United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station

General Technical
Report
PNW-GTR-266
May 1991

Fifty Years of Research Progress: A Historical Document on the Starkey Experimental Forest and Range

Jon M. Skovlin

Author

JON M. SKOVLIN, was principal range scientist (now retired), Forestry and Range Sciences Laboratory, 1401 Gekeler Lane, La Grande, Oregon 97850.

Abstract

Skovlin, Jon M. 1991. Fifty years of research progress: a historical document on the Starkey Experimental Forest and Range. Gen. Tech. Rep. PNW-GTR-266. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 58 p.

This document traces the history of the Starkey Experimental Forest and Range since its establishment on July 11, 1940. It recalls the historical process of community development and the evolution of forest, range, and wildlife exploitation, which produced the conditions making the area appropriate for a research station. This paper recounts the comings and goings of research personnel through a half century of activities and program development. The author also analyzes a succession of events that have brought about ecological changes on the Starkey Range. Included is a list of publications resulting from research at the Starkey Experimental Forest and Range.

Keywords: History, research, range management, forest ecology, Starkey Experimental Forest and Range, Oregon (Blue Mountains).

Contents

Introduction

It is generally recognized that forest range research began in the National Forests of eastern Oregon when J.T. Jardine and A.W. Sampson first investigated the degenerated condition of mountain summer forage supply in the very early 1900s. Jardine, who later became Chief of the Office of Grazing Studies for the Forest Service, and Sampson, who later became the Director of the Great Basin Experiment Station, were working under the auspices of the National Forest Service, recently established to protect and manage the Nation's forest resources.

Although Jardine and Sampson believed that an indepth study should be done here, it would be many years before the Forest Service was able to carry out research. Eventually a separate branch was set up in the Forest Service that had jurisdiction over research, and thus began the administrative process leading to establishment of the experimental area in the Blue Mountains of eastern Oregon, not far from where the early pioneers in range management began their careers.

The first Forest Service experimental field area in the Pacific Northwest was at the Wind River Station (later Wind River Experimental Forest). For several years, the Wind River Station had been a tree seedling nursery, but after 1913 formal studies on planting techniques and seedling survival were done there. Many of the early forest researchers began their careers at the Wind River Station (Munger 1955).

Forest research in the Pacific Northwest (PNW) got its official start in 1924 when the Pacific Northwest Forest Experiment Station (PNW Station) was created in the Pacific Northwest Region of the Forest Service. But it was not until 1936 that funds for range research became available. That year, W.R. Chapline, Chief of Range Research, sent Gerald D. Pickford to Portland to begin a program in range research. The name of the station was changed immediately to the PNW Forest **and Range** Experimental Station.

Because the area reflected the history of resource exploitation typical of the ponderosa pine-bunchgrass[1] forests throughout the West, the Starkey Cattle and Horse Allotment on the Whitman National Forest in the Blue Mountains of eastern Oregon became the focus of interest by the Director and staff of the PNW Station. With the advice of Range Examiner Elbert H. Reid and Division Chief Pickford, this allotment was recommended as the future site of the Starkey Experimental Forest (fig.1).

On July 11, 1940, Acting Forest Service Chief C.M. Granger signed the document creating the Starkey Experimental Forest. Several years later, the name was changed to Starkey Experimental Forest **and Range**, and today it is still the only forest and range experimental area in the United States. Creation of the Starkey Experimental Forest and Range proved a giant step for the emerging science of range management in both research and application. Many research methods and techniques were developed from theories tested there. Studies related to livestock and wildlife interactions would make important contributions to the practical application of forest and range management.

---

[1] See appendix 4 for scientific names of all species mentioned.

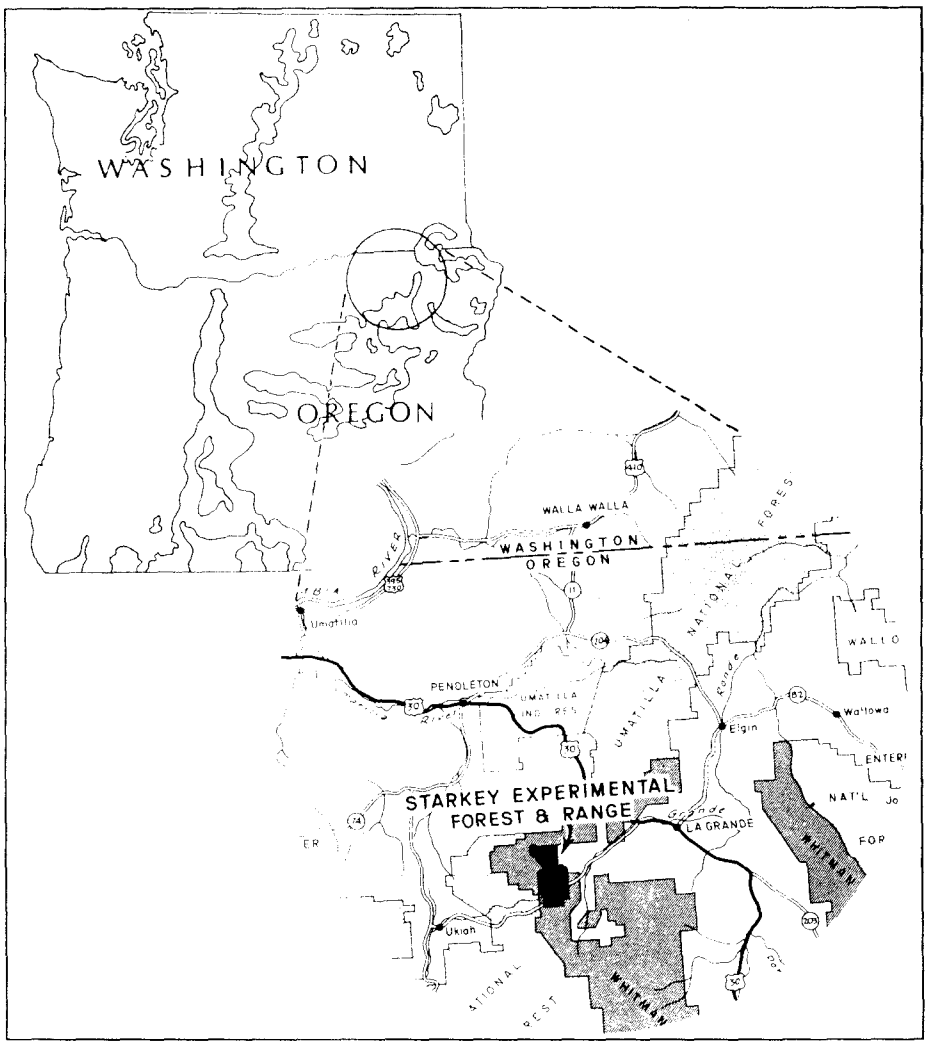


Figure 1—Ponderosa pine zone (on two-state map) in the Pacific Northwest and the Starkey Experimental Forest and Range (detailed map).

In this paper, I will describe the setting of the Starkey Experimental Forest and Range and follow the research activities conducted there. Only studies based at the Experimental Forest and Range will be included, except when essential background is needed. For cultural interest and technical necessity, however, the history of development in the greater Starkey Basin will be related.

Parallel research in other natural resource disciplines is being done at nine other Experimental Forests by the PNW Station, which covers Oregon, Washington, and Alaska. The PNW Station is one of nine similar research stations conducting Forest Service research throughout the United States.

A description of the Starkey Experimental Forest and Range and its resources is provided in appendix 1. A listing of personnel and cooperators is in appendix 2. Appendix 3 is an overview of specific studies and their contributors. Appendix 4 gives the scientific and common names of the species mentioned in the text.

History of the Starkey Basin

When researchers were looking for a site to locate an experimental forest and range in the Pacific Northwest, they looked for an area representative not only of a particular biological mix of forest and grasslands but also one reflecting the typical pattern of use occurring in the ponderosa pine forests since the arrival of settlers and their domestic livestock. Their attention focused on the forested grasslands of the Starkey area in the Blue Mountains of eastern Oregon (fig. 2).

The influence of people from the Eastern United States was first felt in the Starkey Basin when the great migration of pioneers along the Oregon Trail began in 1843. Before that, the area had been frequented by the Cayuse Indians, whose winter quarters were along the Umatilla River. Each spring in May and June, they came to the Starkey Basin to gather camas roots and fish for steelhead. During fall, they returned to catch salmon and hunt for deer and elk. When they acquired their first horses about 1710-20, the Cayuse Indians brought them to the basin, thus beginning the first use of the Starkey grasslands by domestic animals.

Trails to Rails

The main route of the Oregon Trail did not cross the Starkey Prairie but went from the Grande Ronde Valley across the mountains further north past Meacham's Station and Emigrant Springs (old U.S. Highway 30, presently U.S. Interstate 84). But as feed for their livestock herds became more difficult to find along the main wagon trail, the pioneers used an alternative cattle trail that veered to the south. This trail started near present day North Powder, climbed through the forest, and descended into the Starkey Basin. After crossing Starkey Prairie, it dropped down Rocky Ridge near the present town of Pilot Rock.

This stock route was shorter and had more grass and water than the main trail, but it was not negotiable by wagons until 1863 when it was incorporated as a toll road by a man named Daley, probably the first rancher in the Starkey area. An early section of this road was built in 1861 by the military in hopes that emigrants would take the new route rather than trespass across the Umatilla Indian Reservation where overgrazing by emigrant livestock was causing much concern among the Indians. The reservation was established by the Treaty of 1855. This treaty was not ratified by Congress until 1859, and 2 more years were needed to get the money to build the road (Tucker 1963).

Although only one early trail actually traversed what is now the Starkey Experimental Forest and Range (hereafter referred to as the Starkey Range), many routes crossed the Blue Mountains in the immediate vicinity, and the forage of the Starkey area was continually grazed by the horses and cattle passing that way. The Frazier Trail, probably named after miner and later stockman, Jacob Frazier, began as a main branch south from Daley Road after the latter reached the crest of the Blue Mountains. The Frazier Trail, passable to wagons by about 1865, led to the Sumpter and Granite mines from Umatilla Landing on the Columbia River.

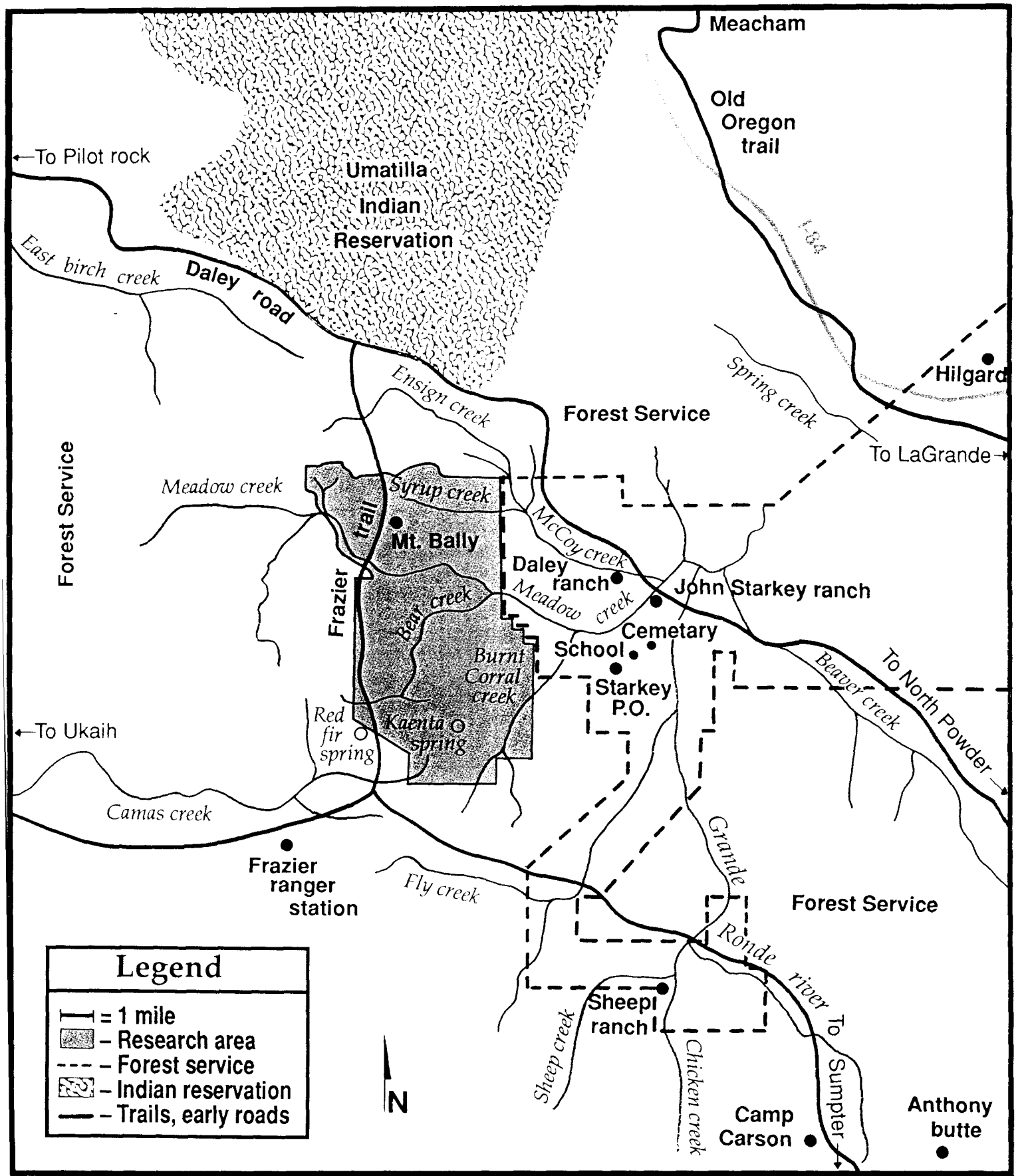


Figure 2—The Starkey area.

The Frazier route entered the Starkey Range from the northwest corner at the ford on McCoy Creek. It crossed Doug Prairie on the way to Bally Mountain and then plunged in and out of upper Meadow Creek not far from the present-day road along the west boundary near Frog Heaven Pond. After reaching Red Fir Springs, the Frazier Trail turned east toward Fly Creek and the upper Grande Ronde River. One branch proceeded east up the river to the mining camp at Woodley and on through to the Anthony Lake mines in the Elkhorn Mountains. Also in this vicinity were the Camp Carson and Indiana Mines. All these camps had drifting populations numbering in the hundreds during the 1860s mining activity, which brought steady traffic and use across the Starkey Basin.

The first movement of livestock across the Starkey area was east to west with the migration along the Oregon Trail. The reverse movement of livestock from west to east occurred during the mid 1860s, when surplus cattle from the Willamette Valley were driven to the Idaho mines. The description of one such trek which crossed the Starkey appeared in a special supplement of the Wallowa County *Chieftain* for the annual meeting of the Oregon State Cattle and Horse Raisers Association held in Enterprise on May 31, 1935. The story is related by E.S. Dement as told by his father, R.D. Dement:

> From there [the Barlow Pass] we forded the Deschutes river, over to the John Day, Birch Creek, and so on to the Blue mountains, via the Daly [sic] route, arriving on the Grande Ronde river July 1, [1864] 30 or 40 miles north [actually south] of La Grande. Here bunch grass in excess was discovered, and the cattle were voted a good rest. Two hired men were sent home leaving father and me with the cattle [200 head of steers]. We stayed there approximately six weeks,...

This was just the beginning of the cattle traffic eastward through Starkey. By the mid-1870s, when the transcontinental railroads opened up the eastern market for surplus beef from the Pacific Northwest, streams of cattle trailed across the Starkey Basin toward the railhead at Cheyenne, Wyoming. Later livestock, including horses, went via Starkey to stock the empty ranges of the Great Plains after the demise of the buffalo and eviction of the Indians. Ranchers there had discovered that Spanish longhorn cattle from Texas could not survive the winters of the northern Great Plains and the hardier Durham and shorthorn stock from Oregon was in great demand.

The Blue Mountains were a formidable crossing for cattle raised in the lowlands, and cowboys were sorely tried in trailing cattle through heavy timber. The main herds were often held on the Starkey Prairie while drovers went back for strays in the timber. Because of ample water, grass, and wood, the Starkey Basin was a popular holding ground for resting these trail driven animals (fig. 3). On the low flat bench halfway between the Daley ranch and the site of John Starkey's cabin, a big set of corrals were built. They were used to sort and brand cattle on the trail from northwest ranges to the Great Plains.

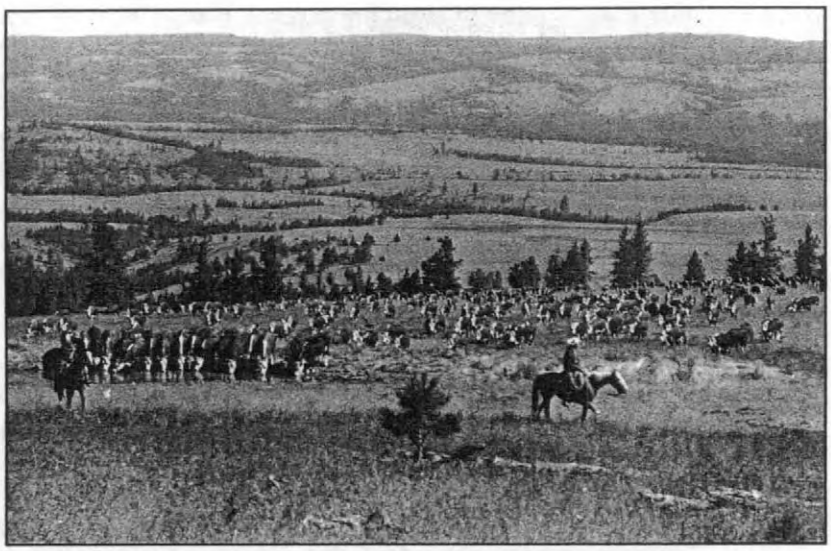


Figure 3—Cattle on trail converge at a water hole above the Starkey basin. The prairie behind them was homesteaded, but the foothills and surrounding mountains became National Forest. The Umatilla Indian Reservation is beyond the distant skyline.

Eastern cattle buyers often took delivery of consigned cattle at the Starkey corrals; for example, the Pendleton *East Oregonian* of 1879 said that Nick Nail took delivery at Starkey of several herds coming from the Columbia Basin. At the time of transfer, these herds were held as long as 2 weeks while the brand of the new owners or a road brand was placed on all trail stock. Even with the help of extra cowboys, this rebranding and sorting took considerable work.

A correspondent from the *East Oregonian*, May 29, 1880, described the scene he and stockman Joe Kenney observed between Pendleton and Pilot Rock as cattle trailed through Starkey. He reported that they saw:

> ...7 bands of cattle all ready to be driven to Cheyenne. The bands numbered about 2,000 head each. We were informed that 2 more bands were on the reservation waiting for those to get through the mountains, which numbered 6,000 head more....We met Tom Quaid, owner of one of the bands of cattle. He expected to take the Daly [sic] road. He informed [us] that 2 bands were already at Starkey's ranch... numbering 5,000.

These figures add to 25,000 head of cattle bottlenecked between Pilot Rock and Starkey waiting for snows to melt. Each spring between 1876 and 1886, it was common to find cattle herds like this crossing the Starkey prairie. Pressure mounted on the once excess bunchgrass. The grasslands of the Starkey Basin were required to meet the needs of the transient stock plus provide yearlong feed for animals belonging to the settlers. After 1886 when the transcontinental rail links of the Union Pacific and Northern Pacific connected east and west, less cattle were trailed across these grasslands.

Pioneering

In about 1869, John Starkey settled on a plot of ground near the forks of Meadow Brook (later Creek) and McCoy Creek (formerly Ensign Creek) on the north end of the Starkey Prairie. He began supplying travelers and cow columns with produce from his garden; for some, it was the first fresh vegetables since Independence, Missouri. About a year later, a man named Ensign helped to put a stagecoach line into service along the Daley Road. He established a way station at the Daley place.

Starkey's place continued to be the focal point for emigrants and later settlers, because his ranch was near the Meadow Creek ford at the crossroads of Daley Road and the improved road from upper Starkey Prairie to the Grande Ronde Valley. This latter road was not in full service until the late 1880s, and even then because it had 31 river crossings, much of the commerce to and from Starkey continued through Pilot Rock and Pendleton until the early 1890s. After construction of the first critical bridges, traffic from Starkey formerly bound for Pendleton began going to La Grande.

The last Indian uprising in the Pacific Northwest was the Paiute-Bannock (Snake) Indian war (Brimlow 1938) with the last battle fought in 1878 on what is now the Starkey Range (Weatherford 1959). The place known as The Battleground at the headwaters of Battle Creek is the site of this engagement. The Snake Indians had been warring throughout southern Idaho and eastern Oregon. Following their first defeat against army forces in the Battle of the Umatilla Reservation, they retreated toward Starkey.

The Baker *Bedrock Democrat* of July 18, 1878, reported on the progress of the war. "Starkey's Ranch, July 9—Scouts just arrived in La Grande report Indians 10 miles west of Starkey's, supposed to be 200 or 300 strong. They heard their howling and shooting."

This created a great deal of fear in Starkey residents, who sought refuge at the Daley ranch where the house was large and made of heavy logs and the water well was in the kitchen. Two days of tense waiting passed before the advanced guard of General Howard's troops arrived to protect them. The troops joined a war party of Cayuse, who after killing the Snake Chief Egan overtook and defeated the Snake Indians on the Starkey battleground.[2]

With the conclusion of the Indian problems, conditions returned to normal for the Starkey settlers. John Starkey applied for the first post office on November 11, 1879, and suggested it be located at the Daley ranch and be called Daleyville (Barklow 1987). This name was rejected, and the second choice, Starkey, was assigned on December 10, 1879. The La Grande *Gazette* of January 31, 1880, reported "The familiar countenance of John Starkey beamed upon us for a few moments on Wednesday. He reports snow melting and cattle doing finely on the Starkey meadows." Further into the paper was the note, "A new post office has been established at Starkey, John Starkey Postmaster. All mail matters for distribution at the new post office should be addressed to Starkey, Union County, Oregon."

---

[2] A 16-pound cannonball thought to have been a relic of these actions was found by a field assistant in the late 1940s. It was used around Starkey Range headquarters as a door stop for many years.

Starkey and his daughter, Aurora, maintained the post office until it was taken over temporarily by Willis Nail on February 2, 1881. The Nail brothers, from Wyoming, had bought the Daley ranch but soon resold it to J.G. McCoy. The post office was discontinued until 1889, when Frank Dun moved it onto the prairie proper. In 1890, Postmaster Dun relinquished the office to Press Burnett, who in turn gave it up to Andy Sullivan in 1895.

Sullivan had arrived in Starkey Basin in spring 1888, looking for pasture for 2,000 head of wild horses that he had driven in from Horse Heaven Hills in southeastern Washington. He soon opened a store on the upper (south) end of the prairie, and by 1900 he reported grossing over $10,000 in sales. Sullivan's Starkey store and post office was the main supply center until about 1930 for most of the cattle and sheep camps in the area. The business of freighting stock salt alone was a sizable undertaking. Sullivan became a prominent stock raiser in the community, and his base property was awarded a 100-head cattle and horse permit when the National Forests were first established.

Most settlement during the late 1880s was in middle and upper Starkey Prairie, and it was here that the first school was located. F.A. Alden contributed the land in 1888, and the materials for the one-room building were freighted in from Stumptown (Perry). Student enrollment throughout the 1890s approached as many as 50 pupils.

Sad days occurred at Starkey in 1892: diphtheria raged throughout the area, and nearly every family lost a child to the disease. The loved ones were buried in the cemetery on a forested hill a mile east of the school. The collapse of Wall Street left markets for cattle, horses, and grain at an all-time low.

Grazing Resources

By the early 1890s, the dwindling grass resources were degraded by roving bands of sheep. Since the mid-1880s, bands of sheep wintering on public domain in southeastern Oregon and northern Nevada had been driven into the Blue Mountains for summer range (Griffiths 1902). These flocks, numbering tens of thousands of animals were encroaching on bunchgrass range normally reserved for winter feed by Starkey cattle owners. J.G. McCoy told the *East Oregonian* of July 4, 1882, that within a 10-mile radius of his place there were 50,000 head of sheep. McCoy later would coauthor the noted Gordon Report (Gordon and others 1883), one of the first documents citing the degenerating conditions of the mountain summer ranges in eastern Oregon.

In 1882, John Starkey observed to the La Grande *Gazette* that the south-slope bunchgrass of the surrounding hills was gone by mid-October. This was partly the result of overgrazing by the herds of cattle being trailed across the area, but mostly it was due to transient sheep being grazed by itinerant owners considered to be "nomadic grass poachers."

Resident stockmen with roots in the Starkey area took exception to these transient bands grazing among their cattle on summer pasture. Cattle ranchers were not strongly opposed to local wool growers claims on the grass if the latter were taxpaying citizens of a nearby community; grass in the mountains was free and belonged to those who got there first, so long as they were not outsiders. The Enclosures Act of 1873 specified that no one could legally fence public domain.

Conventional wisdom of the day suggested that cattle would not graze in areas recently passed over by sheep. Cattle owners said that sheep fouled the grass and thereafter cattle would not "stay put." The fact was that once the sheep had passed through a range, grazing in tight bands of around 2,000 wethers, little grass was left.

Between 1890 and 1895, the tension between cattle owners and itinerant sheep raisers spilled over—often in bloodshed. Union County cattle owners formed a group called the Sheep Shooters Association. They ran advertisements in the La Grande *Gazette* identifying certain cattle ranges where sheep herders were advised not to cross recognizable boundaries or "deadlines." They also used the paper to announce that they would be placing lethal saltpeter mixed with stock salt on certain hotly contested range areas. This was to defer or eliminate areas from sheep grazing so that some grass would be available for cattle near home pastures in late fall and winter.

These measures were countered by local sheep raisers who formed woolgrowers protection associations to defend their interests against resentful cattle owners. Bona fide members of the Baker County branch were listed by name, brand, and location from time to time in the Baker *Democrat Herald* to help local cattle owners recognize resident woolgrowers from itinerant herders.

Aggressive sentiment turned into hostilities around Starkey as strategic positioning for the scarce forage resources became necessary. For example, Andy Sullivan, who ran horses on the flats below the Campbell brothers' homesteads (present-day research headquarters), burned out several night corrals built by itinerant sheep owners along what is now called Burnt Corral Creek. It is very likely that Sullivan also burned the accompanying tented camps of the herders. Blood was shed near the Starkey Range on upper Camas Creek when herder Lew McCarty was shot by unknown assailants.

Acute competition for summer feed in the mountains resulted in serious depletion of the forage resource throughout much of Oregon and caused growing concern among early foresters. Problems in the Cascade Range are described by Coville (1898). In 1898, Gifford Pinchot viewed mountain meadows depleted by overgrazing on the Baker City watershed. In 1902, George Sudworth, Bureau of Plant Industry, surveyed the grazing conditions throughout the central Blue Mountains, and mapped tentative boundaries for the proposed National Forest Reserves. About the same time, David Griffiths (1903), also of the Bureau, described devastated rangelands along the lower slopes on the west side of the Blue Mountains. Early forest researchers also identified serious overgrazing in the higher elevations of the Blue and Wallowa Mountains (Jardine 1909, Sampson 1908).

Reports of the depleted state of forest regeneration and grazing damage done to seedlings and ground cover, especially in Oregon, caused a national outcry and galvanized political action for protection of the forest and the soil resource. With leadership from great conservationists like Theodore Roosevelt and Gifford Pinchot, the Forest Reserve Acts of the late 1890s were passed, and by 1905 National Forest Reserves were announced.

With the creation of the National Forests and partitioning of the grazing resources among cattle and sheep ranchers, the competition for summer forage for livestock in the Blue Mountains and the associated range wars were settled once and for all. Concerning this peaceful settlement, Henry Ireland, first Supervisor of the Blue Mountain Forest Reserve, said in his 1909 report to the Chief of the Forest Service, "I...feel safe in saying that the administration of grazing within the National Forests has been responsible for the elimination or range wars, the saving of large numbers of livestock and even human lives."[3]

Having to purchase Government grass discouraged about half the potential allotment applicants. Half of the pressure from sheep grazing was also eliminated because owners without base property or nearby home ranches could not apply. By 1910, the National Forest grazing load was perhaps only half what it had been in 1900.

The original Starkey Cattle and Horse Allotment contained about 16,600 acres or 26 sections in T. 4 S., R. 34 E. At the 1958 annual meeting of the Starkey Cattle and Horse Association, the group that formed to run livestock on the above allotment, Evert Hawke showed me the letter his father, James J. Hawke, received in 1907 from Forest Ranger Ireland advising him how to make application for grazing the Forest Reserve and informing him of the charges he could expect to pay. These charges were adjusted to the length of use and to the type of livestock:

	Livestock (price per head)	
Season	**Cattle**	**Horses**
	– – – Cents – – –	
May 15-Oct. 15	20	30
April 15-Oct. 31	25	35
Entire year	30	40

For adjacent sheep allotments, Tucker reported fees between 5 and 8 cents for the regular seasons; if stock owners planned to conduct lambing on the reserves, an extra 2 cents per ewe was charged.[4]

[3] Ireland, Henry. 1910. "Grazing conditions on the Blue mountain division." Address presented at the District Supervisors' meeting, March 21-26, 1910, Portland, Oregon. On file with: Wallowa-Whitman National Forest, Box 907, Baker City, OR 97814.

[4] Tucker, Gerald J. 1963. History of the Wallowa National Forest. Unpublished document. On file with: Wallowa-Whitman National Forest, Box 907, Baker City, OR 97814.

The Starkey Cattle and Horse Allotment had over a dozen permittees (fig.4). They were allowed to graze 1,094 head of cattle and 219 horses for about 6-1/2 months (mid-April to November 1), but seasons differed with the permit. Horses were allowed yearlong grazing at first. This stocking was about 2.0 acres per head per month or 2 acres per animal unit month (AUM). Early stocking rates were continually reduced until 1940:

Year	Acres/AUM
1907	2.0
1917	2.5
1927	4.5
1937	5.0
1938	7.0
1940	7.5
1975	7.5

Forest Resources

The first resource in the Starkey area to be exploited was grass. Use of the timber resource would come later as demand increased for wood products and as technology was developed to facilitate harvest and transport to mill sites.

In 1890, the Smith-Stanley Lumber Co. built a mill at Stumptown (later Perry) where they installed the first bandsaw in northeastern Oregon. The mill was later sold to Grande Ronde Lumber Company, which was in full operation by 1895 with 200 loggers harvesting between 15 and 20 million board feet (bd. ft.) of logs per year.

The logs were floated down Meadow Creek and the Grande Ronde River to the mill through a system of splash dams. Starkey settlers found good employment in winter horse logging and spring log drives throughout the 1890s. One splash dam was on Meadow Creek in the center of the Starkey Range. Although splash-dam logging ceased on the Starkey Range in 1906 with creation of the Whitman National Forest, logs from private holdings continued to be floated to the Perry mill.

Figure 4—Some of the descendants of the original permittees are shown with Forest Service personnel at an annual meeting of the Starkey Cattle and Horse Association held at Hilgard in 1940. From left, kneeling, are Alfred Cunha and Ralph Sullivan; standing are Bill Briggs; Rube Butler, Forest Service District Ranger; Charles Umbarger; Carl Ewing, Umatilla National Forest Supervisor, and Phil Umbarger.

In 1893, 10 Starkey ranchers began a company and purchased a lumber mill at the mouth of Spring Creek. They moved the mill to a location between Meadow Creek and McCoy Creek on the Ed Geese ranch. The first trees were felled near the Pete Smith place on McCoy Creek. The mill mostly cut boards and timbers for local consumption, but surplus lumber was freighted to Pendleton and sold for $10 per thousand bd. ft. Later, an entrepreneur from Pendleton, John Leurs, set up a sawmill on his homestead along Meadow Creek near the boundary of what would become the Starkey Range (fig. 5).

There was little demand for timber in eastern Oregon until the supply of timber elsewhere in the United States began to dwindle. The timber resources around Starkey did not receive much attention until about 1920, when eastern corporations began investigating timber-buying opportunities in the upper Grande Ronde River Valley.[5]

In 1927, the new Mt. Emily Lumber Company in La Grande, whose owners were from the East, built a logging railroad from the Union Pacific mainline at Hilgard to their main timber holdings 20 miles up the Grande Ronde River. By 1930, a headquarters camp (now Camp Elkanah) was established on Meadow Creek 2 miles west of the Starkey post office and 2 miles east of the old Starkey cow camp (fig. 6). This logging railroad eventually ran 6 miles through the Starkey allotment and followed Meadow Creek and Bear Creek to a camp at Sardine Springs (Upper Bear Camp). A large woods camp was active near Sardine Springs throughout the mid-1930s. At the height of this operation, 21 carloads of logs were delivered every day to the Union Pacific mainline from the Starkey area for dispatch to the mill in La Grande.

The southern part of the Starkey Range had been under continuous Forest Service administration since 1906. Cutting was limited to 80 percent of the volume of "yellow" or mature ponderosa pine. Harvesting was primarily by winter horse logging to spurline railway landings and was conducted under contract by Mt. Emily Lumber Company between 1930 and 1939. During the late 1930s, tractor logging became commonplace.

The north part of the Starkey Range (Syrup Creek) was in private holdings until a land exchange in 1938. It consisted of 12 sections (T. 3 S., R. 44 E.) previously owned by Cunha and Vey of Echo, Oregon. Nearly all the merchantable timber was cut on this property between 1933 and 1935 and was moved by railroad.

Through the 1940s and 1950s, the headquarters camp for the Mt. Emily Lumber Company was the focal point for logging in this area. Railroad spurlines were removed as harvest was finished on surrounding areas, but the mainline up Meadow Creek and across the Starkey Range along Bear Creek to Camas Creek remained in use until 1955. After 1955, all hauling was done by log truck to La Grande on the newly completed State Highway 244.

---

[5] Lacey Co. 1919. Report on lumbering potential in northeastern Oregon. Pictorial report commissioned by August Stange. On file with: Boise Cascade Corp., Forestry Department, La Grande Division, La Grande, OR 97850.

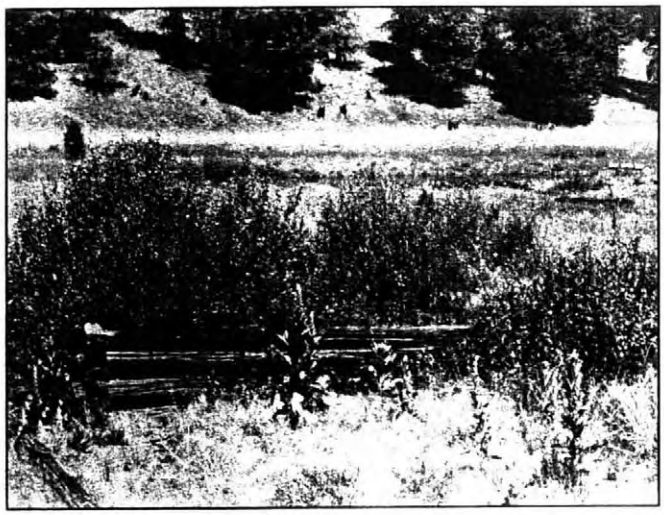
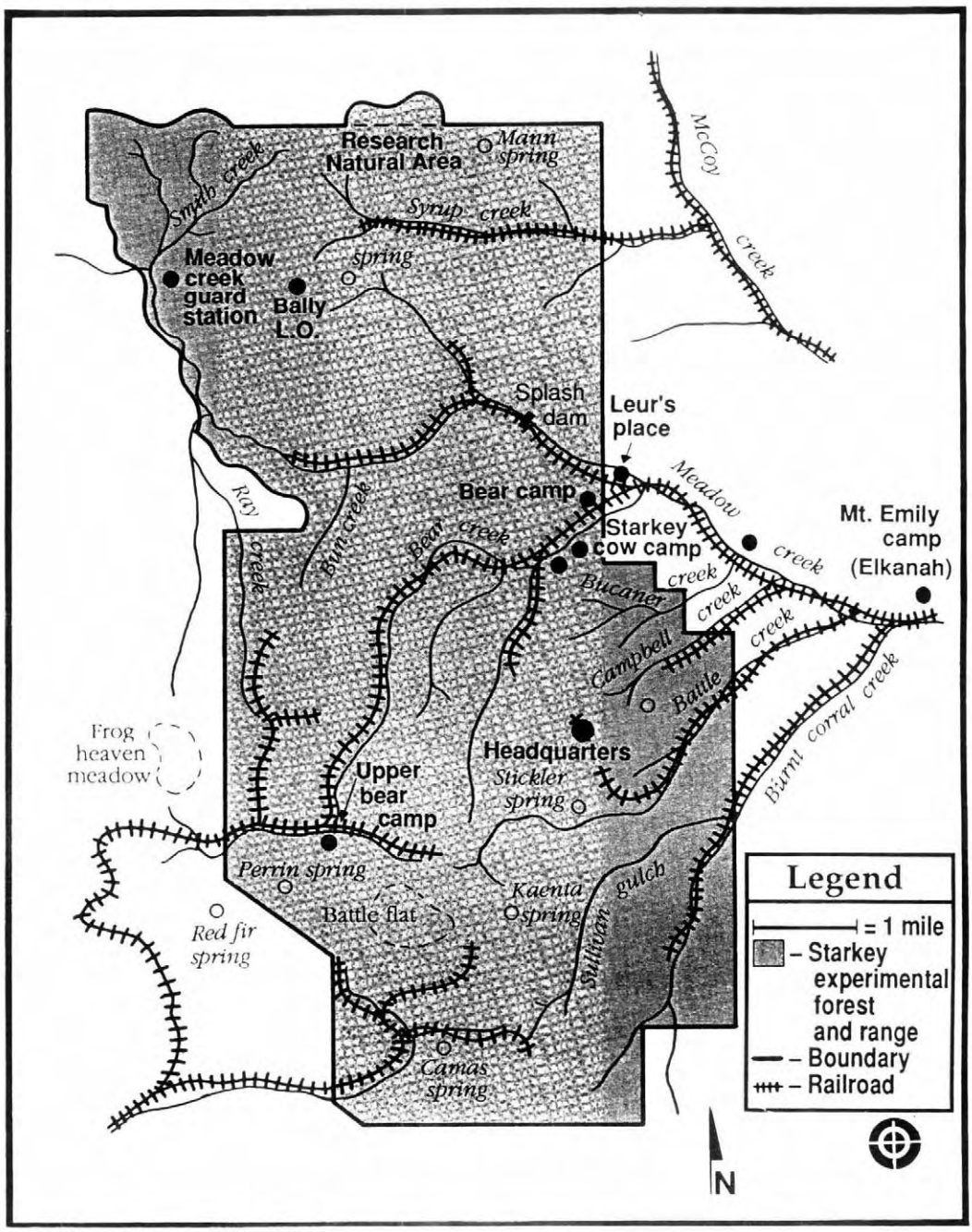


Figure 5—Remnants of the Leurs place, along Meadow Creek 2 miles above the old Starkey cow camp, were still visible in 1989

Figure 6—The Starkey Experimental Forest and Range, showing important place names, geographic features, and logging railroads.



Wildlife Resources

The history of the wildlife resources of the Starkey area follows much the same pattern of use and overuse as that of the range resources. The first written account of Starkey wildlife under pristine conditions was perhaps explorer Robert Stuart's journal for August 4, 1812. He was leading a troop of John Jacob Astor's men east from Fort Astoria looking for the best northwest passage back to the States. On that day his company had speared seven salmon in a deep pool in what was probably Meadow Creek (Rollins 1935).

Not many other early reports on Starkey Basin wildlife can be found until after mid-century: however, other explorers and naturalists, such as Bonneville (Irving 1935) and Townsend (Thwaite 1905), indicated that wildlife off the main traveled routes was in reasonable abundance. Vernon A. Bailey (1936), U.S. Biological Survey, noted "In 1854, Suckley reported...[wolves] very numerous...especially in the Blue Mountain country."

The hard winter of 1860 in the Pacific Northwest was catastrophic for all forms of ungulates, both domestic and wild, but by the mid-1870s, populations of deer and elk had recovered. Bailey (1936) reports that Charles Bendire saw a band of elk at the head of Bear Creek near Starkey in the Blue Mountains in 1878. The Pendleton *East Oregonian*, December 27, 1878, said hunters on Camas prairie reported elk were plentiful.

The La Grande *Gazette,* January 18, 1879, said some of "...the boys were going out for a little recreation and hunting in the vicinity of Rock Creek [toward Starkey]...and returned with 5 fat elk and 2 deer." A week later the paper reported five more elk were bagged above Rock Creek.

Settlers and miners, idled by deep snow and cold, took heavy toll of big game during winter. Many supplemented their income through meat hunting and buck skinning. Butchers in Walla Walla, Washington, were buying wagon loads of venison hams, and a crack shot buck skinner could kill upward of 100 animals per month during fall and early winter.

According to the Baker County *Reveille* of November 2, 1882, three local men hunted southwest into the Blue Mountains and killed 39 deer and one elk. For their 10 days of labor, they got $145 for just the venison. Two years later, the *Reveille* for September 12, 1884, said a prospector from Baker City had spent a month with another party at the headwaters of the Grande Ronde river not far from Starkey. "The party hunted only 3 days and killed 7 deer and 3 elk." It was their intention to return..."shortly and make a business of killing game which they will bring to the market."

This type of harvest seems to have been in excess of production because by the late 1880s, Starkey settlers found very little game. Obadiah Burnett arrived in Starkey in 1884 at age 15. He lived and worked there continuously until 1905 as a teamster and cowboy in summers and as a logger in winters. During that time, he recalled to me that he never saw an elk.[6]

---

[6] Personal communication, Obadiah Burnett, June 22, 1959.

Institution of game laws and the informant bounty system against poachers helped wildlife populations increase after the start of the 20th century. Bailey (1936) wrote, "In 1915, Jewett reported quite a band [elk] ranging over the region of Meadow Creek on the Whitman National Forest, where miners and sheepmen estimated their numbers at 50 or more." By the mid 1920s, elk were plentiful between Tin Trough Springs and Kaenta Springs on the Starkey according to range rider Ray Strack. He related "big bulls were tame as cattle."[7]

Elk seasons in the mid-1930s produced many trophy bulls on the Starkey range. Lumber tycoon August Stange, Mt. Emily Lumber Company, hunted elk from Sardine Springs woods camp and reported that he and his companions always managed to kill many fine specimens.

War years of the early 1940s permitted large elk buildups at Starkey, and during the severe winter of 1948, Starkey ranchers suffered heavy damage to hay stacks and reserved pastures. The Oregon State Game Commission (now Department of Fish and Wildlife) hired guards to keep elk away from stacks during that bad winter. The following year the commission declared an either-sex season. That fall is remembered throughout Starkey as the year of the cow elk slaughter.

The preceding describes the history of the Starkey Basin and how settlement affected the forest, range, and wildlife resources. It brings the reader to the point when early range researchers, Pickford and Reid, argued that a research area should be located at Starkey. They felt the Starkey Cattle and Horse Allotment was an ideal site for an experimental area where methods could be devised to reverse the degradation that uncontrolled livestock grazing had caused on similar areas throughout the ponderosa pine region in the Pacific Northwest.

Establishment and Development

Range research was conducted in northeastern Oregon as early as 1907 by such notables as Arthur W. Sampson and James T. Jardine. At the time of their studies, an idea was proposed to establish a western range experiment station in the Blue Mountains of Oregon. This project was sidetracked in Washington, DC, because there was greater pressure to begin range watershed research. In l912, the Great Basin Experiment Station in Utah was created to tackle that problem (Chapline and others 1944). The idea of an experimental range in the Pacific Northwest lay dormant for nearly 30 more years.

In this interim, the PNW Station was opened in 1924 in Portland as the research counterpart of the Pacific Northwest Region, U.S. Forest Service. This was in line with a national movement to have a research organization in each major forested regions of the country. Each research organization was to be a branch separate in duties and jurisdiction from the administrative branch of the Forest Service. The original intent for the experiment stations was to develop practices leading to sustained yield management of the forest crop—trees.

---

[7] Personal communication, Ray Strack, June 29, 1956.

Forest management research in the PNW Station was active in surveying Federal and private forest lands to subdue fears of a continued "cut out and get out" policy that had developed in the industry in the Midwest only a few decades before. Concern for the dwindling forage resource of the forest and range land after the drought conditions of the mid-1930s had initiated a west-wide cooperative State and Federal effort called the Western Cooperative Range Survey.[8]

National attention also was focused on the deteriorating state of the western range by Senate Document 199 (U.S. Senate 1936), which was dubbed "The Green Book" (from the color of its cover). In response, the problems of overgrazed mountain ranges was added to the list of concerns for the PNW Station to research. The Station had $11,850 to conduct range research in fiscal year 1937.[9]

A forest ecologist with experience in range research, Gerald D. Pickford, was transferred to the PNW Station in December 1936 from the Intermountain Forest and Range Experiment Station. Station Director Thornton T. Munger gave Pickford the task of starting a range management research program. Elbert H. "Bert" Reid, a junior range examiner at the Snoqualmie National Forest, in Washington, was brought to the Station in early 1937 to assist Pickford.

In the late 1930s, Pickford and Reid spent much of their summer field seasons east of the Cascade Range visiting problem sites and assessing research needs. They found serious problems were occurring on both high-mountain sheep range and ponderosa pine summer cattle range.

Field investigations were widespread during these first few years as problem areas and approaches were investigated (fig. 7). To assist PNW Station researchers in range survey methodology and inventory, N. Talmadge Nelson was hired as a field assistant in mid-1937. These three people—Pickford, Reid and Nelson—formed the core of the range division for several years.

While Reid operated field activities from subalpine areas in the Wallowa Mountains to the sagebrush slopes of the Steens Mountains in southeastern Oregon, Pickford usually investigated range problems and developed regional-level cooperative programs. He found problems ranging from sheep overgrazing in Douglas-fir regeneration after clearcutting in the Coast Range to excessive elk use of mountain meadows in the Elkhorn Mountains in eastern Oregon (Pickford and Reid 1942).

---

[8] The Western Cooperative Range Survey was a Federal and State program to investigate range problems and find solutions. Because it involved research and development, the PNW Station was a focal point for coordinating activities in Oregon and Washington.

[9] Cowlin, Robert W. October 1988. Federal forest research in the Pacific Northwest: The Pacific Northwest Research Station. Unpublished report. On file with: All field laboratories of the Pacific Northwest Research Station and in Research Information Services and the Director's Office, Pacific Northwest Research Station, P.O. Box 3890, Portland, OR 97208-3890.

Figure 7—Left to right, Carl Ewing, Umatilla National Forest Supervisor, and Lynn Douglas, Assistant Regional Forester in charge of grazing, look on as Bert Reid (kneeling) shows W.R. Chapline, Chief of Range Research, a map of Starkey during a range review in summer 1938. (Photo courtesy of Stewart Pickford.)

Pickford's memo of September 13, 1938, transmitting an analysis of the PNW range problems to the new Station Director, Stephen N. Wyckoff, identified the most critical problem as lack of information on the management of cattle summer range within the ponderosa pine type. Pickford's subsequent letter of November 3, 1939, copied to Assistant Regional Forester Lynn Douglas and Umatilla National Forest Supervisor Carl Ewing, described the Starkey Cattle and Horse Allotment on the Whitman National Forest in the Blue Mountains as suitable for a research station, one fitting into the entire range program of the PNW Station.

In 1939, the field headquarters for range research was housed at the Frazier Ranger Station, Umatilla National Forest, near Lehman Hot Springs. The four-person survey crew was posted at the nearby Meadow Creek Guard Station with the assignment to compare range survey methods by using land on the Starkey Cattle and Horse Allotment. The outcome of their study was an appraisal of range survey methods, which was reported in the second publication issued by the range research division of the PNW Station (Reid and others 1942). This information was used to formulate a grazing-capacity forage-type map of the Starkey Range. In 1940, this new methodology and the use of aerial photographs were applied to the nearby Bullrun Allotment on the Whitman National Forest in cooperation with Oregon State College (OSC; now Oregon State University [OSU]) as a part of the continuing Western Cooperative Range Survey.

At the end of the 1930s, advocates insisted that a critical need existed for an experimental range east of the Cascade Range. During winter 1939, the range staff drafted an atlas of the Starkey Experimental Forest[10] which described the area and gave justifications for its selection as a research area. Amended to this document was a proposal for the creation of the research area. On June 13, 1939, the document was forwarded to the Chief of the Forest Service and, after due deliberation, on July 11, 1940, the Starkey Experimental Forest was signed into being.

Program Development

Until 1940, emphasis at the Starkey Range had been on developing techniques of survey and measurement of forage production, use, and cover. Now, with the establishment of a bona fide experimental area, application of this research could begin. In 1941, a detailed usage survey was accomplished throughout the grazing season. A series of three 2.5-acre grazing exclosures was installed in 1941 on different grassland range types to assess ecological change over time.

In 1942, the remainder of the allotment boundary was fenced and a cross fence was installed so that a simple two-unit rotated deferred system could begin (fig. 8). The allotment had undergone some reductions in season of grazing in 1939 to bring the stocking level to about 7.5 acres per AUM.

Research was mostly dormant during World War II at Starkey, although training and extension activities continued (fig. 9). Allotment management and administration proceeded under the March 29, 1943, range management plan for the Starkey allotment on the Starkey Experimental Forest.[11] This 15-page document, prepared in cooperation with the Ukiah Ranger District under Ranger Rube Butler, was a model for modern management of the day. Under this management plan, the goals were for the allotment to serve "(1) as a location for range research studies and (2) as a demonstration range in good condition under practical management."

The next research activity on the Starkey began in 1944 with the temporary assignment of Robert S. Rummell (P-1, Range Examiner) for Bert Reid, who was on detail to a military project. Rummell reported to Pickford in Portland in mid-1944 and was immediately sent to run the one-person range use survey of the Starkey Experimental Forest. Rummell had surveyed several adjacent allotments in 1941 and was familiar with the procedures and vegetation. With the survey information, a range development plan was formulated in 1945 that incorporated increased fencing for management systems and expanded water and salt facilities to improve range condition. It was assumed that studies to determine proper levels of stocking would begin soon.

---

[10] The first publication was a simple key to important range plants of eastern Oregon.

[11] Range management plan for the Starkey Experimental Range. March 29, 1943. On file with: La Grande Ranger District, La Grande, OR 97850.

Figure 8—An innovative way to dispense wire for fence building in steep terrain is shown by Curtis J. "Brig" Young, who with his wife, Lydia, built many of the early fences on the Starkey Range. (Photo from National Agricultural Library, Forest Service collection).

Figure 9—Rangers and staff of the Umatilla National Forest attend a grazing workshop put on at Starkey in August 1944 by PNW Station staff. Pictured at the Battleground exclosure from left are Boyd Rasmussen, Bob Rummell (kneeling), unidentified, Gerald Pickford (kneeling facing camera), Gerald Tucker (standing facing in regulation hat), Bert Reid and Willis Ward; John Clouston, (kneeling closest to camera), and to his right, (kneeling), Glen Jorgenson and Don Miller. Others in photo (not readily identifiable) are Charlie Rector, Rube Butler, John Kucera and Bill Webber.

Starkey work was still headquartered at Frazier Ranger Station because the headquarters site at Campbell Flat had no facilities. The site for the headquarters was a contentious issue around the PNW Station for several years.[12] Although the range division, namely G.D. Pickford, had selected a desirable location overlooking grassland flats in the foreground, the Blue Mountains in the midground, and snowcapped Wallowa Mountains in the distance, Director Munger, citing cost consciousness, determined that the range headquarters should be below Campbell Springs with a gravity water feed and in more forested surroundings. Before either site was occupied, the Director resigned and Pickford transferred out of research to the Rocky Mountain Region.

Before he departed, Pickford was cooperatively involved in range reseeding research for restoring depleted lands. With people like E.R. Jackman and Jardine now of OSC, he was able to establish a broad network of reseeding nurseries in eastern Oregon and Washington. A paper by Pickford and Jackman (1944) was the first regional treatment on rangeland reseeding.

In September 1945, another giant in range research emerged from the Intermountain Station to become the Chief of Range Research in PNW Station. This was Joseph F. Pechanec, who in a few years would become the first president of the Society for Range Management. Through his efforts, the name of the Starkey Experimental Forest was changed to the Starkey Experimental Forest **and Range** to recognize the uniqueness of the grassland research done there. Pechanec was able to garner considerable resources for reseeding by exploiting cooperative contacts with OSC, Soil Conservation Service (SCS), and the National Forest System. Rummell was reassigned a position in the Wenatchee Research Station, and Sam Stevenson took charge of range seeding research at Starkey and throughout eastern Oregon.

In 1945, two large reseeding nurseries were established at Starkey. The one at Campbell Flat was an adaptability trial on deep, fertile soils, and the other at Ray Creek Ridge was a soil treatment and scabland rehabilitation site (fig. 10). These trials resulted in immediate turnaround of research money. They were highly visible for demonstration purposes and were popular in research application. Along with research interest in reseeding, practical management projects to improve cattle distribution with such measures as water development, salting, and range riding were being refined at Starkey.

The late 1940s was a time for improvement of facilities. First, a permanent office was established in La Grande for Reid and his research staff. Second, at Starkey, the headquarters site and range were equipped with the physical facilities needed for the comprehensive grazing study being planned. Surplus war materials such as pipe, water tanks, and fencing was stockpiled.

[12] Personal communication, Phil Briegleb, Station Director (retired), September 21, 1988.

Figure 10—The Campbell Flat forage reseeding nursery was a popular tour stop for forest users and managers during the late 1940s.

Field assistant Jack Bohning has the distinction of requisitioning the first permanent building at Starkey headquarters. The story goes that Reid was talking in jest with Carl Ewing, Supervisor of the Umatilla National Forest, at the Frazier Ranger Station and suggested, "We could sure use that office building at Campbell Flat to store grass seed." Also in jest, Ewing said, "Go ahead and take it." Reid immediately told Bohning to move the building to Campbell Flat and set it up. With tractor, truck, and skids, Bohning and Clare Fleetwood, Wallowa-Whitman National Forest Service road crew boss, moved it. Ewing later told Reid he was glad Reid didn't ask for the whole Ranger Station. After it was moved to the Starkey Range, this small building became the Bohning family's residence (fig. 11).

Reid's first draft of the grazing management study, with enlargements on some of Pickford's ideas, was completed in about 1946.[13] Joe Pechanec said "We went through...the agonies of planning with a multitude of experts contributing ingenuous designs."[14] Within the plan was the rationale to answer such questions as, What is the proper level of use under several systems of grazing to maintain or improve forested range land? What rate of stocking gives the best animal performance? How can one recognize rangeland condition and trend in the field? What is the effect of tree overstory on forage, the effect of cattle use on deer and elk, and the influence of levels of stocking on runoff and erosion?

---

[13] Pickford's correspondence on file with: Forestry and Range Sciences Laboratory, 1401 Geckeler Lane, La Grande, OR 97850.

[14] Personal communication, Joe Pechanec, October 4, 1988.

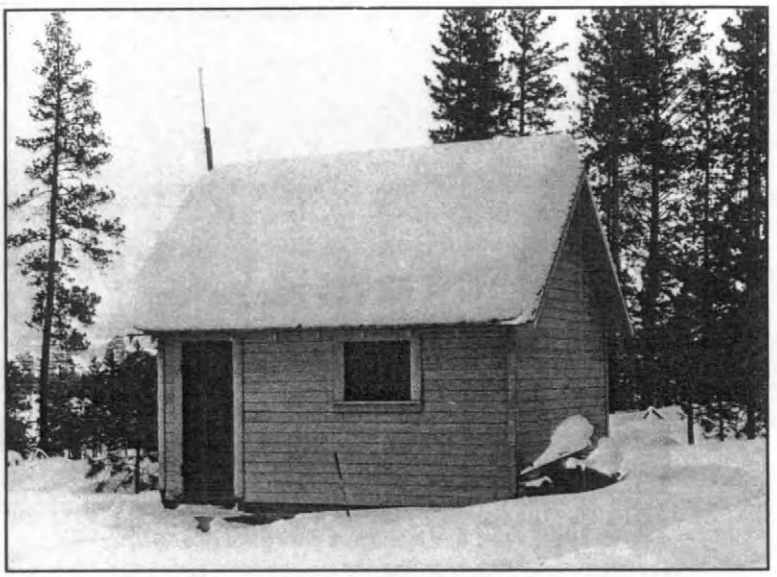


Figure 11—The first building on the Starkey Experimental Forest and Range. It was moved from the Frasier Ranger Station to the headquarters site and has been variously used for seed storage, staff housing, laboratory, radio shack, and equipment storage.

During this time, Robert W. Harris from the Rocky Mountain Forest and Range Experiment Station was hired as a range conservationist (research). Another full-time researcher added at this same time was George A. Garrison from the SCS. Garrison mostly pursued studies off the Starkey Range that dealt with effects of logging on forage production. Clipping response of wildland shrubs also was within his purview. The La Grande work center leader, Reid, transferred to the Washington Office of the Forest Service in 1948 and was replaced by Clark Holscher, who became active in cooperative ventures on big game winter ranges with the Oregon Game Commission.

In 1948, a two-bedroom prefabricated house was erected at the headquarters site (fig. 12), and a 25,000-gallon concrete water storage reservoir was finished. The cooperative weather station was transferred from the Starkey post office to a position in the Campbell Flat exclosure in front of the headquarters.

Besides the ongoing local Starkey projects, a west-wide study to test procedures for evaluating rangeland condition and trend was inaugurated. Kenneth Parker, later Chief of Range Research, was instrumental in locating a test site at Starkey to represent the ponderosa pine-bunchgrass range. One of the more promising procedures, the so-called Parker three-step method, was studied on the Starkey Range.

The early 1950s were a time of reorganization and change. Starkey was most affected by the loss of funding for range reseeding research. This precipitated many changes in activities and personnel at Starkey. The two nurseries were transferred to the Agricultural Research Service (ARS), and agronomist Jerald Klomp took

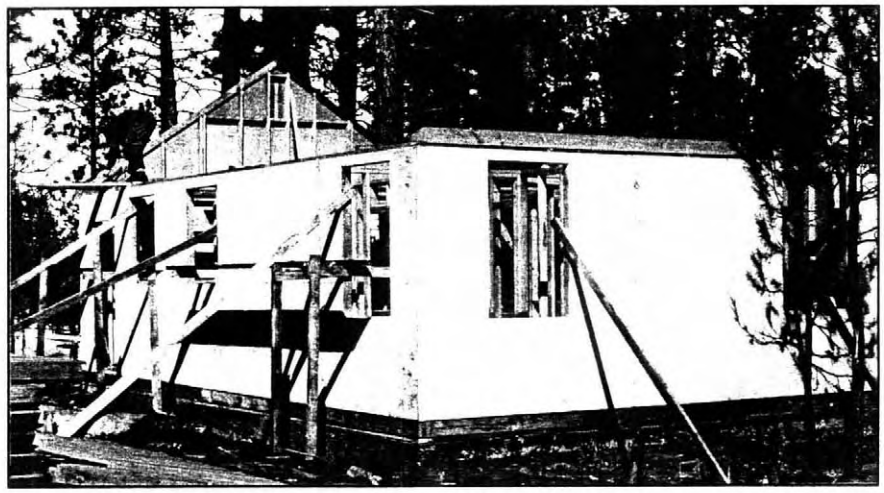


Figure 12—The prefabricated main residence at Starkey headquarters was assembled in late fall 1948. Shorty Oswald, District Ranger Assistant, La Grande District, is shown cutting out rafter notches.

charge of the studies. Stevenson resigned, but before leaving he published most of the reseeding results in cooperation with Pacific Northwest Region range personnel in the first comprehensive range management handbook.[15] Rummell and Holscher (1955) later summarized the remaining Starkey reseeding research.

As a part of the reorganization of research programs, working units now became research centers. The La Grande unit was renamed the Blue Mountain Research Center. The Blue Mountain Experimental Forest within the Malheur National Forest was reactivated in the early 1950s with studies on thinning and spacing and timber growth and yield done by personnel at the Deschutes Research Center at Bend. Some of the fixtures of the old Blue Mountain Experimental Forest were transferred to Starkey by "midnight requisition" before reactivation by the Bend Center.

Richard S. Driscoll, Range Conservationist (Research), came to provide backup on the grazing study. Pechanec transferred to the Washington Office to replace the retired Chapline. In 1953, David F. Costello from the Rocky Mountain Station assumed the position of PNW Station Chief of Range Management Research (vacated by Pechanec), and Reid went to the Rocky Mountain Station after 4 years in the Washington Office. Garrison transferred to Wenatchee to head the program begun by Rummell. By 1954, the rash of transfers and reorganization caused by the ARS takeover was nearly finished.

---

[15] Anonymous. ca. 1954. Range Management Handbook, Region 6, Portland, Oregon: On file in Regional Forester's office, U.S. Department of Agriculture, Portland, OR 97208.

During every change in personnel and administrative reorganization, the plan to implement the big grazing study continued. Two documents were negotiated to ensure its continuity. The first was a formal memorandum of understanding with the Starkey Cattle and Horse Association for use of their cattle and facilities in range research. A separate provision was made for special studies with individual permittees. The second memo documented an expansion of the Starkey Range by 3,500 acres, for a total of nearly 30,000 acres, and the new number of alloted cattle to 825 head. This expansion resulted from an agreement with the Cunha family of Echo, Oregon. When the Cunhas incorporated their adjoining allotment into the Starkey Range, the necessary 250 cattle from a single ownership was available for use in the Starkey grazing study.

Until 1955, the Starkey Cattle and Horse Association had used the old Pete Evenson homestead on Meadow Creek as their cow camp and headquarters. This location was inconvenient for the range rider in charge of the cattle on the experimental area. Before the Mt. Emily Lumber Company removed its logging railline from the Starkey area, several boxcars and buildings were hauled by train to a new cow camp site on Bear Creek. The Starkey Cattle and Horse Association converted the cars to houses. Holding pastures, weighing scales, and large separating corrals were installed near the new cow camp in preparation for the grazing study (fig. 13).

Figure 13—These corrals and weighing scales were completed in 1955 at the new Starkey cow camp on Bear Creek. They were used for both range research programs and cattle allotment managment. (Photo courtesy of Gildemeister Studio.)

By 1954, the pasture fences were completed in preparation for the long-term grazing experiment. Practical means of improving livestock distribution were incorporated throughout the experimental pastures. The number of watering facilities had been doubled since 1948. Careful planning went into the placement of salt grounds and fences to increase the usability of the range forage. During summer 1954, 11 special "show-me" tours were offered to ranchers, range and forest officers, and students (fig. 14). The need for these tours increased as interest widened about the planned study.

In 1955, after 2 years of grazing calibration and minor stocking adjustments, the study was begun. It had the blessing of the Washington Office and budgetary commitments from the PNW Station. This commitment was programmed for 10 years to look at naturally slow successional changes and to capture the normal variation in weather and climate. During the mid-life of the study, several research administrators attempted to scuttle the project.

Harris was made a project leader for the Blue Mountain Research Center after Holscher took an overseas assignment with the Food and Agriculture Organization in Rome, Italy. It was under Harris that the grazing study was finally implemented, but in 1956, he was transferred to the Washington Office. Driscoll was transferred to the Deschutes Research Center to begin the first full-time PNW Station wildlife habitat investigations. While at Starkey, he began a 3-year clipping study of elk sedge, which became the problem part of his graduate program at OSC.

Figure 14—County extension specialists and key eastern Oregon ranchers listen to Range Conservationist (Research) Robert W. Harris discuss the purpose of the Starkey grazing study in front of headquarters in 1951.

By 1956, several new postwar researchers had been brought in to administer ongoing Starkey studies. Merton J. Reed, from the Northern Great Plains Research Center, became Research Center leader following Harris; Gerald Strickler and Jon Skovlin, both recent graduate students and now range conservationists (research), were detailed to carry on condition and trend studies and the Starkey grazing study, respectively. Floyd A. Johnson, PNW Station Biometrician, spent many long days in the grazing pastures discussing theoretical and applied statistics with the new staff. His evenings were spent at headquarters teaching practical games of chance with sometimes debatable statistical methods.

A brief expansion of the forest management research program in the late 1950s brought James Trappe to do cooperative survey work on Blue Mountain lodgepole pine stands with Pilot Rock Lumber Co. Funds were not sustaining, and the sample plots in and near Starkey were later used in an equally short-lived watershed research project by hydrologist Norman Miner and his Portland Division Chief, Jerry Dunford. In 1958, Miner transferred and was replaced by Daniel M. Bishop.

Once again a shift occurred in research philosophy, and in mid-1950 a reorganization brought together interdisciplinary teams of researchers at central locations. These teams were to investigate broad research problems affecting ecological areas as opposed to local problems within fixed research boundaries (Munger 1955). This concept was used at Starkey for about 10 years.

During the late 1950s, the first broad-scale correlated forest and range land soils inventory in the Pacific Northwest was implemented at Starkey with the SCS as lead agency. This undertaking produced a detailed map that became the basis for describing the relation between vegetation and soils for the entire Blue Mountains. The scientific importance of this was not fully realized until the assignment of soil scientist J. Michael Geist to La Grande in the late 1960s.

Problems began to surface between the administration and research branches of the Forest Service regarding the Starkey Range in 1960. A succession of foresters appeared at the La Grande Ranger District just before 1958, and the relation between administering the forest and the purpose of the research area blurred. When John M. Wick was assigned to the La Grande District, his term of service coincided with the purchase of Mt. Emily Lumber Company by Valsetz Lumber Company. In taking over the La Grande holdings, Valsetz sought to follow up on a 18-million-board-foot sale at Starkey; the first big timber offering since a research program had been established. The local forest and Valsetz wanted to consummate the sale to meet the allowable cut for the district. Researchers objected, however, as they did not want to forego future options for timber and range studies.

The above mixture had all the potential for a disastrous outcome for research at Starkey, but with the aid of PNW Station Director and assistance from the Regional Forester, a memorandum of agreement was drafted by all parties based on the original language in the Forest Service regulations that had established the Starkey Experimental Forest and Range Research Station. Although the sale continued, terms of the contract were modified to protect research interests. From then on, the Wallowa-Whitman National Forest deferred to the purpose of research in the Starkey experimental areas.

Reed transferred to the Pacific Southwest Station in 1958 to administer the San Joaquin Experimental Range. His understanding of sampling and statistical analysis had been a great boost to the young research staff at Starkey. Garrison, absent from La Grande for 4 years, returned as center leader. His skill at negotiating cooperative ventures broadened research participation with Eastern Oregon State College (EOSC) in areas of plant materials analysis, computer modeling, and radiological investigation.

In 1962 the Wallowa-Whitman National Forest range staff conducted the first range survey on the Starkey allotment since 1939. Use of the soil survey aided the task and contributed greatly to their survey work throughout the Forest.

By about 1962, the Experiment Station research centers were again reorganized, this time into specific research projects with designated project leaders (fig. 15). This brought separate identity to wildlife studies, and all money previously set aside for wildlife under range programs now appeared in the wildlife project, which was first located at Bend, then Wenatchee, and eventually La Grande. Wildlife habitat investigations were slow to come to Starkey: however, some studies on big game use of range land were incorporated in the Starkey grazing study.

The first wildlife biologist at La Grande was Paul Edgerton (fig. 16). His ecological studies showed elk were capable of modifying their habitat by grazing out the shrub component. An important finding after 5 years of big game inventory at Starkey was that deer and elk use up to half the forage in pastures they graze in common with cattle. Competition for the same plant species and areas was not so acute, however.

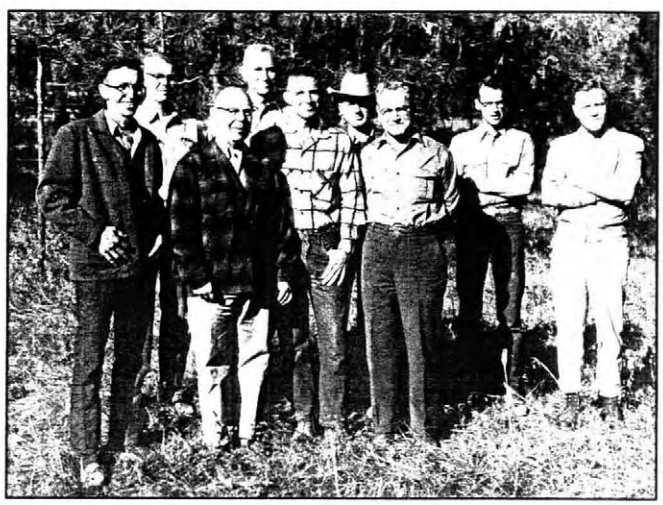


Figure 15—The Range and Wildlife Habitat Division staff attended a program conference at Starkey Experimental Forest and Range in September 1961. Pictured from left to right are Gerald Strickler; Richard Driscoll; David Costello, Division Chief PNW Station; Justin Smith, Project Leader, wildlife habitat project; Burt McConnell; Edward Dealy; George Garrison, Project Leader, range project; Jon Skovlin, and Floyd Johnson, PNW Station Biometrician.

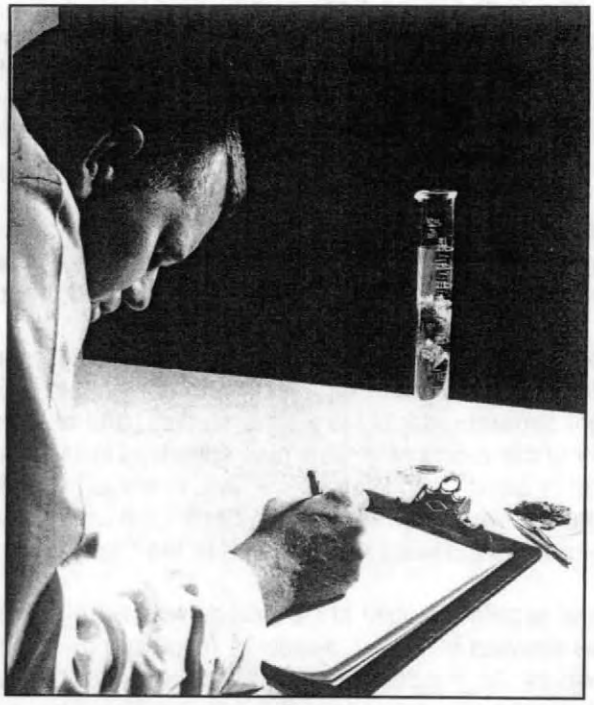


Figure 16—Research wildlife biologist Paul Edgerton records grouse diet in early wildlife studies at the Starkey Range.

Another change in National Forest Service leadership brought emphasis on basic research. Breakthroughs in range science, such as the discovery of isotopes for tracing plant food reserves, were in short supply and sorely needed. The Starkey grazing study was applied research, so the unit looked for ways to shift to more basic science. Carl Goebel was sent to the La Grande center to carry out ecological studies of forested range lands.

By 1966, the Starkey grazing study was in its final phase. Both blocks of pastures (5000 acres each) had been grazed at prescribed rates for 11 years. The frequent roundup of cattle for the weighing trials had been a practical range management experience for many of the researchers during this study (fig. 17). Analysis of the grazing study showed benefits from rotational grazing systems. Although season-long grazing produced about the same weight gains on cows and calves as deferred rotation, deferred rotation provided better protection of forage and soil resources. Until now, most Forest Service allotments had been grazed on a season-long basis because there was no scientific support for a rotational grazing system.

Summer 1967 was devoted to a coordinated effort to update the Starkey Cattle and Horse Allotment Management Plan. The Wallowa-Whitman National Forest range staff, headed by Jim Reid (Bert's son) conducted the field investigation; office procedures were directed by Charles Johnson. This document was preparatory for timber sale planning and allotment management changes at the conclusion of the grazing study.

Figure 17—Research personnel join permittees and range riders to round up cattle from experimental pastures at Starkey. Pictured from left to right, Bud Morgan, John Correa, George Garrison, Ed Bloom, Jon Skovlin, and Ray Strack. (Photo courtesy of Gerald Strickler.)

The problem of integrating future research needs with accelerated management activities by the La Grande Ranger District again became a heated issue. Coincidentally, the Washington Office issued a supplement that required coordinated 5-year action-planning documentation between related institutions; that is, research area administrators (usually project leaders) and forest supervisors.

Resource coordination among disciplines within National Forest systems and between them and dependent communities became essential during the late 1960s. Multiple-use management plans were prepared in all 900 Ranger Districts throughout the United States. The plan for the La Grande District incorporated Starkey research and management in a new framework. Fire management, forest engineering, transportation, and all resource uses were to be planned locally and coordinated with the research program. By now the Starkey Experimental Forest and Range timber reserves had been removed from the allowable cut of the Wallowa-Whitman National Forest.

The Starkey range research staff at La Grande was soon to include a wildlife research staff. In the new round of reorganization in the late 1960s, hydrological studies were moved to Wenatchee, forest management research was concentrated at Bend, and the former Blue Mountain Research Center at La Grande retained range research and acquired the wildlife program. Joining the project leader, Justin Smith, who came in 1967, were Burt R. McConnell from Wenatchee and J. Edward Dealy from Bend. Except for some work by Edgerton, most of the new project's work would be conducted away from the Starkey Range. Skovlin, who had been on a 3-year assignment in Kenya with the United Nations Food and Agriculture Organization, returned in 1971 as a research biologist with the wildlife project.

With the addition of the wildlife component, the need increased for office and laboratory facilities. In 1969, funds were appropriated for a new facility located next to the campus of Eastern Oregon State College in La Grande. This link would allow plant and soils materials from Starkey to be analyzed locally. It would also ease the problem of the expensive lease, which paid for downtown office, laboratory, and storage space. The impressive Range and Wildlife Habitat Laboratory in La Grande was completed in 1969.

Operations at the Starkey headquarters were given a boost in 1970 with provision of year-round electric power (fig. 18). Underground power lines were brought across the lower flats from Camp Elkanah. Electric appliances replaced costly and sometimes dangerous gas-fired ovens and drying facilities, thereby making field sample preparation (for example, forage or soil grinding) much easier. A new central laundry and shower facility made domestic chores less time consuming. Quarters for field assistants were upgraded with several house trailers.

The 1970s brought greater public awareness of environmental issues, and use of pesticides on public land was questioned in all forms. Starkey became a testing ground for certain chemicals because environmental assessment reports were not required for research studies.

During the early 1970s, the Government Draw game-only pasture used in the Starkey grazing study was nominated as a Research Natural Area (RNA). Such areas have total protection for scientific research and future biological observation. The area at Starkey represented a relatively undisturbed pure virgin pine-bunchgrass ecosystem.

Figure 18—Wildlife habitat Project Leader Justin Smith hands range Project Leader George Garrison the keys for switching on the recently acquired electrical power mains at the Starkey range in 1970.

Very little research activity took place at Starkey between 1970 and 1975. This was due partly to redirected research emphasis calling for the "centers of excellence" approach and partly to problems cropping up elsewhere in the area. The thrust of range and wildlife research turned from the ponderosa pine-bunchgrass type to the spruce-fir transitory range type as a result of intensified clearcutting on the higher slopes of the Blue Mountains.

Starkey would soon become the study site for a newly identified problem. A survey of National Forest supervisors and range and wildlife staff offices in 1974 showed the problems associated with livestock grazing in streamside management zones were consistently in the top 5 of their 10 most pressing range or wildlife concerns. In response to this, money and scientific staff were directed to Starkey where absolute control of grazing animals and seasons of use was possible.

New faces appeared in the 1970s. Garrison moved to PNW Station headquarters in Portland as Assistant Director for Planning under Station Director Robert Buckman, and Smith announced his retirement. Jack Ward Thomas, Research Wildlife Biologist, was brought in to become the combined range and wildlife project leader. The new head of the range program at OSU, William S. Krueger, exploited offers of cooperative projects. Riparian hydrology studies were begun by new OSU professor of range, John Buckhouse; livestock studies were designed with the OSU Branch Experiment Station in Union whose new director, Martin Vavra, was a nationally known range animal scientist. Experiments needing to be done on livestock in the riparian study at Starkey, such as esophageal fistulation, far exceeded those commonly done with permittee cattle. The Union Field Station had its own herd of test cattle, so a cooperative study was begun for riparian grazing trials that were to last for the next 10 years.

The Meadow Creek riparian habitat study began in 1975 and included 11 cooperators in a landmark investigation. Research in hydrology, water chemistry, aquatic biology, fisheries, and sophisticated livestock nutrition were included. Nearly all the cooperative work was with OSU, but other cooperators included the fisheries research unit of the PNW Station at the Corvallis Forestry Sciences Laboratory. Wildlife biologist Larry Bryant advanced to a scientist position after studying riparian management at University of Idaho.

During the mid-1970s, wildlife biologist Evelyn Bull arrived. Much of her early investigations centered on the study of nongame wildlife on the Starkey range. Her Ph.D. thesis featured the pileated woodpecker.

Considerable range research and development was accomplished away from the Starkey through the La Grande laboratory as a range evaluation project at the Malheur National Forest in Grant County during the mid-1970s. Some studies of methods for special use in this project were carried out at Starkey. A study of shelterwood cutting in old-growth fir was begun with researchers from Bend. Upgrading the decadent forest stands at the Starkey station through modern timber harvest concepts was also a feature through this period.

To this point, the research staff at the La Grande laboratory was largely limited to range and wildlife project researchers. In 1982, because of the severity of insect pest problems in the Blue Mountains, the PNW Station transferred the insect and disease project from the Corvallis Forestry Sciences Laboratory to the La Grande laboratory. A statistical modeler and forest pathologist later were added to the staff. The newly formed Integrated Pest Management Research Work Unit at La Grande began studies on insect and host phenology, western spruce budworm population dynamics, root diseases, and tree and stand damage at the Starkey. One of the five population monitoring plots for the Blue Mountains was located at Starkey. Studies on whole-tree caging methods were compared here.

The present range and wildlife research at Starkey, which is not yet history, is an integrated study of the interactions of timber harvest on controlled populations of cattle, elk, and deer. It is an ambitious, well-publicized, and highly visible cooperative study with the Oregon Department of Fish and Wildlife. This study will attempt, in part, to project the effects of timber management practices in "the forest of the future" on elk populations. This has forced Forest Service Ranger District personnel to attempt to replicate the "forest of the future" on the Starkey Experimental Forest and Range. Reversing the effects of poor management practices in the past to reach this goal will be a formidable task.

The Starkey Experimental Forest and Range originally was selected as a research area because it represented actual conditions in the Blue Mountain pine-bunchgrass community; this is still true. The station will continue as a study site for research into current problems related to use of the public domain; that is, Forest Service land. The research thrust at the Starkey Experimental Forest and Range rightly will continue to be in flux as researchers attempt to meet the needs of present and future generations of forest users by protecting and managing the Nation's forest resources.

A Look at the Record

The record of research is results, and these are mostly in the form of publications. A look at the bibliography in appendix 3 provides a general understanding of the subject areas of research at the Starkey Experimental Forest and Range over the past 50 years. Of roughly 80 publications, about one-third (29) have been on rangeland topics and only a token amount (2) have been on forestry (table 1). Further analysis shows about the same level of investigation was directed at secondary issues—livestock (19) and wildlife (10)—as at the primary issues of forage and habitat. Abiotic disciplines of hydrology, soils, and weather received nearly one-third (17) as much attention as plants and animals for perhaps a reasonable balance in total effort. As discussed earlier most of the wildlife habitat and pest management program at La Grande has been accomplished away from the Starkey Range.

Table 1—Distribution by discipline of publications resulting from research at the Starkey Experimental Forest and Range, 1940-90

Discipline	Number
Forestry	2
Range management:	
Methodology and techniques	8
Seasons, systems, or levels of grazing	7
Primary productivity by types	2
Rangeland communities and flora—	
Riparian	6
Uplands	2
Use	3
Economics	1
Total, range management	29
Secondary production:	
Livestock (cattle)—	
Methodology	1
Performance and gains	7
Distribution of use	5
Preference	3
Diet intake or quality	3
Total, secondary production	19
Wildlife—	
Species ecology and biology	2
Habitats	1
Habitat requirements	3
Distribution	1
Diet	1
Interactions (livestock)	2
Total, wildlife	10
Soils and hydrology:	
Survey	2
Productivity (fertilizer response)	3
Nutrient status or chemistry	4
Physical properties	2
Soil disturbance	4
Water chemistry	2
Total, soils and hydrology	17
Integrated pest management	2
Miscellaneous	2
Total, all disciplines	81

Early Starkey research centered on developing methods and techniques that became incorporated into the new discipline of range management. Nearly half the studies done in the first two decades dealt with methodology; over the entire 50 years, methodology represented about 10 percent of the total. The first study published was one of the first applications of remote sensing to wildland management. Some of the first attempts to apply principles of plant succession to quantify range conditions were validated at Starkey. Subsampling using aerial photographs to measure long-term forage production was a time-saving, efficient, and nondestructive sampling method. Application of this method was a major contribution to the success of the 11-year Starkey grazing study.

Until mid-century, only season-long grazing was used on public lands, and proper rates of stocking were only estimates because there was no scientific basis for sound recommendations. In 1955 when the study began, only one in five allotments in the Pacific Northwest had a grazing system other than season-long. Ten years later, three out of five had some form of rotational deferred grazing. The Starkey grazing study was a catalyst that improved range management throughout western forested rangelands.

Reseeding studies at Starkey helped identify the best methods for rehabilitating mountain summer ranges, such as those depleted by logging. This was a major thrust from the late 1940s to the mid-1950s, and several important publications resulted. Twenty years later it was again the major emphasis, and five agronomic papers were published. These studies capitalized on the first wildland forest soil survey, which was accomplished at Starkey in cooperation with the SCS. This landmark soil survey bridged the soil-vegetation gap for the entire Blue Mountains area and allowed broad soil-vegetation surveys to proceed rapidly on the three adjacent National Forests.

The first wildlife research at Starkey was on the effects of systems and levels of cattle stocking on distribution and abundance of deer and elk. The nongame wildlife studies at Starkey centered on woodpecker biology and habitat requirements. These studies were instrumental in formulating snag retention policies in regional Forest Service management plans to protect essential habitat for these important forest insect feeders.

The problem of protecting riparian habitats from excessive cattle grazing within extensive allotments was addressed early at Starkey. Altering the season of use and adjusting stocking rates produced acceptable and less expensive solutions compared to fencing projects. Cooperative studies with OSU have shown managers the best sequence for grazing the forage of streamside meadows, forest understory, and grassland openings. New range research methods using techniques such as microhistological analysis of fecal material to determine diet preferences of deer, elk, or cattle have made studies of seasonal forage use obsolete.

Along with findings and results from conventional research, many practical range improvements have been tested at the Starkey Range, including water developments, proper location of fences and salt grounds, and range riding. Practical application of range management techniques maintained the animal stocking rates set in 1939 for four decades while improving allotment forage conditions (fig. 19).

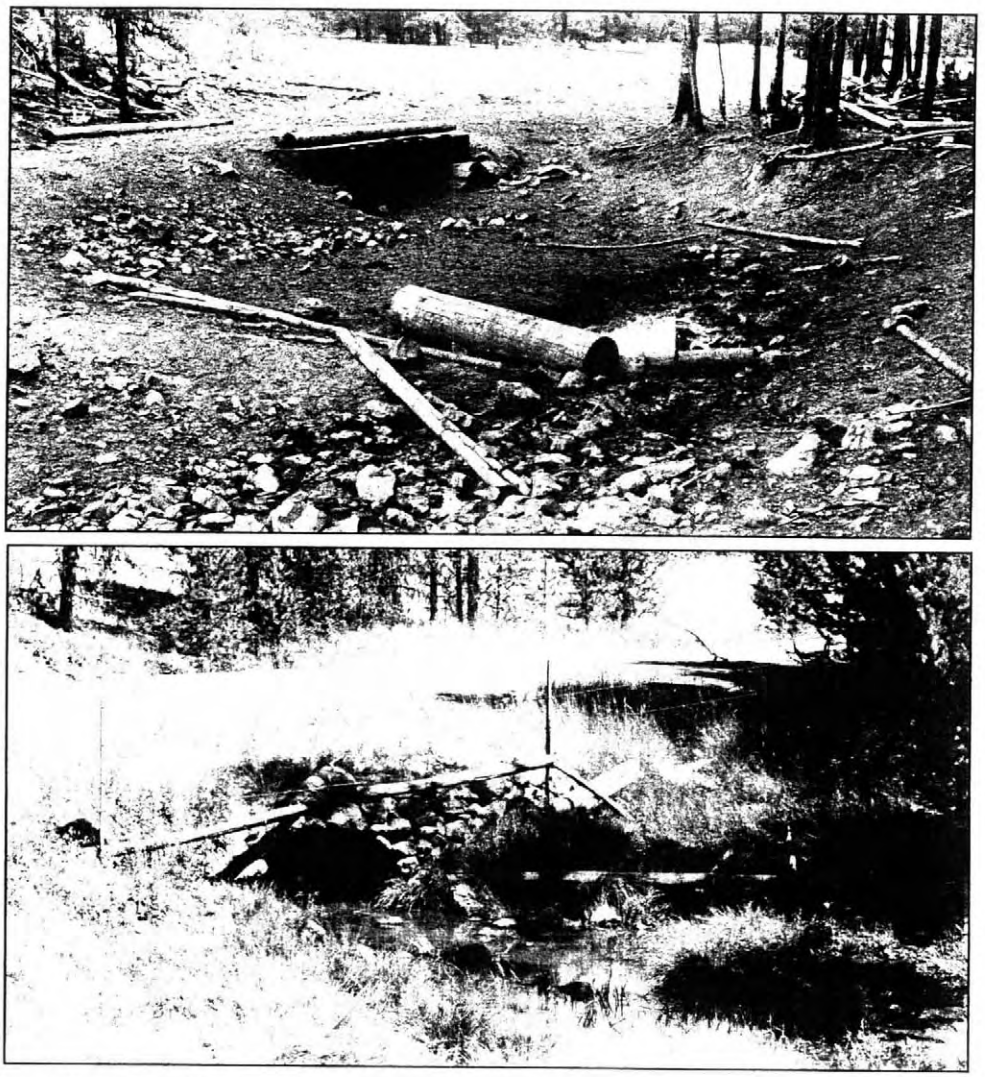


Figure 19—Camas Creek at Camas Springs in July 1939 (above) had only enough water for the occasional cow. By July 1989 (below), it was a free-flowing stream with fingerling steelhead. The right-of-way fence in the foreground keeps allotment cattle off the highway.

The present range and wildlife thrust at Starkey is an integrated study of the interactions of timber harvest on controlled populations of cattle, elk, and deer. Comprehensive studies will investigate the response of deer and elk to cattle grazing and harassment factors, such as hunters or motorized traffic. Reproduction success of cow elk with breeding bulls of two age classes also will be featured.

An Analysis of Ecological Change

A visitor to the Starkey Experimental Forest and Range is struck by the unhealthy appearance of the forest. The question always is, Why are the trees dead? The answer has to do with the human race's ability to profoundly alter the environment and upset the ecological balance of plant and animal communities.

Historically, until the mass migration and arrival of pioneers in about 1860, plant communities at Starkey were in balance with cyclic weather, fire, and biotic factors such as forest insects, wild ungulates, and aboriginal man. Several prehistoric events shaped the structural character of the Starkey vegetation in postglacial times. A period of gradual warming and drying occurred from the late glacial times until the mid-postglacial period of 8,000 to about 4,000 years ago (Hansen 1947). The period of maximal warmth occurred around 6,500 years ago, which coincided with a catastrophic volcanic blast that blew out Mount Mazama to form Crater Lake. The trend since has been toward a cooler, moister climate with resultant shifts in vegetation.

The Starkey portion of the Blue Mountains was directly in the path of prevailing fallout from volcanic dust. Today a 1- to 3-foot layer of gray pumicite soil blankets the original surface mantle on north- and east-facing slopes. Presumably the dust eroded from other aspects. This event would have caused a drastic but temporary disruption in successional patterns not unlike that which occurred with the deposition of the dust cloud following the explosion of Mount St. Helens in 1980.

The history of local forest succession was plotted by Hansen (1943) within the pollen-dispersal area of Starkey in the sediment beds of Mud Lake. The pollen profiles since glacial times show lodgepole pine often gave way in the composition to western larch, thereby indicating catastrophic fires in the Hudsonian (7000-8000 feet) and Canadian life zones (5000-7000 feet) (Bailey 1936). In the lower Arid Transition life zone (3000-5000 feet), the dominant ponderosa pine remains relatively constant throughout the profile, thereby indicating destructive fires did not exist there. Fire scars on old-growth pine in the Starkey area suggest cool, creeping ground fires were repeated at intervals of 7 to 11 years. From his observations throughout the Blue Mountains, Hall (1976) suggests that fires were repeated at least as often as 10 years.

Throughout the parklike Pine-bunchgrass Transition life zone, frequent fires crept slowly along the forest floor and spread from patch to patch in the heavier grass of open meadows. Starkey forests were open grown and widely spaced, and the periodic fires destroyed tree regeneration and burned back low shrubs to their root crowns. Insects and small mammals developed adaptive mechanisms over the centuries to avoid and survive those frequent, cool, creeping fires that occurred on Starkey.

Analysis of tree ring growth patterns over the past 500 years in eastern Oregon (Keen 1937) shows no long-term trends but indicates that the very dry period of the 1930s caused an exceptionally serious drought. An extremely prolonged dry period occurred from the time of Lewis and Clark's westward journey in 1805 until the first wagon trains entered the Oregon Territory on their way to the Willamette Valley in 1843.

Keen (1937) found for the ponderosa pine region of northeastern Oregon that 9.4 years lapsed between good growth years and 7.8 years between poor growth years. Similarly, 13.6 years lapsed between periods of good growth and 12.9 years between periods of poor growth.

A similar analysis of the central Blue Mountains (Meyer 1934) and local precipitation data shows recurring patterns of good and poor growth periods for the Starkey area:

Growth periods	
High cycles	**Low cycles**
	1882-89
1900-17	
	1920-38
1940-58	
	1960-75

Meyer also showed that, on average, a 22-year wet-dry cycle occurs in eastern Oregon and that these highs and lows (about 11 years apart) need to be considered in projections of short-term timber and range land growth and yield.

Catastrophic forest fires occur in certain years with the coincidence of heavy accumulation of herbaceous fuel, hot summers, and frequent dry lightning; examples were 1889, 1909, and 1949 when high-elevation forests burned quite intensely. According to journals of early travelers, the Blue Mountains in certain years seemed to have widespread and continuous fire. Captain Bonneville crossed the Blue Mountains during August 1834 and found travel difficult because of widespread forest fire (Irving 1935).

When pioneer stockmen, miners, farmers, and loggers entered Starkey Basin, the ecological balance shifted drastically. Changes came from heavy grazing by domestic livestock, low fire frequency, exotic plant and animal introductions, selective tree removal, conversion of prairie lands, alteration of water courses, and elimination of certain predators, wildlife prey species, and fish. Settlement eliminated traditional Indian land use, thereby removing a constant source of fire (Shinn 1980). Burning the rough dry grass before returning to winter quarters on the Umatilla River was a customary Cayuse practice.

Introduction of cattle, sheep, and horses to Starkey reduced or sometimes eliminated preferred herbaceous species, opened up ground cover to tree seed, and reduced competing understory vegetation for better seedling establishment; flashy grass fuels were eliminated by grazing and the chance for the spread of fire became much reduced (Weaver 1950). Pioneers were quick to fight the occasional wildfire. Trailing, mostly by sheep, further exposed mineral soil to tree seed germination, seedling establishment, and improved tree survival. Thus, the reduction of fire and eradication of competing vegetation enabled tree seedlings to survive and thrive in the newly created seed beds (Rummell 1951).

After the start of the 20th century, certain annual grasses and noxious plants (weeds) were introduced, and preferred grasses and forbs were eliminated. Giant wild rye, for instance, was completely removed from its normal habitat along alluvial bottomlands. Tufted hairgrass, perhaps the most preferred meadow grass species in the region, was not encountered in any of the rangeland surveys of the late 1930s or early 1940s; today, it is a common constituent of nearly all wet meadows at Starkey, thereby illustrating that a depleted species can be rejuvenated through proper management.

Under these new conditions of land use without fire, combinations of a good tree seed crop followed by a wet summer allowed ponderosa pine to invade and become established far out in the shallow soils of grassland openings. Such offsite invasion was also common with other species such as Douglas-fir, which is fire intolerant and could now encroach into drier sites where it was formerly discouraged by fire.

Soon logging—first with horses then with crawler tractors—further enhanced site preparation for more tree seedling establishment. Early selective logging for high-quality yellow pine timber often left secondary, codominant Douglas-fir as the principal seed source. Extensive logging railroads of the 1930s and early 1940s accessed about 85 per cent of the Starkey area, and log skidding with resultant soil disturbances opened up many new sites for tree regeneration. Thickets from logging activities formed even in the mixed forest type after lumber companies were able to cut and use secondary species and logs of smaller diameter.

Extraordinary efforts went into protecting the Starkey Experimental Forest and Range from wildfire. Since its creation, it has been the number one priority for Ranger District fire suppression efforts because of the high value of research investments there. New roads built to facilitate research further reduced the opportunity for fire to spread by providing fire breaks. This access also allowed for rapid, efficient attack by fire suppression crews. The lookout at Bally Mountain had a commanding view of the entire Experimental Forest.

Heavy thickets from earlier tree encroachment from grazing and lack of fire lowered understory forage yields because of the competition for light, moisture, and nutrients. Not only did this closing overstory reduce grazing capacity for livestock, but it also permitted a cooling in microclimate conditions near the ground. This allowed the easy establishment of shade-tolerant trees, such as white fir, foreign to these sites formerly occupied by ponderosa pine, the climax species after fires.

Tree species growing off their preferred sites may thrive for several years even under thicket conditions, but when cyclic drought arrives, they become stressed and highly susceptible to insect attack and even disease. Where fire once was the natural thinning agent at Starkey, insects now seem to control the stands and have taken over that role. Insects, particularly bark beetles, thrive in dense, stressed, stagnated stands.

Forests of the Blue Mountains have been plagued with insect pest problems. In the 1950s, a large outbreak of western spruce budworm defoliated true fir and Douglas-fir at Starkey. In the early 1970s, a major outbreak of Douglas-fir tussock moth occurred just north of Starkey.

In 1974-75, a major outbreak of mountain pine beetle occurred in the forest and resulted in heavy tree mortality, which forced salvage operations by the La Grande Ranger District. In the late 1970s, larch casebearers reached epidemic proportions just west of Starkey, and in the early 1980s a major western spruce budworm outbreak again developed throughout the Blue Mountains. During the latter outbreak, fir throughout the Starkey Range became heavily infested with budworm. By the late 1980s, remaining fir had become the target of Douglas-fir bark beetles.

Although it seems that insect pests have intensified because of stand stagnation, this is not a simple cause-effect relation. In fact, a major outbreak of mountain pine beetle occurred throughout the Blue Mountains in 1910-11, but it was not necessarily related to stand density. The fact remains, however, our present-day mixed forest stands at Starkey are in an unhealthy state.

At one time, insect epidemics were aerially sprayed with long-lasting chemical pesticides, such as dichloro-diphenyhl-trichloro-ethane (DDT). This practice began with the spruce budworm control program at Starkey in 1950-51. Initially, only the loss of fish, riparian insects, wild honey bees, and other pollinators was noted at Starkey, but soon it became apparent that certain birds of prey were being affected. Environmental awareness has now eliminated use of long-lived harmful pesticides in favor of more natural biological controls. Presently, PNW Station researchers are testing the use of natural pest diseases and predators; however, these tests are mostly in experimental stages and have not yet improved the health of Starkey forests.

Despite the adverse events that reduced the forage under the forest on the Starkey range, the herbaceous layer in the grassland openings perhaps increased one whole ecological condition class; that is, from low fair condition in 1939 to low good condition by the 1980s (fig. 20). During this same time of range improvement, cattle stocking was maintained at the 1939 level despite rapid forest overstory closure and encroaching thickets of tree regeneration (both diminish forage supplies). This stocking rate has remained constant and range conditions have improved even though forage supplies have been depleted by logging disturbances, increased forage competition by a growing big game population (especially elk), and withdrawal of available rangeland through exclosures, natural areas, and other research installations.

While range management practices have been introduced to improve the condition of the range, the trees of the forested areas of Starkey have become unhealthy. It would seem that work on the Experimental Forest and Range helped range managers understand the factors leading to ecological succession on the grasslands to improve the quality of that resource, but study of the forest resource was neglected.

It is not just the forests of the Experimental Forest that are unhealthy; many forests in eastern Oregon are in unproductive condition. The Starkey area was selected as an Experimental Forest and Range because it was representative of a much larger area, and researchers should use the experimental area to develop management practices that will improve the status of local forests. In so doing, they must try to determine what effect past use has had in bringing the forest to its present deteriorating state and develop management programs to rectify the situation.

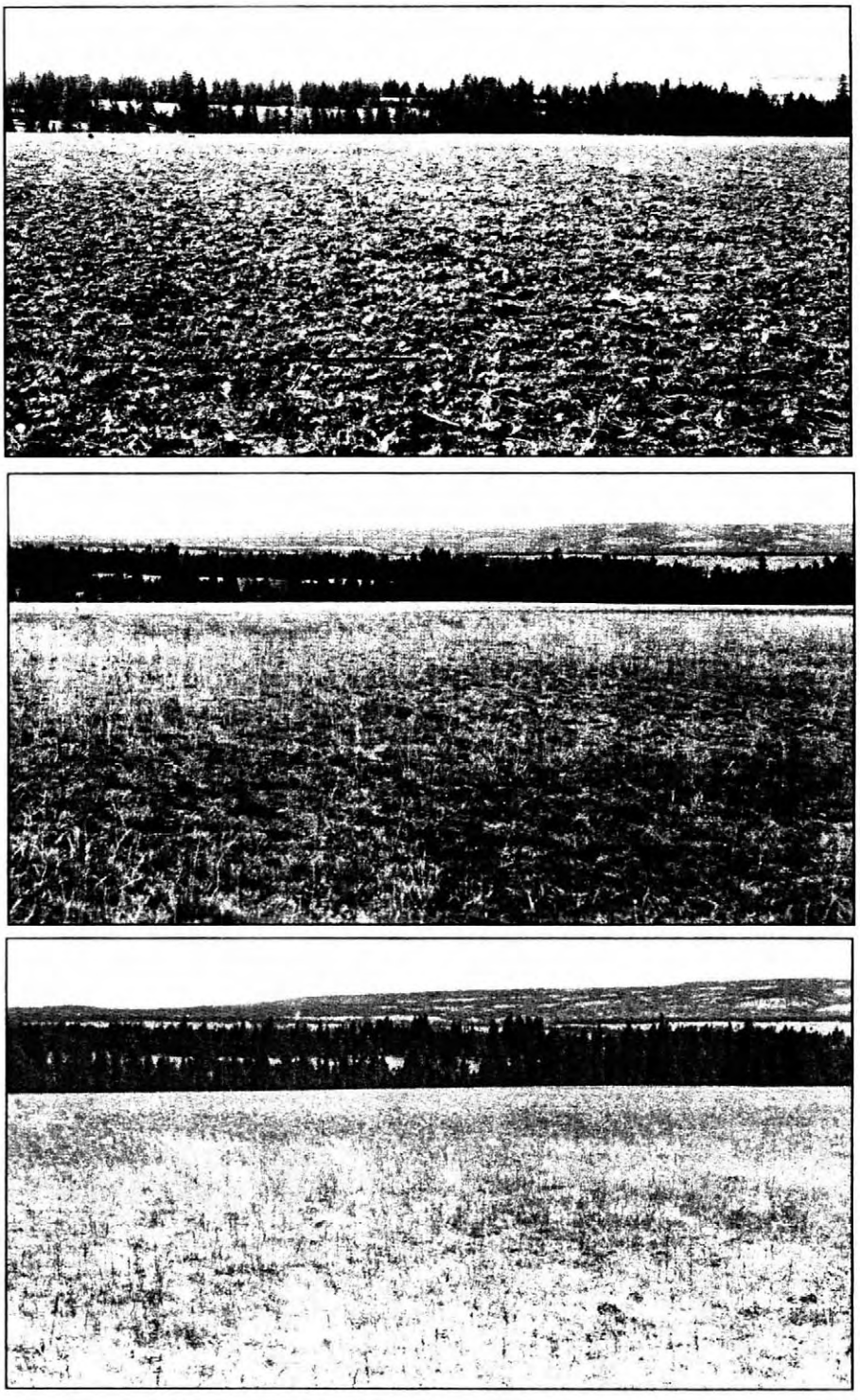


Figure 20—Battle Creek flats in July 1939 (top) showing the forage supply nearly exhausted; in 1949 (center) after 10 years of improved distribution and deferred-rotation grazing, the supply had increased measurably. By 1989, the supply and ground cover is in "good" condition.

As a component of a new program at Starkey, silviculturists need to develop forward-looking management plans. One practice worth considering to rejuvenate the area is cautious reintroduction of controlled burning. Other measures to include are integrated pest management and advanced silvicultural practices, such as shelterwood cutting with reseeding of grass-legume mixtures to control thick tree regeneration. Considerable salvage harvest will be required, and thinning of stagnated young stands might reduce the harmful stress factor of overcrowding that normal cyclical drought conditions will aggravate. For the next several decades these forest stands will need extra measures of protection from fire and insects.

Certainly more resources will have to be invested in improved management and research to rectify the mistakes of past management that have seemingly stagnated forest production. The ecology of this area has been adversely altered by human activity. It is hoped that this condition can be reversed to one that will bring about more healthy, productive forests.

Acknowledgments

The author thanks Richard O. Woodfin, Jr., chair of the History Committee of the Pacific Northwest Research Station, and the committee, Martha Brookes and Kenneth Wright, for their vision in providing the coordination and planning that made this document possible. The staff at the Forestry and Range Sciences Laboratory in La Grande, Oregon, are due particular recognition for assisting in records searches and providing library facilities. The USDA-Forest Service Photo Collection Section, National Agricultural Library, Beltsville, Maryland, retrieved historical photographs of the Starkey Experimental Forest and Range. Reviewers were Kenneth Wright, Boyd Wickman, Larry Bryant, and Robert Harris. Karen Esterholdt and Delbert Thompson, PNW Research Information Services, Portland, Oregon, edited the manuscript and coordinated the illustrations and printing.

I thank Tom Rose, Ted Stickler, Charley Styles, and Winny Taal, former residents of the Starkey prairie; without their help and historical information this paper would lack the cultural setting in the Starkey settlement. Starkey residents now deceased who furnished the author with a wealth of local history were Ob Burnett, Bruce Morehead, Jess Plunkett, Ray Strack, and Pete Townsend.

The author is grateful to several recent retirees from the Forest Service who at one time or another administered programs or worked at the Starkey Experimental Forest and Range; they provided first-hand information and shared experiences in the unfolding of this story: Jack Bohning, Phil Briegleb, Dave Costello, Dick Driscoll, George Garrison, Bob Harris, Joe Pehanec, Bert Reid, Bob Rummell, Justin Smith, and Gerald D. "Pick" Pickford. The author is grateful to his wife, Donna, for editorial assistance and word processing of this document.

Literature Cited

American Ornithologist's Union. 1983. Checklist of North American birds. 6th ed. Lawrence, KS: Allen Press.

Bailey, Reeve M.; Fitch, John E.; Herald, Earl S. [and others]. 1970. A list of common and scientific names of fishes from the United States and Canada. 3d ed. Spec. Publ. 6. Washington, DC: American Fisheries Society. 149 p.

Bailey, Vernon A. 1936. Mammals and life zones of Oregon. Biologial Survey of North American Fauna, No. 55. [Location of publisher unknown]: U.S. Department of the Interior.

Barklow, Irene. 1987. From trails to rails. Enterprise, OR: Enchantment Publishing. 300 p.

Brimlow, George F. 1938. The Bannock Indian War of 1878. Caldwell, ID: Caxton Printers. 278 p.

Chapline, W.R.; Campbell, R.S.; Price, R. [and others]. 1944. The history of western range research. Agricultural History. 18: 127-143.

Coville, F.V. 1898. Forest growth and sheep grazing in the Cascade mountains of Oregon. Bull. 15. [Location of publisher unknown]: U.S. Department of Agriculture, Division of Forestry. 54 p.

Furniss, R.L.; Carolin, V.M. 1977. Western forest insects. Misc. Publ. 1339. Washington, DC: U.S. Department of Agriculture, Forest Service. 654 p.

Garrison, G.A.; Skovlin, J.M.; Poulton, C.E.; Winward, A.H. 1976. Northwest plant names and symbols for ecosystems inventory and analysis. 4th ed. Gen. Tech. Rep. PNW-46. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 263 p.

Gordon, Clarence W.; Gordon, C.W.; McCoy, J.G. [and others]. 1883. Census of 1880, report on cattle, sheep and swine: State of Oregon. 10th rep. [Location of publisher unknown]: U.S. Department of the Interior: 1079-1087.

Griffiths, David. 1902. Forage conditions on the northern border of the Great Basin. Bull. 15. [Location of publisher unknown]: U.S. Bureau of Plant Industry.

Griffiths, David. 1903. Forage conditions and problems in eastern Washington, eastern Oregon, northeastern California and northwestern Nevada. Bull. 38. [Location of publisher unknown]: U.S. Bureau of Plant Industry.

Hansen, Henry P. 1943. A pollen study of a subalpine bog in the Blue Mountains of northeastern Oregon. Ecology. 24: 70-78.

Hansen, Henry P. 1947. Postglacial forest succession, climate and chronology in the Pacific northwest. Transactions of the American Philosophical Society: 114-115.

Hall, Fredrick C. 1976. Fire and vegetation in the Blue Mountains: implications for land managers. In: Proceedings, Tall Timbers fire ecology conference; 1974 October 16-17; Portland, OR. Tallahassee, FL: [Publisher unknown]: 155-170.

Irving, Washington. 1935. The adventures of Captain Bonneville. Portland, OR: Binford and Mort.

Jardine, James T. 1909. The pasturage system for handling range sheep. Circ. 178. Washington, DC: U.S. Forest Service.

Keen, F.P. 1937. Climatic cycles in eastern Oregon as indicated by tree rings. Monthly Weather Review. 65: 175, 183-188.

Meyer, Walter H. 1934. Growth in selectively cut ponderosa pine forests of the Pacific Northwest. Tech. Bull. 407. Washington, DC: U.S. Department of Agriculture.

Munger, Thornton T. 1955. Fifty years of forest research in the Pacific Northwest. Oregon Historical Quarterly. 56: 226-247.

Nowak, R.M.; Paradiso, J.L. 1983. Walker's mammals of the world. 4th ed. Baltimore: John Hopkins University Press. Vol. 2.

Pickford, Gerald D.; Jackman, E.R. 1944. Reseeding eastern Oregon summer ranges. Circ. 159. Corvallis, OR: Oregon Agriculture Experiment Station. 48 p.

Pickford, Gerald D.; Reid, Elbert H. 1942. Competition of elk and domestic livestock for summer range forage. Journal of Wildlife Management. 7: 328-332.

Reid, E.H.; Pickford, G.D.; Nelson, N. Talmadge. 1942. An appraisal of range survey methods from the standpoint of effective range management. Range Research Rep. 2. [Portland, OR]: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 66 p.

Rollins, Philip Ashton, ed. 1935. Discovery of the Oregon Trail (narratives of Robert Stuart). New York: Charles Scribners Sons. 391 p.

Rummell, Robert S. 1951. Some effects of livestock grazing on ponderosa pine forest and range in central Washington. Ecology. 32: 594-607.

Rummell, Robert S.; Holscher, Clark E. 1955. Seeding summer ranges in eastern Oregon and Washington. Farmers' Bull. 2091. [Location of publisher unknown]: U.S. Department of Agriculture. 34 p.

Sampson, Arthur A. 1908. The revegetation of overgrazed range areas, preliminary report. Circ. 158. [Location of publisher unknown]: U.S. Department of Agriculture, Forest Service.

Shinn, Dean A. 1980. Historical perspectives on range burning in the inland Pacific Northwest. Journal of Range Management. 33: 415-422.

Thwaite, R.G., ed. 1905. Early western travelers. Cleveland, OH: Arthur H. Clark. 230 p.

Tucker, Gerald J. 1963. Many roads built into Grande Ronde Valley in 1860s. History of Union County, Supplement 4. La Grande, OR: Union County Historical Society: 1-5.

U.S. Senate. 1936. The western range. Executive document 199, 74th Congress, 2d session.

Weatherford, Mark V. 1959. Bannock-Piute war: the campaign and battles. Corvallis, OR: Lehnert Printing Co.

Weaver, Harold. 1950. Shoals and reefs in ponderosa pine silviculture. Journal of Forestry. 48: 21-22.

Appendix 1: Area Description

The dedicated research area of the Starkey Experimental Forest and Range includes about 27,000 acres within the Wallowa-Whitman National Forest. It is midway between La Grande and Ukiah in southwestern Union County and southeastern Umatilla County, Oregon, on Oregon Highway 244.

Most of the Starkey Range lies within the Grande Ronde River drainage. Several thousand acres in the southwest corner drain into the John Day River. Topography is typified by broad rolling uplands separated by moderately deep canyon drainages. Elevations range from 4,000 to 5,000 feet above mean sea level.

The soils of the area are poorly developed. In general, they are derived from basalt or pumicite overlying basalt. Grassland soils are generally shallow and range from 1 inch on the open ridges to more than 2 feet on better grassland sites. Soil textures vary from a silty clay loam to a heavy clay.

Soils in the timbered areas range from 12 inches to several feet in depth. Soil textures vary from silty clay to clay loam on the more heavily timbered sites to clay loam on the more sparsely timbered sites. Soils along the principal streams or in depressions are well developed and of alluvial origin. They are dark, deep, and fertile.

Annual precipitation averages 20 inches: two-thirds accumulates as snow during the winter. Snowmelt begins in April, and runoff extends into May. The growing season lasts about 120 days, but no months are considered frost-free.

Vegetation growth is mostly during late spring before soils begin to dry in early summer. Critical moisture for herbaceous growth is during June, but moisture and temperature in July often determine the length of the adequate green forage period. Although midsummers are dry, fall rains usually initiate some herbage regrowth.

A forest overstory dominates about three-fourths of the study area. Intermingled natural grassland openings of 5 to 50 acres account for the remainder. Plants in these openings are common to Blue Mountain grasslands.

The most abundant species in the grasslands are usually bearded bluebunch wheatgrass, Sandberg bluegrass, or onespike danthonia. Other less common grasses include Idaho fescue, prairie junegrass, bottlebrush squirreltail, and Letterman needlegrass.

Openings also produce many different forbs but essentially no shrubs. Early-flowering succulent forbs are abundant but short lived. Some summer forbs such as western yarrow, low gumweed, and rush pussytoes are also abundant but soon become stemmy, aromatic, or otherwise unpalatable.

Open stands of ponderosa pine, or pine mixed with Douglas-fir, occupy two-thirds of the forested type and contain a varied understory. Principal herbaceous plants are elk sedge and pinegrass. Other less common grasses are Idaho fescue and prairie junegrass. Numerous minor sedges exist, of which northwestern sedge and Ross sedge are most common. Several forbs occur together with lesser amounts of low shrubs, such as birchleaf spiraea and common snowberry.

The remaining third of the forested type has a dense canopy of lodgepole pine or grand fir; sometimes western larch is also present. Only scattered herbaceous plants and a few evergreen shrubs grow under climax stands; however, seral stands produce a variety of forbs and other shrubs.

Appendix 2: Personnel

This is a partial listing of people who have been instrumental in activities at Starkey Experimental Forest and Range. It includes both research personnel and the permittees of the Starkey Cattle and Horse Association. When available, the dates of service are given.

USDA Forest Service

Chief of Range Research

W. Ridgely Chapline	1920-52
Joseph Pechanec	1952-54
Kenneth Parker (division reorganized into Forest Environmental Research)	1954-71
Dixie Smith	1972-75

PNW Station Director

Thornton Munger	1924-38
Stephen Wyckoff	1938-45
J. Alfred Hall	1945-50
Robert Cowlin	1950-63
Philip Briegleb	1963-71
Robert Buckman	1971-75
Robert Tarrant	1976-79
Robert Ethington	1980-87
Charles Philpot	1987-

PNW Station Division Chief

Gerald Pickford	1936-44
Joseph Pechanec	1945-52
David Costello	1953-66
Robert Harris (division reorganized into geographic areas)	1969-71
Robert Tarrant	1973-76
Donald Flora	1976-84
Arthur Schipper	1984-90

Project Leader

Elbert Reid	1937-48
Clark Holscher	1948-54
Robert Harris	1954-56
Merton Reed	1956-58
George Garrison	1958-74
Justin Smith	1967-75
Jon Skovlin	1975-81
Jack Thomas	1974-
Boyd Wickman	1982-

Project Scientists

Robert Rummell	1944-46
Sam Stevenson	1945-51
Robert Harris	1946-54
George Garrison	1946-54
Richard Driscoll	1954-57
Gerald Strickler	1955-80
Jon Skovlin	1956-75
Jim Trappe	1957-59
Norman Miner	1956-58
Daniel Bishop	1958-61
Carl Goebel	1964-70
Paul Edgerton	1965-80
Michael Geist	1969-
Burt McConnell	1970-75
Edward Dealy	1972-80
Roy Beckwith	1974-84
Reed Sanderson	1976-89
Tom Quigley	1976-
Evelyn Bull	1976-
Larry Bryant	1978-
Roger Ryan	1983-89
Torolf Torgersen	1982-
Richard Mason	1982-
Arthur Tiedeman	1984-
J.J. Colbert	1986-89
Greg Filip	1986-
Catherine Parks	1986-

Project Technicians

Lewis Morgan	1964-76
Wayne Williams	1971-
Larry Bryant	1975-77
Scott Feltus	1982-87
H.G. Paul	1982-
Fred Schmidt	1982-

Support Services

Marian Halsey
Mary Grant
Carol Hadden
Helen Cornett
Dianne Concannon
Nancy DeLong

Distinguished Field Assistants

N. Talmadge Nelson	1937-39
Orval Carey	1939
Bill Webber	1943
Jack Bohning	1947-48
Benny Goodwin	1949
Jim Linebaugh	1953
Jim Davis	1954
Carl Goebel	1955

John Thilenius	1957-58
Don Neff	1961
David Bryant	1967

National Forest System

Ukiah District Rangers

Rube Butler	1930-43
E.J. Parker	1944-46
(Administration transferred to Whitman National Forest, La Grande)	

La Grande District Rangers

G.J. Tucker	1925-39
H.C. Chriswell	1939-42
G.C. Charlton	1942-54
E.H. O'Keeffe	1954-56
J.M. Wick	1956-70
R.G. Dearsley	1970-76
R.R. Sines	1976-79
R.L. Schrenk	1979-85
J.D. Blackwood	1985-87
A.K. Kimbell	1988-

Forest Supervisors

Umatilla National Forest

Carl Ewing	1939-43
(Administration transferred to Whitman National Forest, La Grande)	

Wallowa-Whitman National Forest

Chas. D. Simpson	
Hal Coons	
J.B. Smith	
John L. Rogers	1961-75
Al Oard	1975-81
Jerry G. Allen	1982-86
Bob Richmond	1986-

Starkey Cattle and Horse Association

1938-39 Starkey Allotment Permittees

Name	Location	Cattle	Horses
W.H. Briggs	Starkey	160	5
Joe Cunha	Echo	200	—
J. Hawk and son	Pilot Rock	85	—
Ralph Sullivan	Starkey	75	—
Umbarger brothers	Pendleton	245	—
Total		745	5

Former Members

F.A. Alden
J.H. Briggs
W.H. Briggs
Leader Buckner
Wheeler Buckner
Press Burnett
Katy Burnett
Joe Cunha and sons
Eckles
J.B. Correa
A.D. Coyle
Wynam French
J. Hawke and son
L. Marley
McKinney
W.A. Smith
T.E. Stickler
Stockoff
A. Sullivan and sons
Thomas & Co.
Waite brothers
Wynne estate
P. Umbarger

Range Riders

Dick Burnett	1913-17
Sullivan	
Chas. Briggs	1923-26
Ward A. Smith	1927
Hugh Perrin	1928-32
W.J. McCormik	1933
Art Mann	1934-37
Ted Stickler	1938-44
Ray Strack	1945-54
Stanley Anderson	1955-58
Ray Strack	1959
John B. Correa	1959-61
Edward Bloom	1962-63
John B. Correa	1964-65
Ted Stickler	1967-68
All members	1969-

Extra Riders

Chief Watkins
Curtis J."Brig" Young
Denny Jones
Bud Morgan
Ab Able

Appendix 3: Bibliography

1942:

Reid, E.H.; Pickford, G.D.; Nelson, Talmadge N. An appraisal of range survey methods from the standpoint of effective range management. Res. Rep. 2. Portland. OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 66 p.

1948:

Pickford, G.D.; Reid, E.H. Forage utilization on summer cattle ranges in eastern Oregon. Circ. 796. Washington, DC: U.S. Department of Agriculture, 27 p.

1950:

Stevenson, E.W. Preliminary study of soils on the Starkey Experimental Forest and Range. Special Rep. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 12 p.

1951:

Harris, Robert W. In salt blocks—use the holes. Oregon Farmer. 74: 6-7.

Harris, Robert W. Use of aerial photographs and sub-sampling in range inventories. Journal of Range Management. 4: 270-278.

1953:

Harris, Robert W. Quicker, easier way to make trough shown. Oregon Cattleman. 1: 8-9.

1954:

Harris, Robert W. Fluctuations in forage utilization on ponderosa pine ranges in eastern Oregon. Journal of Range Management. 7: 250-255.

Harris, Robert W. Small stockponds—a practical aid for range livestock distribution. Oregon Cattleman. 3: 7, 20.

Harris, Robert W.; Driscoll, R.S. Gains made by cattle on summer range. Oregon Cattleman. 3: 5, 24.

1955:

Driscoll, Richard S. A guide to the Starkey Experimental Forest and Range. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 21 p.

Driscoll, Richard S. Grazing season determined by forage maturity. Oregon Cattleman. 4: 6,13-15.

1956:

Goebel, Carl J. Water development on the Starkey Experimental Forest and Range. Journal of Range Management. 9: 232-234.

1957:
Skovlin, Jon M. Range riding—the key to range management. Journal of Range Management. 10: 269-271.

1958:
Driscoll, Richard S. A loop method for measuring groundcover characteristics on permanent plots. Journal of Range Management. 11: 94-96.

Driscoll, Richard S. Effects of intensity and date of herbage removal on herbage production of elk sedge. Journal of Range Management. 11: 212.

Driscoll, Richard S. New answers to old problems. Western Livestock Journal. 36: 33-39.

Parker, Kenneth W.; Harris, Robert W. The 3-step method for measuring condition and trend of forest ranges: a resume of its history, development and use. In: Proceedings of a symposium on techniques and methods of measuring understory vegetation; [Dates unknown]; [Location of symposium unknown]. Tifton, GA: U.S. Department of Agriculture, Forest Service, Southern and Southeastern Forest and Range Experiment Station. 174 p.

1959:
Strickler, Gerald S. Use of the densiometer to estimate density of forest canopy on permanent sample plots. Res. Note 180. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 5 p.

1960:
Burr, James J. Soil survey, Starkey Experimental Forest and Range, Union and Umatilla Counties, Oregon. [Location of publisher unknown]: U.S. Department of Agriculture, Soil Conservation Service. 32 p.

1961:
Bishop, Daniel M. Soil moisture depletion in three lodgepole pine stands in northeastern Oregon. Res. Note 213. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 2 p.

Skovlin, Jon M. A study of the relative utilization of important forage plants on summer cattle range in the central Blue Mountains. Journal of Range Management. 14: 174-175.

Strickler, Gerald S. A grid method for obtaining loop readings on small plots. Journal of Range Management. 14: 261-263.

1962:
Skovlin, Jon M. Cow and calf weight trends on mountain summer range. Res. Note 220. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 7 p.

1963:

Reed, Merton J.; Skovlin, Jon M. Estimating grazing values for layout and calibration of experimental ranges. Misc. Publ. 940. Range Research Methods. [Location of publisher unknown]: U.S. Department of Agriculture, Forest Service: 142-148.

1965:

Skovlin, Jon M. Improving cattle distribution on western mountain rangelands. Farmers Bull. 2212. Washington, DC: U.S. Department of Agriculture. 14 p.

Strickler, Gerald S. The flora of the Starkey Experimental Forest and Range. Special Res. Pap. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 85 p.

Strickler, Gerald S. Soil and vegetation on the Starkey Experimental Forest and Range. *Proceedings of the Annual Meeting of the Society of American Foresters.* 30: 168-172.

1966:

Garrison, George A. A preliminary study of response of plant reserves to systems and intensities of grazing on mountain rangeland in northwest U.S.A. In: Proceedings, 10th international grasslands congress; [Dates unknown]; [Location of congress unknown]. Helsinki, Finland: [Publisher unknown]: 937-940.

1967:

Skovlin, Jon M. Fluctuations in forage quality on summer range in the Blue Mountains. Res. Pap. 44. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 20 p.

1968:

Skovlin, Jon M.; Edgerton, Paul J.; Harris, Robert W. The influence of cattle management on deer and elk. In: Proceedings, 33d North American wildlife and natural resources conference; [Year unknown] March 11-13; Houston, TX. [Location of publisher unknown]: [Publisher unknown]: 169-179.

1969:

Strickler, Gerald S. Vegetation response to animal use on the Starkey Experimental Forest and Range. In: *Proceedings of a range management workshop, 1968* February 5-7; Pullman, WA. Pullman, WA: Washington State University: 127-139.

1970:

Geist, Jon M.; Strickler, Gerald S. Chemical characteristics of some forest and grassland soils of northeastern Oregon. 1: Results from reference profile sampling on the Starkey Experimental Forest and Range. Res. Note 137. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 11 p.

Skovlin, Jon M.; Harris, Robert W. Management of conifer woodland grazing resources for cattle, deer and elk. In: Proceedings of the 11th international grasslands congress; [Dates unknown]; Surfers Paradise, Queensland, Australia. [Location of publisher unknown]: [Publisher unknown]: 75-78.

1971:

Edgerton, Paul J.; Smith, Justin G. Seasonal forage use by deer and elk on the Starkey Experimental Forest and Range, Oregon. Res. Pap. 112. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 12 p.

Geist, Jon M. Orchardgrass response to fertilization of seven surface soils from the central Blue Mountains of Oregon. Res. Pap. 122. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 12 p.

1973:

Geist, J. Michael. Chemical characteristics of some forest and grassland soils of northeastern Oregon. II: Progress in defining variability in Tolo and Clicker soils. Res. Note 217. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 15 p.

1975:

Bull, Evelyn Louise. Habitat utilization of pileated woodpecker, Blue Mountains, Oregon. Corvallis, OR: Oregon State University. 58 p. M.S. thesis.

Geist, J. Michael; Hazard, John W. Total nitrogen using a sodium hydroxide index and double sampling theory. In: Proceedings Soil Science Society of America. 39: 340-343.

Skovlin, Jon M.; Harris, Robert W. Grassland and animal response to cattle grazing methods in the ponderosa pine zone. In: Proceedings of the 12th international grasslands congress; [Dates unknown]; Moscow, USSR. [Location of publisher unknown]: [Publisher unknown]: 639-645.

1976:

Geist, J. Michael. Orchardgrass growth on nitrogen and sulfur fertilized volcanic ash soil. Journal of Range Management. 29: 415-418.

Skovlin, Jon M.; Harris, Robert W.; Strickler, Gerald S. [and others]. Effects of cattle grazing methods on ponderosa pine-bunchgrass range in the Pacific Northwest. Tech. Bull. 1531, Washington, DC: U.S. Department of Agriculture, Forest Service. 40 p.

Strickler, Gerald S.; Edgerton, Paul J. Emergent seedlings from coniferous litter and soil in eastern Oregon. Ecology. 57: 801-807.

1977:

Bull, Evelyn, L.; Meslow, E. Charles. Habitat requirements of the pileated woodpecker in northeastern Oregon. Journal of Forestry. 75: 335-337.

Geist, J. Michael. Nitrogen response to vegetation relationships of volcanic ash soils. Journal of Soil Science Society of America. 41: 996-1000.

Knight, Robert William. Streamside erosional responses to animal grazing practices on Meadow Creek in northeastern Oregon. Corvallis, OR: Oregon State University. 59 p. M.S. thesis.

Skovlin, Jon M.; Meehan, W.R.; Buckhouse, J.C. [and others]. A method of study for determining the influence of grazing on riparian and aquatic habitats in the Blue Mountains of northeast Oregon and southwest Washington. In: Proceedings of the symposium on livestock and wildlife/fisheries; [Dates unknown]; Sparks, NV. [Location of publisher unknown]: [Publisher unknown]. 15 p.

Wilson, Nixon; Bull, Evelyn L. Ectoparasites found in the nest cavities of pileated woodpeckers in Oregon. Bird Banding. 48: 171-173.

1978:

Bull, Evelyn L. Roosting activities of a male pileated woodpecker. The Murrelet. 58: 35-36.

Ganskopp, David Conrad. Plant communities and habitat types of the Meadow Creek experimental watershed. Corvallis, OR: Oregon State University. 162 p. M.S. thesis.

Geist, J. Michael; Strickler, Gerald S. Physical and chemical properties of some Blue Mountain soils in eastern Oregon. Res. Pap. 236. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 19 p.

1979:

Buckhouse, John C.; Skovlin, Jon M. Streamside erosion in a Blue Mountain stringer meadow in response to livestock and big game grazing management. In: Progress report on research in range management. Special Rep. 549. Corvallis, OR: Agricultural Experiment Station, Oregon State University: 2-4.

Holechek, J.L.; Vavra, M.; Skovlin, J.M. [and others]. Cattle performance on forested and grassland range. In: Progress report on research in beef cattle nutrition and management. Special Rep. 505. Corvallis, OR: Agricultural Experiment Station, Oregon State University: 7-10.

1980:

Bryant, Larry Duane. Livestock response to riparian zone exclusion. Moscow, ID: University of Idaho. 31 p. M.S. thesis.

Buckhouse, John C.; Knight, Robert W.; Skovlin, Jon M. Some erosional and water quality responses to selected animal grazing practices in northeastern Oregon. Proceedings of the Oregon Academy of Science. 15: 13-22.

Holechek, Jerry Lee. The effect of vegetation type and grazing system on the performance, distribution and intake of yearling cattle. Corvallis, OR: Oregon State University. 247 p. Ph.D. dissertation.

1981:

Buckhouse, John C.; Skovlin, Jon M.; Knight, Robert W. Streambank erosion and ungulate grazing relationships. Journal of Range Management. 34: 339-340.

Holechek, J.L.; Vavra, M.; Skovlin, J. Diet quality and performance of cattle on forest and grassland range. Journal of Animal Science. 53: 291-298.

1982:

Bryant, Larry D. Response of livestock to riparian zone exclusion. Journal of Range Management. 35: 780-785.

Holechek, J.; Vavra, M.; Skovlin, J. Cattle diet and daily gains on a mountain riparian meadow in northeastern Oregon. Journal of Range Management. 35: 745-747.

Holechek, J.L.; Vavra, M.; Arthur, D. Relationships between performance, intake, diet nutritive quality and fecal nutritive quality of cattle on mountain range. Journal of Range Management. 35: 741-744.

Holechek, Jerry L.; Vavra, M.; Skovlin, J.M. [and others]. Cattle diets in the Blue Mountains of Oregon. II: Forests. Journal of Range Management. 35: 239-242.

Holechek, Jerry L.; Vavra, Martin. Forage intake by cattle on forest and grassland ranges. Journal of Range Management. 35: 737-741.

1983:

Bohn, Carolyn C. The response of soils, streambanks and instream coliform bacteria levels to grazing management in a riparian area. Corvallis, OR: Oregon State University. 85 p. M.S. thesis.

Bryant, Larry D. Livestock management in the riparian ecosystem. In: Proceedings of the North American Riparian Conference; 1983 April 16-18; Tucson, AZ. Gen. Tech. Rep. RM-120. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 285-289.

Bryant, Larry D.; Skovlin, J.M. Effect of grazing strategies and rehabilitation on an eastern Oregon stream. In: Proceedings of a symposium on habitat disturbance and recovery; [Dates unknown]; San Francisco. [Location of publisher unknown]: California Trout Inc.; 27-30.

Buckhouse, J.C.; Bohn, C.C. Response of coliform bacteria concentration to grazing management. In: Progress report on research in rangeland management. Special Rep. 682. Corvallis, OR: Agricultural Experiment Station, Oregon State University: 1-7.

Bull, Evelyn L. Longevity of snags and their use by woodpeckers. In: Proceedings of a symposium on snag habitat management; 1983 June 7-9; Flagstaff, AZ. [Location of publisher unknown]: [Publisher unknown]: 64-67.

Holechek, J.L.; Vavra, M. Fistula sample numbers required to determine cattle diet on forest and grassland ranges. Journal of Range Management. 36: 323-326.

Vavra, Martin. Managing grazing animal response to forestland vegetation. In: Proceedings of a symposium on forestland grazing; 1983 February 23-25; Pullman, WA. [Location of publisher unknown]: [Publisher unknown]: [Pages unknown].

1984:

Beckwith, R.C.; Kemp, W.P. Shoot growth models for Douglas-fir and grand fir. Forest Science. 30: 743-746.

Quigley, T.M.; Skovlin, J.M.; Workman, J.P. An economic analysis of two systems and three levels of grazing in ponderosa pine range. Journal of Range Management. 37: 309-311.

Skovlin, Jon M. Impacts of grazing on wetlands and riparian habitat: a review of our knowledge. In: Developing strategies for range management. Boulder, CO: National Research Council/Academy of Science, Westview Press: 1001-1103.

Vavra, Martin. Livestock production possibilities on streamside meadows. In: Proceedings of Pacific northwest range management short course: range watersheds, riparian zones and economics: interrelationships in management and use; [Dates unknown]; Corvallis, OR. [Location of publisher unknown]: [Publisher unknown]: [Pages unknown].

1985:

Beckwith, Roy C.; Bull, Evelyn L. Scat analysis of the arthropod component of pileated woodpecker diet. The Murrelet. 66: 90-92.

Bohn, C.C.; Buckhouse, J.C. Some responses of riparian soils to grazing management in northeastern Oregon. Journal of Range Management. 32: 378-381.

1986:

Bull, Evelyn L.; Peterson, Steven R.; Thomas, Jack Ward. Resource partitioning among woodpeckers in northeastern Oregon. Res. Note 444. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 19 p.

Kemp, William P.; Brian, Dennis; Beckwith, Roy C. Stochastic phenology model for the western spruce budworm (*Lepidoptera: Tortricidae*). Environmental Entomology. 15: 547-554.

1987:

Bull, Evelyn L. Ecology of the pileated woodpecker in northeastern Oregon. Journal of Wildlife Management. 52: 472-481.

Holechek, Jerry L.; Berry, Timothy J.; Vavra, Martin. Grazing system influences on cattle performance in mountain range. Journal of Range Management. 40: 55-59.

1988:

Bull, Evelyn L.; Meslow, Charles. Breeding biology of the pileated woodpecker-management implications. Res. Note 474. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 8 p.

Wickman, Boyd E. Seasonal variation of degree-day accumulation in relation to phenology of western spruce budworm, Douglas-fir tussock moth, and host trees in northeastern Oregon. Res. Note PNW-RN-482. Portland, OR: U.S. Department of Agriculture, Pacific Northwest Research Station. 11 p.

Appendix 4: Common and Scientific Names of Species

Plants[1]

Grasses and grasslike plants—	
Bearded bluebunch wheatgrass	*Agropyron spicatum* (Pursh) Scribn. & Sm.
Bottlebrush squirreltail	*Sitanion hystrix* (Nutt.) J.G. Sm.
Elk sedge	*Carex geyeri* Boott
Giant wild rye	*Elymus cinereus* Scribn. & Merr.
Idaho fescue	*Festuca idahoensis* Elm.
Letterman needlegrass	*Stipa lettermanii* Vas.
Northwestern sedge	*Carex concinnoides* Mack.
Onespike danthonia	*Danthonia unispicata* (Thurb.) Munro ex Macoun
Pinegrass	*Calamagrostis rubescens* Buckl.
Prairie Junegrass	*Koeleria cristata* Pers.
Ross sedge	*Carex rossii* Boott
Sandberg bluegrass	*Poa secunda* Presl.
Tufted hairgrass	*Dischampsia caespitosa* (L.) Beauv.
Forbs—	
Camas root	*Camassia qualmish* Lindl.
Low gumweed	*Grindelia nana* Nutt.
Rush pussytoes	*Antennaria luzuloides* T. & G.
Western yarrow	*Achillea millefolium* var. lanulosa (Nutt.) Piper
Shrubs—	
Birchleaf spiraea	*Spiraea betulifolia lucida* (Dougl.) C.L. Hitchc.
Common snowberry	*Symphoricarpos albus* (L.) Blake

[1] Nomenclature for plants, forbs, shrubs, and trees follows Garrison and others (1976).

Trees—

Douglas-fir (interior)	*Pseudotsuga menziesii* var. *glauca* (Beissn.) Franco
Grand fir	*Abies grandis* (Dougl.) Lindl.
Lodgepole pine	*Pinus contorta* Dougl. ex Loud.
Ponderosa pine	*Pinus ponderosa* Dougl. ex Laws.
Western larch	*Larix occidentalis* Nutt.
Subalpine fir	*Abies lasiocarpa* (Hook.) Beauv.

Animals

Mammals—[2]

Rocky mountain elk	*Cervus elaphus* (Linnaeus)
Rocky mountain mule deer	*Odocoileus hemionus* (Rafinesque)

Birds—[3]

Blue grouse	*Dendragopus obscurus* (Say)
Pileated woodpecker	*Dryocpus pileatus* (Linnaeus)

Fish—[4]

Chinook salmon	*Oncorhynchus tschawytscha* (Walbaum)
Steelhead trout	*Salmo gairdneri* (Richardson)

Insects—[5]

Douglas-fir bark beetle	*Dendroctonus pseudotsugae* (Hopkins)
Douglas-fir tussock moth	*Orgyia pseudotsugata* (McDunnough)
Larch casebearer	*Coleophora laricella* (Hübner)
Mountain pine beetle	*Dendroctonus ponderosae* Hopkins
Spruce budworm	*Choristoneura fumiferana* (Clemens)

---

[2] Nomenclature follows Nowak and Paradiso (1983).
[3] Nomenclature for birds follows that of the American Ornithologist's Union (1983).
[4] Nomenclature used for fish follows the American Fisheries Society (1970).
[5] Nomenclature used for insects follows Furniss and Carolin (1977).

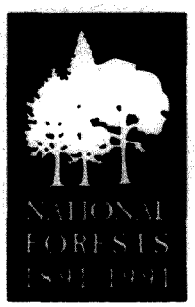
☆ U.S. GOVERNMENT PRINTING OFFICE: 1991-591-001/40038

Skovlin, Jon M. 1991. Fifty years of research progress: a historical document on the Starkey Experimental Forest and Range. Gen. Tech. Rep. PNW-GTR-266. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 58 p.

This document traces the history of the Starkey Experimental Forest and Range since its establishment on July 11, 1940. It recalls the historical process of community development and the evolution of forest, range and wildlife exploitation, which produced the conditions making the area appropriate for a research station. This paper recounts the comings and goings of research personnel through a half century of activities and program development. The author also analyzes a succession of events that have brought about ecological changes on the Starkey Range. Included is a list of publications resulting from research at the Starkey Experimental Forest and Range.

Keywords: History, research, range management, forest ecology, Starkey Experimental Forest and Range, Oregon (Blue Mountains).

Pacific Northwest Research Station
319 S.W. Pine St.
P.O. Box 3890
Portland, Oregon 97208-3890



U.S. Department of Agriculture
Pacific Northwest Research Station
319 S.W. Pine Street
P.O. Box 3890
Portland, Oregon 97208

BULK RATE
POSTAGE +
FEES PAID
USDA-FS
PERMIT No. G-40

Official Business
Penalty for Private Use, $300

do NOT detach label