North Central RISCC MANAGEMENT NETWORK

Regional Invasive Species & Climate Change

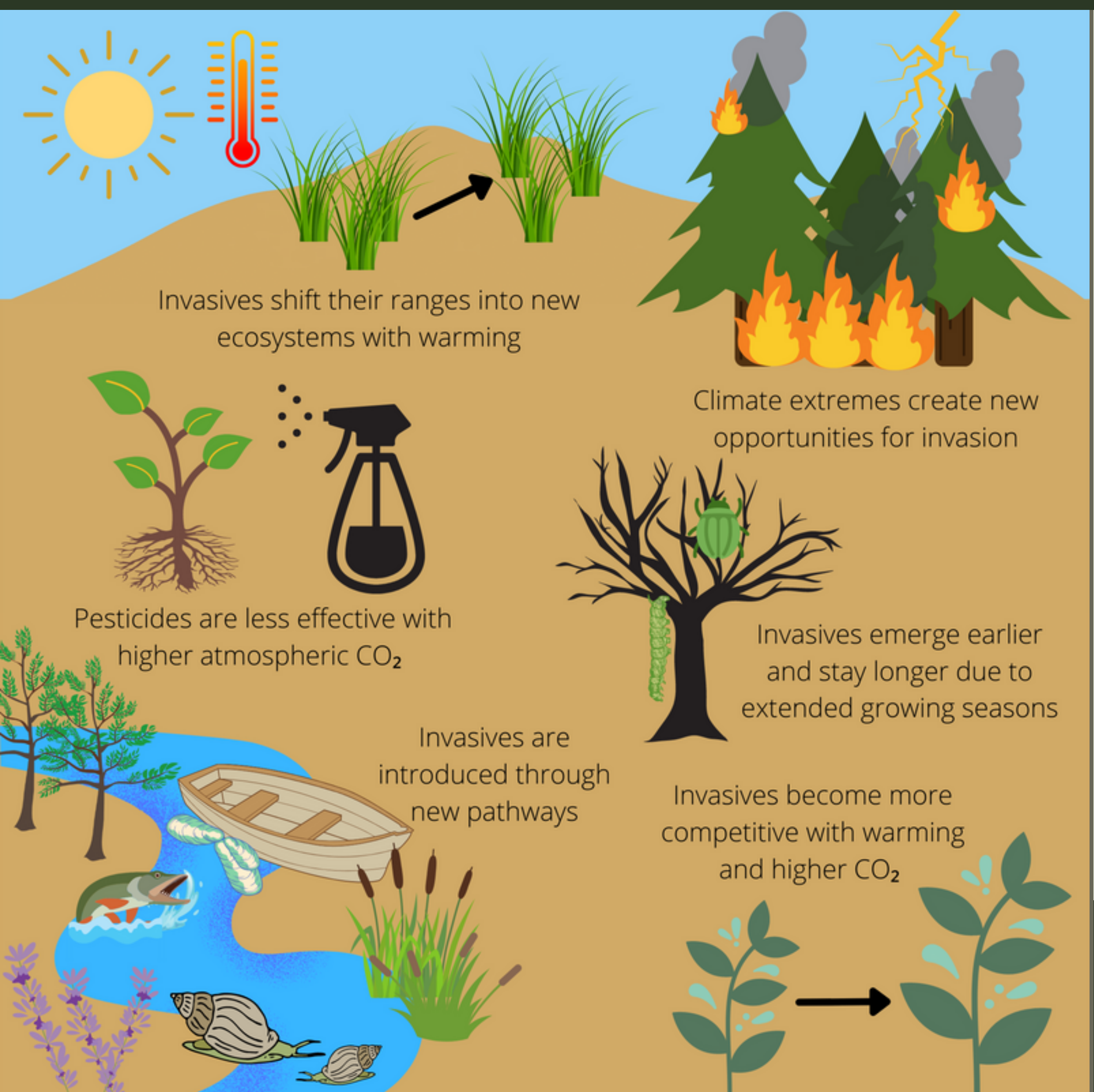
Management Challenge

Double Trouble: Understanding risks from invasive species and climate change

Summary: Individually, invasive species and climate change are major threats to global ecosystems. Together they create new challenges for effective management. Management strategies need to be designed to respond to this double trouble, and we need to understand how these two forms of global change interact.

All regions are likely to see interactions between invasive species and climate change. The North Central region is particularly vulnerable for the following reasons:

- Northerly latitudes are warming more than southerly latitudes, leading to more rapid environmental changes
- Southerly invasive species are shifting their ranges north, and low-elevation invasives are moving upwards
- Some of the North Central's key ecosystems are particularly at risk when climate change is combined with invasion
    - Sagebrush and forest ecosystems can experience a grass-fire cycle with invasive grasses
    - Climate change can make wetland habitats (e.g. prairie potholes) more suitable for invasive species



Management Options

- Monitor for early detection of new invasive species that have moved into the region
    - A place to start: https://www.invasivespeciesinfo.gov/subject/lists
- Look for alternative management strategies if pesticides become less effective
- Keep the timing of management flexible to respond to climate variability, extreme events, and differences in invasive phenologies
- Explore methods to more effectively limit new invasive species introduction

Figure 1: **Major interactions between non-native invasive species and climate change.**

Climate extremes create opportunities for invasion

- Extreme droughts, fires, and floods create novel disturbances and opportunities for invasion
- Drought stress increases tree vulnerability to invasive pests

Cheatgrass takes advantage of extremes and contributes to future fire.


US FWS

Invasives shift their ranges into new ecosystems

- Invasive plants and aquatics are often native to warmer regions, making them preadapted to climate warming in new regions
- New animal pests, pathogens, and 86 invasive plants are expected to move into the North Central region (2040-2060)

Purple starthistles and Japanese beetles are moving northward.


Wikipedia


Clemson University

Invasives become more competitive

- Warming and elevated CO_2 cause invasive plants to grow faster and produce more biomass than native plants
- Invasive species often have traits that help them adapt to new and changing environments (e.g. broad environmental tolerances, rapid growth rates)

(Invasive) Common carp spawn after disturbances before other species arrive.


P. O'Connor, Wikimedia

Shifting seasons / Phenology

- Milder winters increase pest survival
- Invasive plants may have different timing of major life events (e.g. germination, flowering), giving them an advantage in a longer growing season

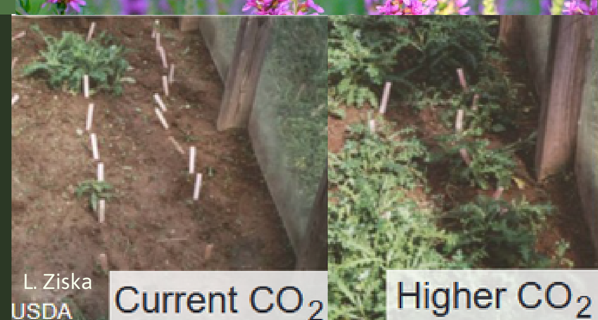
Purple loosestrife may outcompete native rockcress due to the longer available growing season and greater seed production.


Liz West, Wikimedia

Herbicides/Pesticides become less effective

- Rising CO_2 leads to increased weed biomass (particularly roots), making chemical treatments less effective
- Temperature, CO_2, and water availability interact with pesticides, with a net negative impact on efficacy under climate change

Canada Thistle is harder to kill via herbicide with higher CO_2.

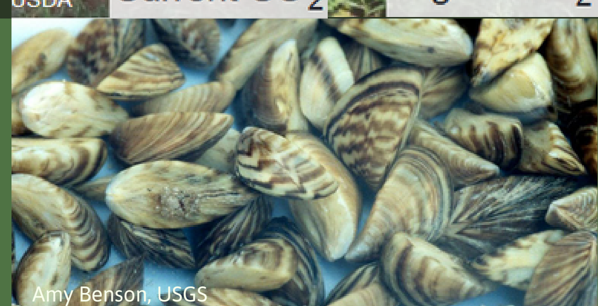


L. Ziska USDA

New introduction pathways

- Human activities that introduce non-native species are likely to move / increase under climate change (e.g. agriculture, recreation, construction)
- Altered streamflows and flood regimes may facilitate dispersal of non-native species

Zebra mussel spread may benefit from new pathways.


Amy Benson, USGS

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Authors: R. Chelsea Nagy*, Elizabeth Woolner, Isabel de Silva, Jennifer K. Balch, Melanie C. Berger, Wynne Moss, Nicole Read, Bethany A. Bradley, Emily Fusco, Evelyn M. Beaury

*chelsea.nagy@colorado.edu

NORTH CENTRAL Climate Adaptation Science Center

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