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Viewpoint: An Alternative Management Paradigm for Plant Communities Affected by Invasive Annual Grass in the Intermountain West

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On the Ground

- Over 400,000 km2 of the Intermountain West is colonized by cheatgrass and other annual grasses.
- Planning and management actions designed to foster perennial grass health throughout the region have never addressed how annual grasses would respond.
- For decades, the most significant landscape-level management approach toward invasive annual grasses has been to complain.
- We now know how to begin the process of taking the Intermountain West back from the domination of invasive annual grasses: through the management of standing dead litter.
- Sustaining perennial bunchgrasses at landscape scales will require an integrated ecological approach to fuels management.

Keywords: Bromus tectorum, Intermountain West, Great Basin, fuels management, invasive annuals, remnant perennial grasses.

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Nineteenth-century explorers Jedediah Smith,[1] Peter Skene Ogden,[2] and James H. Simpson[3] travelled across the Great Basin between 1820 and 1860. They encountered and described a number of geographic, fluvial, riparian, human, wildlife, and vegetation features present throughout the region. They did not record/report any annual grasses that ecologists currently consider invasive, nonindigenous species in what is now Nevada and Utah. Nonindigenous annual grasses may have certainly been present in California by that time, but their impactful migration eastward was still decades away. Moreover, phytogeographers generally agree that the native floristic composition of the Intermountain Region is essentially the same today as at the beginning of the Pleistocene[4–6] (with the notable exception of single-leaf pinyon pine [*Pinus monophylla* Torr. & Frém]).[7] However, internal migration and changes in abundance of species have occurred, with respect to elevation, latitude and longitude, in response to climatic changes during glacial–interglacial periods.[8–10] The current suite of native species is the same suite of species that Smith, Ogden, and Simpson saw on their expeditions, although changes in abundance are probable.

Fire intervals during and just prior to European expeditions into the area were a product of vegetation characteristics influenced by Little Ice Age weather patterns,[11] uncontrolled grazing from native herbivores (including many species of small mammals and insects), and wildfire from both human and nonhuman ignitions.[12] In addition to grazing species such as jackrabbits and pronghorn antelope, bison were widespread in the Great Basin (probably as sink populations) until just before Europeans entered the region,[13] and abundant in eastern Idaho and eastern Oregon from the beginning of the Pleistocene until historic times.[14–16]

Fire intervals in the sagebrush steppe portions of the Great Basin have been estimated, where tree-ring data were in proximity to mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana [Rydb.] Beetle) communities, to be between 6 to 60 years, and these plant communities were neither fuel or ignition limited.[12] Wyoming big sagebrush (*Artemisia tridentata* Nutt. ssp. *wyomingensis* Beetle & Young) and low sagebrush (*Artemisia arbuscula* Nutt.) communities had less frequent disturbance events and slower recovery rates than mountain big sagebrush communities,[17] with fire return intervals in Wyoming big sagebrush communities reported to be from 100 to 240 years.[18] Ignition by indigenous peoples as

well as lightning both played a significant role in shaping the species composition (and their relative abundance) of some Great Basin ecological sites. However, the processes that sorted out native species compositions occurred prior to the advent of the annual grass invasion that began around 120 years ago.

Perryman et al. coined the phrase *pristine-management-paradigm* to describe the widely held concept that ecological systems are static entities that can be held in a static condition if they are literally protected from burning, grazing, and other disturbances.[19] The authors argued it was impossible to achieve societal objectives today based on landscape conditions that were present in 1800 A.D. Others have also stated that returning ecosystems to historical or pre-Euro-American settlement conditions by reintroducing historical disturbance may be detrimental or impractical.[20] Processes that created the landscape conditions of 1800 A.D. or any other previous time period have changed or been altered making their replication impossible. For example: Little Ice Age weather conditions have ended; uncontrolled grazing by wild ungulates presumably influenced by codependent predators is no longer possible or desirable; widespread burning by Native Americans is no longer practiced; and annual grasses have colonized many sagebrush and salt desert shrub communities, permanently altering plant community compositions. We believe that objectives for ecosystem management should instead focus upon specific measurable goals that society has determined are valuable under current ecological conditions (e.g., soil stability, biodiversity, wildlife habitat, forage production, etc.). Today's landscapes are not those described by Smith, Ogden, and Simpson. With over 400,000 km^2 colonized by cheatgrass (*Bromus tectorum* L.) and other annual grasses,[21] we believe it is time to declare: The *pristine-management-paradigm* has failed. Continued, wholesale application of this concept is misguided.

Management Practices of the Past

Although a healthy, resilient perennial grass understory is likely the single most important long-term assurance against invasive annual grass dominance, rangeland ecologists and managers have long applied science-based management practices that exclude consideration of the biology, ecology, and probable management effects these grazing systems would have on the non-native annual grass component of modern landscapes. For instance, the two major grazing systems employed in the Great Basin are deferred-rotation and rest-rotation. Both focus on meeting the physiological needs of grazed perennial grasses,[22,23] but their implementation throughout the region failed to address how annual grasses would respond. Authorized grazing of animal unit months (AUM) on public lands in the Great Basin focuses on allotment carrying capacities provided by only native perennial species (CFR 4110.2–2 Specifying grazing preference). Non-native annual grasses generally are not recognized, authorized, allocated, or normally considered in the development of district wide or allotment management plans. In fact, almost all management planning efforts and implementations are designed to manage perennial grass or palatable shrub species. The allocation of forage derived from annual grasses requires a separate Record of Decision based on an Environmental Assessment (CFR 4130.6–2 Nonrenewable grazing permits and leases) and is seldom granted.

Fuel breaks have received considerable attention for several decades, for reducing fire risks in and around annual grass-dominated plant communities. At best, this management tool, especially when applied as a stand-alone action, is only a stopgap measure to postpone the fire effects of annual grasses near areas still dominated by desired native species. All the while, annual grasses have become the ecologically dominant life form on upwards of 20,000 km^2 in the Great Basin.[24]

Over the past decade or so, a related movement toward an ecologically based weed management approach has spawned the development of potential new tools for the management of invasive annual grasses. Scientists are currently developing delivery methods for newly identified biological control agents. Undoubtedly, these tools will find useful and appropriate applications for yet undetermined situations and scales. The precise combination of chemical fallow and seeding with both native and non-native, deep-rooted perennial grasses and half-shrubs like forage kochia (*Bassia prostrata* L.) has provided success on many ecological sites and topographic settings, but only for a relatively small percentage of the entire affected area.[25] Likewise, grazing cheatgrass in the fall and early winter months, when perennial grasses are dormant, has demonstrated that managed livestock grazing can reduce carryover fuels going into the next year's fire season, while simultaneously reducing the ability of cheatgrass to dominate areas with a remnant perennial grass component (Figs. 1 and 2).[26,27] Managing cheatgrass with dormant season grazing has been successful on demonstration projects at a scale of thousands of acres in southeastern Oregon, on winter dominated precipitation sites (W. Dragt, B. Wilber, and S. Davies, personal communication, August, 2017).

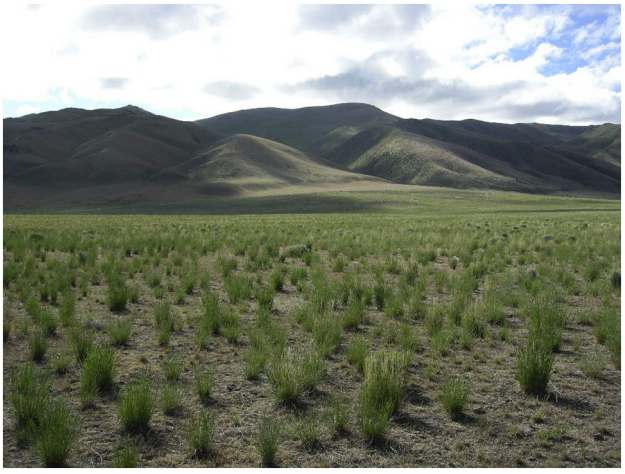

Figure 1. A mixed annual-perennial grass seeding during spring of 2009 that was fall grazed for 3 consecutive years (2006–2008), Gund Ranch, Nevada.