

The Future

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Introduction

Research in the vegetation types of the Central Arizona Highlands has evolved, for the most part, from single resource evaluations (increased water yield) to evaluations that consider the multiple benefits of vegetation management treatments. The papers presented in this publication have demonstrated that vegetation can be managed to increase water yields, while providing timber, forage, recreation, wildlife, and other amenities. One question that should be asked is to what extent can the established research framework and available databases be used to meet future management-oriented informational needs in the Central Arizona Highlands and elsewhere in the Southwest?

Long-Term Monitoring and Evaluation

Long-term monitoring and evaluations, based on reinventories of the permanently-located sampling units on the study sites in the Central Arizona Highlands, represent a valuable use of the cumulative research efforts. A better framework for conservation and the sustainable use of natural resources in the region should evolve from the evaluations obtained.

Repeated measurements of permanent inventory locations provide a basis for the long-term monitoring and evaluations that are central to almost every important ecological concept and environmental issue (Franklin 1989). Information from these measurements allows a look at the “big picture” of how ecosystems might respond to disturbances resulting from climatic change, habitat fragmentation, or invasions of exotic species. Information of this kind is becoming increasingly important in developing a holistic, coherent viewpoint of how ecosystems function (Baskin 1997, Shepperd and Edminster 1997).

Sampling variability is generally reduced when the same transects, plots, or points can be repeatedly visited in

a series of inventories. Analysis of such data sets can result in accurate, precise, meaningful conclusions and predictions for long-term management purposes. To illustrate this point, analysis of data obtained from repeated inventories of ponderosa pine stands on a Beaver Creek watershed shows the changes in volume of trees 7.0-inches diameter breast height (dbh) and larger before (1963 to 1969) and after (1970 to 1995) a heavy thinning treatment was applied on the watershed in 1970 (figure 22). Knowledge of this progression can be helpful in prescribing future management actions on the watershed. Even this relatively long post-treatment record (1970 to 1995) might be insufficient for full appreciation of the changes from implementation of the thinning treatment. Therefore, continued monitoring and evaluation of the thinning treatment is anticipate.

Other Uses of Databases

The diverse databases developed from the research programs in the Central Arizona Highlands describe the dynamics of the ecosystems studied and are unique in their multiresource character. These databases are available today because efforts were made to protect the original maps and airphotos, inventory forms, and file copies of summaries. Many of these databases have been computerized, making them easier to preserve, retrieve, and update. Computerization of the databases facilitates incorporation of future resource inventories into the databases. This allows continuing evaluations of ecosystem properties after implementation of alternative land management activities.

These databases were developed originally at a considerable expense of time and money. By computerizing this information, the stored information can be easily retrieved and analyzed, using new techniques and methodologies to help meet current needs. The databases can be used as stored in the system or modified in structure to analyze the changing trends in specific resource values through time. This information is available to managers, researchers, and decisionmakers to better understand the ecologies of ecosystems in the highlands region.

Initiation of New Studies

Managers, researchers, and decisionmakers continue to analyze these databases to meet current objectives and answer questions that are asked about the impacts of alternative land management activities on these resources and ecosystem properties. However, analyses of existing information can sometime only partially answer these questions. When additional knowledge is needed, the research framework on the Sierra Ancha Experimental Forest, the Beaver Creek watersheds, Castle Creek, Willow Creek, and Thomas Creek watersheds, and other research sites in the Central Arizona Highlands can provide the basis for implementing new studies to complement what is known.

These research sites continue to serve society's needs for outdoor laboratories to study how vegetative manipu-

lations, or its absence, affect forage, wildlife, wood, and water resources, and amenity values such as scenic beauty. As the mixture of these benefits and values changes, the emphasis placed on the newly-formulated studies should also change.

Implications

Implications of the overall research efforts in the Central Arizona Highlands are not confined to Arizona or the Southwest, but instead they are of national and, in some instances, international interest. The research sites continue to be visited frequently by out-of-state and foreign scientists, land managers, administrators, and students. As a consequence, results of the research programs in the highlands are being applied throughout the world today.