

Restoration of juniper woodland-steppe ecosystems: Effects on water capture and release

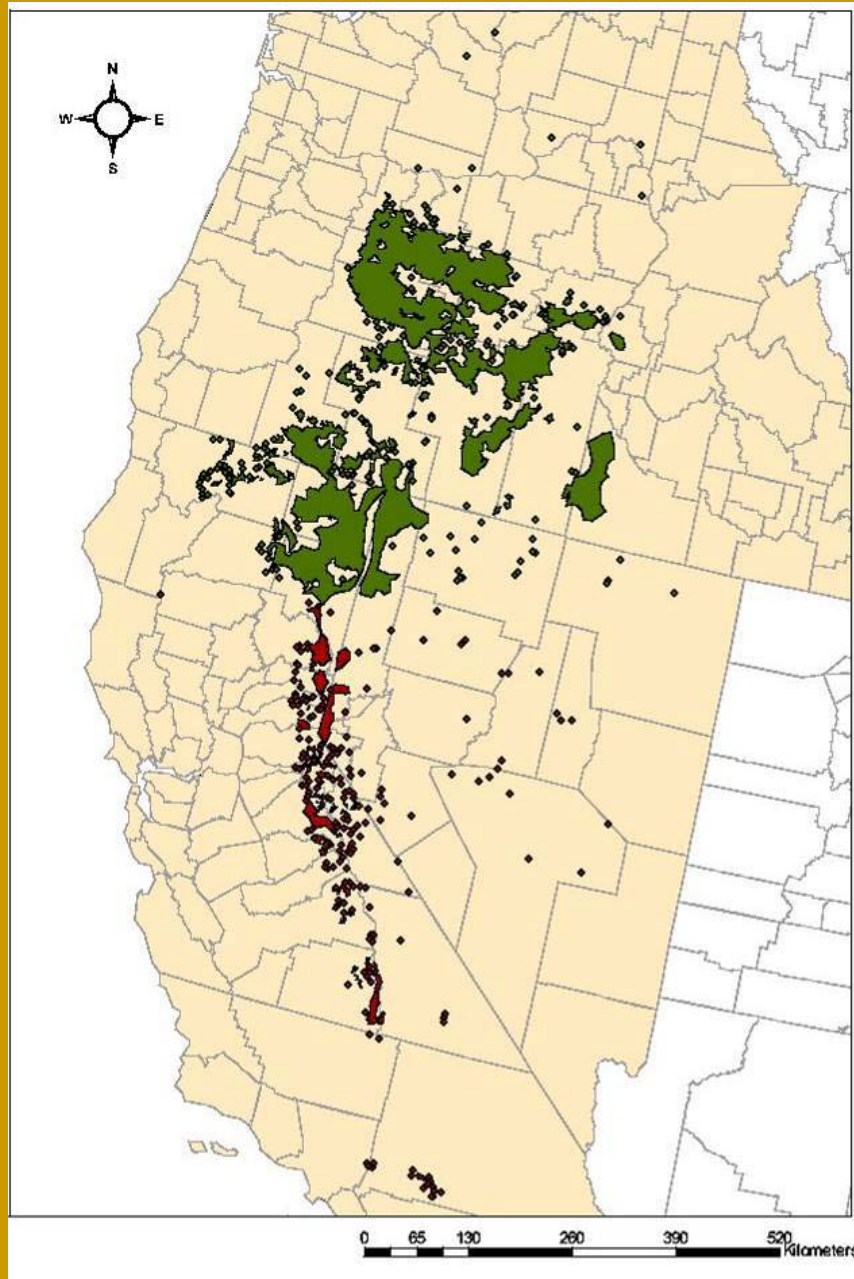
A photograph of a juniper woodland-steppe landscape. In the foreground, a large, gnarled, and dead juniper tree trunk lies on the ground, surrounded by dry, yellowish-brown grass and shrubs. The background shows a vast, rolling landscape with patches of green juniper trees and dry grass, extending to distant mountains under a clear blue sky.

Michael Fisher, COCC Forest Resources Technology
Tim Deboodt, OSU Crook County Extension

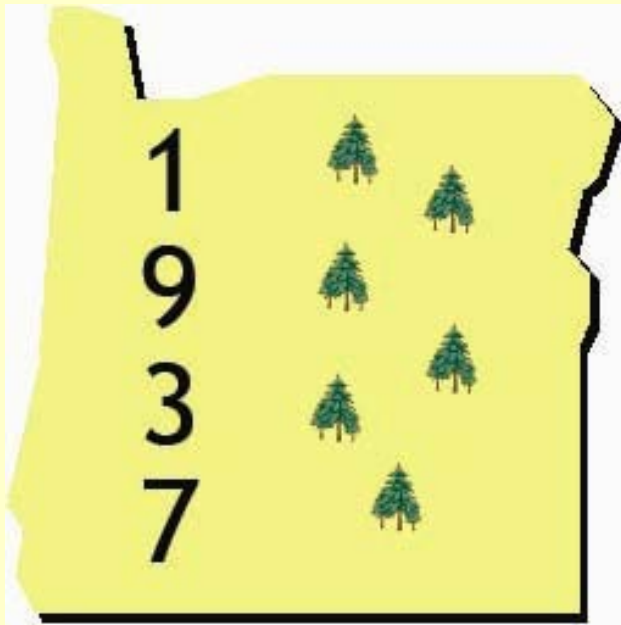
Objectives

- Western juniper woodland expansion
- Western juniper ecology
- Impacts of western juniper on watershed function

Western juniper (*Juniperus occidentalis* var. *occidentalis*)

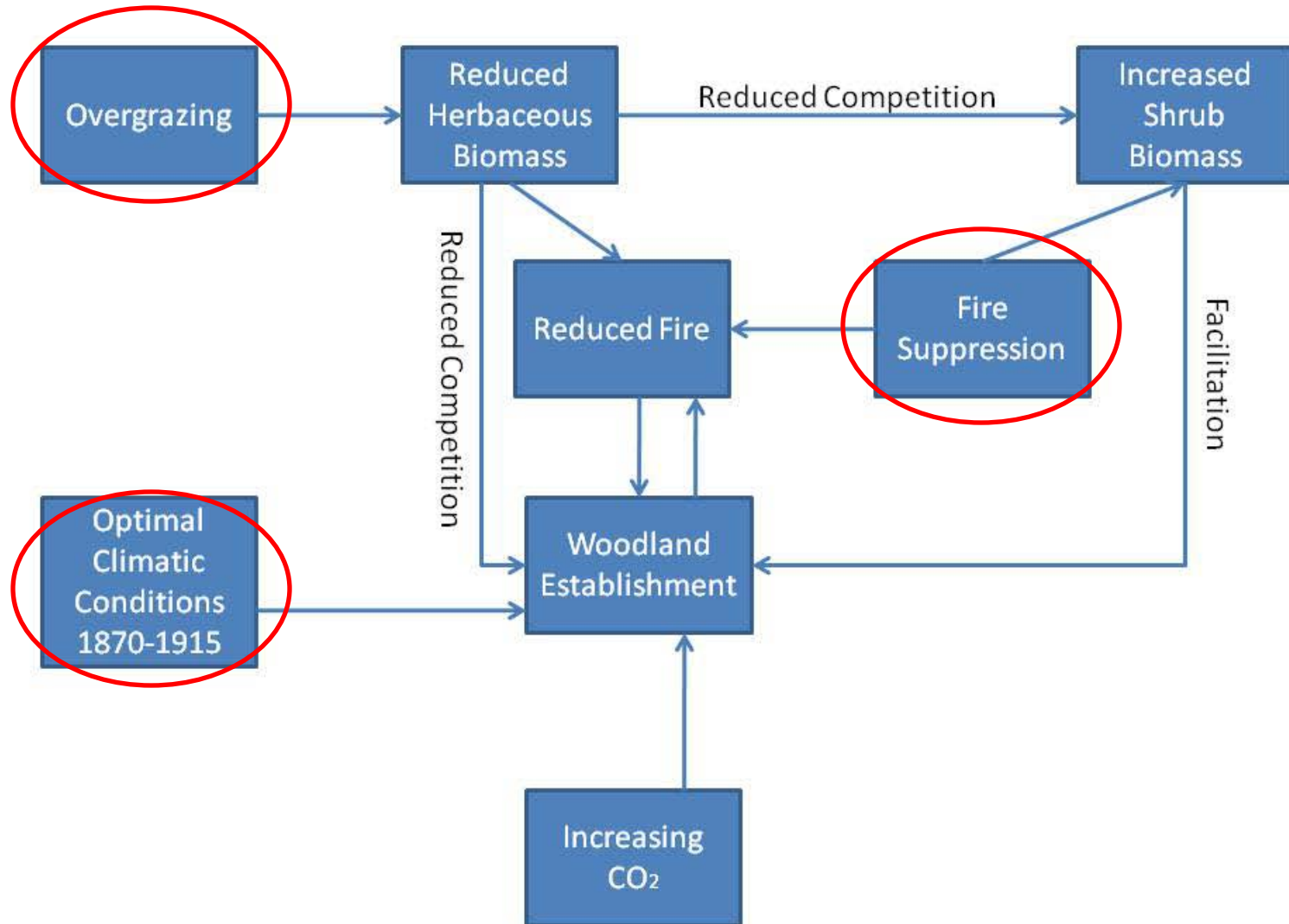


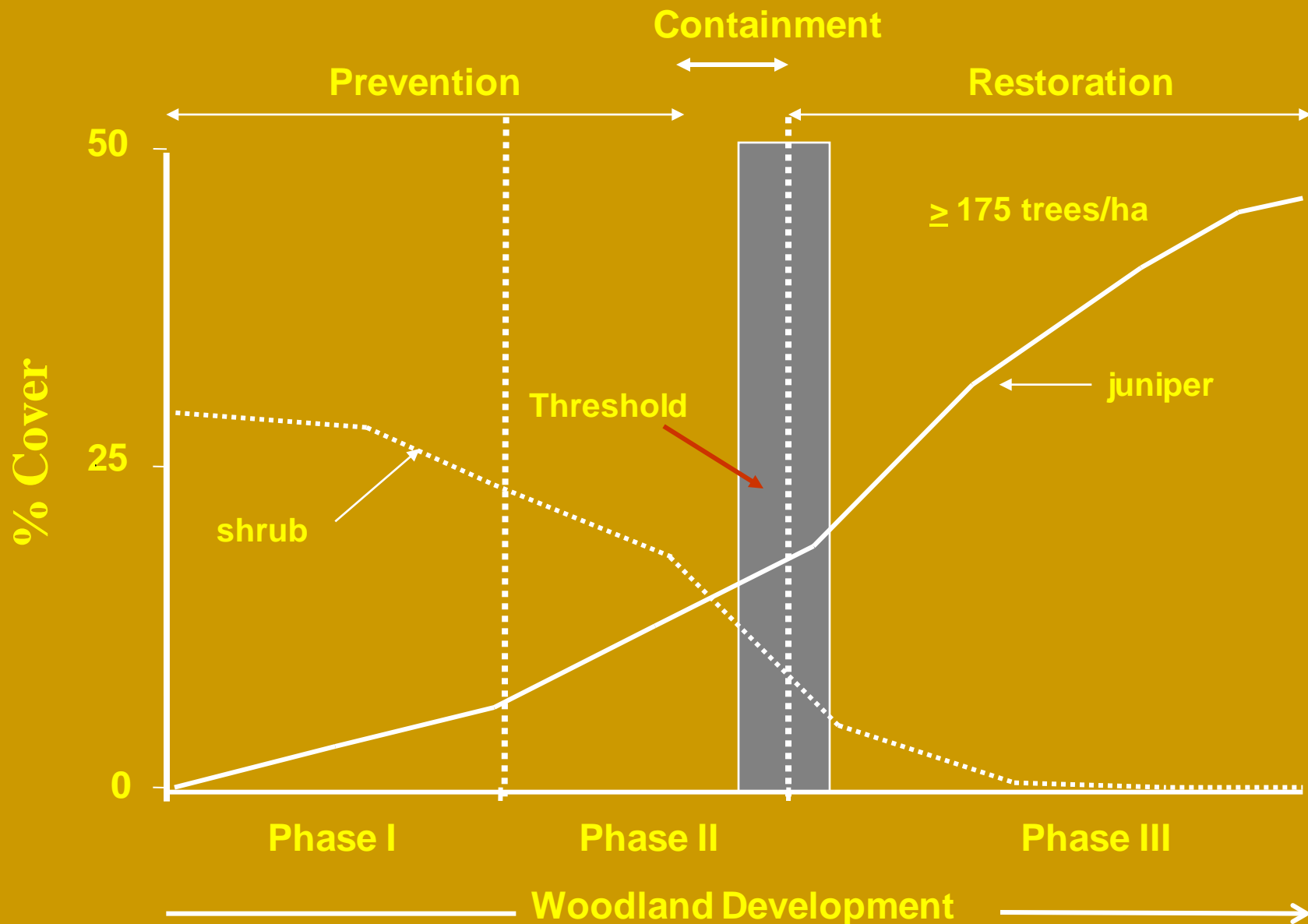
- 1.5 Million acres of Juniper in 1937
- Over 6.5 Million acres of Juniper today





Woody Encroachment into Grasslands





The Invasion Begins

Phase 1:

- Juniper is present
- Small juniper become visible
- Grasses, shrubs and forbs are unaffected
- Little or no change in ground cover



The Invasion Advances

Phase 2:

- Juniper trees throughout the site
- Some shrub die-off possible
- Loss of ground cover

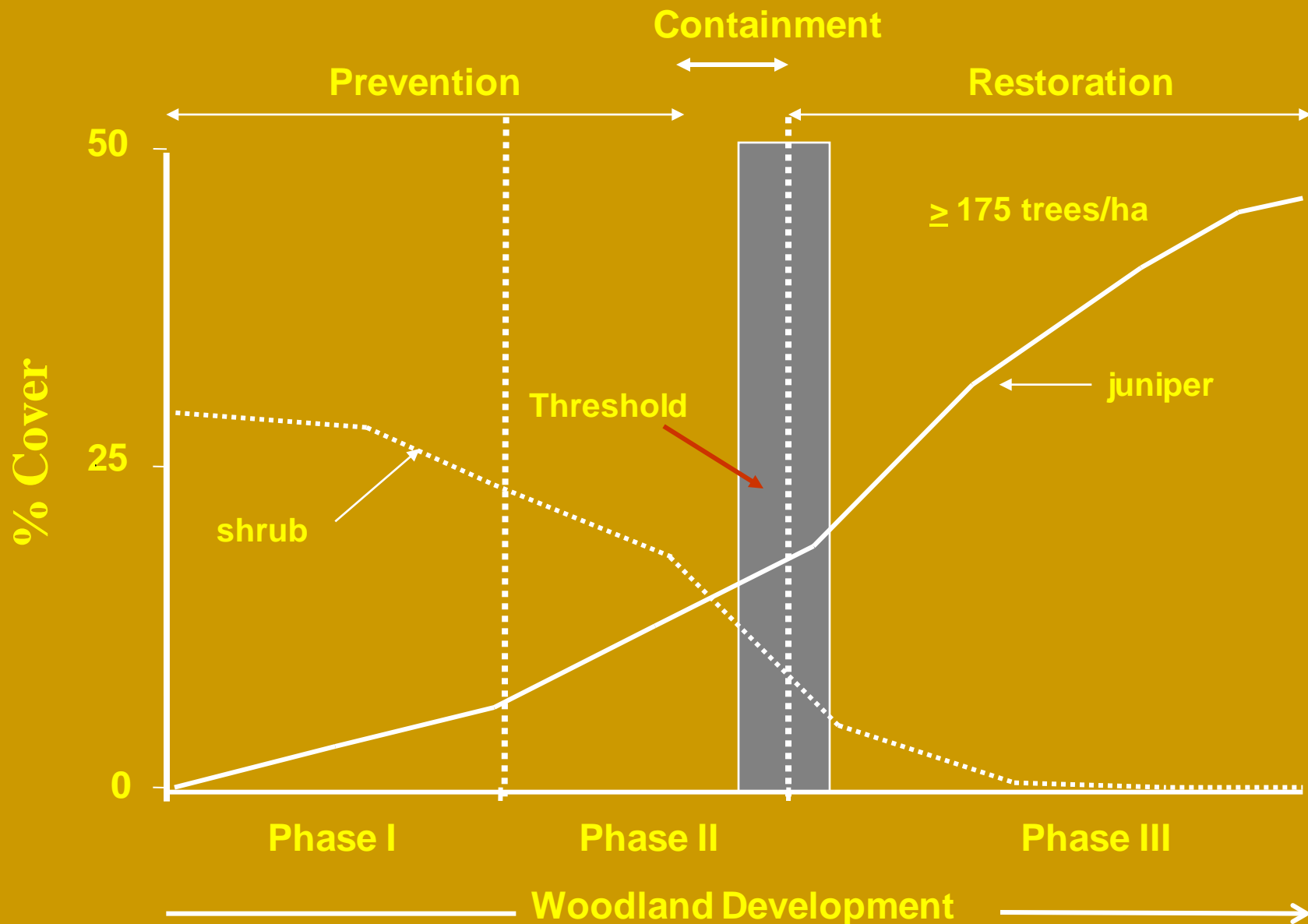


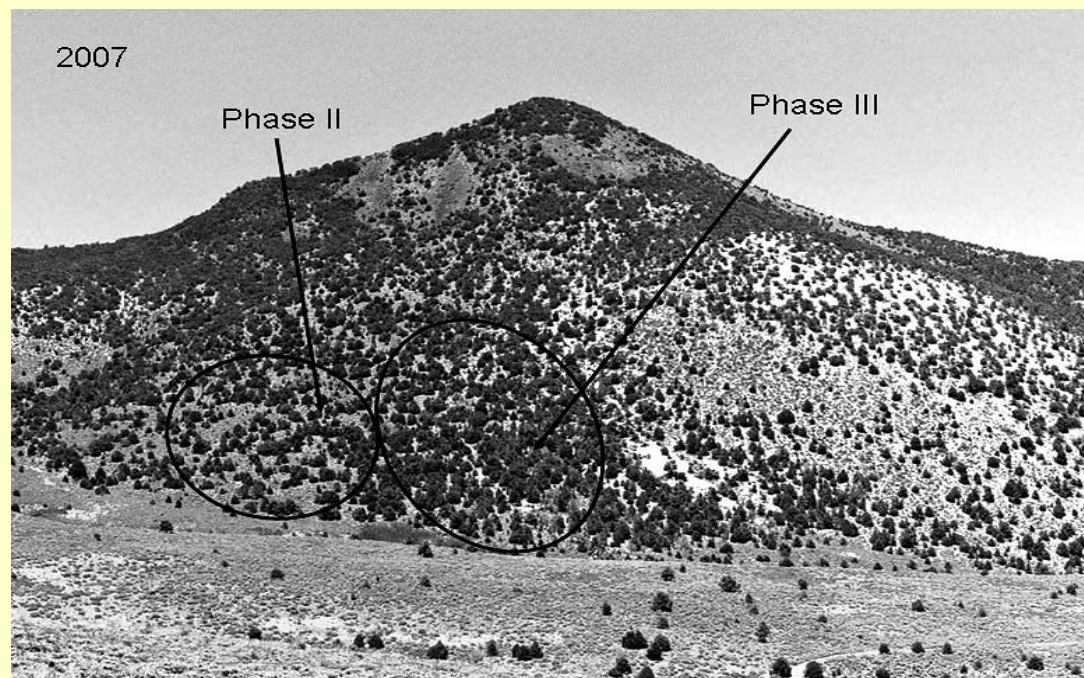
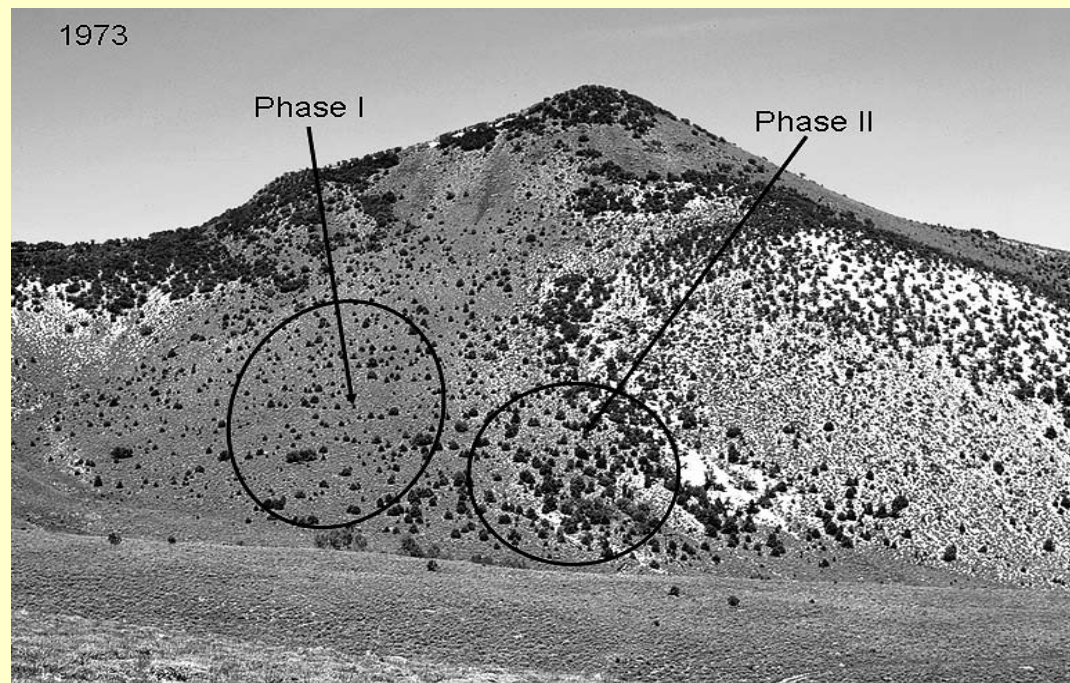
The Invasion Takes Over

Phase 3:

- Juniper canopy closes
- Shrub die-off up to 75%
- Loss of understory vegetation
- Large areas of bare soil
- Overland water flow common







Juniper Encroachment Impacts:



- Loss of native plants
- Loss of wildlife habitat
- Reduced range production
- Reduced watershed function



Juniper Encroachment and watershed function:

- Effective Water Availability
 - Juniper density increases
 - up to 50% of precipitation intercepted
 - evaporated into the atmosphere
 - reduced available water and instream flow

Western juniper

- **50 – 70 percent of precipitation is intercepted by tree canopy**
- **> .3 inch precipitation event for thru-fall**
- **90 percent of precipitation events < .3”**
- **Maintains photosynthetic material year- round**
- **30 – 50 gallons per day per tree (12 inch dbh)**
- **9 – 35 trees per acre (13 inch precipitation zone)**

Camp Creek Paired Watershed Study

Area Description

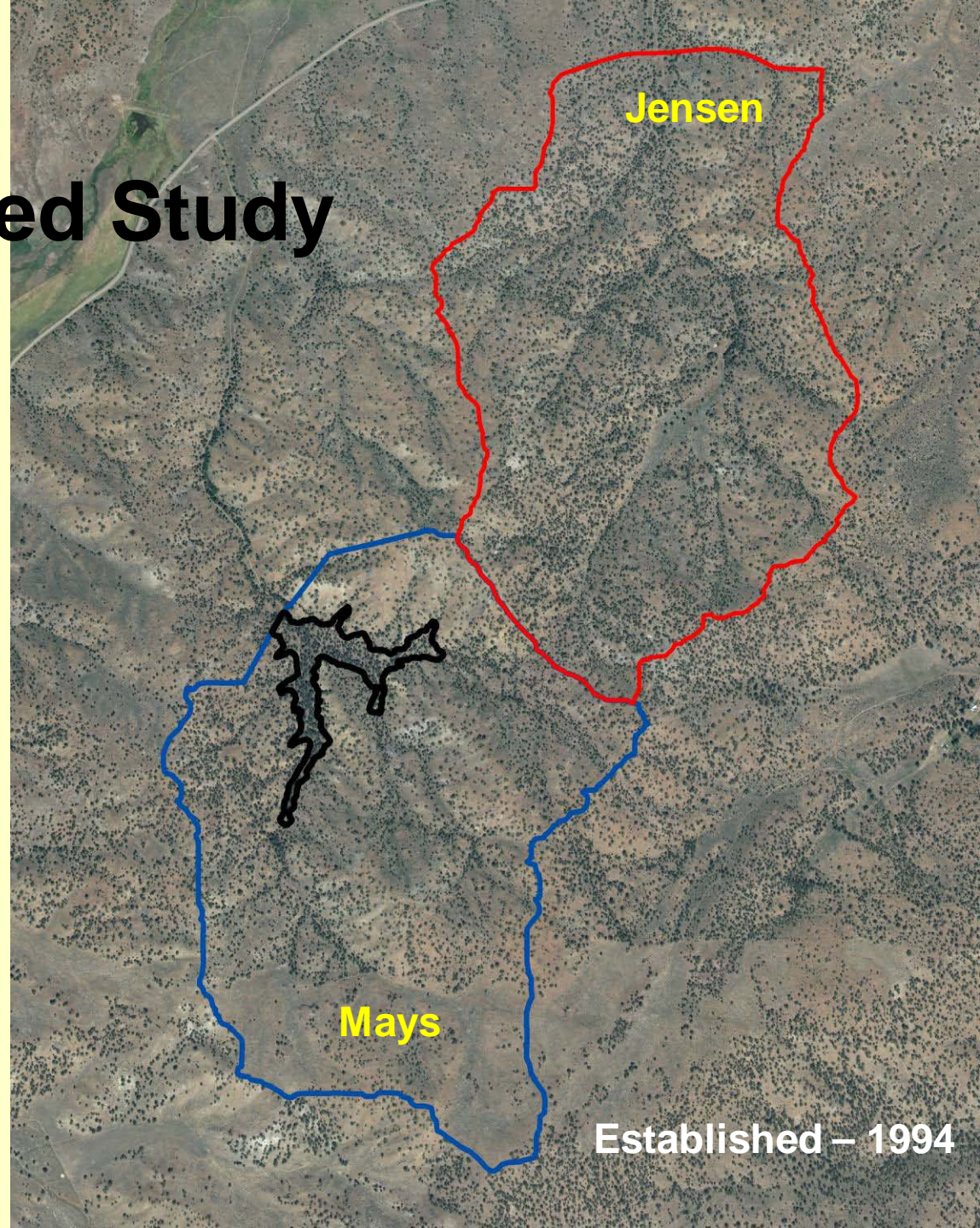
Mays – 279 acres

Jensen – 261 acres

4500 – 5000 ft elevation

Sagebrush/bunchgrass
steppe

13 inches precipitation



Established – 1994

Project History

- 1994-2003: Analysis and classification of watershed characteristics (calibration)
 - Vegetation
 - Soil
 - Topography geology
 - Channel flow
 - Weather patterns
 - Erosion processes

- 2004:
 - Monitoring of ground water
 - Monitoring of spring flow output
 - Monitoring of soil moisture
- 2005: Treatment of Mays watershed
 - October 2005 – April 2006
- 2006: Post treatment monitoring begins

A photograph of a soil moisture and temperature sensor installed in a forest. The sensor consists of a black vertical pole with a white rectangular box at the top, which is connected to a larger white box at the base. The ground is covered with dry grass and small shrubs, and the background is filled with tall evergreen trees.

**Soil Moisture and
Temperature**

A photograph of a drilling rig in a forest. The rig is a large, orange, vertical machine with a long drill bit. A person is standing next to the rig, and a white vehicle is partially visible on the right. The ground is sandy and covered with dry branches and leaves. The background is filled with tall evergreen trees.

**Depth to Ground
Water**

A photograph of a weather station in a snowy forest. The station consists of a tall, silver, vertical pole with various sensors and a solar panel. The ground is covered in snow, and the background is filled with tall evergreen trees.

Weather Stations

A photograph of a spring flow measurement setup in a forest. The setup consists of a black pipe that leads into a white container. The container is surrounded by green grass and small shrubs. The background is filled with tall evergreen trees.

Spring Flow



What we know:

- Late season spring flow increased 225%
- Ground water days has increased 41 days
- Late season soil moisture increased
- Increase in ground cover



Healthy Watershed

- Captures
- Stores
- Safely Releases

