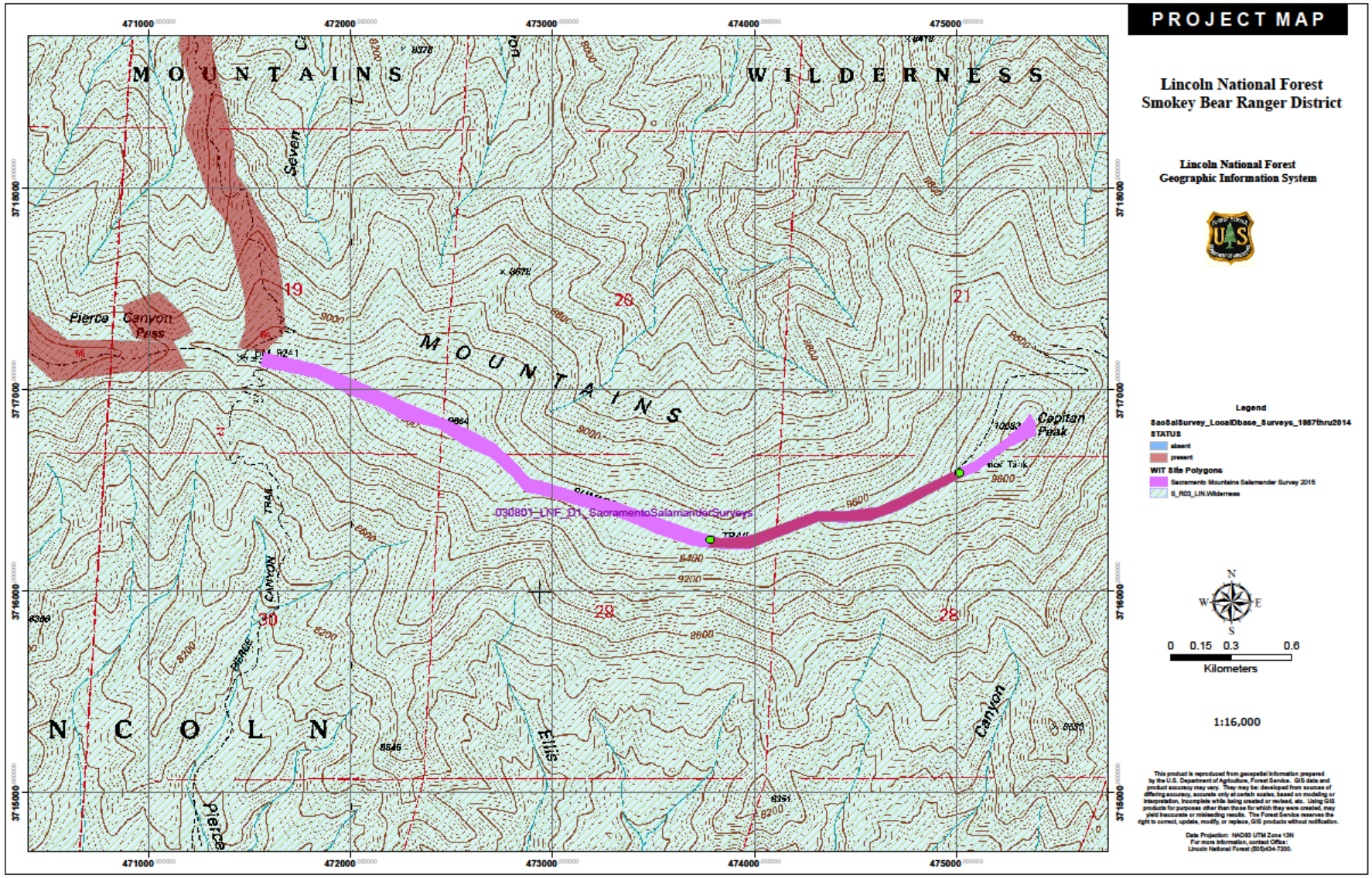
Survey Area: Date: Observers:

Time Begin: End: Total Time:
Weather **Start:** **End:**
Clouds %: Clouds %:
Moisture (Dry, Raining, Rained): Moisture (Dry, Raining , Rained)
Temp °F: Temp °F:
Wind %: Wind %:

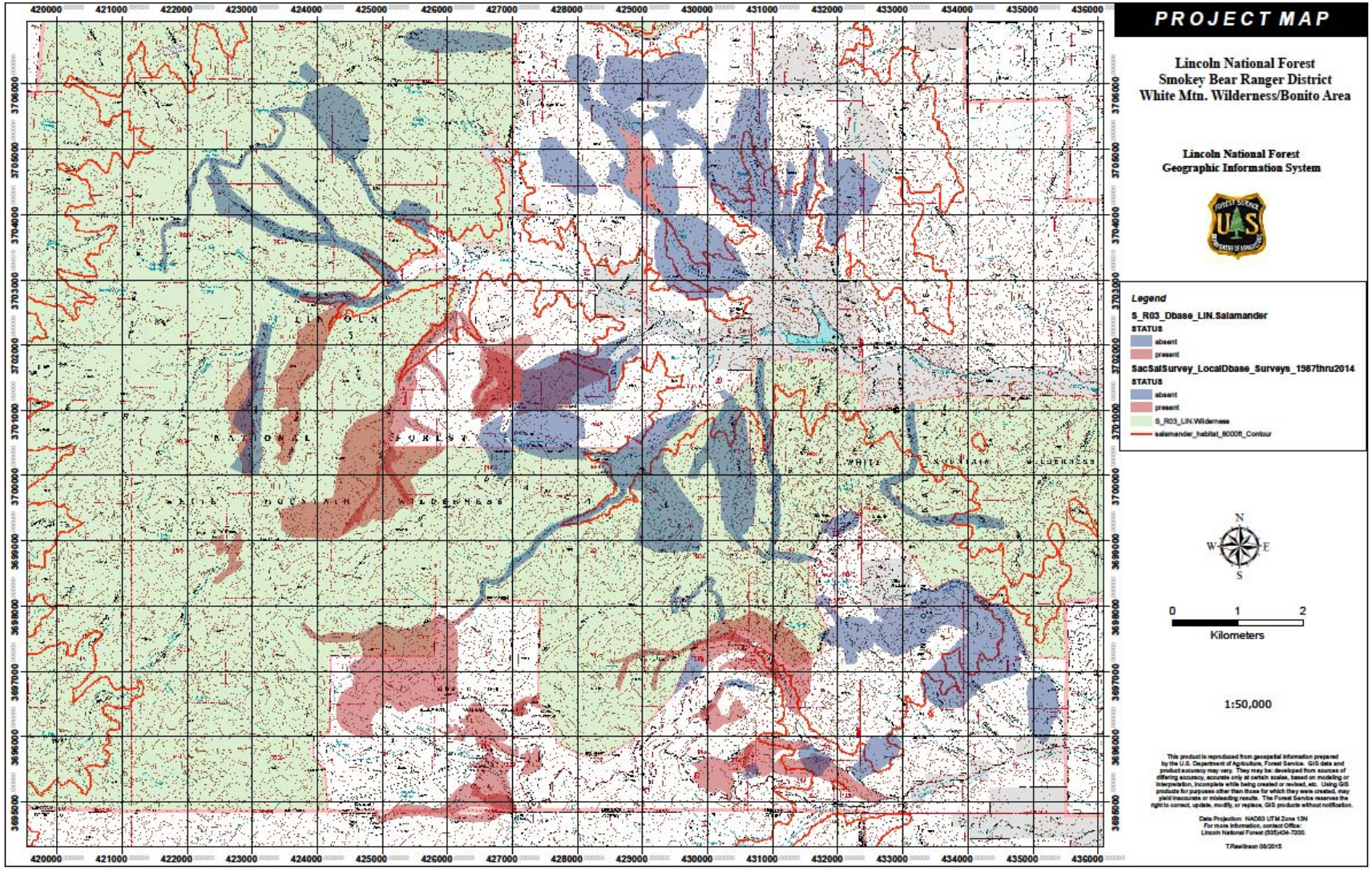
#	Date	Presence (P) Absence (A)	Location: UTM 13 S	Elevation	Distance to drainage	Slope Facing (N,S,E,W)	Canopy Coverage %	Log Type (decay, size, species)	Dominant Tree Species
1									
2									
3									
4									
5									

#	Average Length (mm)	Soil Moisture °F	Ambient Temp °F	Ambient RH %

Additional Information



Capitan Peak Trail Survey Effort 2015.



Historic Surveys 1987 thru 2014 around the White Mtn. Wilderness