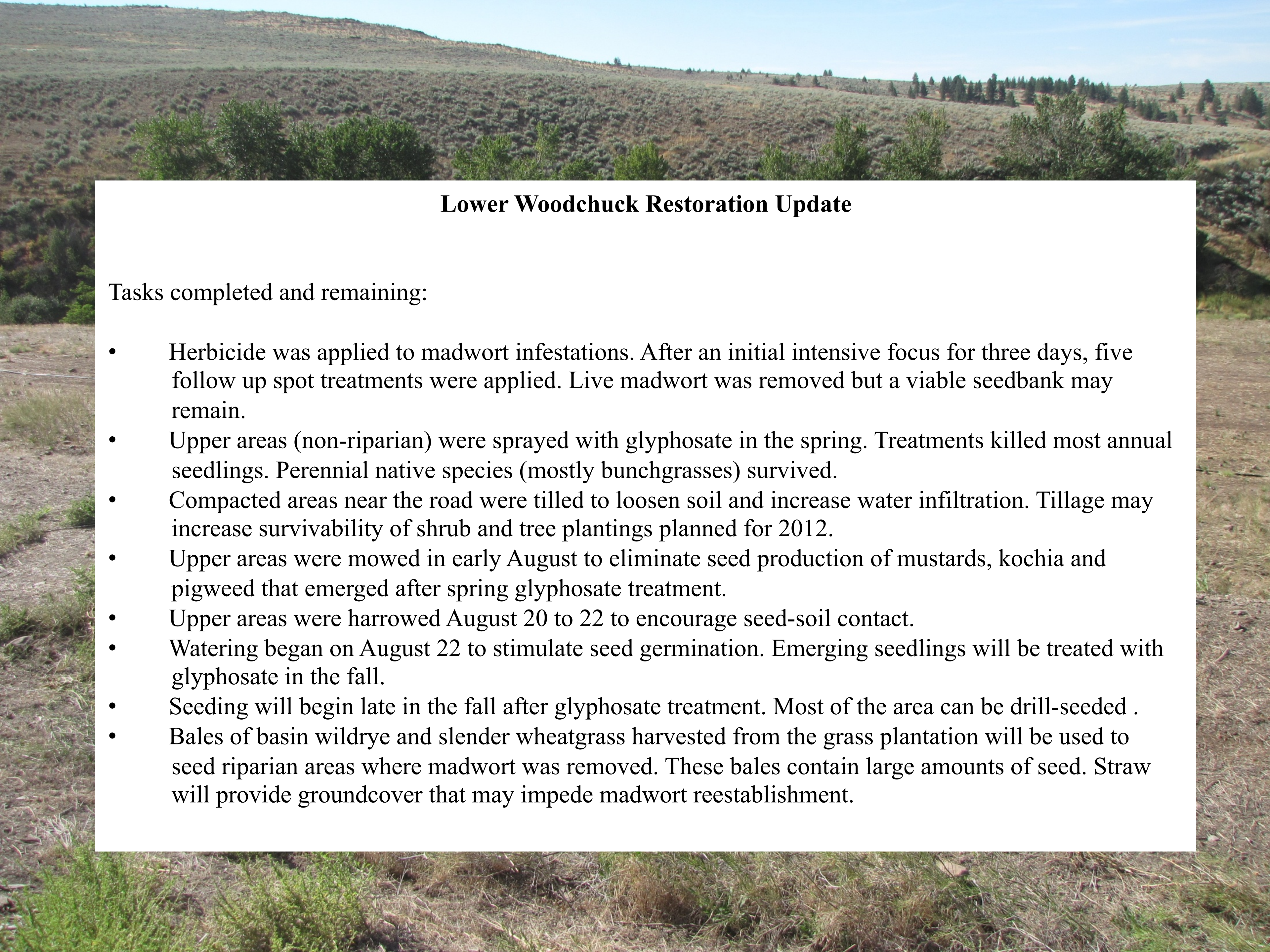
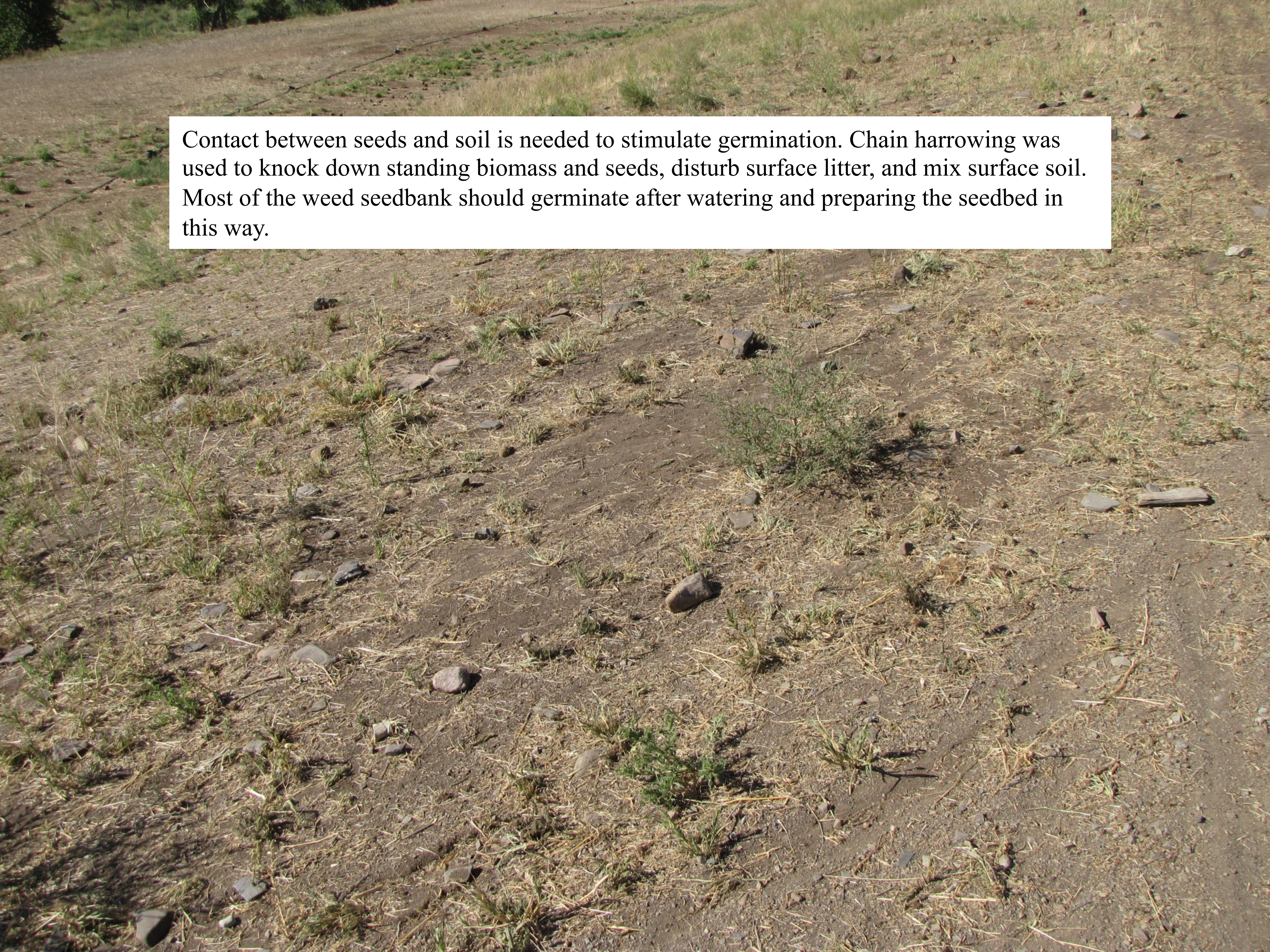


Lower Woodchuck Restoration Update

Tasks completed and remaining:

- Herbicide was applied to madwort infestations. After an initial intensive focus for three days, five follow up spot treatments were applied. Live madwort was removed but a viable seedbank may remain.
- Upper areas (non-riparian) were sprayed with glyphosate in the spring. Treatments killed most annual seedlings. Perennial native species (mostly bunchgrasses) survived.
- Compacted areas near the road were tilled to loosen soil and increase water infiltration. Tillage may increase survivability of shrub and tree plantings planned for 2012.
- Upper areas were mowed in early August to eliminate seed production of mustards, kochia and pigweed that emerged after spring glyphosate treatment.
- Upper areas were harrowed August 20 to 22 to encourage seed-soil contact.
- Watering began on August 22 to stimulate seed germination. Emerging seedlings will be treated with glyphosate in the fall.
- Seeding will begin late in the fall after glyphosate treatment. Most of the area can be drill-seeded .
- Bales of basin wildrye and slender wheatgrass harvested from the grass plantation will be used to seed riparian areas where madwort was removed. These bales contain large amounts of seed. Straw will provide groundcover that may impede madwort reestablishment.

Little cheatgrass emerged after spring herbicide treatment. A large seedbank probably remains.



Contact between seeds and soil is needed to stimulate germination. Chain harrowing was used to knock down standing biomass and seeds, disturb surface litter, and mix surface soil. Most of the weed seedbank should germinate after watering and preparing the seedbed in this way.

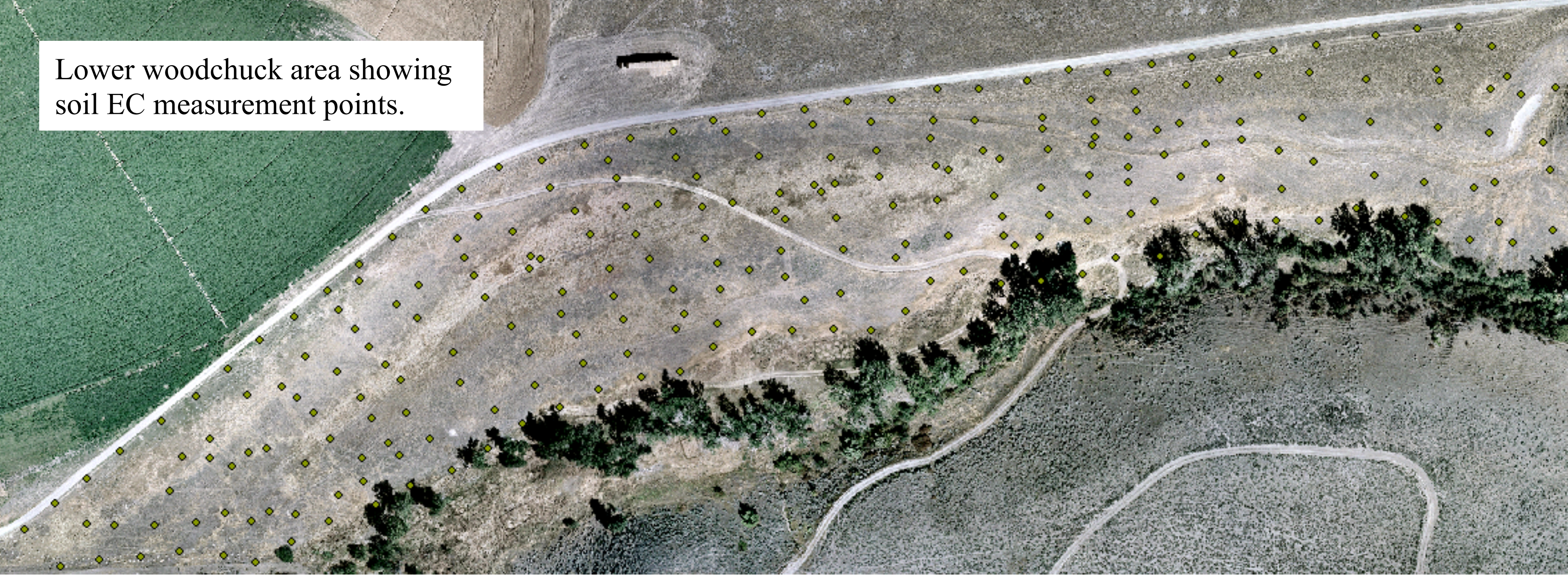
Watering began on August 22. Six K-lines are sufficient to water the entire area in three days.

Soil Electrical Conductivity

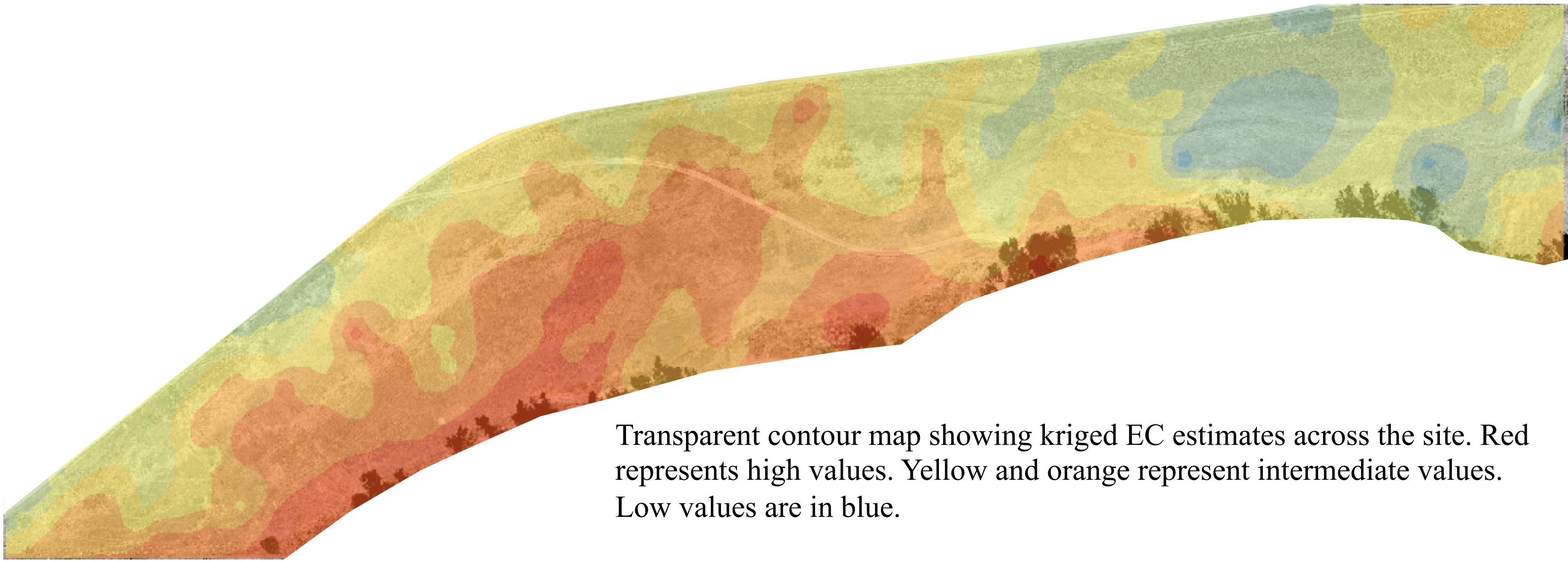
We measured soil electrical conductivity (EC) at 250 locations in the lower woodchuck area and used geostatistical methods to interpolate EC values across the site. We then regressed predicted EC values with measures from soils collected across the site.
Predicted EC values exhibited a strong correlation with soil moisture, the most important determinant of plant growth. Predicted EC was also found to correlate with the nutrients nitrate and potassium.

Relationships between predicted EC and soil measures.

	R^2	F	P
H_2O content	0.366	15.562	<0.001
Nitrate-N	0.235	7.659	0.010
Potassium	0.271	9.291	0.005



Lower woodchuck area showing soil EC measurement points.

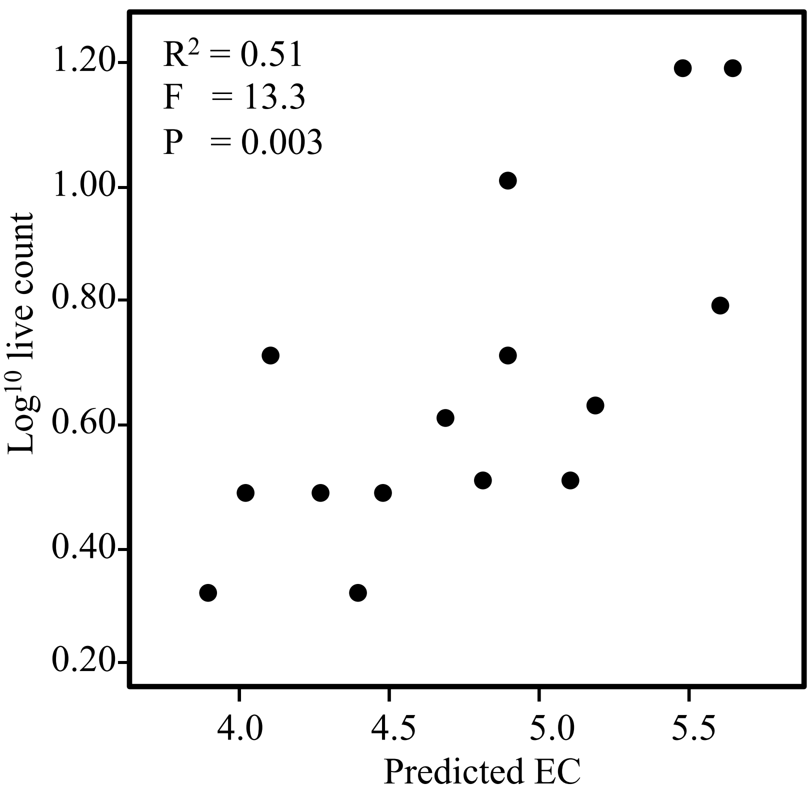


Transparent contour map showing kriged EC estimates across the site. Red represents high values. Yellow and orange represent intermediate values. Low values are in blue.

EC and tree survivability

Relationships between EC and containerized tree and shrub survivability were examined in the lower woodchuck area. We counted surviving trees and shrubs in 100 ft sections of an area planted in 2010. Survivorship was regressed with predicted EC.

Predicted EC was found to account for 51% of the variation in survivability.



Relationship between predicted EC and plant survivability.

Study area and 2010 shrub and tree plantings (orange).

Preliminary analysis of EC data collected this spring from other locations across the ranch indicates that EC is related to soil water content, soil water holding capacity and soil nutrients, all of which are important to plant establishment and growth.

The direct relationship between EC and plant survivability these results indicate suggest that EC measures might be useful for identifying areas suitable for trees and shrubs. EC measures may provide a way to reduce maintenance costs and increase tree and shrub survival.