**Table 5.1−**General management strategies for cheatgrass and other invasives based on the invasion state. Management strategies are based on the level of invasion for cheatgrass, but many of the concepts also apply to annual and perennial invasive forbs. The strategies for invasive plant management are prevention, early detection and rapid response (EDDR), eradication, suppression, containment, and restoration. The invasion state is adapted from Mealor et al. (2013).

|  |
| --- |
| **Invasion State** |
|  | **Invasion Free** | **Trace (1-5%) with Perennials**  | **Mild (6-25%) with Perennials** | **Moderate (26-50%) with Perennials Missing** | **Invasion Dominated State**  |
| **Management****strategies based on invasion level** | **Prevention*** Manage for sufficient density and cover of native perennial grasses and forbs and biological soil crusts
* Monitor high risk priority areas for new invaders
* Use certified weed free straw, hay, mulch and gravel for development or restoration
* Avoid use of invasive species in fuelbreaks
* Minimize road and infrastructure development and disturbance
* Clean clothing, footwear, equipment and vehicle of invasive plant material for land or fire management activities (Cal-IPC 2012, Checklist E)
* Provide training on invasive plant awareness
* Incorporate invasive plant information and management into Fire Incident Action Plans
 | **Prevention*** Manage for sufficient density and cover of native perennial grasses and forbs and biological soil crusts
* Limit soil disturbance and revegetate bare soil post-fire

**EDRR*** Early Detection monitoring
* Rapid Response treatment of new invasions

**Eradication*** Consistent and multiple year treatments with monitoring
* Promote desirable, native vegetation
 | **Prevention*** Manage for native perennial grasses and forbs and prevent further disturbance of biological soil crusts
* Limit soil disturbance and revegetate bare soil post-fire

**Suppression/Containment*** Implement control treatments
* Seed post treatment and implement restoration where appropriate
* Monitor for invasive plants post-fire and post-treatment
* Monitor and manage invasive plants to maintain fuel management sites

**Restoration*** Monitor and maintain desirable vegetation
* Identify native seed sources
* Consider revegetation after invasive or fire management
 | **Prevention*** Manage for native perennial grasses and forbs and prevent further disturbance of biological soil crusts

**Suppression/Containment*** Monitor for invasives post-fire with restoration
* Locate fire lines to reduce additional disturbance and invasive plant spread where feasible

**Restoration*** Implement restoration with seeding in areas lacking perennial grasses and forbs
 | **Containment or Restoration*** For areas with high fire probability,consider fuel breaks adjacent to, not intersecting, relatively uninvaded areas and restored areas
* Consider significant and consistent control treatments for high priority areas or areas adjacent to uninvaded areas
* Consider restoration when invasion dominated site is located between intact sagebrush habitat patches or between high priority areas
 |
| **Cost: Benefit** | Low cost; Highest return | Low cost; Very High return | Mod cost: High return | Mod-High cost: High return | High cost: Moderate return (depending on site and neighboring conditions) |

\*Several prevention best management practices were adapted from Cal-IPC 2012

**Table 5.2−**Management strategies for cheatgrass and other invasives based on the areas relative resilience to disturbance and resistance to invasive annual grasses and the invasion state. Management strategies are based on the level of invasion for cheatgrass, but many of the concepts also apply to annual and perennial invasive forbs. The invasion state is adapted from Mealor et al. (2013); resilience and resistance (R&R) categories are based on Chambers et al. (2017a).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Invasion Free** | **Trace (1-5%) with Perennials**  | **Mild (6-25%) with Perennials** | **Moderate (26-50) with Perennials Missing** | **Invasion Dominated State**  |
| **High Resilience and Resistance** | * Monitor priority areas for new invaders, especially with disturbance or wildfire
* Identify uninvaded areas and minimize disturbance to prevent new introductions
* Manage livestock to maintain or increase perennial native grasses and forbs
* Possibly no action post disturbance (wildfire)
 | * Conduct EDRR monitoring every 3-5 years until detected
* For new, small populations that are detected, herbicide use may be most efficient, but repeated application is required until control is achieved
* Support natural recovery
 | * Manage for native perennials
* Implement periodic grazing deferment
* Prioritize treatment areas to maximize effectiveness
* Use spot herbicide treatment for 3-5 years
* Seed natives post herbicide treatment
 | * Implement periodic grazing deferment
* Evaluate site conditions for integrated weed management when grazing or fire management used
* Use spot herbicide treatments, rather than broadcast treatments, for at least 5-10 years
* Seed natives post herbicide treatment
 | * Restoration success possible both prior to and post-fire
* Avoid seeding introduced species to prevent spread
* Use integrated herbicide application and seeding
* Consider sagebrush transplants
* Locate and maintain fuel breaks to prevent invasive plant introduction and spread and avoid intersecting uninvaded areas
 |
| Recovery Potential |  | Very High | High | High to Moderate | Moderate |
| **Moderate Resilience and Resistance** | Management strategies for moderate R&R depend on soil temperature and moisture regimes. Treat relatively cool and moist areas similarly to high R&R areas. Treat relatively warm and dry areas similarly to low R&R areas.  |
| Recovery Potential |  | High | Moderate | Moderate | Moderate to Low |
| **Low Resilience and Resistance** | * Identify uninvaded areas and prioritize prevention
* Conduct EDRR annually
* Monitor areas that are high priority or adjacent to high priority areas frequently
* Monitor disturbed areas frequently
* Avoid fuel break placements that connect invaded and uninvaded areas and avoid intersecting uninvaded areas
 | * Develop an EDRR network in high priority areas
* Promote desirable native vegetation
* Monitor herbicide treatments and continue treating as needed
* Minimize disturbance and suppress wildfire to prevent new introductions
* Locate and maintain fuel breaks to prevent invasive plant spread
* Prioritize post-fire monitoring for invasive plants
 | * Identify high fire risk areas and identify invasive plant populations in these areas and travel routes to minimize spreading invasives
* Use significant and consistent treatments to prevent crossing threshold into heavy infestation and manage for native perennials
* Minimize disturbance and suppress wildfire
* Locate and maintain fuel breaks to prevent invasive plant introduction and spread
* Prioritize post-fire monitoring for invasive plants with subsequent treatment and revegetation
 | * Identify high fire risk areas and invasive plant populations in these areas
* Use significant and consistent treatments for containment and suppression in high priority areas to prevent crossing threshold into heavy infestation and to protect adjacent high quality habitat
* Suppress wildfire
* Avoid fuel breaks that connect invaded and uninvaded areas and try not to intersect uninvaded areas

  | * Restoration not feasible for most areas. Restoration in high priority area will require significant, and long-term funding
* Consider targeted grazing to reduce invasive annual grass fuels to reduce fire risk to adjacent higher priority areas
* Consider herbicide application and integrated biocontrol at perimeter to prevent spread
* Consider fuel breaks around perimeter of invaded area to contain fine fuels
* Restoration may require repeated interventions
* Consider seeding non-natives where natives fail to establish
 |
| Recovery Potential |  | Moderate | Low | Low | Low to none |