

Fernow Experimental Forest (FER)

The Fernow Experimental Forest, a 1902-ha outdoor laboratory and classroom, was established in 1934, and named after Bernhard Fernow, a pioneer in American forest management and education. Early research addressed high elevation red spruce and the effects of fire on hardwood forests. Closed during World War II, a new research program was initiated in 1948 that focused on silviculture of Appalachian mixed hardwood forests and forest



hydrology. Research Unit NRS-4353 of the Northern Research Station of the USDA Forest Service manages the Fernow for long-term ecosystem research. Critical research issues include: sustainable forest management, air pollution effects on forest ecosystems, endangered species management, and water supply and quality.

Site characteristics: Located near Parsons, WV, the Fernow lies within the Allegheny Mountain section of the unglaciated Allegheny Plateau. Elevations range from 533 to 1112 m, and slopes are generally steep. The climate is characterized as cool and rainy with a mean annual precipitation of about 150 cm that is relatively evenly distributed throughout the year. Mean annual temperature is 8.9°C, with a frost-free season of about 145 days. Although winter snowfall can be heavy, the snowpack is intermittent in duration. The Fernow mostly is underlain by fractured hard sandstone and shale. A majority of the soils are of the Calvin and Dekalb series, which originated from these rocky

materials (loamy-skeletal, mixed mesic Typic Dystrochrepts). On the southeastern part of the Fernow, Greenbrier limestone outcrops to produce a mid-slope zone of limestone soil of the Belmont series (fine-loamy, mixed mesic Typic Hapludalfs). The average soil depth across the Fernow is about 1m.

The Fernow's forests were heavily cutover between 1905 and 1911. The current (mostly second-growth) vegetation is classified as a mixed mesophytic forest type. Characteristic overstory species include: northern red oak (*Quercus rubra*), yellow-poplar (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), sugar maple (*Acer saccharum*) and red maple (*A. rubrum*). Overall vascular plant species diversity is high and wildlife typical of the central Appalachians predominates.

Research Focus: The silvicultural and hydrologic research developed with considerable overlap. Silvicultural research has addressed questions relating to regenerating, growing, tending and harvesting trees and stands of the mixed hardwoods. Watershed research has addressed basic questions about hydrology and water use by forests, as well as questions dealing with forest management effects on water and soil resources, roads, and the development of best management practices. The Fernow also has been in the forefront of acidic deposition and nitrogen saturation research, conducting a whole watershed acidification study since 1989.

The Fernow frequently has served as a template for work examining wildlife habitat relationships in managed forests. More recent efforts have focused on the role of both natural and anthropogenic forest disturbance as positive and negative influences for sensitive species, due to the presence of the endangered Indiana bat (*Myotis sodalis*) and running buffalo clover (*Trifolium stoloniferum*).

Meteorological data have been collected continuously since 1951; deposition chemistry has been monitored since 1987. The Fernow participates in several air quality monitoring networks. Streamflow has been recorded from 5 gaged, forested watersheds since 1951 and stream chemistry since 1971; currently a total of 10 watersheds are monitored for streamflow and stream chemistry. Since 1949, a whole-forest stand database of over 80 silvicultural compartments has been developed and continuously maintained based on 100% tallies (dbh > 12.7cm) to track even-aged and uneven-aged regeneration methods, as well as and intermediate treatments across a wide range of site quality.

Several unmanaged reference or “control” areas also are included in this database. Data include tree species, dbh, merchantable height/grade, and mortality status of stems within each stand. Regeneration data have been concurrently sampled using temporary plot locations for both seedlings (dbh < 2.54 cm) and saplings (dbh < 12.7 cm) throughout. Individual tree information is collected on over 400 permanent growth plots. Growth plots were first established in 1979 and complement whole-stand data described above. Data includes species, dbh, stem characteristics, logging damage, tree form, crown dimensions, and temporal changes. Permanent growth plots are also used to track net primary productivity in long-term ecological studies.



Research results from the Fernow have demonstrated the benefits of forest management in the central Appalachians and have shown that improved log quality gives the greatest return from silvicultural operations. Guidelines for determining site quality from topographic and soil features have been constructed. Improved logging methods that are practical and profitable were developed based on Fernow research. Fernow research has demonstrated that although annual streamflow can be increased for short periods by sound forest management, harvesting does not increase susceptibility to flooding. The Best Management Practices for the State of West Virginia are based on research conducted by Fernow scientists. Research on effects of acidic deposition on forests has proved useful to other scientists nationally and internationally, to policymakers at the state, regional, and national level, and to special interest groups.