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North Central Regional Invasive Species and Climate Change Network

Management Challenge: The RAD Framework to Address Ecological Transformation

Summary: Ecological transformations are persistent shifts in multiple components of an ecosystem that are not easily reversed. They can be caused by many different drivers including wildfire, climate change, and invasive species, as well as interactions between these drivers. For example, increased wildfire and drought frequency and/or severity in sagebrush ecosystems promote the spread of invasive grasses and the transformation to grass-dominated ecosystems. With ecological transformation, it is becoming increasingly hard to maintain ecosystem conditions based on historical baselines. The RAD (resist, accept, direct) framework offers alternative management approaches in addition to those aimed at maintaining historical conditions, including accepting ecosystem transformations or directing systems towards novel conditions (Lynch et al. 2021; Schuurman et al. 2022).



Cheatgrass invasion causing ecological transformation in Southern Wyoming (photograph credit: WyoFile)

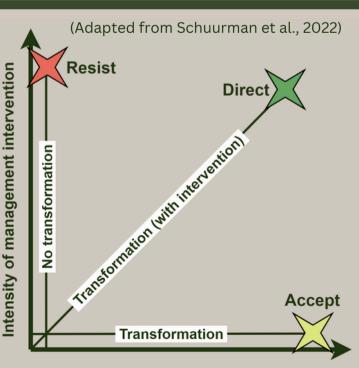
The RAD Framework

Resist: Resist transformation trajectory and restore ecosystem to historic conditions or maintain current conditions

Accept: Accept the ecosystem trajectory and allow ecosystem to change autonomously

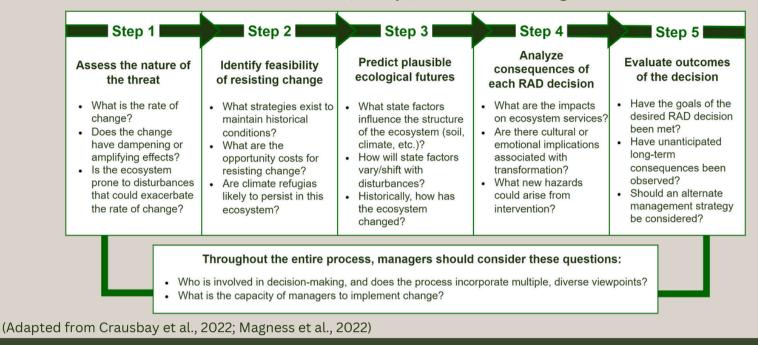
Direct: Shape the ecosystem trajectory towards preferred new conditions

For more information, check out the RAD websites by USGS and National Park Service: <u>RAD – USGS</u>; <u>RAD – NPS</u>



Deviation from historical conditions

Once an ecological transformation is identified as a potential threat, how do managers decide whether to resist, accept, or direct the change?



An example of using the RAD framework for cheatgrass invasion in a grassland ecosystem

Resisting change could include weed management strategies with the goal of eradicating cheatgrass. For example, spring grazing to thin-out cheatgrass before the natives begin to grow, then herbicides in the summer/fall. This method is not always effective.

Directing change could include seeding native plants that are more resilient to cheatgrass invasion. An example is Tanseyleaf Aster, a flowering plant native to the NC Region. This alters species composition, with potential impacts on ecosystem processes. RAD can be used in combination – managers could accept some aspects of transformation and direct or resist others.

> Accepting change would be allowing cheatgrass to invade and transform an ecosystem. This alters ecosystem structure and function. For example, cheatgrass can replace native species and

increase the risk for more severe and frequent fires.

Cheatgrass

photograph credit:

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