Fort Valley: A Natural Laboratory for Research and Education

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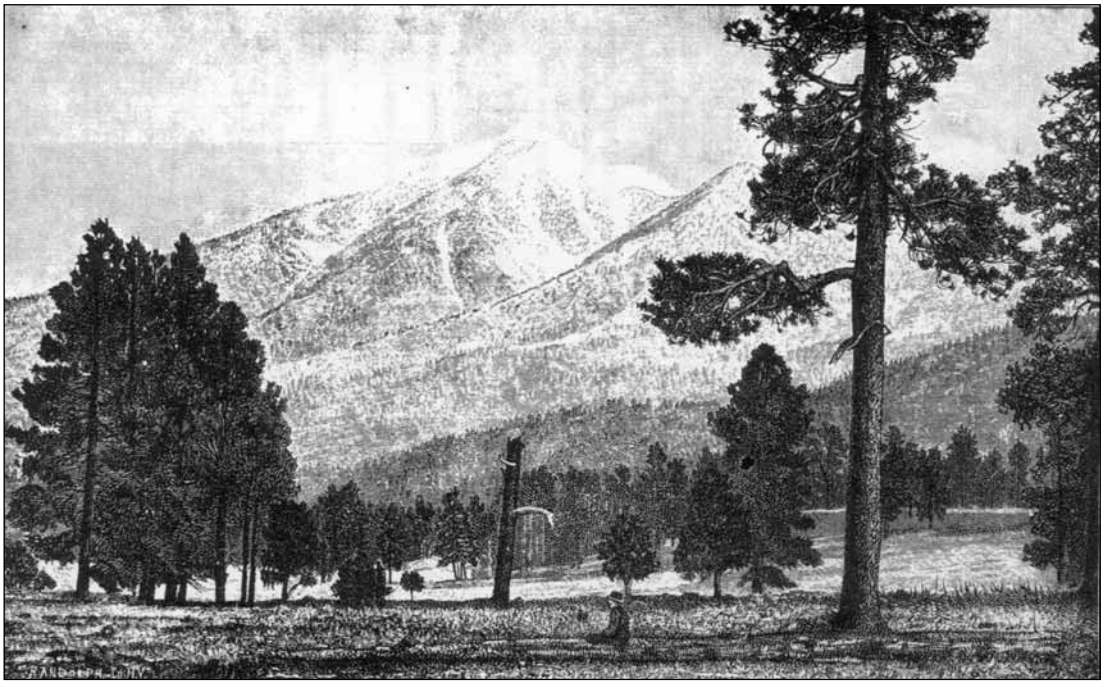
Drought, wildfire, extinction, and invasive species are considered serious threats to the health of our forests. Although these issues have global connections, we most readily see their consequences locally and attempt to respond with management based on science. For 100 years, the Fort Valley Experimental Forest (FVEF) has provided educational and experimental support for management of natural ecosystems in the Southwest. This introduction provides a context for how we address forest health threats through adaptive management.

Fort Valley is a forest-enclosed prairie in northern Arizona, at the base of the San Francisco Peaks. The volcanic Peaks form an isolated, compact montane complex on the extensive Colorado Plateau. The Southwest includes several ecoregions with highland landforms in a warm-dry continental zone. Precipitation is strongly bimodal due to winter storms and summer monsoons; annual precipitation is highly variable. The Southwest interfaces with several biotic provinces—Rocky Mountain, Great Plains, Mexican, Californian, and Great Basin. Because of its geography, the region has a relatively high biodiversity and is characterized by numerous, isolated 'sky islands' with biota that are generically similar but locally distinct. The biological phenomena of life zones are well displayed as one ascends from the Painted Desert to the summits of the San Francisco Peaks, as first scientifically described by C. Hart Merriam in 1890. His observations on the distributions of flora and fauna and their correlation to elevation, aspect, and therefore climate, demonstrate the value of Fort Valley as a biogeographical laboratory.

In the late 1800s, the northern Arizona forests provided an abundant timber supply of valuable and easily harvested southwestern yellow pine (*Pinus ponderosa*) for railroad



A graphical rendition of the San Francisco Peaks, circa 1890 illustrates forest stands were composed of several size-classes, arranged into tree groups and openings. Because several non-forested, alpine slopes in the composition closely resemble what is seen today, this artwork is considered a faithful representation. From: C. Hart Merriam.North American Fauna No. 3. (orig. pub 1890. *In:* Selected Works of Clinton Hart Merrian, NY: Arno Press. 1974.

In: Olberding, Susan D., and Moore, Margaret M., tech coords. 2008. Fort Valley Experimental Forest—A Century of Research 1908-2008. Proceedings RMRS-P-55. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 282 p.

ties. The harvesting process required the heavy cutting of old-growth timber with little attention given to future productivity. This era did, however, generate a concern for forest conservation and especially the local need for regeneration of ponderosa pine on cut-over lands. G.A. Pearson quickly determined that ponderosa pine seeds irregularly and conditions for germination and establishment in the Southwest are infrequent. Chance combined for several years around 1919 to abundantly regenerate Fort Valley's pine forest. Silviculture research could then focus on improvement cutting and reduction of losses from various agents including sheep and mistletoe.

An extensive forest of young ponderosa pine developed. Fire suppression caused a near absence of the frequent, surface fires common in preceding generations and the new forest hardly resembled the forest it was replacing. Technology also developed so by the time of the second cut on Fort Valley silviculture plots, truck logging replaced railroad logging. Silviculturalists could consider options of lighter and more frequent cuttings. Although sheep no longer were a menace to pine, mistletoe became an even greater threat. Plot experiments to compare alternatives for silvicultural control of mistletoe were supplemented with detailed studies of life history and epidemiology. Other research of the time included continuation of meteorological observation, range investigations, studies of other tree species (e.g., Douglas-fir and aspen), and expansion of work to additional sites in the region.

New research methods and questions emerged as the new pine forest grew into dense stands of mostly even-aged blackjack ponderosa pine. Technology provided mensurationists with electronic computers and improved statistical analysis. For optimizing forest productivity through density management and sanitation, research developed growth and yield models. Before prescribed burning was a common management practice in the Southwest, Fort Valley research began quantifying the effects of different burning regimes. The disappearance of old-growth yellow pine exacerbated concerns over loss of wildlife species and their special habitat needs such as large snags.

The 1919 pine forest has reached middle age. Dominant, unstressed trees are large and their growth is still accelerating; but many trees are crowded and their growth is suppressed. With the occurrence of extreme fires and bark beetle infestations, more of the public became involved in forest management discussions and pressed for reduction of fire hazard and restoration of forest health. Research has been established at Fort Valley to test whether re-creating a pre-settlement forest structure and fire regime could produce desirable forest conditions.

The lessons from Fort Valley are that forests and societies change, sometimes unexpectedly and contrary to control efforts. An alternative approach is adaptive management—management as experiment, involving a diverse and informed public with flexible management agencies to foster resilient, healthy ecosystems. In that regard, the Fort Valley Experimental Forest serves several valuable functions. Fort Valley is dedicated for the purpose of long-term research to develop better management strategies and tactics, whether as historically for maximizing timber productivity or currently for sustaining ecological services, or in the future for responding to climate change. With partners, managers, and stakeholders, Fort Valley researchers and professionals bring their scientific experience and knowledge to designing and conducting management experiments. Historically, Fort Valley had been the ranger school, now it can be a conservation education classroom and laboratory for students of all ages and diverse interests to learn ecosystem stewardship.