

SageCon Invasives Initiative Geographic Strategy: Technical Documentation

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Introduction

The SageCon Invasives Initiative takes a strategic approach to invasive annual grasses in Oregon through a collaborative, multi-stakeholder group coordinated by the [SageCon Partnership](#). This document provides technical documentation for the SageCon Invasives Initiative geographic strategy. The geographic strategy contains multiple components, including a **Management Strategy Map** and **Generalized Strategy Map**. For context and background about the geographic strategy, see the Management Guide on the [Invasives Initiative website](#). This documentation describes **version 1** of the geographic strategy maps, released in October 2020. The maps may change over time as they are field tested.

Components of the Geographic Strategy

The geographic strategy contains multiple components for different audiences and scales, including a **Management Strategy Map** and **Generalized Strategy Map**. The Management Strategy Map was built first, and the Generalized Strategy Map is a simplification of the Management Strategy Map. The geographic strategy combines both biotic (herbaceous composition) and abiotic (resilience and resistance) components. **Herbaceous composition** is characterized by both annual (undesirable) and perennial (desirable) herbaceous cover, emphasizing not only the amount of annual herbaceous cover but also the key role of perennial grasses in stabilizing sites and lowering restoration costs. **Resilience and resistance** maps identify soils and climatic conditions that influence recovery potential after disturbance, informing the level restoration intervention that may be needed (Chambers et al 2014). Combining information on biotic and abiotic condition allows a finer-tuned approach to identifying management need as well as restoration potential.

Biotic component: Herbaceous composition map

Inputs: [Rangeland Analysis Platform](#) (RAP) version 2 (released in July 2020) **annual forb & grass cover** (AFG) and **perennial forb & grass cover** (PFG) maps. Note that shrub and tree cover were not considered in this rule set for simplicity, but shrub and tree cover maps are included in the geodatabase delivered with the maps for use in management planning.

Steps:

1. Averaged cover values from years 2015-2019 using cell statistics for AFG and PFG rasters. Cover values were averaged over a 5-year time frame to provide a recent snapshot of AFG and PFG over both wetter and drier years, as herbaceous cover varies widely from year to year with weather conditions. The Int function was used to convert fractions to integers, and maps were clipped to southeastern Oregon, projected, and non-rangeland vegetation types excluded.
2. Calculated AFG:PFG ratio using the Divide function. Using the ratio of AFG to PFG cover incorporates both undesirable (AFG) and desirable (PFG) herbaceous components and adjusts for differences in site productivity and overall biomass potential more effectively than absolute cover thresholds.

3. Applied the following rule set to create four classes, ranging from high herbaceous composition (perennial-dominated) to low herbaceous composition (annual-dominated). The rule set is outlined below with brief notes about how the thresholds were selected. Thresholds were developed by a technical team and reviewed by experts, but it is important to note that all thresholds are approximate and no threshold will work well in all areas. Thresholds may be adjusted over time to better represent the landscape. Individual AFG and PFG cover maps are also provided with the spatial data download as supplemental data layers for use in management planning.
 - a. **High herbaceous composition** (perennial-dominated) – AFG:PFG ratio ≤ 0.33 . *Notes: This category identifies areas with 3 times more perennials than annuals, which captures areas with both $>20\%$ PFG and $<10\%$ AFG, while also including areas with low overall grass cover but very little annual invasion. In some places, areas with very sparse herbaceous cover overall but low AFG cover may not meet this criteria and be classified as Fair despite the low prevalence of annual grasses.*
 - b. **Moderate herbaceous composition** – AFG:PFG ratio between 0.33 and 1.0, and PFG cover $\geq 20\%$. *Notes: This category identifies locations with an intermediate AFG:PFG ratio (between 0.33 and 1), which also have at least 20% perennial herbaceous cover. 20% perennial cover was used as a rough indication that bunchgrasses are adequate to naturally recover after disturbance, and is commonly used as a post-fire recovery benchmark in Oregon (depending on site potential).*
 - c. **Fair herbaceous composition** – AFG:PFG ratio between 0.33 and 1.0, and PFG cover $<20\%$. *Notes: This category identifies locations with an intermediate AFG:PFG ratio (between 0.33 and 1) and less than 20% PFG, where perennial grass cover may be too low for natural recovery after a disturbance (depending on site potential).*
 - d. **Low herbaceous composition** (annual-dominated) – AFG:PFG ratio >1.0 . *Notes: This category identifies areas where AFG cover exceeds PFG cover, which generally corresponds to locations with very high ($>40\%$) AFG cover. It also includes some very dry sites with sparse cover that are dominated by AFG. There may be areas that are just over the 1.0 threshold that should be considered in fair condition, but increasing this ratio to 2 omitted large areas that are heavily impacted by AFG.*

Abiotic component: Resilience and Resistance (R&R)

Resilience and resistance (R&R) is a widely accepted concept to capture resistance of rangeland ecosystems to invasion by invasive annual grasses and resilience to wildfire at broad scales (Chambers et al 2014). The rangelands in southeastern Oregon vary widely in R&R based on soils, climate, elevation and related factors, and R&R affects the type of management intervention that may be successful.

Input: Updated resilience and resistance (R&R) map for Oregon provided in August 2020 by Steve Campbell, Natural Resources Conservation Service West National Technology Support Center. This R&R map improved upon a western US-wide map ([Ecosystem R & R Classes gridded data](#)) by incorporating newer soil surveys from SSURGO and STATSGO (see citations at the end of this document).

Steps: The map acquired in 2020 was classified into low, moderate and high R&R classes as attributed by NRCS. Mesic, wetland and riparian categories were omitted, as this map focuses on upland areas. Where gaps existed in the new map, values were filled from the west-wide map. There were only a few areas where gap filling was necessary.

Constructing the Management Strategy Map

To create the Management Strategy Map, the herbaceous composition (biotic) and R&R (abiotic) rasters were combined to produce 12 unique combinations. This was done by reclassifying values in each input raster and summing the values into unique combinations. The resulting 12 combinations were classified into five management categories, shown in the matrix and list below.

The attribute table included with the Management Strategy Map raster contains the management category (Mgt_Categories, shown above), herbaceous composition classes (Herb_Comp), R&R classes (Resist_Resil), and the herbaceous composition x RR combined name (Herb_RR).

		Herbaceous Composition			
		High	Moderate	Fair	Low
Resilience and Resistance (R&R)	High				
	Moderate				
	Low				

1. **Core:** High herbaceous composition, all levels of R&R.
2. **Transitioning - high uplift potential:** Moderate herbaceous composition, high or moderate R&R.
3. **Transitioning - low R&R:** Moderate or fair herbaceous composition, low R&R.
4. **Transitioning - low perennials:** Fair herbaceous composition with high or moderate R&R; low herbaceous composition with high R&R.
5. **Degraded:** Low herbaceous composition with low or moderate R&R.

Generalized Strategy Map

The Generalized Strategy Map was created as a simplified version of the Management Strategy Map. The map was simplified both thematically (fewer classes) and spatially in three steps:

1. Reclassified the three “transitioning” (green, orange and yellow) classes into one class.
2. Spatially generalized the map using focal statistics (majority class) within a circular 30-cell radius. This was done to reduce the level of speckling in the map from individual pixel values and help the viewer identify broad patterns.
3. Removed non-rangeland pixels and projected the map.

Map Delivery

Maps are provided in a geodatabase **Invasives_Geographic_Strategy_Oct_2020.zip** posted on the [Invasives Initiative website](#). The geodatabase includes the following files:

- **Invasives_Geographic_Strategy_2020_10_01.gdb** – geodatabase containing spatial data
 - **Invasives_Generalized_Strategy_Map_v1:** Generalized Strategy Map
 - **Invasives_Management_Strategy_Map_v1:** Management Strategy Map – attributes include:

- Mgt_Categories: Management categories (5 classes)
- Herb_Comp: Herbaceous composition (4 classes)
- Resist_Resil: R&R (3 classes)
- Herb_RR: Unique combination of herbaceous composition and R&R (12 classes)
- **RAPv2_AFG_2015_2019_Mean**: RAP AFG 2015-2019 average (average value over a 5-year span to minimize interannual variability). Values are predicted percent cover.
- **RAPv2_PFG_2015_2019_Mean**: RAP PFG 2015-2019 average (average value over a 5-year span to minimize interannual variability). Values are predicted percent cover.
- **RAPv2_Shruh_2019**: RAP Shrub 2019. Values are predicted percent cover. This map was not used to build the geographic strategy map but is included as a supplemental data layer.
- **RAPv2_Tree_2019**: RAP Tree 2019. Values are predicted percent cover. This map was not used to build the geographic strategy map but is included as a supplemental data layer.
- Invasives_Generalized_Strategy_Map_v1_layer – layer file for display of generalized strategy map consistent with documentation.
- Invasives_Management_Strategy_Map_v1_layer – layer file for display of management strategy map consistent with documentation.
- Invasives Geographic Strategy v1 Technical Documentation – this document.

Citations for Data Sources

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Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database for Oregon. Available online. Accessed August 2020. Draft SSURGO data were used for parts of Crook, Grant, Malheur, and Wheeler Counties.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. U.S. General Soil Map (STATSGO2) for Oregon. Available online. Accessed August 2020.

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