Rangeland Restoration Pilot Study Recommendations

The working group proposes a pilot study as part of the HCP on rangeland restoration of juniper encroached former grassland savannahs to quantify the specific impact and recharge to the aquifer and to spring flows.

BACKGROUND: Private ranches and rangelands comprise the bulk of lands over the Edwards Aquifer. Open space is critical for water infiltration and recharge in the recharge and contributing zones of the Edwards Aquifer. The precipitation that falls on Texas rangelands is the major source of surface flow and aquifer recharge, and the condition and management of these rangelands has major impacts on the water quality and quantity available for recharge and river flows. Healthy rangelands provide clean, high quality drinking water, promote recharge, conserve soil, filter and slow overland flow of water, provide forage for livestock, and provide wildlife habitat (Hays *et al* 1998). Over the last century, encroachment of woody species (particularly Ashe juniper – commonly known as cedar) across much of Texas' Edwards Plateau open rangelands has degraded many of these services, and research demonstrates juniper has negatively affected recharge and streamflow. Studies indicate that rangeland restoration programs reverse this trend through the use of sound long-term management practices to control woody species, and with proper follow-up management practices healthy (water producing) rangelands can be restored. Such restoration may benefit spring dependent species affected by the Edwards Aquifer as well as downstream organisms and communities dependent on reliable stream flows.

Research indicates rangeland restoration and management increases water quantity, as well as quality, for surface water run-off and aquifer recharge. The proper site and geology are critical specific to aquifer recharge, but most central Texas areas within the recharge zone and contributing zone can be enhanced for increased spring, seep and surface water flow. Woody plant invasion can be reversed through appropriate rangeland restoration. Initial costs, however, are generally more than a landowner can justify when considering livestock production alone. Costs are higher for established, mature stands of unwanted brush and lower for younger aged, non-resprouting species. Ashe juniper, the principal target brush species, does not resprout when mechanically controlled. Under certain circumstances, additional water yield results from rangeland restoration. Recent studies show that within the Edwards Plateau, an additional acre-foot can be gained for every 5 to 8 acres of brush restored to native grassland savannah condition. As demonstrated by several studies, opportunities exist for creating incentive-based programs that lead to additional water yield through rangeland restoration.

Assuming rangeland restoration practices are effective for at least 10 years, the cost to produce an additional acre-foot of water in the Edwards Plateau would be $40 to $180 depending on the method. (Connor *et al* 2008). These surface waters flows are also slowed and cleaned with good range management, releasing higher quality water more slowly over time rather than in a singular muddy rush in a huge flood event, allowing these waters to slowly percolate and be released over time and/or to flow over increased periods of time into aquifer recharge structures, providing extended recharge opportunity. There is still uncertainty as to exactly how much additional water actually enters the aquifer.

PROPOSAL:

The working group provides the following necessary items for the pilot study:

1. Feasibility of Rangeland Restoration for Increasing Streamflow in the Contributing and Recharge Areas of the Edwards Aquifer—initiate a directed effort assessing the feasibility of implementing a rangeland restoration program in the recharge and contributing zones of key watersheds contributing to Comal and San Marcos springs. Quantify the amount of land within the watershed suitable for rangeland restoration based on the physical features of the land including slope, soils, geology, and brush encroachment. Perform an analysis of landowner demographics focused on ownership size that will result in estimates of the likelihood of participation in a rangeland restoration program. These factors will be combined to perform an economic analysis and the cost/benefits of implementing a rangeland restoration program.

2. Measure Rangeland Restoration Impact in Recharge/Contributing Area on Comal and San Marcos Springs Watershed—Monitor and validate impact of rangeland restoration in the recharge and contributing areas of the watersheds of the Comal and San Marcos Springs and quantify changes in spring discharge and aquifer recharge, in essence replicating the monitoring strategies proposed by Conner *et al* (2008) and prepared for Region L. Appropriate designed and implemented monitoring of base flows will provide additional measurable signals on response 5 years after initiation.

3. Quantify Rangeland Restoration Impact on Comal and San Marcos Springs - Monitor and validate impact of rangeland restoration in specific locations identified as most likely to directly impact base flow exiting Comal and San Marcos springs. Utilize USGS data for identification of predominant major recharge locations quantify new water exiting the springs as identified by measurements using stable isotope identification based on source mapping while comparing that to base flow monitoring at springs.

NEXT STEPS:

The committee asked for:
1) a general approximation of cost.
2) estimated size of area, with map of approx proposed area for study (best area to directly impact springs in recharge and contributing areas, highlighting above San Marcos springs in particular since most sensitive flow needs here, as well as Comal Springs also).
3) a timeline for the study (ex over first 5 yrs of HCP).