A Call to Action to Address Contemporary Conservation Issues on Experimental Forests and Ranges

by Michael Rains, Station Director, Northern Research Station

For more than 100 years, the USDA Forest Service has been conducting scientific research on a suite of formally designated experimental forests and ranges (EFRs). These EFRs are the oldest and most extensive system of research sites in America dedicated to resolving the nation’s natural resource conservation issues. They have been at the forefront of discovering new knowledge on resource management, technology development, and public education.

At the October meeting of the Forest Service Research Executive Team (FSRET), a decision was made regarding the future path of our EFR network. Research and Development (R&D) executives have been deliberating for several months over options presented to them in the Experimental Forest and Range Strategic Vision (May 2012). Notwithstanding the very challenging budgetary conditions currently faced by Forest Service R&D, an assertive decision to move forward in a thoughtful and prudent manner was adopted unanimously.

R&D leadership adopted a Call to Action designed to improve the agency’s ability to address contemporary conservation issues. This decision entails an initial investment of up to $500,000 with about half of this amount targeted for new technologies to support an “…EFR network of smart forests linked to a suite of landscape laboratories to become the foundation of a nationwide Forest Service learning laboratory.” A coordinator will oversee the efforts to ensure attainment of these objectives.

Guiding principles. The following will help guide this program emphasis:

► The initiative aims to serve the entire EFR network. This will initially involve a strategically selected subset of our EFRs to test and demonstrate the principal concepts of this strategy.

► The fundamental purpose of this initiative is to develop credible scientific data and analyses to inform land and resource management decisions. Strategic partnerships with other federal, state, and private agencies and universities will be developed where possible.

(continued on next page)
Call to Action to Address Contemporary Conservation Issues on EFRs  (from page 1)

► The basic intention for this initiative is to provide for data integrity and access to improve Forest Service mission attainment. Data collection protocols, accuracy and precision, and accessibility will have the highest priority.

► A fundamental shift in the sharing and ownership of scientific data will be required to make this initiative a success. It will be important to further develop and foster a culture of collegiality and collaboration.

► It shall be recognized that this is an investment in the future that requires a short-term investment followed by a long-term commitment to maintain the system.

The Call to Action. The following are the five actions outlined by FSRET to expand the utility of the EFR network. (Action 6 is provided for reference and future evaluation and analysis—to be considered later.)

► Action 1: Forest Research and Development shall agree on the EFR network of smart forests, a set of strategically selected sites, to help agency mission attainment. Part of the criteria for site selection will be the ability of the network to build support for science efficiently. The keys to its success will be modularity and flexibility.

► Action 2: Through a competitive announcement, a coordinator will be designated to convene a small group of experts (referred to in Action 1 as the planning committee) to help define, describe, and propose the network of smart forests, as well as technology requirements, the model forests, and all other aspects of this initiative for approval by the Deputy Chief.

► Action 3: Invest up to $500,000 for the first year for effective deployment. About half of these funds will be specifically designated for new technology to achieve the goal of establishing smart forests. The remaining funds shall be used for special emphasis activities within the initiative, at the discretion of the coordinator. Annual funding amounts for the second year and beyond will be proposed by the coordinator and agreed to by the Deputy Chief.

► Action 4: Implement the Landscape Laboratory concept. Specific locations will be nominated by the coordinator and agreed to by the deputy chiefs of the National Forest System and R&D mission areas. This suite of landscape laboratories will become the foundation of the Learning Laboratory for the Forest Service. An “all-lands” approach to forest stewardship—Landscape-Scale Conservation—will be an important element. The designation of the landscape laboratories will be a collaborative effort with a wide range of partners.

► Action 5: Decide on a specific subject to fully utilize the network of smart forests, linking to the landscape laboratories to achieve the objectives of the national learning laboratory.

These subjects might include:
- Deployment of the new Planning Rule through a set of Best Management Practices.
- Control of catastrophic wildfires through market expansion and development.
- Deployment of the Information, Monitoring, and Assessment (IM&A) project.
- Evaluation of the effects of a changing climate on natural resources.

The final item(s) selected will need to be evaluated to determine the funding requirements for deployment by the Forest Service.

Action 6: Evaluate the opportunity to join the International Model Forests Network (IMFN) to link the smart forests and landscape laboratories with that global network. Explore the similarity in goals and strategies of the IMFN and this initiative. Assess the benefits and costs of joining this international network and how joining that partnership would benefit Forest Service R&D and the EFR network.
A Half Century of Cooperative Research at the Caspar Creek Experimental Watersheds

Fifty years ago, the USDA Forest Service Pacific Southwest Research Station (PSW) and the California Department of Forestry and Fire Protection (CAL FIRE) joined forces to establish the Caspar Creek Experimental Watersheds to evaluate the effects of logging on watershed resources in a rain-dominated climate. Two major experiments and related topical studies have been carried out at Caspar Creek since then, and a third experiment is underway. More than 170 publications and reports describe study results, and Caspar Creek data (available at http://www.rsl.psw.fs.fed.us/projects/water/caspar.html) have supported research by others both regionally and abroad.

The experimental watersheds are located in Jackson Demonstration State Forest in the moderately steep Coast Range of northern California. Caspar Creek’s old-growth redwoods and Douglas-fir were originally logged between the 1860s and 1904. A robust second-growth forest had regrown by 1962, when gaging weirs were built in the 473-ha North Fork and 424-ha South Fork watersheds.

The first experiment was designed to quantify the effects of tractor logging on erosion and runoff. After a calibration period, roads were constructed in the South Fork in 1967, while the North Fork was left as a paired-basin control. About two-thirds of the South Fork wood volume was then tractor logged between 1971 and 1973. Results showed a significant increase in sediment load after logging, providing information that helped to inform revision of California’s forest practice rules.

Continued monitoring has revealed unexpected long-term effects of South Fork timber operations. Sediment loads dropped to background levels by 1980 but increased again in the 1990s as roads deteriorated. Major riparian roads were decommissioned in 1998, but sediment loads remain higher than before logging. Summer flows also showed a prolonged response. After an initial rise with logging, dry-season flows returned to pretreatment levels by 1985, only to continue their decline and remain at reduced levels for the next 25 years.

The second experiment began in 1985 with installation of 13 stream gages within the North Fork watershed. These nested gages allowed tracking of flow and sediment through

(continued on next page)
A Half Century of Cooperative Research
(from page 3)

Results showed significantly increased peak flows even for large storms, and ancillary studies found that reduced rainfall interception and transpiration explained the increases. Patterns of hydrologic change were consistent across the range of watershed sizes, but sediment increases and channel changes showed more variation. Small tributaries enlarged, while the main channel aggraded in response to accelerated blowdown along riparian buffer strips. Increased flow appears to have triggered much of the initial increase in sediment load from in-channel sources, which cannot be mitigated by increasing buffer-strip widths or improving roads. Sediment loads again increased with the occurrence of several large landslides 9 to 14 years after logging.

The third experiment is being designed to explore the nature and magnitude of cumulative effects from sequential timber operations by evaluating interactions between modern forest practices and the altered hillslope and channel conditions left by 1970s logging in the South Fork.

The 50-year perspective at Caspar Creek illuminates several points regarding research in experimental forests:

1. Long-term monitoring is essential if the full effects of land management activities and their interactions are to be identified and understood.
2. Long-term data allow new questions to be addressed that were not imaginable when measurements began.
3. Careful documentation and maintenance of historical data are critical if they are to remain accessible for future studies.

Research now proceeds at Caspar Creek under a 100-year Memorandum of Understanding between PSW and CAL FIRE, a document that expresses our shared commitment to providing information needed to improve future management of forested watersheds.
Throughout the 100-year history of the Priest River Experimental Forest (PREF), the genetics of western conifers have been studied and continue to play a prominent role in the research program. As early as 1911, Raphael Zon, then in charge of silvicultural research for the Forest Service, encouraged progeny experiments at several of the newly established forest experiment stations in the Western United States.

In response to Zon’s request, a racial variation test of ponderosa pine was established at PREF in November 1911. This test was composed of seed sources from 22 locations throughout the West. Growth and mortality data were collected over the next 25 years and several publications resulted from this effort. This plot has been maintained and, recently, the surviving trees were remeasured.

Genetics projects continued as scientists at PREF conducted studies of growth characteristics, disease resistance, and provenance tests of western white pine. PREF has also been the site of numerous common garden studies defining seed-transfer rules for western conifers.

As we enter a second century of research at PREF, the issue of climate change has appeared in the forefront of forest genetics and long-term forest health. The present warming trend will evoke a response from the tree species, as projected by computer models using our knowledge of the genetic variability controlling species distribution. But the scope and magnitude of climate change and species response is still not clear. Forest geneticists from the British Columbia Forest Service (BCFS) have taken a proactive approach by initiating a program, called the Assisted Migration Adaptation Trial (AMAT), that is expected to address the uncertainty of climate change and species response. They contacted PREF administrators with a request to install a long-term study; soon thereafter a suitable site was

(continued on next page)
Climate Change and Genetic Variability  (from page 5)

located. An agreement between BCFS and the Rocky Mountain Research Station solidified the cooperative venture.

The purpose of AMAT is to better understand the climate tolerance of a range of seed sources of most commercial tree species found in western North America. By relating the performance of each seed source to the climates in which it is tested, it should be possible to identify seed sources most likely to be best adapted for any given location in western North America now and in the future.

In addition to gaining a better general understanding of the climate adaptation of seed sources in anticipation of changing climates, the BCFS is specifically interested in the climate adaptation of northwestern United States seed sources. The BCFS could become reliant on seed sources from neighboring states within the next couple of decades because many of the climates that are expected to reside in British Columbia in the next rotation (especially in the southern part of the province where productivity is greatest) reside largely in neighboring states at the moment. Therefore, the BCFS considers it imperative to begin testing seed sources from neighboring states immediately.

Methods

The AMAT is the largest forestry climate change research project in British Columbia, consisting of seed sources from 16 species (49 seed sources; 10 from USA, 39 from British Columbia) that will be planted at 48 test sites in British Columbia, Yukon, Idaho, Washington, Oregon, and California. In May 2012, the PREF test site received 100 seedlings from each of 32 seed sources. The 100 seedlings of each seed source were planted in groups of 25 in a 5- by 5-tree square plot, with 2.5 m between seedlings. A row of buffer trees was planted around the perimeter of the 150 m by 150 m trial.

Growth, form, and health will be assessed every 5 years for 30 years, beginning at age 5. Weather will be recorded at each site, allowing the performance of each seed source to be related to the climate at each site. The data generated by this project will be valuable to both parties in the management and sustainability of the forests under our stewardship. The principal investigator for the AMAT project is Greg O’Neill, forest geneticist, British Columbia Forest Service. ☎️
The Permanent Sampling Plot Network

Long-term studies are critical for understanding patterns and processes that cannot be inferred in any other manner. A prime example of how experimental forests have conducted and managed such studies in the Pacific Northwest is the Permanent Sampling Plot network (PSP). The PSP is a consortium of agency and university scientists who collect repeat measures of trees and other vegetation at forested plots distributed across Oregon and Washington. The PSP originated in 1910 when Thornton T. Munger (the first director of the Pacific Northwest Research Station) established a series of plots to better understand growth and yield of timber-producing stands in the region. Subsequently, the network has expanded to more than 145 sites (127 of which are currently remeasured on a regular basis), including locations at four experimental forests (Cascade Head, Wind River, H.J. Andrews, and Pringle Falls), 25 research natural areas, one national monument (Mount St. Helens), and two national parks (Olympic and Mount Rainier). Protocols for data collection have evolved as the need for understanding forests has evolved, but most PSP data include a core set of measurements based on sampling methodology that has been consistent throughout its 100-year history.

Data from the PSP network have made a number of significant and wide-ranging contributions to science and land management, including quantifying regional timber growth and yield, defining old-growth forest for inventory and planning, understanding habitat needs for threatened and endangered species, and validating computer simulation models of forest dynamics and processes including assessing effects of wildfire, logging, and climate change. It is also one of the few corporate data sets that allow for cross-EFR investigations in the region. What has made the PSP particularly successful is that the need for data archiving and management was recognized from its onset. Today, all data are stored and made publically available through the Forest Science Databank, an LTER (Long Term Ecological Research) product associated with the H.J. Andrews Experimental Forest (see http://andrewsforest.oregonstate.edu/data/abstract.cfm?dbcode=TV010&topnav=97).

PSP partners recently held a week-long writing and analyzing workshop at the Wind River EF.
The Permanent Sampling Plot Network (from page 7)

Number of sites and length of sampling periods for the Permanent Sampling Plot Network in Oregon and Washington. The goal for most sites is to remeasure vegetation at ≤5-year intervals. Bar shading represents seral stage at time of plot establishment.

headquarters. Participants included 16 scientists and doctoral students from the University of Washington, Oregon State University, Washington State University, University of Montana, and Pacific Northwest Research Station. The purpose of this workshop was to strengthen relationships among partners and help jumpstart the publication of a number of journal articles based on PSP data. As a result of this effort, at least eight papers are expected to be produced over the next year, with wide-ranging topics that include long-term trends in tree growth and mortality, woody biomass, net primary productivity, understory/overstory dynamics, tree spatial patterning, and snag recruitment rates.

The future of the PSP network isn’t without its challenges. Like many other data collection efforts on EFRs, there is no explicit corporate strategy to ensure that data continues to be collected, archived, or made accessible. Instead, the PSP network remains an organic movement that assumes individuals will pass the torch of responsibility for managing the network from generation to generation—an assumption that could potentially jeopardize the network if there is ever a hiatus in interest by one or more of the key partners involved. Covering costs associated with data collection and management is also a constant challenge, with data collection increasingly resting on the shoulders of student and volunteers to ensure that remeasurements remain on schedule.

Despite the challenges, the fact that the PSP network has a strong coalition of partners and has persisted for so long provides some confidence that it will persist into the future. With continued Forest Service leadership, we hope that scientists and managers 100 years from now will marvel at the vision and insight of the individuals today who kept these efforts going... much as we marvel today at the foresight of those individuals who initiated and developed the PSP network over the last 100 years.
Estate Thomas Experimental Forest is the easternmost experimental forest in the United States and it is the only major public forest in the interior of the island of St. Croix in the U.S. Virgin Islands (USVI). Estate Thomas EF was designated as a place to study subtropical dry forest ecosystems. On October 30, 2012, a celebration was held to inaugurate the new open air pavilion at the experimental forest.

Dr. Grizelle González, International Institute of Tropical Forestry (IITF) research project leader, presented a short history of the site and research opportunities recognized for this location. Constance Carpenter, IITF Cooperative Forestry Leader, discussed the long-range plans for conservation education and interpretation, and Katie Frerker, IITF conservation education coordinator, outlined opportunities to work with her in the development of a conservation education program that takes advantage of this public resource.

Roughly $230,000 in funds from the American Recovery and Reinvestment Act of 2009 was used to build this new outdoor pavilion and related facilities at Estate Thomas EF. At the inauguration of the facility, IITF Director Dr. Ariel Lugo was joined by USVI Lieutenant Governor Gregory R. Francis, USVI Senator Nereida “Nellie” Rivera-O’Reilly, St. Croix Administrator Dodson James, and Louis Petersen, Commissioner of the Virgin Islands Department of Agriculture. The IITF presented partnership awards to Carol Burke of the St. Croix Environmental Association and Marilyn Chakroff of the Virgin Islands Division of Forestry.

Estate Thomas Experimental Forest is envisioned as a place for the community to explore and learn the secrets of forest plants and animals, and an outdoor laboratory where teachers can give students hands-on experiences that reinforce lessons in math and science. The pavilion and related improvements will be the first of many steps in that direction. This event was open to the public.
Experimental Forests and Ranges On the Web  

Web sites are an important communication tool, and it is important to make it easy for Web site visitors to find the information they are looking for. We are trying to improve EFR Web sites in two ways. First, we are implementing a new navigation structure, which is grounded on the larger Forest Service Web navigation structure. Our plan is to gradually convert sites to this new structure, creating a common EFR “look.” Currently, six pilot sites use the new design:

► Fernow EF (http://www.nrs.fs.fed.us/ef/locations/wv/fernow/),
► Fort Valley EF (http://www.rmrs.nau.edu/fortvalley/),
► Fraser EF (http://www.fs.usda.gov/fraser),
► Long Valley EF (http://www.fs.usda.gov/longvalley),
► Manitou EF (http://www.fs.usda.gov/manitou), and
► Penobscot EF (http://www.nrs.fs.fed.us/ef/locations/me/penobscot/).

There are still differences across these sites. This is partly by design—different sites have different types of content, so not all sites use all of the available navigation elements. However, it also reflects that different sites are hosted on different platforms and the generic structure was adapted to work with each platform.

Second, we are trying to improve Web access to EFR research data. Many EFR data products are available through Datalyst (http://www.fs.usda.gov/rds/archive/data-catalog/). Each product has a digital object identifier (DOI) that provides the ability to locate the product over time as URLs come and go; the DOI should be included in any citation. Although most of these products are downloadable, sometimes the whole data set is rather large. We have developed a common infrastructure for using databases to host the data, allowing the user to query a database and access the entire data set or subsets of interest. Three of the pilot Web sites listed above use this new capability:

► Fernow EF (http://www.nrs.fs.fed.us/ef/locations/wv/fernow/),
► Fort Valley EF (http://www.rmrs.nau.edu/fortvalley/),
► Penobscot EF (http://www.nrs.fs.fed.us/ef/locations/me/penobscot/).

Access to the Fernow and Penobscot databases requires some information on how the data will be used and by whom. This information is used by the Forest Service to assess the usefulness and impact of the data product (it is not used as a filter to decide who is allowed access). The metadata for these published data can be viewed by anyone, but only those who have agreed to the data use policy, provided the necessary information, and signed into the system will be able to query the databases.

We are very interested in feedback on both the “content” Web sites and the “data” Web sites. Lacking an immediate feedback capability on each site, the best approach is to send an email containing your comments and ideas to Peter Stine, EFR Coordinator (pstine at fs.fed.us).