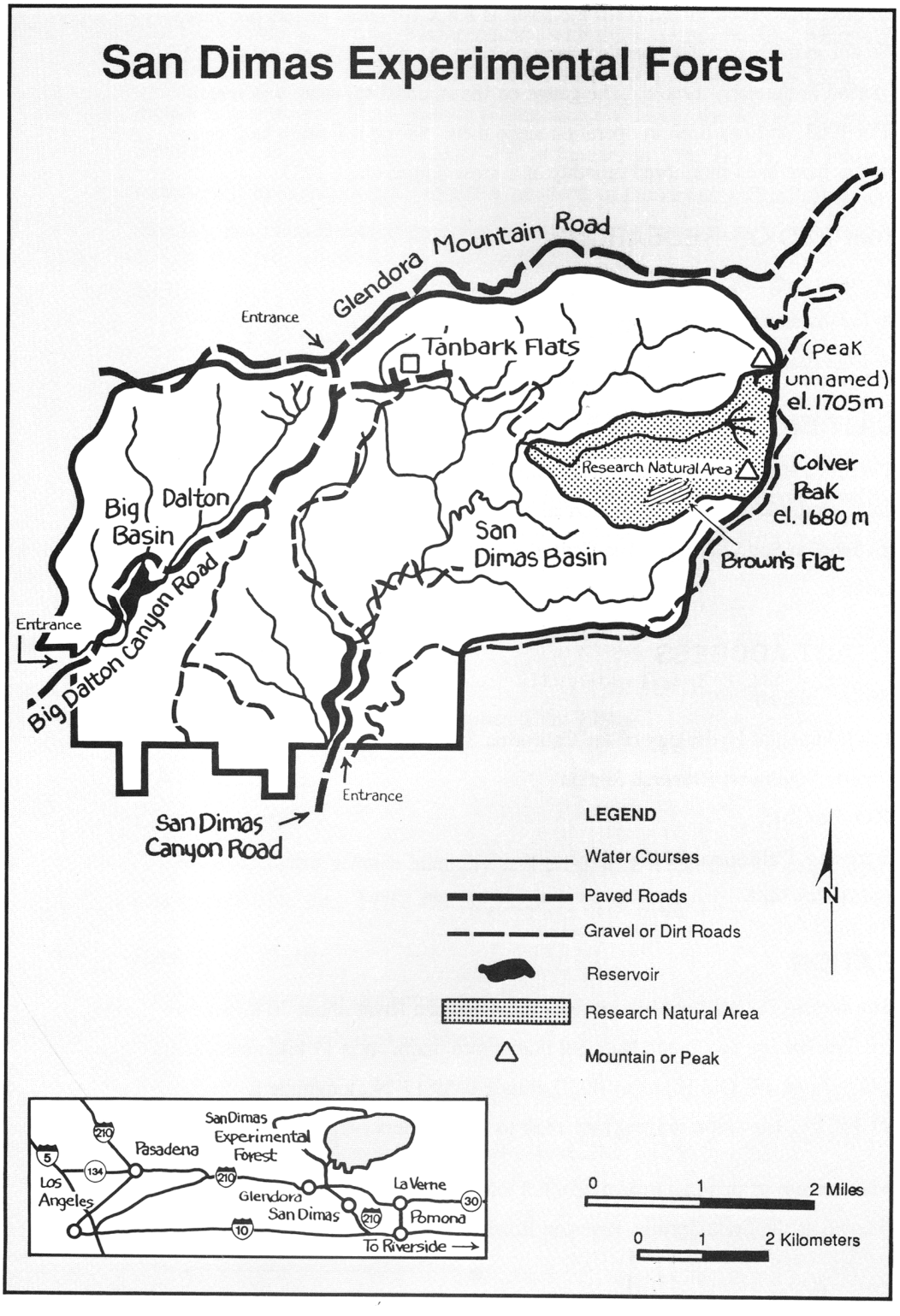
San Dimas Experimental Forest
Glendora Mountain Road
Entrance
Tanbark Flats
(peak unnamed) el. 1705 m
Research Natural Area
Colver Peak el. 1680 m
Big Dalton Basin
San Dimas Basin
Brown's Flat
Big Dalton Canyon Road
Entrance
Entrance
San Dimas Canyon Road
LEGEND
Water Courses
Paved Roads
Gravel or Dirt Roads
Reservoir
Research Natural Area
Mountain or Peak
N
0 1 2 Miles
0 1 2 Kilometers
San Dimas Experimental Forest
Pasadena
Los Angeles
Glendora
San Dimas
La Verne
Pomona
To Riverside
5
134
210
10
30

SAN DIMAS
Experimental Forest

The San Dimas Experimental Forest (SDEF) contains some of the earliest and longest records from continuously monitored, experimental watersheds in the United States. It has been designated by the Man and the Biosphere Program of the United Nations as a Biosphere Reserve and by the National Science Foundation and the Institute of Ecology as an Experimental Ecological Reserve. Fern Canyon, a 550-hectare tributary to San Dimas Canyon, was set aside in 1972 as a Research Natural Area (RNA)—a pristine area where only nondestructive research can take place. Included in the area is Brown's Flat, a locally unique, mountain meadow that supports a grove of ponderosa pine *(Pinus ponderosa* Dougl. ex Laws.).

The Experimental Forest was established in response to the need for an outdoor laboratory in southern California to study various aspects of watershed management. The need for an experimental forest in southern California had been recognized since the founding of the California Forest Experiment Station (now Pacific Southwest Research Station) in 1926. Edward I. Kotok, Station Director, Charles J. Kraebel of the Station's research staff, and Walter C. Lowdermilk of the University of California College of Forestry evaluated several potential sites and formally recommended the San Dimas site in May 1932. Research operations began in January 1933 when J. Donald Sinclair arrived as its first director (then called scientist-in-charge), and this has long been regarded as the actual (if unofficial) beginning of the Experimental Forest. The Forest was formally established on March 28, 1934.

The Experimental Forest is located within the Angeles National Forest and comprises 6786 ha of steep, rugged terrain in the southeastern San Gabriel Mountains, with elevations ranging from 400 to 1700 m and slopes averaging 68 percent (34 degrees). It encompasses the entire upper watersheds of the Big Dalton and San Dimas drainage basins. Each of these basins is controlled by a large flood control dam, built and maintained by the Los Angeles County Department of Public Works. The two dams are located within the Experimental Forest just

Figure 7—*Stream gauging station in Volfe Canyon (Watershed 09) measuring streamflow through its 0.9-meter flume (note gate at right and slightly above flume). Directly behind is the 2.4-meter flume used for measuring high flows. Discharge shown in this photo is 450 liters/second. During low flows the gates are closed and flow is measured by a 90° v-notch wier to the left of the instrument house.*

upstream from the mountain front. For research purposes, these two basins are subdivided into 10 major watershed units with areas of 260 to 650 ha, and over 40 smaller watersheds ranging from less than 2 ha to over 40 ha. These watersheds are all equipped with stream gauging stations (*fig. 7*), and many also have debris basins for sedimentation studies.

A climatic station has been maintained at Tanbark Flats, the field headquarters within the Experimental Forest, for over 50 years. Other instruments currently in operation include eight recording raingauges, six stream gauging stations and four debris basins to measure sedimentation. Much larger networks of these instruments were maintained in the past, and data gathered from all the instruments are still available. A seismograph is located in Fern Canyon, and the U.S. Geological Survey maintains a pore-water pressure monitoring station on the east side of Bell Canyon. Tanbark Flats has an acid deposition monitoring site for the National Trends Network as part of the National Acid Deposition Program.

The most elaborate research facility on the Experimental Forest is the large lysimeter installation at Tanbark Flats (*fig. 8*). It consists of 26 large lysimeters and numerous smaller ones. Although the studies for which it was originally designed in the early 1930's have ended, it is still used for a variety of experiments requiring relatively small, controlled soil environments. It remains the largest structure of its type ever built.

Figure 8—*View of a portion of the San Dimas Experimental Forest (ca. 1935) looking northwest from above the field headquarters at Tanbark Flats—the buildings in the near middleground. The large cleared area behind the buildings is the lysimeter installation for which the Experimental Forest is noted. Glendora Ridge, the level area in the background, marks the northern boundary of the Forest.*

The course of research studies has changed considerably since the establishment of the San Dimas Experimental Forest. The original research was directed towards increasing water yield, but new problems have led to new avenues of research. Currently, the principal efforts are directed towards studying erosion and sediment movement, water quality, postfire ecosystem recovery and the effects of smog, as well as the continuation of several earlier programs. Because of its accessibility to several nearby universities, research by their staffs and faculties is an important part of the work at San Dimas. The forest also serves as an outdoor teaching laboratory for local colleges, high schools, and educational groups.

Most major chaparral species are represented on SDEF. The dominant species include chamise *(Adenostoma fasciculatum* H. & A.), *Ceanothus* spp., California scrub oak *(Quercus dumosa* Nutt.), sumac *(Rhus* spp.) and manzanita *(Arctostaphylos* spp.). Soft chaparral species include yerba santa *(Eriodictyon* spp.), California buckwheat *(Eriogonum fasciculatum* Benth.), *Lotus* spp., and lupine *(Lupinus* spp.).

Large grass covered areas in Bell and Monroe Canyons are the result of studies aimed at increasing water yield by converting brush to grass. Begun in the late 1950's, this conversion produced some unexpected results in the form of increased ground failures. The effects of this watershed manipulation are still being studied.

Many tree species, especially coast live oak *(Quercus agrifolia* Nee.), California sycamore (*Platanus racemosa* Nutt.), California bay *(Umbellularia californica* [H. & A.] Nutt.), white alder *(Alnus rhombifolia* Nutt.), and bigleaf maple (*Acer macrophyllum* Pursh) can be found in and near the riparian zones. Several old stands of bigcone Douglas-fir *(Pseudotsuga macrocarpa* [Vasey] Mayr.) are gradually disappearing, possibly because of recurring fires and smog damage. At higher elevations on north-facing slopes there are woodlands with large stands of canyon live oak *(Quercus chrysolepis* Liebm.) interspersed with bigcone Douglas-

Figure 9—*Oak woodland chaparral vegetation in the Fern Canyon Research Natural Area is typical of the higher elevations on the San Dimas Experimental Forest. Bigcone Douglas-fir* (Pseudotsuga macrocarpa) *in the right center of the photograph is a typical associate of chaparral types at this elevation—about 1515 meters. (Photo ca. 1935)*

fir plus a few ponderosa pine and sugar pine *(Pinus lambertiana* Dougl.) *(fig. 9)*. (An arboretum featuring both native and introduced trees is located at Tanbark Flats).

Wildlife is abundant and varied in the San Dimas Experimental Forest. Over 40 species of mammals and over 180 species of birds either live in the experimental forest or visit it annually. In addition there are over 35 species of reptiles and amphibians, and numerous migratory waterfowl and birds associated with urban environments.

A publication describing the research history of the Experimental Forest includes complete species lists for both plants and animals (Dunn and others 1988).

CLIMATE

The climate is typically Mediterranean with hot, dry summers and cool, wet winters. Annual precipitation at Tanbark Flats is 705 millimeters and falls primarily as rain. Snow is common only in the northeastern part of the Forest where elevations exceed 1500 meters. The rainy season runs from November through March. The coolest month of the year is January and the warmest is August. Mean monthly temperatures at Tanbark Flats are shown below:

Month	Mean temperature °C
January	8.5
February	9.1
March	9.6
April	12.1
May	14.0
June	17.6
July	22.3
August	22.6
September	21.1
October	16.6
November	12.3
December	10.0

SOILS

The soils of the Experimental Forest are generally shallow, rocky and poorly developed. Most are derived from one of two parent materials—a Precambrian complex of gneisses and schists, and a Mesozoic igneous complex (primarily tonalite, and granodiorite). The most extensive soil groups are coarse-loamy, mixed, thermic, shallow Typic Xerorthents and fine-loamy, mixed, thermic Mollic Haploxeralfs, the latter developing primarily on the granitic parent materials and the former on both types of parent material. At higher elevations (above 1370 m) these same parent materials underlie fine-loamy, mixed, mesic Mollic Haploxeralfs. Around Johnstone Peak in the southwestern part of the Forest is a small area of fine, mixed, thermic Typic Argixerolls developed over a Miocene volcanic parent material (andesite and rhyolite). On gentler slopes small areas of coarse-loamy, mixed, thermic Pachic Haploxerolls can be found. These are underlain by parent materials of schist and andesite.

MAIN COMMUNITIES

According to Kuchler's (1977) classification there are three communities on the Experimental Forest: chaparral (Kuchler 29), coastal sagebrush (Kuchler 32), and California mixed hardwood forest (Kuchler 23). Locally, chaparral is called "hard chaparral" and coastal sagebrush is called "soft chaparral." The California mixed evergreen type includes two communities that are locally recognized as distinct types—oak woodland *(Quercus* spp./*Pseudotsuga macrocarpa*) and riparian woodland *(Quercus/Alnus/Acer/Platanus*).

DATA BASES

Reports and Publications

A master file of over 500 reports and publications has resulted from work done on the Experimental Forest. In addition to published papers, this file includes unpublished reports, surveys, study plans and miscellaneous data, as well as complete plant and animal species lists.

Long-Term Records (more than 20 years)

Available long-term records cover precipitation, temperature, relative humidity, *wind direction and speed, evaporation, streamflow and sediment yield. The rainfall* records include the 62-year record from Tanbark Flats and the 110-year record from Glendora. For the local area (Los Angeles County), the Glendora record is second in length only to the 113-year record from downtown Los Angeles.

Short-Term Records (less than 20 years)

Short-term records cover solar radiation, hillslope runoff and erosion, acid rainfall, dry and wet deposition of air pollutants, and chemical pollutants in streamflow (especially nitrates).

Maps and Aerial Photos

Available maps include soils, vegetation, geology and topographic features (such as slope facets, steepness, aspect). Aerial photo sets date back to the late 1930's. Most sets cover only part of the Experimental Forest.

EXAMPLES OF RESEARCH

- Fire effects and postfire recovery of watersheds
  - Effects of fire on ecosystems
  - Effects of fire on the physical environment
  - Postfire recovery of ecosystems
  - Postfire erosion and recovery
  - Postfire water yields
- Erosion and sedimentation
  - Hillslope processes
  - Sediment storage and movement in channels
  - Debris flow dynamics
  - Sediment budgets
- Chaparral and woodland ecology
- Air quality
  - Acid rain/fog
  - Atmospheric deposition
- Nutrient cycling

- Wildland hydrology
  - Water quality
  - Water yield
  - Soil water and groundwater movement
- Prescribed fire applications
- Geologic hazards
- Wildlife studies
- Climatic studies.

FACILITIES

The field headquarters at Tanbark Flats has office space, living quarters and laboratory facilities, all with running water, electricity, and telephone communications. The availability of these facilities is limited and must be scheduled in advance. Tanbark Flats also has an all-purpose shop, limited facilities for equipment storage, a fireproof vault for records storage, a dining and assembly hall, and a heliport.

Field research facilities include over 50 gauged watersheds, the lysimeter complex, the Fern Canyon Research Natural Area, two major dams and reservoirs and three plantations of domestic and introduced trees. The gauged watersheds range in area from 1 to 4200 hectares, and many have debris basins for trapping sediment.

Other features of the Forest include internal access via 10 roads and an extensive network of trails and availability of labor crews on request (this may be limited by other demands, especially during fire season). The entire Experimental Forest is closed to the public and entry requires the issue of a use permit and necessary keys. This helps insure that ongoing studies are subjected to a minimum of disturbance.

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LOCATION

The San Dimas Experimental Forest (lat. 34°12′ N., long. 117°46′ W.) is bordered on the south by the cities of Glendora, San Dimas, and La Verne (see map). Elevation ranges from 400 to 1700 meters.

Primary access is from Glendora via Glendora Mountain Road and Big Dalton Canyon Road. The field headquarters at Tanbark Flats is 16 kilometers from Glendora via Big Dalton Road and 24 kilometers via Glendora Mountain Road. Access is also available from the town of San Dimas.

The forest manager's office is located in Glendora at the Mount Baldy District Ranger Station. Limited office space is available at the manager's office. Also available in Glendora are clerical support to aid in searching records and access to the Forest Service-wide computer network. The Forest Fire Laboratory of the Pacific Southwest Research Station is 64 kilometers east of the Glendora office via freeway, in Riverside.