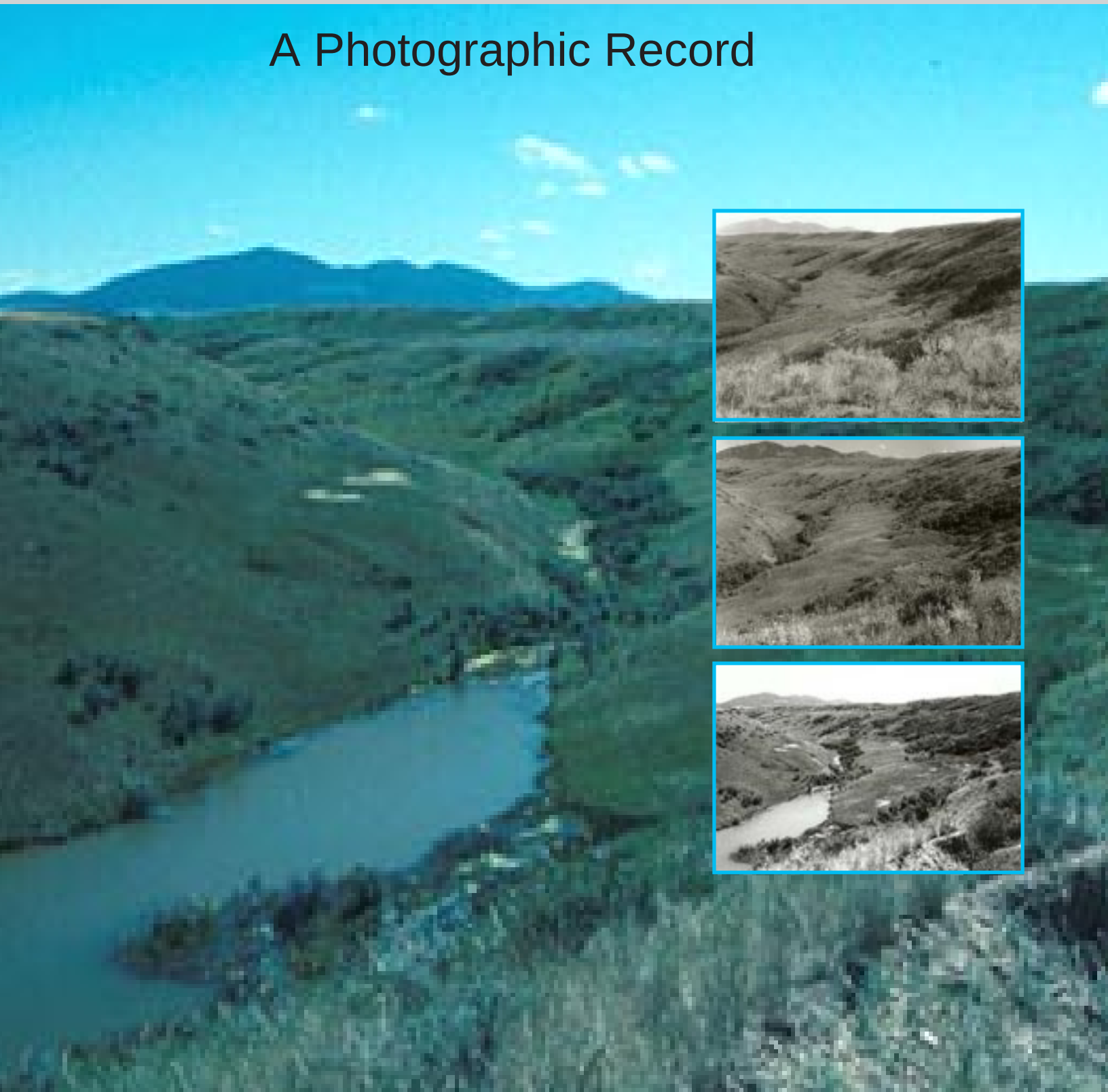
United States Department of Agriculture
Agricultural Research Service
Conservation Research Report No. 45
December 2001

Eighty Years of Vegetation and Landscape Changes in the Northern Great Plains

A Photographic Record



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Eighty Years of Vegetation and Landscape Changes in the Northern Great Plains

A Photographic Record

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Abstract

Klement, K.D., R.K. Heitschmidt, and C.E. Kay. 2001. Eighty Years of Vegetation and Landscape Changes in the Northern Great Plains: A Photographic Record. U.S. Department of Agriculture, Agricultural Research Service, Conservation Research Report No. 45.

This publication is a photographic record of vegetation and landscape changes that have occurred at selected sites in the Northern Great Plains over the past 80 to 90 years. Based on photographic and written records, the authors found few changes had taken place other than (1) a general increase in the density and cover of woody plant species, particularly Ponderosa pine; (2) those resulting from direct human intervention, such as tillage, haying, and road construction; and (3) a general increase in nonindigenous species, particularly yellow sweet clover and created wheatgrass, as they escape from roadside restoration projects and agronomic plantings. Otherwise, the changes are subtle. Audiences for the publication include researchers, naturalists, land managers, policy makers, and the general public.

Keywords:

forbs, grasses, landscape, Northern Great Plains, plant species composition, shrubs, trees.

While supplies last, single copies of this publication may be obtained at no cost from USDA, Agricultural Research Service, Fort Keogh Livestock & Range Research Laboratory, RR 1, Box 2021, Miles City, MT 59301.

Copies of this publication may be purchased from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161; telephone (703) 605–6000.

Contents

Introduction

Shifts in the composition of plant species are often linked to changes in the structure and function of ecological systems. But detecting such shifts in relatively undisturbed natural systems, such as rangelands and forests, is often difficult because changes occur very slowly and therefore are quite subtle. Often, changes aren't recognized because substantial change seldom occurs within a single human generation; rather, readily detectable change usually requires the span of several generations.

This publication is an attempt to provide researchers, naturalists, land managers, policy makers, and the general public with a new awareness of and appreciation for the subtle, yet real changes that have occurred over the past 80 to 90 years in the Northern Great Plains. We recorded the changes by repeating landscape photographs, which we augment with descriptions derived from on-site visits. The challenge to us authors, as well as our readers, revolves around how we might use the information presented here as a means for improving land stewardship.

The earliest photographs were taken by Dr. Homer Shantz, University of Arizona, from July 14, 1908 to September 1, 1937.

The second set of photos was taken of the original sites from June 13, 1958 to August 18, 1960. Shantz took a portion of these before he died in 1958 while on the road rephotographing the sites. He was accompanied on that trip by Dr. Walter S. Phillips, University of Arizona, who completed the repeat photography task in 1959, with the assistance of University of Arizona student Freeman Smith (now Dr. Freeman Smith, Colorado State University), and in 1960 in the company of his wife, Thelma K. Phillips.

The 1998 photographs were taken from July 21 to August 5, 1998, by Dr. Charles Kay, Utah State University.

Sites were again visited during the summer of 1999 by Keith Klement, U.S. Department of Agriculture, Agricultural Research Service, Fort Keogh Livestock and Range Research Laboratory, Miles City, Montana.

The original photographs, first retakes, and associated site descriptions were published by Phillips in 1963 in *Photographic Documentation: Vegetational Changes in Northern Great Plains*. A history of the two earlier photographic expeditions is contained in that publication.

The current publication includes repeat photographs from 42 of Shantz's 81 original sites. We limited our sites to rangelands. For most sites, four photographs are reproduced: (1) Shantz's black and white original, (2) the 1958–1960 black and white retake, (3) a 1998 black and white retake, and (4) a 1998 color retake.

Under **Location**, we include county, state, section (Sec.), range (R.), township (T.), and GPS–UTM coordinates (±250 m). The combination of letters and numbers following the date of each photograph refers to filing systems for the negatives of Shantz (original photograph), Phillips (first retake), or Kay (second retake). Shantz's and Phillips' original negatives are stored at the University of Arizona herbarium, in Tucson. Kay currently maintains his negatives, which he intends to leave to the Utah State University library, in Logan, upon his retirement.

The description provided in **First Retake** and **Description** is quoted from Phillips' publication, except we removed taxonomic authorities from scientific names and deleted references to other photographs. Each taxonomic **Description** following the head **Second Retake** is based on site visits by Klement, a highly experienced taxonomist. Dominant plant genera and species under **Description** are listed in order of their estimated relative abundance.

It is refreshing to review the photographs and conclude that the general ecological condition of the lands appears to have changed little over the past 75-plus years, with three exceptions. The first exception is that the density and cover of woody plants appear to have increased, particularly with respect to the Ponderosa pine. The second exception concerns changes in plant community structure and species composition due to human intervention (tillage, haying, and road construction, for example). And the third exception is those instances where nonindigenous species, particularly yellow sweet clover and crested wheatgrass, have invaded sites by escaping from nearby roadside restoration projects and agronomic plantings. Otherwise, the changes seem subtle.

Original Photograph

September 18, 1917.
Shantz P–1–1917.
Facing west-northwest.

First Retake and Description

June 30, 1959.
W.S.P., H–2–1959.

Looking WNW the original vegetation is *Bouteloua* spp. and *Koeleria cristata*. *Carex filifolia* is abundant in flat areas. Shrub in grass is *Artemisia frigida*. *Shepherdia canadensis* is a common shrub on the hillsides and bottomlands. Erosion not evident. Trees in creek bottom are better developed in later picture (from Phillips 1963, p. 23).

Second Retake

July 21, 1998.
Kay–4326–9.

Danvers, Montana

Location

Fergus Co., MT; Sec. 2, R. 16 E., T. 17 N.; GPS–UTM 5234960 N, 602195 E.

About 20 miles northwest of Lewistown.

From Lewistown, Montana, travel north on U.S. Highway 191 about 9 miles to Montana Highway 81. Turn left (west) onto Highway 81 and continue about 12 miles. Near this point is a left turnoff leading south to Danvers and a right turnoff leading north onto a private two-track road. Turn right and travel about 1 mile. The photopoint is about 75 yards north-northeast of cornerpost overlooking Warm Spring Creek and its drainages.

Description

August 11, 1999

Upland

Grasses. *Bouteloua gracilis, Koeleria pyramidata, Agropyron smithii, Stipa comata, Bouteloua cutipendula, Agropyron spicatum*

Forbs. *Liatris punctata, Achillea millefolium, Psoralea tenuiflora, Solidago* spp.

Ridgetops

Shrubs and Trees. *Artemisia frigida, Gutierrezia sarothrae*

Side Slopes

Shrubs and Trees. *Rhus trilobata, Prunus virginiana, Shepherdia argentea, Juniperus scopulorum, Amelanchier alnifolia, Artemisia cana*

Lowland

Grasses. *Agropyron smithii, Koeleria pyramidata, Stipa viridula, Poa pratensis, Agropyron trachycaulum, Spartina pectinata*

Forbs. *Achillea millefolium, Artemisia ludoviciana, Solidago* spp.

Shrubs and Trees. *Salix exigua, Shepherdia argentea, Rosa woodsii, Symphoricarpos occidentalis, Populus deltoides, Populus trichocarpa, Populus angustifolia, Juniperus scopulorum*

Synopsis

During the span of 82 years, shrubs have increased in density and grown in height and diameter along the ridges, ridgetops, and creek bottom. *Pinus ponderosa* has increased along the distant ridge since 1917. In the 1998 photo, *Melilotus officinalis* has invaded the uplands. The *Shepherdia canadensis* listed by Phillips as common on hillsides was identified as *Shepherdia argentea* in 1999. A wheat pasture occupies the plateau in the center right of the 1998 picture. A soil slump is present just below the ridge on the center plateau in 1959. This slump is even more apparent in 1998. Near the center of the 1998 photo, just below the shrub line, is a second soil slump. This slump has increased in size since first being photographed in 1959. Overall, this series of photographs shows a general increase in shrubs, trees, and vegetative cover, with the exception of the soil slumps.

Original Photograph

September 18, 1917.
Shantz O–8–1917.
Facing east.

First Retake and Description

June 30, 1959.
W.S.P., H–9–1959.

Looking up a side creek bottom from Judith River. *Andropogon scoparius* was abundant in the original picture but very rare in the retake. *Shepherdia canadensis* along creek much increased (from Phillips 1963, p. 25).

Second Retake

July 21, 1998.
Kay–4326–35.

Danvers, Montana

Location

Fergus Co., MT; Sec. 2, R. 16 E., T. 17 N.; GPS–UTM 5234986 N, 602283 E.

About 20 miles northwest of Lewistown.

From Lewistown, Montana, travel north on U.S. Highway 191 about 9 miles, to Montana Highway 81. Turn left (west) onto Highway 81 and continue about 12 miles. Near this point is a left turnoff leading south to Danvers and a right turnoff leading north onto a private two-track road. Turn right and travel about 1 mile. The photopoint is about 75 yards north-northeast of cornerpost overlooking Warm Spring Creek and its drainages.

Description

August 11, 1999

Upland Near Photopoint

Grasses. *Agropyron spicatum*

Forbs. *Achillea millefolium, Artemisia ludoviciana*

Shrubs and Trees. *Artemisia frigida, Rhus trilobata, Artemisia cana*

Side Slopes

Shrubs and Trees. *Shepherdia argentea, Prunus virginiana, Amelanchier alnifolia, Juniperus scopulorum*

Bottomland Along Drainage and Around Reservoir

Grasses. *Agropyron smithii, Koeleria pyramidata, Stipa viridula, Poa pratensis, Agropyron trachycaulum, Spartina pectinata*

Forbs. *Achillea millefolium, Artemisia ludoviciana*

Shrubs and Trees. *Shepherdia argentea, Symphoricarpos albus, Prunus virginiana, Amelanchier alnifolia, Juniperus scopulorum*

Synopsis

The 1998 photopoint is slightly below and south of the original photopoint. This change was necessary because the original point moved in conjunction with a large soil slump arising from the irrigation of cropland on the adjacent upland bench. The original "side creek bottom" is Warm Spring Creek, not the Judith River mentioned by Phillips in 1959. *Shizachyrium scoparium* has continued to decline along the upland, whereas a more mesic vegetation complex, dominated by *Spartina pectinata*, has developed in the bottomlands in conjunction with the construction of a small reservoir after 1959. *Artemisia cana* has also declined in abundance in foreground uplands, whereas *Juniperus scopulorum, Amalanchier alnifolia*, and *Prunus virginiana* has increased dramatically along the north-facing hillside (right side of photo). *Pinus ponderosa* has continued to increase in abundance on the distant mountain.

Original Photograph

September 18, 1917.
Shantz O–12–1917.
Facing north.

First Retake and Description

June 30, 1959.
W.S.P., H–6–1959.

The original vegetation was *Bouteloua* spp. and *Koeleria cristata*. *Carex filifolia* is abundant in flat areas. Shrub in grass is *Artemisia frigida*. *Shepherdia canadensis* is a common shrub on the hillsides and bottomlands. The river has meandered and changed its course several times since the original picture. *Pinus ponderosa* on the mountains is much thicker (from Phillips 1963, p. 27).

Second Retake

July 21, 1998.
Kay–4329–1.

Danvers, Montana

Location

Fergus Co., MT; Sec. 2, R. 16 E., T. 17 N.; GPS–UTM 5235250 N, 602846 E.

About 20 miles northwest of Lewistown.

From Lewistown, Montana, travel north on U.S. Highway 191 about 9 miles, to Montana Highway 81. Turn left (west) onto Highway 81 and continue about 12 miles. Near this point is a left turnoff leading south to Danvers, Montana, and a right turnoff leading north onto a private two-track road. Turn right and travel about 1 mile. The photopoint is on the north aspect of the slope and north of the wheat pasture shown in the first set of photos (Danvers, Montana, page 4). Photopoint overlooks Warm Spring Creek.

Description

August 11, 1999

Upland Including Ridgetops and Slopes

Grasses. *Bouteloua gracilis, Koeleria pyramidata, Agropyron smithii, Stipa comata*

Forbs. *Achillea millefolium, Artemisia ludoviciana*

Shrubs. *Rhus trilobata, Artemisia frigida, Artemisia cana*

Bottomland

Grasses. *Agropyron smithii, Koeleria pyramidata, Stipa viridula, Poa pratensis, Agropyron trachycaulum, Spartina pectinata*

Shrubs and Trees. *Shepherdia argenteus, Symphoricarpos occidentalis, Prunus virginiana, Amelanchier alnifolia, Populus deltoides, Populus trichocarpa, Populus angustifolia, Salix exigua*

Synopsis

Bottomland is Warm Spring Creek. Rather dramatic increase in abundance of *Salix* spp. has occurred since 1917, whereas abundance of *Populus* spp. has declined. Abundance of *Pinus ponderosa* on mountains and buttes has also increased tremendously since 1917, as that of *Shepherdia argentea* (originally reported as *S. canadensis*) on hillsides and bottomland. Creek has changed courses several times; note its direction is different in each photo. The 1959 photo shows a wide and somewhat less meandering stream compared with the earlier and later photos.

Original Photograph

September 23, 1917. Shantz R–8–1917. Facing northwest.

First Retake and Description

June 29, 1959. W.S.P., G–5–1959.

This picture illustrates a remarkable regrowth of the *Pinus ponderosa*. The vegetation in the foreground has little changed (from Phillips 1963, p. 35).

Second Retake

July 23, 1998. Kay–4331–12A.

Grassrange, Montana

Location

Fergus Co., MT; Sec. 20, R. 23 E., T. 14 N.; GPS–UTM 5203446 N, 665626 E.

About 4 miles south of Grassrange.

From Grassrange, travel to the southwest corner of town. Take the left fork onto Tyler Cutoff Road, which crosses the south fork of McDonald Creek. Continue south after crossing the creek, about 4 miles. Photopoint is located west of the road before the road descends a steep grade.

Description

August 11, 1999

Side Slope Along Fence

Grasses. *Agropyron spicatum, Agropyron cristatum, Poa pratensis*

Forbs. *Achillea millefolium, Melilotus officinalis*

Shrubs. *Rosa woodsii*

Upland Behind Fence

Grasses. *Agropyron smithii, Stipa comata, Koeleria pyramidata, Bouteloua gracilis, Agropyron cristatum*

Forbs. *Psoralea tenuiflora, Melilotus officinalis, Solidago* spp.

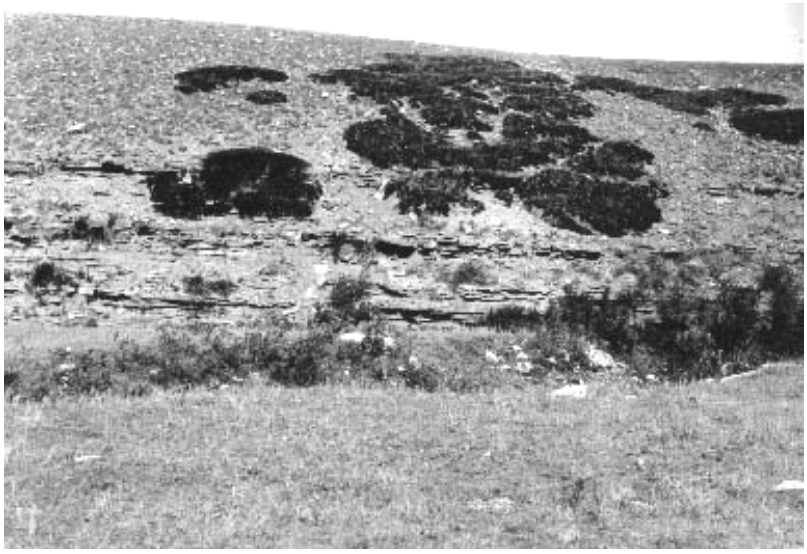
Shrubs. *Artemisia cana, Artemisia frigida, Rhus trilobata*

Synopsis

Original photo served as the cover shot for Phillips' (1963) publication. In contrast to 1917, barren areas are completely vegetated in 1998, with *Melilotus officinale* invading open areas, particularly near the road and along the fence line. The most apparent change is the dramatic increase of *Pinus ponderosa* on the hillside in the background. Originally considered a moderate cover of *Pinus ponderosa*, this site now supports a closed canopy. The central drainage area is the south fork of McDonald Creek. No notable change in drainage vegetation has occurred since 1917.

Original Photograph

September 23, 1917. Shantz R–9–1917. Facing north.



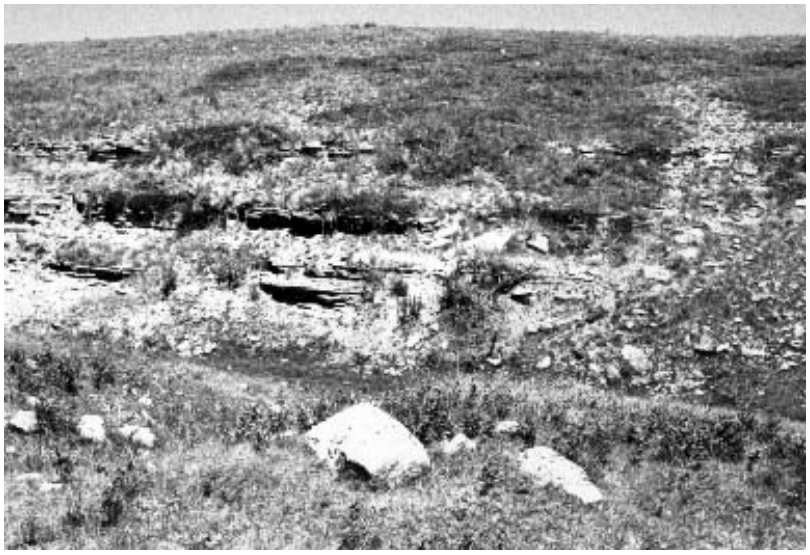
First Retake and Description

June 29, 1959. W.S.P., G–6–1959.

Clumps of *Juniperus* growing on the side of a wash cut in the original picture. Dr. Shantz mentions both *Juniperus horizontalis* and *Juniperus communis*. In the retake there was only one plant of *Juniperus communis* left. The shrub in the foreground is mainly *Shepherdia canadensis* (from Phillips 1963, p. 37).

Second Retake

July 23, 1998. Kay–4331–20A.



Grassrange, Montana

Location

Fergus Co., MT; Sec. 7, R. 22 E., T. 13 N.; GPS–UTM 5196943 N, 662854 E.

About 9 miles southwest of Grassrange.

From Grassrange, travel to the southwest corner of town. Take the left fork onto Tyler Cutoff Road, which crosses the south fork of McDonald Creek. Continue south and west after crossing the creek, about 9 miles. Photopoint is about 75 yards west of road near a livestock watering tank.

Description

August 11, 1999

Upland Near Photopoint

Grasses. *Agropyron smithii, Agropyron cristatum, Poa pratensis*

Hillside

Grasses. *Agropyron smithii, Koeleria pyramidata, Stipa comata, Bouteloua gracilis*

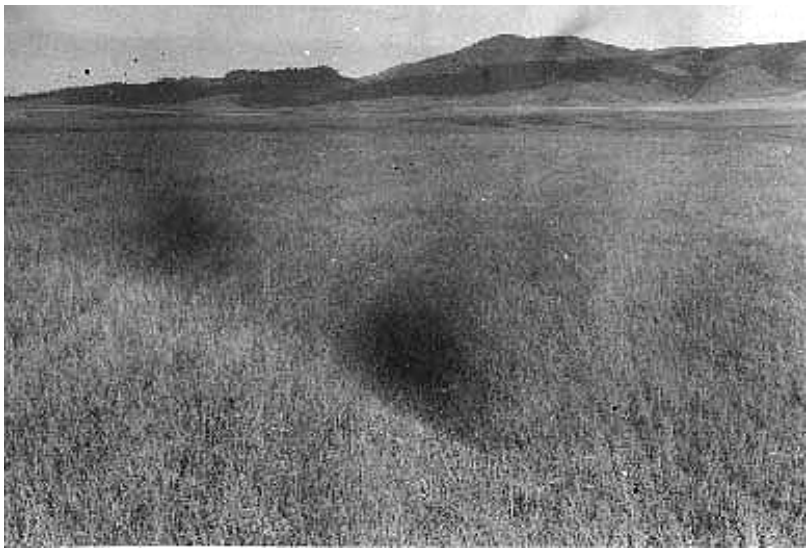
Shrubs. *Juniperus horizontalis, Rhus trilobata, Shepherdia canadensis, Symphoricarpos occidentalis*

Synopsis

This site is of a hillside with very thin soil and a rock outcrop, which is in center of the photo. The diversity and density of shrub species had increased on this site by the time the 1959 photo was taken. The 1998 photo shows an increased use similar to that in 1917. A livestock watering tank, located about 50 yards behind the photopoint, may be affecting this area.

Original Photograph

September 16, 1917.
Shantz N–10–1917.
Facing northwest.



First Retake and Description

August 6, 1960. W.S.P., B–5–1960.

The original grass cover consisted of *Bouteloua gracilis*, *Koeleria cristata*, and *Agropyron smithii*, with pines on the hills. In the retake, the same plants are still present, but *K. cristata* seems to be dominant (from Phillips 1963, p. 43).

Second Retake

July 23, 1998.
Kay–4326–8.

Lewistown, Montana

Location

Fergus Co., MT; Sec. 21, R. 18 E., T. 16 N.; GPS–UTM 5221028 N, 617215 E.

About 5 miles north-northwest of Lewistown.

From Lewistown, travel north on U.S. Highway 191 about 4.5 miles. Turn left (west) onto graveled road (Danvers/Denton Cutoff Road). Continue west, then north, for about 0.7 mile. Photopoint is west of road before crossing a drainage.

Description

August 10, 1999

Upland Near Photopoint

Grasses. *Agropyron smithii, Koeleria pyramidata, Bouteloua gracilis, Poa pratensis, Stipa comata, Stipa columbiana*

Forbs. *Achillea millefolium, Liatris punctata, Psoralea tenuiflora, Phlox hoodii, Melilotus officinalis*

Shrubs. *Artemisia frigida, Gutierrezia sarothrae*

Bottomland Near Right Center of Photo

Grasses. *Phleum pratense, Poa pratensis*

Forbs. *Rumex* spp., *Melilotus officinalis*

Synopsis

Left center of photo shows a gradual increase in the cultivated area since 1917. Upland vegetation to cultivated area was invaded by *Melilotus officinalis* sometime after 1960. A small reservoir located in the depression between the uplands in the foreground and background is altering area drainage patterns while supporting large amounts of *Rumex* spp. Cover and density of *Pinus ponderosa* have continued to increase on South Mocassin Mountains.

Original Photograph

September 23, 1917. Reproduced black and white slide; Shantz R–3–1917 missing.
Facing west.

First Retake and Description

June 30, 1959. W.S.P., No. 2119.

Stipa and *Bouteloua* spp. are the main grasses in both pictures. *Pinus ponderosa* on the Judith Mountains has increased noticeably. Note the same fence post by the hood of the cars, although the new road has been moved back 100 yards (from Phillips 1963, p. 45).

Second Retake

July 22, 1998. Kay–4329–24.

Lewistown, Montana

Location

Fergus Co., MT; Sec. 13, R. 21 E., T. 17 N.; GPS–UTM 5233646 N, 651673 E.

About 10 miles south-southwest of Roy.

From Roy, Montana, travel south through town on Black Butte Road, which runs between Roy and Giltedge. Travel south about 10 miles. Photopoint is to the east, about 100 yards above present road and near abandoned road.

Description

August 10, 1999

Upland to Road

Grasses. *Agropyron smithii, Stipa comata, Bromus japonicus, Bromus inermis, Poa pratensis, Stipa viridula*

Forbs. *Artemisia ludoviciana, Chrysopsis villosa, Achillea millefolium, Melilotus officinale*

Shrubs. *Artemisia cana, Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Artemisia frigida*

Upland Between Road and Drainage

Grasses. *Agropyron smithii, Poa pratensis*

Forbs. *Artemisia ludoviciana, Melilotus officinalis*

Drainage

Shrubs and Trees. *Symphoricarpos occidentalis, Prunus virginiana, Crataegus succulenta*

Synopsis

Density and cover of *Pinus ponderosa* growing on Judith Mountains in background have increased dramatically over time. So have the density and cover of riparian shrubs, particularly *Symphoricarpos occidentalis, Prunus virginiana,* and *Crataegus succulenta.* Although the upland herbaceous vegetation in the foreground is species rich, upland vegetation in the background is largely dominated by *Agropyron smithii* and *Poa pratensis*.

Original Photograph

September 23, 1917.
Shantz R–5–1917.
Facing northeast.

First Retake and Description

June 29, 1959. W.S.P., G–10–1959.

The grass in this area has shown remarkable recovery, although there is a lot of *Selaginella densa* in it. *Opuntia* spp. is very common in this grassland, although Shantz does not mention it in the original publication (from Phillips 1963, p. 47).

Second Retake

July 22, 1998.
Kay–4329–28.

Lewistown, Montana

Location

Fergus Co., MT; Sec. 4, R. 21 E., T. 16 N.; GPS–UTM 5226185 N, 646907 E.

About 16 miles southwest of Roy.

From Roy, Montana, travel south through town on Black Butte Road, which runs between Roy and Giltedge. Continue about 16 miles south and west . Photopoint is located north of the road, about 50 yards.

Description

August 10, 1999

Upland

Grasses. *Agropyron smithii, Koeleria pyramidata, Stipa comata, Poa pratensis*

Forbs. *Liatris punctata, Achillea millefolium, Chrysopsis villosa*

Shrubs. *Rosa woodsii, Artemisia frigida*

Drainage

Trees. *Populus* spp.

Synopsis

An abundance of *Melilotus officinalis* is evident in the 1998 photo but not in earlier photos. However, only very small seedlings were present during the 1999 site visit. This reduction was attributed to mechanical or herbicide treatment or both. The amount of *Pinus ponderosa* on Black Butte has increased considerably over time. Although the presence of *Opuntia* spp. is noted in 1959, it was not present in 1998 or 1999.

Original Photograph

September 23, 1917.
Shantz R–4–1917.
Facing north.

First Retake and Description

June 29, 1959. W.S.P.,
G–11–1959.

No description available.

Second Retake

July 22, 1998.
Kay–4329–18.

Lewistown, Montana

Location

Fergus Co., MT; Sec. 13, R. 20 E., T. 16 N.; GPS–UTM 5223136 N, 641749 E.

About 21.5 miles southwest of Roy.

From Roy, Montana, travel south through town on Black Butte Road, which runs between Roy and Giltedge. Continue about 21.5 miles south and west. Photopoint is located directly north of road and on hill parallel to road.

Description

August 10, 1999

Upland

Grasses. *Agropyron smithii, Bouteloua gracilis, Agropyron spicatum, Stipa comata, Agropyron cristatum*

Forbs. *Achillea millefolium, Liatris punctata, Artemisia ludoviciana, Solidago* spp.

Shrubs. *Artemisia tridentata, Artemisia frigida, Gutierrezia sarothrae*

Bottomland

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata*

Forbs. *Achillea millefolium, Liatris punctata, Artemisia ludoviciana, Solidago* spp.

Shrubs. *Artemisia cana, Artemisia frigida, Symphoricarpos albus*

Drainage

Shrubs. *Salix exigua, Crataegus succulenta, Prunus virginiana, Shepherdia argentea*

Synopsis

Since the 1959 photo, the bottomland has been cultivated and planted to *Medicago sativa* (alfalfa) and *Hordeum vulgare* (barley). The density and cover of *Pinus ponderosa* on Judith Mountains in the background has continued to increase over time. Similarly, the density and size of streambank shrubs have continued to increase, although species diversity has remained relatively stable.

Original Photograph

August 10, 1918.
Shantz U–6–1918.
Facing west.

First Retake and Description

August 8, 1960. W.S.P., D–2–1960.

Yellow pines in the two pictures show little change, except the increase in size. Number of trees about the same. Dr. Shantz marked this picture "Type of Divide." The grass is mainly Grama grass with occasional *Andropogon scoparius* and *Calamovilfa longifolia*.

Second Retake

July 24, 1998.
Kay–4331–23A.

Roundup, Montana

Location

Musselshell Co., MT; Sec. 21, R. 26 E., T. 6 N.; GPS–UTM 5125394 N, 694957 E.

About 14 miles south of Roundup.

From Roundup, travel south about 14 miles on U.S. Highway 87. One-hundred yards south of mile marker 34, turn right (west) on Majerus Road (gravel road). Follow road 0.6 mile, then turn left (east) onto tertiary, unimproved trail. Continue about 0.2 mile. Photopoint is on top of high rock ledge located about 100 yards south of the tertiary road.

Description

August 12, 1999

Rock Ledge

Grasses. *Agropyron spicatum*

Forbs. *Erigeron* spp.

Between Rock Ledge and Fence

Grasses. *Agropyron smithii, Agropyron spicatum, Bouteloua gracilis*

Shrubs. *Chrysothamnus nauseosus, Tetradymia canescens, Gutierrezia sarothrae*

Beyond Fence to Cropland

Grasses. *Agropyron smithii, Stipa comata, Bouteloua gracilis, Buchloe dactyloides, Koeleria pyramidata, Agropyron intermedium, Poa pratensis, Bromus japonicus*

Shrubs and Trees. *Rhus trilobata, Symphoricarpos occidentalis, Artemisia cana, Artemisia frigida, Pinus ponderosa*

Synopsis

The major change is the increase in density and cover of *Pinus ponderosa* across the landscape. Growth of individual trees is apparent. Landscape on left side of picture shows remnants of a fire from 1984, which left some snags and removed several conifers. Cropland in center of photo has existed at least since 1918.

Original Photograph

August 10, 1918.
Shantz U–11–1918.
Facing east.

First Retake and Description

June 28, 1959. W.S.P., F–6–1959.

This is looking in the opposite direction from the other picture in this panorama (U–6, see page 22). It shows the development of the tree vegetation. A few more trees are evident. There were some cultivated areas in the middle background near the end of the road which have been abandoned and are now regrassed. The over-all picture shows the general development of the forest (from Phillips 1963, p. 55).

Second Retake

July 24, 1998.
Kay–4331–32A.

Roundup, Montana

Location

Musselshell Co., MT; Sec. 21, R. 26 E., T. 6 N.; GPS–UTM 5125394 N, 694957 E.

About 14 miles south of Roundup.

From Roundup, travel south about 14 miles on U.S. Highway 87. One hundred yards south of mile marker 34, turn right (west) on Majerus Road (gravel road). Follow road 0.6 mile, then turn left (east) onto tertiary, unimproved trail. Continue about 0.2 mile on tertiary road. Photopoint is on top of high rock ledge, located about 100 yards south of the tertiary road.

Description

August 12, 1999

Rock Ledge

Grasses. *Agropyron spicatum*

Forbs. *Erigeron* spp.

Rock Ledge to Highway

(bottom right of photo)

Grasses. *Agropyron smithii, Stipa comata, Bouteloua gracilis, Bromus japonicus, Poa pratensis*

Shrubs and Trees. *Chrysothamnus nauseosus, Artemisia cana, Gutierrezia sarothrae, Pinus ponderosa*

Synopsis

The greatest apparent vegetation change is in the size of the *Pinus ponderosa* trees throughout the area. Reduced *P. ponderosa* cover on the right-hand side of 1998 photo shows results of a 1984 fire. The apparent reduction in cover on the left-hand portion of the photo was not readily apparent during the 1998 and 1999 on-site visits; no explanation is offered other than the camera angle in 1998 was slightly different than those in 1918 and 1958 photos, or recent housing development projects are thinning out the trees (note houses in upper center portion of photo). Although descriptions of vegetation are missing from early in the century, current composition suggests gradual intrusion of *Poa pratensis* and *Bromus japonicus*, two invasive species. The road cut, near the center right of the 1998 photo, is parallel to U.S. Highway 87.

Original Photograph

August 10, 1918. Shantz V–2–1918. Facing southwest.

First Retake and Description

June 28, 1959. W.S.P., No. 2365.

No description available.

Second Retake

July 24, 1998. Kay–4333–7.

Roundup, Montana

Location

Musselshell Co., MT; Sec. 21, R. 26 E., T. 6 N.; GPS–UTM 5125394 N, 694957 E.

About 14 miles south of Roundup.

From Roundup, travel south about 14 miles on U.S. Highway 87. One hundred yards south of mile marker 34, turn right (west) on Majerus Road (gravel road). Follow road 0.6 mile, then turn left (east) onto tertiary, unimproved trail. Continue about 0.2 mile on tertiary road. Photopoint is on top of high rock ledge, located about 100 yards south of the tertiary road.

Description

August 12, 1999

Rock Ledge

Grasses. *Agropyron spicatum*

Forbs. *Erigeron* spp.

Uplands and Ridges

Grasses. *Agropyron smithii, Stipa comata, Bouteloua gracilis, Bromus japonicus, Poa pratensis*

Shrubs and Trees. *Chrysothamnus nauseosus, Rhus trilobata, Gutierrezia sarothrae, Pinus ponderosa*

Synopsis

A fire went through this area in 1984, causing a major decrease of *Pinus ponderosa*. The ridges in this picture are dominated by shrub species, predominantly *Rhus trilobata*. Grass is sparse in the foreground but is much more apparent in the lowlands. *Agropyron smithii* dominates the lowland and upland vegetation. However, *Bromus japonicus* and *Poa pratensis* have invaded some localized areas.

Original Photograph

August 9, 1918. Shantz T–3–1918. Facing southeast.

First Retake and Description

June 29, 1959. W.S.P., G–7–1959.

The original grass is *Bouteloua gracilis* and *Agropyron smithii*. Small amount of *Artemisia* spp. in low areas. In the retake the grasses seem about the same but *Artemisia* spp. has spread considerably and *Opuntia* spp. is common in the grass. *Pinus ponderosa* on the bluffs has about the same number of trees, but they are larger. The stump of the farthest tree to the left is still present, although the tree has been cut down (from Phillips 1963, p. 61).

Second Retake

July 22, 1998. Kay–4329–33.

Valentine, Montana

Location

Fergus Co., MT; Sec. 16, R. 26 E., T. 18 N.; GPS–UTM 6244564 N, 695746 E.

About 30 miles east of Roy.

From Roy, travel east 7.5 miles on U.S. Highway 191, then south 0.5 mile on Montana Highway 19 to Valentine Road. Turn left (east) onto Valentine Road (gravel road) and continue about 19 miles to intersection of Dovetail Trail Road and Valentine Road. Continue straight (east) on Dovetail Road about 0.3 mile until road turns north. Photopoint is about 350 yards southeast of bend in the road.

Description

August 10, 1999

Upland Near Photopoint

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata, Stipa viridula, Koeleria cristata, Poa secunda, Calamovilfa longifolia, Bromus japonicus, Agropyron cristatum*

Forbs. *Sphaeralcea coccinea, Psoralea tenuiflora, Liatris punctata*

Drainage to Ridge

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata, Koeleria pyramidata, Poa secunda*

Forbs. *Sphaeralcea coccinea, Psoralea tenuiflora*

Shrubs. *Artemisia cana, Artemisia tridentata, Ceratoides lanata, Tetradymia canescens*

Synopsis

The upland in the foreground has been invaded by *Agropyron cristatum*. *Opuntia* spp. are still present. Both *Artemisia tridentata* and *A. cana* have significantly increased in density and size. Although *Pinus ponderosa* density seems to have increased only slightly, trees have grown in size.

Original Photograph

August 9, 1918. Shantz T–5–1918. Facing east.

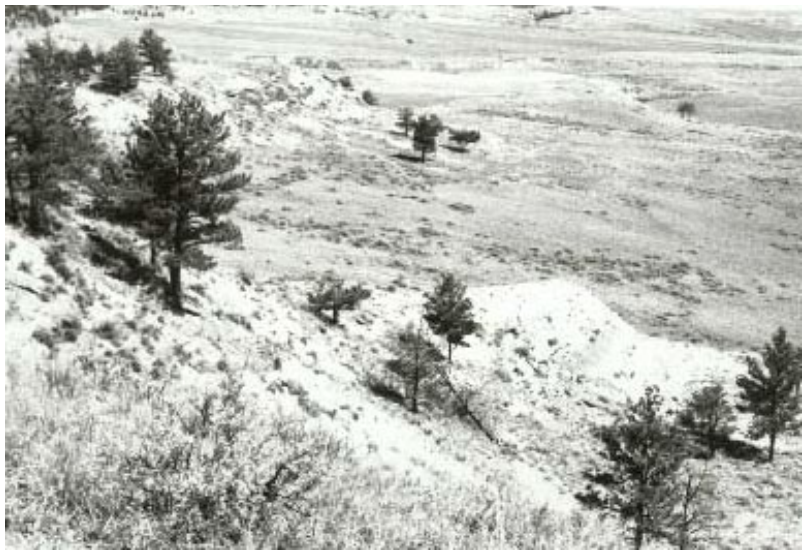
First Retake and Description

June 29, 1959. W.S.P., G–9–1959.

Grasses of *Agropyron smithii* and some *Stipa* spp. still present. *Pinus ponderosa* shows some increase in size of individual trees and some reproduction. Original snag in middle foreground still present (from Phillips 1963, p. 63).

Second Retake

July 22, 1998. Kay–4331–6A.



Valentine, Montana

Location

Fergus Co., MT; Sec. 16, R. 26 E., T. 18 N.; GPS–UTM 5244386 N, 696118 E.

About 30 miles east of Roy.

From Roy, travel east 7.5 miles on U.S. Highway 191, then south 0.5 mile on Montana Highway 19 to Valentine Road. Turn left (east) onto Valentine Road (gravel road) and continue about 19 miles to intersection of Dovetail Trail Road and Valentine Road. Continue east on Dovetail Road about 0.3 mile until road turns north. Photopoint is from southernmost ridge, located southeast of the intersection of Dovetail Road and Valentine Road, or northeast of Valentine, Montana. Ridge for this photopoint is shown in previous photo set (Valentine, Montana pages 29 and 30).

Description

August 10, 1999

Near Photopoint and Along Ridge

Grasses. *Calamovilfa longifolia, Oryzopsis hymenoides, Agropyron spicatum, Muhlenbergia cuspidata, Schizachyrium scoparium*

Forbs. *Solidago* spp.

Shrubs. *Rhus trilobata, Atriplex confertifolia, Yucca glauca, Artemisia tridentata*

Upland Below Ridge

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata, Koeleria pyramidata, Poa secunda*

Shrubs. *Artemisia tridentata, Artemisia frigida*

Synopsis

Most of the *Pinus ponderosa* have increased in size. In the bottom center of picture, along the lower end of the slope, two trees have increased in size while two others have died since 1959. *Artemisia tridentata* now covers a much larger area than before. Near the upper right corner of the 1998 photo, hayfields are apparent.

Original Photograph

October 19, 1909. Reproduced black and white slide; Shantz W–6–1909 missing. Facing west.

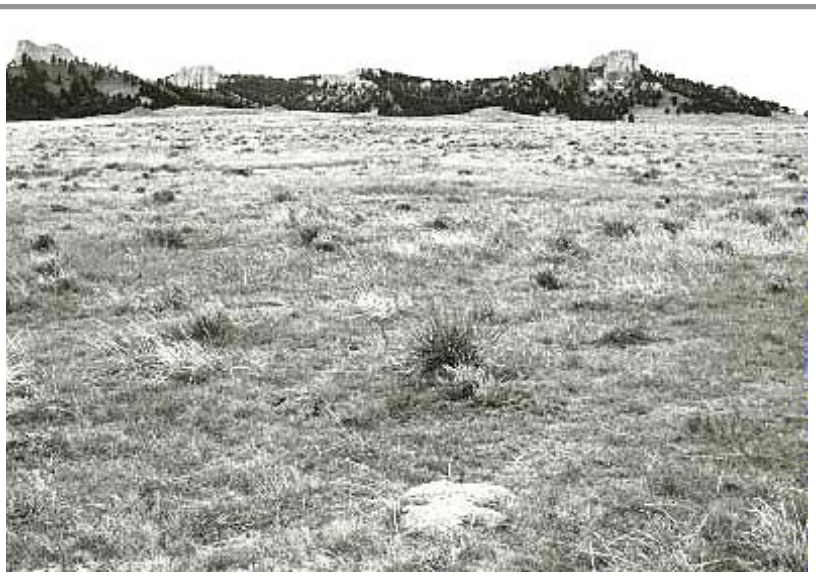
First Retake and Description

August 12, 1960. W.S.P., No. 2390.

The vegetation is mainly *Bouteloua gracilis* and *Bouteloua hirsuta*. *Carex filifolia* amounts to almost one half of the ground cover in many places. *Stipa comata* and *Artemisia filifolia* account for most of the other growth. A few plants of *Liatris punctata* and *Psoralea tenuiflora* are present. In many places *Calamovilfa longifolia* is predominant. On the hills in the background are trees of *Pinus ponderosa*. No particular change in the ecotone between grasses and pines (from Phillips 1963, p. 65).

Second Retake

August 3, 1998. Kay–4358–10.



Crawford, Nebraska

Location

Dawes Co., NE; Sec. 4, R. 52 W., T. 31 N.; GPS–UTM 4727406 N, 629088 E.

West of Crawford City Park at Ft. Robinson State Park.

From Crawford, at intersection of U.S. Highway 20 and Nebraska Highways 2 and 71, continue west through town to Crawford City Park. Proceed west of city park stadium about 100 yards to Ft. Robinson State Park's fence line. Photopoint is located about 100 yards west of Ft. Robinson State Park's east fence line.

Description

September 21, 1999

Upland

Grasses. *Carex filifolia, Stipa comata, Bouteloua gracilis, Koeleria pyramidata, Poa secunda, Poa pratensis, Aristida longiseta, Calamovilfa longifolia, Andropogon hallii*

Forbs. *Liatris punctata, Aster ericoides, Ambrosia psilostachya, Chrysopsis villosa, Erigonium* spp., *Psoralea tenuiflora*

Shrubs. *Artemisia filifolia, Yucca glauca*

Synopsis

Composition of plant species is similar to that in 1960 description. Present grass and grasslike composition is estimated as 60 percent *Carex, Stipa,* and *Bouteloua*; 30 percent *Koeleria, Poa,* and *Aristida;* and 10 percent *Calamovilfa* and *Andropogon.* One distinct difference is the absence of the *Bouteloua hirsuta* recorded in 1960. Density and cover of *Pinus ponderosa* has continued to steadily increase since 1909. Pocket gopher activity is visible in the 1998 photo. Notes also indicate the presence of horses on this site in 1998.

Original Photograph

October 21, 1909.
Shantz X–9–1909.
Facing south.

First Retake and Description

June 17, 1958. W.S.P.,
C–12–1958.

This is an excellent location for western extension of eastern trees. The trees here are various species of *Quercus, Ulmus, Salix, Populus,* and *Acer negundo.* The shrub in the foreground is *Rhus glabra* mixed in with this are *Pinus ponderosa* and *Juniperus* spp. The creek bed in this photograph has changed considerably. Some of the same trees in the old photograph can be picked out in the new photograph. The vegetation seems much denser in the new picture, but this may be due to the fact that the old picture was taken in October when the deciduous trees had shed some of their leaves (from Phillips 1963, p. 69).

Second Retake

August 2, 1998.
Kay–4354–26.

Long Pine, Nebraska

Location

Brown Co., NE; Sec. 31, R. 20 W., T. 30 N.; GPS–UTM 4708894 N, 441588 E.

About 1.5 miles south-southwest of Long Pine.

From Long Pine, off U.S. Highway 20, travel south on Main Street and cross a bike path (that is, abandoned railroad tracks) near the center of town. Turn right (west) immediately after crossing the bike path and travel about 0.2 mile to the bridge. Photopoint is from the east end of bridge.

Description

September 22, 1999

Bottomland and Ridges

Grasses. *Muhlenbergia racemosa, Panicum virgatum, Calamovilfa longifolia, Andropogon gerardii, Andropogon hallii, Schizachyrium scoparium, Bouteloua gracilis, Dicanthelium* spp., *Carex* spp.

Forbs. *Ambrosia psilostachya, Aster ericoides, Conyza canadensis, Asclepias* spp., *Helianthus annuus, Kochia scoparia, Medicago sativa*

Trees. *Acer negundo, Pinus ponderosa, Populus deltoides, Ulmus americana, Quercus stellata, Juniperus virginiana*

Synopsis

The course of Long Pine Creek has become less meandering since 1908. The 1908 photo shows few shrubs and trees along the watercourse and a narrow meandering creek. Although the 1958 and 1998 retakes show an increase in deciduous and evergreen tree densities and cover, which hide a good portion of the creek, the visible areas reflect a wider and shallower creek. Many seral and invasive species, such as *Conyza canadensis, Helianthus annuus, Kochia scoparia,* and *Ambrosia psilostachya,* are currently present.

Original Photograph

September 22, 1924. Shantz H²–2–1924. Facing southeast.

First Retake and Description

June 26, 1959. W.S.P., E–10–1959.

This is the left hand end of the panorama and shows the erosion bank. The shrubs in the foreground mainly *Symphoricarpos* spp. and shruby Cinquefoil. The grasses are mainly *Stipa comata,* with some *Bouteloua* spp. The "peaks" on the horizon of the old picture are haystacks (from Phillips 1963, p. 75).

Second Retake

July 30, 1998. Kay–4346–24A.

Fryburg, North Dakota

Location

Billings Co., ND; Sec. 18, R. 100 W., T. 139 N.; GPS–UTM 5191143 N, 625999 E.

About 2 miles west-southwest of Fryburg.

From Medora, South Dakota, travel 13 miles east on U.S. Interstate 94. Take Exit 36 and turn right (south). Continue through Fryburg to "T" in road, located about 0.4 mile south of town. Turn right (west) onto Sully Creek Road and travel 2 miles. Photopoint is about 30 yards south of the road.

Description

August 27, 1999

Bottomland

Grasses. *Agropyron cristatum, Agropyron smithii*

Forbs. *Kochia scoparia, Sphaeralcea coccinea, Psoralea tenuiflora, Artemisia ludoviciana*

Hills, Ridgetops, Upper Plateaus

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata, Calamovilfa longifolia*

Shrubs and Trees. *Artemisia cana, Artemisia tridentata, Artemisia frigida, Rhus trilobata Juniperus communis, Juniperus scopulorum, Fraxinus pennsylvanica*

Synopsis

Much of the native range has been cultivated on the upper plateaus (note the round hay bales in upper center of 1998 photo). A haystack yard fence is visible in the bottom right corner of the 1998 photo. *Kochia scoparia* and *Agropyron cristatum* are abundant inside the stack yard. The shrubs (look to be *Shepherdia argentea*) in immediate foreground of 1924 photo had been removed by the 1959 retake. Size of *Artemisia* spp. and *Juniperus* spp. have increased since 1924

Original Photograph

September 22, 1924.
Shantz H²–4–1924.
Facing south.

First Retake and Description

June 26, 1959. W.S.P.,
E–12–1959.

Very little change in this. The trees mainly pines on the hill in the center are about the same. Two dirt tanks have been built in the background to the right. Erosion has not changed much (from Phillips 1963, p. 77).

Second Retake

July 30, 1998.
Kay–4346–29A.

Fryburg, North Dakota

Location

Billings Co., ND; Sec. 18, R. 100 W., T. 139 N.; GPS–UTM 5191143 N, 625999 E.

About 2 miles west-southwest of Fryburg.

From Medora, South Dakota, travel 13 miles east on U.S. Interstate 94. Take Exit 36 and turn right (south). Continue through Fryburg to "T" in road, located about 0.4 mile south of town. Turn right (west) onto Sully Creek Road and travel 2 miles. Photopoint is about 30 yards south of the road.

Description

August 27, 1999

Bottomland

Grasses. *Agropyron cristatum, Agropyron smithii, Hordeum jubatum*

Forbs. *Kochia scoparia, Sphaeralcea coccinea, Psoralea tenuiflora, Artemisia ludoviciana*

Hills, Ridgetops, Upper Plateaus

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata, Calamovilfa longifolia*

Shrubs and Trees. *Artemisia cana, Artemisia tridentata, Artemisia frigida, Rhus trilobata, Juniperus communis, Juniperus scopulorum, Fraxinus pennsylvanica*

Synopsis

Similar to "Fryburg, North Dakota (page 37)," as much of the upland native range has been converted to cropland on the upper plateaus. Bottomland vegetation previously dominated by *Bouteloua gracilis* and *Agropyron smithii*, is mostly *Agropyron cristatum*, *Hordeum jubatum*, and *Kochia scoparia*. The pine trees discussed in the 1959 description are actually junipers (*Juniperus* spp.).

Original Photograph

September 22, 1924. Shantz G²–8–1924. Facing north.

First Retake and Description

June 25, 1959. W.S.P., E–4–1959.

Dr. Shantz had taken a series of about ten pictures in this area within a distance of about fifty feet. The area is a dry water course with some watering holes for cattle. The grasses here are *Stipa comata* and *Bouteloua gracilis* with some *Andropogon scoparius*. The shrubs are mainly *Shepherdia canadensis* and *Symphoricarpos* spp. In the new picture the tree growth has increased. The large tree in the center is *Fraxinus* spp., and the shrubs are the same as the original picture except for *Prunus* spp. which Dr. Shantz does not mention. The Microwave Station was in the middle distance (from Phillips 1963, p. 79).

Second Retake

July 30, 1998. Kay–4346–9A.

Fryburg, North Dakota

Location

Billings Co., ND; Sec. 8, R. 100 W., T. 139 N.; GPS–UTM 5191148 N, 627345 E.

About 1.3 miles west-southwest of Fryburg.

From Medora, South Dakota, travel 13 miles east on U.S. Interstate 94. Take Exit 36 and turn right (south). Continue through Fryburg to "T" in road, located about 0.4 mile south of town. Turn right (west) onto Sully Creek Road and travel 1.3 miles. Photopoint is in a swale about 50 yards north of the road.

Description

August 27, 1999

Upland and Hillsides

Grasses. *Agropyron smithii, Koeleria pyramidata, Stipa comata, Poa pratensis, Bouteloua gracilis, Poa secunda*

Forbs. *Chrysopsis villosa, Solidago* spp., *Psoralea tenuiflora, Artemisia ludoviciana*

Shrubs. *Artemisia dracunculus, Artemisia frigida, Symphoricarpos occidentalis*

Drainage

Shrubs and Trees. *Shepherdia argentea, Prunus virginiana, Potentilla fruticosa, Fraxinus pennsylvanica*

Synopsis

Uplands and hillsides dominated by grasses in 1924 are now rich in shrub and tree species. Since 1924, shrub height and volume has increased greatly; otherwise, since 1959, the composition of herbaceous and woody species appears to have changed little.

Original Photograph

September 22, 1924. Shantz G²–12–1924. Facing northwest.

First Retake and Description

June 25, 1959. W.S.P., E–5–1959.

This shows the recovery of an eroded stream bank. The shrubs are mainly *Fraxinus* spp. and *Prunus* spp. (from Phillips 1963, p. 81).

Second Retake

July 30, 1998. Kay–4346–14A.

Fryburg, North Dakota

Location

Billings Co., ND; Sec. 8, R. 100 W., T. 139 N.; GPS–UTM 5191175 N, 627347 E.

About 1.3 miles west-southwest of Fryburg.

From Medora, South Dakota, travel 13 miles east on U.S. Interstate 94. Take Exit 36 and turn right (south). Continue through Fryburg to "T" in road, located about 0.4 mile south of town. Turn right (west) onto Sully Creek Road and travel 1.3 miles. Photopoint is in a swale about 50 yards north of the road.

Description

August 27, 1999

Near Photopoint

Shrubs and Trees. *Shepherdia argentea, Prunus virginiana, Rhus trilobata, Potentilla fruticosa, Fraxinus pennsylvanica*

Hills

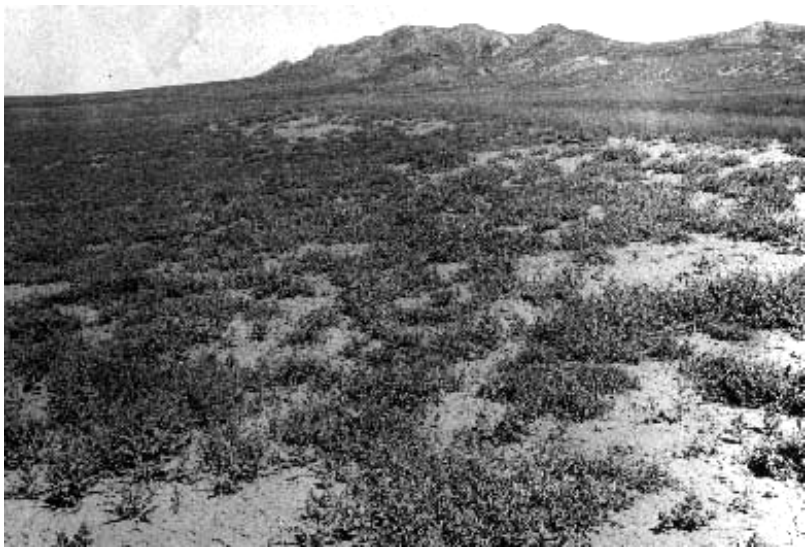
Shrubs and Trees. *Rhus trilobata, Artemisia frigida, Fraxinus pennsylvanica*

Synopsis

Since 1924, a community once dominated by grass now shows a dramatic increase in the size and density of woody species.

Original Photograph

July 19, 1927. Shantz V–10–1927.
Facing north.



First Retake and Description

June 19, 1959. W.S.P., B–6–1959.

These two photographs illustrate how little change can occur over a long period of time in some of the more arid sites. The main plant is *Atriplex nuttallii.* A small amount of grass visible in the mid picture is one of the wheat grasses *(Agropyron smithii)* and shows in both photographs (from Phillips 1963, p. 91).

Second Retake

July 31, 1998.
Kay–4349–9.

Belle Fourche, South Dakota

Location

Butte Co., SD; Sec. 6, R. 3 E., T. 10 N.; GPS–UTM 4968196 N, 593644 E.

About 14.2 miles north-northeast of Belle Fourche.

From Belle Fourche, travel north 14.2 miles along U.S. Highway 85. Photopoint is 50 yards north of the highway.

Description

September 20, 1999

Shrub-Dominated Upland

Shrubs. *Atriplex nuttallii*

Upland Before Hills

Grasses. *Agropyron smithii, Koeleria pyramidata, Agropyron cristatum*

Forbs. *Melilotus officinalis*

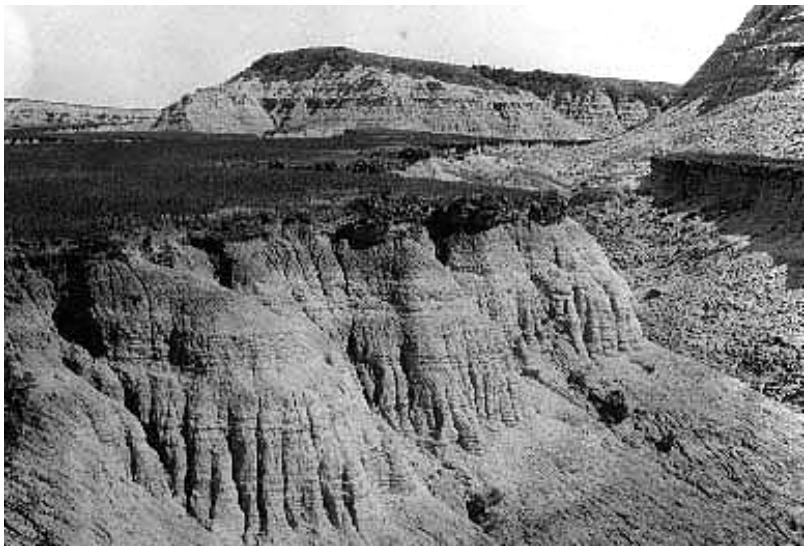
Shrubs. *Atriplex nuttallii, Sarcobatus vermiculatus, Artemisia tridentata*

Synopsis

Vegetation structure and composition appear to have changed little since 1927, although a noticeable increase has occurred in density of *Atriplex nuttallii.* More grass plants *(Agropyron cristatum)* are visible in 1998 than the previous two photos. *Melilotus officinalis* is also present.

Original Photograph

July 3, 1927. Shantz P–12–1927. Facing northeast.



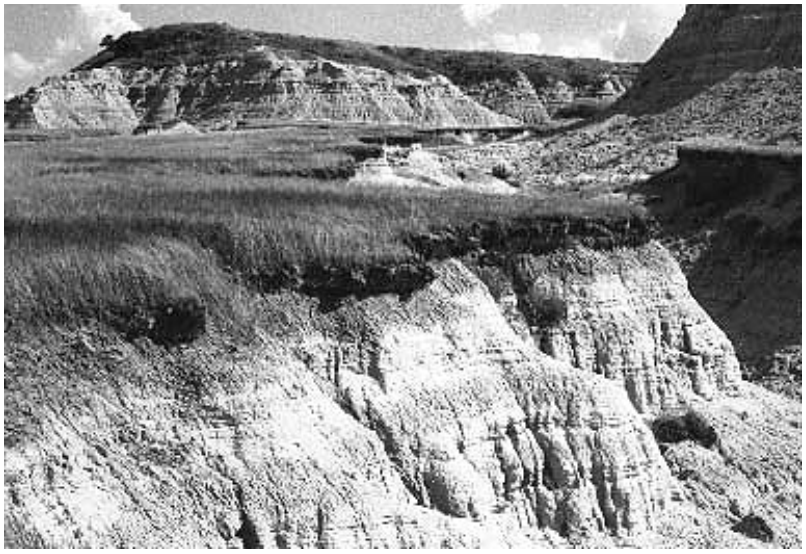
First Retake and Description

June 16, 1958. W.S.P., C–5–1958.

This picture and others from the same region illustrates minimal erosion effects. The cliffs were little changed and even the same ridges can be seen in both photographs. Probably the erosion is extremely slow and apt to be catastrophic. The sod of short grass plants holds the surface firmly in place. Notice along the top of erosion bank, colonies of *Opuntia* spp., an indication that this plant comes into unoccupied grass areas (from Phillips 1963, p. 93).

Second Retake

August 2, 1998. Kay–4356–14A.



Belvidere, South Dakota

Location

Jackson Co., SD; Sec. 36, R. 33 W., T. 43 N.; GPS–UTM 4835468 N, 323562 E.

About 17 miles south-southeast of Belvidere.

From Belvidere, at the intersection of U.S. Interstate 90 and South Dakota Highway 63, travel about 17 miles south to milepost 61.5. Photopoint is located about 150 yards southeast of the road and milepost marker.

Description

September 22, 1999

Upland Flats and Ridgetops

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata, Calamovilfa longifolia, Schizachyrium scoparium, Bouteloua curtipendula*

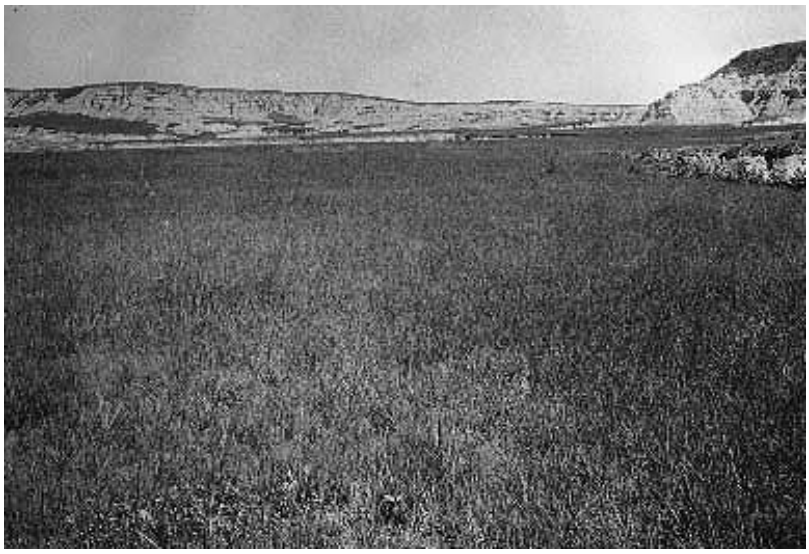
Forbs. *Melilotus officinalis, Opuntia polycantha*

Synopsis

Vegetation composition appears to have changed little since 1927 other than a possible decline in the density of *Opuntia polycantha*. *Agropyron smithii* is the overwhelmingly dominant grass species.

Original Photograph

July 3, 1927. Shantz P–10–1927. Facing northeast.



First Retake and Description

June 16, 1958. W.S.P., C–6–1958.

This is a typical area of short grass plains. There has been very little change over the period of the two pictures and the same grasses are present in both pictures. The main plants are *Bouteloua* spp., *Stipa comata* and *Aristida* spp. (from Phillips 1963, p. 95).

Second Retake

August 2, 1998. Kay–4356–19A.

Belvidere, South Dakota

Location

Jackson Co., SD; Sec. 36, R. 33 W., T. 43 N.; GPS–UTM 4835468 N, 323562 E.

About 17 miles south-southeast of Belvidere.

From Belvidere, at the intersection of U.S. Interstate 90 and South Dakota Highway 63, travel about 17 miles south to milepost 61.5. Photopoint is located about 150 yards southeast of the road and milepost marker.

Description

September 22, 1999

Upland Flats and Ridgetops

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata, Calamovilfa longifolia*

Forbs. *Melilotus officinalis, Opuntia polycantha*

Synopsis

Vegetation structure appears to have changed little since 1927 other than some decline in the density of *Opuntia polycantha*. In contrast to the 1959 description, *Agropyron smithii* is now the overwhelmingly dominant grass species. We also suspect, based on the 1959 photo as opposed to the written description, that it was quite abundant then as well.

Original Photograph

July 15, 1927. Shantz X–10–1927. Facing southeast.

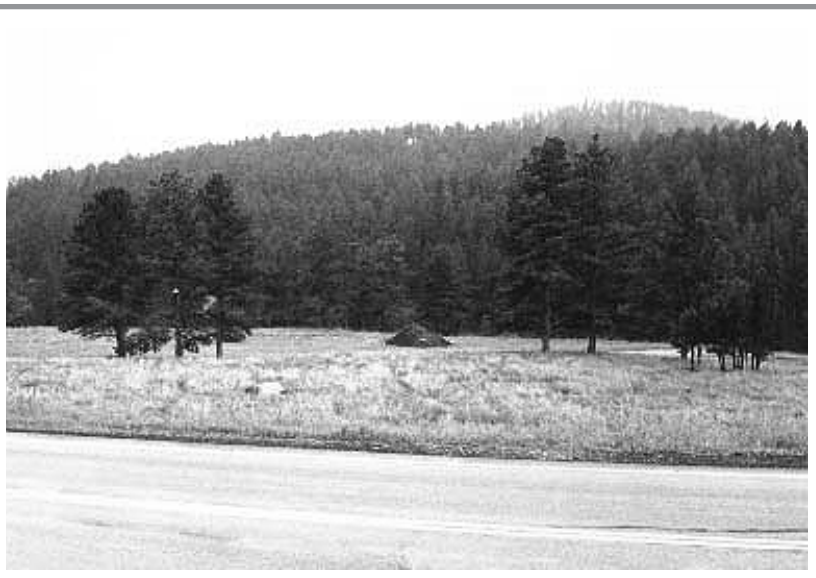
First Retake and Description

June 30, 1958. W.S.P., D–8–1958.

Forest mainly of *Ponderosa pines* shows remarkable recovery. *Agropyron smithii* is still the dominant plant in both pictures, however, the 1927 photograph shows much *Psoralea tenuiflora*. This plant was rare when the photograph was retaken and found only along the roadside. *Melilotus officinalis* and *Bromus tectorum* were common throughout this area, although they are not mentioned in Dr. Shantz' original notes. The shrubs under the trees are *Rosa* spp. (from Phillips 1963, p. 99).

Second Retake

August 4, 1998. Kay–4358–19.



Custer State Park, South Dakota

Location

Custer Co., SD; Sec. 25, R. 6 E., T. 3 S.; GPS–UTM 4847163 N, 633332 E (of roadside turnout).

About 11 miles west-southwest of Hermosa.

From Hermosa, South Dakota, continue south on South Dakota Highway 79 about 1 mile to junction of South Dakota Highway 36. Turn right (west) onto South Dakota Highway 36 and travel about 10 miles to the Custer State Park entrance station. From entrance of park, continue west on South Dakota Highway 36 about 0.4 mile. Photopoint is near a left-of-road (south) gravel turnoff. Photopoint is also 2.2 miles east of Custer State Park Game Lodge on South Dakota Highway 36.

Description

September 21, 1999

Open Grassland Park

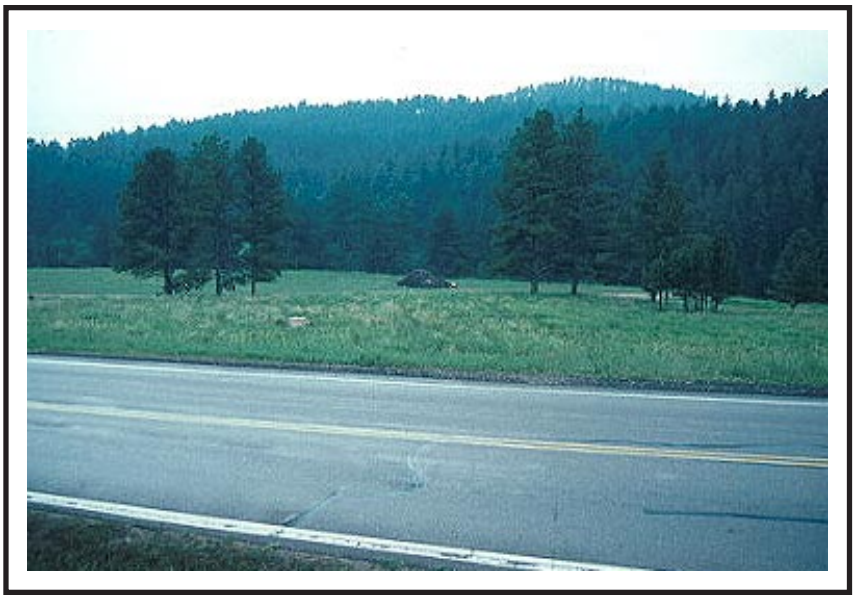
Grasses. *Agropyron smithii, Andropogon gerardii, Poa secunda, Poa pratensis*

Forbs. *Ambrosia psilostachya, Grindelia squarrosa, Artemisia ludoviciana, Solidago* spp. *Echinacea angustifolia, Vervain* spp.

Shrubs and Trees. *Rosa woodsii, Symphoricarpos occidentalis, Pinus ponderosa*

Synopsis

A very diverse vegetation complex, but *Psoralea tenuiflora* was considered rare in 1927 and it was absent in 1999. *Agropyron smithii r*emains the overwhelming dominant. Density and size of *Pinus ponderosa* trees have continued to increase. Highway and roadside parking area have been realigned since 1958.



Original Photograph

July 3, 1927. Shantz Q–7–1927. Facing south.

First Retake and Description

June 16, 1958. W.S.P., B–8–1958.

There is remarkably little change in these Dakota Badlands. The same individual plants can be picked out in the old and new photographs with very little change. The hills in the background have *Juniperus* spp. with Buffalo Berry (from Phillips 1963, p. 113).

Second Retake

August 3, 1998. Kay–4356–34A.

Kadoka, South Dakota

Location

Jackson Co., SD; Sec. 30, R. 35 W., T. 43 N.; GPS–UTM 4838058 N, 295232 E.

About 7.5 miles south of Kadoka.

From Kadoka, travel about 7 miles east to intersection of U.S. Interstate 90 and South Dakota Highway 73. Exit right (south) onto South Dakota Highway 73 and travel south about 1 mile to milepost 59. Photopoint is located near milepost 59.

Description

September 22, 1999

Bottomland

Grasses. *Agropyron smithii, Bouteloua gracilis, Stipa comata, Calamovilfa longifolia*

Trees *Juniperus* spp.

Synopsis

Minimal change in vegetation composition and structure has occurred. Areas between high clay textured (that is, gumbo) hills is predominately *Agropyron smithii, Bouteloua gracilis, Stipa comata,* and *Calamovilfa longifolia,* with a scattering, but increased density, of *Juniperus* trees. No *Shepherdia argentea* (buffaloberry) was found.

Original Photograph

June 29, 1913. Shantz M–2–1913. Facing northwest.

First Retake and Description

June 19, 1959. W.S.P., No. 2079.

Dr. Shantz took a 180^0 panorama from this point and made a rather complete list of the species present at this rock. The main grasses are *Agropyron* spp. and *Stipa viridula*. In addition Dr. Shantz listed the following plants as growing in this area: *Agropyron* spp., *Stipa viridula, Cirsium plattense, Grindelia squarrosa, Phlox* spp., *Vicia americana, Iva axillaris, Aster* spp., *Lesquerella* spp., *Erysium asperum, Comandra pallida, Opuntia polycantha, Bahia oppositifolia, Helianthus* spp., *Atriplex canescens, Allium reticulatum,* and *Plantago purshii.* In the pictures of this area the most noticeable changes between the old and the new is the increase in the amount of Prickly Pear in the new pictures (from Phillips 1963, p. 119).

Second Retake

July 31, 1998. Kay–4351–24A.

Newell, South Dakota

Location

Butte Co., SD; Sec. 4, R. 6 E., T. 9 N.; GPS–UTM 4959195 N, 626870 E.

About 6 miles north-northeast of Newell.

From Newell, travel north about 4 miles on South Dakota Highway 79. Next, turn right (east) for 1 mile across private lands, then turn left (northeast) through a gate onto a tertiary road and continue for 1 mile. Continue north about 0.7 mile through two pastures to a group of large rocks located in the south-central part of the second pasture. Photopoint is north of the adjacent irrigation canal and hayfield and west of a natural drainage area.

Description

September 22, 1999

Upland

Grasses. *Agropyron smithii, Stipa comata, Stipa viridula, Bromus japonicus*

Forbs. *Melilotus officinalis, Lesquella* spp., *Psoralea tenuiflora, Grindelia squarrosa, Vicia americana*

Synopsis

Earlier photos indicate heavy grazing. However, 1998 photos reveal grazing intensity had been dramatically reduced, resulting in a grass-dominant complex of *Agropyron smithii, Stipa comata,* and *Stipa viridula*. Furthermore, the position of the large rocks has remained constant, but an abundance of *Melilotus officinalis* in 1999 caused their presence to be less conspicuous because of the taller vegetation.

Original Photograph

June 29, 1913. Shantz M–4–1913. Facing north.

First Retake and Description

June 19, 1959. W.S.P., B–5–1959.

This is one of the series of panoramic pictures Dr. Shantz took from this point. The alkali areas showing in the original photograph are almost entirely gone. Grasses (*Agropyron* spp. and *Stipa viridula*) seem to be about the same (from Phillips 1963, p. 121).

Second Retake

July 31, 1998. Kay–4351–25A.

Newell, South Dakota

Location

Butte Co., SD; Sec. 4, R. 6 E., T. 9 N.; GPS–UTM 4959195 N, 626870 E.

About 6 miles north-northeast of Newell.

From Newell, travel north about 4 miles on South Dakota Highway 79. Next, turn right (east) for 1 mile across private lands, then turn left (northeast) through a gate onto a tertiary road and continue for 1 mile. Continue north about 0.7 mile through two pastures to a group of large rocks located in the south-central part of the second pasture. Photopoint is north of the adjacent irrigation canal and hayfield and west of a natural drainage area.

Description

September 22, 1999

Upland

Grasses. *Agropyron smithii, Stipa comata, Stipa viridula, Bromus japonicus*

Forbs. *Melilotus officinalis, Lesquella* spp., *Psoralea tenuiflora, Grindelia squarrosa, Vicia americana*

Synopsis

The vegetation has remained a grass-dominated mix of *Agropyron smithii, Stipa comata,* and *Stipa viridula*. Forbs are abundant, with considerable amounts of *Melilotus officinale* found in 1999, but not apparent in the photos shown here. The abundance of *Opuntia polycantha* has declined sharply in at least a partial response to occasional haying of the area (communication with landowner). The soils/vegetation complex throughout the area appears to have recovered fully from previous management tactics.

Original Photograph

July 6, 1927. Shantz V–3–1927. Facing east.

First Retake and Description

August 11, 1960. W.S.P., E–8–1960.

Dr. Shantz' original picture shows an almost pure stand of *Agropyron smithii.* When the 1960 picture was taken there was very little of this grass, there being mainly *Koeleria cristata* (from Phillips 1963, p. 129).

Second Retake

August 3, 1998. Kay–4358–15.

Rumford, South Dakota

Location

Fall River Co., SD; Sec. 6, R. 54 W., T. 36 N. GPS–UTM 4775673 N, 606085 E.

About 8 miles north-northwest of Ardmore.

From Ardmore, South Dakota, travel north about 6 miles on South Dakota Highway 71, then turn left (northwest) for 2 miles on South Dakota Highway 471 (County Road 52). Photopoint is from road near a gravel parking area that replaced a railroad switching yard.

Description

September 21, 1999

Between Fence and Road

Grasses. *Agropyron cristatum, Setaria* spp., *Bromus inermis*

Forbs. *Helianthus annuus*

Fence to Drainage

Grasses. *Agropyron cristatum, Agropyron smithii*

Shrubs. *Sarcobatus vermiculatus*

Trees. *Populus deltoides*

Synopsis

Current herbaceous vegetation is dominated by *Agropyron cristatum*. This is a shift from a dominance of *Agropyron smithii* in 1927 (seeded?) and possibly *Koeleria pyramidata* in 1960, although close examination of the 1960 photo suggests the dominant species was still *Agropyron smithii.* Both the size and density of *Populus deltoides* trees growing along the drainage have increased considerably since 1927.

Original Photograph

August 10, 1914. Shantz R–8–1914. Facing northwest.

First Retake and Description

June 20, 1959. W.S.P., C–3–1959.

This is a series of three panoramic pictures taken at this point. The original description shows the following species present: *Stipa comata, Artemisia frigida, Gutierrezia sarothrae, Paronychia jamesii, Carex filifolia, Artemisia canadensis, Chrysopsis villosa,* and *Artemisia gnaphalodes* (from Phillips 1963, p. 131).

Second Retake

July 31, 1998. Kay–4349–28.

Spearfish, South Dakota

Location

Lawrence Co., SD; Sec. 10, R. 2 E., T. 7 N.; GPS–UTM 4936725 N, 590582 E.

About 6.4 miles north of Spearfish.

From Spearfish, travel north 6.4 miles on U.S. Highway 85. Turn right (east) onto a private lane. The photopoint is from the small hill, to the left (north), immediately upon entering the private property.

Description

September 21, 1999

Photopoint

Grasses. *Agropyron intermedium, Agropyron smithii, Agropyron cristatum, Poa secunda, Schizachyrium scoparium, Bromus inermis*

Forbs. *Melilotus officinalis, Grindelia squarrosa, Aster* spp.

Shrubs. *Gutierrezia sarothrae*

Creek Bottom and Drainages

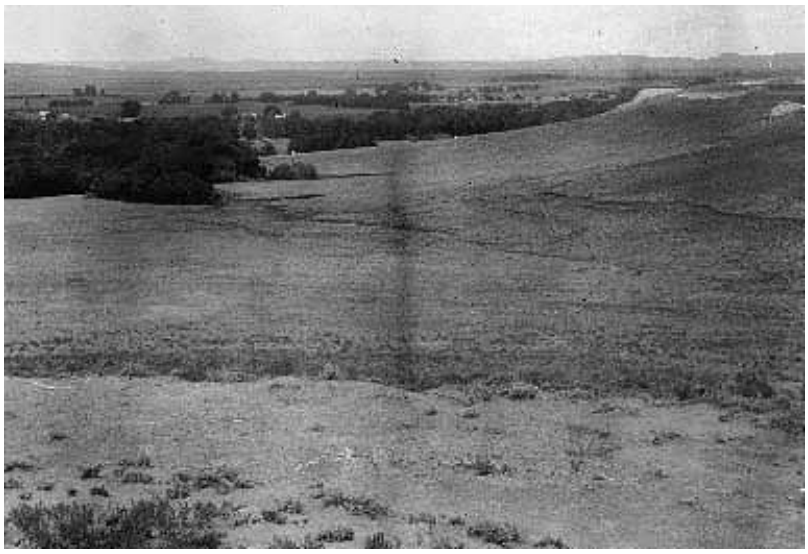
Shrubs and Trees. *Artemisia frigida, Artemisia dracunculoides, Artemisia cana, Populus deltoides, Eleagnus angustifolia, Fraxinus pennsylvanica, Shepherdia argentea*

Synopsis

Many species are growing on this site, most of which are invaders or seral species. Foreground is a seeded remnant gravel site. The vegetation near the photopoint has been mowed recently. Dominant species are *Agropyron intermedium, Agropyron smithii, Agropyron cristatum, Grindelia squarrosa, Melilotus officinalis, Aster* spp., *Poa secunda, Schizachyrium scoparium, Artemisia frigida, Artemisia cana,* and *Artemisia dracunculoides.* Background is now dominated by cropland and farm building. The most notable vegetation change on the drainages is the increase in size and abundance of *Populus deltoides, Eleagnus angustifolia, Prunus virginiana,* and *Fraxinus pennsylvanica. Pinus ponderosa* density has increased on the hill in the upper left of the 1998 photo. Cropland is planted to *Medicago sativa.*

Original Photograph

August 10, 1914. Shantz R–12–1914. Facing west.



First Retake and Description

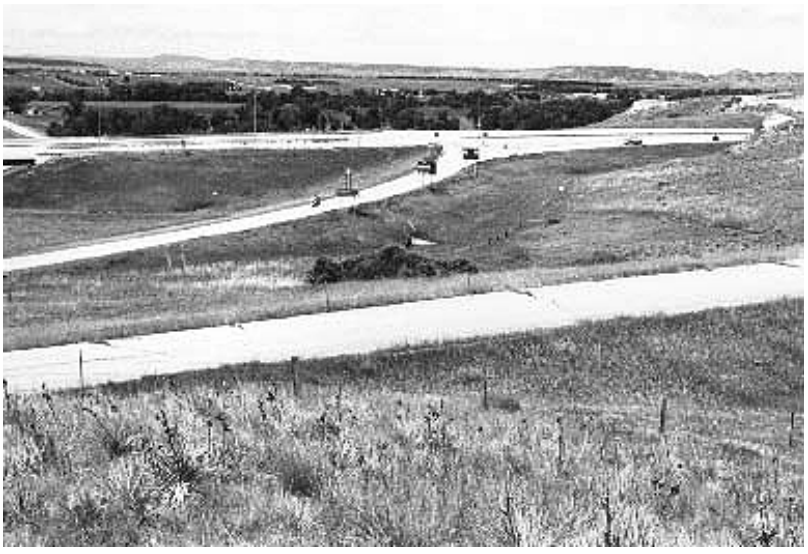
June 20, 1959. W.S.P., B–9–1959. No photo available.

The river valley is showing an increase in tree numbers. One tree of Box Elder is filling in the erosion gully in almost the exact center of the photograph. The background of the picture shows good grass because of restricted grazing (from Phillips 1963, p. 133).

NO PHOTO AVAILABLE

Second Retake

July 31, 1998. Kay–4349–36.



Spearfish, South Dakota

Location

Lawrence Co., SD; Sec. 34, R. 2 E., T. 7 N.; GPS–UTM 4930102 N, 590496 E.

About 2 miles north of Spearfish.

From Spearfish, travel north about 2 miles to the junction of U.S. Highways 14 and 85. Turn right (east) onto access road parallel to U.S. Highway 85, next to public utility station. Then, travel south about 0.5 mile. Picture was taken on the hill to the left (east) of access road.

Description

September 21, 1999

Before Fence

Grasses. *Agropyron smithii, Stipa comata, Schizachyrium scoparium, Muhlenbergia cuspidata, Carex filifolia, Calamovilfa longifolia, Panicum virgatum*

Shrubs and Trees. *Rosa woodsii, Artemisia frigida, Yucca glauca, Gutierrezia sarothrae*

Along Roadside

Grasses. *Bromus inermis, Agropyron intermedium, Panicum virgatum*

Trees. *Populus deltoides, Fraxinus pennsylvanica*

Synopsis

Although this set of photos shows highway and urban development, the geological features of rock outcrops are still apparent at the right center of photos. The distant hills show an increase in conifer density, while deciduous tree species have remained about the same as they were in 1914 due to land management practices. Note the abundance of *Yucca glauca* in the vegetation complex in foreground.

Original Photograph

August 10, 1914.
Shantz S–4–1914.
Facing southeast.

First Retake and Description

June 22, 1958. W.S.P.,
F–6–1958.

This is a hill to the southeast of the picture point and it has good recovery of grass with the same *Rhus* spp. in the foreground. The old road ran along by the power lines and is still visible. In the background the hill has shown but little removal of the tree species (from Phillips 1963, p. 135).

Second Retake

July 31, 1998.
Kay–4351–19A.

Spearfish, South Dakota

Location

Lawrence Co., SD; Sec. 34, R. 2 E., T. 7 N.; GPS–UTM 4930102 N, 590496 E.

About 2 miles north of Spearfish.

From Spearfish, travel north about 2 miles to the junction of U.S. Highways 14 and 85. Turn right (east) onto access road parallel to U.S. Highway 85, next to public utility station. Then, travel south about 0.5 mile. Picture was taken on the hill to the left (east) of access road.

Description

September 21, 1999

Upland to Hills

Grasses. *Agropyron smithii, Stipa comata, Schizachyrium scoparium, Muhlenbergia cuspidata, Carex filifolia, Calamovilfa longifolia, Panicum virgatum*

Shrubs and Trees. *Artemisia frigida, Yucca glauca, Gutierrezia sarothrae*

Hills and Foothills

Grasses. *Agropyron smithii, Carex filifolia, Stipa comata, Calamovilfa longifolia, Panicum virgatum*

Shrubs and Trees. *Pinus ponderosa, Quercus macrocarpa*

Synopsis

An electric line and fence have been in existence since 1914. *Pinus ponderosa* and *Quercus macrocarpa* have increased on the distant hillside over the years. In the foreground, *Yucca glauca* seems to have increased dramatically, and grass production and cover have improved.

Original Photograph

July 2, 1927. Shantz N–2–1927. Facing northwest.

First Retake and Description

June 16, 1958. W.S.P., C–8–1958.

The original picture shows much *Andropogon scoparius*. There seems to be very little of this grass left in the retake, but *Stipa viridula* and *Bouteloua gracilis* are very common. The trees along the river are Cottonwood and Willow (from Phillips 1963, p. 143).

Second Retake

August 2, 1998. Kay–4354–36A.

White River, South Dakota

Location

Mellette Co., SD; Sec. 19, R. 28 W., T. 42 N.; GPS–UTM 4829632 N, 362066 E.

About 3.5 miles northeast of White River.

From the junction of U.S. Highways 44 and 83 in White River, South Dakota, travel north 2.2 miles on U.S. Highway 83. Then, turn right (east) onto an unnamed gravel road just south of the Little White River bridge. Continue east for 2.3 miles to an unfenced area adjacent to the White River. From this point, the photopoint is north of the road about 50 yards.

Description

September 22, 1999

Island on White River

Grasses. *Stipa viridula, Stipa comata, Bouteloua curtipendula, Bouteloua gracilis, Agropyron smithii, Spartina pectinata, Elymus canadensis, Andropogon gerardii, Andropogon hallii, Schizachyrium scoparium, Calamovilfa longifolia*

Forbs. *Solidago* spp., *Xanthium strumarium, Artemisia ludoviciana, Conyza canadensis, Ambrosia psilostachya, Ambrosia gigantea*

Shrubs. *Amorpha canescens, Prunus* spp., *Rhus trilobata, Symphoricarpos occidentalis, Fraxinus pennsylvanica, Acer negundo, Salix* spp., *Populus deltoides, Shepherdia argentea*

Riverbanks

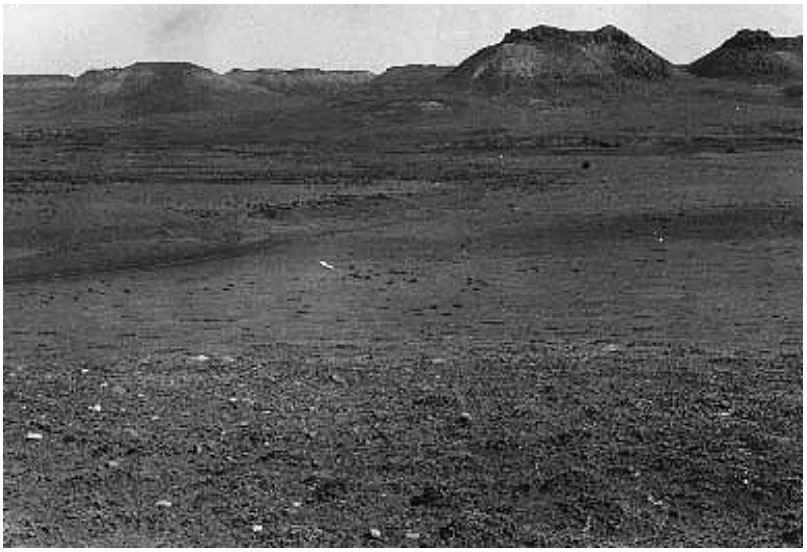
Trees. *Populus deltoides, Fraxinus pennsylvanica*

Synopsis

The largest portion of land area shown in the photograph is now an island because of a change in the river's course. Grazing intensity appears to have been extremely heavy in the 1927 photo (see horses) but much reduced thereafter. Accordingly, density of both herbaceous and woody species have increased along riverbanks, with *Populus deltoides* the dominant tree. Fields across the river are now planted to *Medicago sativa* and *Bromus inermis*.

Original Photograph

September 27, 1917.
Shantz S–10–1917.
Facing southeast.



First Retake and Description

July 5, 1959. W.S.P.,
I–10–1959.

The original picture shows a very much overgrazed range. The grasses consisting of depauperate *Bouteloua* plants, *Carex filifolia*, and some *Phlox* spp. The retake shows an improved range with a fair amount of *Bouteloua gracilis*. However, *Carex filifolia* is still abundant and there is some *Stipa* spp. still present (from Phillips 1963, p. 151).

Second Retake

July 27, 1998.
Kay–4344–34.

Buffalo, Wyoming

Location

Johnson Co., WY; Sec. 12, R. 81 W., T. 50 N.; GPS–UTM 4908859 N, 376974 E.

Upon exiting U.S. Interstate 25 at Buffalo, travel east on the main road before turning right onto county road TW. Continue southeast 8.4 miles to Tipperary Road before turning left (northeast) onto a secondary road. Continue northeast for 0.5 mile and stop near drainage that is present on both sides of the road. Photopoint is located on a hill about 250 yards left (northwest).

Description

September 8, 1999

Upland to Road

Grasses. *Bouteloua gracilis, Buchloe dactyloides, Carex filifolia, Koeleria pyramidata, Agropyron smithii, Stipa comata, Agropyron spicatum, Stipa viridula, Bromus japonicus, Bromus tectorum*

Shrubs. *Artemisia tridentata, Artemisia frigida*

South of Highway to Hills

Grasses. *Buchloe dactyloides, Stipa comata, Poa secunda, Koeleria pyramidata, Carex filifolia, Agropyron smithii, Bromus japonicus, Agropyron cristatum, Stipa viridula*

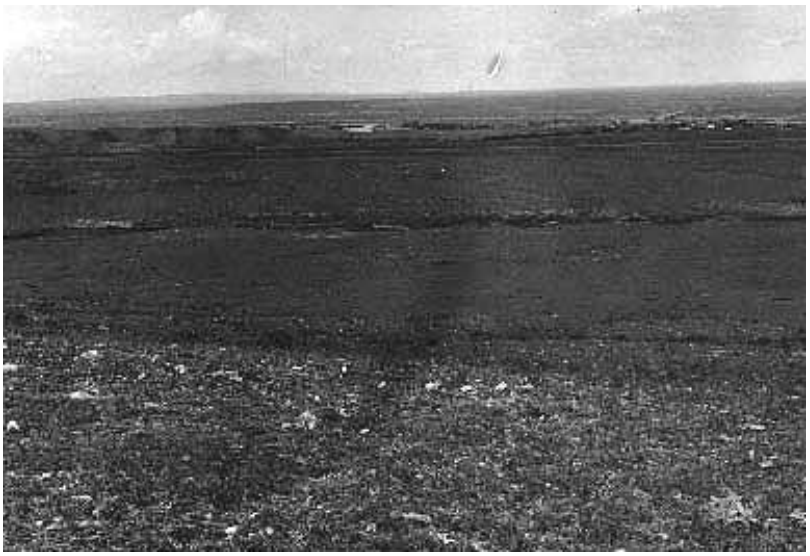
Shrubs. *Artemisia tridentata, Artemisia frigida*

Synopsis

The 1917 photo shows a high-use area as noted by the state of vegetation. By 1959, the vegetation had recovered moderately and *Artemisia tridentata* had increased. The 1998 photo shows a more productive site, with good grass cover and a tremendous increase in *Artemisia tridentata*.

Original Photograph

August 20, 1916. Shantz M–11–1916. Facing north-northwest.



First Retake and Description

July 7, 1959. W.S.P., J–4–1959.

The original picture shows *Koeleria cristata* and *Carex filifolia* as the main plants. The same plants are present in the retake, although *Stipa* spp. is very abundant (from Phillips 1963, p. 155).

Second Retake

August 4, 1998. Kay–4360–18.

Casper, Wyoming

Location

Johnson Co., WY; Sec. 16, R. 79 W., T. 33 N.; GPS–UTM 4741931 N, 392000 E.

About 4 miles southeast of Casper.

Exit U.S. Interstate 25, 2 miles south of Casper onto Wyoming Highway 258 (south loop of Casper). Continue on south loop and turn left (south) onto Walcott Street. Then turn left (east) onto 15th Street, then right (south) on Oakcrest Street to the Casper Golf Course. The photopoint is southwest of the clubhouse on a man-made hill, which lies between the rifle range and golf course. The photo is taken toward the city of Casper. A water tank also helps locate the bench.

Description

September 8, 1999

Between Fairways and Around Pond

Grasses. *Agropyron intermedium, Agropyron cristatum, Agropyron smithii, Bouteloua gracilis, Stipa comata*

Synopsis

A golf course now occupies this site. The city of Casper can be seen in the distance. In the immediate foreground of the 1998 photo is *Agropyron intermedium*, which dominates much of the area around the golf course fairways.

Original Photograph

August 21, 1916. Shantz N–2–1916. Facing south.

First Retake and Description

July 7, 1959. W.S.P., J–9–1959.

The original picture has much *Artemisia* spp. and *Koeleria cristata*. In the retake the *Artemisia* has lessened and there is more grass covering. *Koeleria cristata* is abundant and also *Stipa comata* (from Phillips 1963, p. 157).

Second Retake

August 4, 1998. Kay–4360–5.

Casper, Wyoming

Location

Johnson Co., WY; Sec. 16, R. 79 W., T. 33 N.; GPS–UTM 4741934 N, 391986 E.

About 4 miles southeast of Casper.

Exit U.S. Interstate 25, 2 miles south of Casper onto Wyoming Highway 258 (south loop of Casper). Continue on south loop until Walcott Street. Then turn left (east) and continue to the public golf course. This photopoint is south of the photopoint for the previous site (pages 70 and 71).

Description

September 8, 1999

Uplands and Hills

Grasses. *Carex filifolia, Koeleria pyramidata, Agropyron smithii, Stipa comata, Bouteloua gracilis, Agropyron intermedium*

Shrubs. *Artemisia tridentata, Artemisia frigida, Gutierrezia sarothrae, Yucca glauca*

Drainage

Trees. *Populus deltoides*

Synopsis

Grass density has increased significantly since 1916. A few plants of *Populus deltoides* have become apparent in a drainage near the center between 1959 and 1998. Conifer species, predominantly *Pinus ponderosa*, have increased on the mountain. Two species, *Agropyron intermedium* and *Agropyron cristatum*, which were seeded along the edge of a golf course near this site, are now invading the site.

Original Photograph

August 21, 1916. Shantz N–5–1916. Facing south.

First Retake and Description

July 7, 1959. W.S.P., J–10–1959.

The pines here consist of two species, *Pinus ponderosa and Pinus flexilis*. The grass is mainly *Koeleria cristata* and *Carex filifolia*. There has not been much change here. The same trees are present and very little reproduction. This is an open exposed ridge, exposed to high winds. At the time the picture was taken it was necessary to hold the tripod down (from Phillips 1963, p. 159).

Second Retake

August 4, 1998. Kay–4360–30.

Casper, Wyoming

Location

Johnson, Co., WY; Sec. 33, R. 79 W., T. 33 N.; GPS–UTM 4738179 N, 391942 E.

About 5 miles south of Casper.

From Exit 185 on U.S. Interstate 25, travel south and then turn right (east) on Wyoming Boulevard (Wyoming Highway 258). Continue about 4.5 miles, then turn left (south) onto an unnamed gravel road (about 0.8 mile east of Wyoming County Road 510). Proceed about 1.5 miles to ranch headquarters. Photopoint is on top of ridge about 550 yards southwest of ranch house.

Description

September 9, 1999

Ridgetop and Slope

Grasses. *Agropyron spicatum, Koeleria pyramidata, Agropyron smithii, Stipa comata*

Shrubs and Trees. *Cercocarpus montanus, Rhus trilobata, Pinus ponderosa, Pinus flexilis*

Upland

Grasses. *Carex filifolia, Agropyron smithii, Koeleria pyramidata, Stipa comata*

Shrubs and Trees. *Artemisia tridentata, Rhus trilobata*

Synopsis

The size and abundance of conifers and shrubs have increased significantly both along the ridge in the foreground and on the mountain in the distance. Other species appear to have changed little over the past 82 years.

Original Photograph

September 1, 1937.
Shantz P–2–1937.
Facing east.

First Retake and Description

August 14, 1960. W.S.P., No. 2402.

This original picture was evidently taken from low road along side of the old road which has been completely dug out as a gravel pit for regrading the road. The original cover as described by Dr. Shantz consisted of *Stipa comata*, *Poa* spp., *Koeleria cristata*, *Opuntia polycantha*, and *Artemisia frigida*. These plants are still in evidence, but the grazing is much more intense and the *Artemisia* is more predominant in the later picture (from Phillips 1963, p. 161).

Second Retake

July 26, 1998.
Kay–4342–12A.

Cody, Wyoming

Location

Park Co., WY; Sec. 34, R. 105 W., T. 50 N.; GPS–UTM 4902330 N, 621115 E for 1937 and 1998 photopoint, and GPS–UTM 4902032 N, 620976 E for 1960 photopoint.

About 30 miles southwest of Cody.

From Cody, travel west on U.S. Highway 14 through town to Wyoming Highway 291. Continue southwest on Wyoming Highway 291, along the south fork of the Shoshoni River, for about 29 miles to the entrance of Shoshoni National Forest.

This set of photos was taken from two photopoints. The original (1937) and second retake (1998) were taken from the same photopoint, about 50 yards south of the north entrance on the east side of Wyoming Highway 291. The photopoint for the 1960 photo was taken on the west side of Wyoming Highway 291 about 50 yards south.

Description

September 10, 1999

Upland to Mountain

Grasses. *Agropyron spicatum, Stipa comata, Koeleria pyramidata*

Forbs. *Opuntia polycantha*

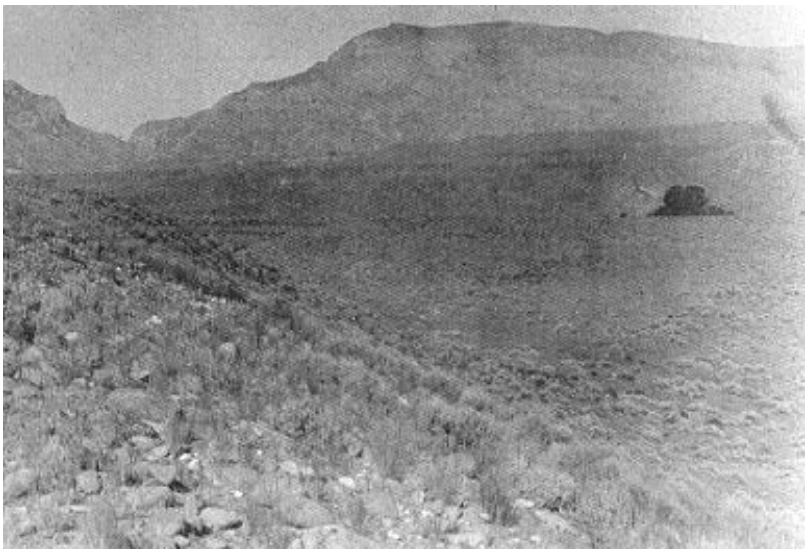
Shrubs and Trees. *Artemisia frigida, Artemisia tridentata*

Synopsis

All three photos indicate little change has occurred in herbaceous cover, production, and species composition over time, with only a slight increase in conifer density *(Pinus ponderosa)* on the mountains

Original Photograph

July 24, 1927. Reproduced black and white slide; Shantz BB–8–1927 missing. Facing west.



First Retake and Description

July 4, 1959. W.S.P., I–1–1959.

Very little difference in these two pictures. The *Pinus ponderosa* on the mountains has thickened up somewhat. The grasses mainly *Stipa* spp. about the same in both pictures, with the exception of where fill has covered grass. *Artemisia* spp. in bottomland similar and the cottonwoods along seep bank are the same (from Phillips 1963, p. 163).

Second Retake

July 26, 1998. Kay–4342–7A.

Cody, Wyoming

Location

Park Co., WY; Sec. 31, R. 101 W., T. 53 N; GPS–UTM 4932199 N, 652897 E.

North side of Buffalo Bill Museum in Cody.

From Cody, travel west on U.S. Highway 14 until reaching the Buffalo Bill Museum. The photopoint is north of the museum and about 30 yards west of the Buffalo Bill statue.

Description

September 10, 1999

Uplands to Mountain

Grasses. *Agropyron cristatum, Agropyron spicatum, Bouteloua gracilis*

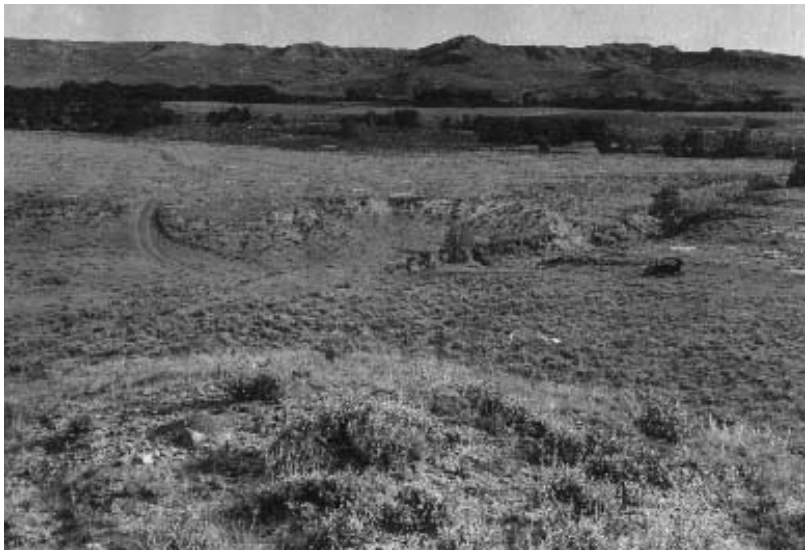
Shrubs and Trees. *Artemisia frigida, Chrysothamnus viscidiflorus, Artemisia tridentata, Shepherdia argentea, Fraxinus pennsylvanica, Populus deltoides*

Synopsis

Very little change is apparent in the retaken photographs. The original photopoint has been disturbed slightly due to development on the hillside near the Buffalo Bill monument. An electric line has been gone since 1959. *Melilotus officinalis* and *Agropyron cristatum* have invaded the disturbed hillside in the foreground. As for mountain vegetation, there has been a minor increase in conifer density in some areas but a larger reduction near the left center of the photo. The “C” in the middle of the picture (representing the town of Cody) can be seen as early as 1959.

Original Photograph

September 27, 1917.
Shantz S–11–1917.
Facing southeast.



First Retake and Description

July 5, 1959. W.S.P.,
I–11–1959.

These two pictures are remarkably alike in spite of some forty years difference in time. The modern county highway has been well-graded. Also original highway (note old Ford [above]) followed the contours of the land. The scar is still visible in the new picture. This was taken about three tenths of a mile from ranch house along main road (from Phillips 1963, p. 167).

Second Retake

July 27, 1998.
Kay–4346–7A.

Crazy Woman Creek, Wyoming

Location

Johnson Co., WY; Sec. 8, R. 79 W., T. 51 N; GPS–UTM 4917608 N, 390112 E.

About 20 miles southeast of Buffalo.

Upon exiting U.S. Interstate 25 at Buffalo, travel east on the main road before turning right onto county road TW. Continue southeast 8.4 miles to Tipperary Road before turning left (northeast) onto a secondary road. Continue northeast for 15 miles. Photopoint is on hill 50 yards north of road.

Description

September 8, 1999

Photopoint to Road

Grasses. *Poa secunda, Agropyron spicatum, Agropyron smithii, Bromus japonicus, Carex filifolia*

Shrubs. *Sarcobatus vermiculatus, Artemisia tridentata*

Beyond Road

Grasses. *Agropyron smithii, Poa secunda, Bromus japonicus, Bromus tectorum, Bouteloua gracilis, Buchloe dactyloides*

Shrubs and Trees. *Sarcobatus vermiculatus, Artemisia tridentata, Populus deltoides*

NO PHOTO AVAILABLE

Synopsis

In the 1917 photo, an old road is visible and more sagebrush is growing in the foreground than in more recent photos. *Populus deltoides* trees present in 1917 showed a significant increase in size on both drainages until 1959. However, 1998 gave a significantly different result, with *Populus deltoides* density and size reducing in the closer drainage and very little change in the distant creek. By 1959, a more permanent gravel road was established, and a ponded area is visible on the left side of the photo. After 1959, a few more buildings were constructed.

Original Photograph

September 26, 1917. Shantz S–4–1917. Facing northwest.

First Retake and Description

July 5, 1959. W.S.P., I–4–1959.

In almost the center of the original picture [above] is the Massacre Hill Monument, whereas in the new picture it is off to the right of the main road and has a gravel road leading up to it. The vegetation of this picture is almost exactly the same as S–2–1917 [see page 84] (from Phillips 1963, p. 177).

Second Retake

July 27, 1998. Kay–4344–10.

Story, Wyoming

Location

Sheridan Co., WY; Sec. 15, R. 83 W., T. 53 N.; GPS–UTM 4936150 N, 353906 E.

About 3 miles east of Story.

From Buffalo, Wyoming, travel north on U.S. Interstate 90 to Exit 44. Travel northwest on U.S. Highway 87/Wyoming Highway 344 about 5 miles to Massacre Hill Monument, site of Fetterman Massacre. Photopoint is on the large hill about 0.5 mile southwest of the monument.

Description

September 8, 1999

Uplands

Grasses. *Agropyron smithii, Stipa comata, Koeleria pyramidata, Poa pratensis, Poa secunda, Agropyron spicatum*

Shrubs. *Artemisia frigida, Gutierrezia sarothrae*

Roadside

Grasses. *Bromus inermis, Agropyron intermedium, Sporobolus cryptandrus, Agropyron smithii, Bromus japonicus*

Shrubs. *Artemisia cana*

Bottomlands and Ridges

Shrubs and Trees. *Artemisia cana, Symphoricarpos occidentalis, Shepherdia argentea, Prunus virginiana, Salix* spp., *Fraxinus pennsylvanica, Populus tremuloides*

Synopsis

Other than the landscaping from highway development (for example, note realignment of irrigation canal), the vegetation complex has changed very little over the past 80 years. The density and size of woody species appear to have increased slightly but nothing dramatic.

Original Photograph

September 26, 1917. Shantz S–2–1917. Facing north-northeast.

First Retake and Description

July 5, 1959. W.S.P., I–2–1959.

Dr. Shantz took a panorama from the top of this hill, which has a surveyor's bench mark on it. Only two of these panoramic sets of pictures are included in this report. The grass in the original picture was *Bouteloua gracilis,* along with much *Carex filifolia*. The dark shrub is *Rhus* spp., and the light colored shrub in the grass is *Artemisia* spp. In the retake, the same plants are still present and there is not too much change. The *Rhus* seems to have lessened and the *Artemisia* increased (from Phillips 1963, p.179).

Second Retake

July 27, 1998. Kay–4344–3.

Story, Wyoming

Location

Sheridan Co., WY; Sec. 15, R. 83 W., T. 53 N.; GPS–UTM 4936150 N, 353906 E.

About 3 miles east of Story.

From Buffalo, Wyoming, travel north on U.S. Interstate 90 to Exit 44. Travel northwest on U.S. Highway 87/Wyoming Highway 344 about 5 miles to Massacre Hill Monument, site of Fetterman Massacre. Photopoint is on the large hill about 0.5 mile southwest of the monument.

Description

September 8, 1999

Uplands and Hills

Grasses. *Agropyron smithii, Agropyron spicatum, Stipa comata, Koeleria pyramidata, Poa pratensis, Poa secunda, Agropyron spicatum*

Shrubs. *Artemisia frigida, Gutierrezia sarothrae*

Bottomland

Shrubs and Trees. *Artemisia cana, Artemisia tridentata, Symphoricarpos occidentalis, Shepherdia argentea, Prunus virginiana, Rhus trilobata*

Synopsis

Rhus trilobata and *Symphoricarpos occidentalis* stands continue to increase in size, as does the density of *Artemisia tridentata* and *A. cana* plants in the bottomlands. Cover of *Pinus ponderosa* has increased significantly on the Bighorn Mountains in the background. A livestock watering facility, located near the center of the photo, has been added since 1959.

Original Photograph

August 22, 1916. Reproduced black and white slide; Shantz H–10–1916 missing. Facing northwest.

First Retake and Description

July 6, 1959. W.S.P., J–3–1959.

The highway and the railroad are on opposite banks of the river in the canyon so that this retake is not in the exact location. However, it is one of the few pictures that actually show some geological change. A large section of the central bluff has caved in and fallen down since the original picture was taken. The vegetation is about the same, and aside from the angle of the retake this picture matches very well (from Phillips 1963, p. 185).

Second Retake

August 5, 1998. Kay–4360–36.

Thermopolis, Wyoming

Location

Hot Springs Co., WY; Sec. 21, R. 6 E., T. 6 N.; GPS–UTM 4818371 N 729042 E.

About 13 miles south of Thermopolis.

From Thermopolis, travel south about 13 miles on U.S. Highway 20 to milepost 119. Original photo was taken from the railroad on the west side of the river. The retakes were taken on the east side of the river near the highway. Photopoint is within the Wind River Canyon and Wind River Indian Reservation.

Description

September 9, 1999

Riverbanks

Grasses. *Phalaris arundinacea, Bromus inermis*

Shrubs and Trees. *Juniperus scopulorum*

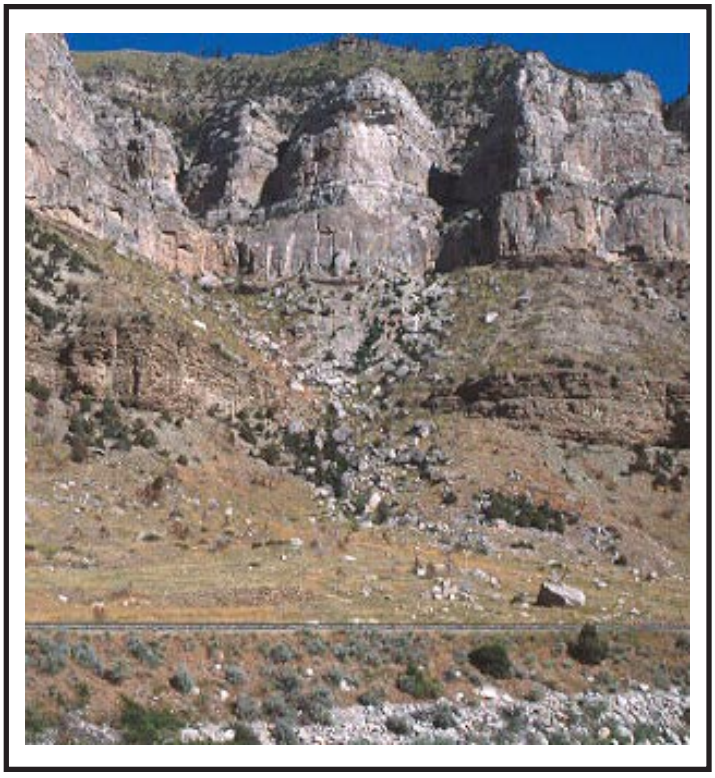
Foothills and Bluff

Grasses. *Agropyron spicatum, Koeleria pyramidata, Poa secunda, Agropyron cristatum*

Shrubs and Trees. *Juniperus scopulorum*

Synopsis

The geological changes that Phillips describes are very noticeable in the retakes. An additional rock slide occurred between 1959 and 1998 in the same area. There was also a fire on this site; notice the dead *Juniperus scopulorum* in the 1916 photograph. Fire scars can be found on many shrubs in the area. An increase in *J. scopulorum* is apparent in the 1998 retake.



Appendix 1. Plant Species, by Genus and Species and Common Name

Genus and Species	Common Name
Grasses	
Agropyron cristatum (L.) Gaertn.	Crested wheatgrass
Agropyron intermedium Host. Beauv.	Intermediate wheatgrass
Agropyron smithii Rydb.	Western wheatgrass
Agropyron spicatum (Pursh) Scribn. and Smith	Bluebunch wheatgrass
Agropyron trachycaulum Link. Malta.	Slender wheatgrass
Andropogon gerardii Vitman	Big bluestem
Andropogon hallii Hack.	Sand bluestem
Aristida pupurea var. *longiseta* (Steud.)	Fendler three-awn
Bouteloua curtipendula (Michx.)	Side-oats grama
Bouteloua gracilis (H.B.K.) Lag. ex Griffiths	Blue grama
Bouteloua hirsuta Lag.	Hairy grama
Bromus inermis Leyss.	Smooth brome
Bromus japonicus Thunb. ex Murr.	Japanese brome
Bromus tectorum L.	Downy brome
Buchloe dactyloides (Nutt.) Engelm.	Buffalograss
Calamovilfa longifolia (Hook.) Scribn.	Prairie sandreed
Carex filifolia Nutt.	Threadleaf sedge
Dichanthelium spp. (Hitch. & Chase) Gould	Dichanthelium
Elymus canadensis L.	Canada wild rye
Hordeum jubatum L.	Foxtail barley
Hordeum vulgare L.	Barley
Koeleria pyramidata (Lam.) Beauv.*	Junegrass
Muhlenbergia cuspidata (Torr.) Rydb.	Plains muhly
Muhlenbergia racemosa (Michx.) B.S.P.	Marsh muhly
Oryzopsis hymenoides (R. & S.) Ricker	Indian ricegrass
Panicum virgatum L.	Switchgrass
Phalaris arundinacea L.	Reed canarygrass
Phleum pratense L.	Timothy
Poa pratensis L.	Kentucky bluegrass
Poa secunda Presl	Sandberg's bluegrass
Schizachyrium scoparium (Michx.) Nash.†	Little bluestem
Setaria spp. Beauv.	Bristlegrass

Genus and Species	Common Name
Spartina pectinata Link	Prairie cordgrass
Sporobolus cryptandrus (Torr.) A. Gray	Sand dropseed
Stipa columbiana Macoun.	Columbia needlegrass
Stipa comata Trin. & Rupr.	Needle-and-thread grass
Stipa viridula Trin.	Green needlegrass

Forbs

Achillea millefolium L.	Yarrow
Allium reticulatum M. Ownbey	Wild onion
Allium canadense L.	Wild onion
Ambrosia trifida L.	Giant ragweed
Ambrosia psilostachya DC.	Western ragweed
Artemisia ludoviciana Nutt.‡	Cudweed sagewort
Asclepias spp. L.	Milkweed
Aster ericoides L.	White aster
Aster spp. L.	Wild aster
Bahia oppositifolia (Nutt.) DC.	Bahia
Chrysopsis villosa (Pursh) Nutt.	Golden aster
Cirsium plattense (Rydb.) Cockll.	Platte thistle
Comandra pallida (L.) Nutt.	Comandra
Conyza canadensis (L.) Cronq.	Horse-weed
Echinacea angustifolia DC.	Purple coneflower
Eriogonium spp. Michx.	Wild buckwheat
Erysimum asperum (Nutt.) DC.	Western wallflower
Grindelia squarrosa (Pursh) Dun.	Curly-top gumweed
Helianthus annuus L.	Common sunflower
Kochia scoparia (L.) Schrad.	Kochia
Lesquerella spp. S. Wats.	Bladderpod
Liatris punctata Hook.	Blazing-star
Medicago sativa L.	Alfalfa
Melilotus officinalis (L.) Pall.	Yellow sweetclover
Opuntia polycantha Haw.	Plains pricklypear
Paronychia jamesii T. & G.	James' nailwort
Phlox hoodii Rich.	Hood's phlox

Genus and Species	Common Name
Plantago patagonica Jacq.§	Patagonian plantain
Psoralea tenuiflora Pursh.	Scurfypea
Rumex spp. L.	Dock
Selaginella densa Rydb.	Spikemoss
Solidago spp. L.	Goldenrod
Sphaeralcea coccinea (Pursh) Rydb.	Scarlet globemallow
Verbena spp. L.	Vervain
Vicia americana Muhl. ex Willd.	American vetch
Xanthium strumarium L.	Cocklebur

Shrubs and Trees

Acer negundo L.	Boxelder
Amelanchier alnifolia Nutt.	Saskatoon serviceberry
Artemisia cana Pursh.	Silver sagebrush
Artemisia dracunculus L.	Silky wormwood
Artemisia filifolia Torr.	Sand sagebrush
Artemisia frigida Willd.	Fringed sagewort
Artemisia tridentata Nutt.	Big sagebrush
Atriplex nuttallii S. Wats.	Nuttall saltbush
Atriplex canescens (Pursh) Nutt.	Four-wing saltbush
Atriplex confertifolia (Torr. & Frem.) S. Wats.	Spiny saltbush
Ceratoides lanata (Pursh) Howell	Winterfat
Cercocarpus ledifolius Raf.	Mountain mahogany
Chrysothamnus nauseosus (Pall.) Britt.	Rubber rabbitbrush
Chrysothamnus viscidiflorus (Nutt.) Hook.	Green rabbitbrush
Crataegus succulenta Link	Succulent hawthorn
Eleagnus angustifolia L.	Russian olive
Fraxinus pennsylvanica Marsh.	Green ash
Gutierrezia sarothrae (Pursh) Britt. & Rusby	Broom snakeweed
Juniperus communis L.	Common juniper
Juniperus horizontalis Moench	Creeping juniper
Juniperus scopulorum Sarg.	Rocky Mountain juniper
Juniperus virginiana L.	Red cedar
Pinus ponderosa Laws.	Ponderosa pine

Genus and Species	Common Name
Shrubs and Trees	
Populus angustifolia James	Narrowleaf cottonwood
Populus deltoides Marsh.	Cottonwood
Populus tremuloides Michx.	Quaking aspen
Populus trichocarpa T. & G.	Black cottonwood
Potentilla fruticosa L.	Shrubby cinquefoil
Prunus virginiana L.	Chokecherry
Quercus stellata Wang.	Post oak
Quercus macrocarpa Michx.	Bur oak
Rhus trilobata Nutt.	Skunkbush sumac
Rosa woodsii Lindl.	Western wild rose
Salix exigua Nutt.	Sandbar willow
Sarcobatus vermiculatus (Hook.) Torr.	Greasewood
Shepherdia argentea (Pursh) Nutt.	Buffaloberry
Symphoricarpos albus (L.) Blake	White coralberry
Symphoricarpos occidentalis Hook.	Western snowberry
Tetradymia canescens DC.	Gray horsebrush
Ulmus americana L.	American elm

* *Koeleria cristata* Pers. in Phillips 1963.
† *Andropogon scoparius* Michx. in Phillips 1963.
‡ *Artemisia gnaphalodes* Nutt. in Phillips 1963.
§ *Plantago purshii* R.& S. in Phillips 1963.

Sources: Hitchcock 1950, Great Plains Flora Association 1986.

References

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