

Restoration of Juniper Savanna on the Pueblo of Santa Ana, Sandoval County, New Mexico

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Abstract—The Pueblo of Santa Ana (Pueblo) is located in north central New Mexico within southeastern Sandoval County, about 15 miles north of Albuquerque and 45 miles south of Santa Fe. The Pueblo encompasses approximately 79,000 acres of trust lands. Between 1999 and 2001, the Pueblo of Santa Ana Department of Natural Resources, through a United States Environmental Protection Agency grant, collected quantitative and qualitative baseline ecological data from 145 long-term monitoring plots established across the Pueblo. These data were used to develop a plant association and watershed assessment that facilitated the Pueblo's ability to identify priority natural resource concerns and implement ecosystem-based management and restoration practices.

Predominant plant associations on the Pueblo are oneseed juniper (*Juniperus monosperma*) dominated woodlands (nine juniper plant associations), which vary in both species composition and structure and their position within the landscape. Of particular management concern to the Pueblo are oneseed juniper woodlands with perennial herbaceous understories on well developed soils—Juniper Savannah. Juniper Savannah is a valuable trust asset to the Pueblo because it provides critical habitat for traditionally important wildlife species such as mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), Rocky Mountain elk (*Cervus elaphus*), and many species of birds and small mammals. Analysis of aerial photographs from 1935 and 1998 indicate that juniper tree densities have nearly doubled over the last 63 years within Juniper Savannah on the Pueblo. On average, tree densities per acre have increased by 93.2 percent or from 17 to 30 trees per acre. At the current rate of oneseed juniper encroachment, the composition and structure and continued persistence of Juniper Savannah on the Pueblo is threatened. An increase in juniper tree density within Juniper Savannah on the Pueblo is considered a problem because it may result in: 1) reductions in perennial herbaceous vegetation; 2) increases in soil erosion; 3) slower ground water infiltration rates; and 4) loss of quality wildlife habitats. Furthermore, juniper encroachment increases the probability of large, high intensity catastrophic wildfires, which can lead to and compound all of the consequences listed above.

Given the potential negative impacts of an overabundance of oneseed juniper on the Pueblo, the Pueblo developed a project to restore Juniper Savannah to historic conditions. The goals of the project are to reduce the threat of catastrophic wildfire, reinstate a semi-natural fire regime, increase perennial herbaceous cover, and improve wildlife habitat within Juniper Savannah. Using a combination of aerial photography and a vegetation map, the Pueblo delineated 2,700 acres of Juniper Savannah to be restored. A low impact treatment method was adopted to minimize soil and vegetation disturbance. The method consists of manual chainsaw thinning to reduce tree density and lopping and scattering of slash to promote

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perennial herbaceous recruitment. Old growth (single stemmed) trees and trees with bird nests or burrowing activity near the root crown are preserved. In addition to reducing the density of juniper trees, the project involves the extraction of salvageable fuel wood to reduce fuel loads in preparation for implementation of prescribed fire. Furthermore, the project provides valuable fuel wood to community members. Since 2003, the Pueblo has reduced the density of juniper trees from approximately 1,200 acres of Juniper Savannah and extracted and provided 42,400 ft³ (331 cords) of salvaged fuel wood to community members. Three advancements in methods were made over the first three years of the project. First, a more precise estimate of work effort was identified—it takes a five person crew an average of 1.3 days to reduce the density of juniper trees, lop and scatter slash, and extract and transport salvageable fuel wood from 1 acre of Juniper Savannah on the Pueblo. Second, it was determined that the original treatment of reducing tree density by 75 percent per acre needed to be modified to 100 foot spacing between trees in moderately dense areas and 60 foot spacing between trees in highly dense areas. Thirdly, in order to maximize the amount of time the crew spends working in the field, it was determined that work schedules needed to be adjusted according to seasonal variation in available daylight and remoteness of treatment site. Specifically, the most efficient work schedule involves working four, 10-hour days per week during spring and summer at more remote sites and five, 8-hour days per week during fall and winter at less remote sites.

To evaluate if the project is effectively restoring Juniper Savannah to historic and desired conditions, the Pueblo, Bureau of Indian Affairs-Southern Pueblos Agency (BIA-SPA), local youth groups, and Southwestern Indian Polytechnic Institute (SIPI) and Santa Fe Indian School (SFIS) students will collaborate in collecting and analyzing wildlife, vegetation, fuels reduction, and fuel load monitoring data. The project is a collaborative effort funded by the Pueblo, United States Forest Service Collaborative Forest Restoration Program, and BIA-SPA. Results from this project will have great potential for application to other landscape-scale watershed restoration projects within Juniper Savannah across the Southwest.