White-tailed Ptarmigan Callback Surveys, Pointing Dog Surveys, and Genetic Analysis

Avery Cook - Upland Game Project Leader
Jason Robinson - Upland Game Program Coordinator
Kimberly Hersey - Mammal Conservation Coordinator
Utah Division of Wildlife Resources
30 June 2018

Executive Summary

White-tailed ptarmigan have been present in Utah since their introduction to the Uinta Mountains in 1976. Following the introduction, populations were monitored periodically through 1995 to document their expansion into most available habitat in the Uinta Mountains. Information available after 1995 on white-tailed ptarmigan has been incidental observations and harvest survey returns. In June of 2012 the US Fish and Wildlife Service announced in an 90-day finding that a petition to list the southern white-tailed ptarmigan (*Lagopus leucura altipentens*) as threatened was warranted and that a status review should be initiated.

The Utah Division of Wildlife Resources had very little information of the distribution and abundance of white-tailed ptarmigan within the state. To acquire information on distribution and abundance callback and pointing dog surveys were conducted during the summer of 2017.

We conducted 38 callback surveys in the Uinta Mountains. Callback surveys were not successful in detecting white-tailed ptarmigan, and there were no incidental detections while traveling to callback points. However, biologists were able to detect white-tailed ptarmigan during pointing dog surveys. White-tailed ptarmigan were detected on 2 of 17 pointing dog surveys observing a total of 14 ptarmigan. When the 2.6 km^2 search area is extrapolated to 616.6 km^2 of available habitat we estimate there are 3,325 white-tailed ptarmigan in Utah.

We recommend continuing pointing dog surveys for a second year to obtain a more accurate population estimate and distribution record. In following years we recommend limited surveys at selected transects to obtain population index data.

In fall 2016, 20 genetic samples of ptarmigan harvested in the Uinta Mountains were provided to the Colorado United States Geological Survey (USGS) genetics lab for analysis. Utah's samples were compared to samples taken from across the range of white-tailed ptarmigan. The intent was to determine if unique genetic markers could be identified in Utah's ptarmigan to determine if ptarmigan were present in the Uinta Mountains prior to the 1976 releases. Genetically speaking, Utah ptarmigan are almost identical to translocation source populations in Colorado, with no unique genetic markers identified. Based on all available information, UDWR considers white-tailed ptarmigan an introduced species.

History

White-tailed ptarmigan (*Lagopus leucura;* hereafter ptarmigan) were established in the Uinta Mountains of Utah following two transplants by the Utah Division of Wildlife Resources (UDWR) from Colorado in June and September of 1976. A total of 55 ptarmigan were released (25 adult male, 25 adult female and 5 young of the year). Follow up over the next two years showed good annual survival and successful reproduction (Braun et al 1978). Production remained high through 1980 as shown by relatively large average brood sizes. Production was somewhat lower from 1981, possibly due to increased raptor predation. However, by the late 1980's ptarmigan had expanded into most of the available habitat in the Uinta Mountains (UDWR 1992).

A hunting season for ptarmigan in Utah was first opened in 1982, in which 21 hunters participated (UDWR 1992). The season remains open as of 2018 with a bag limit of 4 birds a day and possession limit of 12 birds. All though severe weather and other factors can impact density and breeding success the population has persisted through years of drought and high snowfall indicating that the population is robust to variations in annual weather and is secure for the foreseeable future.

In addition to harvest surveys, breeding territory surveys were conducted mid to late June from 1977 through 1995 and brood surveys were conducted mid to late August from 1977 through 1991. Breeding territory and brood surveys were discontinued due to the large amount of time required in

such a remote, high elevation area. From 1995 to 2016 only harvest survey information is available (see upland game annual reports available at wildlife.utah.gov). Low annual participation in the hunt results in small sample sizes for the harvest survey with considerable variation. However, all hunters are required to obtain a free ptarmigan hunting permit, which allows UDWR to contact all hunters to survey them about their hunting success. Average participation from 1982-2016 was 45 hunters per year with a range of 3 to 114 hunters. Ptarmigan harvest averaged 30 per year with a range of 0 to 149 birds. In 2017, an estimated 75 ptarmigan were harvested, representing 2.3% of the total estimated statewide ptarmigan population. Annual harvest provides a rough index of population trends, however, with such a small sample size introducing considerable variation in year-to-year results it is hard to draw a conclusion on overall population trends. Harvest surveys also do not provide data to estimate range, density or population size.

In June of 2012 a 90-day finding was issued by the US Fish and Wildlife Service in response to a petition for listing under the endangered species act (USFWS 2012). The 90-day finding concluded that the southern white-tailed ptarmigan (*Lagopus leucura altipentens*) petition for listing was warranted and that a status review should be initiated. As of June 2018 a 12-month finding has not been published in the federal register. Concern that a lack of population data may lead to an unneeded endangered species act listing highlights the need for better data on ptarmigan distribution and density within Utah. To fill these data gaps we initiated ptarmigan callback and pointing dog surveys in summer and fall of 2017.

Section 1: Ptarmigan Callback Survey

Methods

Ptarmigan callback surveys were added to previously planned American pika (*Ochotona princeps;* hereafter pika) surveys. Pika and ptarmigan habitat widely overlap and callback survey could be added to pika surveys without significant increased cost or staff time. Pika plots were located in high elevation and montane areas throughout Utah within modeled pika habitat.

The pika habitat model was previously built by the UDWR Mammal Conservation Coordinator using ArcMap 9.2 with Spatial Analyst and Model Builder extensions (Environmental Systems Research Institute, Redlands, CA). We considered 7 southwest ReGap landcover types as possible habitat for pikas. Those included: North American Alpine Ice Field; Rocky Mountain Alpine Bedrock and Scree; Rocky Mountain Cliff, Canyon, and Massive Bedrock; Inter-Mountain Basins Volcanic Rock and Cinder Land; and Rocky Mountain Dry Tundra. All types were weighted similarly except for North American Alpine Ice Field, Rocky Mountain Dry Tundra and Rocky Mountain Alpine Fell-Field. Those types were weighted at half the other types because they contained primarily stabilized soil, not rock, however, they could contain forage sites for pikas. An elevation mask of 2200 m (7218 feet) was used. No cover type below that level was considered in the model. That elevation was a conservative estimate and included all areas above the lowest “pika equivalent” elevation, a predictor of the lower elevation limit of pikas based on the consistent effect of longitude and latitude (Hafner 1993). The lowest pika equivalent elevation occurring at the northeastern corner of Utah was 2500 m (8202 feet). Northern aspects were weighed higher than other aspects to account for microclimate conditions. Model weights for landcover and aspect were added together and all non-zero 30 m grid cells above 2200 m (7218 feet) were considered potential habitat.

Ptarmigan callback surveys were conducted at pika plot center points prior to conducting the pika survey. Surveys consisted of a 10 minute calling sequence played on an electronic (FoxPro brand) calling device. The calling sequence consisted of periods of silence and periods of chick distress call played at increasing volume with start and stop times recorded (see table 1 for full calling sequence). If

a response from ptarmigan were heard or ptarmigan were visually observed the number of adults, juvenile or unknown age individuals were recorded. Additional habitat information was collected including course ground cover classifications (habitat types, willow cover, talus size), slope, aspect, and weather. See appendix 1 for complete data sheet and field instructions.

Mountain ranges geographically distant from recorded ptarmigan range were excluded from the study area, even if the model identified potential habitat within those ranges. The mountain ranges excluded from analysis were: Great Basin mountain ranges, Abajo, Boulder, Fish Lake, Monroe, Manti, Tushar, Henry, Bear River, and the Range Creek/Avintaquin area. From the remaining ranges, the calling sequence was planned to broadcast on the Uinta, La Sal, Wasatch, and Nebo North ranges. Habitat characteristics were documented at sites visited from pika surveys but excluded from ptarmigan callback to evaluate habitat suitability for potential range expansions.

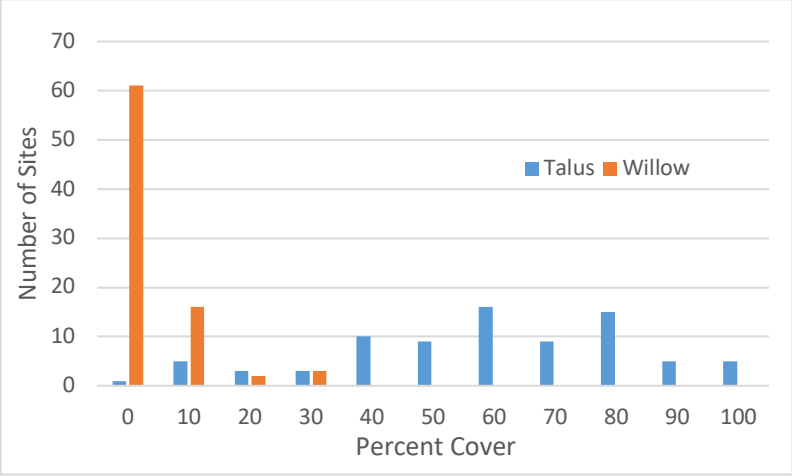
Table 1: Ptarmigan callback survey calling sequence

Time	Action
0.00-1.00 min	silence, listen and look for ptarmigan
1.01-2.00 min	chick distress in 360 degrees, low volume
2.01-4.00 min	silence, listen and look for ptarmigan
4.01-5.00 min	chick distress in 360 degrees, moderate volume
5.01-7.00 min	silence, listen and look for ptarmigan
7.01-8.00 min	chick distress in 360 degrees, high volume
8.01-10.00 min	silence, listen and look for ptarmigan

Results

Out of 134 pika sites visited, 77 required ptarmigan callback surveys, and 82 surveys were conducted (Appendix 5). Additional surveys were conducted on the northern portion of the Manti Mountains in addition to the required callback locations. There were no ptarmigan responses or other ptarmigan detections recorded on any of the callback plots visited. Additionally, no incidental records were recorded while survey personnel were traveling to or from survey locations.

Figure 1: Percent cover of dominant primary habitat within 100 m of ptarmigan callback points.



Of the 82 surveys, 19 were conducted in the La Sal Mountains, 8 in the Manti Mountains, 17 in the Wasatch Mountains, and 38 in the Uinta Mountains (Figure 4). Ptarmigan have only been previously detected in the Uinta Mountains. Of the 82 completed callback surveys, 11 were in modeled ptarmigan habitat, 57 within were within 100 m, 19 within 101 to 250 m, 26 within 251 to 1000 m and 12 were further than 1000 m from modeled habitat.

Willow (*Salix* spp.) was only present within 100 m of 21 of the callback points. Out of the 21 points with willow 16 had 1-10% cover, 2 had 11-20% cover and 3 had 21-30%

cover. Talus was a major habitat component at most callback points, with most sites having 40 to 100% of the area within 100 m composed of talus (Figure 1). The primary and secondary habitat type was recorded for each site and is shown in table 2.

Table 2: Dominant Habitat Types at Callback Sites

	Primary	Secondary
Aspen Forest	1	0
Coniferous Forest	11	26
Meadow	5	12
Mixed Forest	0	7
Rock Outcrop	1	6
Shrubland	0	4
Talus	57	11
Tundra	7	11
Willow	0	3

Section 2 Pointing Dog Survey

Methods

Habitat Model

This survey work used points randomly generated for pika surveys and constrained to the points falling within or adjacent to modeled white-tailed ptarmigan habitat within the Uinta Mountains in northeast Utah.

We modeled ptarmigan habitat at a 30 m resolution using ArcGIS 10.3 with model builder extension. A decision tree model was used to constrain habitat to areas of the Uinta Mountains between 3200 (10499 feet) and 4250 m (13944 feet) in elevation (Braun 1993, Braun 1971, Braun and Rodgers 1971), areas less than 45 degrees slope (Giesen et al. 1980), and within a set of ReGAP habitat types extracted from areas of known occupied habitat (Table 3). Isolated single pixels and groups of 5 or less pixels were removed from the modeled habitat.

Table 3: ReGAP landcover types included as probable habitat types to model available ptarmigan habitat in the Uinta Mountains, Utah.

Code	Description
S004	Rocky Mountain Alpine Fell-Field
S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
S043	Rocky Mountain Alpine Dwarf-Shrubland
S081	Rocky Mountain Dry Tundra
S083	Rocky Mountain Subalpine Mesic Meadow
S102	Rocky Mountain Alpine-Montane Wet Meadow
S091	Rocky Mountain Subalpine-Montane Riparian Shrubland
S071	Inter-Mountain Basins Montane Sagebrush Steppe

Site Selection

We evaluated 48 pika points in the Uinta Mountains and evaluated each point for distance to modeled ptarmigan habitat. Twenty-eight points that were within 90 m of modeled ptarmigan habitat

were retained as potential survey sites (Figure 4). Using the rand() function in Microsoft excel potential sites were ranked in order of priority. Each point was then examined via satellite imagery and google earth 3D renderings of the site for suitability. Five sites that were predominately within conifer forest or otherwise inaccessible were eliminated. For the remaining 23 sites we drew 2000 m square or rectangular transects at each point. Each transect was constrained to contain a pika survey point. The length of each side of the transect was variable, but never < 200 m, to conform to available habitat or accessibility (i.e. avoided walking over steep cliffs). Field survey work was planned to evaluate the highest priority sites first.

Pointing Dog Survey

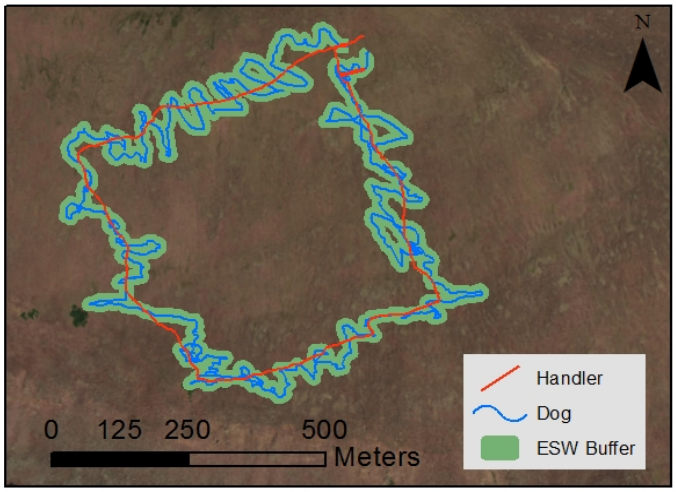
Field surveys were conducted between 16 August and 13 September 2017. Each survey was conducted by a single observer/handler and single pointing dog. Dog-handler pairs remained constant through the survey period to reduce variation in detection probability. Dogs were required to be a sporting breed, trained steady to wing (pointer) or heel/woah (flusher), physically conditioned, older than 1.5 years, with at least 15 days experience searching for wild game birds in western states. At each survey location, the start point and detection point UTM coordinates were recorded. Handler GPS track and dog GPS track were recorded for each transect using Garmin Alpha receivers and Garmin TT15 GPS collars. Dog tracks were recorded using a 2.5 second location update interval. Survey data, additional information on habitat characteristics and environmental conditions were recorded (Appendix 2, 4). Two individual dogs were used, paired with the same observer, and were Brittanys.

Analysis

Tracks and points were downloaded and organized using Garmin Basecamp software. Points and tracks were then imported to ArcGIS Desktop for analysis. Total track length for handler and dogs was calculated. Dog tracks were buffered by an effective strip with of 13.2 m (Guthery and Mecozzi 2008), with overlapping areas dissolved to a single polygon (Figures 2, 3). Polygon area was then exported and used as the search area. Density was estimated by dividing the number of birds flushed by the total search area.

Due to equipment failure, two complete and one partial dog track was lost, however sighting records were intact. The length of missing or incomplete dog tracks were estimated based on the individual dog's average miles covered per handler mile. Area covered was then estimated using the dog specific average area surveyed per dog mile.

Figure 2: Pointing dog survey on a plot without ptarmigan detections showing the handler path relative to the effective search area of the pointing dog.



Results

Our habitat model estimates there is 616.6 km^2 (238 miles^2) of ptarmigan habitat available in the Uinta Mountains. Of the 23 available sites, surveys were conducted at 17 and ptarmigan were detected at two sites (Appendix 4). Dogs ran 73.7 miles of survey covering a total of 2.68 km^2 (661.3 ac) of survey area. Four coveys were detected in the survey area. A total of 14 ptarmigan were flushed resulting in an average density of 5.2 ptarmigan per km^2. Assuming sampled

areas are representative of modeled habitat there are an estimated 3,325 ptarmigan in the Uinta Mountains in 2017.

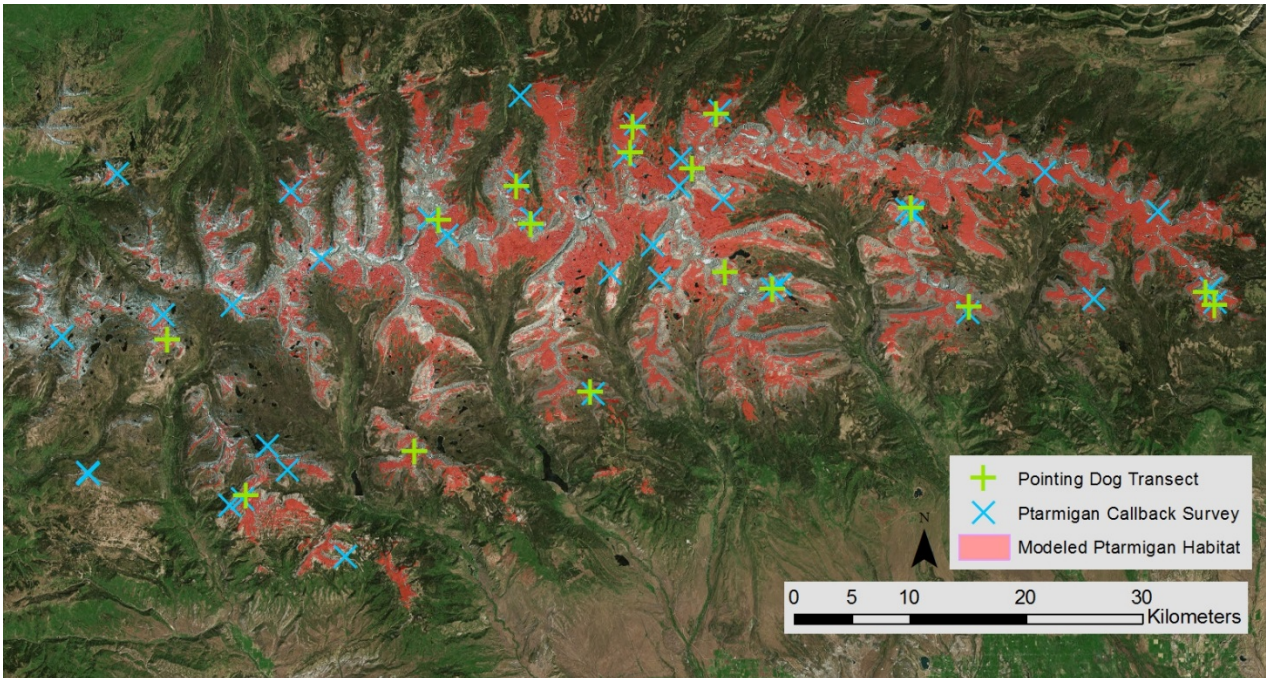
Of the 17 completed dog surveys, all intersected modeled ptarmigan habitat, with 86% of dog survey miles in modeled habitat and 14% of dog survey miles outside of modeled habitat.

The primary habitat type for 13 of the 17 dog surveys was tundra, three were talus and one was willow. Secondary habitat was varied with coniferous forest, sedge, and meadow also included as habitat types present along transects (Table 4). All ptarmigan detections were in the alpine tundra habitat type.

Table 4: Count of dominant Habitat Types at Dog Survey Sites

	Primary	Secondary
Meadow	0	1
NA	0	4
Coniferous Forest	0	1
Sedges	0	1
Talus	3	6
Tundra	13	2
Willow	1	2

Figure 4 Ptarmigan callback survey points, pointing dog survey points and modeled ptarmigan habitat within the Uinta Mountains in NE Utah.



Section 3 Genetic Analysis

Methods

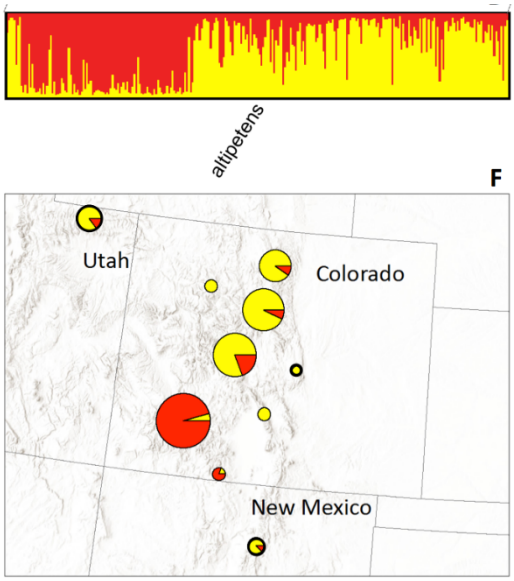
UDWR contacted all hunters who obtained a free white-tailed ptarmigan permit in 2015 or 2016 via an e-mailed flyer (Appendix 3), asking them to provide UDWR genetic samples from ptarmigan legally harvested during the August 27 to October 31, 2016 hunting season. Hunters were required to meet all state requirements for hunting, and have a valid hunting license and ptarmigan permit. Daily bag limit was set at 4 ptarmigan per day, with a possession limit of 12. We requested if hunters were successful in harvesting one or more ptarmigan that they take a genetic sample from each bird. Samples could be any of the following: A wing cut near the body, the head of the bird, the heart of the bird. We requested hunters store the sample in a ziplock bag, keep the samples as cool as possible in the field and place samples in freezer as soon as possible. Once samples were received by the UDWR they were kept frozen until analysis. The following information was collected in association with each sample: a) location (drainage) the bird was harvested b) date of harvest, c) hunter name d) hunter phone #, and e) GPS location, if possible.

UDWR collected all samples and shipped to the USGS lab in Fort Collins, Colorado. Most samples from outside Utah were obtained from capture and release of adults where blood or feathers were collected from the bird. Twelve microsatellite loci were genotyped using PCR techniques (Langin et al. In Review). Utah samples were compared to samples from across the species range, and specifically to Colorado populations.

Results

In total, 327 hunters obtained a Utah ptarmigan permit in 2016. Of those, 123 hunters participated in the post hunt survey, 40 (33%) hunted ptarmigan, 83 (66%) did not hunt. An estimated 106 hunters went afield, and 35 ptarmigan were harvested by 12 hunters. UDWR submitted 20 genetic samples to USGS for genetic analysis.

Figure 5. Genetic profiles of white-tailed ptarmigan in Utah, Colorado and New Mexico (Langin et al. in review).



A total of 436 samples from across the species range were used for the analysis, 248 from Colorado, 8 from New Mexico, 20 from Utah, 43 from Washington, 17 from Montana, 21 from Alberta, 9 from British Columbia, 34 from Vancouver Island, 10 from the Yukon, and 26 from Alaska (Langin et al. In Review).

The genetic profile of ptarmigan in Utah is nearly identical to ptarmigan in north central Colorado (Figure 5). No unique genetic markers were discovered in the Utah ptarmigan. In addition, no museum specimens were collected from the Uinta Mountains or Utah, from over 380 specimens analyzed by Langin et al.

Section 4 Discussion

The primary goal of using two overlapping survey methods was to evaluate the relative effectiveness of pointing dog surveys and callback surveys to detect ptarmigan. Callback surveys were not successful; during 82 callback surveys done in Utah and 38 callback surveys in the Uinta Mountains, there were no ptarmigan detections. Pointing dog surveys were effective at detecting ptarmigan, with ptarmigan being detected on 2 of 17 survey transects. The 2 dog surveys in which ptarmigan were detected were in the same location as callback surveys that did not detect ptarmigan.

The winter of 2016-2017 had considerably more precipitation than the preceding 5 years. Hard winter conditions and relatively late snowmelt may have reduced reproductive success and the number of broods present. This likely reduced the total number of ptarmigan in the Uinta Mountains available for detection, compared to recent years past, based on previous experience hunting with pointing dogs in the survey areas (J. Robinson, personal observation).

The callback recordings used were chick distress calls intended to illicit a response from brood hens. Lack of broods due to a hard winter and late spring may have precluded callback effectiveness even if adult birds were present. Male territory calls may have been effective if they were used earlier in the season, however the period for territory calls did not align with pika surveys that were conducted in conjunction with the ptarmigan callback surveys, and were not attempted.

Callback surveys were constrained to previously selected pika survey points because the ptarmigan callback survey was utilizing staff already present at the pika survey points. When points were examined remotely, it appeared that there was sufficient overlap in habitat characteristics that most pika points would also be within ptarmigan habitat. However, actual pika survey/ptarmigan callback points often varied significantly from the assigned location of the survey or were not conducted. The actual callback survey was within the dog survey transect or within 100 m for 9 of the 17 pointing dog transects. Habitat characteristics of pika survey/ ptarmigan callback surveys were dominated by tallus and had a significant component of coniferous forest, habitat types that correspond to ptarmigan escape cover and unsuitable habitat.

Brood hen callback surveys do not appear to be reliable in the Uinta Mountains, and detection rates may be biased based on current year production and presence of broods. If callback surveys are repeated, points should be selected specifically for ptarmigan callback surveys and fall brood callback should not be used unless there is minimal cost associated with the survey (i.e. added on to other field work already being conducted). Spring territory calls may be more effective.

We recommend continuing pointing dog surveys because they are reliable, repeatable and provide a density estimate to derive population estimates. A second year of baseline pointing dog survey is recommend to establish a density estimate in a year of below average snowfall, (i.e. 2018). We recommend a goal of 20 pointing dog surveys following the same methods. However, locations should be selected based on the modeled ptarmigan habitat, rather than constrained to locations that could be run in conjunction with pika surveys. Following baseline surveys, annual surveys at a limited number of index sites where ptarmigan have been previously detected should be conducted to provide an index of the population moving forward.

There are reports of ptarmigan in the Uinta Mountains from around the early 1900s (Twomey 1942, Woodbury et al. 1949, Worthen 1968). However, none of these observations have been verified. In addition, no museum specimens were collected from Utah prior to the translocation in 1976. There are other grouse species that could be confused with ptarmigan by early explorers, including dusky grouse, ruffed grouse, sharp-tailed grouse, and even greater sage-grouse (a greater sage-grouse was observed within ¼ mile of ptarmigan in the Uinta Mountains in 2016 by J. Robinson). Braun et al (1978)

concluded that ptarmigan were not in the Uinta Mountain prior to 1976. However, they did not disregard the possibility that prehistoric occurrence in the Uinta Mountains. Langin et al. (In Review) conducted a thorough analysis of the genetic makeup of white-tailed ptarmigan across the species range. This is the best available information on the genetic makeup of this species. Utah ptarmigan showed no genetic differences from the 1976 translocation Colorado source populations. Based on all the available information, UDWR does not believe ptarmigan were in the Uinta Mountains at the time of the 1976 translocation. UDWR believes, at this time, that the white-tailed ptarmigan is an introduced species to Utah.

Citations:

Braun, C.E. 1971. Habitat requirements of Colorado white-tailed ptarmigan. Proceedings of the Western Association of State Game and Fish Commission. 51:284-292.

Braun, C.E. 1993. White-tailed ptarmigan (*Lagopus leucura*). The birds of North America

Braun, C.E., D.H. Nish, and K.M. Giesen. 1978. Release and establishment of White-tailed Ptarmigan in Utah. The Southwestern Naturalist 23(4):661-667.

Braun C.E. and G. E. Rodgers. 1971. The white-tailed ptarmigan in Colorado. Technical Publication, Colorado Division of Game, Fish and Parks.

Giesen, K.M., C.E. Braun, and T.A. May, 1980. Reproduction and nest-site selection by white-tailed ptarmigan in Colorado. The Wilson Bulletin 92(2):188-199.

Guthery, F.S. and G.E. Mecozzi. 2008. Developing the concept of estimating bobwhite density with pointing dogs. Journal of Wildlife Management 72(5):1175-1180.

Hafner, D.J., 1993. North American pika (*Ochotona princeps*) as a late Quaternary biogeographic indicator species. Quaternary Research 39(3):373-380.

Langin, K.M., C.L. Aldridge, J.A. Fike, R.S. Cornman, K.M. Martin, G.T. Wann, A.E. Seglund, M.A. Schroeder, B.P. Benson, B.C. Fedy, J.R. Young, S. Wilson, D.H. Wolfe, C.E. Braun, and S.J. Oyler-McCance. [in Review]. Characterizing range-wide population divergence in an alpine-endemic bird: a comparison of genetic and genomic approaches. PlosOne.

Twomey, A.C. 1942. The birds of the Uinta Basin, Utah. Ann. Carnegie Museum 28: 341-490.

US Fish and Wildlife Service. 2012. 90-Day Finding on a Petition to List the Southern White-Tailed Ptarmigan and the Mt. Rainier White-Tailed Ptarmigan as Threatened With Critical Habitat. Federal Register 77 FR 33143 33155

Utah Division of Wildlife Resources [UDWR]. 1992. History and Summary of White-tailed Ptarmigan in the Uinta Mountains. Agency Report.

Woodbury, A. M., C. Cottam, and J.W. Sugden. 1949. Annotated check-list of the birds of Utah. Bulletin University of Utah 39, Biology Series 11: 1-40.

Worthen, G.L. 1968. The taxonomy and distribution of the birds of the southeastern Great Basin, Utah. M.S. Thesis. University of Utah, Salt Lake City, 588 pp.

Appendix 1: Ptarmigan Callback Data Sheet.

White-tailed Ptarmigan Survey Form

PlotID #: _____ DWR Region:_____

Date:_____Time:_____ Observer 1:_____

Mtn Range:_____ Observer 2:_____

UTM (NAD83): E ☐☐☐☐☐☐ N☐☐☐☐☐☐☐ Elev (ft): _____

Slope (degrees): _____ Aspect: _____

Temp. (F):_____ Wind: _____ Sky:_____

% Willows w/in 100m radius:_____ Approx height tallest (ft): _____

Predominant habitat type: _____%_____

Secondary habitat type: _____%_____

% Talus: _____

Of total rocks, what % of each rock size:

%small (<1m): _____ %med (1-2m): _____ %large (>2m): _____

Photo ID Ground Cover: _____ Comments:_____
North photo ID: _____ Comments:_____
East photo ID: _____ Comments:_____
South photo ID: _____ Comments:_____
West photo ID: Comments:

PlotID#-YYYYMMDD-direction

Calling Start time:_____ Calling Stop time:_____
adults detected (seen or heard): _____
chicks detected (seen or heard): _____
unknown age detected (seen or heard): _____
TOTAL WTptarmigan detected (seen or heard):

Comments:

Incidental Observations of ptarmigan or ptarmigan sign
Type (bird, track, droppings, feather):_____ Date:_____
UTM (NAD83): N_____ E _____ Elev.:_____
Ad Birds:_____ # Chicks:_____ # Unknown:_____
General Habitat type: Photo ID:

Brief Instructions

1. Observer 1- begin filling out data form
   Observer 2-begin calling sequence (Uinta Mtns, La Sal Mtns, Wasatch Mtns, Nebo North)
2. Both observers will watch and listen for ptarmigan, but only record Ob2 detections
   Ob1 will note any ptarmigan they detected during survey, but not tell Ob2 til end
3. Observer 1 records all site data
4. Date YYYYMMDD, time 12-hr clock (e.g. 1:00 pm), UTM NAD83, Elev in Feet
5. Slope in degrees (e.g. 25 degrees), Aspect in Cardinal directions (e.g. NE aspect)
6. Temp in Fahrenheit, Wind: use 0-5 scale below, Sky: use 0-8 scale below
7. Document % willows within the 100m radius around the plot point, estimate the height of tallest willows (in feet); willows are CRITICAL for WTptarmigan
8. Document veg types using types below and % of 100m w/in each type (may be <100%)
9. Record if boulders are present w/in the 100m radius of the site, estimate % cover of each of 3 boulder sizes (e.g. 0.2m= basketball, 0.3m= beachball, your arm span= 1.5m etc.)
10. Take photographs of the site from 5 directions at approx. 5.5 feet above the ground (straight down, magnetic north, east, south, west, in that order), use photoID paper in each photo
    Plot ID# - YYYYMMDD - Direction (e.g. Uinta-01-20170701-N)

Calling will NOT be done on some sites, see 1. above

11. Record start time of calling sequence, 12-hr
12. Record stop time of calling sequence, 12-hr
13. Record the # of all WTptarmigan detected; and age, if possible. Detection is seen or heard.
14. Add any comments that are relevant
15. Record any observations, outside the 100m plot, of ptarmigan or ptarmigan sign. Take photo w/ photoID page, Site-IO-YYYYMMDD-direction (Uinta-IO-20170701-NE), record all data on sheet

Calling Sequence		Equipment needed
Start		clip board
0-1 min	silence, listen and look for ptarmigan	data sheet
1-2 min	chick distress in 360 degrees, low volume	pencil
2-4 min	silence, listen and look for ptarmigan	GPS
4-5 min	chick distress in 360 degrees, moderate volume	camera
5-7 mins	silence, listen and look for ptarmigan	batteries
7-8 mins	chick distress in 360 degrees, high volume	compass
8-10 mins	silence, listen and look for ptarmigan	stop watch
End		fox pro w preloaded calls
Use male territory call May 1 - June 15		binoculars
Use either male territory or chick distress June 16 - 30		Photo ID page/dry erase pen
Use chick distress July 1 - Sept 15		thermometer

Wind: 0=smoke rises vertically, 1=wind direction shown by smoke, 2=wind felt on face and leaves rustle, 3=leaves and small twigs in constant motion, 4=wind raises dust banches move,and 5=small trees sway

Sky: 0=clear or few clouds, 1=partly cloudy, 2=cloudy, 3=overcast, 4=fog, 5=drizzle, 6=?, 7=snow, 8=showers

Habitat Types: Tundra/ Talus/ Coniferous Forest/ Aspen Forest/ Mixed Forest/ Shrubland/ High Mountain/ Meadow/ Rock outcrop (cliff)/ Ice or Snow/ Other (explain)

Appendix 2: Bird dog survey form and associated instructions.

Bird Dog Survey Form

Plot ID: _____ DWR Region:_____

Date:_____Time:_____ Observer:_____

Mtn Range:_____ Dog/Breed 1:_____

Survey Species: _____ Dog/Breed 2: _____

UTM (NAD83): E ☐☐☐☐☐☐ N☐☐☐☐☐☐☐ Elev (ft): _____

Slope (degrees): _____ Aspect: _____

Temp. (F):_____ Wind: _____ Sky:_____

Predominant habitat type: _____%_____

Secondary habitat type: _____%_____

PhotoID @ Start point: _____ Comments:_____

Survey Start time:_____ Survey Stop time:_____

adults detected: _____

young detected: _____

unknown age detected: _____

TOTAL Birds detected:_____

Comments:

Incidental Observations of game birds or sign

Type (bird, track, droppings, feather):_____ Date:_____

UTM (NAD83): E ☐☐☐☐☐☐ N☐☐☐☐☐☐☐ Elev (ft): _____

Ad Birds:_____ # Young:_____ # Unknown:_____

General Habitat type: Photo ID:

Brief Instructions

1. Walk dog to survey area on a leash.
2. Check GPS prior to release of dog. Start recording data at the start point.
3. Record start time and release the dog.
4. Survey the full transect, focusing only on the dog and GPS.
5. Mark all bird detections with a point on the GPS at the spot the birds were sitting
   Go back to the original point on the observers transect (box) and begin surveying again
6. At the end of the survey, record all site data
7. Date DDMMYYYY, time 12-hr clock (e.g. 1:00 pm), UTM NAD83, Elev in Feet
8. Slope in degrees (e.g. 25 degrees), Aspect in Cardinal dircections (e.g. NE aspect)
9. Temp in Fahrenheit, Wind: use 0-5 scale below, Sky: use 0-8 scale below
10. Document veg types using types below and % w/in 100m (may not equal 100%)
11. Take a photo from the start/end point towards the center of the survey box
    PlotID#-DDMMYYYY-Direction (e.g. 1003-01072017-N)
12. record stop time of the survey, 12-hr
13. record the # of all birds detected; and age, if possible.
14. Add any comments that are relevant

15. Record any observations, outside the plot, of game birds or sign. Take photo with photoID page, IO-DDMMYYYY-direction (IO-01072017-NE), record all data on sheet

Equipment needed	
clip board	Compass
data sheet	Stop watch
pencil	Trained Bird Dog
GPS (e.g. Garmin Astro or Alpha)	Binoculars
Camera	Thermometer
Batteries	Leash

Wind: 0 = smoke rises vertically, 1 = wind direction shown by smoke, 2 = wind felt on face and leaves rustle, 3 =leaves and small twigs in constant moation, 4 =wind raises dust and 5= small trees sway

Sky: 0=clear or few clouds, 1= partly cloudy, 2=cloudy, 3=overcast, 4=fog, 5=drizzle, 6=?, 7=snow, 8=showers

Habitat Types: Tundra/ Talus/ Coniferous Forest/ Aspen Forest/ Mixed Forest/ Shrubland/ High Mountain/ Meadow/ Rock outcrop (cliff)/ Ice or Snow/ Other (explain)

Appendix 3. Genetic analysis collection protocol and call for help from hunters, UDWR 2016.

ATTENTION PTARMIGAN HUNTERS!!
UDWR NEEDS YOUR HELP
COLLECTING SAMPLES

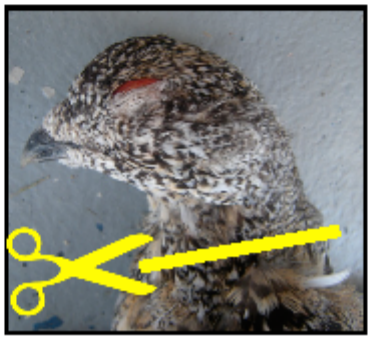
- The Utah Division of Wildlife Resources, in cooperation with USGS, is conducting a White-tailed ptarmigan genetics study.
- UDWR is asking hunters for help collecting genetic samples
- Steps to help UDWR:
  1. Obtain a hunting or combination license
  2. Obtain a free ptarmigan hunting permit and follow all regulations
  3 Learn how to find ptarmigan at: http://wildlife.utah.gov/uplandgame/ptarmigan/uinta_wt.php
  4. Get excited about the adventure here: http://wildlife.utah.gov/blog/2013/the-ultimate-upland-game-hunting-experience/

If you are successful in harvesting one or more ptarmigan take a genetic sample from each bird.

Samples can be one of the following:

A wing cut near the body (see picture below)
The head of the bird
The heart of the bird (if bird is to be mounted)

1) place each genetic sample into a CLEAN ziplock bag (not your trail mix or sandwich bag!),
2) keep cool in the field as much as possible (in a cooler, in the shade, etc.),
3) get into a freezer as soon as possible,
4) keep sample frozen,
5) place a sheet of paper in or stapled to the ziplock bag with the following info: a) location (drainage) the bird was harvested (this info is VERY important) b) date of harvest, c) your name d) your phone #, and e) GPS location, if possible,
6) **Contact UDWR at 801-538-4786 to arrange pick-up** of the genetic sample (s).



Appendix 4: Pointing dog transects conducted in the Uinta Mountains and associated habitat classifications

Plot Name	Pika Plot ID	Callback Survey Within Transect	Date	Time	Elevation (ft)	Slope (Deg)	Aspect	Temp (F)	Wind (Beaufort)	Sky	Primary Habitat Type	Primary Habitat Percent Cover	Secondary Habitat Type	Secondary Habitat Type Percent Cover	Survey Start Time	Survey End Time	Ptarmigan Detected				Comments
																	Adults	Young	Unknown	Total	
Murdock		N	16-Aug-17	8:45 AM	10911		NW	48	2	Clear	Tundra	98	NA		8:45 AM	9:36 AM	0	0	0	0	5 Mountain goats. Trigger pointed 2 goats @ 10 yards. 1.5 hour drive from SLO. Start photo is looking east with pack in picture.
Fox Queant Pass	18	Y	16-Aug-17	10:05 AM	11035	30	NW	59	2	Partly Cloudy	Talus	80	Tundra	20	10:07 AM	11:45 AM	0	0	0	0	Habitat looked good (veg between rocks) at the top of the transect but half was just scree. USFS trail crew was working on the trail at the bottom of the transect, they had not seen any ptarmigan.
Swaysey's Hole		Y	17-Aug-17	12:20 PM	10965	30	E	56	1	Cloudy	Talus	90	Sedges	10	11:20 AM	12:20 PM	0	0	0	0	Not good habitat. Very little dirt/food. Mostly rocks. Terrible Hiking. Do not run a hard charging dog here!
Rock Lake	28	N	17-Aug-17	8:14 AM	11646	5	S	53	1	Partly Cloudy	Tundra	80	Talus	20	8:17 AM	9:34 AM	0	0	0	0	Bottom 1/2 of transect was scree. Dog got tired on the scree and slowed a bit. Ridgeline looks like very good habitat. Thunder clouds building at 9:30 after a clear morning with a few high clouds.
Island Lake	39	N	22-Aug-17	3:41 PM	11370	8	SW	71	1	Cloudy	Tundra	60	Willow	30	3:46 AM	4:48 AM	0	0	0	0	Sign found along transect. Domestic sheep on transect. 10% Scree
Flat Top Mt	48	Y	23-Aug-17	6:32 AM	11554	10	SW	49	2	Overcast	Tundra	60	Willow	30	6:38 AM	7:30 AM	0	0	0	0	Flat Top Mt. Looks like good habitat - high, lots of forage between the rocks. Very Wet - sections of the transect were swampy wetland. 1 cow elk.
Gilbert Peak	52	N	24-Aug-17	6:19 AM	12270	4	W	38	1	Cloudy	Tundra	50	Talus	50	6:25 AM	7:40 AM	0	0	0	0	Above Gunsight Pass. Habitat generally looks good - combo of escape cover, tundra, and moisture (there is water flowing in the rocks).
Kidney Lake		N	24-Aug-17	11:00 AM	11478	5	NE	48	3	Drizzle	Alpine	95	Pine	5	11:00 AM	11:37 AM	0	0	0	0	Good habitat. 4.5 hour drive and 1.9 mile hike.
Joulious Creek	40	Y	25-Aug-17	6:26 AM	11602	20	S	35	1	Partly Cloudy	Talus	30	Tundra	70	6:32 AM	8:04 AM	6	4	0	10	willow cover with flat area above. Also an additional incidental detection at dusk on the way to the transect. Herd chick call but could not see well for a good count or Ad/Juv.
Marsh Peak 2	D-1	N	30-Aug-17	10:00 AM	12115	8	NW	55	2	Partly Cloudy	Alpine	100	NA		9:55 AM	10:57 AM	0	0	0	0	Good habitat. Very Dry. No Sign. Trigger VERY tired, me too! No water.
Marsh Peak 1	D-2	Y	30-Aug-17	8:10 AM	11534	12	SE	48	2	Clear	Alpine	100	NA		8:10 AM	8:56 AM	0	0	0	0	Perfect habitat. Tons of habitat. 3 mountain goat. Start photo is looking NW
Blacks Little East Fork Bench	42	Y	6-Sep-17	6:56 AM	11099	16	NW	41	1	Partly Cloudy	Willow	40	Meadow	30	6:59 AM	7:50 AM	0	0	0	0	20 % conifer. 2 bull moose. Too many trees and shoulder high willow.
Blacks Little East Fork Top		Y	6-Sep-17	9:48 AM	11178	30	NW	61	1	Partly Cloudy	Tundra	70	Talus	20	9:50 AM	11:10 AM	0	0	0	0	Conifer/willow 10%. Habitat looks good but a little dry.
Blacks Fork Mt Lovenia	41	N	7-Sep-17	12:01 PM	11541	7	W	64	1	Clear	Tundra	90	Talus	10	12:05 PM	1:26 PM	0	0	0	0	Nice looking habitat, but has been hammered by sheep. 8 domestic sheep on transect.
Oke Doke Lake	14	Y	13-Sep-17	12:30 PM	11332	3	E	60	2	Cloudy	Tundra	90	Talus	10	12:34 PM	1:39 PM	3	0	1	4	4 Ptarmigan by small pond. 1 may have been Juv. Area has a limited amount of habitat.
Roberts Lake	12	N	13-Sep-17	8:00 AM	11530	8	SW	53	1	Partly Cloudy	Tundra	60	Talus	30	8:07 AM	9:08 AM	0	0	0	0	Transect is about 10% water (lake). 17 mile hike from the trailhead.
Castle Rocks	N-1	Y	13-Sep-17	8:20 AM	11204	1	NW	45	3	Partly Cloudy	Alpine	100	NA		8:20 AM	8:53 AM	0	0	0	0	Huge area of good habitat. Easy drive 2.5 hours from office. Few willows, but present. Ptarmigan probably here just low density.

Appendix 5: Ptarmigan callback surveys at associated pika survey points. The were no ptarmigan responses detected.

Plot Name	Callback Required	Date	Call Start Time	Elevation (ft)	Slope (Deg)	Aspect	Temp (F)	Wind (Beaufourt)	Sky	Percent Willow Within 100m	Willow Height (ft)	Primary Habitat Type	Primary Habitat Type Percent Cover	Secondary Habitat Type	Secondary Habitat Type Percent Cover	Talus			
																Percent	Small	Med	Large
Bear_River_05	N	16-Aug-17	NA	8390	30	NW	75	0	0			Talus	30	Conifer	30	30	70	30	0
Bear_River_09	N	16-Aug-17	NA	8137	30	E	66	2	1			Talus	60	Conifer	10	60	50	30	20
Bear_River_14	N	16-Aug-17	NA	8478	35	NE	72	1	1			Conifer	45	Talus	40	40	50	30	20
Boul_01	N	15-Aug-17	NA	10314	25	NE	56.3	3	3	0	NA	Talus	67	Coniferous Forest	17	67	35	35	30
Boul_02	N	30-Aug-17	NA	10751	41	S	64.4	3	2	0	NA	Coniferous Forest	50	High Mountain Meadow	25	10	60	30	10
Boul_04	N	28-Aug-17	NA	10852	29	W	71	2	2	0	NA	Mixed Forest	50	Talus	30	30	55	30	15
Boul_05	N	31-Aug-17	NA	10370	28	W	60	1	2	2	7	Talus	68	Coniferous Forest	16	68	9	15	76
Boul_07	N	25-Aug-17	NA	10833	48	W	70	1	1	0	NA	Mixed Forest	50	Talus	40	40	70	15	15
Boul_08	N	16-Aug-17	NA	10452		E	65.5	2	1	0	NA	Talus	70	Mixed Forest	15	70	20	35	45
Boul_09	N	19-Aug-17	NA	10446	25	NE	61.7	2	1	0	NA	Talus	63	Mixed Forest	24	63	18	40	42
Boul_14	N	29-Aug-17	NA	10465	35	W	75.4	2	1	10	11	Mixed Forest	40	Talus	35	35	25	25	50
Boul_A04	N	29-Aug-17	NA	10538	44	W	75.6	1	1	0	NA	Mixed Forest	55	Talus	30	30	30	50	20
Boul_A05	N	30-Aug-17	NA	10218	48	NW	62.1	1	1	0	NA	Mixed Forest	70	Talus	23	23	30	30	40
Fish_03	N	1-Aug-17	NA	10479	15	W	79	1	0	0	NA	Coniferous Forest	45	Talus	28	28	87	10	3
Fish_04	N	4-Aug-17	NA	8996	9	NW	76.5	1	0	0	NA	Talus	50	Mixed Forest	50	50	70	26	4
Fish_05	N	2-Aug-17	NA	10485	34	N	72	1	1	0	NA	Coniferous Forest	62	Talus	25	25	50	45	5
Fish_06	N	22-Aug-17	NA	10830	20	NW	64.9	2	1	0	NA	Talus	53	Coniferous Forest	30	53	27	48	25
Fish_07	N	21-Aug-17	NA	10689	15	W	65	1	3	0	NA	Talus	57	Coniferous Forest	23	57	28	58	14
Fish_08	N	2-Aug-17	NA	9717	21	E	70	1	1	0	NA	Mixed Forest	65	Talus	30	30	20	72	8
Fish_09	N	2-Aug-17	NA	10442	21	N	67	0	1	0	NA	Coniferous Forest	78	Talus	17	17	8	52	40
Fish_10	N	23-Aug-17	NA	10022	22	N	63	1	1	0	NA	Mixed Forest	50	Talus	35	35	10	20	70
La_Sal_01	Y	10-Sep-17	1:05 PM	12090	20	W	46	1	5	0	NA	Talus	70	Dirt/Tundra	30	70	98	1	1
La_Sal_03	Y	29-Aug-17	2:40 PM	11640	25	NE	67	3	1	0	NA	Talus	60	Meadow	30	60	88	10	2
La_Sal_04	Y	2-Aug-17	12:25 PM	11490	30	SE	60	1	1	0	NA	Talus	92	Coniferous Forest	5	92	85	13	2
La_Sal_06	Y	27-Jul-17	1:47 PM	10286	40	SSW	73	1	1	0	NA	Talus	47	Mixed Forest	40	47	95	5	0
La_Sal_07	Y	14-Aug-17	12:15 PM	12273		Peak	53	3	2	0	NA	Talus	80	Meadow	20	80	99	1	0
La_Sal_08	Y	14-Sep-17	2:17 PM	11715	50	WSW	55	4	1	0	NA	Talus	70	High Mountain Meadow	30	70	95	5	0
La_Sal_09	Y	9-Aug-17	1:48 PM	10020	45	N	63	1	1	0	NA	Talus	50	Coniferous Forest	45	50	98	2	0
La_Sal_10	Y	8-Aug-17	1:48 PM	9065	10	WSW	72	2	1	0	NA	Aspen Forest	45	Talus	40	40	60	30	10
La_Sal_11	Y	7-Sep-17	1:21 PM	11379	35	NW	61	1	1	0	NA	Talus	60	Meadow	35	60	40	30	30
La_Sal_12	Y	10-Sep-17	12:25 PM	11912	20	NE	46	8	1	0	0	Talus	75	Dirt/Tundra	20	75	100	0	0
La_Sal_13	Y	1-Aug-17	2:16 PM	11410	35	SW	55	2	2	0	NA	Talus	76	Coniferous Forest	10	76	98	2	0
La_Sal_14	Y	7-Sep-17	10:49 AM	10677	30	N	59	1	0	0	NA	Talus	60	Coniferous Forest	30	60	75	20	5
La_Sal_15	Y	10-Sep-17	NA	11980															
La_Sal_16	Y	1-Aug-17	6:44 PM	10180	5	NE	56	1	0	0	NA	Talus	75	Mixed Forest	20	75	97	3	0
La_Sal_17	Y	9-Sep-17	4:13 PM	9982	42	N	60.8	3	1	5	12	Talus	80	Mixed Forest	17	80	97	2	1
La_Sal_18	Y	9-Sep-17	12:21 PM	11193	31	W	60	3	1	0	0	Talus	80	Mixed Forest	20	80	96	3	1
La_Sal_20	Y	2-Aug-17	2:22 PM	9945	16	S	70	1	3	0	NA	Talus	50	Mixed Forest	37	50	75	20	5
La_Sal_20A	Y	13-Sep-17	3:01 PM	11253	12	N	68	2	1	0	NA	Talus	100			100	90	8	2
La_Sal_21	Y	13-Sep-17	12:25 PM	12605	20	SE	60	1	0	0	NA	Talus	60	High Mountain Meadow	40	60	99	1	0
La_Sal_22	Y	7-Sep-17	3:08 PM	12005	50	S	58	2	1	0	NA	Talus	70	High Mountain Meadow	25	70	85	10	5
Manti_01	N	21-Sep-17	NA	10700	25	W	53.1	3	1	0	0	Coniferous Forest	33	Talus	33	33	60	20	20

Manti_02	N	1-Aug-17	NA	10383	0		68.6	1	2	0	0	Coniferous Forest	60	High Mountain Meadow	40	0	85	10	5
Manti_03	N	3-Aug-17	NA	10451	35	SW	69.7	1	1	0	0	Talus	60	Coniferous Forest	30	30	40	30	30
Manti_04	N	11-Aug-17	NA	10310	10	SW	74	3	2	0	0	Coniferous Forest	40	Talus	20	20	93	5	2
Manti_05	N	19-Sep-17	NA	10600		SW	50	4	1	0	0	Talus	40	Mixed Forest	40	40	20	40	30
Manti_06	N	19-Sep-17	NA	10575	35	SW	55.5	4	1	0	0	Coniferous Forest	50	Talus	20	20	50	25	25
Manti_07	N	7-Sep-17	NA	10555	24	N	71.1	3	1	0	0	Talus	80	Mixed Forest	20	80	50	40	10
Manti_08	N	21-Sep-17	NA	10350	55	SE	55	3	1	0	0	Shrubland	60	Meadow	30	2	60	20	20
Manti_09	N	8-Aug-17	15:45 PM	10643	35	N	69	2	1	0	0	Coniferous Forest	50	Talus	40	40	94	5	1
Manti_10	N	27-Aug-17	12:20 PM	10380		W	71	1	1	0	0	Coniferous Forest	50	Talus	50	60	40	50	10
Manti_11	N	10-Aug-17	NA	10600	18	W	65.5	3	1	0	0	High Mountain Meadow	65	Other (mix talus/gravel)	30	10	99	1	0
Manti_12	N	1-Aug-17	4:05 PM	8723	20	NE	78	1	1	15	7	Rock Outcrop	50	Mixed Conifer Forest	30	30	70	20	10
Manti_17	N	2-Aug-17	10:44 AM	10698	30	E	66	2	1	0	0	Talus	70	Coniferous Forest	30	70	30	50	20
Manti_18	N	2-Aug-17	1:10 PM	7217		SE	70	2	1	0	0	Mountain Meadow	80	Coniferous Forest	20	10	90	5	5
Manti_19c	N	2-Aug-17	3:35 PM	10413	30	S	70	2	1	0	0	Coniferous Forest	50	Rock Cliff	30	50	40	20	40
Manti_20	N	3-Aug-17	11:12 AM	10403	15	W	64	1	1	0	0	Talus	60	Coniferous Forest	30	60	30	30	40
Manti_21	N	8-Aug-17	1:45 AM	10521	40	S	64	2	1	0	0	Coniferous Forest	50	Mountain Meadow	50	10	98	1	1
Manti_901	N	1-Aug-17	NA	10299	34	SE	72.4	2	1	0	0	High Mountain Meadow	50	Gravel	20	0	99	1	0
Manti_902	N	3-Aug-17	NA	10634	40	E	63.9	1	3	0	0	Coniferous Forest	65	High Mountain Meadow	35	5	90	5	5
Manti_903	N	19-Sep-17	NA	10500	16	S	46.6	4	1	0	0	Talus	67	Mixed Forest	20	67	20	40	40
Manti_904	N	11-Aug-17	NA	11032	28	N	70.2	2	1	0	0	Talus	90	Coniferous Forest	5	90	93	3	4
Manti_905	N	10-Aug-17	NA	10660	30	S	62	3	1	0	0	High Mountain Meadow	60	Other/Talus	30	10	93	5	2
Manti_906	N	29-Sep-17	NA		20	S	54	1	1	0	0	High Mountain Meadow	40	Cliff	25	20	50	40	10
Mark_10	N	29-Sep-17	NA	10933	36	NW	49.5	1	2	0	NA	Talus	68	Coniferous Forest	15	68	55	20	25
Monr_07	N	27-Jul-17	NA	10726	27	SE	75	1	2	0	NA	Talus	75	Mixed Forest	11	75	10	60	30
Monr_10	N	27-Jul-17	NA	10804	36	SW	78	2	1	0	NA	Talus	55	Shrubland	30	55	89	10	1
Monr_A01	N	26-Jul-17	NA	10219	20	SE	70	1	1	0	NA	Mixed Forest	74	Talus	23	23	81	18	1
Monr_A02	N	26-Jul-17	NA	10447	38	E	79	1	1	0	NA	Mixed Forest	62	Talus	20	20	30	50	20
Tush_01	N	24-Aug-17	NA	9845	17	W	69	0	1	0	NA	Aspen Forest	80	Talus	10	10	80	10	10
Tush_03	N	8-Aug-17	NA	10807	23	E	63	2	2	0	NA	Talus	55	Coniferous Forest	14	55	92	7	1
Tush_04	N	8-Aug-17	NA	10068	23	NW	71	2	1	0	NA	Mixed Forest	40	Scree	38	8	94	8	0
Tush_05	N	9-Aug-17	NA	10674	41	NW	76	1	1	0	NA	Coniferous Forest		High Mountain Meadow		8	20	70	10
Tush_09	N	10-Aug-17	NA	9708	57	SW	79	2	1	0	NA	Mixed Forest	40	Shrubland	25	15	95	5	0
Tush_10	N	10-Aug-17	NA	9786	30	N	70	2	1	0	NA	Talus	54	Mixed Forest	30	54	95	5	0
Tush_A01	N	5-Sep-17	NA	9884	7	E	71	2	3	0	NA	Mixed Forest	42	Talus	40	40	50	35	15
Tush_A04	N	4-Sep-17	NA	9514	35	NW	74	1	2	0	NA	Talus	61	Coniferous Forest	27	61	89	7	4
Uinta_01	Y	24-Aug-17	6:20 PM	10160	35	W	70	0	2	0	NA	Talus	80	Mixed Forest	20	80	60	30	10
Uinta_02	Y	22-Aug-17	1:40 PM	11218	25	S	70	4	2	0	NA	Talus	80	Grass	20	80	90	10	0
Uinta_03	Y	11-Aug-17	7:10 PM	11827	40	NW	55	2	0	0	NA	Talus	40	Rock/Cliff	20	40	30	60	10
Uinta_04	Y	27-Jul-17	6:35 PM	12280	35	N	60	2	3	0	NA	Talus	98	Cliff	5	95	90	9	1
Uinta_05	Y	4-Aug-17	1:30 PM	40247	40	S	74	3	2	0	NA	Conifer	60	Talus	40	40	30	30	40
Uinta_06	Y	3-Aug-17	11:20 AM	10000	35	NE	69	1	2	0	NA	Talus	90	Conifer	10	90	60	20	20
Uinta_06A	Y	23-Sep-17	11:20 AM	9870		N	62	1	1	0	NA	Talus	70	Conifer (Spruce)	30	70	30	50	20
Uinta_07	Y	3-Aug-17	7:30 PM	10351	30	E	69	0	0	0	NA	Conifer	40	Forb	60	10	100	0	0
Uinta_08	Y	12-Aug-17	2:30 PM	11421	45	NW	56	1	2	10	4.9	Talus	80	Shrub	10	80	60	30	10
Uinta_09	Y	10-Aug-17	7:24 PM	11965	35	E	53	0	1	10	2.4	Talus	90	Willow	10	90	60	20	20
Uinta_10	Y	8-Jul-17	4:00 PM	11647	30	N	45	3	5	10	2.4	Talus	90	Grass	10	90	90	10	0
Uinta_11	Y	27-Jul-17	4:00 PM	12015	38	W	63	2	3	0	NA	Talus	80	Cliff	20	80	75	20	5
Uinta_12	Y	25-Aug-17	3:40 PM	11061	0	NA	64	2	5	30	0.8	Conifer	40	Shrub	30	0			
Uinta_13	Y	25-Aug-17	1:30 PM	11226	40	N	66	2	0	10		Talus	65	Conifer	10	65	70	20	10

Uinta_16	Y	19-Aug-17	NA	10538	28	E	67	0	5	5	2	Talus	90	Cliff	10	90	40	30	30
Uinta_18	Y	10-Aug-17	12:15 PM	11621	30	E	64	3	2	10	1.6	Talus	60	Willow	10	60	50	40	10
Uinta_19	Y	23-Aug-17	1:40 AM		45	N	58	1	5	5	3.2	Talus	90	Conifer	10	90	70	20	10
Uinta_21	Y	20-Jul-17	NA	11486	40	SW	62	3	1	0	NA	Talus	95	Conifer	5	95	90	10	0
Uinta_24	Y	18-Sep-17	1:30 AM	10334			50	1	2	0	NA	Talus	80	Conifer	20	80	30	50	20
Uinta_25	Y	21-Aug-17	10:30 AM		14	S	62	0	0	5	0.5	Coniferous Forest		Talus					
Uinta_27	Y	21-Sep-17	11:30 AM	10254	20	W	46	2	2	0	NA	Talus	90	Conifer	10	10	50	30	20
Uinta_27A	Y	9-Aug-17	11:17 AM	11215	7	W	51.8	2	1	0	NA	Tundra	80	Rock	20	20	20	70	10
Uinta_28	Y	24-Aug-17	11:15 AM	9820	4	E	60	1	2	0	NA	Talus	60	Coniferous Forest	20	60	20	60	20
Uinta_30	Y	1-Aug-17	11:40 AM	11004	4	S	56	1	1	0	NA	Alpine Meadow	60	Talus	40	40	20	50	30
Uinta_31	Y	12-Sep-17	8:20 AM	11171	26	W	45	0	0	5	4	Talus	50	Tundra	45	50	85	10	5
Uinta_32	Y	12-Sep-17	12:37 PM	11331	16	W	61	2	1	0	NA	Talus	85	Pine Shrub	10	85	90	5	5
Uinta_33	Y	12-Sep-17	3:05 PM	10944	8	W	68	2	1	10	4	Talus	45	Coniferous Forest	30	45	98	1	1
Uinta_35	Y	9-Sep-17	8:37 AM	11394	26	S	63	0	1	1	2	Talus	60	Coniferous Forest	20	60	90	5	5
Uinta_36	Y	26-Aug-17	9:30 AM	11339	2	NE	58	0	0	10	1	Tundra	60	Talus	40	40	90	10	0
Uinta_37	Y	27-Aug-17	8:00 AM	11257	35	S	45	0	0	5	1	Talus	60	Tundra	40	60	30	50	20
Uinta_40	Y	11-Aug-17	11:15 AM	11069	14	E	55	2	1	5	3	Talus	60	Tundra	20	60	50	40	10
Uinta_40A	Y	11-Aug-17	10:30 AM	11061	13	N	56	3	1	25	1	Tundra	60	Shrubland	25	15	60	30	10
Uinta_40B	Y	11-Aug-17	12:20 AM	11411	15	W	49.5	1	1	10	1.5	Talus	50	Tundra	40	50	70	25	5
Uinta_42	Y	31-Aug-17	12:00 PM	10775	20	S	50	2	2	1	3	Talus	75	High Mountain Meadow	20	75	50	30	20
Uinta_43	Y	1-Aug-17	9:45 AM	11600	25	E	55	2	0	0	NA	Talus	50	Tundra	50	50	68	30	2
Uinta_44	Y	1-Sep-17	11:26 AM	11979	18	NW	51	3	0	0	NA	Talus	55	Tundra	45	55	95	5	0
Uinta_45	Y	1-Sep-17	10:05 AM	11624	15	S	56	2	0	0	NA	Tundra	70	Talus	30	30	95	4	1
Uinta_50	Y	23-Aug-17	12:05 PM	10881	32	S	48	1	2	0	NA	Talus	95	Rock Outcrop	5	95	20	30	50
Uinta_51	Y	5-Aug-17	8:42 AM	12212	30	E	58	2	1	0	NA	Tundra	60	Talus	40	40	93	5	2
Uinta_52A	Y	13-Sep-17	12:00 PM	11452	4	S	49	2	2	30	3	Tundra	50	Willow	30	20	80	15	5
Wasatch_02	Y	23-Aug-17	7:56 AM	10059	30	N	54	1	1	0	0	Talus	95	Coniferous Forest	5	70	80	15	5
Wasatch_03	Y	22-Aug-17	2:27 PM	9340	20	NW	71	2	1	0	0	Talus	95	Coniferous Forest	5	60	60	35	5
Wasatch_04	Y	24-Aug-17	2:10 PM	9200	25	SW	71	1	1	0	0	Forb	40	Shrub	30	30	70	20	10
Wasatch_05	Y	28-Aug-17	2:15 PM	7034	30	N	79	2	1	0	0	Mountain Meadow	40	Coniferous Forest	30	40	99	1	0
Wasatch_06	Y	28-Jul-17	1:18 PM	9068	35	NW	70	1	2	0	0	Talus	60	Coniferous Forest	35	60	10	60	30
Wasatch_07	Y	19-Jul-17	11:45 AM	9580	40		68	1	3	0	0	Alpine-Conifer	100	Cliffrock Present		60	30	30	40
Wasatch_08	Y	7-Aug-17	3:50 PM	9829	30	NE	61	1	2	0	0	Talus	70	Coniferous Forest	30	70	30	40	30
Wasatch_09	Y	12-Sep-17	1:15 PM	9475	20	NW	70	2	1	0	0	Talus	80	Mountain Meadow	20	75	35	45	20
Wasatch_10	Y	31-Aug-17	12:54 PM	9366	25	E	61	2	3	0	0	Mountain Meadow	60	Coniferous Forest	30	10	85	15	0
Wasatch_11	Y	28-Sep-17	12:00 PM		25	NW	53	1	3	0	0	Coniferous Forest	30	Talus	70	60	10	20	70
Wasatch_13	Y	14-Sep-17	2:29 PM	8800	33	se	45	0	7	0	0	Talus	35	Fir	30	35	50	40	10
Wasatch_16	Y	15-Aug-17	12:13 PM	8540	20	N	65	1	1	20	7	Talus	70	Mountain Meadow	30	70	20	60	20
Wasatch_17	Y	7-Sep-17	13:30 PM	10541	40	NE	64	2	1	0	0	Talus	80	Mountain Meadow	20	80	85	10	5
Wasatch_19	Y	25-Aug-17	2:30 PM	9524	20	W	71	1	1	0	0	Coniferous Forest	30	Mountain Meadow	20	50	10	25	65
Wasatch_20	Y	25-Jul-17	12:40 PM	9101	20	E	63	1	3	0	0	Mountain Meadow	50	Coniferous Forest	50	40	90	10	0
Wastach_14	Y	8-Aug-17	1:45 PM	10111	59	NW	59	2	1	0	0	Talus	100			100	30	55	15
Wastach_15	Y	31-Jul-17	12:50 PM	8799	20	SE	74	2	1	0	0	Talus	80	Mixed Forest	20	80	30	30	40