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 shift into the North Central region (2040-2060).
Purple stinkhisses and Japanese beetles are moving northward.

Pesticides become less effective
- Rising CO₂ causes some weeds to invest less energy in shoot growth, making chemical treatments less effective.
- Temperature, CO₂, and water availability interact with pesticides, with a net negative impact on efficacy under climate change.
Canada Thistle is harder to kill with herbicides under higher CO₂.

New introduction pathways
- Human activities that introduce species may move to colder areas under climate change (e.g. aqua/agriculture, recreation, construction).
- Altered streamflows and flood regimes may facilitate dispersal of non-native species.
Zebra mussels spread may benefit from new pathways.

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 benefits from new opportunities post-fire.

Shifting seasons / phenology
- Milder winters increase pest survival.
- Invasive plants may have different timing of major life events (e.g. green-up, flowering), giving them a competitive advantage in a longer growing season.
Purple loosestrife outcompetes native rockcress due to different flowering.

Invasives become more competitive
- Warming and elevated CO₂ causes 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, dispersal).
Common carp spawn after disturbances before other species arrive.

The North Central Regional Invasive Species and Climate Change (NC RISCC) Network, founded by this team, connects managers and researchers to integrate climate adaptation science and management for invasive species.
Learn more at https://www.risccnetwork.org/north-central