



An inventory of the avifauna in the Long Pines of southeastern Montana
by Kristi Lynn DuBois

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE
in Fish and Wildlife Management
Montana State University
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Abstract:

Songbird populations within the Long Pines of southeastern Montana were censused during 1977 and 1978 to provide baseline data prior to possible uranium mining. Breeding pair densities, species composition and relative abundance of birds were determined in grassland, ponderosa pine savannah, ponderosa pine forest, and deciduous draw forest formations. Censuses were taken at 22 stations on a road route, on three 16 ha plots, and on two 31 ha strip-plots. Breeding pair density and number of breeding species were lowest in grasslands (59 pairs/ 100 ha, 2 species), higher in savannah (109 pairs/100 ha, 8 species) and ponderosa pine forest (312 pairs/100 ha, 11 species), and highest in deciduous draw forests (413 pairs/100 ha, 19 species). Species diversity and breeding bird density were related to the structural diversity of the vegetation and interspersed of different plant communities. Habitats which would probably be most heavily impacted from uranium mining are the deciduous draw and ponderosa pine forest which support the highest bird densities and diversity.

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Date April 30, 1979

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KRISTI LYNN DUBOIS

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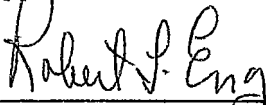
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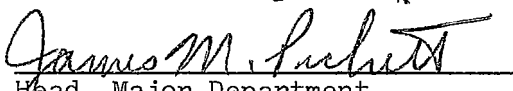
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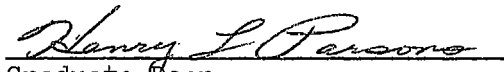
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ABSTRACT

Songbird populations within the Long Pines of southeastern Montana were censused during 1977 and 1978 to provide baseline data prior to possible uranium mining. Breeding pair densities, species composition and relative abundance of birds were determined in grassland, ponderosa pine savannah, ponderosa pine forest, and deciduous draw forest formations. Censuses were taken at 22 stations on a road route, on three 16 ha plots, and on two 31 ha strip-plots. Breeding pair density and number of breeding species were lowest in grasslands (59 pairs/100 ha, 2 species), higher in savannah (109 pairs/100 ha, 8 species) and ponderosa pine forest (312 pairs/100 ha, 11 species), and highest in deciduous draw forests (413 pairs/100 ha, 19 species). Species diversity and breeding bird density were related to the structural diversity of the vegetation and interspersed of different plant communities. Habitats which would probably be most heavily impacted from uranium mining are the deciduous draw and ponderosa pine forest which support the highest bird densities and diversity.

INTRODUCTION

Increasing demand for energy and oil shortages have stimulated development of atomic energy. As energy costs rise, exploitation of lower-grade uranium ore becomes more economical. One method of exploiting low-grade ore is known as in-situ, or solution mining. This entails leaching the uranium compounds by pumping a sulphuric acid solution directly into the bedrock. Several companies are engaged in exploratory drilling for uranium in the Long Pines of southeastern Montana, to determine the feasibility of in-situ mining.

Songbirds are often used as indicators of environmental change due to their wide distribution and abundance, and sensitivity to habitat changes (Graber and Graber 1976). This study was undertaken to provide baseline data on songbirds in the Long Pines for future reference in monitoring the effects of uranium mining or other land disturbance. Specific objectives were to determine breeding bird densities, relative abundance and species composition of songbirds in the various habitats found within the Long Pines. Field work was conducted from mid-June to mid-August 1977, and from early April to early September 1978.

DESCRIPTION OF STUDY AREA

The Long Pines is a small range of hills located approximately 39 km (24 mi) southeast of Ekalaka in Carter County, Montana. The range is L-shaped, about 24 km (15 mi) long, 11 to 19 km (7 to 12 mi) wide, and rising 366 m (1200 ft) above the surrounding plains to a maximum elevation of 1280 m (4200 ft). The Long Pines, together with several other isolated pine hills, is included in the Sioux Division of the Custer National Forest. The range consists of flat-topped hills with some exposed rimrock, steep ridges and V-shaped valleys. Vegetation consists primarily of grasslands and forests of ponderosa pine (*Pinus ponderosa*). The study area (Figure 1) included 263 sq km (65,000 ac) of National Forest land and some surrounding private land, for a total of 544 sq km (210 sq mi).

Soils in the Long Pines are generally shallow and rocky, often with a high clay content. The surface bedrock is mostly sandstones and clay "gumbo" of the Arikaree Formation (Miocene) and the Fort Union Formation (Paleocene). Underlying beds of the Fox Hills Formation (Upper Cretaceous) contain the uranium deposits (AAPG 1972).

The major drainages in the area are Boxelder Creek, which cuts across the northwest corner of the study area, and the Little Missouri River, several km southeast of the study area. Many of the drainage-ways in the Long Pines contain intermittent streams. Numerous springs

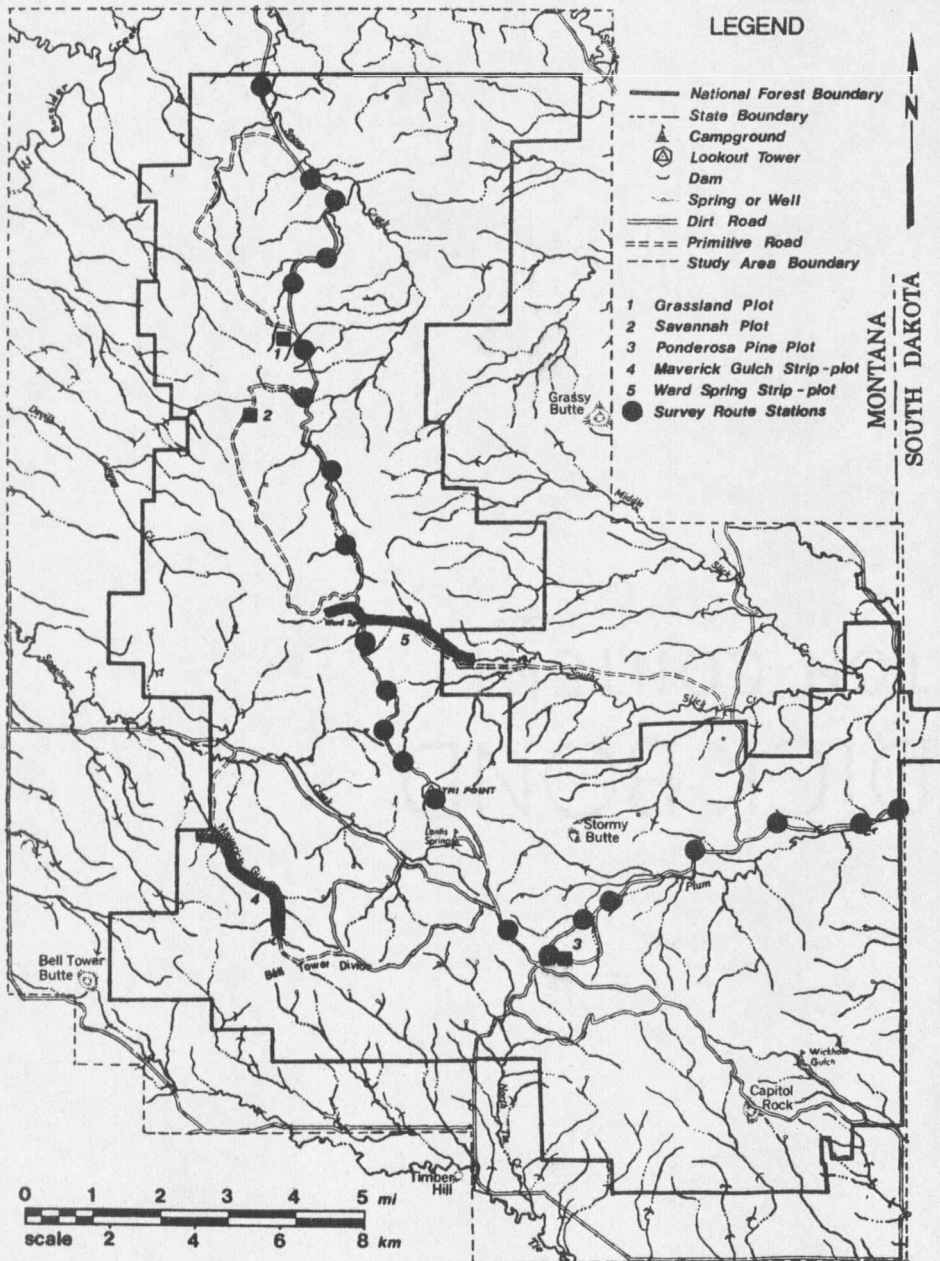


Figure 1. Map of study area including survey route stations and breeding bird plots.

and seeps are found in the draws, providing sufficient water to support many small beaver ponds. Standing water has been increased by the addition of man-made stockdams and tanks. High turbidity is common due to erosion.

The climate is continental with hot, dry summers and cold, dry winters. The mean annual temperature for Ekalaka, Montana is 6.6°C (43.8°F), with means for January and July being -8.1°C (17.5°F) and 21.4°C (70.5°F) respectively. The mean annual precipitation is approximately 38 cm (15 in), with just over half occurring in May, June, and July (U.S.D.C., 1977, 1978).

The summer of 1977 was very hot and dry, with precipitation 7.6 cm (3 in) below normal and mean temperatures averaging 2.8°C (5°F) above normal for April through July (Appendix Table 13). The spring and summer of 1978 were cool and wet, with mean temperatures slightly below normal and precipitation 5.1 cm (2 in) above normal for April through August. The precipitation for May 1978 was extremely high at 15.04 cm (5.92 in), almost ten cm above normal.

The major land uses within the Long Pines are cattle grazing, logging, and recreation. All of the National Forest land is grazed, with individual pastures being grazed for two to three months between May and October. Most of the recreational use is by hunters and campers. Vehicle trails are abundant throughout the Long Pines, attracting off-road vehicle recreationists. Such trails are a potential source of

silt in the ponds and creeks. The private land in the study area is used primarily for sheep and cattle ranching and production of small grains.

The fauna and flora of the Long Pines have been little-studied due to the area's isolation and low human density. Cameron (1907), Saunders (1916), and Visher (1911, 1912, 1913) mentioned the Long Pines in their annotated bird lists for the region. Skaar (1975) and supplements listed 151 species of birds as occurring in the latilong containing Carter County. The mammals of Carter County were described by Lampe et al. (1974).

The vegetation of the Long Pines was described by Jonas (1966). Well-developed ponderosa pine forest covers the higher elevations, grading into a savannah with interspersed patches of ponderosa pine forest and grassland at lower elevations. The forested areas are characterized by even-aged stands of ponderosa pine with many scattered grassland parks. The understory is predominately snowberry (*Symphoricarpos sp.*), kentucky bluegrass (*Poa pratensis*), and oregon grape (*Berberis repens*) on the more mesic slopes; and skunkbush sumac (*Rhus trilobata*) and bluebunch wheatgrass (*Agropyron spicatum*) predominate on the dryer slopes. The shrub layer is poorly developed, giving most stands an open park-like appearance. Similar ponderosa pine forests in North Dakota were described by Potter and Green (1964).

The grasslands are a mixed-grass prairie with a variety of both

bunchgrasses and sod-forming grasses. The dominant type is a western wheatgrass (*Agropyron smithii*) - needle-and-thread (*Stipa comata*) community. A large number of forb species are present, mostly of the composite and legume families. Silver sage (*Artemisia cana*) and big sage (*Artemisia tridentata*) dominate small areas of sagebrush-grassland.

Mesic draws running through the Long Pines support several different deciduous plant communities. Draws running through ponderosa pine forest at higher elevations contain stands of trembling aspen (*Populus tremuloides*), and several north-facing draws contain relict stands of paper birch (*Betula papyrifera*). Draws at lower elevations in more open areas with abundant moisture support boxelder (*Acer negundo*), green ash (*Fraxinus pennsylvanicus*), and fleshy hawthorne (*Crataegus succulenta*). Dry draws running through prairie contain homogeneous stands of snowberry (*Symphoricarpos sp.*).

METHODS

Vegetation

Vegetational analyses were conducted at stations along a breeding bird survey route and on the five breeding bird density plots. Vegetational formations (grassland, savannah, ponderosa pine forest, deciduous draw forest) were delineated at each station along the breeding bird survey route within a circle of 400 m (0.25 mi) radius from aerial photos. A dot grid was used to determine the percentages of each formation.

Three 16 ha (approximately 40 acres) breeding bird plots were established, one each in mixed grass prairie, ponderosa pine savannah, and ponderosa pine forest. Each plot was 400 m on a side, gridded and staked at 50 m intervals. Two strip plots were established, one each along two draws containing deciduous overstory. Each strip-plot was approximately 31 ha in size, 100 m wide and approximately 2950 m long, with stakes at 50 m intervals down the center along the draw. The plant communities were mapped from large-scale color infrared photos. The percentage of each community was determined with a dot grid.

Ground vegetation (including shrubs under 0.5 m) was sampled quantitatively at each survey route station and on the five plots using a modification of the method described by Daubenmire (1959). Twenty points were sampled at 2 m intervals along a 40 m line in vegetation which was characteristic of the community type. Percent cover of the

different plants was determined at each point within a 20 x 50 cm frame. Data from similar plant communities were combined for analysis.

Dominance, densities, and frequencies of trees were determined on the ponderosa pine forest plot, savannah plot, and both deciduous draw strip-plots using the point-quarter method (Cottam and Curtis 1956). Twenty points were sampled in each stand, chosen randomly using the transect method described by Weins (1969). Basal area for trees with multiple trunks was obtained by adding the basal areas of the individual trunks from the same root stock. Tree canopy cover was determined with a dot grid. Percent cover of sampling trees and shrubs under 2 m was estimated within a radius of 2.8 m (area of 25 m²) at each of the twenty points in each stand.

Heights of the various vegetational strata were measured for comparison between types. The heights of grasses, forbs, shrubs, trees, and lowest tree branches with living foliage were estimated or measured while doing other vegetation work. Heights above 2 m were measured with a clinometer; heights below 2 m were estimated, spot-checking with a ruler.

A plant species list was compiled for the breeding bird survey route stations and five breeding bird density plots (Appendix Table 14). Nomenclature follows Hitchcock and Cronquist (1976) and Gleason and Cronquist (1963).

Birds

Breeding Bird Survey Route

A road route was established through the middle of the Long Pines to determine an index of relative bird abundance using a method similar to that described by Robbins and Van Velzen (1967). Twenty stops were placed along the route at approximately 1.6 km (one mile) intervals, but adjusted so five stations would lie in each of the four major vegetational formations (grassland, savannah, ponderosa pine forest, deciduous draw). Two extra stations were included, one to sample a field being invaded by ponderosa pine, and the other to sample a small cliff, a common micro-habitat found throughout the study area. The route was started one-half hour before sunrise and took about three hours to complete. All birds seen and heard were recorded for three minutes at each stop. The number of individuals of all species, except red crossbills (*Loxia curvirostra*), was recorded. Red Crossbills were wandering in large non-breeding flocks and no accurate count could be made due to poor visibility in the pine forests they favored.

Breeding Bird Density Plots

A breeding pair census was conducted on the three 16 ha plots using a method similar to that described by Robbins (1970). Each plot was covered by walking every other 50 m line and mapping birds seen and heard within 50 m of either side. Species, sex (if possible), and territorial behavior (such as singing) were recorded for each bird observed.

Birds were mapped along the strip-plots in a similar way, by walking along the middle of the strip-plot and mapping birds in and adjacent to the deciduous draw. Each plot or strip-plot took approximately two hours to cover. Two plots were censused per morning from early May through late June. The plots and survey route were run in sequence to form a four-day sampling period. The actual sampling period was usually longer due to poor weather. Census work was started one-half hour before sunrise and completed by 10:00 a.m. Starting in late June only one plot was censused per morning to complete work by 10:00 a.m. before rising temperatures suppressed bird activity. Census work was not conducted when poor weather conditions (rain, fog, high winds) suppressed bird activity or limited the observer's ability to detect birds.

Nest locations and bird sightings during mid-day and unfavorable weather were used to supplement the census data. The Weins chasing method (Weins 1969) was used to supplement census data on the grassland plot. All census data were gathered during the 1978 season; the 1977 season was started too late in the breeding season to obtain meaningful data.

A list of all bird species observed in the entire study area was compiled for both seasons, and is presented in Appendix Table 15. Nomenclature follows the A.O.U. Checklist (1957) and Supplements (1973, 1976).

RESULTS

Vegetation

Breeding Bird Survey Route

Stations with 80% or more grassland were classified as grassland; those with 70% or more ponderosa pine were classified as ponderosa pine forest. Stations with 30% to 80% grassland were classified as savannah. Most of the deciduous draw stations were within savannah areas.

Grassland on the stations mainly consisted of a western wheat-grass - needle-and-thread community with scattered patches of little bluestem (*Andropogon scoparius*). Similar grassland communities were described by Ross and Hunter (1976) for eastern sedimentary plains.

Ponderosa pine communities consisted mainly of ponderosa pine - skunkbush sumac on the savannah stations and ponderosa pine - snowberry on the ponderosa pine forest stations. These communities are similar to communities of the same name described by Pfister et al. (1974). Pfister also described a ponderosa pine - chokecherry (*Prunus virginiana*) community which may also be widespread in the Long Pines. Chokecherry is present in most of the ponderosa pine - snowberry stands, but has probably been suppressed by extensive cattle and deer browsing.

Deciduous draw stations were placed in two aspen draws and three boxelder - ash draws. Two of the boxelder - ash draws contained small ponds. Several other stations also contained small amounts of deciduous forest due to the tendency of the road to follow draws.

The aspen stands in the Long Pines fit the description given by Pfister et al. (1974) of Aspen - Conifer communities which are usually perpetuated by fire. Fire suppression and ungulate grazing may be limiting aspen reproduction in the Long Pines. Many stands contain a few mature and many dead trees, with no saplings present to replace them. The paper birch stand also contained many large dead aspen trees.

Dusek (1977) classified the boxelder - ash draw as a separate habitat type. This community is similar to the Hardwood Climax Forest described by Ross and Hunter (1976) except for the absence of cottonwoods (*Populus sp.*) which require more moisture than the draws provide. The vegetation in the draws can best be described by a continuum with aspen stands occupying the higher, dryer sites, grading into cottonwood forests along the larger, permanent creeks. Draws in grasslands contain a similar continuum, with snowberry on the driest sites, grading into hawthorne thickets on intermediate sites, grading into boxelder or cottonwood forests on the larger creek bottoms.

The station which sampled the field being invaded by ponderosa pine saplings was primarily covered by ponderosa pine forest, with the field occupying 13% of the site. The majority of the young pines within the field were approximately 2 m tall. This invasion of grassy parks by pines is widespread throughout the Long Pines, and may be due to fire suppression.

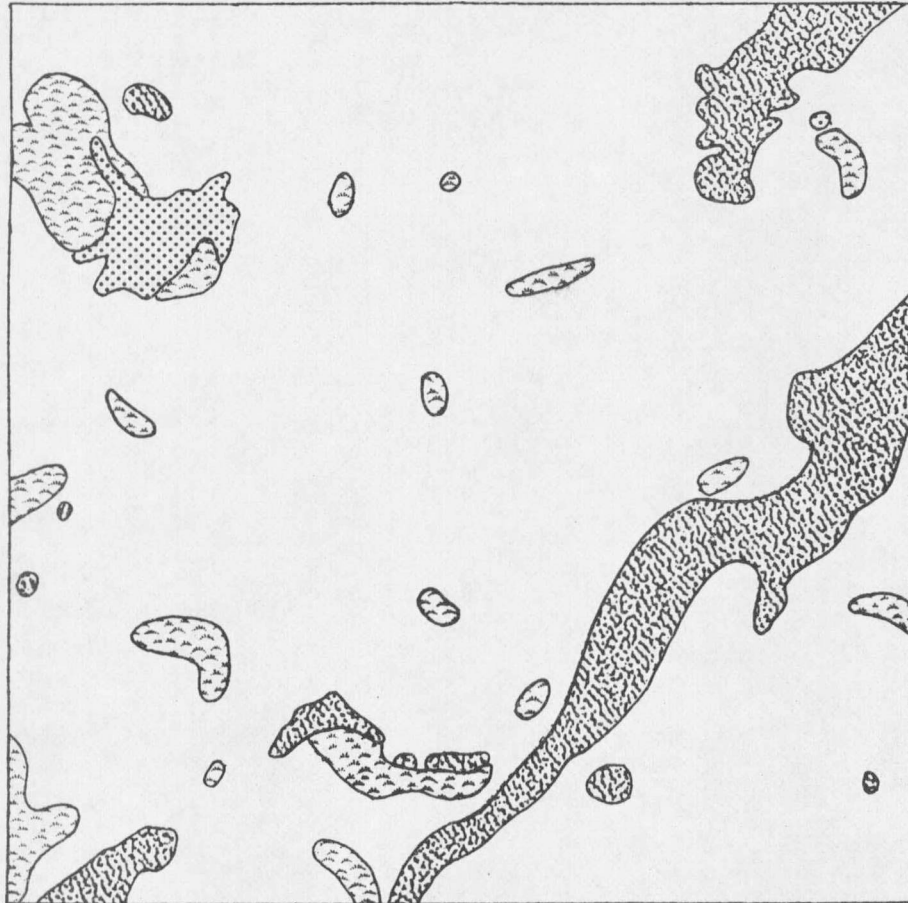
The last station sampled a cliff on one side of a pine-covered




hill surrounded by grassland. The cliff contained many grasses and forbs found in the surrounding ponderosa pine - skunkbush community. A small pocket of water at the base of the cliff supported several ash trees and a sedge (*Carex sp.*) - wild rye (*Elymus sp.*) - alkali cordgrass (*Spartina gracilis*) community.

Breeding Bird Density Plots

Figure 2 shows the major plant communities found on the grassland plot. The western wheatgrass - needle-and-thread community dominated (Appendix Table 16), although homogeneous patches of snowberry were present in the draws, and several nearly homogeneous patches of creeping juniper (*Juniperus horizontalis*) were located on the uplands (Figure 3). The nearest available water was a small natural pothole about 6 m in diameter and 0.5 m deep, approximately 200 m from the north edge of the plot. This pothole was completely dry by August in 1977 and contained only a few cm of water in August 1978. A stock tank and windmill were located approximately 400 m south of the plot. The topography consisted of gently rolling hills. The area was grazed from about 1 August to 15 October in 1977 and from 21 May to 1 August in 1978.

Figure 4 shows the major plant communities found on the savannah plot. The plot was covered by roughly equal amounts of grassland and ponderosa pine stands (Appendix Table 16). Ponderosa pine - skunkbush was the dominant forest community, with some ponderosa pine - snowberry



Western wheatgrass- needle-and-thread		Snowberry	
Little bluestem		Creeping juniper	

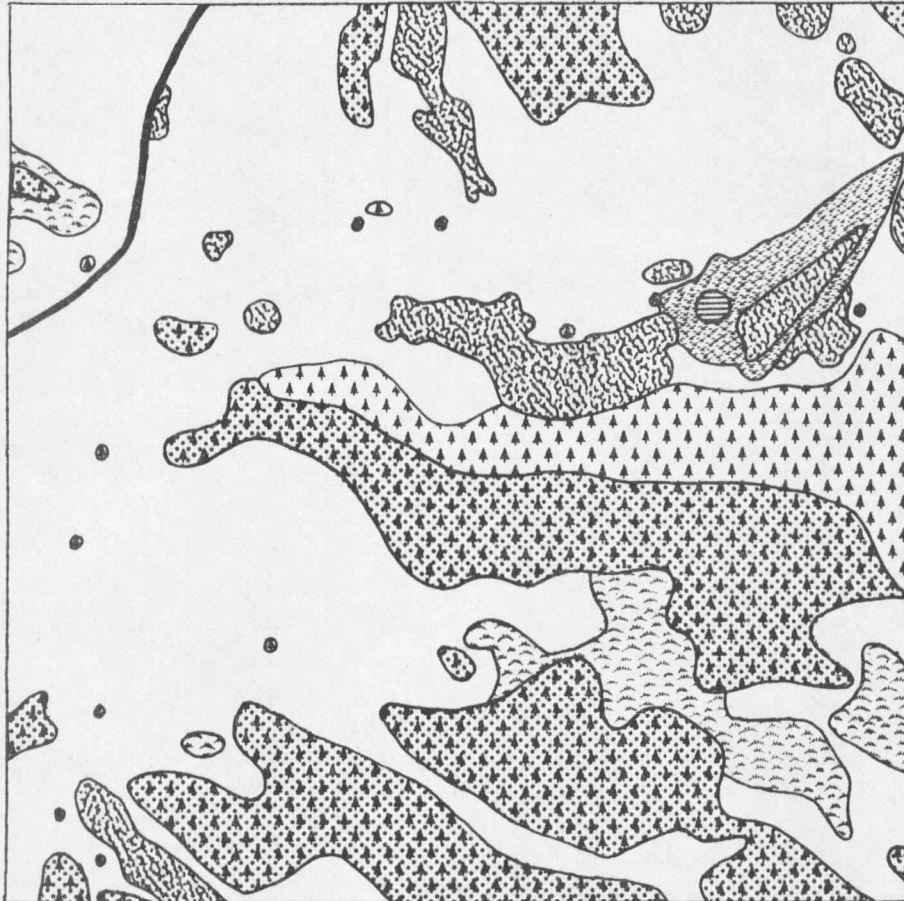
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Figure 2. Plant communities found on the grassland plot.



Figure 3. Western wheatgrass - needle-and-thread community (mixed grassland) on the grassland plot.



**Western wheatgrass-
needle-and-thread**



Little bluestem



Ponderosa pine - skunkbush



Ponderosa pine - snowberry



Snowberry



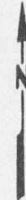
Disturbed area



Pond



Road



0 100
scale m

Figure 4. Plant communities found on the savannah plot.

on the north-facing slopes (Figure 5). Grasslands consisted of western wheatgrass - needle-and-thread and little bluestem communities, and patches of snowberry covered the draws. An aspen draw ran just outside the south edge of the plot. A large dike had been built across one of the draws in an attempt to create a stockpond, but it only collected about 15 cm of water due to an insufficient watershed. The dike created a large disturbed area dominated by foxtail barley (*Hordeum jubatum*) near the water, and wild licorice (*Glycyrrhiza lepidota*) and lupine (*Lupinus argenteus*) on the dryer sites. The plot was located on top of a mesa about 100 m from the rimrock. The largest ponderosa pine stand in the middle of the plot, containing both ponderosa pine - skunkbush and ponderosa pine - snowberry communities, was sampled with the point-quarter method (Appendix Table 17). The trees were 100% ponderosa pine with a density of 387.5 trees/ha and a mean basal area of 407 cm². Tree canopy cover was 36% within the ponderosa pine - skunkbush stands and 56% within the ponderosa pine - snowberry stand. The plot was grazed from 21 May to 1 August in 1977 and from 1 August to 15 October in 1978.

Figure 6 shows the major plant communities found on the ponderosa pine forest plot. The majority of this plot was covered by a ponderosa pine - snowberry community with large, mature pine trees (Figure 7). One of the aspen draws running through the plot contained a small seep which provided a trickle of running water throughout the summer. The plot was located in fairly steep, hilly terrain. Appendix Tables 17



-18-

Figure 5. Ponderosa pine - skunkbush stand on the savannah plot.

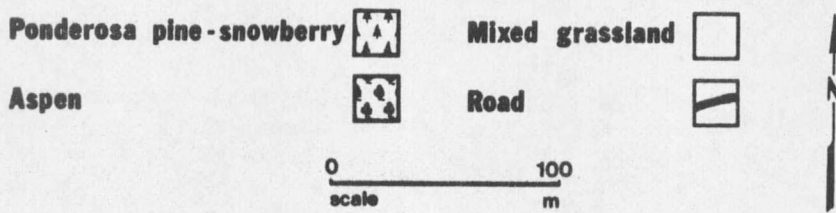
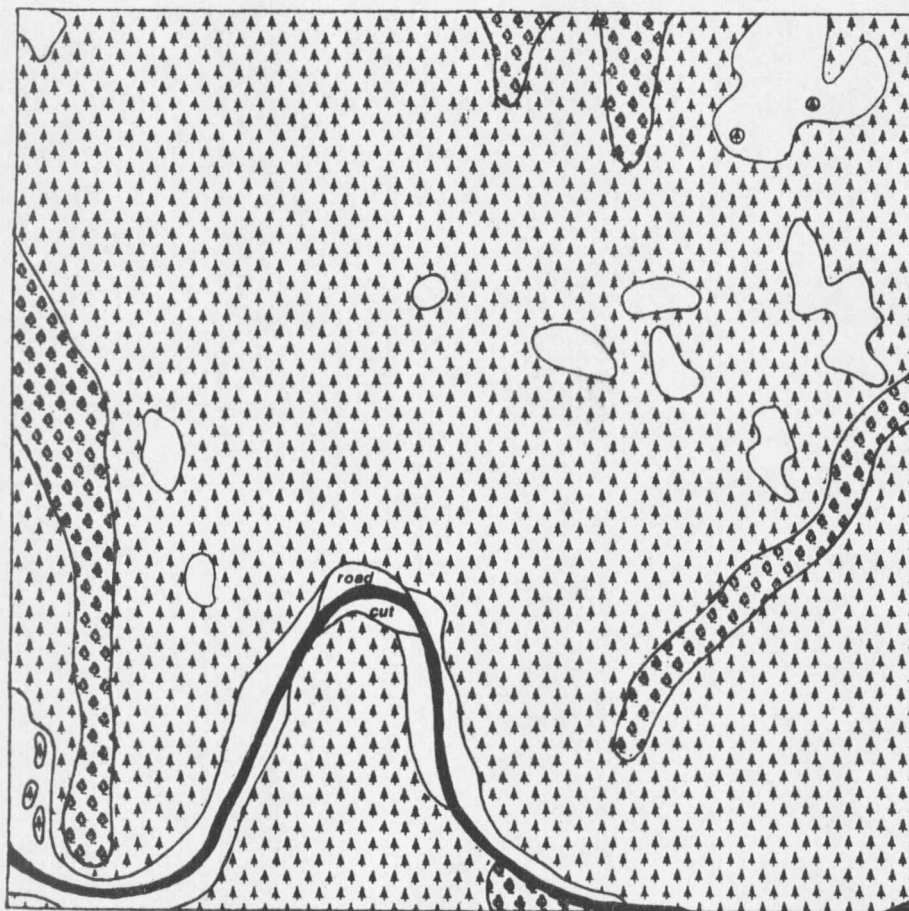


Figure 6. Plant communities found on the ponderosa pine forest plot.



Figure 7. Ponderosa pine - snowberry community on the ponderosa pine forest plot.

and 18 list the results of the point-quarter and shrub analyses respectively, from east and west-facing slopes. Tree canopy covers were 75% and 65% for east and west slopes respectively. The plot was grazed from 16 May to 1 August during 1977, with the draws being very heavily used by cattle. The area was not grazed during 1978.

Figure 8 shows the major plant communities found on the Maverick Gulch strip-plot. The upper portion of the draw contained a relict birch stand (Figure 9) which graded into an aspen community at lower elevations. The lower portion of the draw contained a boxelder - ash community with interspersed ponderosa pine trees. The strip-plot covered 31.2 ha, of which 17% was deciduous draw. The boxelder - ash community covered the majority of the draw (Appendix Table 16). Tree canopy cover within the draw was 57%. Appendix Tables 17 and 18 list the results of the point-quarter and shrub analyses respectively.

The Maverick Gulch draw contained several seeps and small pockets of standing water and a large stock pond at the lower end of the strip-plot. A vehicle trail followed the draw from the top to the bottom. The area was heavily used by cattle, and was grazed from about 16 May to 31 July both years of the study. The bottom of the draw was severely eroded in many places due to the attractiveness of the moist areas to cattle. Water quality was very poor, with high turbidity due to both the road and cattle, and pollution from cattle waste material.

Figure 10 shows the major plant communities on the strip-plot

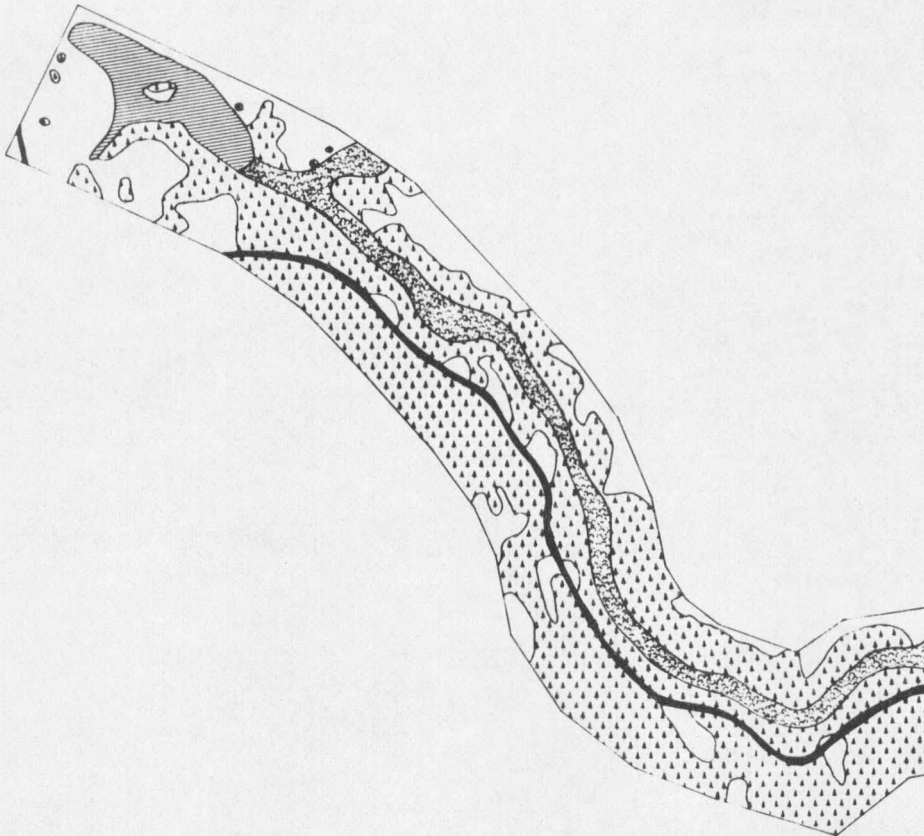


Figure 8. Plant communities found on the Maverick Gulch deciduous draw strip-plot. (Legend on next page)

