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ANALYSIS

# Texas landowner perceptions regarding ecosystem services and cost-sharing land management programs

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**Abstract**

Publicly funded management programs can enhance important ecological services including watershed functions, wildlife habitat, and carbon sequestration. A mail survey was conducted in 2003 in the Western Edwards Aquifer area of Texas to assess landowner perceptions regarding the supply of ecological services from rangelands and their willingness to participate in various land management programs aimed at enhancing such services, which are receiving increasing public consideration. In general, landowners favorably viewed programs that would reduce woody plant (brush) cover in an effort to increase water yields or to improve wildlife habitat, but they disapproved of programs that would encourage the proliferation of woody plants in an attempt to increase atmospheric carbon sequestration. In addition, whether land management programs were voluntary or mandatory had a much greater influence on the level of landowner willingness to participate in programs than the availability of publicly funded cost-sharing. Three-fourths of respondents indicated they would be willing to enroll in cost-sharing brush management programs, and most viewed short-term (5–10 year) performance contracts as the most acceptable legal instrument for participating. To deal with ecosystem trade-offs resulting from woody plant management, we recommend that publicly funded programs aimed at enhancing ecosystem services through effective woody plant management should be flexible. In addition, we recommend the promotion of ecosystem level planning for such programs and cooperative management strategies for landowners participating in such program in order to maximize the effectiveness of associated public investments.


*Keywords:* Brush management; Carbon sequestration; Mail survey; Water yield; Wildlife habitat

## 1. Introduction

Important ecological services provided by rangelands in the Edwards Plateau include watershed functions, wildlife habitat, and carbon sequestration, all of which are being affected by changes in land use

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and land cover. During the last 25 years, changes in the use of rangelands overlying the Edwards Aquifer have been driven mainly by the outward population migration from nearby urban areas. The associated land subdivision and development has led to a decline in the area of farmland and contiguous rangelands. In addition, the encroachment of woody plants into the native grasslands and savannas of the Edwards Plateau has accelerated during the 20th century, mainly due to increased suppression of fire, as well as overgrazing and the dissemination of woody plant seed by livestock (Smeins and Merrill, 1988; Taylor and Smeins, 1994; Archer, 1994; Ansley et al., 1996; Smeins et al., 1997).

The westward expansion of human population in Texas has been especially pronounced along Highway I35 between the State Capital, Austin, and San Antonio, the ninth largest city in the United States (USBC, 2000). For example, the area of urbanized land in Bexar County, in which San Antonio is located, increased 29% between 1976 and 1991 and led to a 4% decline in the estimated annual value of ecosystem services as a result of land conversion (Kreuter et al., 2001). In addition to reducing the amount of rangeland, the rapidly growing population is exerting ever greater pressure on the relatively static supply of water from the Edwards Aquifer, which has been capped at 450,000 acre-feet per year and upon which San Antonio and several surrounding communities rely exclusively (Wagner and Kreuter, 2004). The water supply challenges are being further exacerbated by political pressure to restrict the construction of new surface reservoirs (Griffin and Chowdury, 1993; TWDB, 2001).

Elevated woody plant (brush) cover, especially Ashe juniper (*Juniperus ashei* Buchh.) that dominates much of the Edwards Plateau, can diminish streamflow and aquifer recharge because woody plants with dense canopies tend to increase evapotranspiration because they often intercept more precipitation and use more soil moisture than herbaceous plants (Thurow and Hester, 1997). As a consequence, reduction in brush cover can enhance water yields under certain geohydrologic conditions (Dugas and Mayeux, 1991; Dugas et al., 1998; Wright et al., 1976). In particular, the shallow soils and fractured karst geology of the Edwards Plateau may favorably impact the effect of woody plant removal on water yield (Wilcox, 2002) and be less costly than buying open-market water rights to supplement the existing supply of Edwards Aquifer water (Bach and Conner, 2000; Olenick et al., 2004).

Conversely, indiscriminate woody plant removal can lead to habitat fragmentation and a decline in biodiversity as well as food and cover resources for wildlife (Rollins, 2000). These impacts could be especially harmful to whitetail deer (*Odocoileus virginianus* Boddaert) and associated hunting enterprises that represent a significant source of income for Edwards Plateau landowners (Fulbright, 1997; Rollins et al., 1988). Garriga (1998) and Thurow et al. (2000) reported that the most common response from 119 Edwards Plateau ranchers (some with livestock grazing operations, some with deer hunting enterprises, and some with both) to a mail survey was a preference for landscapes with a brush cover average of 27%. In addition, the shift from grassland to shrubland can detrimentally affect grassland-associated wildlife, especially grassland birds which are declining at a faster rate than any other bird group in North America (Peterjohn and Sauer, 1999). Because the Edwards Plateau provides both breeding and wintering habitat for many grassland bird species, selective brush management programs could enhance habitat for such species as well as species requiring hiding cover (Wilkins et al., 2002).

Public concern over the environmental impact of greenhouse gas emissions has gradually grown due to projections by the Intergovernmental Panel on Climate Change that global temperatures will rise 1.4 to 5.8 °C by the end of the century if current greenhouse gas emissions rates persist (IPCC, 2001), which would lead to significant climate and land use changes. Texas is particularly vulnerable to climate changes because increasing temperatures could cause more severe droughts that could decrease groundwater resources and streamflow by 35% to 75% (Schmandt et al., 1992; North et al., 1995; EPA, 1997; Bernow et al., 2000).

To counteract such environmental impacts, the current U.S. administration has included carbon sequestration through changes in land cover as a key element of its climate change initiative. U.S. farmlands and rangelands could potentially sequester 13% of the country's carbon emissions (Comis et al., 2001). In addition, soils with high organic carbon