

Introduction

In the rural western United States, much of the land is under management by various federal agencies, including the United States Department of Agriculture Forest Service (Forest Service), Bureau of Land Management (BLM), and National Park Service. Since the National Environmental Policy Act (NEPA) was passed in 1969 (42 U.S.C. §4321, 1969), all development and land management decisions have been required to take the health and welfare of the natural environment into consideration. Historically, these land management decisions were made by a local level agency supervisor, and had focused on resource use and/or extraction with little regard towards conservation at least in the first 100 years of the BLM and Forest Service. Additionally, the Forest Service and BLM were required under the Multiple-Use Sustained-Yield Act (16 U.S.C. §528, 1960) to "be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes".

Similarly, the U.S. Supreme Court decided in *Geer v. Connecticut* (161 U.S. 519, 1896) that the states own the game and fish species found within their borders, and that it is their right and responsibility to regulate and preserve such game for the common benefit of the people. At the time, game was considered a valuable food supply, much more so than today. However, certain big game species, such as Rocky Mountain elk (*Cervus elaphus*), are quite popular among recreational hunting enthusiasts and as such, many are willing to pay a much higher price for the opportunity of hunting a trophy-sized animal, especially if they believed that they can be nearly guaranteed a successful hunt. However, there are other factors that influence a hunters satisfaction from the hunt.

With the controversy around filling the Grand Canyon for water storage and hydroelectric generation, the modern environmental movement was born. In the 1980s, environmental groups

became much more vocal and active. In an effort to force federal agencies to comply with the requirements of the various conservation laws, these groups have utilized litigation as an important enforcement tool to force all federal agencies into complying with the Endangered Species Act (16 U.S.C. 1531, 1973) and NEPA, among others. Some federal lands in the West have been fortunate and have not yet been sued. Surprisingly, state game and fish agencies have not been sued as frequently.

While serving as an intern with such a state agency, I questioned a state legislator about why he would not support a certain bill. I was told that such a bill would make his job as a litigator for an environmental group much more difficult, and that it is usually much more difficult to sue a state agency than a federal one. Though anecdotal, I think this situation may be common.

In an effort to avoid litigation, some agencies have come to realize that land management decisions should be made by incorporating the voices and needs of the many stakeholders in the area, which also happens to comply with NEPA. One such local agency is the Fishlake National Forest (NF), located in south-central Utah. Fishlake NF came together with ten other agencies and interest groups to cooperatively manage the Monroe Mountain Ecosystem, which is located within Fishlake NF lands (Mrowka & Campbell 1996) and is also called the Monroe Mountain "Seeking Common Ground" Initiative.

They chose to use quaking aspen (*Populus tremuloides*), the keystone species of the aspen ecosystem type, as it relates to the concept of "properly functioning condition" and towards managing the lands of the Fishlake NF. A 1997 USDA Forest Service definition (Campbell & Bartos 2001) states that a "properly functioning condition exists when soil and

water are conserved, and plants and animals can grow and reproduce and respond favorably to periodic disturbances.”

According to Bartos and Campbell (1998) and others (Mueggler 1985, White et. al. 1998, White 2001), quaking aspen have been steadily declining over the last 100 years. Aspen ecosystems have been found to be the most biologically diverse ecosystems in the Intermountain West, with the exception of riparian areas (Bartos 1998, Campbell & Bartos 1998, White et. al 1998). As aspen dominated landscapes get converted to other cover types, such as mixed-conifer or sagebrush-grasslands, tremendous biodiversity is lost (Bartos & Amacher 1998; Bartos & Campbell 1998; Campbell & Bartos 2001). Such losses include vascular and non-vascular plants, vertebrate animals and invertebrate organisms. Thus, measures taken to sustain aspen ecosystems will also help to maintain regional biodiversity. Gifford et. al. (1984) noted that for every 1,000 acres converted from aspen to mixed-conifer, 250 to 500 acre feet of water is lost by transpiration into the atmosphere and not into streamflow. Additionally, Mrowka & Campbell (1996) project 500 to 1000 tons of understory biomass production would be lost annually, along with a loss in plant and animal diversity.

"It is commonly recognized that aspen ecosystems in the West produce numerous products and benefits, some of which include: (1) favored wildlife habitat for big-game and non-game species, (2) forage for livestock, (3) water for downstream users, (4) watershed protection, (5) esthetics, (6) sites for recreational opportunities, (7) wood fiber, and (8) landscape diversity (Bartos 1998)."

Even though controversy exists regarding the absolute cause of aspen loss to the landscape, Bartos (1998), Chappell (1997), Jones & DeByle (1985a), and White et. al. (1998), to name a few, recognize that fire played an important role in the historical perpetuation of aspen

on the landscape prior to European settlement. Jones & DeByle (1985a) reported that the rate of fire rejuvenation of aspen in the West has greatly decreased. On Monroe Mountain, Chappell (1997) determined that pre-settlement fire intervals ranged from 17 to 66 years, but the study underestimates the number of historic fires, due to the nature of fire temperatures and the resultant fire scar. She goes on to say that most fires on Monroe Mountain were likely lightning ignited, and not anthropogenic, because in an earlier study, fire scars had been found on aspen, which don't burn as well during summer months when lightning strikes are highest.

According to Rawley and Rawley (1967) and Utah DWR (1994), elk had been all but extirpated from Utah by the late 1800s, due to unregulated hunting. Elk were exported from the Jackson Hole and northern Yellowstone herds, and released into six localities from 1912 to 1915, one of which was near Fish Lake in 1912. Monroe Mountain's elk herd is "a new elk unit" (Davis 1998), with the first elk hunt being held in 1982. This researcher was not able to find any information regarding historical predator populations, but throughout the West it was common for ranchers to hunt or trap wolves (*Canis lupis*), mountain lions (*Felis concolor*), coyotes (*Canis latrans*) and bears (*Ursus sp.*) that they viewed to be a threat to their livestock. So it may be safe to assume that predator numbers were high enough on Monroe Mountain, to have kept native ungulate populations in balance prior to European settlement, especially, if the Mountain was not important to native peoples.

The Monroe Mountain "Seeking Common Ground" Initiative was part of a national demonstration initiative, that used (Mrowka & Campbell 1996) "partnerships in an ecological approach to management as the vehicle for obtaining consensus on how to achieve integrated natural resources management." The Demonstration began in 1993. A Steering Committee composed of the principle state and federal land managing agencies, private landowners, and

sportsman's groups, worked to identify and develop solutions to problems that they held in common, by formulating programs of work and funding for the projects from within agencies and from outside grants.

One of the stated goals in the Monroe Mountain Common Ground Initiative Charter for 1993-1998 was to "support efforts to successfully manage the area as a quality elk management unit for both hunting and viewing trophy class bulls." Another stated objective was to "see a significant progress toward improvement of food to cover ratios, a significant increase in grass and forb production and improved aspen reproduction". Since the beginning of the agreement, wildlife numbers have been increasing, and aspen restoration projects have been conducted, but to what effect?

Monroe Mountain became an important focus of this study, because restoration work done there hadn't been assessed, and the mountain is important summer range, at 9000 feet elevation, for the deer and trophy bull elk herd found there. Additionally, the Richfield Ranger District has divided the mountain into twelve grazing allotments, which are important for local livestock growers.

The purpose of this study was to assess sustainability and landscape heterogeneity of aspen ecosystems and their management by the Fishlake NF, which is part of a multi-agency, land-management cooperative association. The USDA Forest Service (Forest Service) is required under federal law to manage their lands for multiple uses, which is often called the Multiple-Use Mandate (16 U.S.C. §528, 1960). Under this mandate, the Forest Service and BLM are required to incorporate the needs of people and ecosystem health for the sustainable use of these lands. This work will assess the effectiveness of this multi-agency approach.

The sampling method that I used was adapted from Shepperd and Fairweather (1994) and from personal communication with Wayne D. Shepperd, Research Forester, Rocky Mountain Research Station, USDA Forest Service. The primary difference is that in his study he varied plot size with aspen densities (i.e. if aspen are sparsely distributed, make the plot radius larger), whereas I limited all my sample plots to 0.001 acre plots, because in most cases young, regenerating aspen stands are dense. My variances were likely wider, but I felt that sampling would be quicker per plot, and that it more closely resembled the actual conditions observed on the ground. In most cases, I tried to survey/tally 20 plots per treatment area. On occasion, that number was reduced, if the units were small or if weather conditions forced us out of the mountains.

The remainder of this study will be divided into logical sections. First, I will detail the procedures used in sampling the units, then I will describe the most recent treatment histories for each of the larger treatment areas. Next, the results of the study will be stated, followed that a discussion of the reasons for what was observed in the results, along with a deeper analysis of the larger issues contributing to those patterns. Lastly, I will make recommendations regarding the next steps and strategies that could be utilized to better support ecosystem health in the context of aspen restoration efforts.