SPATIAL PRODUCTS & RESOURCES FOR

INVASIVE ANNUAL GRASSES

SPATIAL DATA

A Sagebrush Conservation Design to Proactively Restore America's Sagebrush Biome

https://www.sciencebase.gov/catalog/item/62d57e89d34e87fffb2dda62

These data were compiled as a part of a landscape conservation design effort for the sagebrush biome, and are the result of applying a spatially explicit model that assessed geographic patterns in sagebrush ecological integrity and used these results to identify Core Sagebrush Areas (CSAs), Growth Opportunity Areas (GOAs), and Other Rangeland Areas (ORAs). These data represent the estimated integrity of sagebrush ecosystems, estimated from a spatial model that assigns high integrity to areas with abundant big sagebrush and perennial grass/forb cover and with minimal annual grass/forb cover, minimal conifers, and minimal human modification. This spatial model was applied over the entire sagebrush biome for several time periods and were estimated for 5 historical time periods between 1998 and 2020, and for one future time period (2030-2060). This approach to estimating ecological integrity was developed by consultation with experts from across the biome, allowing for the relationship between integrity and plant cover to vary among regions, as described in Doherty et al (2022).

INHABIT: A web-based decision support tool for invasive plant species habitat visualization and assessment across the contiguous United States

https://www.usgs.gov/centers/fort-collins-science-center/science/inhabit-a-web-based-decision-support-tool-invasive

INHABIT provides practical information for over 200 invasive plant species, including downloadable maps and detailed tabular summaries of invasion risk for over 4,000 management units for federal land management agencies and U.S. counties. The maps can help prioritize control efforts by providing information on the scope of potential invasions and providing national and regional context to local invasions. Summaries of invasion risk and distance to known populations within focal management units can inform watch list creation for EDRR activities.

Land Treatment Exploration Tool

https://www.usgs.gov/apps/land-treatment-exploration-tool/

The Land Treatment Exploration Tool, provided by the U.S. Geological Survey, is designed for land managers to use when planning land treatments and rangeland restoration projects. It compiles information from various sites, providing map layers that include past treatments from the Land Treatment Digital Library, wildfire history, and climate and soil data. For example, a land manager could explore past treatments similar to one being planned on a similar site in the future to evaluate the feasibility and efficacy of certain treatments.

Mean Annual Herbaceous Cover for the Sagebrush Biome, USA (2020 - 2022)

https://zenodo.org/records/7876394

Mean annual herbceous cover for the years 2020 - 2022 using only cover data from the Rangeland Analysis Platform. Data coverage includes all rangelands within the U.S. sagebrush biome. This product used the Rangeland Analysis Platform V3 cover product from years 2020, 2021, and 2022. A mean composite was generated from the yearly raster data using the 'annual herbaceous functional type' (AFG) layer, representing percent cover of annual forb and grasses. The methodology for producing the cover product is described in Allred et al. 2021. Cover error for AFG in RAP Cover V3 was 7.0% (MAE) and 11.0% (RMSE). More information can be found at https://rangelands.app/products/. The data is clipped to the extent of the sagebrush biome using the data from Jeffries and Finn (2019).

Rangeland Analysis Platform (RAP)

https://rangelands.app/

The Rangeland Analysis Platform uses satellite imagery along with a multitude of vegetation measurements to map vegetation across the U.S., with measurements going as far back as the 1980s. This includes perennial and annual forbs and grass, shrubs, trees, as well as bare ground. RAP also allows users to see how vegetation has changed throughout the growing season.

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Threat-based ecostate maps https://tools.oregonexplorer.info/OE_HtmlViewer/index.html?viewer=sagegrouse

Threat-based ecostate maps depict sagebrush rangeland condition and trend across the sagebrush biome. Based on the principles of Threat-Based Land Management (https://sageshare.org/), ecostates provide coarse bins of vegetation condition based on primary ecosystem-level threats from invasive annual grasses, conifer encroachment, and wildfire. The most recent map displays a snapshot of rangeland condition for 2021-2023, and a time series from circa 1990 to present depicts trend over time. Ecostates are mapped as 30m pixels based on percent cover of annual forbs & grasses, perennial forbs & grasses, shrubs, and trees from the Rangeland Analysis Platform vegetation version 3 cover products. Agriculture, barren areas and urban areas are excluded. These maps were originally developed for sagebrush rangelands in Oregon and have since expanded to the sagebrush biome; use caution in applying this model in areas that are not current or historic sagebrush steppe.

COMPILATION

Invasive Annual Grass (IAG) Spatial Dataset Compilation and Synthesis https://www.usgs.gov/centers/fort-collins-science-center/science/invasive-annual-grass-iag-spatial-dataset-compilation

Summary of spatial datasets that describe measurable aspects of invasive annual grasses (e.g., biomass or presence) across the western United Stated and beyond. Products include a data viewer, compendium that describes each product, and user guide for selecting annual grass spatial products.

Invasive Annual Grass Spatial Data Products https://www.sciencebase.gov/catalog/item/6108b1bad34ef8d70565fa8c

A detailed comparison of various invasive annual grass spatial products. Includes specifics on spatial data extent, resolution, recentness, update frequency, intended use, modeling approach, model covariates, and accessibility.

ARTICLES

A Framework for Conservation Action in the Sagebrush Biome https://www.wlfw.org/wp-content/uploads/2022/11/SagebrushFramework.pdf

Article by USDA-NRCS's Working Lands for Wildlife initiative outlines a framework for the sagebrush biome which addresses threats such as annual grass invasion, conifer encroachment, land conversion, and riparian/meadow degradation. This includes proactive management approaches to invasive annual grasses, focusing on defending and growing "core" sagebrush areas with little to no annual grasses.

A Sagebrush Conservation Design to Proactively Restore America's Sagebrush Biome https://www.usgs.gov/publications/a-sagebrush-conservation-design-proactively-restore-americas-sagebrush-biome

Utilizes remotely-sensed land cover data to create maps of sagebrush rangeland condition and landscape threats, which then help determine where conservation actions are most needed. The study shows an average of 1.3 million acres per year have transitioned to "other rangeland areas," that is, areas primarily dominated by invasive annual grass, in the last two decades. This indicates that targeted restoration and management is needed at a greater scale to offset this loss

A User Guide to Selecting Invasive Annual Grass Spatial Products for the Western United States Background https://pubs.usgs.gov/publication/fs20223001/full

An article that describes spatial data resources for invasive annual grass and highlights characteristics and considerations that user's should be aware of. Gives a good background on spatial data basics, considerations, accuracy assessments, and spatial data product tradeoffs.

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ARTICLES

Bridging the Gap Between Spatial Modeling and Management of Invasive Annual Grasses in the Imperiled Sagebrush Biome

https://www.sciencedirect.com/science/article/pii/S1550742422000069?via%3Dihub

This article describes the challenges managers face translating invasive annual grass spatial products into management action. Spatial products are increasing in spatial and temporal resolution and even invasion severity, invasive annual grass spatial product utilities are limited by the time required for managers to find, compare, understand, and operationalize spatial data products.

Defend the core: Maintaining Intact Rangelands by Reducing Vulnerability to Invasive Annual Grasses

https://www.sciencedirect.com/science/article/pii/S0190052821001231

Explores the concept of "defending the core," and highlights management steps to protect core sagebrush rangeland from annual grass invasion in the context of a vulnerability-based model. These steps include: limiting exposure to annual grass seed sources; improving resilience to disturbance and resistance to invasion through the promotion of perennial grasses; and increasing the capacity of communities and partnerships to adapt to changing conditions/climate and to respond to the issue of annual grass invasion in a timely way.

Guiding Principles for using Satellite-Derived maps in Rangeland Management

https://www.sciencedirect.com/science/article/pii/S0190052821000845

Articulates opportunities and limitations of satellite imagery, and outlines principles for using these maps in rangeland management. These include using maps with clear objectives and within a decision-making framework; embracing and using maps to better understand the heterogeneity of the landscape; and approaching error and contradictions from a different perspective.

Satellite-derived plant cover maps vary in performance depending on version and product

https://www.sciencedirect.com/science/article/pii/S1470160X23010920

An article that compares and contrasts the accuracy of commonly used rangeland vegetation cover products including RAP, RCMAP, LandCart, and field based methods. Specifically, the article 1) evaluates r2 agreement between versions of each satellite-derived product and plot-level field data and 2) assesses relative standard error of agreement in cover between LandCart and continuous field-based Empirical Bayesian Kriging (EBK) regression models. Agreement between satellite- compared to field-plot values of cover (r2) increased for RCMAP Version 5.0 compared to Version 2.0, but there were negligible changes between versions of RAP. Despite this, r2 values of RCMAP and LandCart were nearly always less than RAP.

Threat-Based Ecostate Mapping Storymap

https://storymaps.arcgis.com/stories/5b3558b88d6f494f94a5236ca8bc3345

A storymap describes threat-based ecostate maps in an easily interpretable and visual format, including their conceptual framing, definitions of each ecostate, a description of how maps were built, applications, limitations, and information about how to access maps in multiple formats.