Great Basin LCC Webinar Series

Large-scale traps and conifer encroachment: Using archaeological data to plan the Greater Sage-grouse conservation effort

LARGE-SCALE TRAPS AND CONIFER ENCROACHMENT: USING ARCHAEOLOGICAL DATA TO PLAN THE GREATER SAGE GROUSE CONSERVATION EFFORT

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SETTING THE SCENE

- Federal agencies, including BLM, Forest Service, and F&WS, consulted with a host of state agencies, private organizations, and individuals to develop a plan to stabilize GSG populations.

- Future vegetation treatment projects are being proposed in order to stabilize GSG populations. These include restoring sagebrush habitat damaged by fire and intensive grazing, as well as P-J thinning in areas in which conifers have encroached into habitat critical for GSG survival.

- For Nevada's tribal communities, P-J habitat is critical to the survival of their traditional lifeways and culture.

  - **Juniper**
    - Used as medicine
    - Raw material for the construction of bows – bow stave trees

  - **Pinyon**
    - Annual pine nut harvest
    - Family
    - Communal ceremonies and songs

- In order to implement sound vegetation treatment projects, it is important to understand the science behind the development of P-J habitat in the Great Basin.

- Therefore, it would be useful to know:

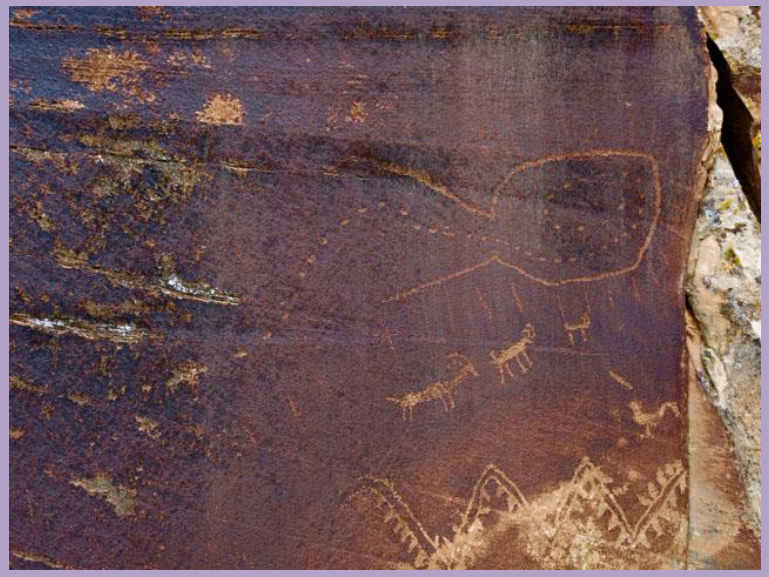
  - When did pinyon pine and Utah juniper begin growing in central and northern Nevada where the GSG now live?

  - What is the degree of recent (post-1860) P-J encroachment into sagebrush habitat?

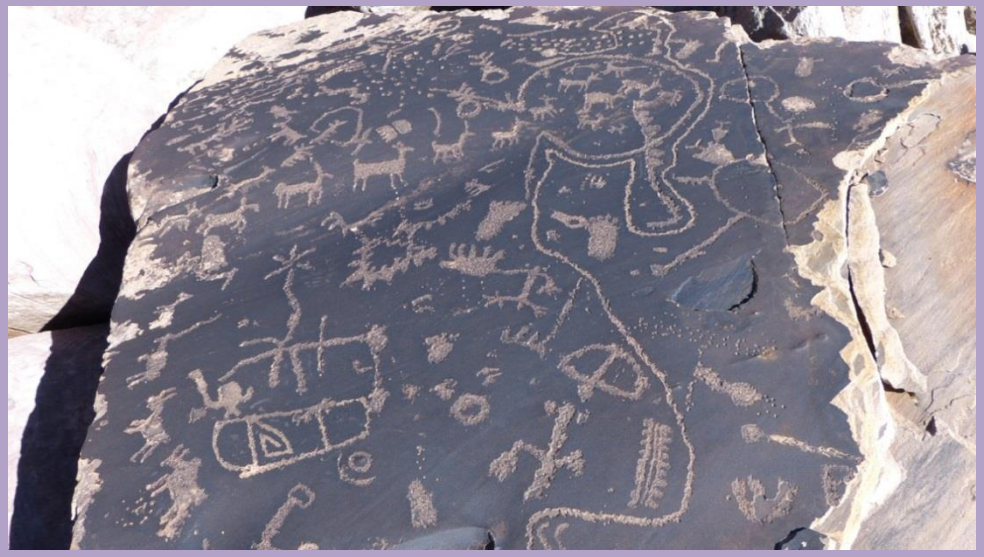
  - Has conifer encroachment been uniform across Nevada?

  - If not, where has it occurred, and where has it not occurred?

Answering these types of questions has typically been conducted by ecologists; however, archaeological and ethnographic evidence also has relevance to understanding these issues.



Large-scale trap/corral and mountain sheep depicted in aboriginal rock art near Moab, Utah.



Large-scale trap with pronghorn antelope entering corral depicted in aboriginal rock art near Petrified National Forest, Arizona

When Did P-J Begin Inhabiting Central and Northern Nevada?

- Pinyon pine was growing in the Schell Creek Range in White Pine County and near the Pilot Range in Elko County (near its northern-most extent) by 7,000 years ago.

- Utah juniper re-inhabited northern Nevada between 5,500 – 7,000 years ago. However, Rocky Mountain juniper was present in these earlier times.

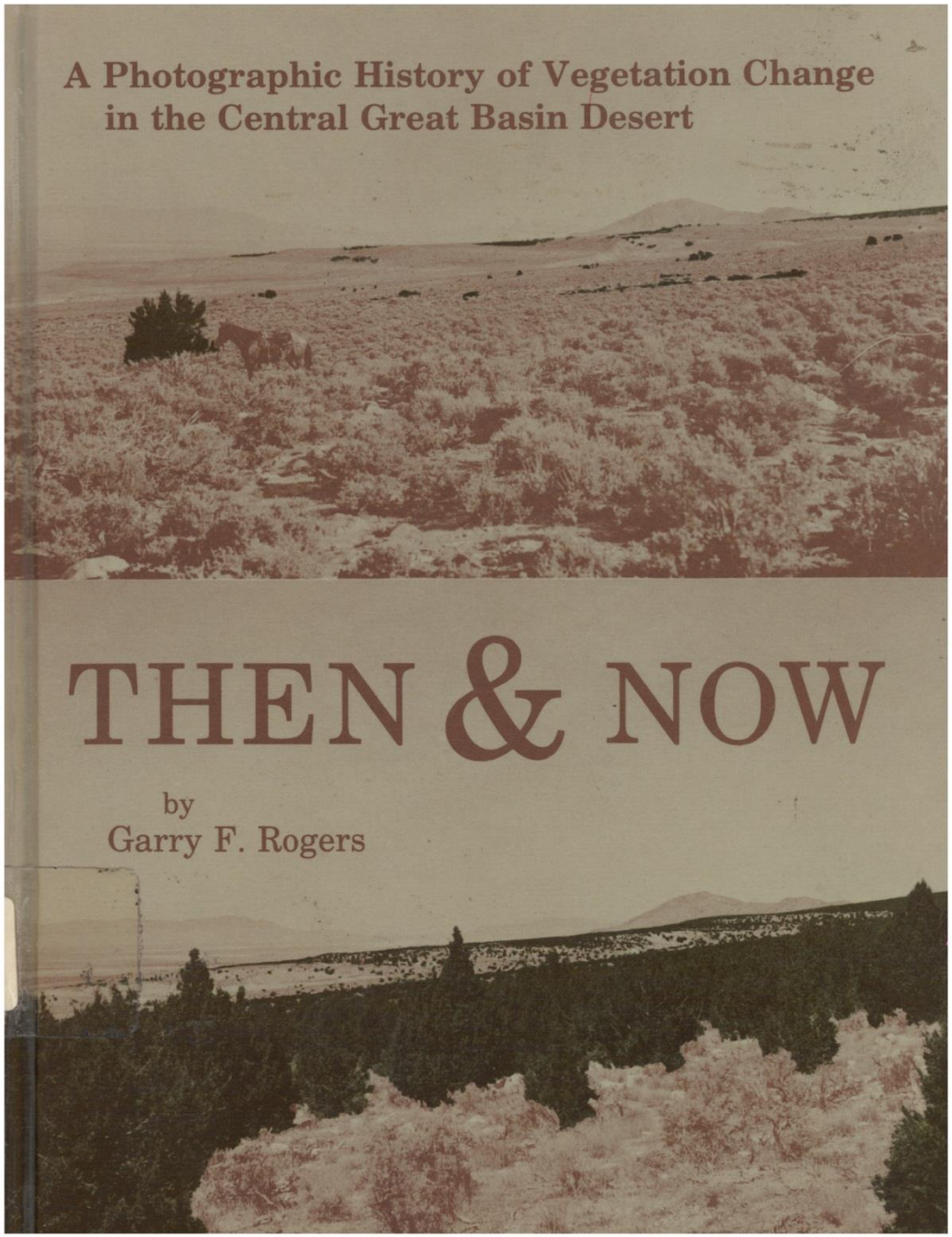
- The earlier spread of pinyon compared to Utah juniper was probably aided by human transport and consumption.

- **By 5,000 years ago, "…pinyon was likely present on all the major mountain ranges where it occurs at present"** (Madsen et al. 2001:264).

Source: Madsen, David et al. (2001) *Late Quaternary environmental change in the Bonneville Basin, western USA*. Palaeogeography, Palaeoclimatology, Palaeoecology 167:243-271.

WHERE HAS ENCROACHMENT OCCURRED?

- Before –and-After-Photography



Published in 1982

Compares vegetation change over ~70 year period between early and late 20th century

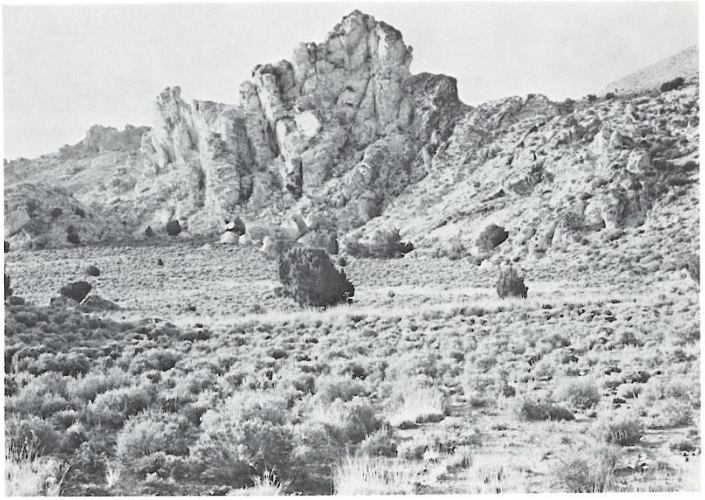
Includes three primary vegetation zones that contained juniper in the early 20th century:

1. Lower Valleys
2. Upper Valleys & Foothills with Sagebrush and Grass
3. Upper Valleys & Foothills with Juniper

LOWER VALLEYS

Plate 11. Lavender Buttes.
Location: The view is north from a saddle on the southwest side of the Buttes, about 2 km (1.2 mi) east of the Sand Pass road, NW¼ T. 13 S., R. 15 W. The altitude of the camera is about 1703 m (5190 ft). This site is located on the Granite Mountain Quadrangle on which the Buttes are named "Honeycombs."
Original: 1901, Gilbert No. 1906 (left).

1906



Match: May 13, 1978, Rogers No. 166 (right).
Description: A few juniper have been added to the scene, and the growth of those present in the original scene is quite apparent. Small shrubs, including shadscale, horsebrush, Mormon tea, and black sagebrush, still dominate the scene but bunchgrasses (those in the foreground are galleta) have increased noticeably.
Climate: Annual precipitation 20 cm (8 in), annual PE 71 cm (28 in), freeze-free season 160 days.

1978

Analysis: Lacks evidence for substantial juniper encroachment

UPPER VALLEYS & FOOTHILLS WITH SAGEBRUSH AND GRASS

Plate 20. South Mountain, Tooele Valley.
Location: The camera station is east of a small hill inside the southern boundary of the Tooele Army Depot. The view is southwest from the SW¼ sec. 3, T. 4 S., R. 5 W., at altitude 1611 m (4910 ft).
Original: June 13, 1912, Shantz No. D-5-12 (left).
Match: June 12, 1978, Rogers No. 115 (right).
Description: Apart from the small patch of green molly summercypress, the original scene is dominated by

sagebrush and stands of juniper below the beaches and on the slopes of South Mountain. The foreground of the match, which is today heavily disturbed by vehicular traffic, is dominated by pepperweed and lesser amounts of cheatgrass, crested wheat grass [*Agropyron cristatum* (L). Gaertn.], storksbill, snakeweed, and bur buttercup. The remainder of the scene, up to the base of South Mountain, is dominated by cheatgrass. The juniper stands on the mountain slopes have thickened and expanded, but the stand below the beach has almost disappeared.
Climate: Annual precipitation 31 cm (12 in), annual PE 70 cm (27.5 in), freeze-free season 150 days.

1912

1978

Analysis: Lacks evidence for substantial juniper encroachment

UPPER VALLEYS & FOOTHILLS WITH JUNIPER

Highly variable from site-to-site.

I broke the photographic plates into 4 subcategories, ranking the degree of juniper in-fill and/or encroachment

1. <10% increased in-fill/encroachment
2. 10-25% increased in-fill/encroachment
3. 25-50% increased in-fill/encroachment
4. >50% increased in-fill/encroachment

UPPER VALLEYS & FOOTHILLS WITH JUNIPER
Sand Mountain, Utah:
Example of <10% juniper in-fill/encroachment

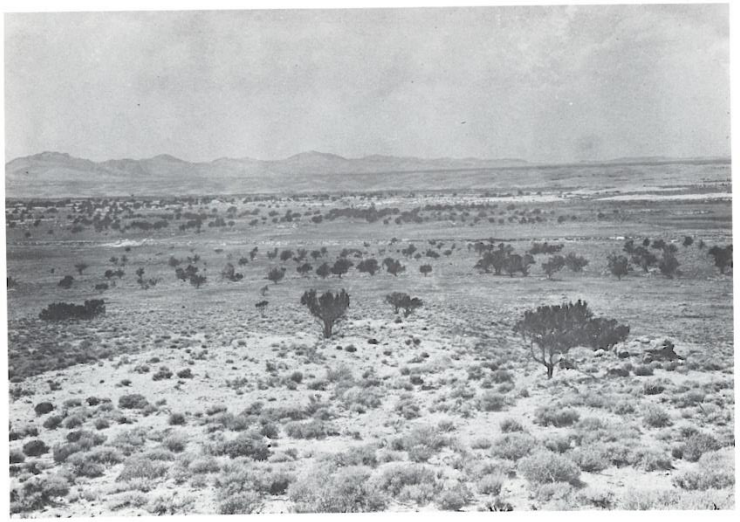
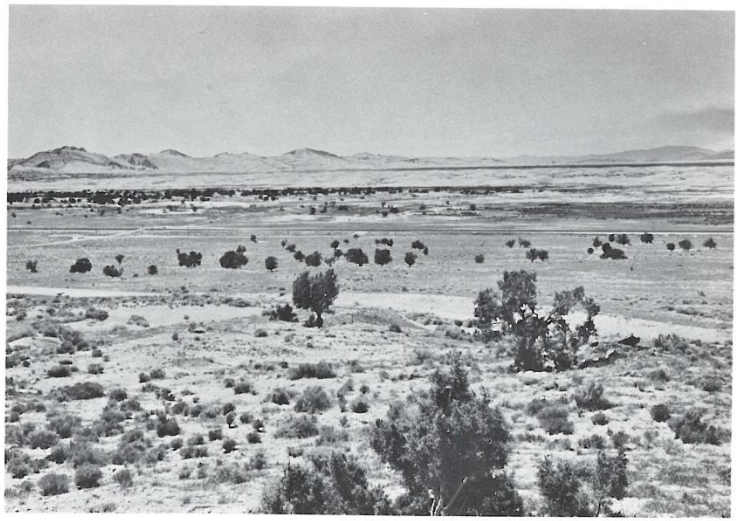


Plate 34. Sand Mountain, west of High Mountain.
Location: The view is west from a small hill on the east side of State Highway 50, in the SE½ sec. 33, T. 13 S., R. 4 W., altitude 1585 m (5200 ft). The camera station of Plate 13 is near the left center edge of the scene.
Original: August 30, 1913, Shantz No. LL-12-13 (left).
Match: May 13, 1978, Rogers No. 338 (right).



Description: Shadscale, dominant in the foreground of the original scene, has decreased somewhat, and snakeweed and cheatgrass have increased. Juniper has decreased probably because of fire. Charred stumps are numerous beyond the railroad near the sand-dune field.
Climate: Annual precipitation 23 cm (9 in), annual PE 65 cm (25.5 in), freeze-free season 140 days.

1913

1978

UPPER VALLEYS & FOOTHILLS WITH JUNIPER
Parowan, Utah:
Example of 10-25% juniper in-fill/encroachment

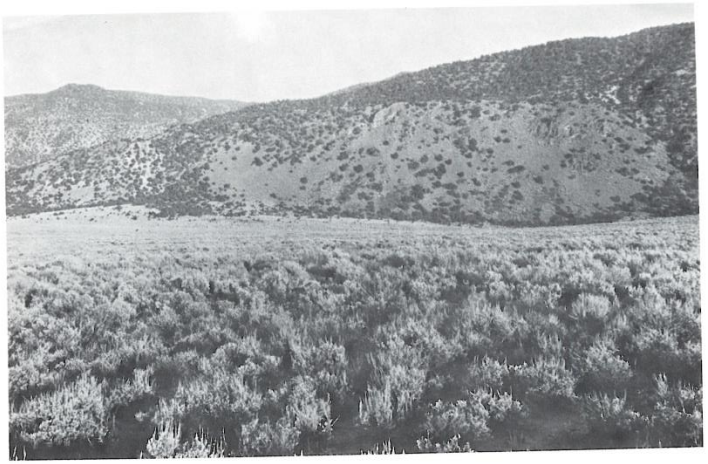


Plate 37. Parowan, Utah.
Location: The camera faces southeast from the NW¼ T. 34 S., R. 8 W., altitude about 1830 m (6000 ft).
Original: September 6, 1914, Shantz No. V-8-14 (left).
Match: July 4, 1979, Rogers No. 317 (right).
Description: The foreground sagebrush community has been removed for agricultural purposes and the juniper

1914

on the slopes has increased. Sometime before 1968 when this scene was matched by Turner the alluvial fan at left center had been cleared, probably by chaining. In 1979 reoccupation of the cleared area by juniper was well underway.
Climate: Annual precipitation 36 cm (14 in), annual PE 61 cm (24 in), freeze-free season 105 days.

1979

UPPER VALLEYS & FOOTHILLS WITH JUNIPER
Red Pine Mountain, Utah
Example of 25-50% juniper in-fill/encroachment

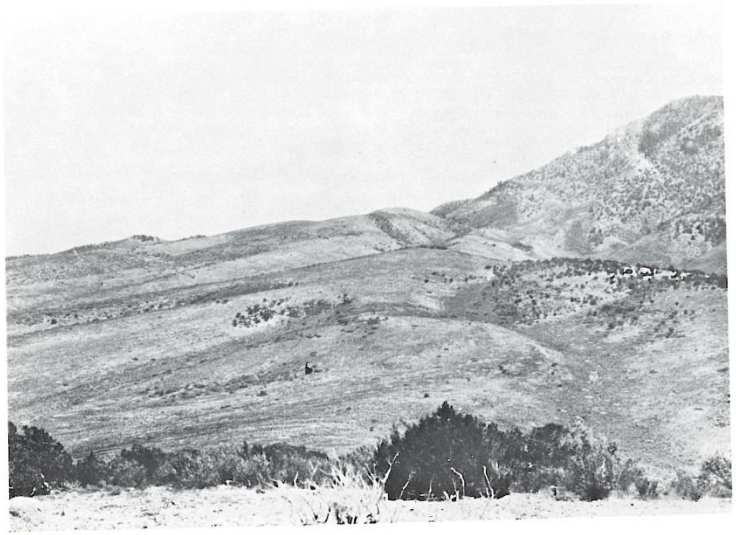
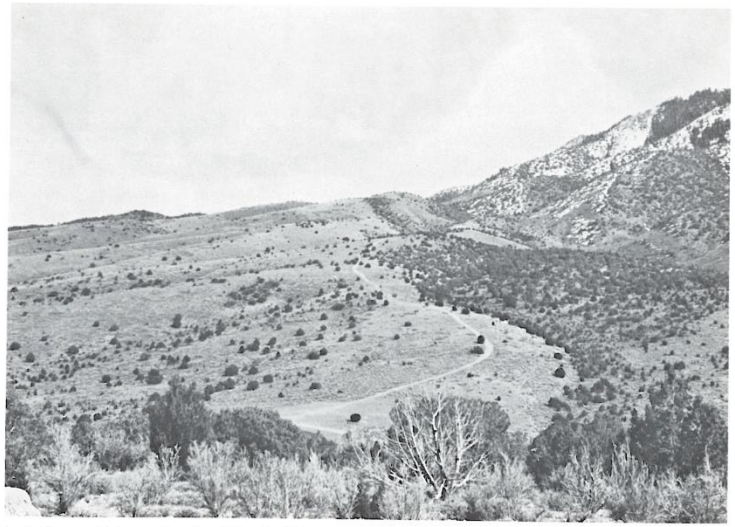


Plate 31. North face of Red Pine Mountain.
Location: This camera station is on a slope above a corral, about 5 km (3 mi) south of the Pony Express route. It is reached by a dirt road that turns south about 1.6 km (1 mi) west of Lookout Pass. The view is southeast, altitude 2231 m (6800 ft).
Original: 1901, Gilbert No. 1857 (left).
Match: April 26, 1980, Rogers No. 142 (right).
Description: On the mountain slopes pinyon has increased, as has Douglas fir [*Pseudotsuga menziesii* (Mirb.) Franco] in the steep canyons. Increases on lower slopes have been made by juniper and several shrub species

1901



including serviceberry [*Amelanchier alnifolia* (Nutt.) Nutt.], cliffrose [*Cowania mexicana* D. Don var. *stansburiana* (Torr.) Jeps], curlleaf mountain mahogany (*Cercocarpus ledifolius* Nutt.), and squawbush (*Rhus trilobata* Nutt. in T. & G.). Sagebrush is common throughout the scene, and cheatgrass and snakeweed are abundant on the lower slopes and the sloping plain at the left. Grasses appear to have increased on the plain, and those present include Sandburg bluegrass, bluebunch wheatgrass, and Indian ricegrass. Most of the increase in the foreground has been by juniper and cliffrose. Large patches of bark had been removed from most pinyon on the slopes, perhaps by porcupines.
Climate: Annual precipitation 41 cm (16 in), annual PE 53 cm (21 in), freeze-free season 100 days.

1980

UPPER VALLEYS & FOOTHILLS WITH JUNIPER
Stansbury Mountains, Utah:
Example of >50% juniper in-fill/encroachment

Plate 28. Stansbury Mountains.
Location: The view is northeast from the S½ sec. 13, T. 4 S., R. 8 W., altitude 1657 m (5050 ft). The mountains are to the right. Salt Mountain is visible in the right center of the scene.
Original: 1901, Gilbert No. 1843 (left).
Match: September 2, 1976, Rogers No. 124 (right).
Description: Juniper is replacing the sagebrush community that dominated the original scene. The new camera station is on top of a large rock about 30 m (97 ft) farther back (south) than the original. The small clearing in the

foreground is not typical, but this position was selected for the match to enable viewing the Lake Bonneville shore spits in the distance. From the original camera position most of the scene was blocked by juniper in the foreground. Herbaceous vegetation has increased not only in the clearing but at the original position as well. Sandburg bluegrass is dominant and is common throughout the woodland. Small amounts of cheatgrass, snakeweed, and cactus (*Opuntia* Mill.) are also present.
Climate: Annual precipitation 36 cm (14 in), annual PE 57 cm (22.5 in), freeze-free season 170 days.

1901

1976

Note: These are the photos chosen for the book cover.

SUMMARY:

UPPER VALLEYS & FOOTHILLS WITH JUNIPER

ANALYSIS:

- 30% of sites show evidence of >50% juniper encroachment; 40% show evidence for <25% juniper encroachment; 60% show evidence of >25%.

- Conifer encroachment appears to be highly variable and site-specific.

DO ALL OR MOST NON-OLD GROWTH TREES REPRESENT ENCROACHMENT?

Historical Ecology

HISTORIC MINING

- "In 1864, for example, several hundred American laborers were constantly cutting and hauling firewood from nearby woodlands. Chinese laborers followed the wood cutters, pulling up the brush, stumps, and roots from the overcut hills." (p. 23)

- "As a result, more than 190,000 acres of second-growth pinyon-juniper woodland now cover Douglas, Ormsby, and southernmost Washoe Counties." (p. 24).

    - **Note: this figure represents a single mining complex out of the dozens that developed in the 19th and early 20th centuries.**

Source: Young, James, and Jerry Budy (1986) *Energy crisis in 19th century Great Basin woodlands*. In *Proceedings – Pinyon-Juniper Conference*, edited by Richard Everett, pp. 23-28. Intermountain Research Station, Ogden, Utah.

HISTORIC RANCHING

"Despite the huge demand for charcoal in mills, the use of pinyon and juniper wood for home heating and cooking may have had an even greater effect on the total woodland environment…Every isolated mine and ranch had to have wood as a source of fuel and fencing. The corrals, for example, at the Walti Hot Springs in central Nevada are constructed of 3,000 juniper poles…Some 50 miles of barbed wire fence is supported by juniper posts, with 260 posts per mile" (p. 27).

Note: This totals 13,000 juniper posts for a single fenceline.

ANALYSIS:

Historical ecological records indicate that hundreds of thousands of acres of P-J were cut to support Nevada's burgeoning mining and ranching industry in the 19th and early 20th centuries. As a result, we may expect to see large areas of Nevada covered by secondary regrowth of P-J since 1860.

Source: Young, James, and Jerry Budy (1986) *Energy crisis in 19th century Great Basin woodlands*. In *Proceedings – Pinyon-Juniper Conference*, edited by Richard Everett, pp. 23-28. Intermountain Research Station, Ogden, Utah.

ARCHAEOLOGICAL EVIDENCE CONCERNING THE ROLE OF CONIFER ENCROACHMENT SINCE 1860

Because of Nevada's dry climate, many aspects of the native hunting traditions remain preserved on the landscape; this includes features made of wood such as wickiups and large-scale traps or corrals.

Wichman Deer Corral,
Pine Grove Mountains,
Western Nevada

Pronghorn antelope

Mountain sheep

Mule deer

In the Great Basin, evidence for the construction of large-scale trap features dates back 5,000 to 6,000 years. These features were constructed primarily out of juniper tree limbs and stumps, and were sometimes anchored at their base by rocks. They were built to mass capture migrating herds of antelope, mountain sheep, or deer. They occur primarily in central and northern Nevada, usually within the pinyon-juniper belt; many were built along the conifer-sagebrush interface.

Sources: Hockett, Bryan, and Timothy Murphy (2009) *Antiquity of communal pronghorn hunting in the north-central Great Basin*. American Antiquity 74:708-734.

Hockett, Bryan et al. (2013) *Large-scale trapping features from the Great Basin, USA: the significance of leadership and communal gatherings in ancient foraging societies*. Quaternary International 297:64-78.

HOW DO WE KNOW HOW OLD THESE FEATURES ARE?

Radiocarbon dating of bark left on some of the limbs cut to make ancient antelope traps usually dates between 1600 and 1850 A.D., suggesting that the wood can survive for at least 4 to 5 centuries in some places.

Wichman deer trap, Pine Grove Hills, Mineral County, Nevada

Source: Jensen, Jill (2007) *Sexual division of labor and group-effort hunting: the archaeology of pronghorn traps and point accumulations in the Great Basin.* MA Thesis, University of Nevada, Reno.

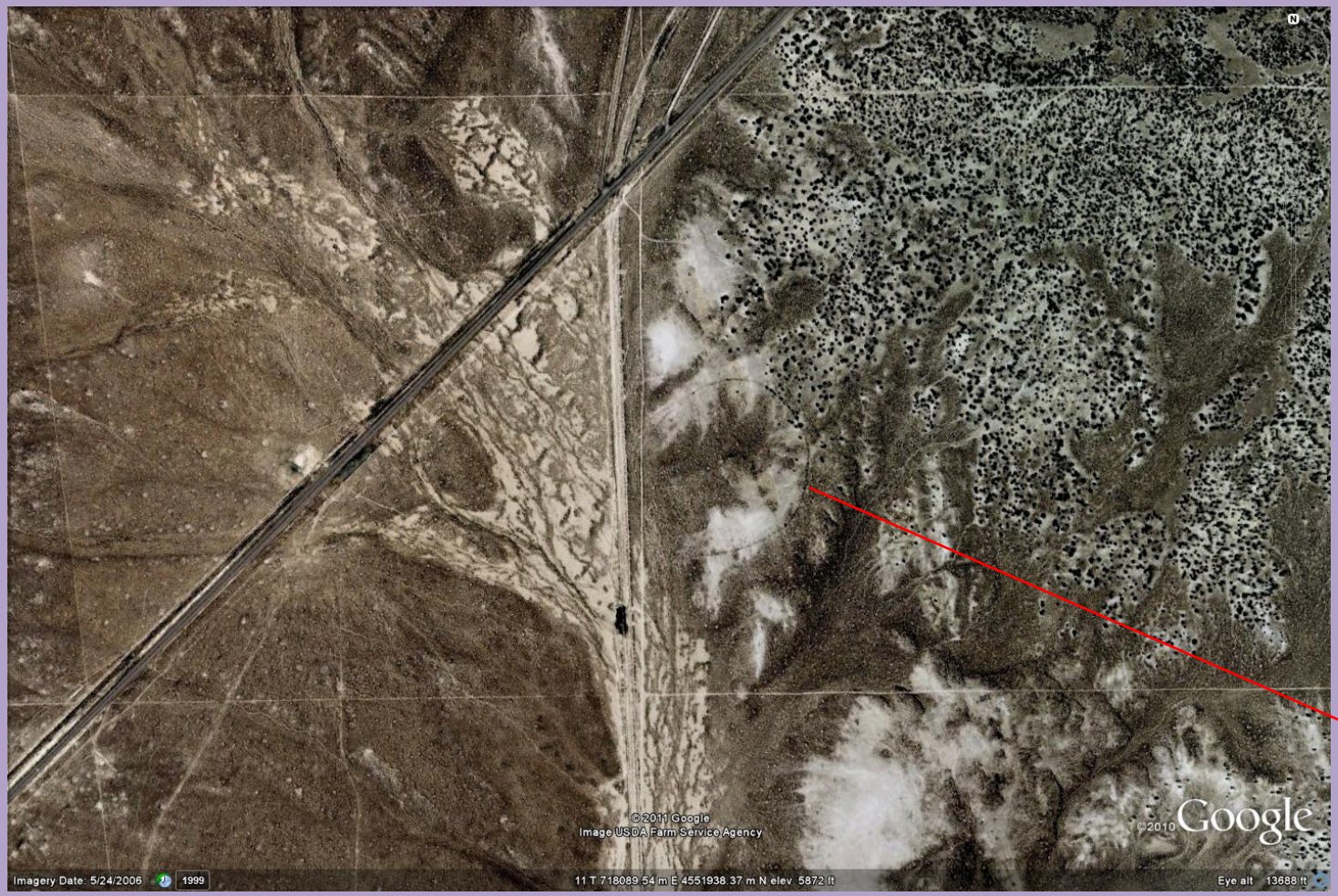
HYPOTHESES:

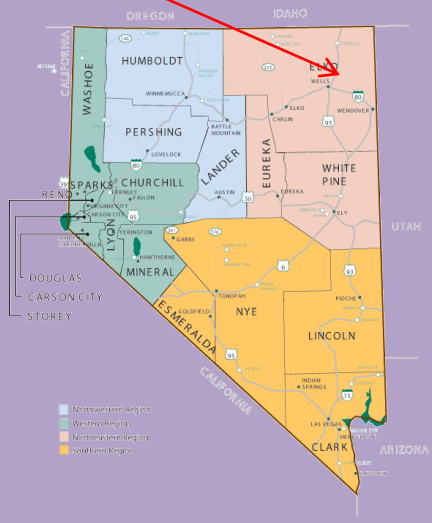
1. If wooden corrals are present, then fire has not burned through the area for at least 200 years.

2. If conifers are not growing within large-scale traps or below the traps, then conifer encroachment has been minimal over the past 200+ years.

3. If conifers are present within the corrals but not below them, then this suggests conifer regrowth following aboriginal cutting rather than encroachment per se.

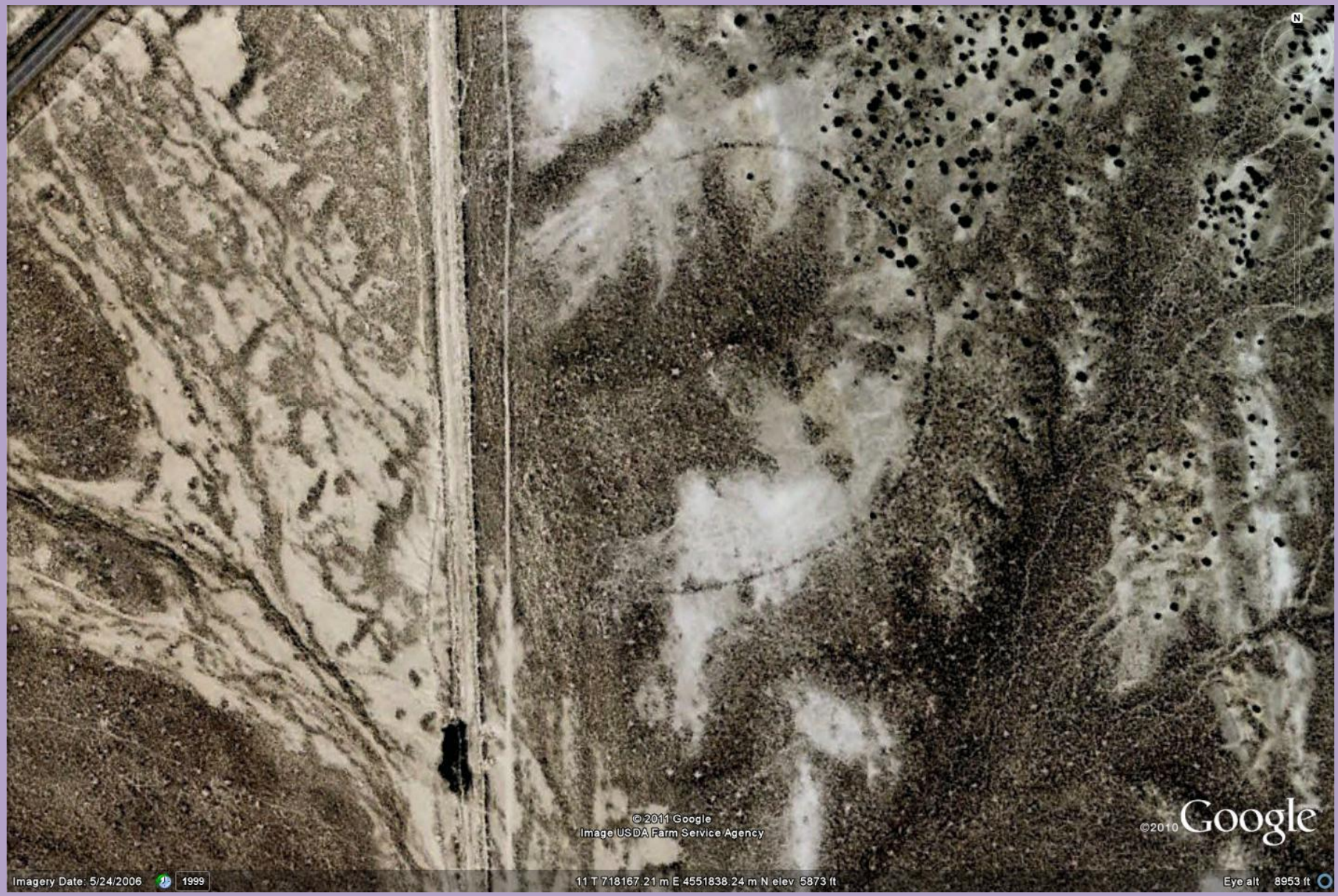
4. If conifers are growing within and below traps, then conifer encroachment has likely occurred over the past couple of centuries.



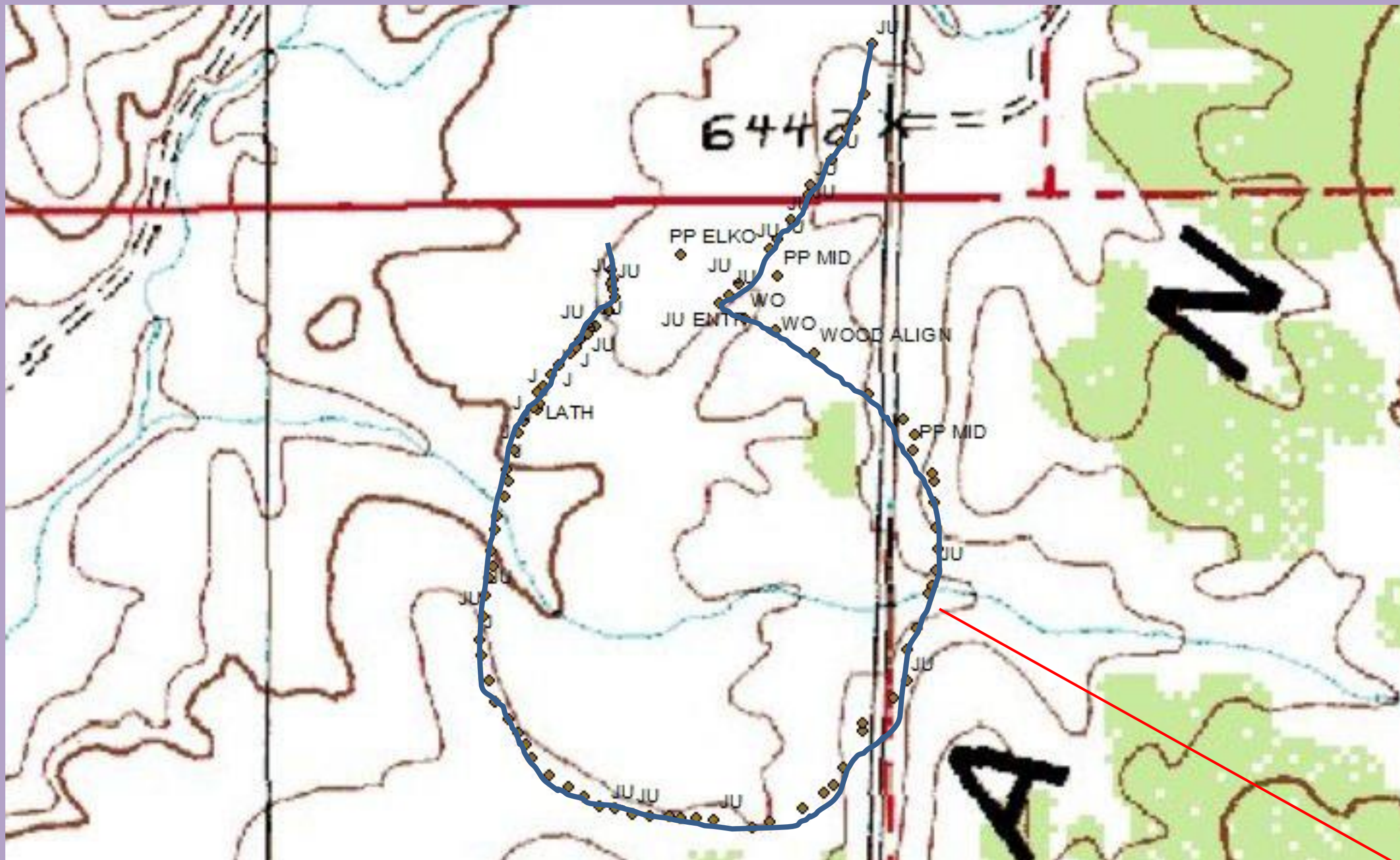


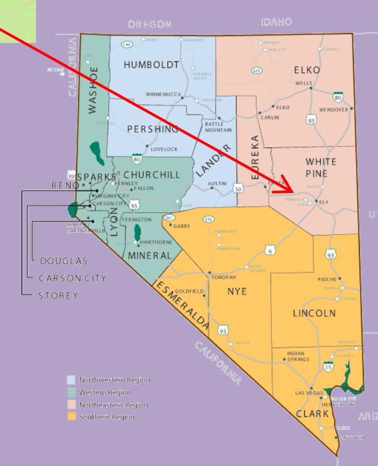
Aerial view of the Cobre Antelope Trap north of Wells, NV (Elko County). Note lack of trees below the upper end of the corral.

Archaeological Evidence: Lack of conifer encroachment and fire over the past 200+ years at this locale.



Close-up of Cobre Trap demonstrating lack of conifer encroachment.





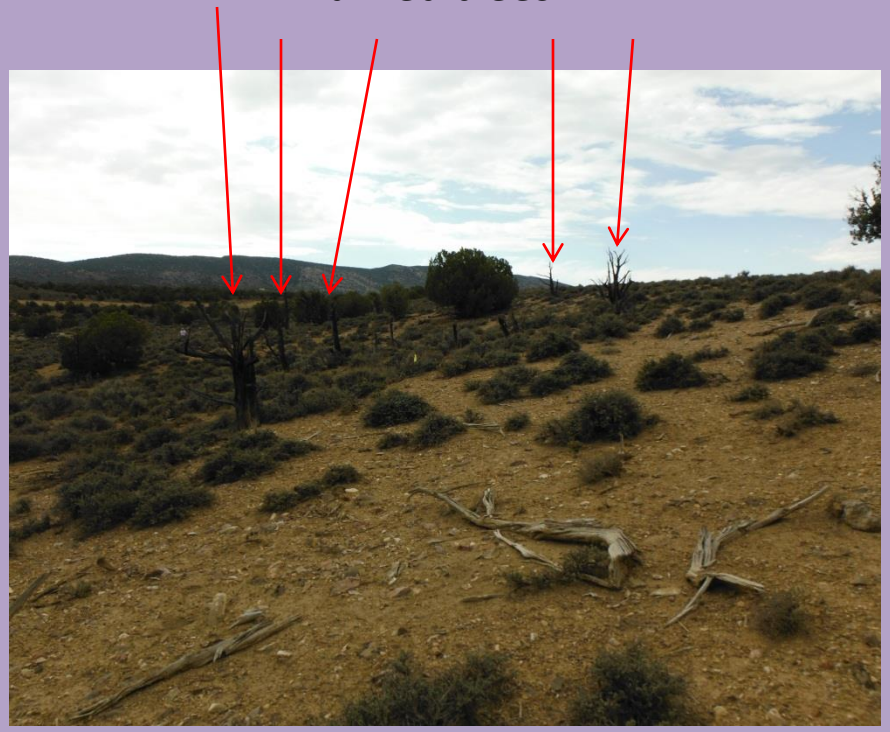
Easy Junior 1 Antelope Trap, White Pine County, Nevada. Note lack of trees within the corral. An estimated 300-400 juniper trees were target-burned and chopped to construct the corral.

Archaeological Evidence: Lack of conifer encroachment and fire over the past 200+ years at this locale.

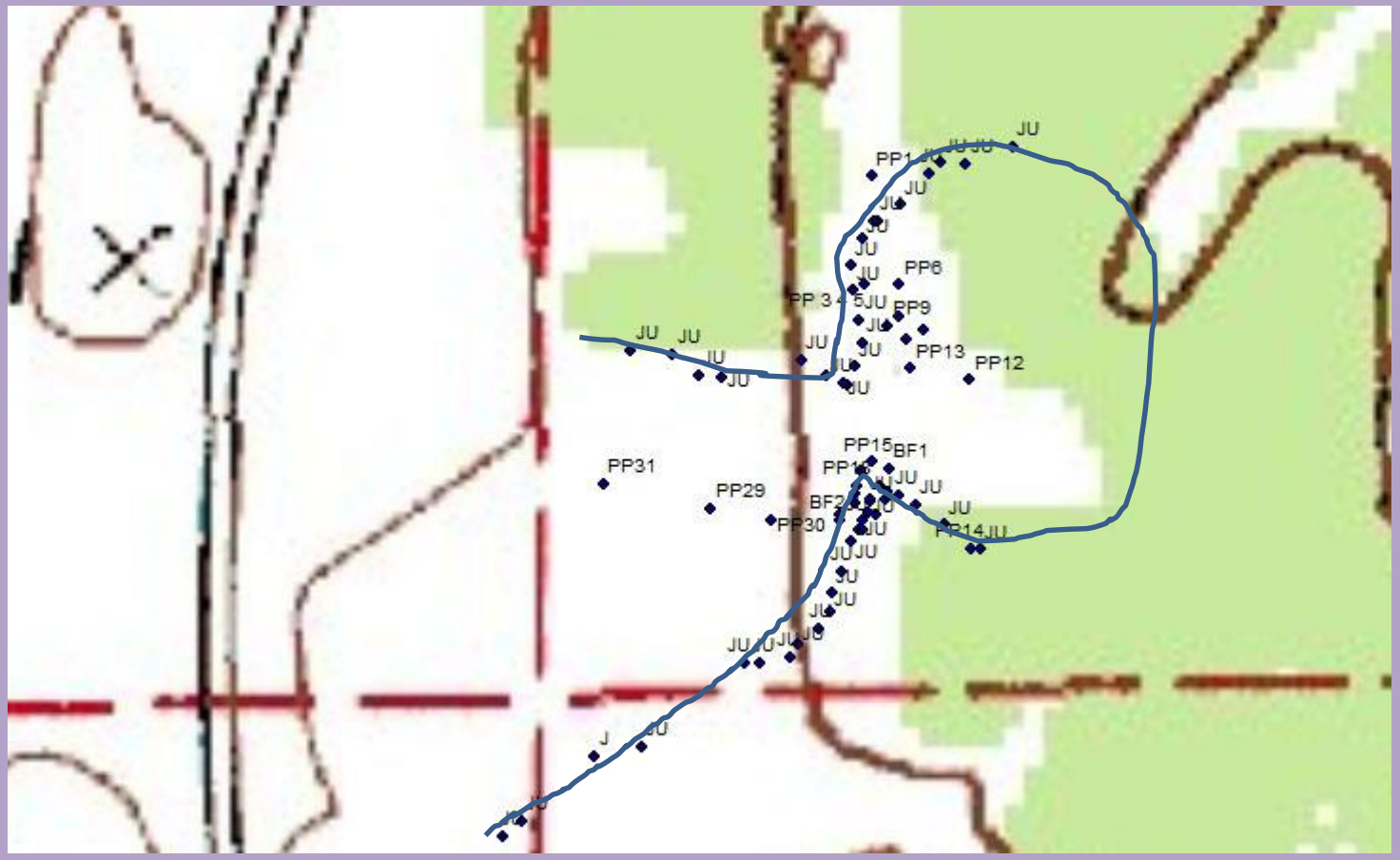
Close-up of Easy Junior 1 Antelope Trap area,
East Side Pancake Range, White Pine County, NV

Section of upright juniper poles used to make the corral wall.

Burned trees.



Trees burned aboriginally to construct the corral. Burning here is not caused by natural fire.

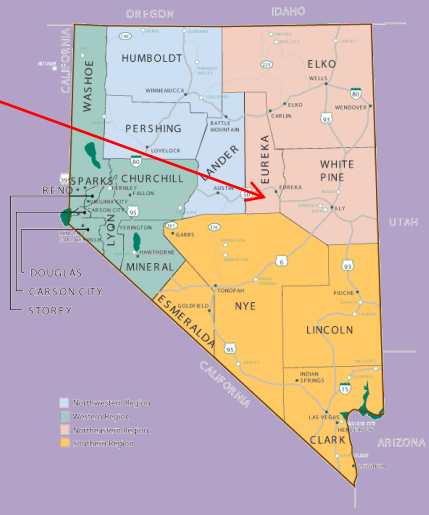


Easy Junior 3 Antelope Trap, White Pine County, Nevada. Note the lack of trees within the wings of the corral and the entrance. These trees were removed 200+ years ago to construct the corral.

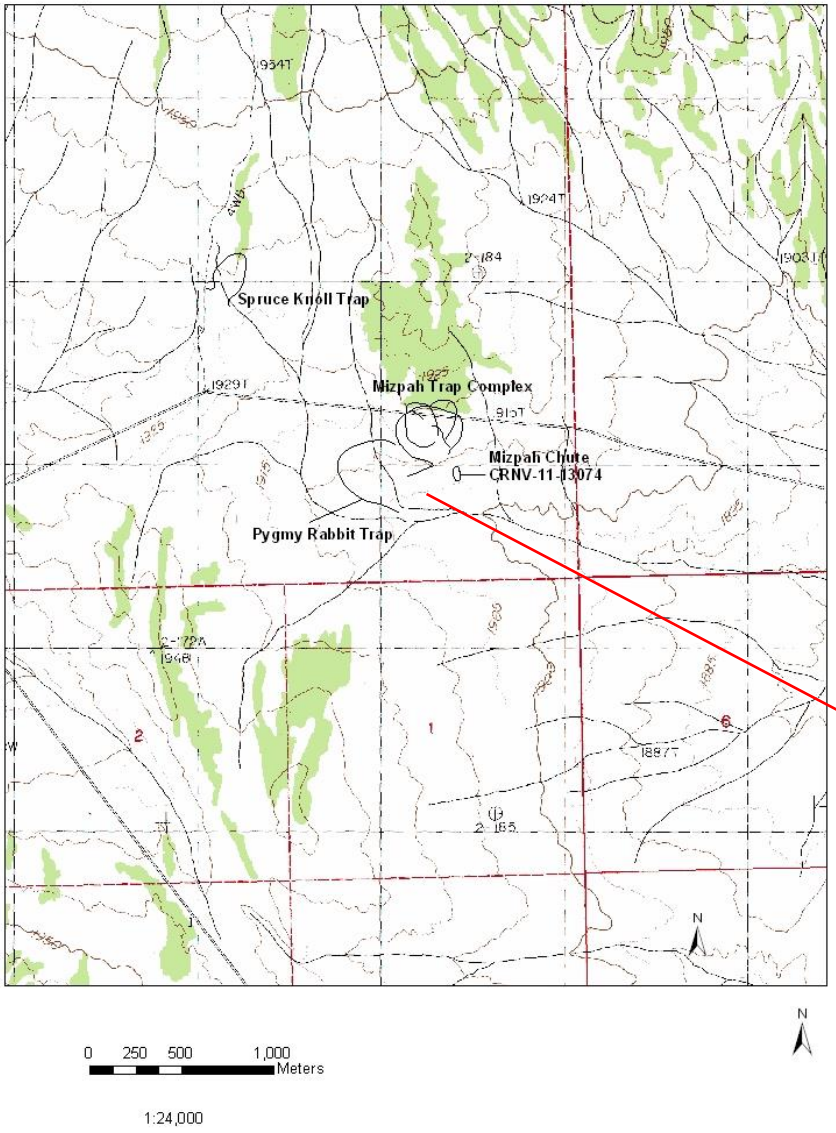
Archaeological Evidence: Lack of conifer encroachment and fire similar to nearby Easy Junior 1 trap.

Gibellini Antelope Trap, Eureka County, Nevada. Archaeologists are walking along one edge of the corral wall. The inside of the corral is the region of sagebrush lacking trees in this photo.

Archaeological Evidence: Lack of conifer encroachment and fire over the past 200+ years.

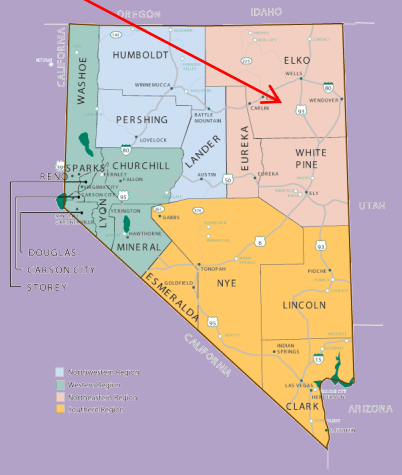


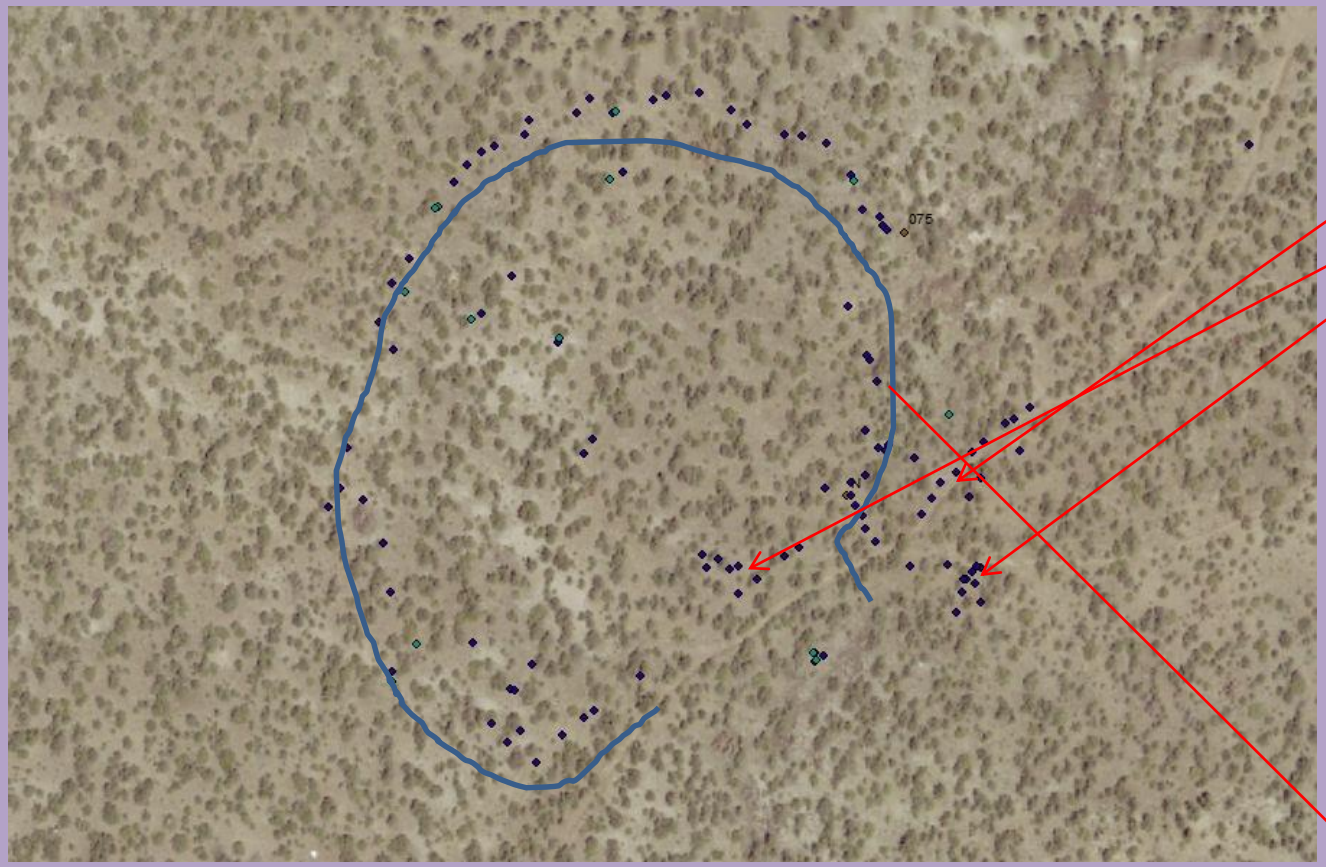
Corral wall made of juniper limbs.



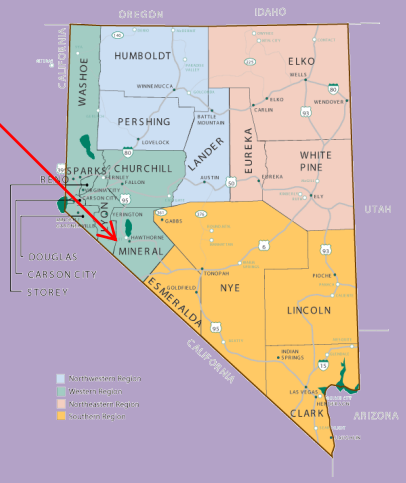
Series of Antelope Traps, Spruce Mountain area, Elko County, Nevada. All are located just below current conifer belt.

Archaeological Evidence: Lack of conifer encroachment and fire over the past 200+ years.



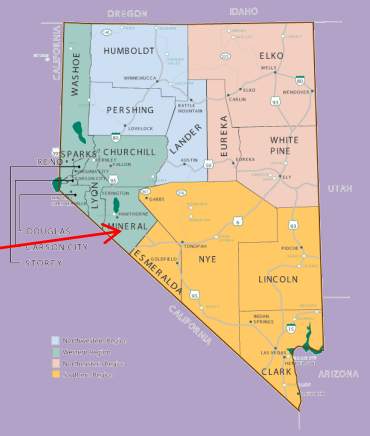


Projectile point concentrations; ancient kill zones during trapping.



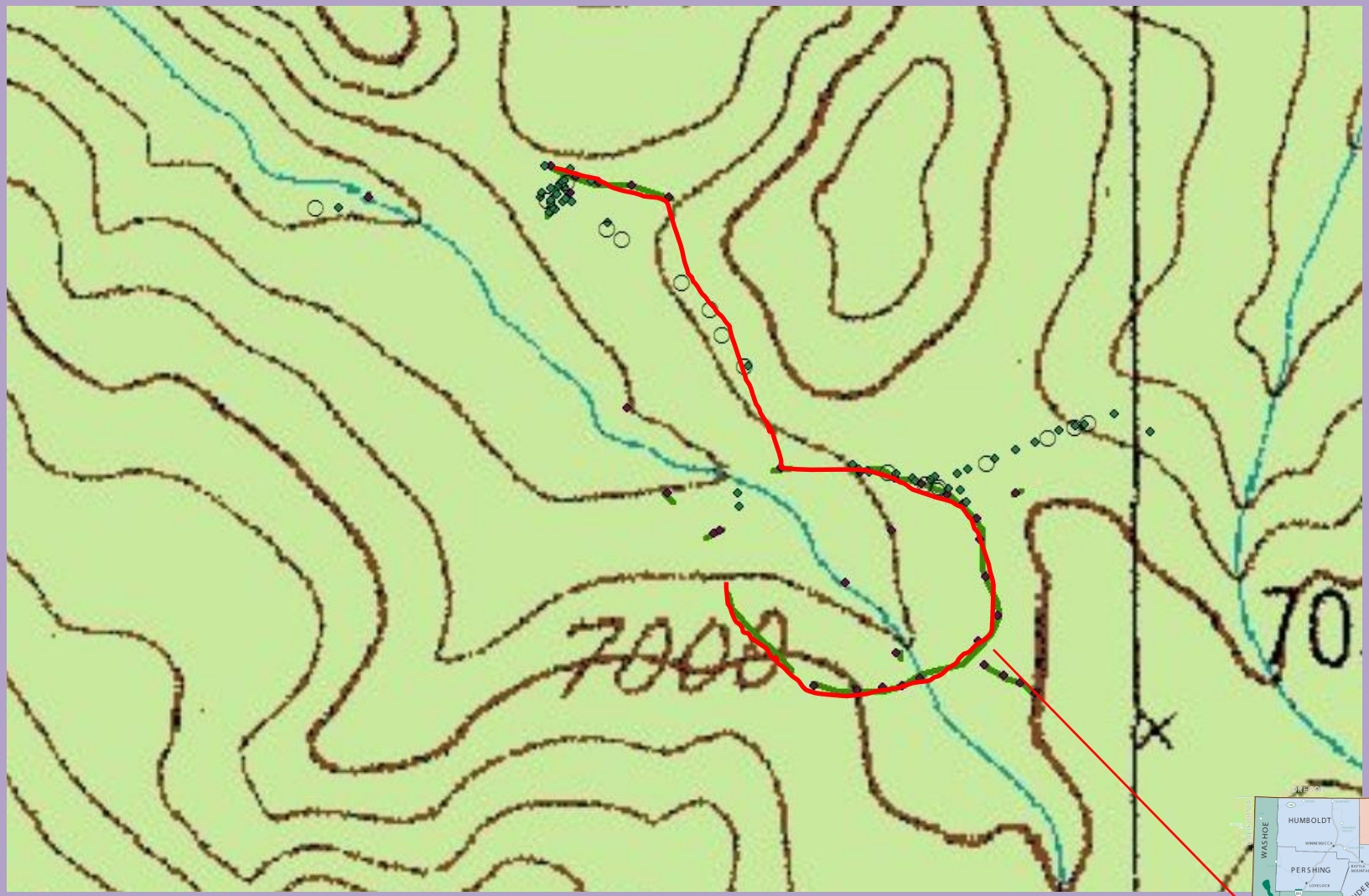
Tunna Nosi Antelope or Mountain Sheep Trap, Mineral County, Nevada. The corral is completely in-filled with juniper and pinyon trees.

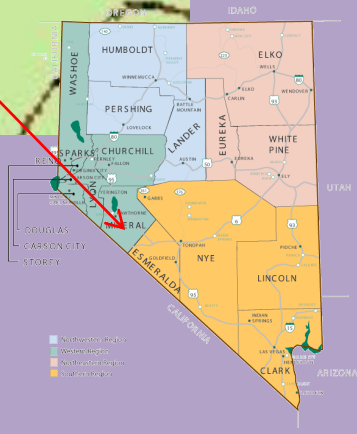
Archaeological Evidence: Conifer encroachment (and perhaps fire) in the recent past. Evidence for historic charcoal production in the area; thus, conifer tree growth and regrowth rapid. Treatments of conifer removal would be expected to require continuous re-treatments.



Standing along the corral wall at the Anchorite Pass antelope trap, western Nevada.

Archaeological Evidence: A young tree grows along with sagebrush in the corridor opened when trees were felled to construct the corral. Heavy conifer growth within the corral itself suggests rather rapid conifer growth and possible expansion over the past 200 years.





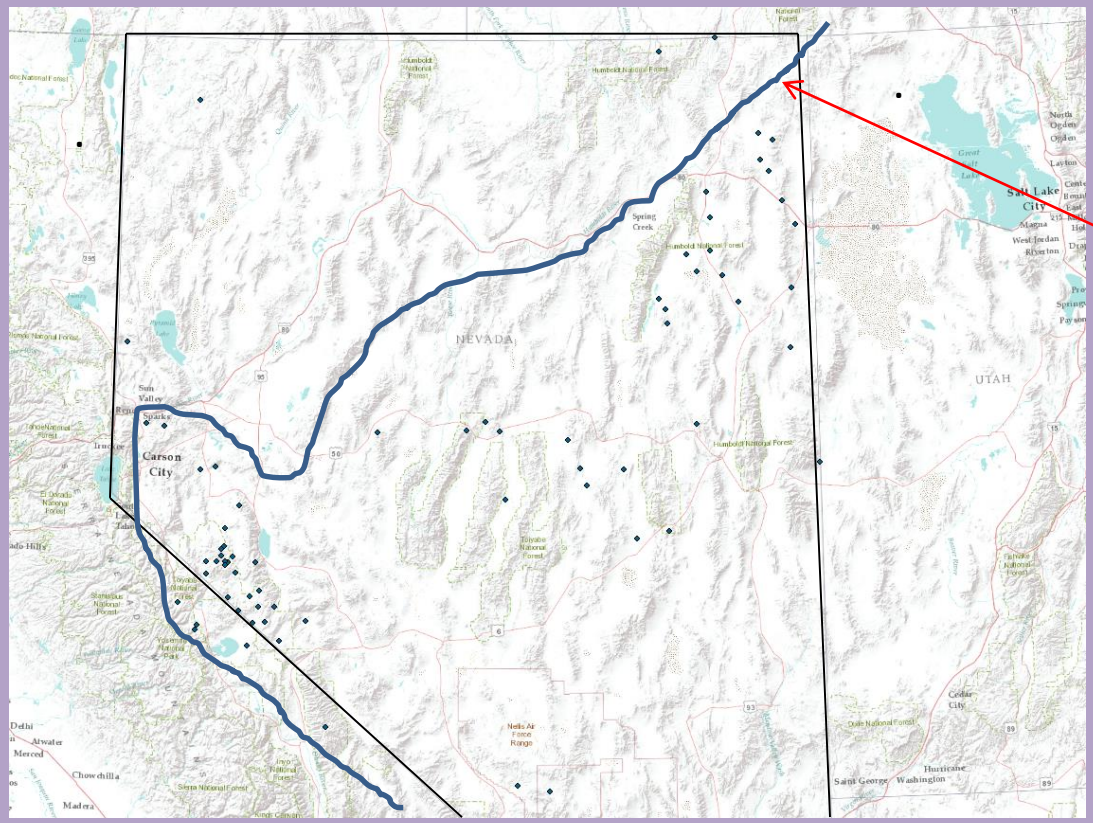
Excelsior deer trap, Excelsior Mountains, western Nevada.

Archaeological Evidence: The entire corral is inundated with pinyon-juniper trees, suggesting rather rapid conifer regrowth following trap construction. Lack of fire, however, for the past 200 years.

CONCLUSIONS

- Large-scale trap features built to mass capture large numbers of migrating big game were built across the central and northern Great Basin beginning about 5,000 years ago. That date correlates with the timing of P-J occupation of Nevada's mountain ranges.

- There are currently about 80 of these aboriginal structures known from Nevada and eastern California.



northern extent of pinyon pine

. = large-scale traps

CONCLUSIONS

- Hundreds of conifer trees were burned and dismantled to construct each aboriginal corral. Thus, Native Americans actively removed conifer trees for trapping, and in the process likely enhanced sagebrush habitat and GSG populations.

CONCLUSIONS

- Archaeological evidence is commensurate with paleoecological data, before-and-after photography, and historic records that suggest conifer in-fill/encroachment has been highly variable and site specific. There is no pan-Basin pattern of encroachment.

- The data presented here suggest that the planning for conifer removal in the Great Basin needs to be thoughtful and site-specific. Evidence suggests a strong conifer presence in many areas of central and northern Nevada for at least 5,000 years.

CONCLUSIONS

- In terms of addressing precisely where conifer encroachment has or has not occurred over the past two centuries in the Great Basin, potentially negatively impacting GSG populations, archaeological evidence provides a strong set of proxy data with which to answer this question.

Walking along a section of the Easy Junior #2 antelope trap, White Pine County, Nevada

LARGE-SCALE TRAPS AND CONIFER ENCROACHMENT: USING ARCHAEOLOGICAL DATA TO PLAN THE GREATER SAGE-GROUSE CONSERVATION EFFORT

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A recording of today's webinar and slides from the presentation will be available at **www.GreatBasinLCC.org**.

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