WESTERN GOVERNORS' ASSOCIATION

A Toolkit for Invasive Annual Grass Management in the West

JULY 2020

The Western Governors' Association (WGA) and the U.S. Department of Agriculture (USDA), under a Shared Stewardship Memorandum of Understanding (MOU), agreed in June 2019 to pursue an effort to meaningfully address the large-scale infestation of invasive annual grasses on western forests and rangelands. The spread of invasive annual grasses – such as cheatgrass, medusahead and ventenata – is causing major damage to western working lands. To date, many control efforts have been reactive, focusing on highly infested areas where control is more expensive and has a lower likelihood of success.

One product of this effort is a new toolkit for land managers working to combat the spread of invasive annual grasses in the West. The toolkit is comprised of three elements:

- A roadmap for invasive grass management in the West, with new best management practices for the identification, protection, and expansion of "core" areas – regions with relatively low, or no, annual grass invasion;
- Case studies highlighting the application of these practices in Idaho and Wyoming; and
- A new geospatial data layer (which uses analytical tools to compile existing federal data) to help state and local managers assess invasive annual grasses within their jurisdictions, while also offering opportunities to identify new cross-boundary collaborative projects.

The roadmap and data layer are designed for easy integration into local management plans and can be tailored by state and local managers to reflect local data, knowledge, capacities and priorities.

Roadmap

The Challenge

Cheatgrass (Bromus tectorum, or downy brome) and other invasive annual grasses are spreading across America's western rangelands, increasing wildfire size and frequency, reducing forage productivity, and threatening wildlife habitat and rural economies. More than 50 million acres are estimated to currently support more than 15 percent cover of cheatgrass, which was accidentally introduced to the U.S. in the 1800s, making it one of the single largest threats to the health and resilience of western working lands. Although not as pervasive or well-known, other exotic annual grasses, like medusahead (Taeniatherum caput-medusae) and ventenata (Ventenata dubia), are also increasing and may be even more problematic than cheatgrass if left unchecked.

Many past efforts to manage cheatgrass and other invasive annual grasses have been reactive, focused on areas where invasive grass infestations are already extensive, and lacking an emphasis on cross-boundary management. Science shows that invasive species control is more effective and cost-efficient when done early, before infestations become widespread, and when management is coordinated across jurisdictional boundaries. This roadmap articulates a new approach to tackling invasive annual grasses in the West, one that fosters early and targeted cross-boundary coordination to proactively address the problem in relatively uninfested core areas. This approach provides a common set of guiding principles for invasive annual grass management that state and local land managers can tailor to account for unique conditions and capacities.

A Path Forward

Under the 2018 Shared Stewardship Memorandum of Understanding between WGA and USDA, the Western Governors-appointed Western Invasive Species Council (WISC) convened a cheatgrass committee to develop a toolkit for invasive annual grass management across the West. The committee included representatives from the U.S. Forest Service, the USDA Natural Resources Conservation Service (NRCS), the Bureau of Land Management, the U.S. Fish and Wildlife Service, the U.S Geological Survey (USGS), and representatives from western state agencies, land grant universities and stakeholder groups. Leveraging new technology and insights from state-based solutions emerging in Idaho and Wyoming, the committee developed tools that emphasize proactive and preventative management. The toolkit will support land managers as they work to identify and protect remaining intact "core" areas from annual grass conversion so that the invasions do not spread and create even more wildfire risk and management burden.

This document contains a first-of-its-kind roadmap for invasive annual grass management. The roadmap principles are not intended to be prescriptive, but rather to generate regional conversations, programmatic

Photo: Audubon Society

planning, and coordinated action for cross-boundary management. State and local managers can incorporate the roadmap into local management plans, using local knowledge and data with information and criteria to identify new management opportunities.

A New Conceptual Model

We know that, in medicine, prevention and early treatment are more effective than waiting until a problem is advanced and requires emergency care. Similarly, prevention, early detection and rapid response tactics are preferred when controlling invasive species. While this model has been successfully deployed locally against invasive annual grasses in many instances, the concept has not been consistently applied to species such as cheatgrass at a large scale in relatively uninfested core areas. The proposed roadmap leverages what we know about the landscape extent of invasive annuals to devise a proactive approach for tackling the problem (Fig. 1).

Viewing the landscape based on the relative amount of invasive annual grasses can inform a new conceptual model: "**Defend the Core, Grow the Core, Mitigate Impacts**." Key elements of this approach:

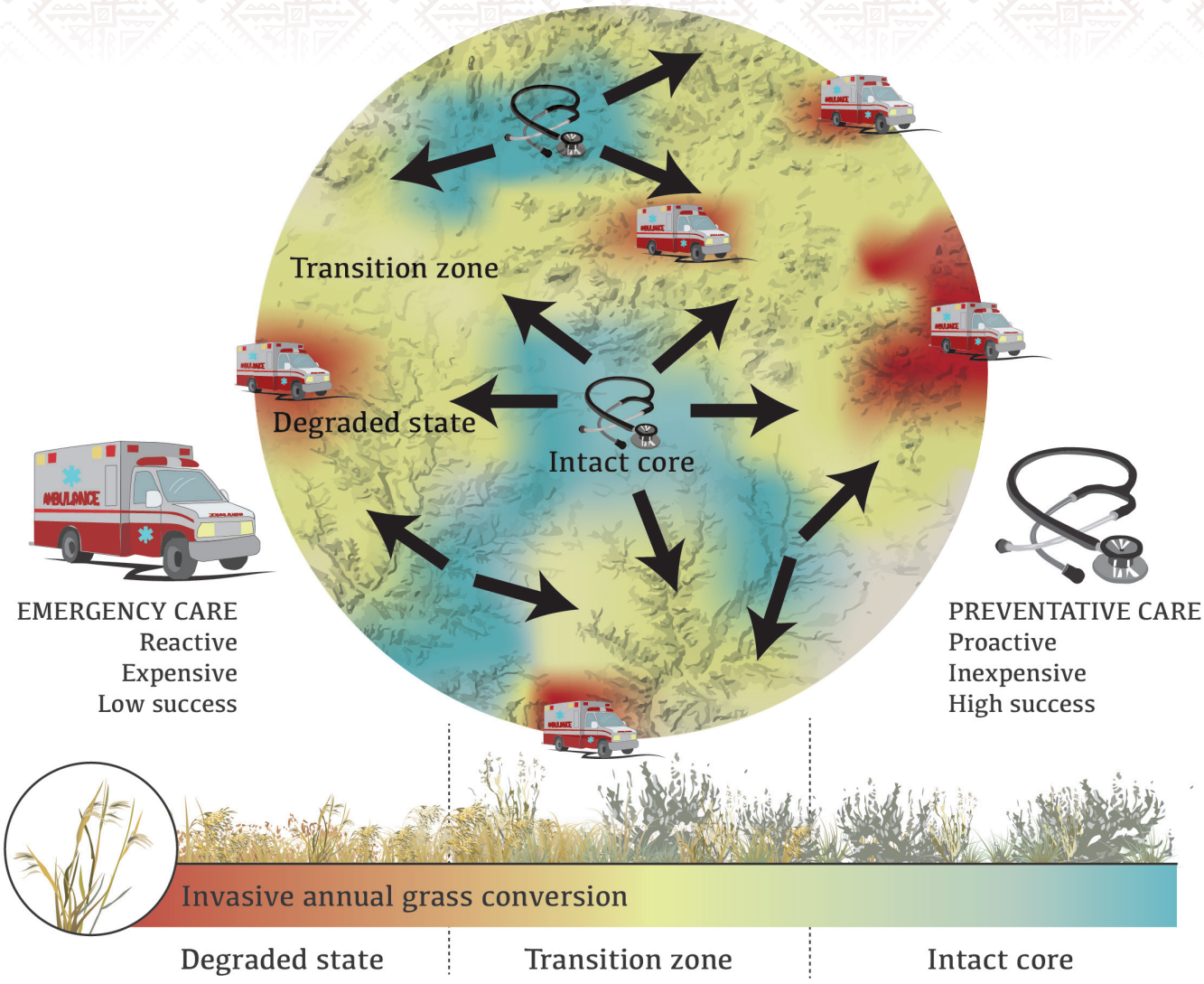
1. **Defend the Core.** Defending large cores from annual grass conversion is a top priority for management. Prevention, early and aggressive management of annual grass invasions, and promotion of a healthy perennial system is needed to maintain and build resistance and resilience of cores.

2. **Grow the Core.** While cores are being defended, strategies also should be deployed to grow the core by pushing back the adjacent invasion spread in the transitioning zone. A sustained and multifaceted effort of aggressive management, including large-scale restoration, is needed in these areas to halt and reverse the regional spread of annual grass conversion.

3. **Mitigate Impacts.** Perpetual management will be required in degraded annual grass areas to mitigate the most severe impacts of the invasive annuals on life and property. Primary actions in these areas include asset protection, spread containment, fine fuels reduction, fuel breaks, fire suppression, and rehabilitation and maintenance of perennial grasses.

Of critical importance in this roadmap is identifying relatively intact "core" areas. Core areas represent

Fig. 1. Conceptual illustration of how the extent of annual grass invasion can be used in a new model for proactive management.



Credit: USDA-NRCS, Working Lands for Wildlife

regions with relatively low, or no, annual grass invasion. Local areas of higher annual grass invasion may be present, but the overall level of invasion in the area is relatively low. Core areas serve as anchor points for conservation and restoration. Local management in these areas will be less costly and more successful at maintaining healthy rangelands in the long run because of the favorable landscape context.

Conversely, heavily invaded regions dominated by moderate-to-high amounts of invasive annual grasses may have already converted to a degraded state. Local areas of lower annual grass invasion may be present, but their long-term integrity is compromised by occurring in a setting of higher invasive annuals. Frequent fires and reinvasion from neighboring areas makes it difficult and costly to maintain these areas as healthy rangelands.

Without aggressive management, zones between cores and heavily invaded areas are vulnerable to transitioning into degraded states. Addressing these important areas is critical to stem the tide of annual grass conversion, but they are also areas of high unpredictability for management success due to site conditions, disturbance, and the rapid change that may be occurring.

The new data layer is primarily designed to illustrate the distribution of cheatgrass and other invasive annuals. Detecting very early invasions in areas where species were not known to previously exist requires more intensive surveys and monitoring. Invasive annual grasses such as medusahead and ventenata may not yet exist in certain states or counties. Still, a similar proactive approach can be applied to address these more narrowly distributed species where detailed inventories of those invasions are available. Eradication, containment and aggressive management of new invasions is essential to protect healthy cores. In such situations, adapting Early Detection-Rapid

Response (EDRR) approaches to defending core areas may provide the best opportunities to proactively manage invasive species with limited distributions. Local expert knowledge can guide decisions based on species-specific threats and opportunities to minimize further degradation of core or core-transitional areas.

While the roadmap emphasizes the importance of proactive management of intact areas and identifies a preferred direction of action, it acknowledges that continued management across all lands will be needed. The new geospatial data layer (Fig. 4) can provide a context for land managers as they identify actions within this model.

Case Studies

State and local managers interested in applying the roadmap can be aided by the new data layer discussed below, as well as local knowledge and data. Two state case studies, focused on species with different distributions that require customized approaches, illustrate the flexibility of this framework.

Idaho's Cheatgrass Challenge (Fig. 2) offers the first example. Cheatgrass is already widespread in Idaho, and landscape-scale data on annual herbaceous cover provided local land managers with a tool to identify relatively intact cores and adopt a proactive statewide management strategy. In this instance, efforts prioritize protection and active management within the multiple statewide cores to protect the suite of ecosystem goods and services provided by relatively uninvaded rangelands. Within the already-impacted "Annual Grass Region" along the Snake River Plain, management expectations and tactics shift to mitigating large-scale impacts and developing alternative, long-term management strategies to reduce probabilities of catastrophic events leading to further harm and ecological degradation. When coupled with local data, such spatial prioritization schemes illustrate the

Fig. 2. Example of the use of this model for a widely-distributed species being implemented in Idaho's Cheatgrass Challenge.

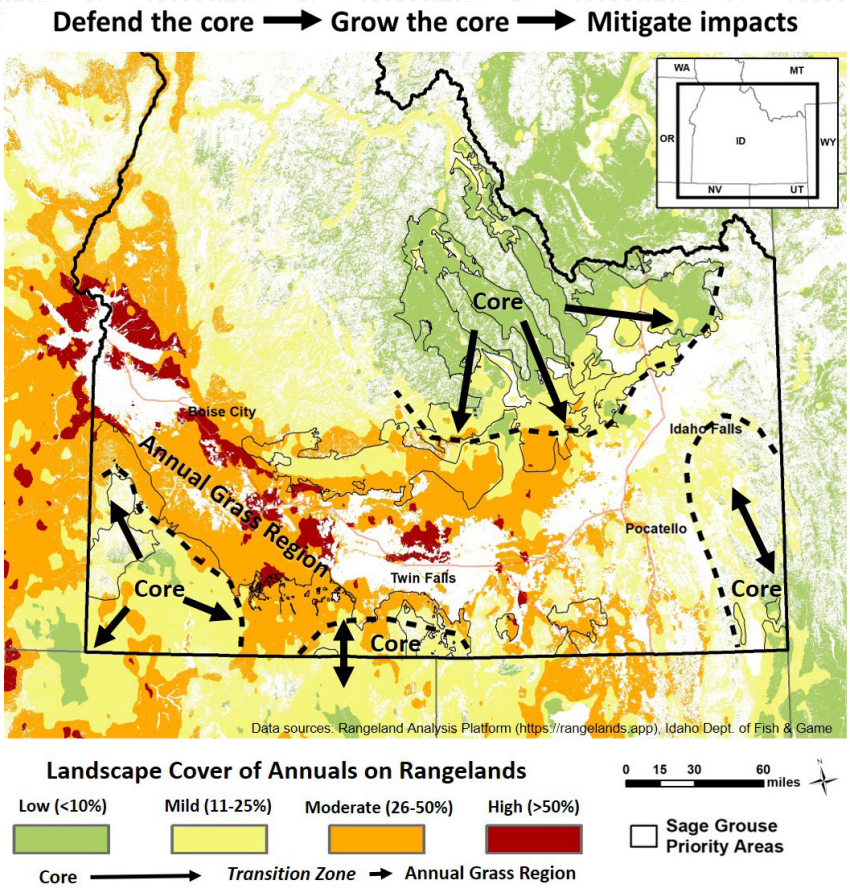
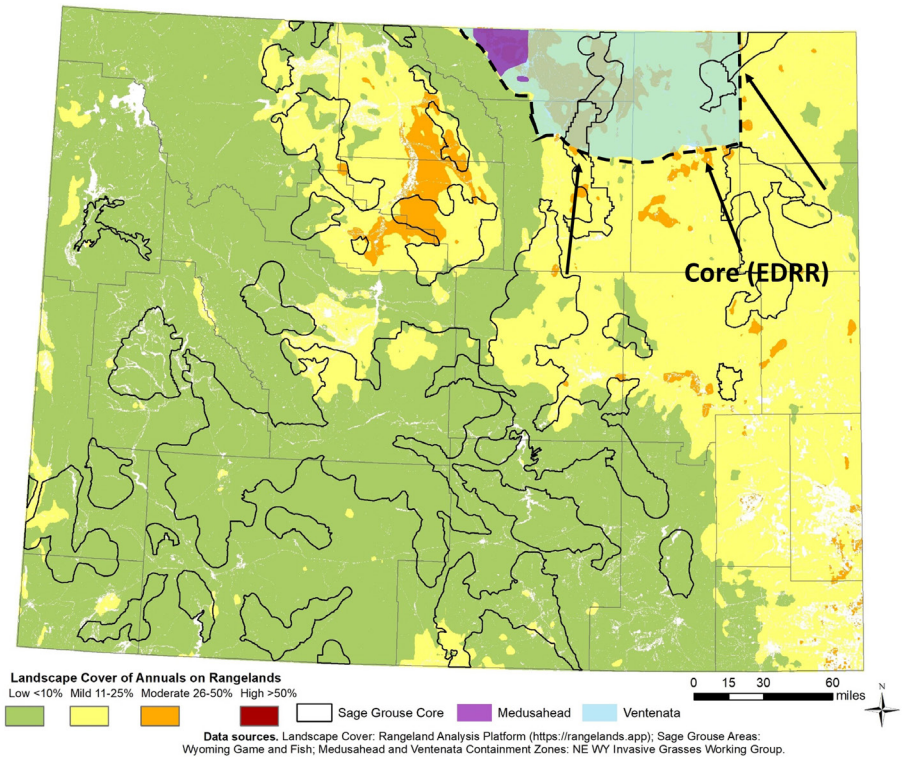


Fig. 3. Example of the application of this model for two narrowly-distributed invasive annual grasses being implemented in Wyoming: medusahead (purple polygon) and ventenata (blue polygon).



potential strength of the "Defend the Core, Grow the Core, Mitigate Impacts" principles.

A second example, from Wyoming, illustrates how the same principles can be applied to newly emerging invasive annual grasses where local distribution data are available (Fig. 3). In this situation, opportunities still exist for eradication or containment, thereby preventing the spread of invasives across a larger landscape. Wyoming's example, focused on medusahead and ventenata, filters this model through the lens of those species with relatively limited distribution (current mapped medusahead is <1% of the state's surface). Species-specific distribution data identify opportunities to establish a containment zone around known medusahead and ventenata populations (shown in purple and blue) to defend and grow the "core" (most of the state) that is susceptible to invasion but not yet colonized by these species. In this case, the landscape map of annuals is better informed with local data on the distributions of these new annual grass invaders to inform spatial prioritization.

With both examples, successful implementation of the proactive model hinges on community-based partnerships banding together to coordinate actions across boundaries, develop locally tailored prescriptions, and leverage resources to achieve a common goal. The statewide approach provides a common vision for partners to work towards, but provides flexibility to incorporate additional information at the local level to determine how best to prioritize specific projects.

Data Layer

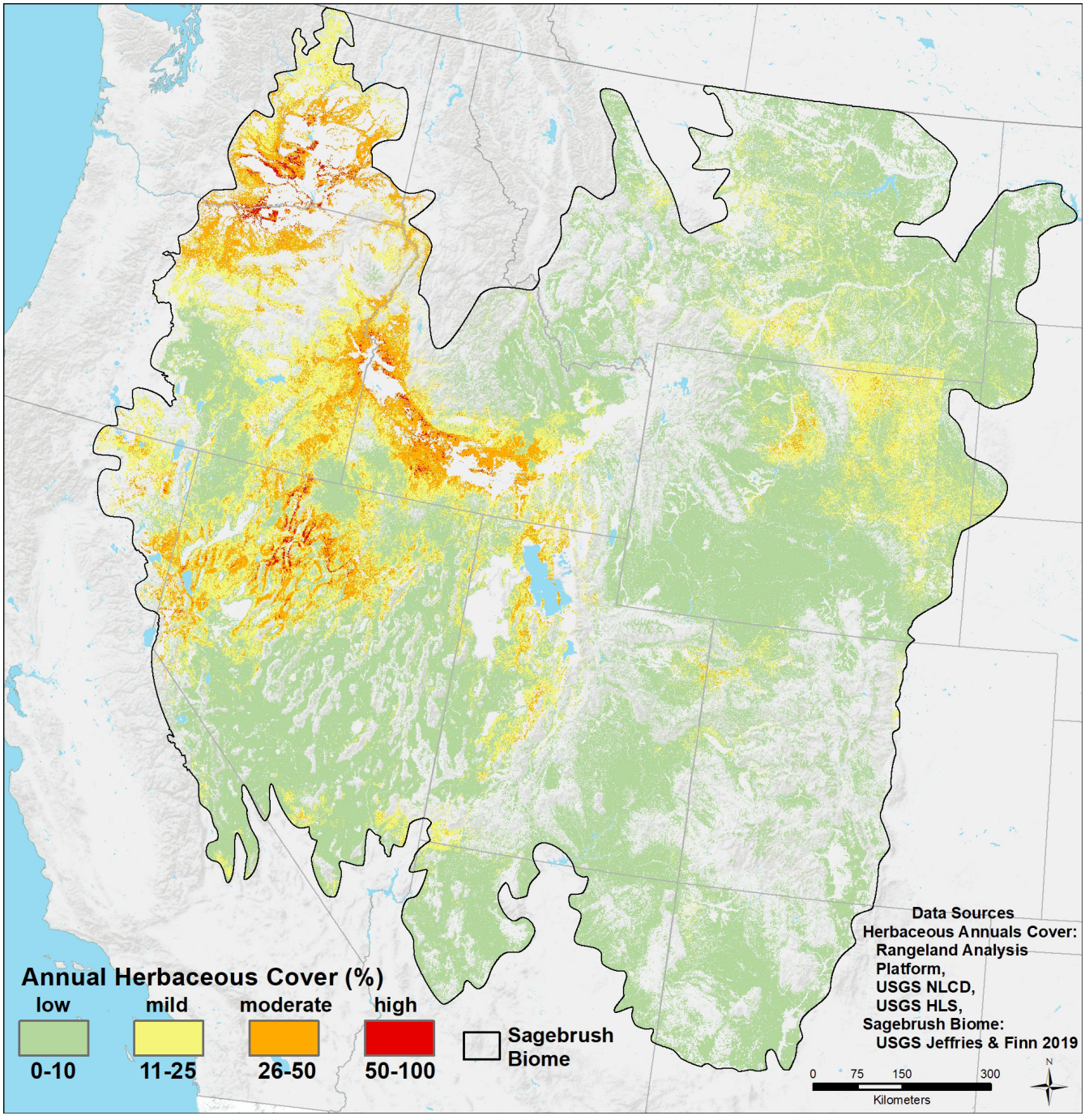
The committee developed a new data layer depicting the extent of annuals on rangelands across the sagebrush biome (Fig. 4). By combining existing, publicly available data from the NRCS and the USGS, it is now possible to characterize the landscape based on the relative level of annual grass invasion across large areas. The new data layer brings together three cutting-edge remote sensing data products, available across large geographies and through time, to provide a single estimate of the cover of herbaceous annuals at 30-m resolution (https://rangelands.app/cheatgrass/). Green areas represent relatively low cover of annuals, while warmer colors indicate increasing amounts of annuals, with red representing annual dominated areas.

An important caveat is that this data layer depicts all annual herbaceous plant species (grasses and forbs,

native and exotic) not just invasive annual grasses. Nevertheless, annual herbaceous plant cover provides a useful, coarse-scale, surrogate for invasive annuals on arid rangelands where native annuals typically represent a small proportion of the persistent vegetation cover most years.

Cheatgrass has a wide distribution, occurring in all 50 U.S. states, but its impacts are not equal everywhere. This data layer focuses on rangelands of the Intermountain West, where invasive annual grasses have been most problematic and are resulting in wholesale loss of native grass and shrublands. Other ecosystems, such as western dry forests, are also susceptible to negative impacts from annual grass invasion. However, the remote-sensing maps of annual herbaceous cover may not be as useful a surrogate for invasive annuals in higher productivity systems where annuals are naturally more abundant. State and local managers can continue to seek to clearly understand species-level distributions of invasive annuals and threats and include such knowledge into the model described in this document.

Fig. 4. Percent cover of herbaceous annuals on rangelands across the sagebrush biome during the time period 2016-2018. Non-rangeland areas, such as, forests, bare ground, crops, and development have been excluded.



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