AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
FUNDING CYCLE 2014 – 2016

TITLE: Water savings from juniper removal: Looking at the groundwater response

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COOPERATORS: Crook County SWCD, the Hatfield High Desert Ranch, and the Prineville District **BLM**

SUMMARY: This project builds on a long-term paired watershed study aimed to provide better understanding of hydrologic interactions in juniper woodlands of Oregon. The study site is located in the Camp Creek watershed (lat 43.96N, long 120.34W) in central Oregon. The study site comprises an area of approximately 500 ha and includes two adjacent watersheds, one treated (~ 90% of the western juniper removed) and one untreated, and a riparian valley where the two watersheds drain into. A seasonal groundwater level rise beginning in the winter season was observed in most wells. Also, a temporary hydrologic connection between upland and valley locations through the shallow groundwater system was noted. A greater and more rapid response to individual precipitation events in the fall season was observed in wells in the treated watershed and in the valley. This study provides valuable information regarding subsurface flow processes and the mechanisms of aquifer recharge in western juniper-dominated landscapes.

OBJECTIVES: The main objective was to characterize shallow groundwater level fluctuations in treated and untreated areas of a paired-watershed study in Central Oregon**.**

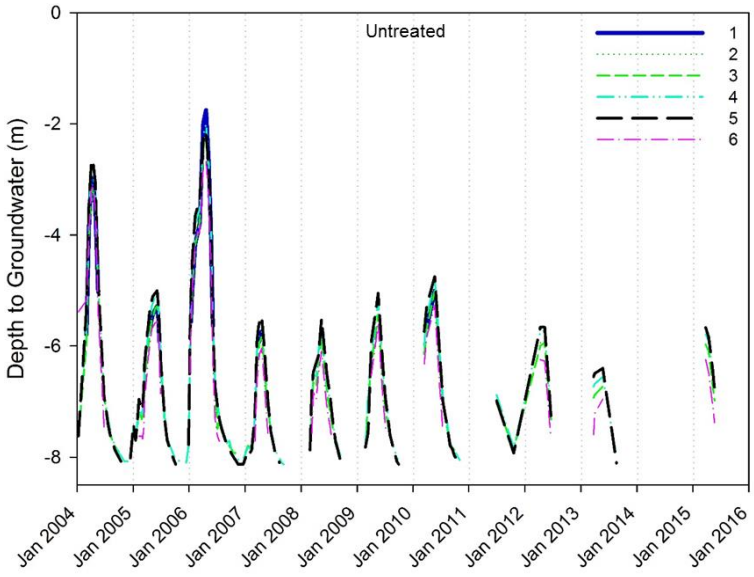
PROCEDURES: An analysis of eleven years of manually collected groundwater level data was conducted to characterize seasonality of precipitation associated with groundwater fluctuations. In addition, previously installed and new experimental wells that were placed at selected stream and valley locations were instrumented with stand-alone water level loggers to monitor shallow groundwater table fluctuations and to identify potential hydrologic connections between upland and valley locations. Data collected is being used for determining the timing and magnitude of shallow groundwater table rise and decline in response to precipitation infiltration inputs.

SIGNIFICANT ACCOMPLISHMENTS: The long-term (2004 – 2015) analysis of groundwater level fluctuations showed there to be distinct seasonal and storm-event responses. Groundwater levels in the untreated watershed consistently displayed higher yearly maximum values when compared to the treated watershed. However, groundwater levels in the treated watershed persisted longer into the dry out period. Both watersheds showed groundwater level fluctuations in response to seasonal and storm-event precipitation. However, groundwater

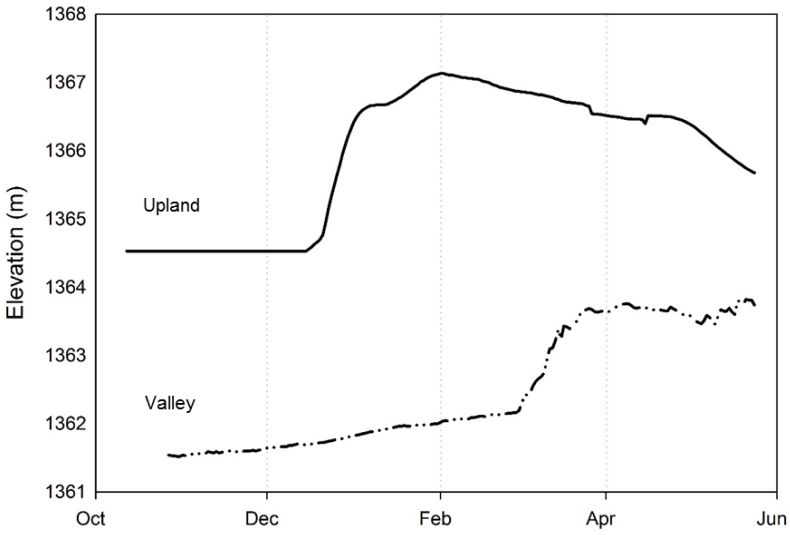
response to specific precipitation events was more apparent in the treated watershed, which could be observed in the order of hours. In the case of the untreated watershed, the groundwater response was observed several days after the event.

Temporary subsurface hydrologic connections were observed between upland and valley wells as the wet season progressed. This connection was supported by the results of a stable isotope analysis conducted, which indicated that the origin of the water samples collected from upland and valley locations might be the same.

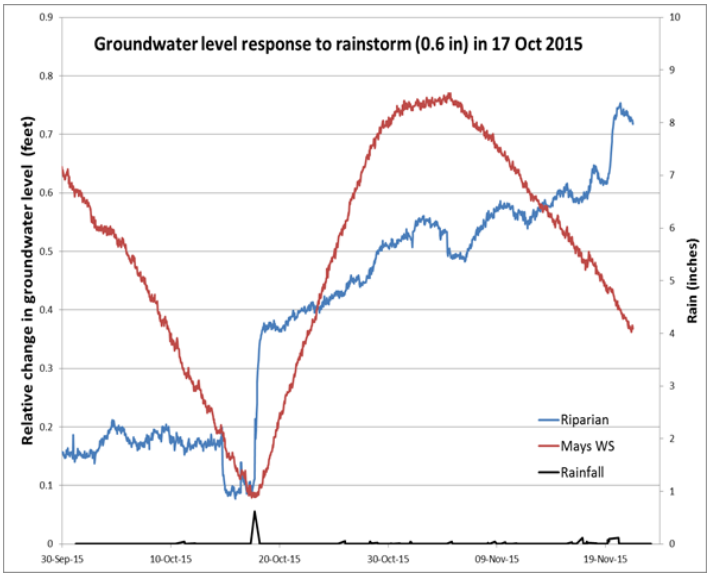
Data derived from this project was part of a MS thesis in Rangeland Ecology and Management. Results are being incorporated into a manuscript that will be submitted to the journal Rangeland Ecology and Management. Project findings are being presented at different local, national, and international meetings. For instance, the annual meeting of the Society for Range Management (SRM) and different meetings of the Pacific North West section of the SRM.



Groundwater level response for six upland monitoring wells in the untreated watershed (2004 – 2015).



Temporary hydrologic connectivity between upland and valley locations indicated by shallow groundwater level fluctuations from dry to wet season for one upland and one valley well.



A 0.6-inch storm in the Fall of 2015 resulted in about 8 inches groundwater level rise in a well in the treated watershed and a well in the valley downstream. No response was observed in any of the wells in the untreated watershed.

BENEFITS & IMPACT: The need for having better information regarding the hydrologic response to juniper removal has been discussed by different stakeholders including producers, state and federal agency personnel, and researchers. Results from this study provide critical information regarding potential water savings from juniper removal practices.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM: Funds from start-up package complemented this project.

FUTURE FUNDING POSSIBILITIES: OBC, OWEB, USDA AFRI