

Land Reclamation On the Nevada Test Site—A Field Tour

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Abstract—An all-day tour to observe arid land reclamation on the Nevada Test Site was conducted in conjunction with the Eighth Wildland Shrub and Arid Land Restoration Symposium. Tour participants were introduced to the U. S. Department of Energy reclamation programs for the Yucca Mountain Project and the Treatability Studies for Soil Media Project. The tour consisted of several stops that covered a variety of topics and studies including revegetation by seeding, topsoil stockpile stabilization, erosion control, shrub transplanting, shrub herbivory, irrigation, mulching, water harvesting, and weather monitoring.

According to the Nuclear Waste Policy Act of 1982 (as amended in 1987), the U.S. Department of Energy must study and characterize Yucca Mountain, Nevada, as a potential site for long-term underground storage of high-level nuclear waste.

Site characterization activities include a variety of geological, geochemical, geotechnical, and hydrologic studies that will disturb approximately 180 ha. of vegetation and soils. The Department of Energy is committed to reclaiming all lands disturbed by the project, and returning them to a stable ecological state, with a composition and productivity similar to pre-disturbance conditions.

The Reclamation Program of the Yucca Mountain Project

Since limited information exists pertaining to Mojave Desert reclamation, the Department of Energy has implemented a series of feasibility studies to investigate the success of various reclamation techniques for the Yucca Mountain area. The most successful techniques will be used for stabilizing and revegetating temporary topsoil stockpiles, and reclaiming sites released for final reclamation.

Yucca Mountain is at the northern edge of the Mojave Desert and the flora consists of a mixture of Mojave and Great Basin desert species. Dominant plant species include creosotebush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), Anderson wolfberry (*Lycium andersonii*), spiny hopsage (*Grayia spinosa*), and blackbrush

(*Coleogyne ramosissima*). Elevations range from 944 to 1,789 m above sea level. The climate is characterized by hot summers and cool winters. Average annual precipitation is approximately 130 mm, falling sporadically throughout the year.

The first portion of the tour consisted of an overview of the reclamation program at Yucca Mountain. Several stops were made in this area to highlight some of the current reclamation research (fig. 1). The first stop was at a revegetation trial where participants listened to an overview of the Yucca Mountain reclamation program as well as a description of several revegetation trials being conducted in the Yucca Mountain area. Scientists are

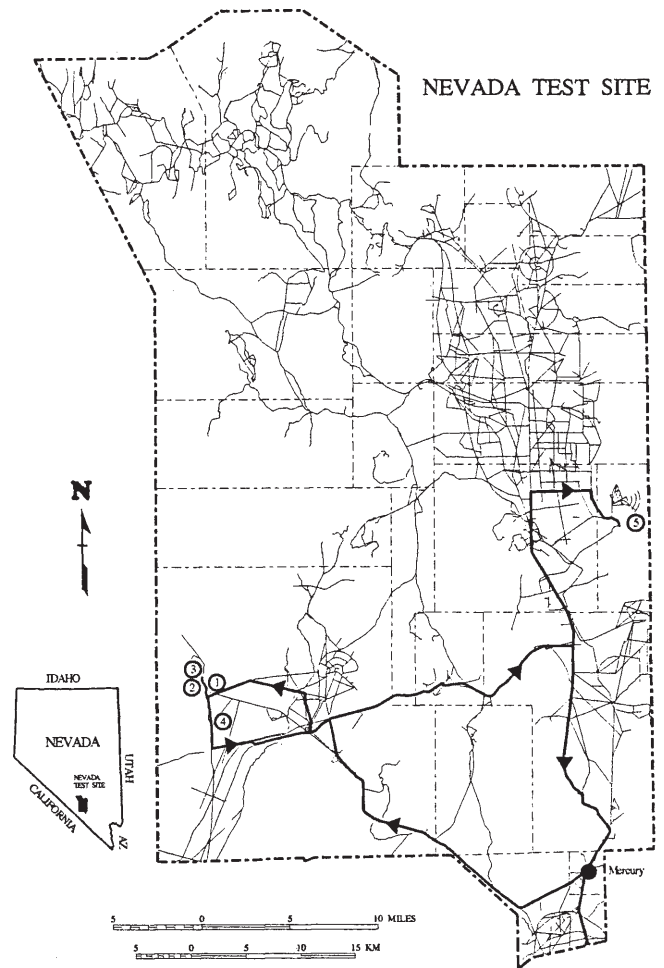


Figure 1—Map of the Nevada Test Site showing field tour stops.

In: Roundy, Bruce A.; McArthur, E. Durant; Haley, Jennifer S.; Mann, David K., comps. 1995. Proceedings: wildland shrub and arid land restoration symposium; 1993 October 19-21; Las Vegas, NV. Gen. Tech. Rep. INT-GTR-315. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.

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conducting a variety of trials utilizing various seed mixes, as well as testing seedbed modification and water management treatments such as ripping, imprinting, pitting, drill and broadcast seeding, irrigation and mulching.

The second stop was the site of a large topsoil stockpile recently established and stabilized with a vegetative cover. Studies are being conducted on the stockpile to determine the effects of time and stockpile depth on soil microbes. Various combinations of plant species are being evaluated to assess their effects on soil microbial and nutrient levels (particularly nitrogen) in the soil.

At the next stop (3), tour participants were shown a key element of the Yucca Mountain Project, the North Portal Facility. This is the site where a tunnel will be constructed that will drop over 300 meters to the geological formation that is being characterized for placement of high level nuclear waste. Participants observed the starter tunnel which was constructed using blasting techniques. The remainder of the tunnels used for site characterization will be dug with a tunnel boring machine.

The last stop (4) in the Yucca Mountain area was a reclaimed drill pad. Soils at this site are over 90% sand. This causes unique problems for vegetation establishment. The water holding capacity of the soil is low, it lacks structure and is very susceptible to erosion. To mitigate these conditions, scientists are studying the effects of mulches that cannot only conserve soil moisture but will protect the soil from erosion and provide organic matter and nutrients to the soil. Selected plots were also treated with polyacrylamide gel to assess the effects of this material under these conditions. Gels have been shown to be effective for holding and storing moisture for use by vegetation in the landscaping industry, and may have potential for aiding revegetation of disturbed lands in the Mojave Desert.

The Reclamation Program of the Treatability Studies for Soil Media Project

Tour participants traveled to Plutonium Valley (stop 5) on the Nevada Test Site to a site where a series of reclamation trials are currently being conducted for the

Treatability Studies for Soil Media Project. During the 1950's and 1960's, a series of safety tests were conducted on and adjacent to the Nevada Test Site to determine the consequences of accidental detonation or destruction of a nuclear device. This led to the contamination of approximately 800 hectares with plutonium. The U.S. Department of Energy Nevada Operations Office has developed a feasibility study to examine methods for cleaning up these contaminated lands. The objectives of the program are to evaluate technologies to: 1) selectively excavate the contaminated soil, 2) remove the plutonium from the soil, and 3) stabilize and revegetate the disturbed sites.

Stabilization and revegetation of the disturbed sites are critical to control erosion and reestablish wildlife habitat. Several studies have been initiated to determine the most effective methods to provide short-term soil stabilization to mediate the human health risk from plutonium, and to establish a long-term self-perpetuating plant community to provide permanent soil stabilization and wildlife habitat.

The Plutonium Valley study site is situated on an alluvial fan of the northern slope of French Peak Mountain at an elevation of 1,271 m. The soil is a gravelly sandy loam. The slope at the site is 3-5 percent and the aspect is northwest. The site is in a transition zone between the Mojave and Great Basin deserts with major plant species consisting of shadscale (*Atriplex confertifolia*), winterfat (*Ceratoides lanata*), Anderson wolfberry (*Lycium andersonii*), and Indian ricegrass (*Oryzopsis hymenoides*). The climate is characterized by hot summers and cool winters. Average annual precipitation for the past 30 years, obtained 5 km from the site, is 168 mm, falling sporadically throughout the year.

At the Plutonium Valley site, studies are being conducted to assess the effects of seedbed preparation, irrigation, water harvesting and topsoil removal on plant establishment, as well as the effects of short-term soil stabilization treatments on wind and water erosion. Other studies are designed to determine effects of topsoil stockpiling on soil viability; and effects of irrigation, seed origin and herbivory on establishment of transplanted shrubs. Participants listened to an overview of the Treatability Studies for Soil Media Project and descriptions about the individual studies being conducted at the site. Participants were then allowed time to view the studies, as well as a variety of reclamation implements, an irrigation system, and weather monitoring systems.