

Decision Tree for Managing Rangeland Health Against Invasive Annual Grasses

For more information scan the QR code or visit oregon.gov/oda/weeds/pages/rangeland-health.aspx

June 2026



We are losing an average of 1.3 M acres of functional rangelands each year in the sagebrush biome, largely driven by invasive annual grasses (IAGs). This document intends to empower rangeland managers and practitioners to explore treatment options by providing a broad overview of management strategies where rangelands are vulnerable to IAGs. The decision tree below walks through key questions with generalized, science-based information where available (e.g., % cover thresholds) to inform decisions, leading to management strategies with potential actions on the reverse side.

Consult local weed experts when using this document.



IAGs are widespread and entrenched in many western rangelands; **approach management with long-term goals** and an adaptive mindset. Ongoing vigilance, monitoring, and management will be necessary for durable outcomes.



Work with neighbors to expand areas of good condition and make IAG control more effective.



Manage site to promote perennial grass (PG) health and vigor - healthy perennial vegetation helps keep IAGs out.

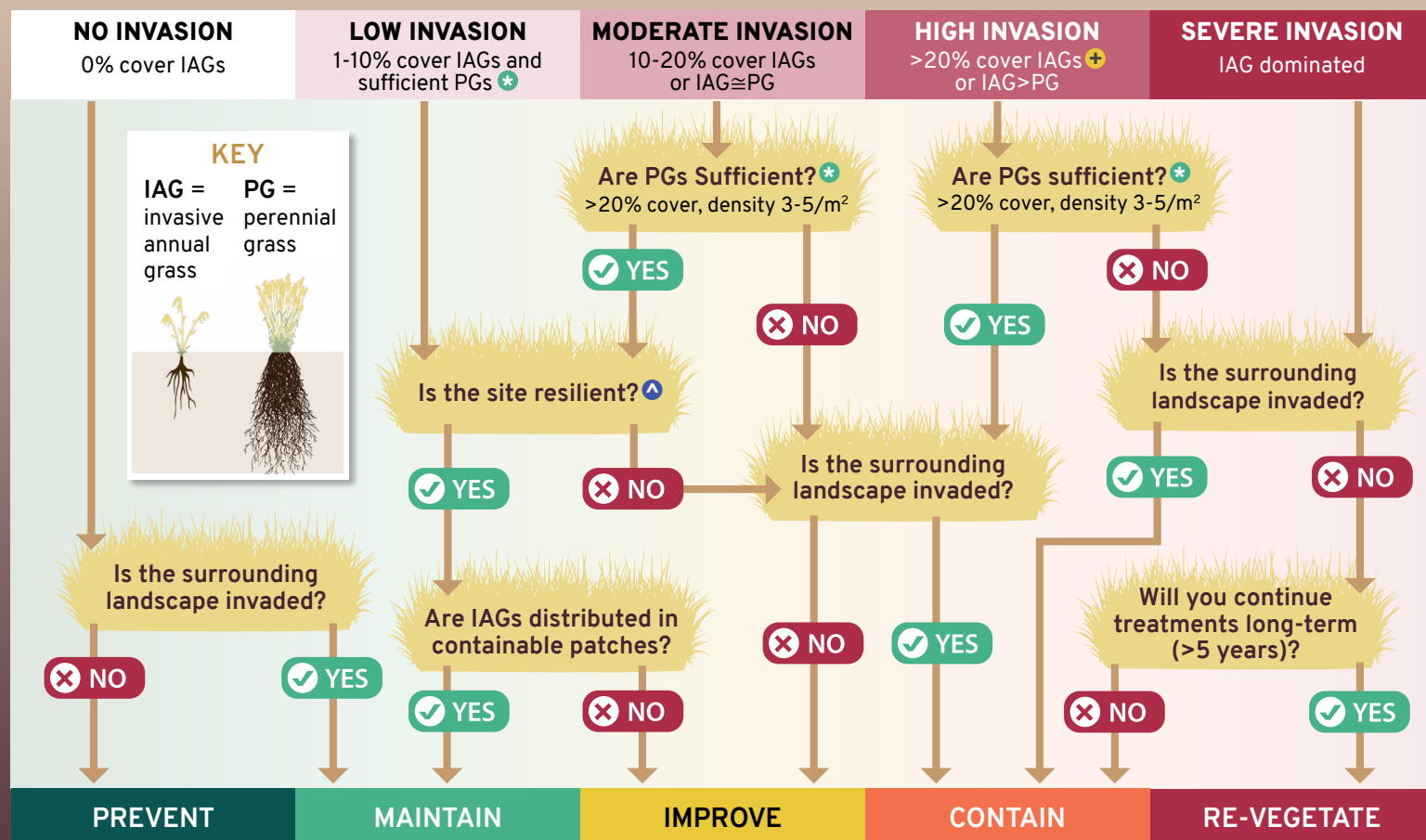


Prevention and early intervention are the most effective options for IAG management. Where intensive restoration is needed, be patient, learn from past treatments, and try treating test plots to evaluate potential outcomes.



In a post-fire environment, consider soil stability, burn severity and perennial grass recovery.

What Are the Current Conditions in Your Area of Concern?



See the reverse side for more information about key questions, potential tools, and suggested data sources.

HIGH Likelihood of success in long-term maintenance of healthy perennial vegetation **LOW**

* **Perennial grass health:** Research in the Great Basin shows that areas with >20% perennial grass cover and density of ~3-5 plants/m² for perennial bunchgrasses corresponds to improved long-term resistance to IAG invasion.

+ **20% IAG threshold:** Studies point to greater risk of post-fire conversion to IAGs, habitat degradation and loss of carbon when IAG cover exceeds 20%.

^ **Site resilience:** Resilience is the ability of a plant community to recover after disturbance. Resilience is greater where there is higher summer precipitation and/or where soils support moisture retention into the summer months. This tends to occur at higher elevations, in deep soils that lack a hardpan, and on north aspects.

This table provides generalized guidance on activities, key questions, and tools for each management strategy as identified on the previous page. This tool was developed in the semi-arid rangelands of eastern Oregon and is most applicable in the northern Great Basin. If noxious weeds or weedy forbs (e.g. rush skeletonweed, spotted knapweed, Russian thistle, redstem storksbill, salsify etc.) are present in your vegetation community, plan accordingly, as plants like these can be 'released' by herbicides that target IAGs. **Consultation with weed experts or properly licensed applicators is recommended in all cases. Follow herbicide label recommendations: The label is the law!**

MANAGEMENT STRATEGY	KEY QUESTIONS	POTENTIAL TOOLS
<p>PREVENT</p> <p><i>The most effective action against IAGs.</i></p> <p>State: Uninvaded perennial plant community.</p> <p>Focus on:</p> <ol style="list-style-type: none"> 1. Maintain or increase PG health 2. Identify and limit seed vectors 3. Limit disturbance 4. Long-term vigilance 	<ul style="list-style-type: none"> » Is this area managed to promote perennial grass vigor? » How often is the area surveyed for new infestations? » How and where is this area exposed to IAG seed sources? » What areas are most susceptible to invasion? 	<ul style="list-style-type: none"> » Time disturbance (grazing, recreation, fire, etc) intervals, intensities and rest to promote PG health. » Ground and aerial survey for IAGs and broadleaf weeds. Treat promptly if found (See Maintain below). » Use local and/or weed-free forage, mulch and gravel/rock. » Clean equipment, spray roadsides, allow livestock time to pass /shed seeds before entering area. » Use targeted grazing, herbicides, and green belt plantings to create fuel breaks along well-established roads.
<p>MAINTAIN</p> <p>State: Desirable perennial vegetation is abundant and robust, IAGs are in discrete patches or at a low-level of invasion in an otherwise intact landscape.</p> <p>Focus on:</p> <ol style="list-style-type: none"> 1-4. As in Prevent above and 5. Control IAGs and release PGs with spot broadcasts of herbicides (widely buffered treatments of visible infestation to account for unseen seedbed). 	<p>As in Prevent (above) and:</p> <ul style="list-style-type: none"> » Are there broadleaf weeds? If so, address during IAG treatments. » Are IAGs <i>germinated</i> when treating? (if yes → imazapic* required for year 1 efficacy) » Can you time treatment with necessary moisture - more than 2 days after and within several weeks of application? » Does grazing allow for PG recovery/establishment? 	<ul style="list-style-type: none"> » Time disturbance (grazing, recreation, fire, etc) intervals, intensities and rest to promote perennial grass. » Spot broadcast treatments of IAG patches. <ul style="list-style-type: none"> » Indaziflam only: gives multi-year control of IAG seeds but may miss some IAGs year one; use before IAG germination if PGs are shallow-rooted or stressed; single herbicide may reduce impacts on shallow-rooted or stressed PGs vs tank mixes. » Imazapic* only: gives ~1 year control of IAG seeds & actively growing plants; most useful where short term PG release is needed due to disturbance (e.g., fire). » Indaziflam + imazapic* together: use combination if PG community is healthy and deep rooted; apply with late fall moisture to control seedlings and seeds for several years.
<p>IMPROVE</p> <p>State: Invaded sites with potential for uplift using appropriate intervention.</p> <p>Focus on:</p> <ol style="list-style-type: none"> 1-4. As in Prevent above and 5. Release native plants by broadcast spraying areas of concern to alleviate pressure from IAGs. 6. Combine spraying and seeding in areas of low perennial cover. 	<p>As in Prevent/Maintain, and:</p> <ul style="list-style-type: none"> » Are perennial grasses deep rooted and vigorous? If so, an herbicide-only treatment may be appropriate. » Are perennial grasses shallow-rooted or stressed? » Is seeding required and what is the seeding interval after herbicide? » Does grazing allow for PG recovery/establishment? 	<ul style="list-style-type: none"> » Time disturbance (grazing, recreation, fire, etc) intervals, intensities and rest to promote perennial grass health. » Broadcast whole area of concern with IAG-targeted herbicides (as described above in spot broadcast) to release PGs when no seeding is planned. » Spray and seed: Year 1: Imazapic*, ensure treatment doesn't harm shallow-rooted PGs. Year 2: seeding/ planting with native or introduced species appropriate for goals. Year 3 or 4: indaziflam, if seeding was successful. » Shrub and grass plugs can be planted after an indaziflam treatment.
<p>CONTAIN</p> <p>State: Invaded sites that pose a risk to surrounding uninvaded areas.</p> <p>Focus on:</p> <p>Active management to:</p> <ol style="list-style-type: none"> 1. Contain IAG seed spread. 2. Consider fuel breaks. 3. Alternative uses. 	<ul style="list-style-type: none"> » Can you use test plots to evaluate PGs, weeds on site, and potential for recovery? » Will people, livestock, or wildlife move through the area when seeds are ripe? » Are there ignition risks? » How can this site be useful (forage bank, calving, feeding)? 	<ul style="list-style-type: none"> » Manage vectors of IAG seed movement. » Consider indaziflam and/or imazapic* to create buffers to limit IAG seed spread and reduce fine fuels. » Establish green fuel breaks. Consider introduced perennial species that plant that stay green through fire season (e.g. forage kochia) » Graze (or burn) to reduce seed and fuel production. » Manage season of use so seeds don't spread (avoid late summer seed drop and muddy seasons). » Monitor adjacent areas, pastures, properties for IAGs.
<p>RE-VEGETATE</p> <p>State: Highly invaded sites with restoration potential OR high priority areas where long-term funds and effort are available.</p> <p>Focus on:</p> <ol style="list-style-type: none"> 1. Management of existing weedy vegetation throughout for revegetation. 	<ul style="list-style-type: none"> » Can this site be revegetated, given the time, effort and money it will likely take? » Why was this site so invaded in the first place? » What species are appropriate for revegetation? 	<ul style="list-style-type: none"> » Manage vectors of IAG seed movement. » Multi-year treatment could include: <ul style="list-style-type: none"> » Year 1: Consider glyphosate, imazapic* and/or other broad spectrum low residual herbicides to control non-desirable vegetation. » Year 2: seeding/planting, Year 3 or 4 indaziflam, if seeding was successful. Seed with species appropriate for management goals and site potential. Re-assess if seeding was unsuccessful.

* imazapic is a proxy for several herbicides (rimsulfuron, sulfosulfuron, etc) that impact emerged IAGs and have a short soil residual.

SUGGESTED INFORMATION SOURCES

(See the SageCon Landscape Planning Tool for data in Oregon: <https://beav.es/lpt>)

Field-based information

- » Local knowledge
- » Consult range/weed specialist
- » Available field data

Site-specific information

- » [Annual & perennial grass maps](#)
- » [Invasion Severity Index \(v1\)](#)
- » [Web soil survey](#)

Broad ecological context

- » [Elevation-heatload index](#)
- » [Threat-based ecostate maps](#)
- » [Sagebrush Conservation Design](#)

Mark Porter, Oregon Department of Agriculture - Rangeland Health Specialist, Noxious Weed Department

Toby Maxwell, Oregon State University, Cascades - Assistant Professor: Senior Research

Megan Creutzburg, The Nature Conservancy - Sagebrush Sea Upland Restoration Program Manager

CONTACT INFORMATION

Mark Porter
mark.porter@oda.oregon.gov

Toby Maxwell
toby.maxwell@osucascades.edu

Megan Creutzburg
megan.creutzburg@tnc.org

Oregon Department of Agriculture
<https://www.oregon.gov/oda>