

**SHORT-TERM WILDLIFE RESPONSES TO
PONDEROSA PINE FOREST RESTORATION TREATMENTS
IN THE MOUNT TRUMBULL AREA, ARIZONA**

Annual Progress Report
October 1, 1999 – September 30, 2000

Heather L. Germaine
Stephen S. Germaine
Research Branch
Arizona Game and Fish Department
2221 West Greenway Road
Phoenix, Arizona 85023

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Arizona Game & Fish Department
Office of the Deputy Director, DOHQ
2221 West Greenway Road
Phoenix, AZ 85023-4399

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EXECUTIVE SUMMARY

This report details progress through our fourth field season investigating the effects of restoration treatments on herpetofauna, Abert's squirrels (*Sciurus aberti*), mule deer (*Odocoileus hemionus*), turkeys (*Meleagris gallopavo*), migrant songbirds, and western bluebirds (*Sialia mexicana*). Data collected to date on the herpetofauna, Abert's squirrels and migrant songbirds are from untreated forests. Pre- and post-treatment data have been collected on the remainder of the wildlife groups under investigation.

We did not collect data on reptiles or Abert's squirrels this year because units in which we are studying these organisms have not been treated yet. We have collected pre-treatment data over the past three years and felt that a fourth year of pre-treatment data was unnecessary. Post-treatment sampling will begin on reptiles and squirrels after Cinder, Nixon, Boundary, Springs, and Lo units have been fully treated.

We successfully captured and telemetered 6 additional female mule deer this summer. One doe died during winter 1999-2000 leaving our current telemetered deer population at 18 does. We confirmed successful reproduction for 8 of the 18 does with fawn survival through September very high. We collected day-bedding and foraging habitat data at 59 and 53 sites, respectively. We observed telemetered deer feeding and bedding in both treated and untreated areas. Winter aerial tracking of deer showed that all deer moved to lower elevations and off the Mt. Trumbull RCA by February 15. Deer moved off the study area in all directions, but primarily south/southwest of Mt. Logan. Most marked deer that survived the winter returned to the study area the following summer.

We conducted 14 turkey surveys averaging 2.2 hours per survey. We observed an average of 0.5 turkeys per survey with a hen:poult ratio of 1:0.8.

We conducted migrant songbird surveys only during the spring. We recorded 48 bird species on the Mt. Trumbull RCA at 96 untreated grid-points.

We documented clutch size, hatching dates, number of nestlings, fledging dates, and success rates for 36 western bluebird nests. Nests were located in both treated and untreated forests. Twenty-five of the 36 nests successfully fledged at least one nestling, with the majority of failures (n=7) occurring in nests in untreated forests. After nestlings fledged, we collected nest material from all accessible nests to be tested for the presence of *Protocalliphora* larva. Similar to last year, infestation rates and intensity were greater in nests in treated forest.

Polygons demarcating different vegetative cover types on the Mt. Trumbull RCA were digitized by GIS personnel from NAU's Ecological Restoration Institute during the spring 2000. We classified all polygons into 1 of 8 cover types using existing vegetation data. We visited 170 random locations in an intensive field verification to assess accuracy of our classifications. We classified data collected at random locations into corresponding cover types and compared them with our initial classification. Overall accuracy of vegetation map is 75%.

INTRODUCTION

This fourth annual Arizona Game & Fish Department progress report summarizes our progress in evaluating the effects of ponderosa pine restoration treatments on selected wildlife taxa in the Mt. Trumbull area during October 1, 1999 – September 30, 2000. Study objectives, collection methods and protocols are consistent with the previous 3 years data collection unless otherwise noted. For detailed descriptions of this information, refer to the Second Annual Progress Report for 1997-1998. All data collected to date on all wildlife taxa under investigation are being analyzed and will be presented in a comprehensive 5-year report, available fall 2001.

REPTILES

Objective: To document the effects of forest restoration treatments on reptile abundance and demographics on the Mt. Trumbull RCA.

Summary of Research Progress

Year 4 (2000)

We did not collect any data on reptiles this year because very few sampling arrays are located in areas that have been treated. Data collected on reptiles the 3 previous summers (97, 98, 99) serve as pre-treatment data, and therefore a fourth year of pre-treatment sampling was unnecessary.

Post-treatment data collection will begin after Cinder, Boundary, Springs and Lo units have been fully treated.

ABERT'S SQUIRRELS

Objective: To document the effects of forest restoration treatments on Abert's squirrel feeding frequency and abundance estimates.

Summary of Research Progress

Year 4 (2000)

We did not collect data on Abert's squirrels this year. As with lizards, units containing our squirrel sampling grids are behind treatment schedule and have not been treated. We collected pre-treatment data the 3 previous summers; therefore, a fourth year of pre-treatment sampling was unnecessary.

Post-treatment data collection will begin after Cinder, Boundary, Springs, Nixon and Lo units have been fully treated.

MULE DEER

LANDSCAPE SCALE HABITAT SELECTION

Objective a: To determine 3rd order macro-habitat selection patterns of mule deer on the Mt. Trumbull RCA.

Objective b: To determine whether a dynamic relationship exists between habitat restoration treatments and 3rd order mule deer macro-habitat selection on the Mt. Trumbull RCA.

Summary of Research Progress

Year 4 (2000)

We captured and successfully telemetered 6 new female mule deer between July 9 and September 21, with no capture-related mortality. One collared mule deer died during the winter of 1999-2000, leaving our telemetered deer population at 18 does.

Several of the telemetry collars we placed on deer during 97-98 are nearing projected expiration dates. Deer wearing these collars are very valuable to us since they are the only deer which have a known history of habitat use dating back to 1997. We contracted Wildlife Capture Services, of Manhattan Beach, California, to replace 3 collars originally hung in 1997. Wildlife Capture Services replaced 1 of these collars with a new collar in September. We will continue to try and replace the remaining 2 collars, as well as any additional collars projected to expire in 2001.

We collected a total of 128 deer locations from June 4 to August 7 (Figure 1). These observations included day-bed and foraging sites, and “general” observations with no specific activity associated.

We confirmed successful reproduction for 8 of the 18 collared does this spring; all were single-fawn births with the exception of one doe with twins. As with past summers, we took special care to track the fates of fawns while collecting visual observations; as of late September we had documented no fawn mortalities.

MULE DEER

MICRO-SCALE HABITAT SELECTION

Objective c: To identify 3rd order micro-scale habitat selection by mule deer at foraging and bed site locations on the Mt. Trumbull RCA.

Objective d: To determine whether a dynamic relationship exists between habitat restoration treatments and 3rd order mule deer micro-habitat selection on the Mt. Trumbull RCA.

Summary of Research Progress

Year 4 (2000)

We collected vegetative data at 59 observed day-bed sites, 53 foraging sites, and 112 associated random plots. This brings our 4-year total to 253 and 215 bed and foraging sites, respectively. These data have been collected from 22 telemetered, and an unknown number of non-telemetered mule deer.

Winter Deer Locations 1999-2000

We aurally located collared mule deer on February 15, 2000 (Figure 2). By this date all deer had left the study area with the exception of one doe that died 0.2 km east of the aspen grove. Consistent with the past 3 winters, deer moved off the study area in all directions with 75% moving south/southwest of Mt. Logan to the Whitmore Canyon area. Distance moved off the study area ranged from 5-19 kilometers with the majority moving approximately 15 kilometers.

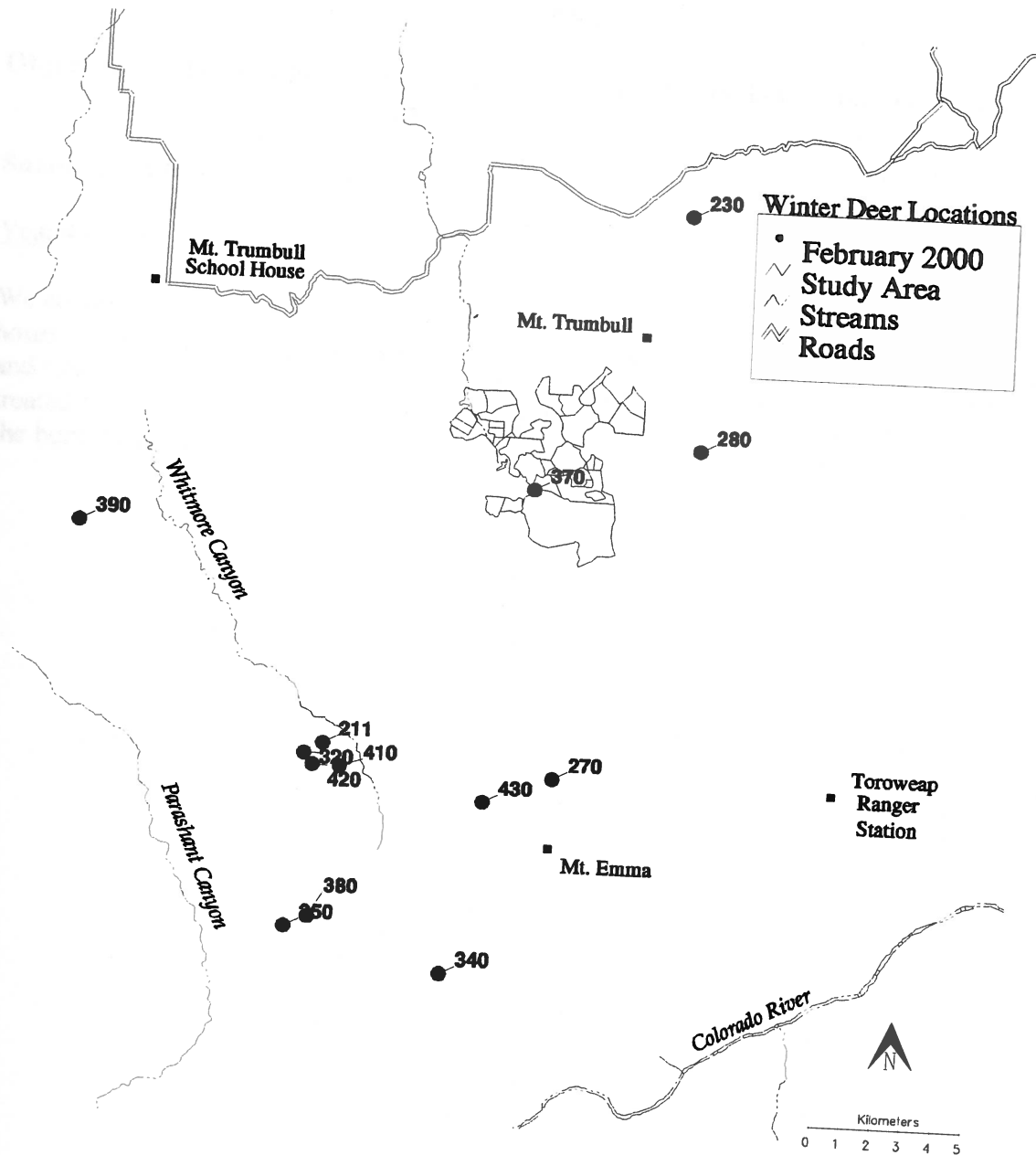


Figure 2. GPS locations of aerially located mule deer on February 15, 2000 near Mt. Trumbull. Numbers associated with locations are individual deer ID's; at the time of the flight all deer were alive with the exception of 370.

TURKEYS

Objective: To establish long-term surveys to monitor turkey population trends on the Mt. Trumbull RCA.

Summary of Research Progress

Year 4 (2000)

We conducted 14 turkey surveys between July 6 and August 8. Average survey duration was 2.2 hours observing an average 0.5 turkeys per survey. The observed hen:poult ratio during surveys and other activities within the RCA was 1:0.8. Turkeys were observed in both untreated and treated forest areas. We also discovered a previously unknown turkey roost site 0.2 km north of the burn meadow drinker in September.

MIGRANT SONGBIRDS

Objective: To document the effects of forest restoration treatments on migrant songbird abundance, diversity, and habitat use on the Mt. Trumbull RCA.

Summary of Research Progress

Year 3 (2000)

We conducted songbird surveys during the spring migration. Surveys were conducted from May 11 through May 20 at 96 grid-points, all of which were in untreated forest (Figure 3).

We identified 48 species of birds during the spring surveys. Based on the number of detections, the 6 most abundant bird species in decreasing order included; white-breasted nuthatch (*Sitta carolinensis*), yellow-rumped warbler (*Dendroica coronata*), Grace's warbler (*D. graciae*), mountain chickadee (*Parus gambeli*), western tanager (*Piranga ludoviciana*), and dark-eyed junco (*Junco hyemalis*).

Post-treatment surveys of both the fall and spring migration periods will be conducted after Boundary, Springs, Nixon, Corner, North Slope, Hi-Lo, Cinder and North Sawmill units have been fully treated.

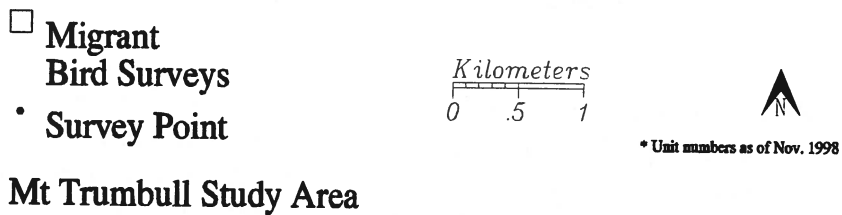


Figure 3. Treatment and control units containing migrant songbird census points on the Mt. Trumbull Resource Conservation Area.

NESTLING PROVISIONING RATES AND FLEDGING FATES

Objective: To determine whether parental provisioning rates, prey type, and fledging success differ between untreated and treated forest on the Mt. Trumbull RCA.

Summary of Research Progress

Year 3 (2000)

We documented clutch size, hatching dates, number of nestlings, fledging dates, and fledging success rates of 36 western bluebird nests. Nineteen of the nests were located in treated units (Demo, Trick Tank, Rye Flat, and EB2) and the remaining 17 nests were located in non-treated units (Nixon, Springs, War Club, Twain, and the Control; Figure 4). Nests contained from 1-5 nestlings with an average of 3.3 nestlings/nest in the untreated areas and 4.4 nestlings/nest in the treated areas. Of the 17 nests in untreated areas, 7 failed due to predation. The remaining 10 nests fledged young between June 21 and August 4. Two of the 19 nests in treated areas failed to predation, and the remaining 17 nests successfully fledged young between June 6 and July 14.

From June 3 through July 3, we recorded 84 2-hour video sessions at active bluebird nests. We will review tapes later this winter to record frequency of prey delivery by each parent.

We collected nest material from all accessible nests within 2 weeks after nestlings fledged. We sent nesting material to an entomologist in Tacoma, Washington who analyzed material for the presence of *Protocalliphora* (blowfly) larva. All 14 (100%) of the nests collected in the treated areas were infested with blowflies; 6 of the 11 (55%) nests collected in untreated areas were infested. In addition, the average number of puparia/adults per nest was almost 5 times greater in infested nests in treated areas than in untreated areas.

Between June 16 and July 16, we banded 18 adult bluebirds from 10 different nests; 9 birds in both treated and untreated forest areas. We banded both adults at all but 3 nests where we were only able to catch the female. In addition, we banded a male helper at one nest in the War Club unit.

We captured adults using a fine-mesh mist net set up either directly in front of the cavity or in a path used often by the parent traveling to or from the cavity. All captured birds received a metal U.S. Fish and Wildlife Service number band and a combination of color bands. Pairs were given identical color combinations. Banding information will allow us to follow adults through-out each summer to identify second brooding attempts and survival over time.

In early August, we collected detailed vegetation data at each nest. Collection protocol was similar to that from the lizard array vegetation collection with the addition of characteristics specific to nesting sites.



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AERIAL PHOTOGRAPHS & GIS VEGETATION COVERS

We completed and field verified a landscape-scale vegetation map for the entire Mt. Trumbull RCA (Figure 5). GIS personnel from NAU's Ecological Restoration Institute digitized polygons demarcating different vegetative cover types into Arc/Info during spring 2000. We generated relative tree densities by species using stem density data collected by NAU at all 300-m points and stem density data collected at our deer bed and random bed locations. We then assigned each 300-m point and deer bed and random bed location to a cover type using pre-determined definitions based on species composition (Table 1). We overlaid these points onto the polygon coverage. Polygons that contained multiple data points suggesting different cover types were individually evaluated to determine the most accurate classification and whether polygons needed to be split. We classified polygons containing no data points using our knowledge of the study area, and with the use of color aerial photographs.

After the entire study area was initially classified we conducted an intensive field verification to assess accuracy of our classifications. We first determined percentage of total area for each cover type and used this percentage to determine proportional number of random locations we needed to visit for each cover type. We then generated a couple hundred random locations proportionally spread across each cover type. Six of us from the Research Branch of the Arizona Game and Fish Department conducted the field verification from September 12-19. We referenced all random locations from the nearest 300-m point and arrived at random locations by compass and pacing. At each random location, we collected stem density data of all trees by species ≥ 2.5 cm DBH within a 6-meter wide belt transect extending 25 meters in the 4 cardinal directions. In addition, we collected a GPS file at every location. We collected stem density data at 170 points; however, 24 of these locations were unusable because they either had bad GPS files or we were unable to collect a location, thus leaving our total number of points for accuracy assessment at 146 (Table 2).

We assigned all random locations to a cover type using the same definitions as for the initial classification (Table 1). We then plotted random locations onto the habitat map using the GPS files collected to compare classification of random location with initial classification. To account for the non-discrete "feathering" of one habitat type into another, random locations within 25 meters of a boundary separating 2 different habitat types were individually assessed and, where necessary, the accuracy assessment was adjusted to best reflect this phenomenon. Accuracy of initially classified habitat map ranges from 47 to 100% within the different habitat types, with an overall map accuracy of 75% (Table 3).

Mt. Trumbull Vegetation

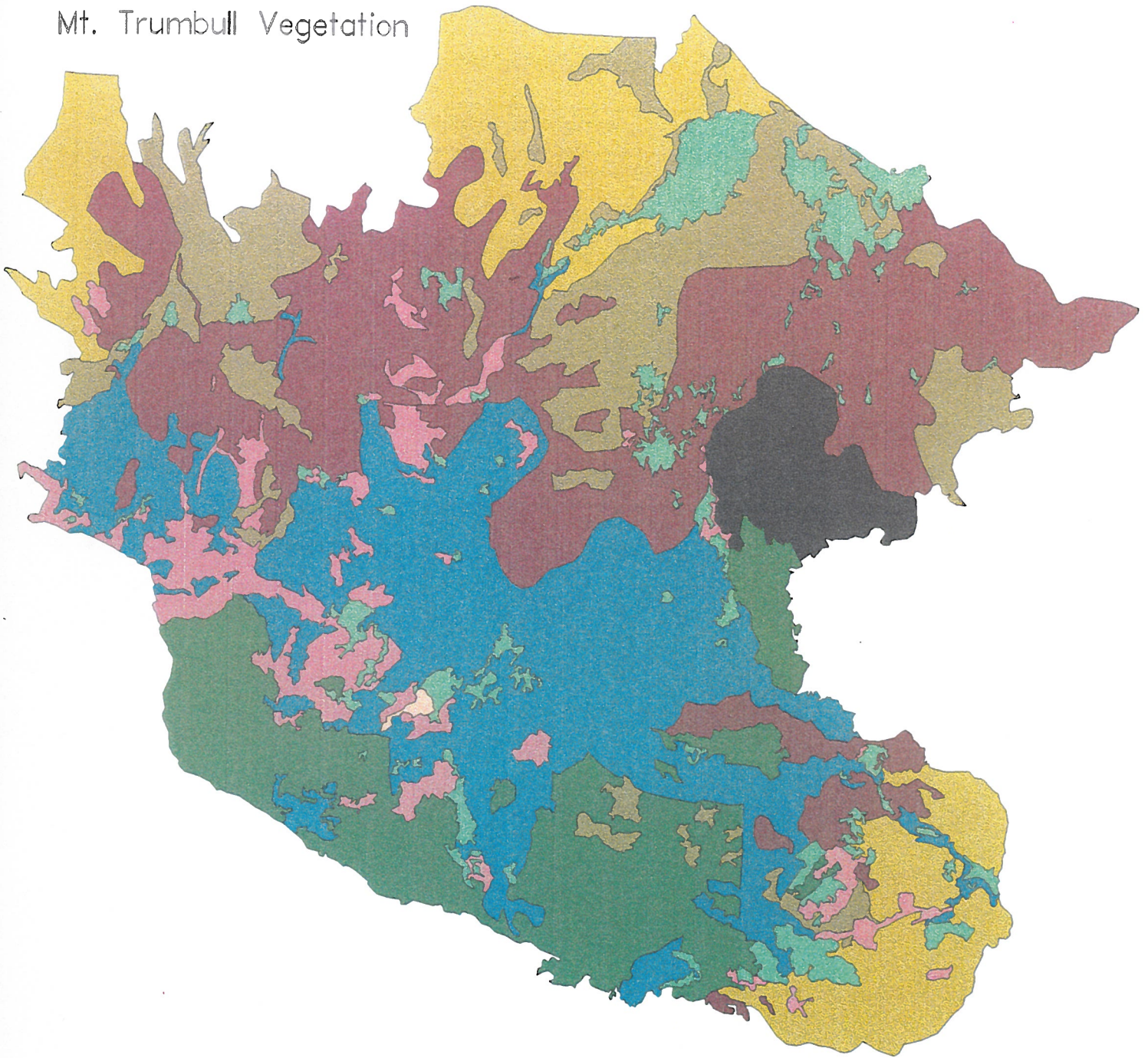


Figure 5. Classification of habitat types on the Mt. Trumbull Resource Conservation Area.

- Ponderosa pine forest
- Ponderosa/deciduous forest
- Ponderosa/pinyon-juniper forest
- Ponderosa/deciduous/pinyon-juniper forest
- Deciduous forest
- Aspen stand
- Pinyon-juniper forest
- Meadow
- Lava

Kilometers
0 .5 1



Table 1. Mt. Trumbull RCA cover types and definitions

Cover type	Definition (relative density)
Ponderosa pine	≥90% pipo, <5% each decid, pj, aspen
Ponderosa/Deciduous ¹	≥5% pipo, ≥5% decid, <5% pj
Ponderosa/PJ ²	≥5%pipo, ≥5% pj, and <5% decid
Ponderosa/Deciduous/PJ	≥5% each pipo, pj, decid
Deciduous	≥90% decid, <5% each pipo, pj
Aspen	≥90% aspen, <5% each pipo, decid
Pinyon-Juniper	≥90% pj, <5% each pipo, decid
Meadow	≥1/2 acre and contain meadow vegetation (e.g., sage, grass)

¹Oak, locust and aspen stems not within the known aspen patch are lumped into deciduous.

²Pinyon and juniper are lumped into "PJ".

Table 2. Proportional number of random locations to be visited for accuracy assessment for each cover type based on area and actual number of locations visited for each cover type.

Cover Type	Area (sq km)	% Area	# of Random Locations Based on Proportion	Actual # of Random Locations Visited
Ponderosa pine	4.778	13	19	16
Ponderosa/Deciduous	8.275	22.5	33	30
Ponderosa/PJ	4.592	12.5	18	30
Ponderosa/Deciduous /PJ	9.374	25.5	37	39
Deciduous	2.153	5.8	9	7
Aspen ¹	0.037	0.1	0	0
Pinyon-Juniper	5.321	14.5	21	10
Meadow	2.294	6.2	9	14
Totals	36.824	100	146	146

¹The aspen patch is a homogeneous, discrete patch; therefore, assessment of classification accuracy was unnecessary.

Table 3. Accuracy assessment of classified cover types within the Mt. Trumbull RCA.

Cover Type	Accuracy Assessment
Ponderosa pine	88%
Ponderosa/Deciduous	90%
Ponderosa/PJ	47%
Ponderosa/Deciduous/PJ	67%
Deciduous	100%
Pinyon-Juniper	80%
Meadow	100%
Overall	75%

NORTHERN GOSHAWK UPDATE

Due to growing external concern about the fates of northern goshawks nesting on the study area we attempted to locate active nests, and to band nestlings and adults if the opportunity arose. James Battin's bird crew found an active goshawk nest in the Control Unit, in the vicinity of grid point 1440. At the time the nest was discovered the nestlings were too old to attempt capturing and banding without an unacceptably high risk of causing premature fledging. AGFD located a goshawk nest in July in the vicinity of grid point 1276, if successful, young had already fledged. We have no information this year on the pair that had nested in the vicinity of the Demonstration Units in 1997 and 1998.