

# Reclamation Efforts at the Lockwood, Nevada Landfill

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## Introduction

The reclamation of disturbed arid rangelands is a monumental task under the best of conditions. The Lockwood Landfill, located 17 km, east of Reno, Nevada is a regional Landfill of some 8800 ha in area. This Landfill services all of northern Nevada and much of northern California. Returning land after solid waste is buried back to use as wildlife habitat, livestock grazing, and recreational activities is the goal of the Landfill management. The Lockwood Landfill had contracted out to have reclamation efforts done on some of their slopes, but became discouraged when these expensive efforts resulted in almost complete failure (Figure 1). We were then invited to conduct research on cost effective treatments to restore desirable vegetation cover to prevent accelerated erosion and dominance of exotic annual weeds.

The Landfill is in an arid environment that receives an average of 12.5 cm of precipitation annually. The pre-disturbance vegetation was Wyoming big sage brush (*Artemisia tridentata* ssp. *wyomingensis*) and shadscale (*Atriplex canescens*) with an understory of squirreltail (*Elymus elymoides*), Indian ricegrass (*Achnatherum hymenoides*), and the invasive annual weed cheatgrass (*Bromus tectorum*) (Figure 2). The completed landfills have no developed soil profiles and the 20-45% slopes are finished with a fine sand to silt textured volcanic tephra mined from buried deposits.

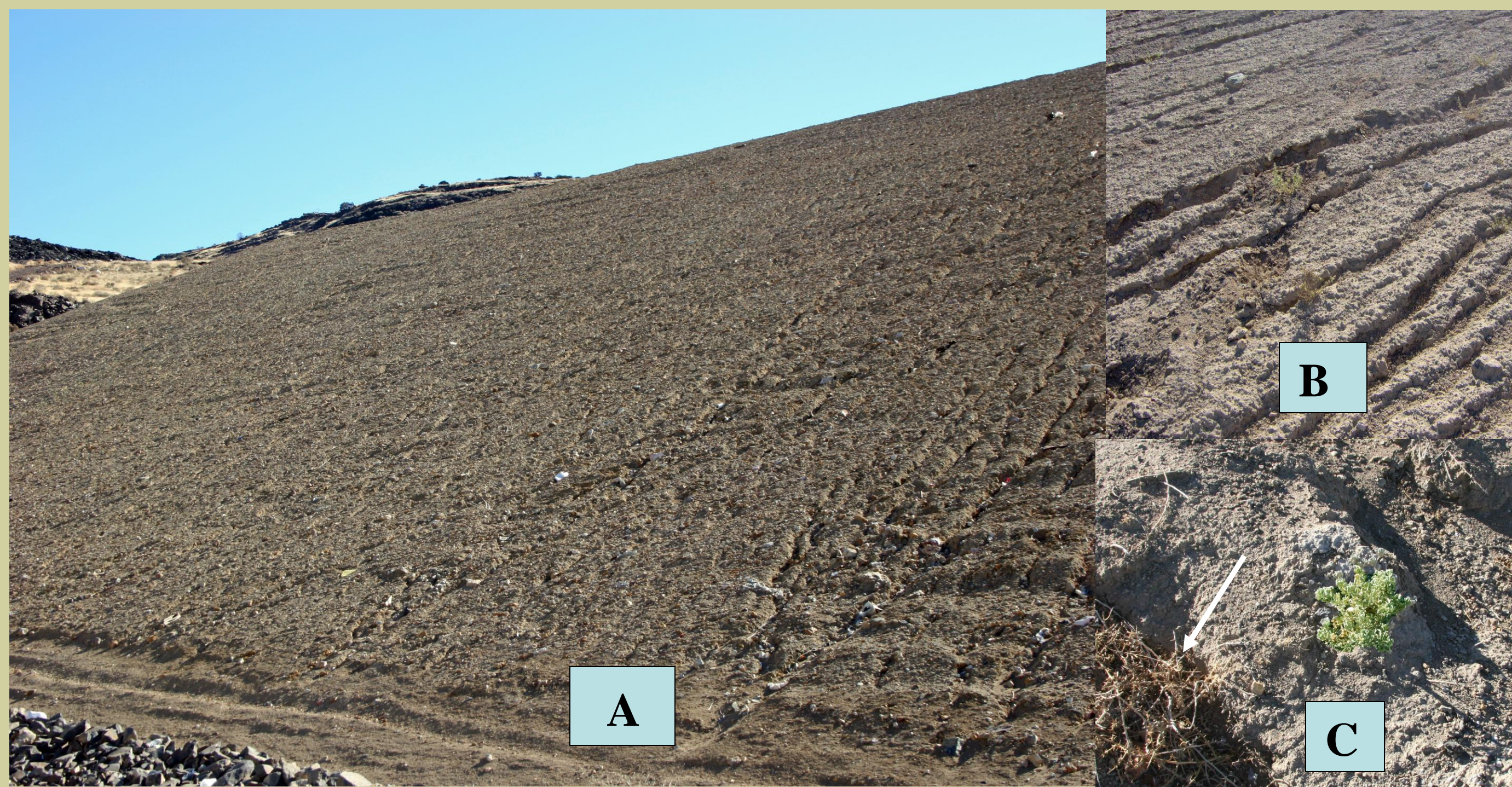


Figure 1. **A.** Failed contracted seeding of one of many slopes. **B.** Heavy erosion that occurs on steep slopes when there are a lack plants to stabilize the soil. **C.** Sagebrush plant stabilizing soil with heavy erosion on both sides of the plant. Notice the Russian thistle seeds that accumulate in the erosion depression



Figure 2. The physically unaltered adjacent plant community.

## Methods and Results

We implemented broadcast and drill seeding along with the transplanting of quart sized seedlings with a variety of plant materials in an effort to get plants established in this harsh environment. We drill seeded and broadcast seeded a variety of grass and shrub species, but the mined tephra particles are glass sharp and though we experienced initial germination and sprouting of seedlings, most died due to desiccation and wind erosion. The transplanting of a variety of plant materials (Table 1) yielded some very promising results as Wyoming big sagebrush (90%), shadscale (72%), four-wing saltbush (*Atriplex confertifolia*) (68%), and 'Immigrant' Forage Kochia (*Kochia prostrata*) (60%) were recorded (Table 1). Grass species such as Crested Wheatgrass (*Agropyrum desertorum*) (38%), Indian ricegrass (24%), and Sherman big bluegrass (*Poa ampla*) (22%) experienced lower success rates (Table 1).

Table 1. Transplanted plant material and their success.

Common Name	Scientific Name	% Success
Antelope Bitterbrush	<i>Purshia tridentata</i>	10
Big Bluegrass	<i>Poa secunda</i>	22
Big Sagebrush, Wyoming	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	90
Greasewood	<i>Sarcobatus vermiculatus</i>	60
Crested Wheatgrass	<i>Agropyron desertorum</i>	38
Four-wing Saltbush	<i>Atriplex confertifolia</i>	68
'Immigrant' Forage Kochia	<i>Kochia prostrata</i>	60
Indian Ricegrass	<i>Achnatherum hymenoides</i>	24
Low Sagebrush	<i>Artemesia arbuscula</i>	0
Mountain Mahogany	<i>Cercocarpus ledifolius</i>	5
Needle-and-Threadgrass	<i>Stipa comata</i>	0
Shadscale	<i>Atriplex canescens</i>	72
Sherman Big Bluegrass	<i>Poa ampla</i>	22
Squirreltail	<i>Elymus elymoides</i>	14
Thurber's Needlegrass	<i>Stipa thurberiana</i>	5
Winterfat	<i>Krascheninnikovia lanata</i>	10

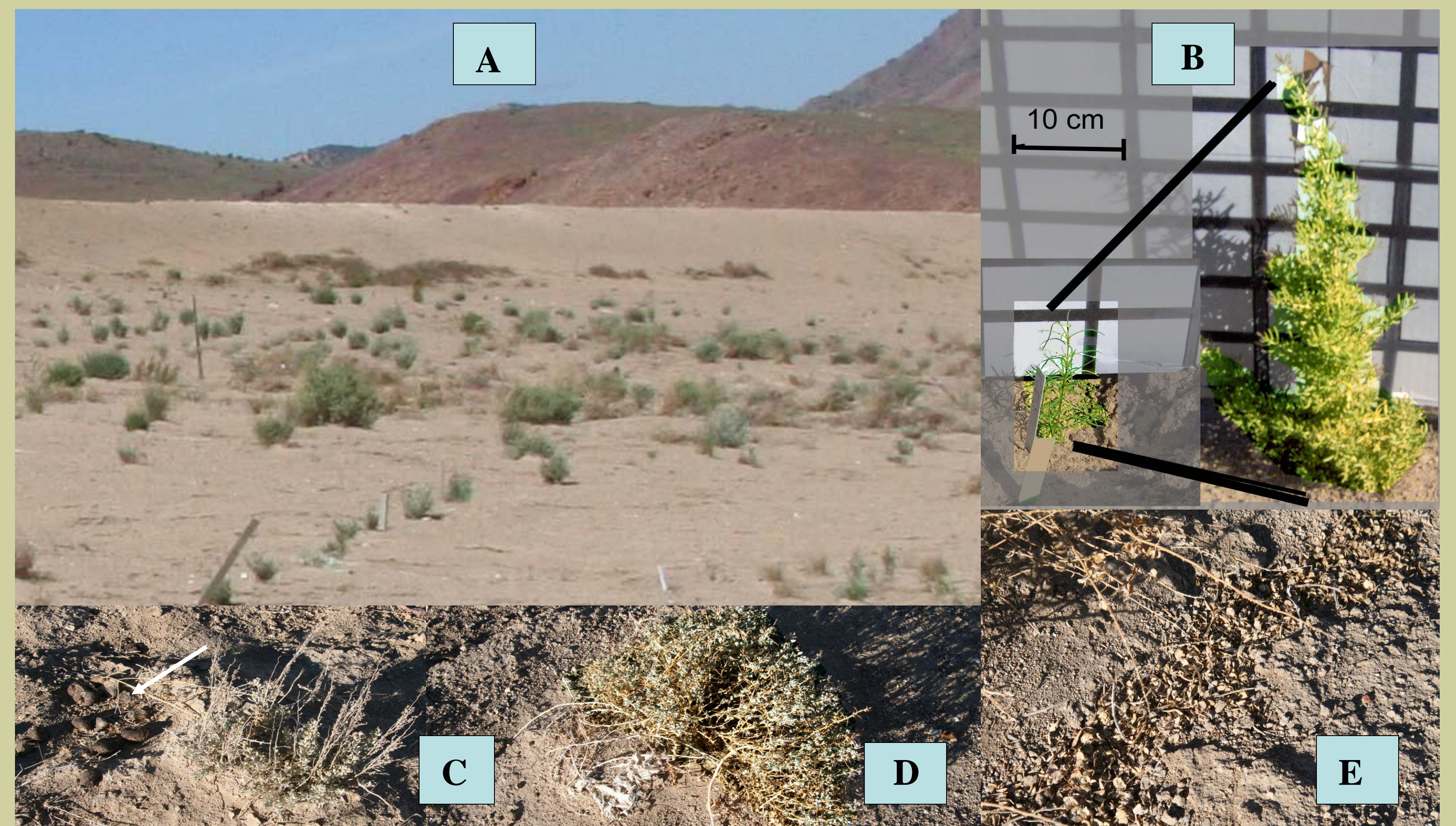


Figure 3. **A.** Established shrubs and grass species. **B.** One growing season's biomass production of a greasewood plant. **C.** A flowering sagebrush plant with evidence of rabbit presence (left side). **D.** An established shadscale plant. **E.** Fourwing saltbush seed from a transplant accumulating in an erosion depression.

## Discussion

There is no doubt that the reclamation of disturbed lands such as this Landfill are very difficult and challenging, but at the same time very critical. There are obviously more methodologies that could have been implemented such as irrigation, but our research focused on cost effective measures that are desired by this Landfill Station. The Lockwood Landfill Station is interested in achieving one plant per meter square, and therefore our goal was to accomplish this. Our transplanting efforts consisted of 1 year old quart sized containers that we grew from our greenhouse stock, we estimate the cost of these seedlings at an average of \$2.15 each, so you can see that on an average slope at this Landfill you need the success of some 7,000 plants, this can get quite expensive. The Lockwood Landfill Station spent \$36,000 for a reclamation Contract on one slope that was almost a complete failure (Figure 1). We estimate that the cost of the slope we did our research on would be in the neighborhood of 45,000 to achieve one plant per meter (Figure 3).