Fraser Experimental Forest (FRA) [USFS]

The Fraser Experimental Forest (FRA) was established in 1937 in high-elevation subalpine coniferous forests located ca. 80 km west of Denver, CO (http://www.fs.fed.us/rm/fraser/). FRA includes subalpine forests and alpine tundra typical of the central Rocky Mountains (Fig. A1-29). In the forested areas below timberline, Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) are predominant trees at higher elevations, or north slopes and along streams; lodgepole pine (*Pinus contorta var. latifolia*) is the predominant tree at lower elevations and on drier upper slopes. The majority of the forest began natural regeneration after a stand-replacing fire in 1685. Pockets of older trees exist in draws and at higher elevations. The flat, low elevation portion of the forest was logged in the early 1900's. Overall, the climate is cool and humid with long, cold winters and short, cool summers. Frost and snowfall can occur any month of the year. Nearly two-thirds of the precipitation falls as snow from October to May, and ca. half of the precipitation is lost as runoff with peak flow occurring in the second week of June. Elevation varies from 2680-3900 m, and about one-third of the forest is above timberline at 3350 m.

Research focus. The FRA studies effects of management practices on water yield and quality. Long-term study plots were established in both lodgepole pine and Engelmann spruce, and seven watersheds have been monitored for streamflow, climate, and snow; some records now exceed 60 years in length. Snow depth and water content are collected on five watersheds, with records dating to 1941 for one watershed. Current research addresses questions about links among forests, riparian areas, and streams in order to better understand mechanisms important in water balance, watershed chemistry, nutrient cycling, and ecosystem carbon storage. The current outbreak of Mountain Pine Bark Beetle has shifted focus to widespread disturbance of subalpine forests, and subsequent changes in water yield, nutrient cycling, soil processes, sedimentation and riparian structure.

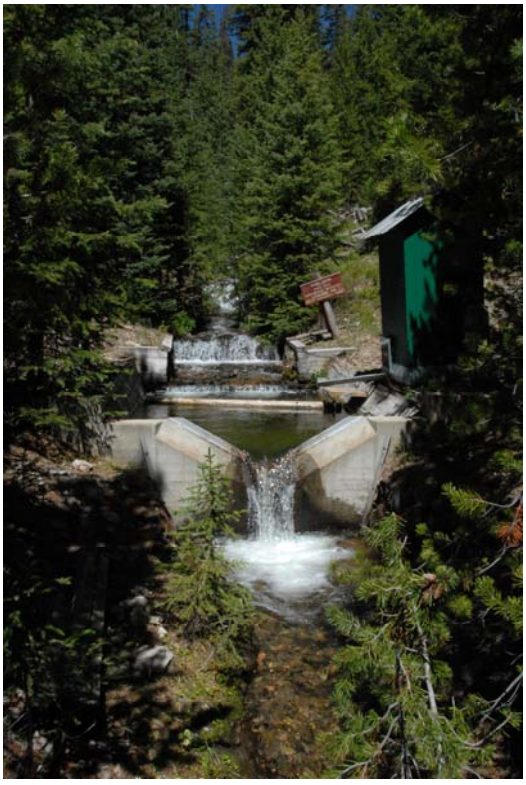

Fig. A1-29. The Fraser Experimental Forest (FRA USFS) is located in subalpine coniferous forests of the central Rocky Mountains. Photo: FRA photo gallery.

Long-term studies. Most of the hydrological and silvicultural practices used in managing subalpine forests in the central Rocky Mountains are derived from research done at FRA. Improvements in understanding the factors that control snow distribution and water yield across heterogeneous landscapes have been incorporated into water yield models. Studies of tree water use and ecophysiology have provided a better understanding of the growth dynamics of forests and transpiration water loss, and have been incorporated into models used to predict the impact of changing climate on forest production and carbon storage. Long-term studies of manipulated forest stands indicate that recovery requires substantially longer than originally hypothesized. Aquatic and terrestrial biogeochemistry have been studied in manipulated and control catchments, providing a greater understanding of the processes that control stream water quality. Long-term data sets of stream and precipitation chemistry are extremely valuable given the potential for increases in anthropogenic emissions in coming decades.