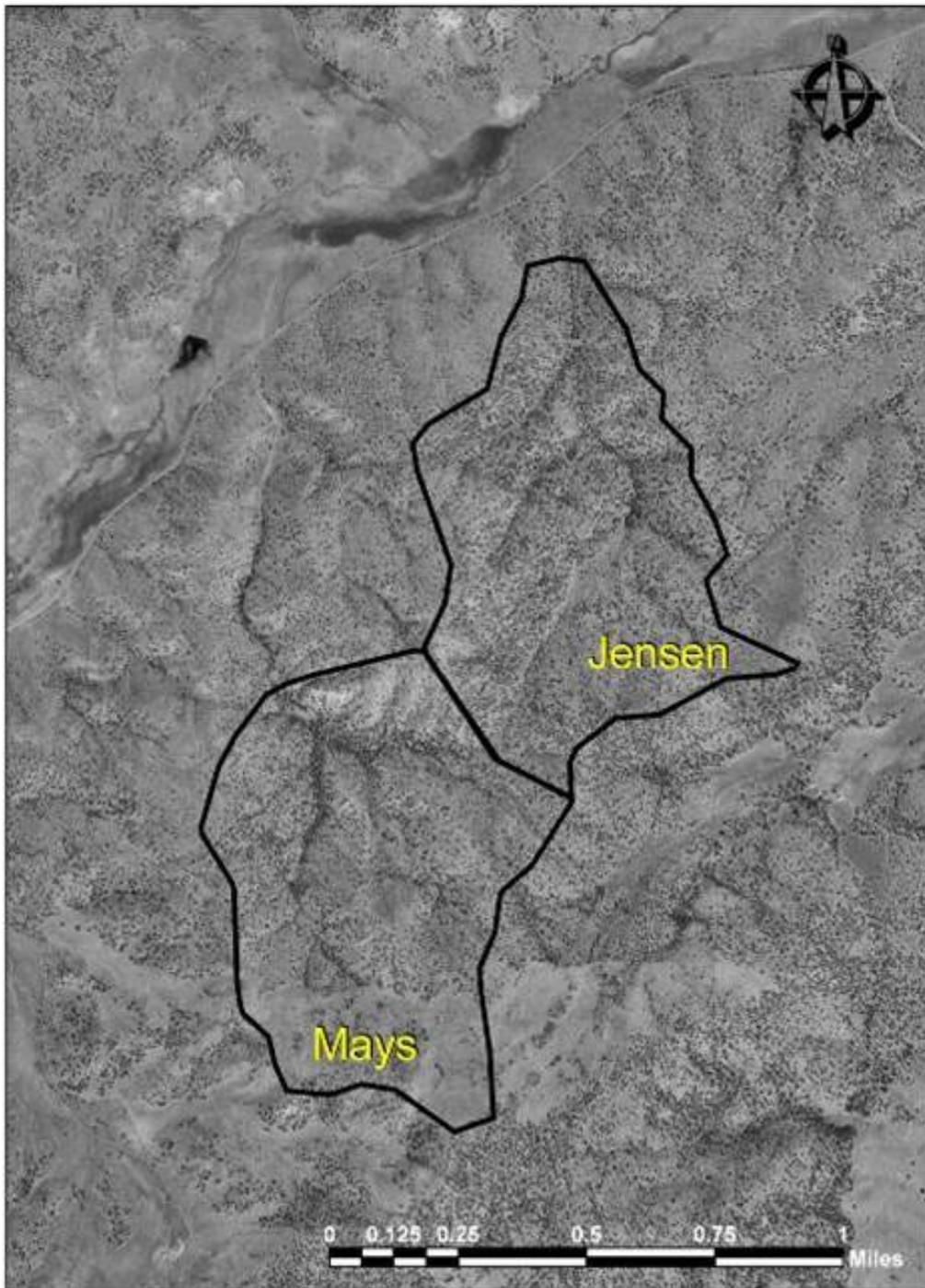


Camp Creek Paired Watershed Study

Oregon Watershed Improvement Board
Final Report

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Paired Watershed Study: Juniper Control and Changes in Water Flow

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Introduction

According to U.S. Forest Service publication PNW-GTR-464, *Western Juniper in Eastern Oregon*, western juniper's dominance in eastern Oregon has increased 5 fold since 1934 (420,000 acres to 2,200,000 acres). Based on water use models for individual trees, the U.S. Forest Service estimates that mature western juniper tree densities, ranging from 9 to 35 trees per acre, are capable of utilizing all of the available soil moisture on a given site. Research has shown that soil loss from sites with higher than the natural variation of western juniper cover is 10 to 100 times greater than similar sites that are still within their natural range of variation. Previous monitoring studies have been limited in their scope of monitoring to water quality impacts following western juniper control.

Water quality, quantity and timing are the primary factors being monitored with this project. The project involves the use of a paired watershed study. The project consists of the treatment (cutting juniper) of one of the paired watersheds totaling approximately 300 acres with the other watershed serving as the untreated control. Scheduled for fall, 2005, the Prineville BLM District will cut approximately 300 acres of western juniper in one of the watersheds and post-treatment monitoring will occur in both watersheds in order to compare responses and document impacts.

The paired watershed project is located approximately 60 miles southeast of Prineville, Oregon. In 1993, two watersheds (Mays and Jensen) were identified in the Camp Creek Drainage, a tributary of the Crooked River. The average elevation of the site is 4,500 feet with an average annual precipitation of 13 inches. The historic vegetation type was mountain big sagebrush / Idaho fescue. The site is currently dominated by western juniper with a sparse understory of shallow rooted perennial grasses and forbs.

The Prineville District, BLM manages ninety percent of the treatment area while the remaining 10 percent is owned by the Hatfield High Desert Ranch. The BLM, in cooperation with Crook County SWCD, the permittee (Hatfields), and OSU Rangeland Resources Department identified the paired watersheds as areas of interest because of the opportunities they provided to monitor changes in water yields as a result of juniper control. Access to the site is from the Camp Creek/Bear Creek road.

Since 1994, the two watersheds have been monitored for similarities and differences. Precipitation, vegetation composition and cover, erosion rates, changes in streambed morphology and surface flows have been monitored annually. Channel flow is monitored continuously and changes in streambed morphology are measured twice a year.

Situation

Junipers are known to increase soil loss with runoff water; intercept rain and snow before it reaches the ground making it unavailable for plant growth, stream flow or groundwater recharge; and consume large amounts of soil moisture. Previous monitoring of juniper control projects have focused on changes in vegetative composition and production. With this project we are monitoring the effects – on a watershed scale – of juniper control on the availability of water

(quantity and timing) for other beneficial uses. Water yield over time will be measured, demonstrating the relative ability of the paired watersheds to catch and safely release water.

This project is unique in that it involves a paired study approach to monitoring changes in a system's water budget following western juniper control. Monitoring water yield following juniper control has not been done in the western juniper vegetation type. The value of a paired watershed study is that the impacts of the treatment can be compared to the untreated watershed. This study is also unique in that it is the only long-term study of its type in the Northwest. Because of the time and expense in monitoring watershed level activities, such watershed comparison studies are rarely undertaken. Similar studies in different ecological and climatic zones have been conducted in Idaho, Utah and Colorado but no paired watershed studies have been implemented in western juniper ecosystems.

As per an agreement between Oregon State University, Department of Rangeland Resources and the Prineville District, BLM, the treatment phase will take place only after an adequate amount of baseline data has been collected. Baseline data has been collected in both watersheds since 1994 and has included the following parameters: 1) stream flow measurements including duration, intensity and volume have been recorded on a continual basis, 2) changes in stream channel morphology, 3) understory vegetative composition, 4) cover and juniper tree density, 5) soil comparisons and differences, 6) side hill erosion activity, and 7) precipitation. The value of this constant monitoring over the last 10 years is that annual variation in precipitation, vegetation expression, soil movement and storm activity has been documented.

Initial data collected also included an ecological site description and analysis of the two watersheds based on vegetation, soils, topography, geology, channel morphology, streamflow, local climate and erosive processes. In 1996, six peizometers per watershed were established to monitor subsurface water in areas adjacent to the flumes. Average depth of these peizeometers is 5 feet.

As a result of these initial monitoring activities, additional monitoring needs were identified. Additional monitoring needs included soil moisture, sub-surface water, on-site weather data and water use by juniper (timing).

Project Activities

As a result of the identified monitoring needs, grant monies were applied for and received from the Oregon Watershed Enhancement Board, the Bureau of Land Management – Science Program, Title II and Title III Secured Schools Act and the Crook County Taylor Grazing Board. These monies were used for: 1) instrumentation for soil moisture monitoring so that continuous soil moisture data can be collected, 2) install and instrument additional peizometers to capture water data below the soil surface, 3) purchase and install on-site weather stations, and 4) improve and instrument spring developments for flow monitoring.

Monitoring equipment and satellite communication was coordinated and purchased through Wy'East RC & D and *Automata Inc.* Personnel from Wy'East RC&D provided leadership in the installation process and have continued to provide technical assistance. Prineville BLM has contributed dollars for NEPA, project oversight and cutting of the junipers in the project area.

In-kind contributions to the project have been numerous. Countless individuals, agencies and organizations have provided input and direction to the project. Notable contributions include Prineville District, BLM (NEPA, layout, and contract supervision), Hatfield High Desert Ranch and the OSU Department of Rangeland Ecology and Management (equipment and personnel).

Current weather, channel and spring flow along with soil moisture conditions can be viewed at <http://ifpnet.com>. This web site is managed by Wy'East RC&D as part of their integrated fruit program.

Presentations and Posters:

One paper and one poster were prepared and presented at the Society for Range Management's Annual meeting in Fort Worth Texas in February, 2005. Copies of the poster are available for viewing in the Crook County Extension Office, Prineville, Oregon and the OSU Range Department, Corvallis. An electronic version is available at the Prineville BLM Office.

Deboodt, T., M. Fisher and J. Buckhouse. (2005). Camp Creek Paired Watershed Juniper Control/Water Quality Monitoring Project. 58th Annual Meeting, Society for Range Management. Fort Worth, TX. Abstract no. 75 pg. 36.

Fisher, M., T. Deboodt and J. Buckhouse. (2005). Camp Creek Paired Watershed Study. 58th Annual Meeting, Society for Range Management. Fort Worth, TX. Abstract no. 111. pg. 54

Deboodt, T., J. Buckhouse and M. Fisher. (2005). Determining the impact of Juniper Harvest on Water Yield: Calibrating the Paired Watersheds. 2005 National Association of County Agricultural Agents (NACAA) Annual Meeting and Professional Improvement Conference. Buffalo, NY. CD.

Additional talks that included information about this project include the Monument SWCD Watershed Meeting, Monument, OR., Juniper Management, Confederated Tribes of Warm Springs, Warm Springs, OR., and Cows and Creeks Workshop, Prineville, OR. 176 people attended one or more of these workshops.

Articles about the paired watershed project were written for Automata Inc. newsletter and OSU Central Oregon Agriculture newsletter. Combined circulation for these newsletters is 2500.

Web site access to weather station information is: <http://nopro.com/ifpnet>. This web site is maintained by Automata Inc. and Wy'East RC&D. To view weather data, click on "change map" and highlight Crook County. Flags on map represent each weather station, Mays and Jensen.

Field trips: 6 organized field trips and numerous personal tours have been conducted at the watershed over the last 2 years. Total attendance for these events is 213 people.

Partnerships in Project.

As this project progresses, the number of organizations, agencies, and individuals involved continues to grow. The current list of partners includes:

Prineville District, BLM	Deschutes Resource Conservancy	OSU Extension Service
Ochoco National Forest	Crook Co. Natural Resources Ad. Comm.	Doc and Connie Hatfield
OSU Rangeland Resources	Crooked River Watershed Council	COCC Forestry Dept.
Crook Co. Cattlemen's Assoc.	Crook/Wheeler Co. Farm Bureau	Crook County SWCD
Oregon Dept. DEQ	Western Juniper Work Group	McCormack and Sons
Malheur Co. Experiment Station	Congressman Walden, Senator Wyden	Larry Swan, U.S.F.S.
Ochoco Irrigation District	Oregon Watershed Enhancement Board	Wy'East RC & D



Installation of the weather stations begins by digging the footings for support of the towers.



The base of the weather station is set in concrete which is reinforced with galvanized pipe.



Each of the electronic sensors (precipitation, solar radiation, temperature, relative humidity, wind speed and direction, leaf wetness, and weighing rain gauge) are connected to the satellite radio for transmission of data.



Jensen weather station located near the flume at the bottom of the study area. Wy'East personnel make the final checks in the installation.



Mays spring is one of two springs where old spring boxes were no longer functional. Development of the springs allows the monitoring of flow over the year.



The old spring box was removed and spring area excavated to determine where the flow was originating.



PVC spring box, coffer dam and gravel collection area are prepared.



Spring flow is captured in a pipe and measurements are manually recorded every 14 to 21 days. Mays spring was doubled piped in anticipation of large flows.



Small track excavator is used to begin the installation process of the soil moisture monitoring probes.



Bore holes are drilled into the wall of the larger hole.



Soil moisture probes are placed at 8, 18 and 30 inches below the ground surface. The top probe also includes soil temperature sensors.



A completed soil moisture monitoring site includes solar panels, battery housing and housing for satellite radio.



The Ochoco National Forest provided personnel and equipment to install the ground water peizometers. 6 peizometer wells were installed in each watershed, perpendicular to the drainage.



Each hole was drilled to a depth of 27 feet or until bedrock was encountered. Perforated 2" pipe was placed in each hole with washed gravel placed on the outside of the pipe. Water is free to move into and out of the pipe and is not under pressure.



Each well is capped to provide easy access for measuring depth to water. All wells were surveyed for the purpose of understanding relationships to bottom of the channel.



The 6 wells are placed across the valley bottom for the purpose of better understanding ground water movement out of the watersheds.



Permanent vegetative transects were established for the purpose of monitoring understory vegetative changes over time. 8 transects are located in each watershed, 2 per aspect.



In addition to data collected, photos are taken at each transect. One photo which includes the entire transect and one photo at the zero point.



Permanent channel cross-sections are located in each watershed. 25 cross-sections per watershed are measured two (2) times per year.



Cross sections are measured after spring channel flow ceases and then again after the summer thunderstorm period.



Middle section of Mays watershed prior to juniper harvest (6/29/05).



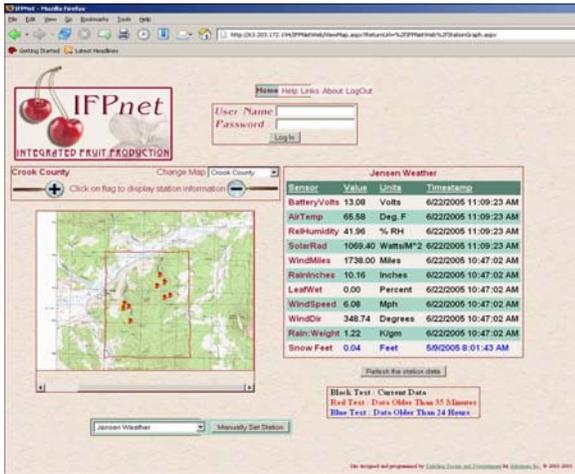
Middle section of Mays watershed after juniper cut (11/2/05).



West section of Mays watershed prior to juniper harvest (6/29/05).



West Section of Mays watershed after juniper harvest (11/2/05).



Web site access allows for remote monitoring of both the site and the equipment, providing real time information.

Web Address: <http://nopro.com/ifpnet>



Spring flow, soil moisture, weather, depth of snow and channel flow are parameters which can be monitored from the web site.



Use of monitoring equipment allows for data collection 24 hours a day, 365 days a year.



Regular visits to the site allow for maintenance of equipment, point in time data collection and verification of data being collected by system.

