A History of Plant Improvement by the USDA-ARS Forage and Range Research Laboratory for Rehabilitation of Degraded Western U.S. Rangelands

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On the Ground

- Climate change models for the western United States predict warmer winters in the Great Basin and hotter, drier summers in the Mojave Desert, increasing the already high rate of rangeland and pasture degradation, which in turn will increase annual grass invasion, escalate wildfire frequency, and reduce forage production.
- These changes in western U.S. rangelands will continue to result in the emergence of novel ecosystems that will require different and/or improved plant materials for successful revegetation.
- Traditional plant improvement of native and non-native rangeland plant species by the USDA, ARS Forage and Range Research Laboratory (FRRL, Logan, Utah) has been accomplished through rigorous evaluation of seed collections followed by recurrent selection and hybridization of unique plant types within selected populations to identify plants with superior establishment and performance characteristics. After such plant types have been selected, they are further evaluated in multiple ecologically diverse locations to identify broadly adapted superior germplasm for public release.
- Plant improvement of perennial grasses, legumes, and forbs by the FRRL has provided and will continue to deliver plant materials that support sustainable rangeland management efforts to service productive and functionally diverse rangelands.

Keywords: plant materials, restoration, novel ecosystems, plant breeding, abiotic stress tolerance, resilience.

Rangelands 38(5):233--240
doi: 10.1016/j.rala.2016.08.004
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The semi-arid and arid rangelands of the western United States provide a broad array of ecosystem services, including wildlife/livestock forage, a diversity of native plants, pollinators, wildlife, and recreational activities. However, disturbances by wildfire, livestock, wildlife (e.g., undomesticated mammals), and humans (including recreational activities) have contributed to degraded conditions on much of America’s 800 million acres of rangeland. Many of these regions have been classified as severely disturbed and non-productive, resulting in the emergence of novel ecosystems (i.e., the emergence of species that occur in combinations and relative abundances that have not occurred previously within a given biome). Moreover, based on predicted climate change models for semi-arid regions, seasonal weather patterns of several environments in the western United States will likely change (e.g., warmer winters in the Great Basin and hotter, drier summers in the Mojave Desert), increasing the already high rate of rangeland and pasture degradation and resulting in the spread and dominance of invasive annual grass species, more frequent wildfires, and reduced forage productivity. In fact, currently available plant materials do not often display the degree/type of traits required to persist in novel ecosystems. Thus, in water-limited environments of the western United States, there is a need to develop grasses, legumes, and forbs that will establish under drought, compete with invasive weeds, and persist with adequate productivity and quality to meet the needs of wildlife populations and livestock throughout the year.

The U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS), Forage and Range Research Laboratory (FRRL) in Logan, Utah has historically provided improved...