Salt Cedar: Erosion

Definition

We are attempting demonstrate that the invasive species, Tamarix salt cedar, produces much more salt than native plants [see appendix A]. The increased salt dries out the soil faster than a plant with less salt production would. This dryer soil should more susceptible to erosion. Therefore, the soil around the salt cedar should show signs of increased erosion as compared to a native plant. We plan to conduct field studies to confirm this empirically in addition to our computer simulation.

The Plan

We plan on studying this problem by using a NetLogo. The NetLogo model will simulate soil saturating after raining with diffusion. As the soil dries it will expand. This expansion will be used as a proxy for determining erodibility. We may also incorporate an Aeolian erosion component in the model. The model will expand in response to how dry the soil becomes; the soil will dry out faster due to the salt cedar producing salt. We will also use research on the Cottonwood trees growth and the Tamarix salt cedar's growth. Finally, we will do an experiment in the Bosque, at a site behind the Bosque school, while following a procedure to determine the compactness of the soil.

Current Progress

Up to this point, we have designed and organized an experiment and a procedure to follow while doing the experiment, in addition to conducting it, and come up with about 1/3 of our code, and have done some basic research on the salt cedar.

Expected Results

We expect that the soil around the Tamarix will be more compact than the soil around the cottonwood due to wind and gravitational factors, which will prove our hypothesis that the salt cedar causes erosion, due to it increasing the salt content in the soil (see Appendix A for more information).

Appendix A

Salt cedar trees grow rampantly in the Middle East, Asia, and parts of Africa, accustomed to harsh landscapes with little rain. They first appeared on the East Coast of America in the early 1800s, carried over the sea and sold to plant nurseries as ornamental shrubs. The brushy trees flourished in saline soils, their grey-green leaves rough-textured with salt. Scientists call the species *Tamarix*, but most people know it by the nickname "salt cedar" or tamarisk.

In the two centuries since salt cedar took root in America, it has been welcomed, vilified, battled, and exhaustively researched. Targeted as a needless waste of water, this tenacious, non-native species is a somber reflection of our drive to supply the thirst of western states. Attempts to control salt cedar call into question our understanding of what we label invasive, unwanted, and destructive, and what has come to belong to the transforming desert.

Merely ornamental in the gardens of the lush East, salt cedar had a different role to play in the settlement of the Southwest. As farmers and homesteaders wrestled wild rivers into submission with dams and drilled deep wells to reach intractable aquifers, native trees began to die out. The long gallery forests of cottonwoods and willows that once graced desert streams disappeared. Silt crumbled into the water, filling reservoirs and eroding the fragile banks of streams. Cutting winds blew the topsoil away from cultivated fields.

Impacts

Ecological: Salt cedar is an aggressive, woody invasive plant species that has become established over as much as a million acres of the western United States (Carpenter 1998). Salt cedar crowds out native stands of riparian and wetland vegetation. It increases the salinity of surface soil rendering the soil inhospitable to native plant species. Salt cedar provides generally lower wildlife habitat value than native vegetation. Saltcedar widens floodplains by clogging stream channels and increases sediment deposition due to the abundance of salt cedar stems in dense stands.

Habitat and Distribution

General requirements: Salt cedar grows well on moist sandy, sandy loam, loamy, and clayey soil textures (FEIS 1998). Salt cedar is tolerant of highly saline habitats, and it concentrates salts in its leaves. Over time, as leaf litter accumulates under saltcedar plants, the surface soil can become highly saline, thus impeding future colonization by many native plant species. Salt cedar is not tolerant of shading. Shaded plants have altered leaf morphology and reduced reproduction (FEIS 1998). Salt cedar commonly occurs along floodplains, riverbanks, stream courses, saltflats, marshes, and irrigation ditches in arid regions of the Southwest and the Southern Great Plains (FEIS 1998).

Bibliography

http://www.cwma.org/SaltCedar.html

http://www.terrain.org/articles/27/lamberton.htm