Restoration of Riparian Areas Following the Removal of Cattle in the Northwestern Great Basin

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Preface

- Impacts of Grazing
- The Importance of Hart Mountain
- The Potential of Passive Restoration

Cattle Impacts

- One Million Square Kilometers Open to Grazing
  - 80% of BLM and 60% of US Forest Service
- Congregate in Riparian Areas
  - Denuding of Vegetation
  - Erosion of Stream Banks

Cattle Impacts

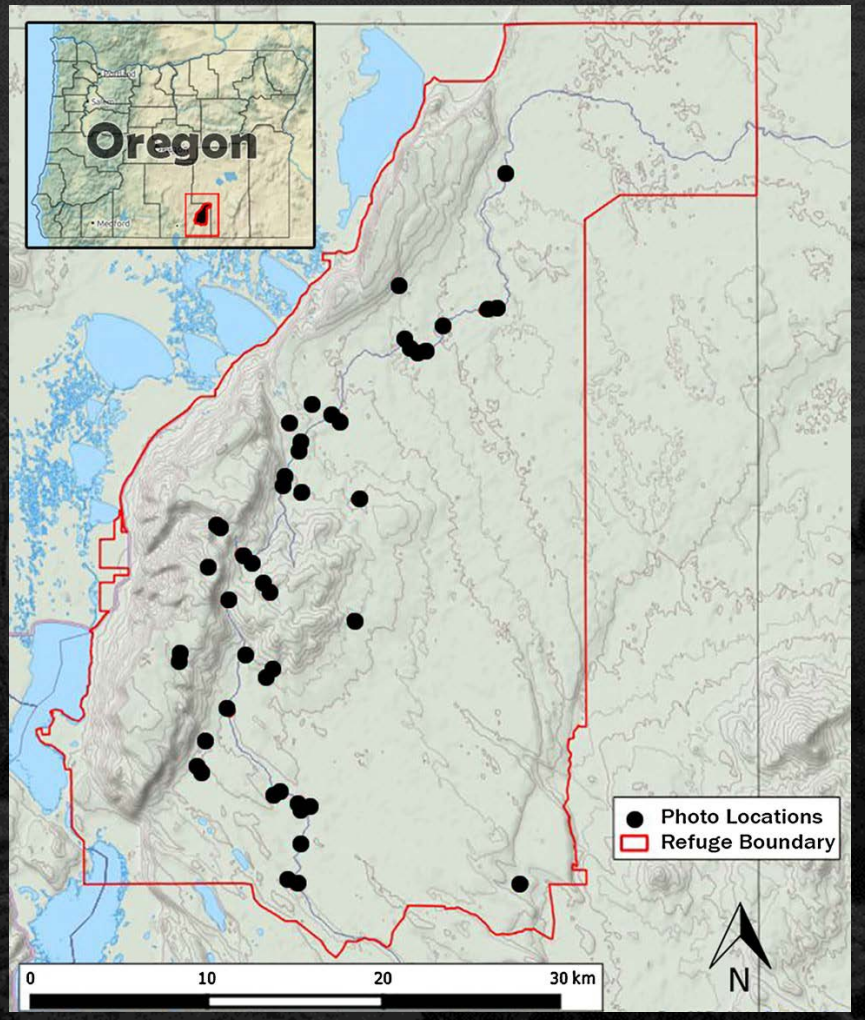
- Removes Habitat
- Exacerbates Effects of Climate Change

Objectives

- Historical Photos & Retakes
- Use Image Analysis to Assess the Amount of Change
- Assess the Accuracy of Image Analysis
- Compare Active Management to Passive Restoration

Importance of Hart Mountain

- Southeast Oregon
  - Northern Basin and Range Ecoregion
- Removal of Cattle in 1990
  - Limited Active Restoration Efforts



Methods Overview

- Photo Retakes
  - 64 photo pairs
- Field Measurements
  - Veg Transects
- Qualitative Visual
- Quantitative Digital Transects
- Accuracy Assessment

Qualitative Visual

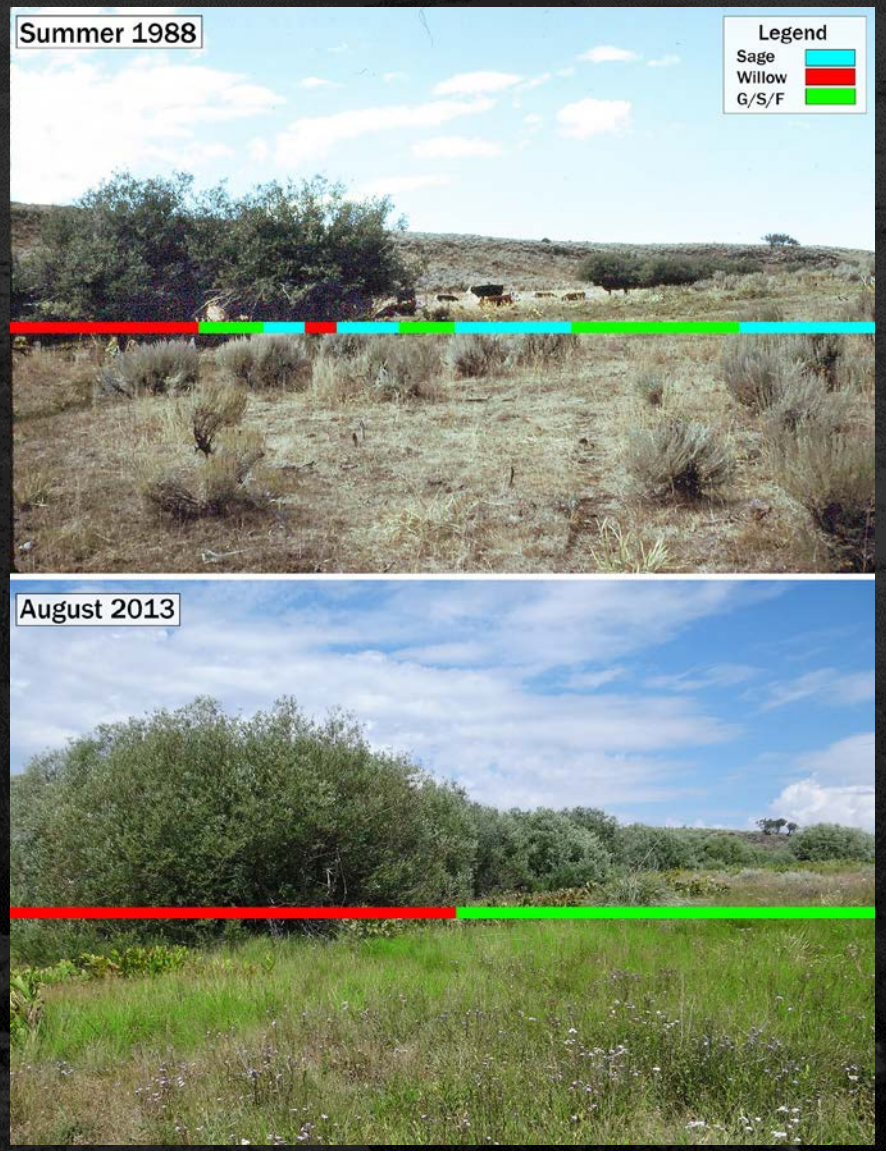
- **Visual Assessment of Each Photo Pair**
- **Seven Categories**
  - willow cover
  - sagebrush cover
  - aspen recruitment
  - amount of bare soil
  - exposed channel
  - eroding banks
  - channel width

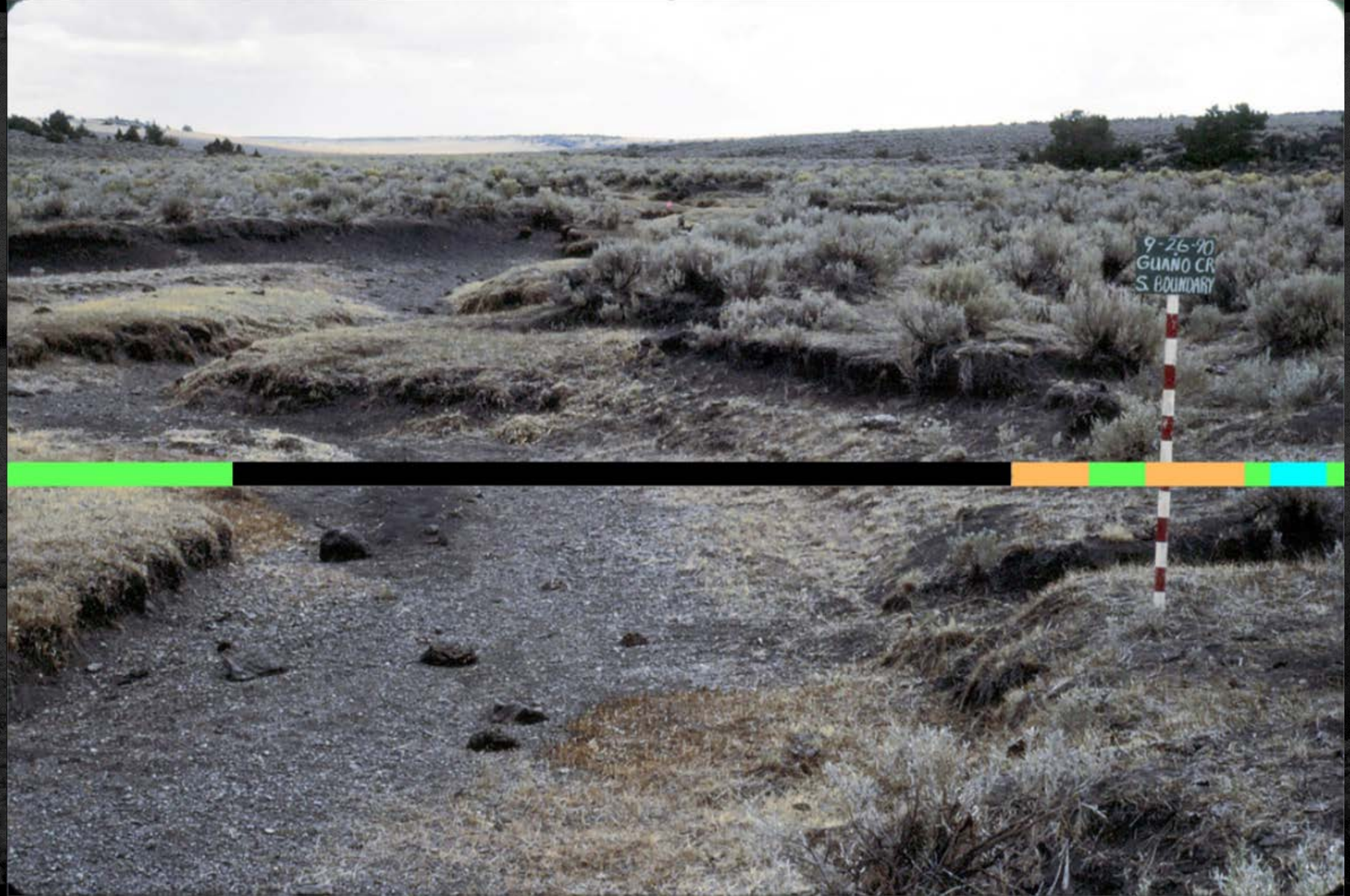

OCT. 1970

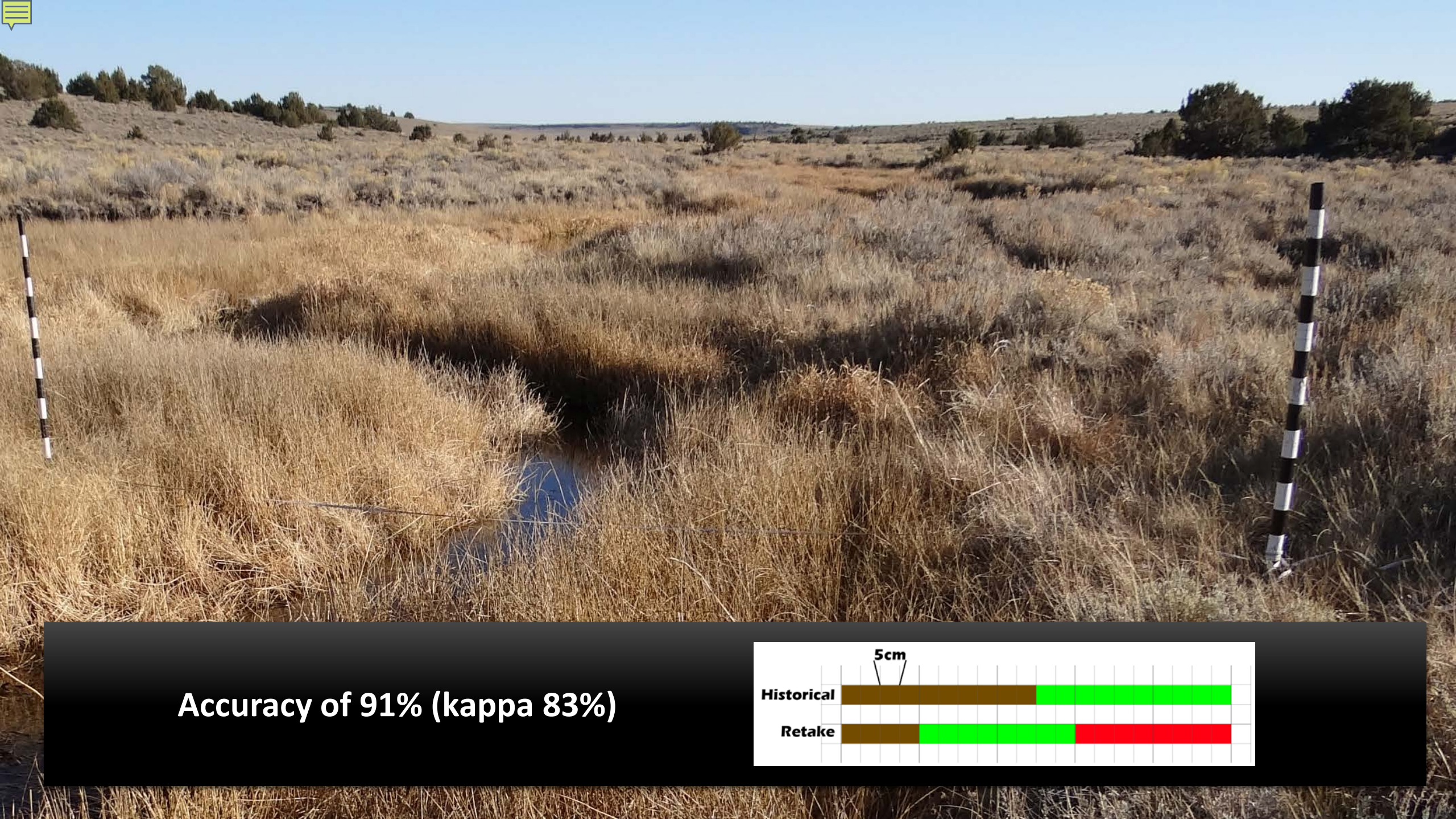
3007.4.168.1990
Rock Creek downstream from Morgan Drift Fence
Mar 1990

Quantitative Digital Transects

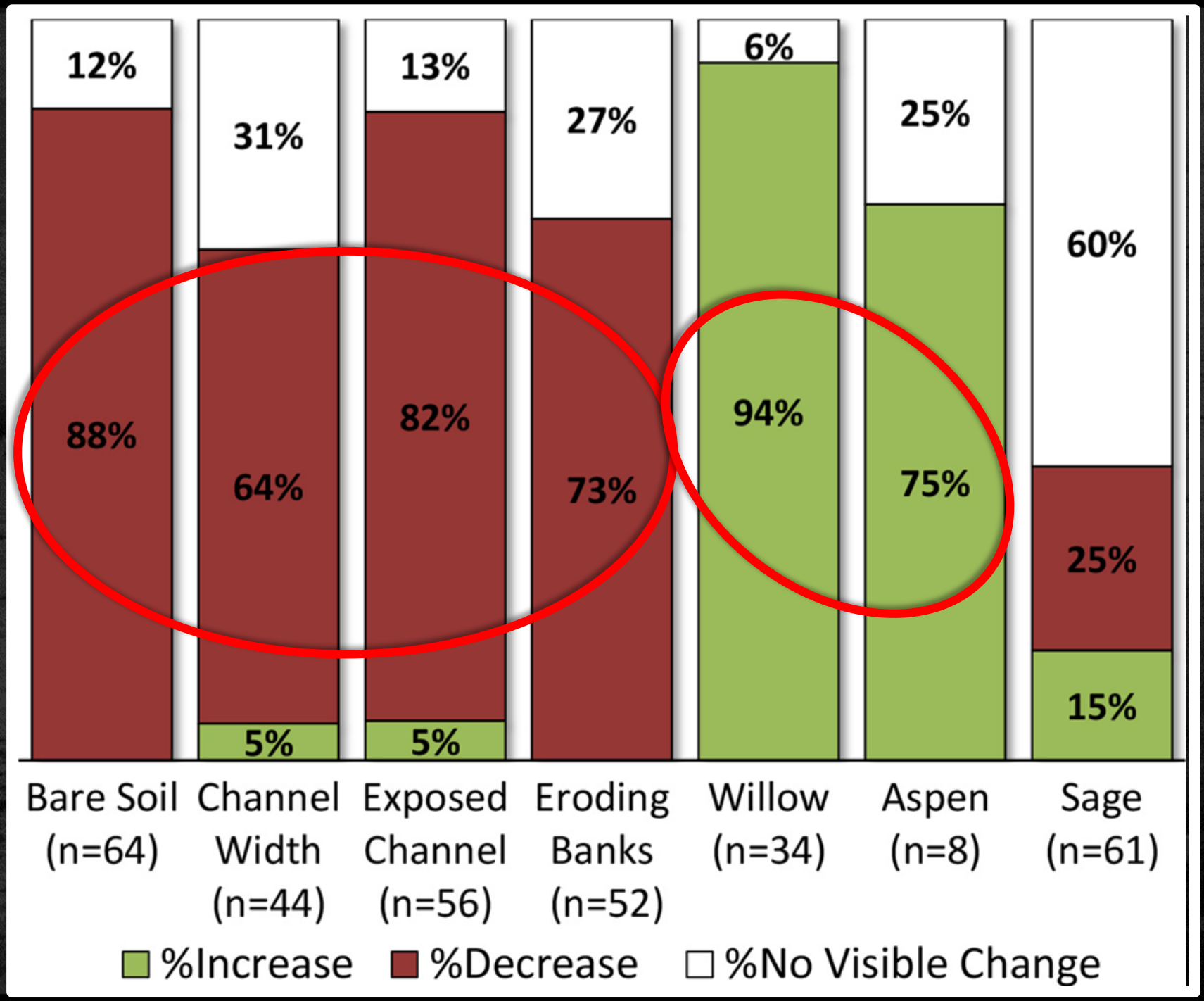
- **Novel Approach of Inserting Digital Transects Into Each Photo Pair**
- **Each Pixel on the Transect was Assigned One of Seven Categories**
  - bare soil
  - exposed channel
  - Willow
  - grasses/sedges/forbs (G/S/F)
  - Rushes
  - Sagebrush
  - “other”
- **Raster Calculator to Determine What Each Pixel Changed to**



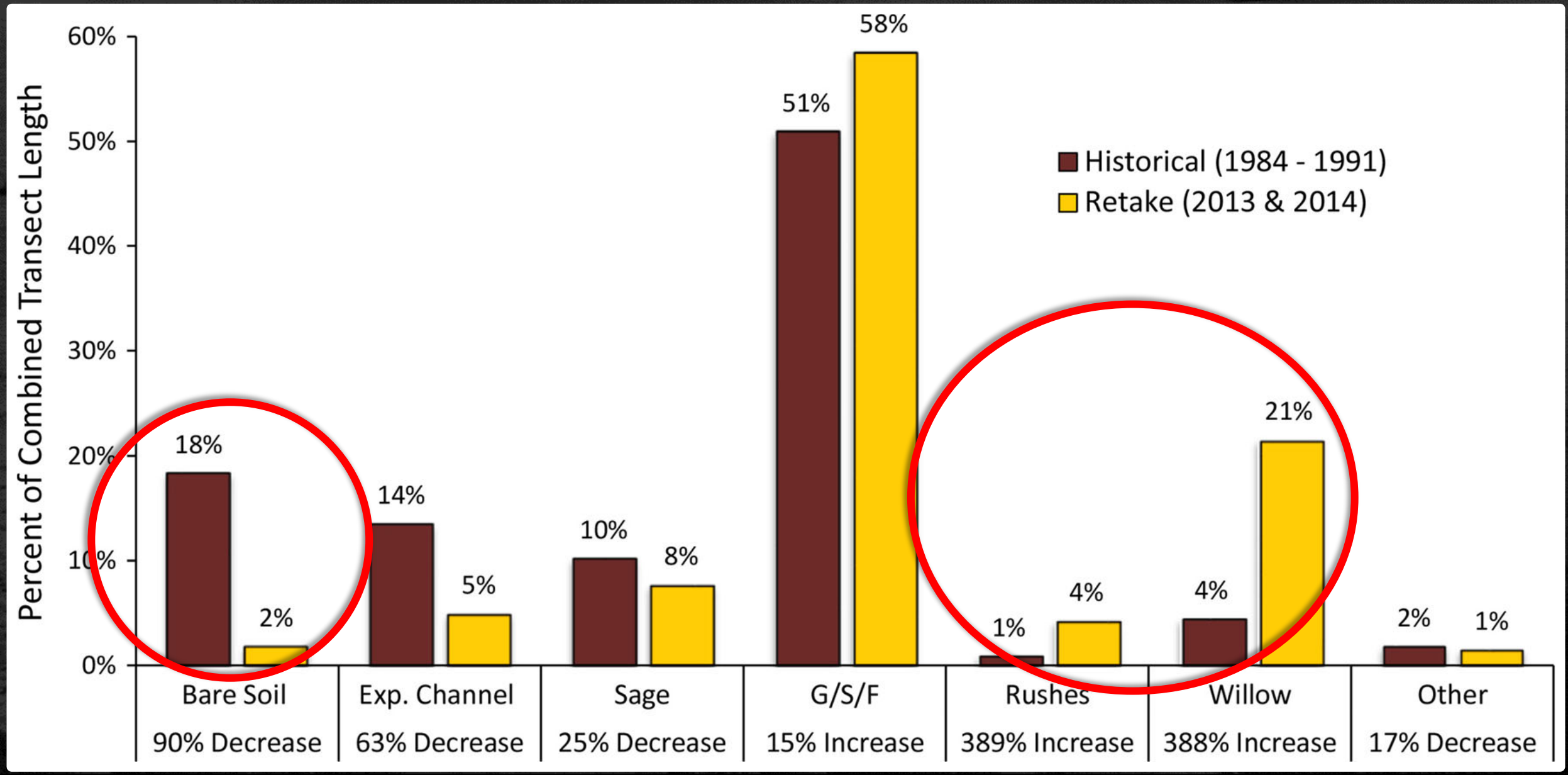

9-26-90
GUANO CR
S. BOUNDARY

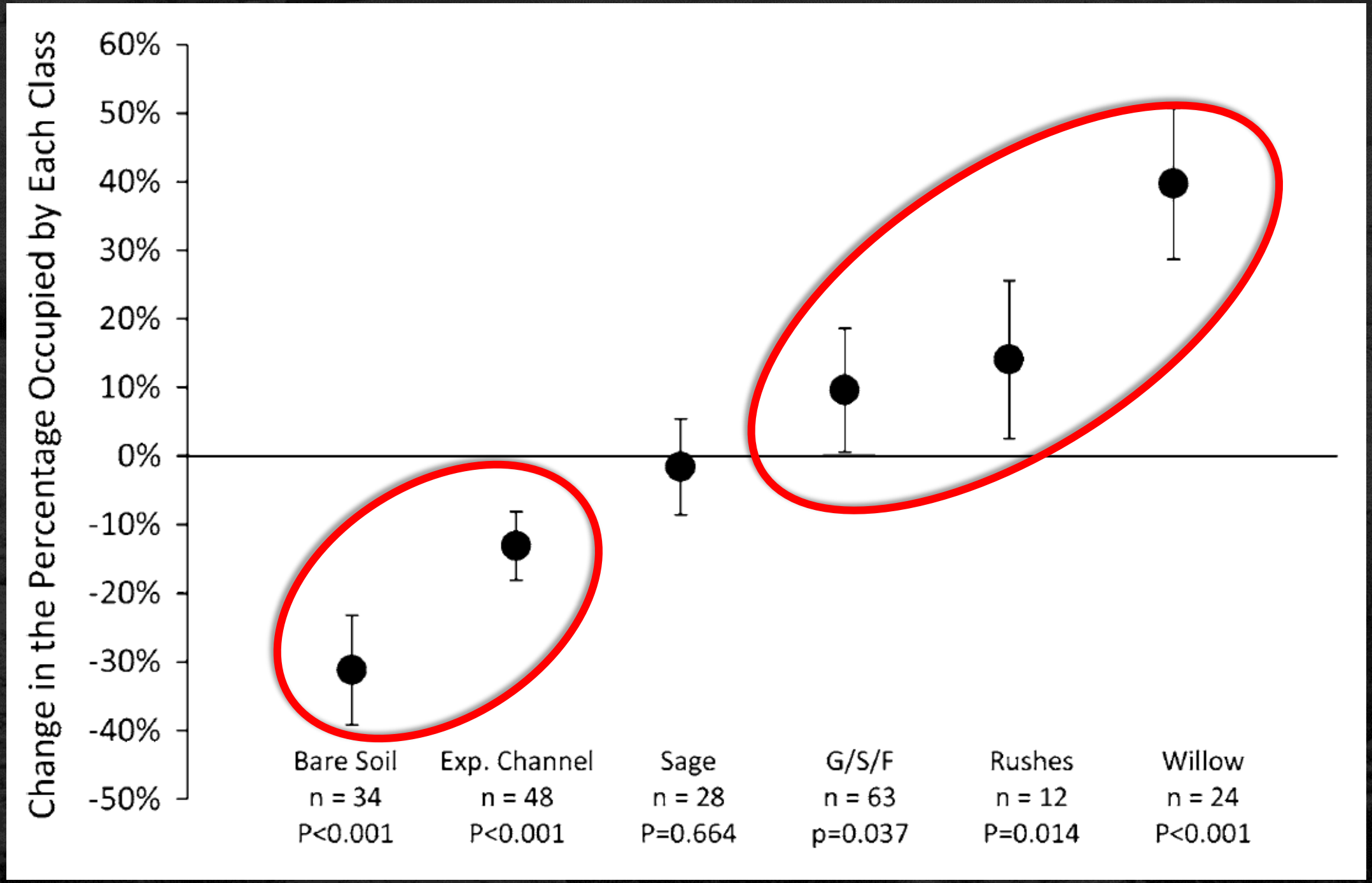

Accuracy of 91% (kappa 83%)
5cm
Historical
Retake

Results: Qualitative Visual Assessment

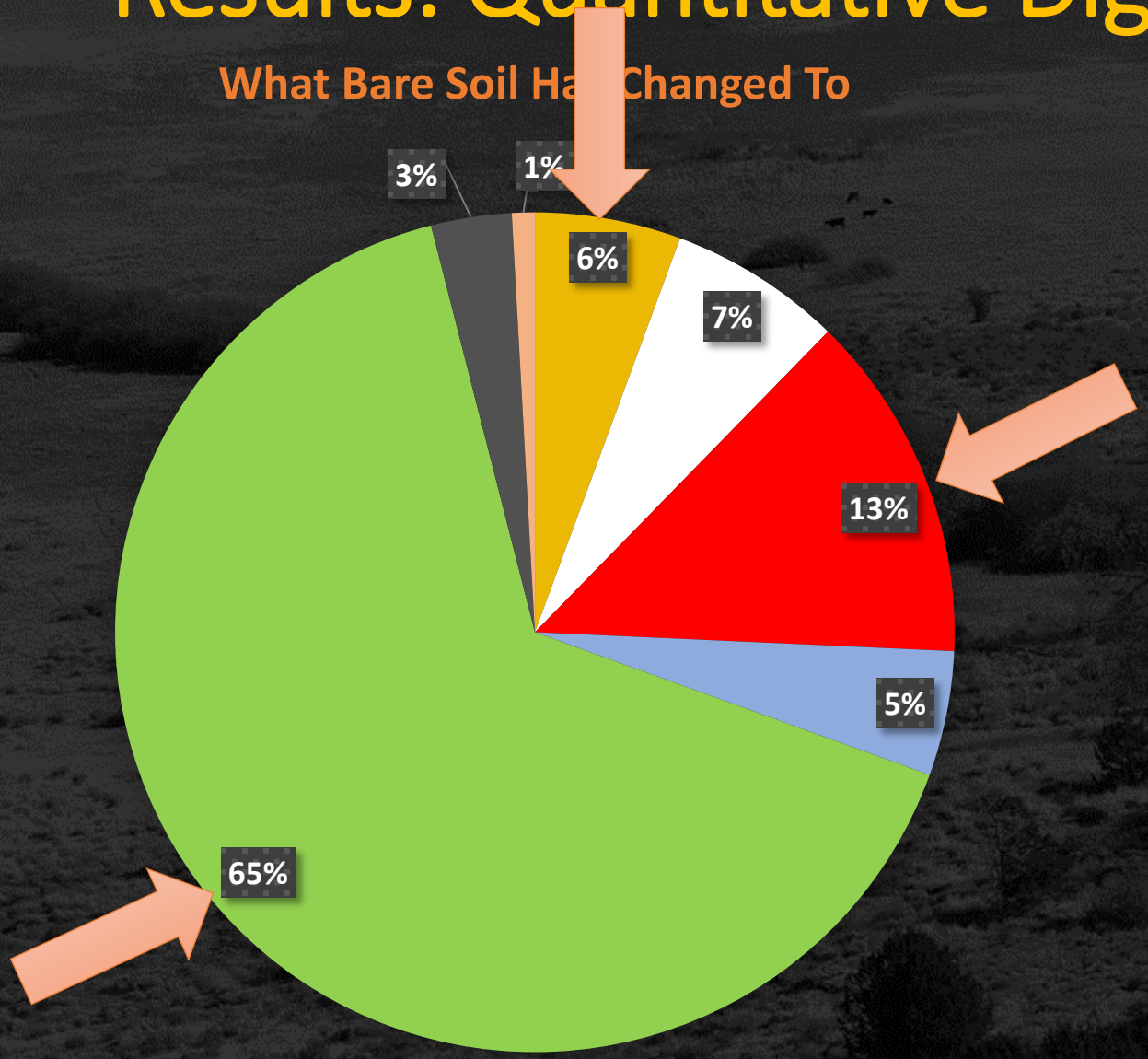


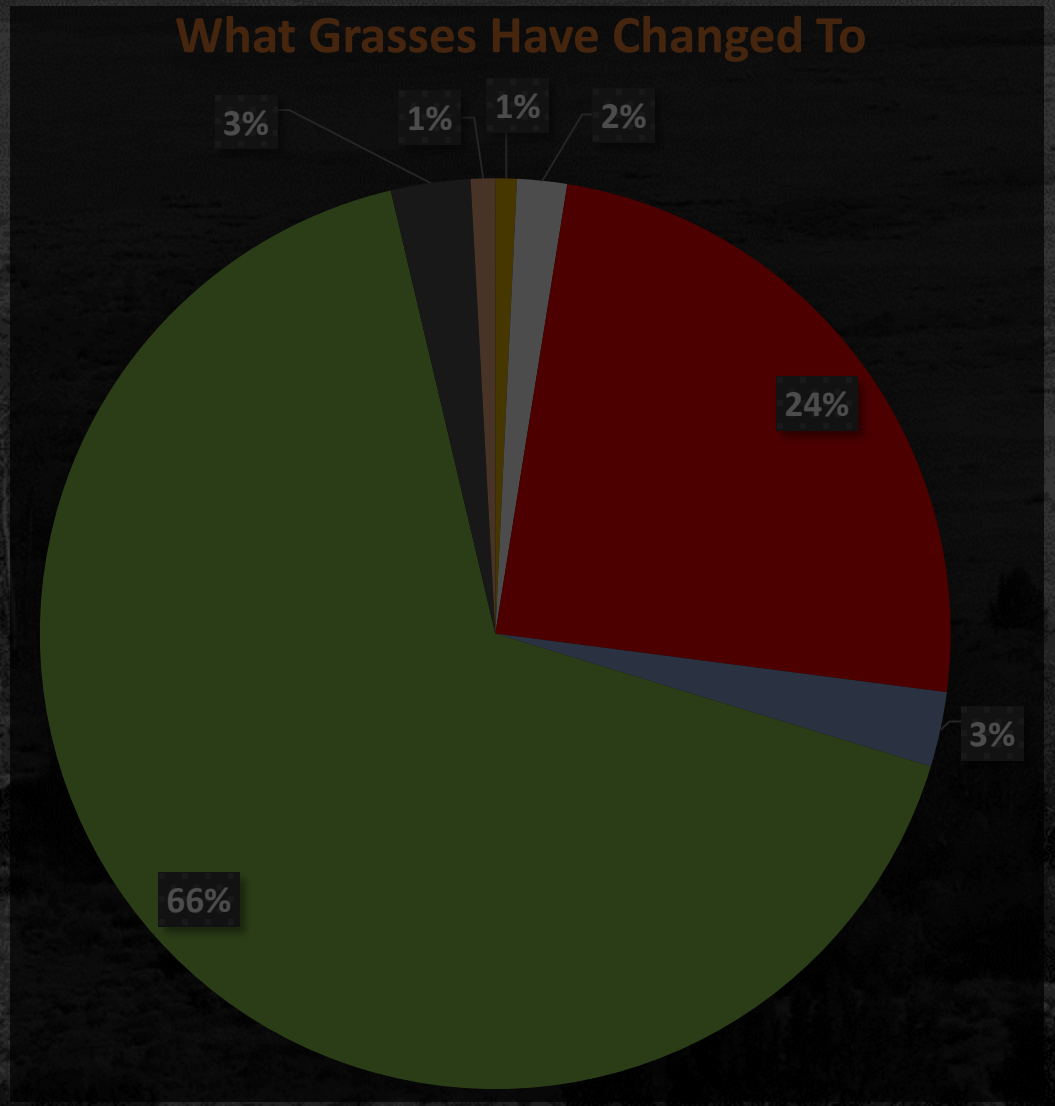
Results: Quantitative Digital Line Intercept




Change in the Percentage Occupied by Each Class
60%
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
Bare Soil
n = 34
P<0.001
Exp. Channel
n = 48
P<0.001
Sage
n = 28
P=0.664
G/S/F
n = 63
p=0.037
Rushes
n = 12
P=0.014
Willow
n = 24
P<0.001

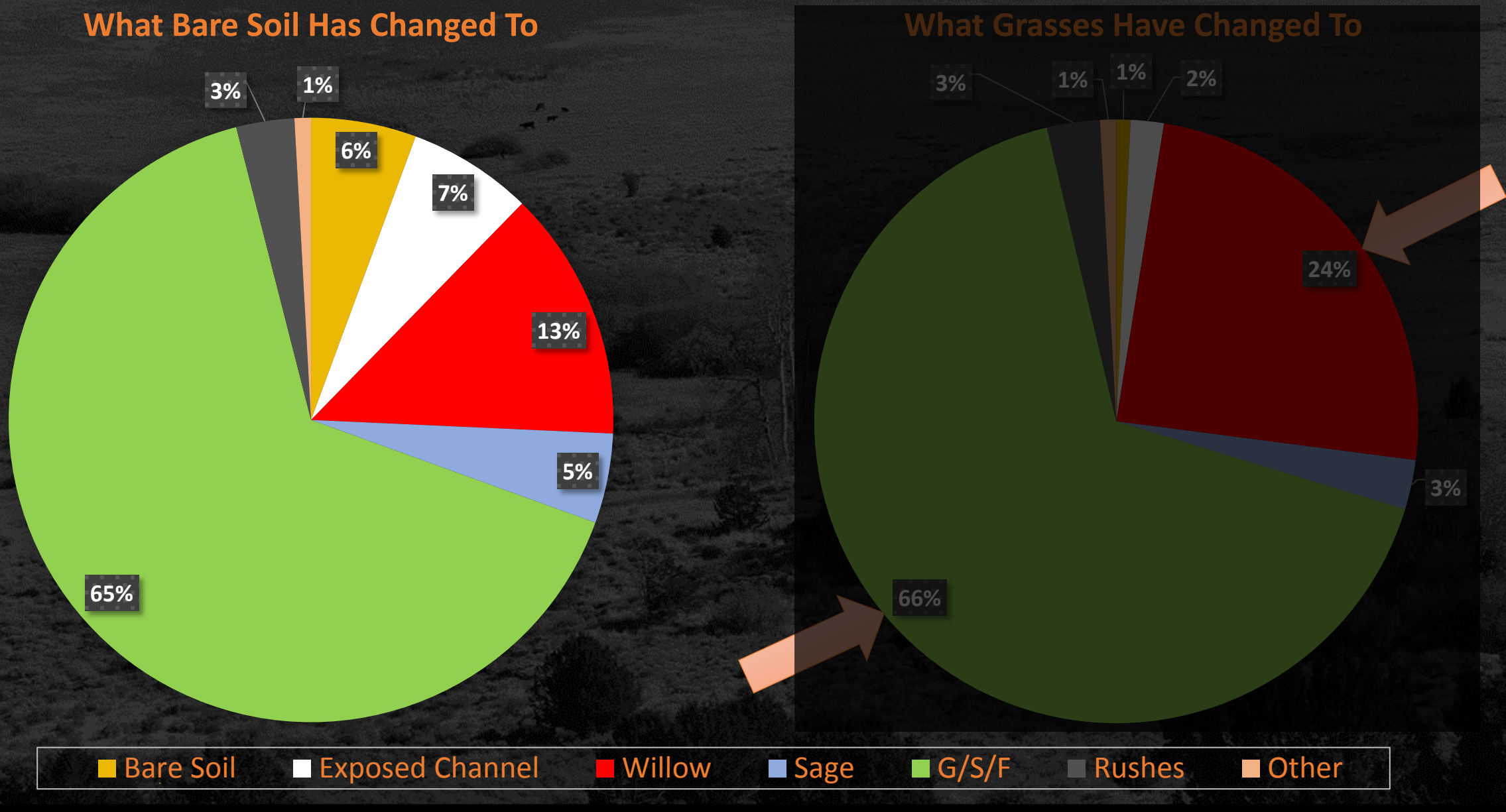
Results: Quantitative Digital Line Intercept





Bare Soil | Exposed Channel | Willow | Sage | G/S/F | Rushes | Other

Results: Quantitative Digital Line Intercept



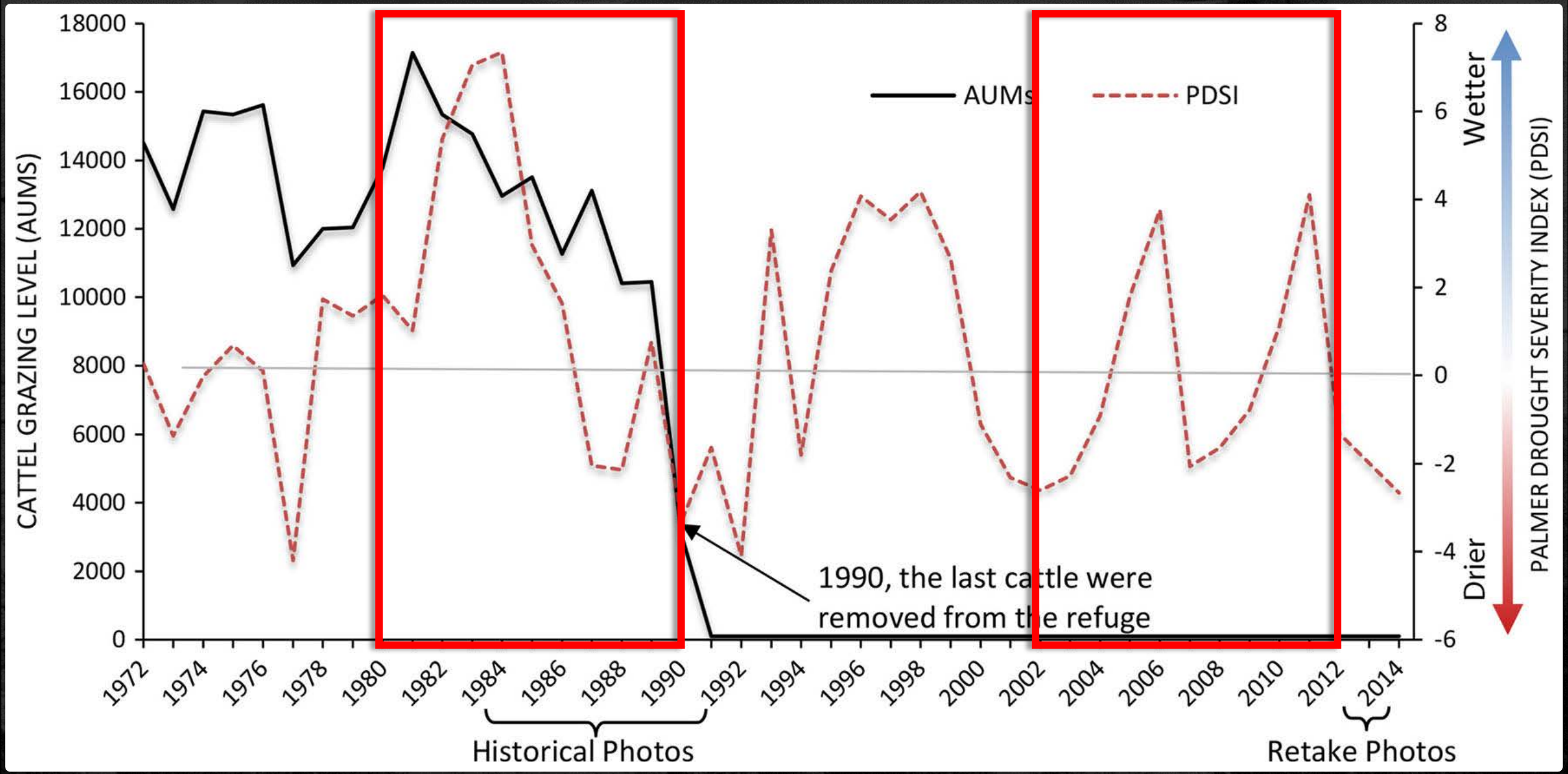
Passive Vs Active Restoration

- **No Significant Difference in Willow**
  - **Sites Burned** (n = 10) **Vs. Not Burned** (n = 14) (P = 0.67)
  - **Planted** (n = 9) **Vs. Not Planted** (n = 15) (P = 0.42)
- **No Significant Difference in Herbaceous Vegetation**
  - **Sites Burned** (n = 30) **Vs. Not Burned** (n = 30) (P = 0.28)
- **Significantly less Sagebrush in Burned Areas**
  - **Sites Burned** (n = 7) **Vs. Not Burned** (n = 15) (P = 0.03)

Assumptions & Limitations

- Right Spot?
  - Location of the Retake Photograph
- Right Stuff?
  - Broad Ground Cover Categories
- Right Amount?
  - Foreground Shrubs Blocking Transect Location
- Right Inference?
  - Cattle or Climate

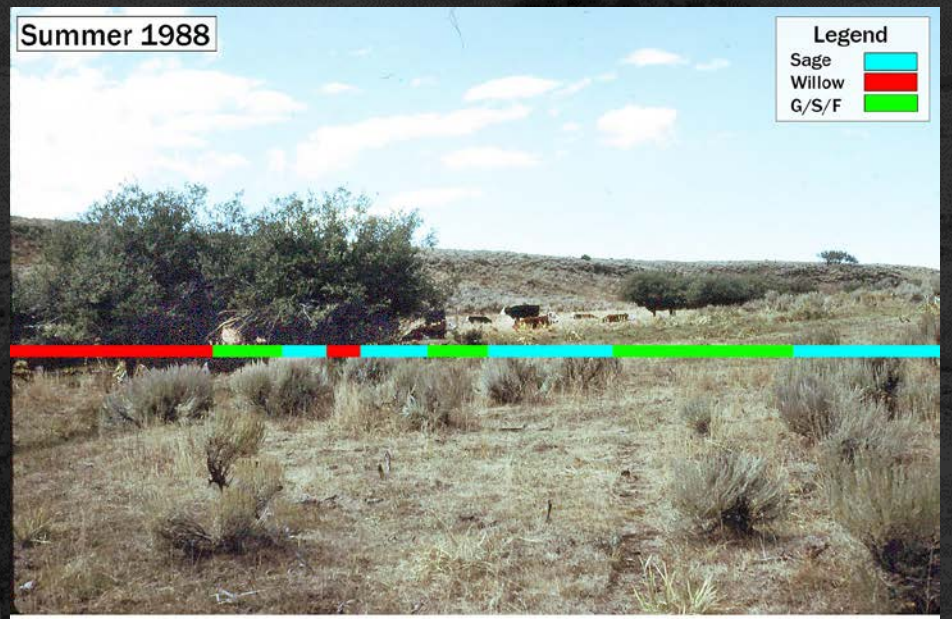
Land Use Vs Climate

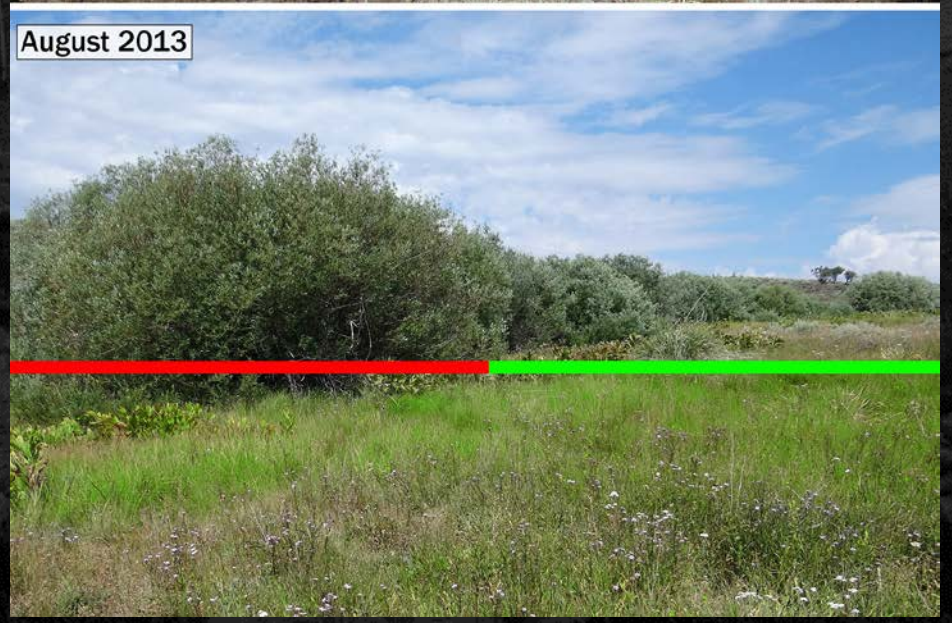


Conclusion


October 1990

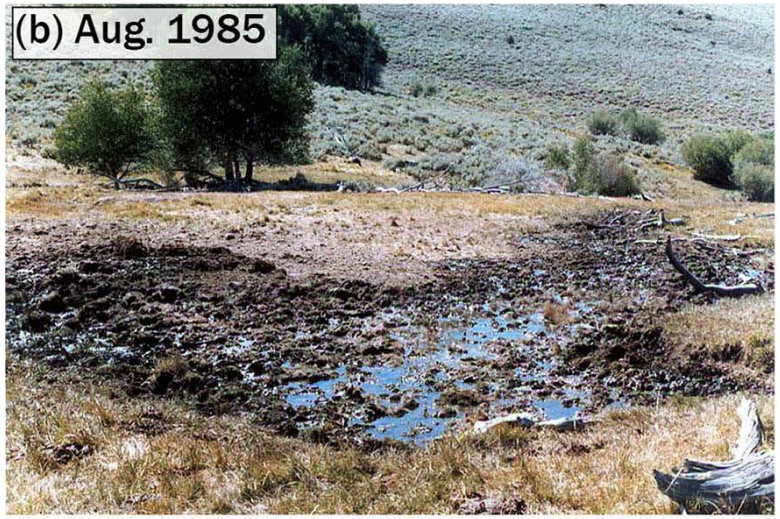

October 2013

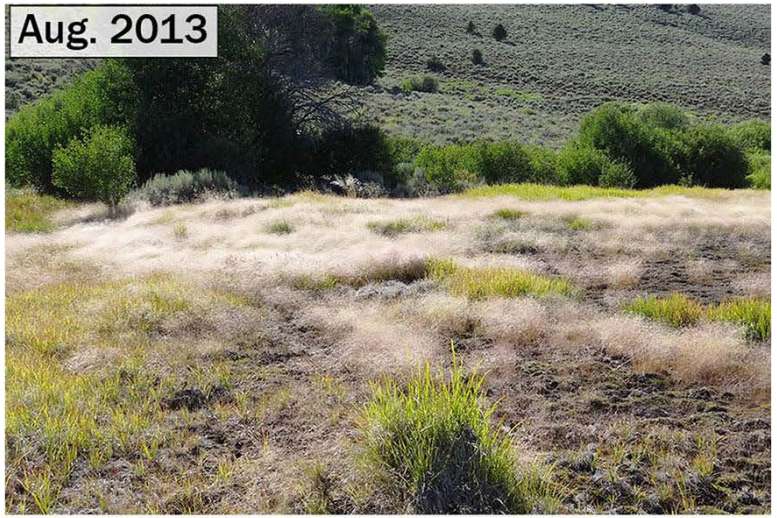

Summer 1988
Legend
Sage
Willow
G/S/F


August 2013

Conclusion

Simply removing cattle from areas may be all that is required to restore many degraded riparian areas in the American West.





Questions?

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OSU Oregon State University College of Forestry

U.S. Department of the Interior Bureau of Land Management

Forest Service U.S. Department of Agriculture

Wilburforce Foundation

Greater Hart-Sheldon Conservation Fund