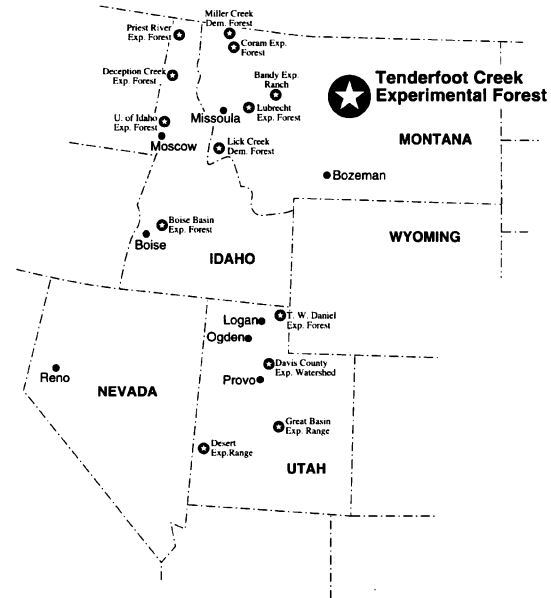


Tenderfoot Creek Experimental Forest

Ward W. McCaughey

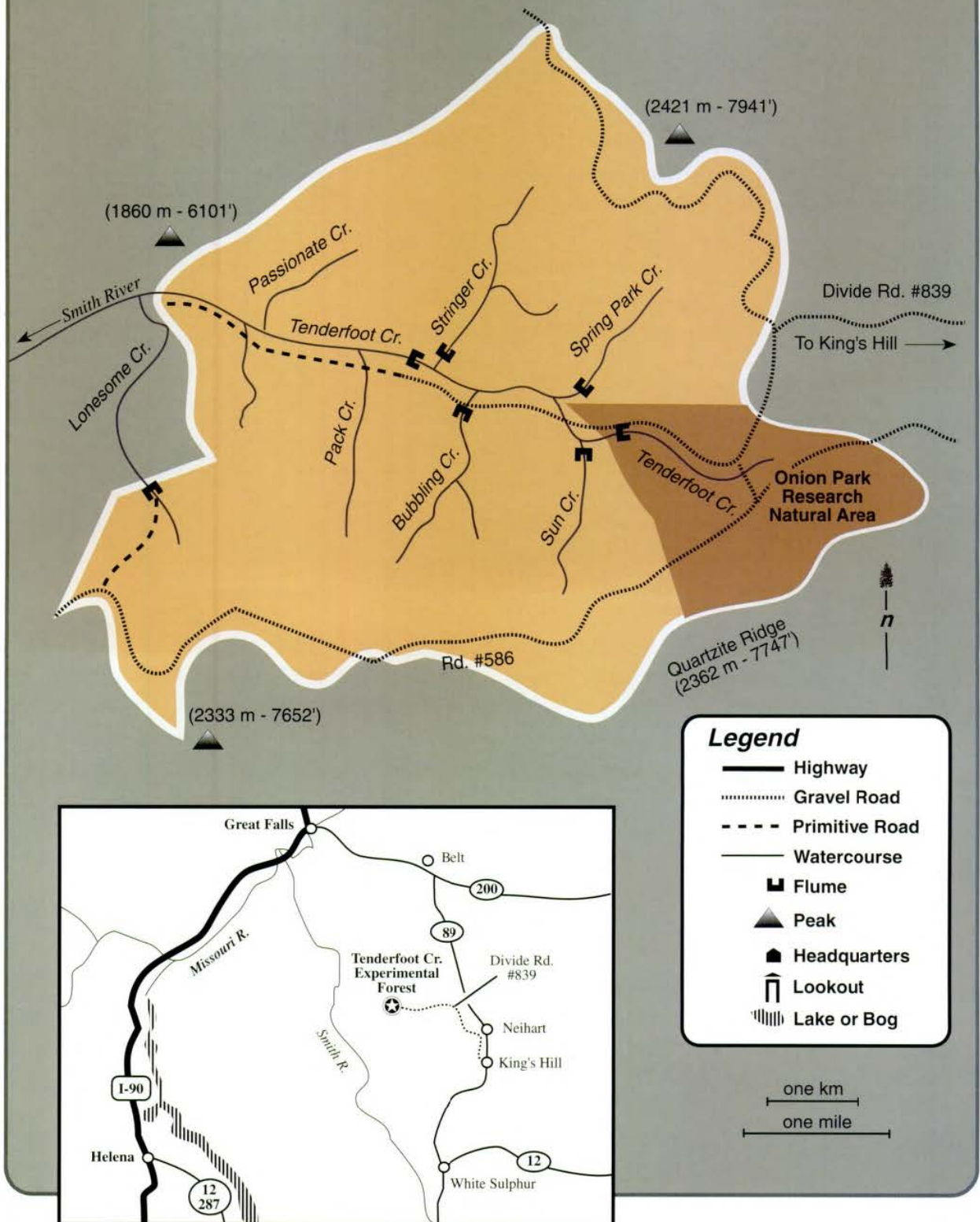
The Tenderfoot Creek Experimental Forest, established in 1961, is representative of the vast expanses of lodgepole pine (*Pinus contorta*) found east of the Continental Divide in Montana, southwest Alberta, and Wyoming. Discrete generations of even-age lodgepole stands form a mosaic typical of the fire-prone forests at moderate to high altitudes in the Northern Rocky Mountains. Spruce (*Picea engelmannii*) grows in the area's sparse but species-rich wetlands, while whitebark pine (*Pinus albicaulis*) and subalpine fir (*Abies lasiocarpa*) grace the higher ridgetops. Native cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*Oncorhynchus mykiss*), cutthroat-rainbow hybrids, and brook trout (*Salvelinus fontinalis*) spawn in the forest's six main drainages.



The Tenderfoot Creek Experimental Forest is the only experimental forest formally dedicated to research on the east slope of the Northern Rockies. Established originally for watershed research, its scope was recently expanded to include study of fire history, fisheries, composition of vegetation and animal communities, including rare, endangered, and sensitive species, and other physical, biological, and social factors as they relate to landscape-level management.

The Tenderfoot Creek Experimental Forest encompasses 3,591 ha (8,870 acres) in the Little Belt Mountains on the Lewis and Clark National Forest, about 40 air km (25 miles) north of White Sulphur Springs, Montana. Lodgepole pine occupies about 3,412 ha (8,428 acres) of the forest, wet meadows cover 125 ha (309 acres), while grassy slopes make up another 54 ha (133 acres). Elevations in this rugged area range from 1,840 to 2,421 m (6,035 to 7,941 ft). Tenderfoot Creek drains into the Smith River (a tributary of the Missouri River), a well-known blue-ribbon trout stream.

Tenderfoot Creek Experimental Forest

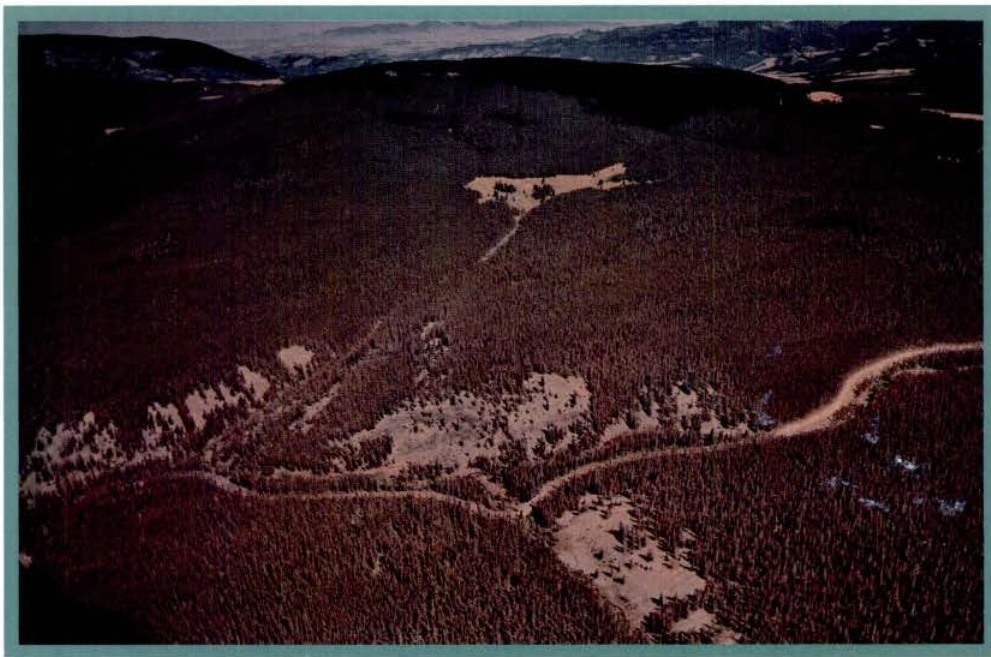


Climate

The climate in the Little Belt Mountains is generally continental with occasional influence of the Pacific maritime climate along the Continental Divide from Marias Pass south. Average annual precipitation ranges between 380 to 510 mm (15 to 20 inches) on the drier foothill regions on the south side of the Little Belts and over 1,020 mm (40 inches) on some of the alpine ridges in the central parts of the range.

Annual precipitation on Tenderfoot Creek Experimental Forest averages 880 mm (35 inches) and ranges from 594 to 1,050 mm (23 to 41 inches) from the lowest to highest elevations. Monthly precipitation generally peaks in December or January at 100 to 125 mm (4 to 5 inches) per month and declines to a late July through October dry period of only 50 to 60 mm (2 to 4 inches) per month. Approximately 70 percent of the annual precipitation falls during November through May, usually in the form of snow. Intense summer thunderstorms are relatively rare, and most overland flow and associated soil erosion are associated with snowmelt. Runoff from the forest is estimated to average about 250 mm (9.8 inches) per year. Peak flow usually occurs in late May or early June and is generated by snowmelt or in combination with rainfall. Lowest flows usually occur from August through winter months.

Mountain soils generally are at field capacity at the beginning of plant growth in early spring. At lower elevations and on dry south-facing slopes, plant soil moisture stress



Aerial view of Tenderfoot Creek Experimental Forest, a typical lodgepole pine ecosystem in the Northern Rockies.



Snow depths and water equivalents are measured periodically at dispersed sites on Tenderfoot Creek Experimental Forest.

stops plant growth for shallow rooted plants by mid-July. At higher elevations growing seasons are shorter, and killing frosts limit growth rather than does moisture stress.

Freezing temperatures and snow can occur every month of the year at Tenderfoot Creek Experimental Forest and throughout the Little Belt range. For hardy native plants, growing seasons average 45 to 75 days decreasing to 30 to 45 days on the higher ridges.

Soils

Tenderfoot Creek, a west-flowing perennial stream, has developed across a gently sloping north-south anticline. The most extensive soil groups are the loamy skeletal, mixed Typic Cryochrepts and clayey, mixed Aquic Cryoboralfs. Rock talus slopes are prominent on the perimeter of the landscape, but rock outcrops are confined chiefly to areas adjacent to the main stream channels. Also prominent in the area are grassland parks chiefly at the head of the drainages. Soils in the parks range from well to poorly drained. Seeps and springs are common over the entire forest.

The geology of Tenderfoot Creek Experimental Forest is characterized by igneous intrusive sills of quartz porphyry, Wolsey shales, Flathead quartzite, and granite gneiss. The northern part of the forest occupies the highest elevations and steepest upland topography

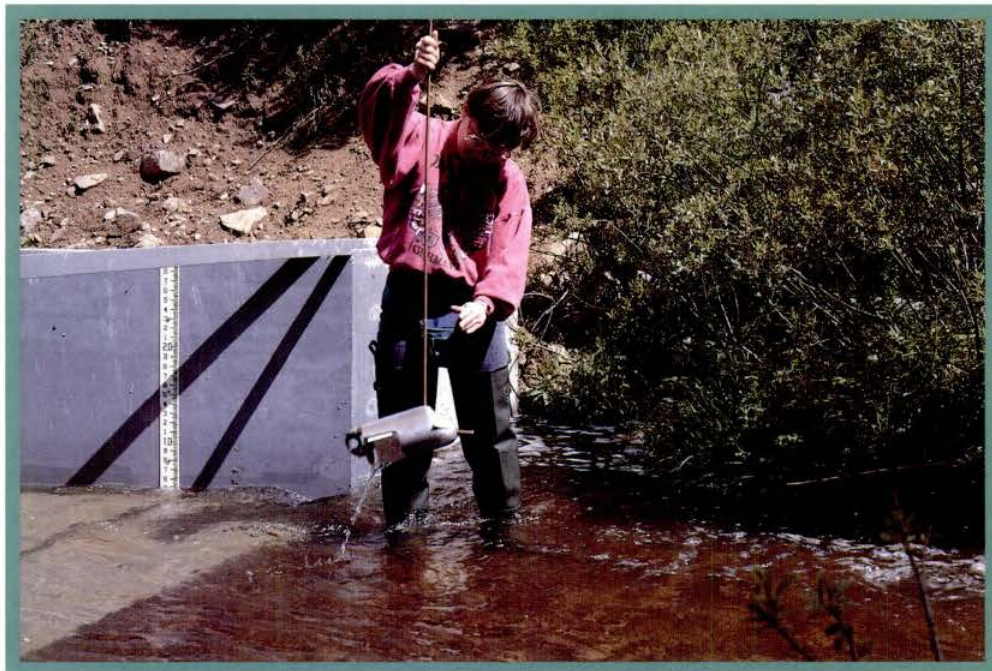
and is underlain by igneous intrusive granitic rocks. The arched bedrock in the area was formed from metasediments of Cambrian Age consisting mainly of argillites and quartzites. Glaciation has influenced the landform, producing broad basins in which the streams are beginning to regain a water-carved dendritic pattern. Tenderfoot Creek has carved the deepest pattern and is entrenched in a steep canyon with prominent bedrock cliffs.

Main Communities

According to Pfister's (1977) habitat type classification, four forest habitat types are present on the Tenderfoot Creek Experimental Forest:

- *Abies lasiocarpa/Vaccinium scoparium*
- *Abies lasiocarpa/Vaccinium globulare*
- *Abies lasiocarpa/Calamagrostis canadensis*
- *Abies lasiocarpa-Pinus albicaulis/Vaccinium scoparium*

In addition to these four climax types, a portion of the forest keys to the *Pinus contorta/Vaccinium* community type. In this case, however, the community type is attributable to the *Abies lasiocarpa/Vaccinium scoparium* habitat type because of the extensive and continuous presence of *Abies* regeneration and old growth throughout the forest.



Stream flow is monitored continuously, and water sediment and nutrient/chemical samples are collected periodically at flume sites on Tenderfoot Creek Experimental Forest.

Within each habitat type there are stands of different age classes occurring intermittently throughout the forest. Four other general land descriptions classified for the forest are talus slopes, rock outcrops, grassland parks, and wet meadows.

Data Bases

Among reports on the establishment and early survey work of Tenderfoot Creek Experimental Forest are:

- Establishment report—1961
- Timber inventory—1957-1963
- Soil types and maps—1966
- Fuels analysis—1974
- Ecological habitat type descriptions—1975
- Prospectus of multiresource research program—1975
- Wildlife prescriptions—1977
- Silviculture prescription for timber—1977
- First approximation of integrated treatments for Tenderfoot Creek Experimental Forest—1978
- Hydrologic Instrumentation Plan—1979
- Action Plan for Tenderfoot Creek Experimental Forest—1990

A recent report describes the research activities for the experimental forest since watershed monitoring began in 1991. Reports can be obtained from the Forest Manager (see contact address).

Climatic Data

Weather records dating back to 1967 are available from Snow Survey Telemetry System (SNOTEL) sites near Tenderfoot Creek Experimental Forest. A weather station was installed on the forest in 1993, and eight precipitation and snow course data sites were installed in 1992. Two snow pillows were installed in 1993 and are recording snow water equivalent values for open and closed canopy areas in the upper elevations of the experimental forest. In 1992 snow depth and snow water equivalent monitoring were initiated for evaluating winter precipitation.

Hydrologic Data

Three flumes were installed in 1992, two in 1993, and two in 1994. Stream discharge records are being recorded on continuous strip chart recorders. Sediment and nutrient composition of streams have been monitored since 1992. Automated sediment samplers were installed in 1994, collecting daily sediment production during spring, summer, and fall.

Vegetation Data

Basic forest stand information has been compiled by Lewis and Clark National Forest for all stands identified on Tenderfoot Creek Experimental Forest. Fire history data show fire patterns and current forest stand characteristics. A vegetation mapping study of Onion Park Research Natural Area describes 17 habitat and community types of that portion of Tenderfoot Creek Experimental Forest. A fuels inventory was completed in 1974 for the experimental forest.

Maps and Aerial Photos

Available maps include soils, habitat types, forest stands, geology, fire history, Onion Park Research Natural Area vegetation communities, topographic features, transportation plan, precipitation zones, and watershed boundaries. Aerial photos are available from 1945, 1955, 1960, 1971, 1981, 1988, and 1989 (infrared). Geographical Information Systems layers include forest stands, experimental forest boundaries, roads, streams, watershed boundaries, precipitation zones, data sampling locations, and elevations.

Examples of Research

Research activity on Tenderfoot Creek Experimental Forest is designed to develop and evaluate methods for sustaining the productivity and biodiversity of east-side lodge-pole pine communities. Baseline information is being collected in these subject areas:

- Vegetation resources
- Hydrologic inputs and outputs
- Water quality (chemical and sediment)
- Climate
- Wildlife (avian and mammals)
- Fisheries resources (habitat and population surveys)
- Social aspects
- Fire history
- Stream channel characterization

Facilities

The ten permanent structures on Tenderfoot Creek Experimental Forest include seven flumes and three snow pillows. A fully contained travel trailer is parked on or near the experimental forest during summers providing temporary quarters for field crews.

Field research facilities include seven watershed gauging stations, a snow and weather station in Onion Park Research Natural Area, and eight data sites for collection of snow and rainfall data.

Other features include two internal access roads for stream monitoring (Tenderfoot Creek and Lonesome Creek). All other roads are just within, or on the border of, three of the four forest boundaries. The western boundary of the forest is accessed by trails only. Tenderfoot Creek Experimental Forest is open for foot, horse, and motorbike travel in the summer and snowmobile use in the winter. The main road along Tenderfoot Creek is closed to large motorized vehicles except for administrative use.

Location

The 3,591 ha (8,870 acres) Tenderfoot Creek Experimental Forest (lat. 46°55' N., long. 110°52' W.) is at the headwaters of Tenderfoot Creek on the Lewis and Clark National Forest in Meagher County, Montana. The experimental forest lies within T. 13 N., R. 6, 7 E. and T. 14 N., R. 6, 7 E., MPM.

The forest is approximately a 64 km (40 mile) drive north of White Sulphur Springs, Montana, or a 114 km (71 mile) drive southeast of Great Falls, Montana. The Forest Manager's office is at the Forestry Sciences Laboratory in Bozeman, Montana, approximately 177 km (110 miles) south of the experimental forest.

Suggested Reading

- Farnes, Phillip E.; McCaughey, Ward W. 1995. Hydrologic and geologic characterization of Tenderfoot Creek Experimental Forest, Montana. Unpublished Report. Bozeman, MT: Forestry Sciences Laboratory, Montana State University. 200 p.
- McCaughy, Ward W.; Farnes, Phillip E. 1994. Tenderfoot Creek Experimental Forest 1992 and 1993 annual report. Unpublished Report. Bozeman, MT: Forestry Sciences Laboratory, Montana State University. 73 p.
- Pfister, R.D.; Kovalchick, B.L.; Arno, S.; Presby, R. 1977. Forest habitat types of Montana. Gen. Tech. Rep. INT-34. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 174 p.

Contact Address

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