North Central RISCC MANAGEMENT NETWORK

North Central Regional Invasive Species and Climate Change Network

Management Challenge: Invasion Potential

Invasion Potential: The unrealized distribution of invasive species that may occur with future climate conditions. Here the term is used to describe both 1) the potential for an invasive species to invade and 2) the potential for an environment to be invaded.

Summary: As Earth's climate changes, it alters the characteristics of ecosystems which can stress native species, increasing a community's susceptibility to novel invasions. This can increase the invasion potential of an invasive plant species or region. Whether or not the invasion potential is realized depends on several factors including species interactions (which are difficult to quantify) and the traits of the invasive and native species in the community. Climate and species distribution models can be used to predict invasion potential, and these predictions can inform management decisions to help protect ecosystems from invasive plant species. This management challenge will overview two species specific examples of invasion potential, then outline some general strategies for better management.

Cheatgrass *(Bromus tectorum)*

Jim Kennedy, June 4, 2014

Threat to Native Ecosystems: Outcompetes native sagebrush and adds fine fuel which can alter historic fire regimes.
Current Distribution: Lower Altitudes and Latitudes in Western US (typically 500 - 6,000 ft.)
Future Habitat from Invasion Potential: Higher Altitudes and Latitudes in Western US
Why: Increasing temperatures at higher altitudes and latitudes make regions of the Western U.S. more climatically suitable for cheatgrass invasion. After cheatgrass has been established, future changes in precipitation may increase its competitiveness. For example, increased winter/spring precipitation favors cheatgrass as its growing season is in the spring whereas native grasses and shrubs grow in the summer. Moreover, decreased summer precipitation increases the likelihood of wildfires which creates more opportunities for cheatgrass to establish and outcompete native species.

North Africa Grass *(Ventenata dubia)*

Threat to Native Ecosystems: Outcompetes native sagebrush and adds fine fuel which can alter historic fire regimes.
Current Distribution: Pacific Northwest US
Future Habitat from Invasion Potential: Great Plains and North Central US
Why: North Africa Grass is common in dry, open regions and it is able to grow in latitudes ranging from sea level to 1,800 meters (5,900 ft), making the North Central region a suitable habitat for invasion. Climate change is causing increased winter precipitation, which increases the likelihood of this species' establishment because it has an earlier growing season compared to native plants in the North Central region.

Matt Lavin, July 13, 2008

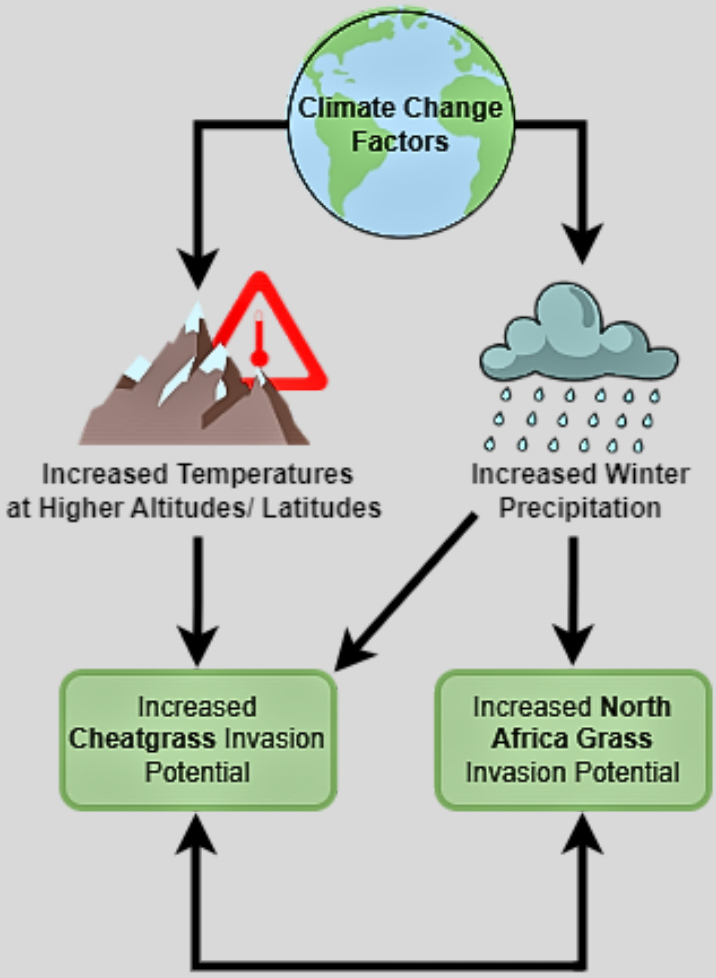

Figure 1: The driving environmental factors (increased temperatures at higher altitudes/latitudes and increased winter precipitation) mediated by climate change that increase invasion potential for Cheatgrass and North Africa Grass. Since communities with existing invasive plants have a higher invasion potential, increased Cheatgrass invasion potential could increase North Africa Grass invasion potential and vice versa (bottom arrow). *Note that invasion potential is ecoregion specific so not everywhere that experiences increased temperatures and winter precipitation will be at risk of invasion.*

Management Strategies

Strategies to address invasion potential will differ from strategies for invasive species control for species that are already established. The key difference is that managers will have the opportunity to prepare for an invasion before it occurs. The following strategies demonstrate how this difference can be used to our advantage.

- **Early detection and rapid response (EDRR):** The main pillars of invasive species management are prevention, surveillance, and control. Since prevention is the most cost effective, a common strategy is to prioritize prevention efforts if the invasive species has not yet arrived. One prevention strategy is to monitor an ecosystem's borders and apply treatment strategies when the target invasive species is first detected. In areas with high invasion potential, consistent monitoring can be prioritized to catch the invasions before they spread.
- **Ensemble climate modeling:** Species distribution models are one tool to assist with decision making about invasive species in a changing climate. These models can include information about current locations, climate model projections, and species traits to understand how species ranges may change in the future. An ensemble of climate models can be used to show a range of possible scenarios for a particular species.

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