

# Building Resiliency to Climate Change – A Tool for Invasive Species Control



# Minnesota Board of Water and Soil Resources Mission

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Improve and protect Minnesota's water and soil resources by working in partnership with local organizations and private landowners

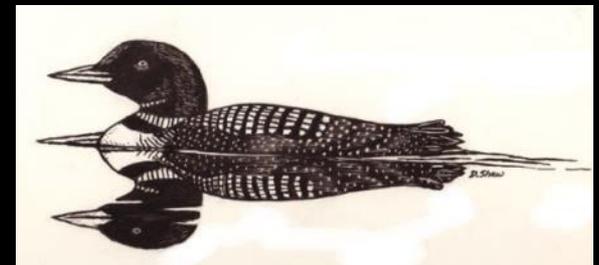
Through Partnerships Restored around 260,000 acres over 26 years

# Minnesota Board of Water and Soil Resources



Focus on conservation on private lands (75% of Minnesota's land area)

Climate change has the potential to decrease our ability to maintain important environmental and economic benefits.



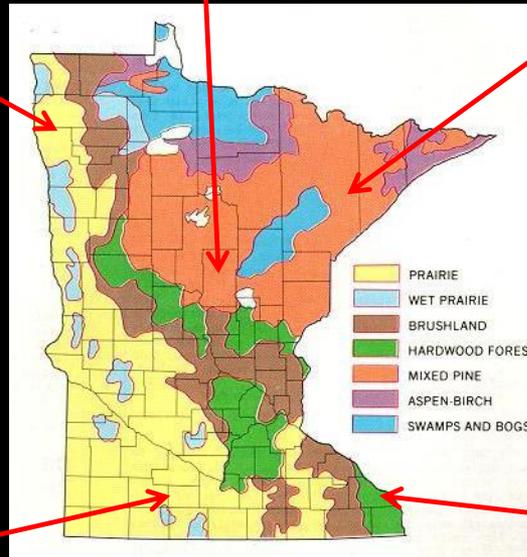


# Presentation Topics

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- Climate Change Trends
- What is a “Resilient Landscape”
- Resilient Project Examples

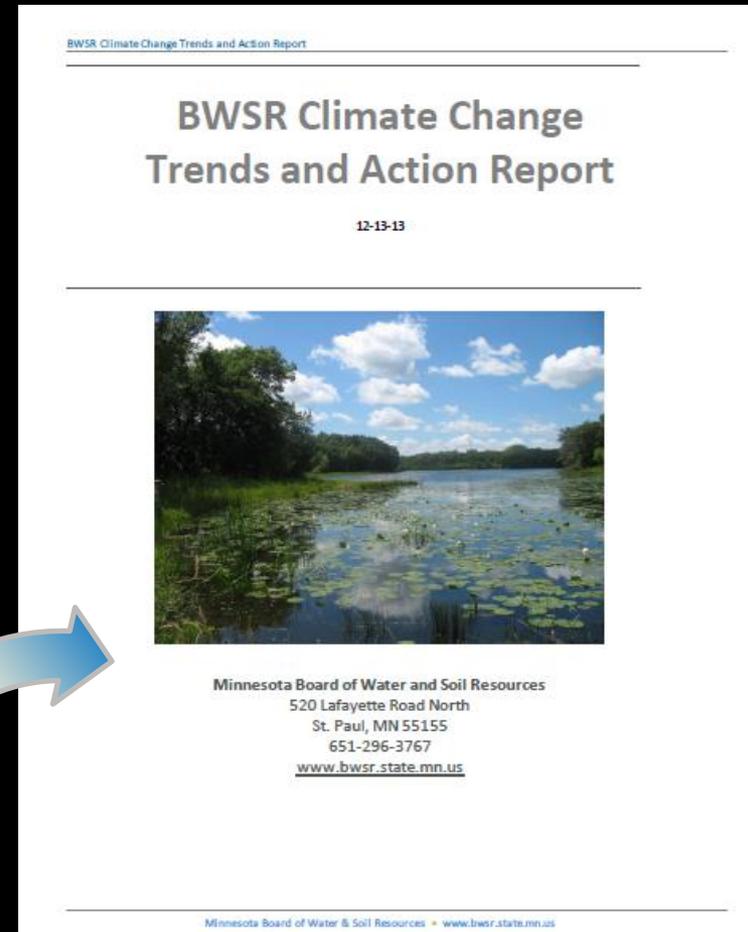
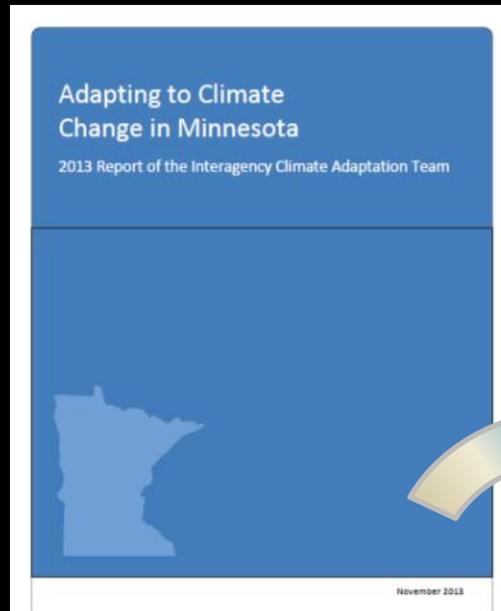
# Climate Change Trends





# Climate Change Trends

- Climate Change Trends and Action Report
- Landscape Resiliency Toolbox



# Climate Change Trends

## Trends



Extreme rain events



Damaged conservation projects



Stressed aquatic systems



Changing forests



Invasive species

# What is a Resilient Landscape?

An ecosystem that can respond to disturbance by resisting damage and recovering quickly



*Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity (Leopold 1949)*

# Strategies for Resilient Landscapes



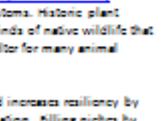
## Landscape Resiliency Toolbox

Strategies and Tools to Increase Resiliency to Climate Change and other Stressors

Summer 2014

Protecting and restoring landscapes that are **resilient** to climate change and other stressors has become increasingly important. The following strategies outline ways we can develop projects that provide important landscape functions and services now and into the future. These strategies borrow from the disciplines of conservation, ecological restoration, landscape ecology, and sustainable farming and are key methods for planning, designing and managing landscapes that withstand both changing land use practices and extreme weather conditions.

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- 1) Practicing Strategic Site Protection/Selection** - Work with project partners to identify the **prairie, forest, wetland** and aquatic landscapes that are in greatest need of protection and restoration based on resource needs and ecological function. This may involve restoring habitat complexes or buffering key water resources to restore natural cycles and plant and animal populations. 
- 2) Minimizing Landscape Stressors** - Investigate opportunities to improve environmental conditions throughout **watersheds**. Site projects in locations where ecological stressors such as flooding, decreasing water tables, or invasive species will not significantly detract from key functions into the future. 
- 3) Making Landscape Connections** - Establish strong **connections** across landscapes. Create habitat and genetic dispersal corridors and decrease landscape fragmentation. Also create networks of conservation practices in agricultural areas. Pulling together important remnants plays a key role in restoring landscape resiliency and providing refuge for wildlife species. 
- 4) Maximizing Ecological Function** - Be strategic in the selection of primary and secondary project goals. Be selective in making certain **functions** a priority, but remember that multiple functions including wildlife habitat, plant diversity, food production, **water quality**, treatment, soil quality and nutrient cycling can often be accomplished at once. 
- 5) Matching Plant Communities to the Site** - Match targeted vegetation to the **native plant community** that best fit site conditions. Also restore natural hydrologic regimes to aquatic and wetland systems. Historic plant community information can be used as a guide for decision making. Determine the kinds of native wildlife that can benefit from the project and include native plants that will provide food and shelter for many animal species.
- 6) Restoring and Maintaining Diversity** - Plant diversity supports wildlife species and increases resiliency by helping plant communities continue to function as intact systems during climate variation. Filling niches by **planting native species** also prevents the establishment of **invasive species**. In addition to plant species diversity protect genetic diversity of individual plant species by using site appropriate sources that can adapt to future conditions. Diverse **state seed mixes** are available for a variety of project types and the **Minnesota Wetland Restoration Guide** summarizes restoration strategies for uplands and wetlands.

Minnesota Board of Water & Soil Resources [www.bwsr.state.mn.us](http://www.bwsr.state.mn.us)

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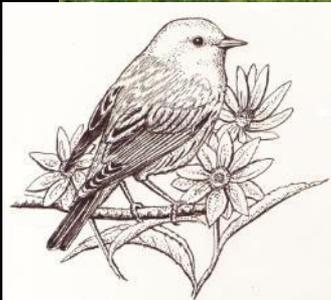
- 7) Providing Habitat for Pollinators and other Beneficial Organisms** - **Pollinators** and other insects and organisms play an essential role in supporting ecosystems. Pollinators provide seeds and fruits that are relied on by a wide range of wildlife by pollinating around 70% of flowering plant. Support insect and **soil microbes** and other organisms that support ecosystems by minimizing pesticide use, buffering natural areas and diverse plantings from pesticide exposure, restoring habitat complexes and wide natural corridors, **increasing plant diversity**, and restoring clean water sources. 
- 8) Guiding Effective Water Management, Treatment and Use** - Implement a variety of **practices** such as perennial crops, conservation tillage, conservation drainage, cover crops, buffer strips, infiltration basins, **outlets**, and wetland restoration to manage water resources. Incorporate these practices in urban and rural landscapes to reduce runoff, recharge groundwater, maintain agricultural productivity, improve water quality, and reduce flooding. Promote the wise use of water resources and the use of catchment systems to help ensure adequate supplies into the future. 
- 9) Preserving and Restoring Soil Health** - Use cover crops and perennial vegetation in degraded soils to promote good soil structure, organic content and microorganism populations that translate into **healthy soils** that promote productive ecological and agricultural landscapes. 
- 10) Working with Ecological Adaptation** - Natural plant communities **test** the ability to adapt and develop a natural dynamic through genetic adaptation, **succession** and natural colonization. Promote these processes to provide desired ecological functions, and buffer the community during future changes in climate and associated disturbance. Use **assisted colonization** as needed to help maintain plant community integrity in plant communities. 
- 11) Promoting Natural Disturbance** - Restore natural **disturbances** that sustain specific natural plant communities such as prescribed fire, conservation grazing and hydrologic variation. These **disturbances play** a key role in maintaining diversity as well as plant community structure and wildlife use.
- 12) Managing Invasive Species Species Boundaries** - **Invasive species** are effective at dispersal, giving them an advantage in adapting to climate change. Plan to work in **partnerships** and manage invasive species across ownership boundaries to restore resilient landscapes.
- 13) Practicing Adaptive Management** - Adjust **management practices** based on monitoring efforts and experience with successes and failures to improve the long-term effectiveness of management practices and resiliency of plant communities. Practices such as prescribed burning, water level management and prescribed grazing and haying may replicate natural disturbances and promote diversity and resiliency.
- 14) Learning from Front Line Experience** - Information about project successes and innovative practices is valuable. What practices provide the most benefits in our landscapes? What common activities are not worth the cost or make a problem worse? BWSR's **"What's Working"** information collects practitioner information about real-world outcomes.

For more information, contact: [dan.shaw@state.mn.us](mailto:dan.shaw@state.mn.us)

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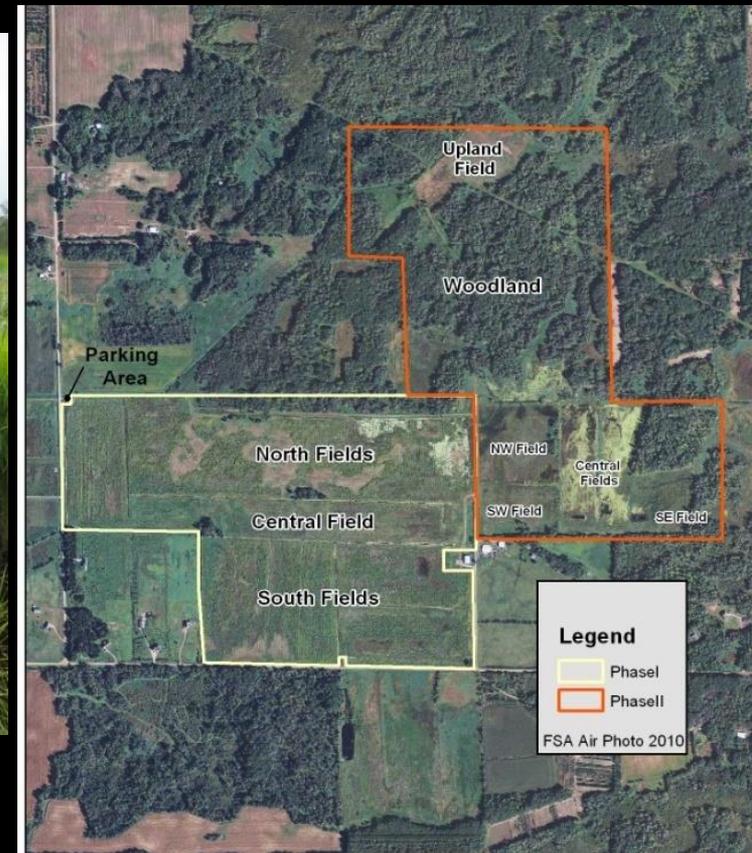
# Strategies for Resilient Landscapes

## Strategic Site Protection/Selection



# Strategies for Resilient Landscapes

## Making Landscape Connections



# Strategies for Resilient Landscapes

## Restoring and Maintaining Diversity

(Folke et al., 2004; Thompson et al., 2009)



# Strategies for Resilient Landscapes

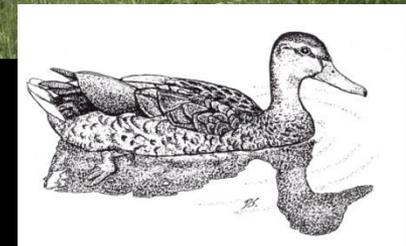
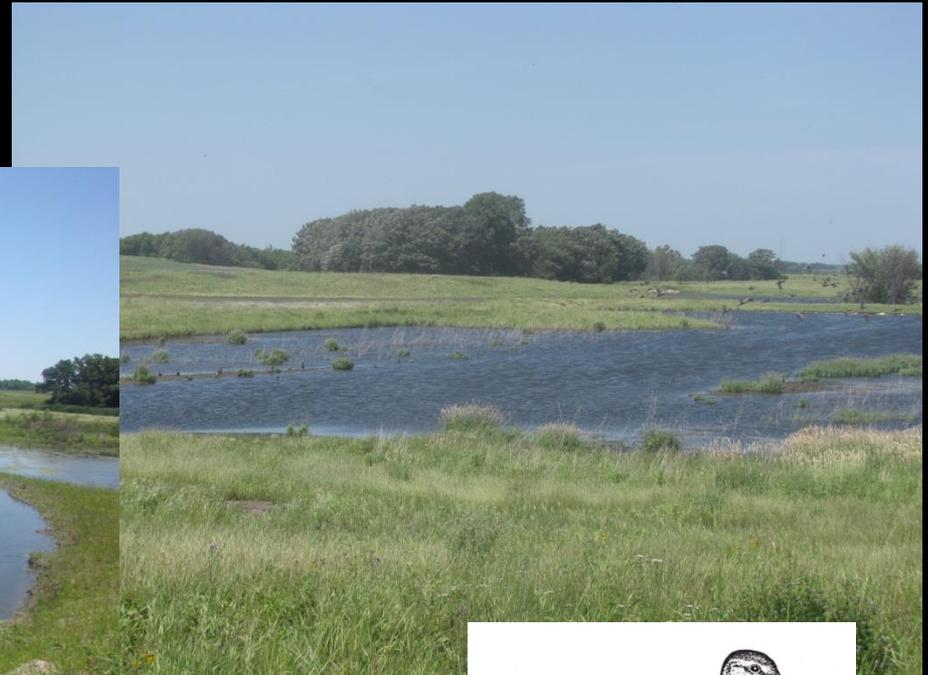
## Providing Habitat for Pollinators and Other Beneficial Organisms

(Bridgeland et. al 2010)



# Strategies for Resilient Landscapes

## Effective Water Management, Treatment and Use

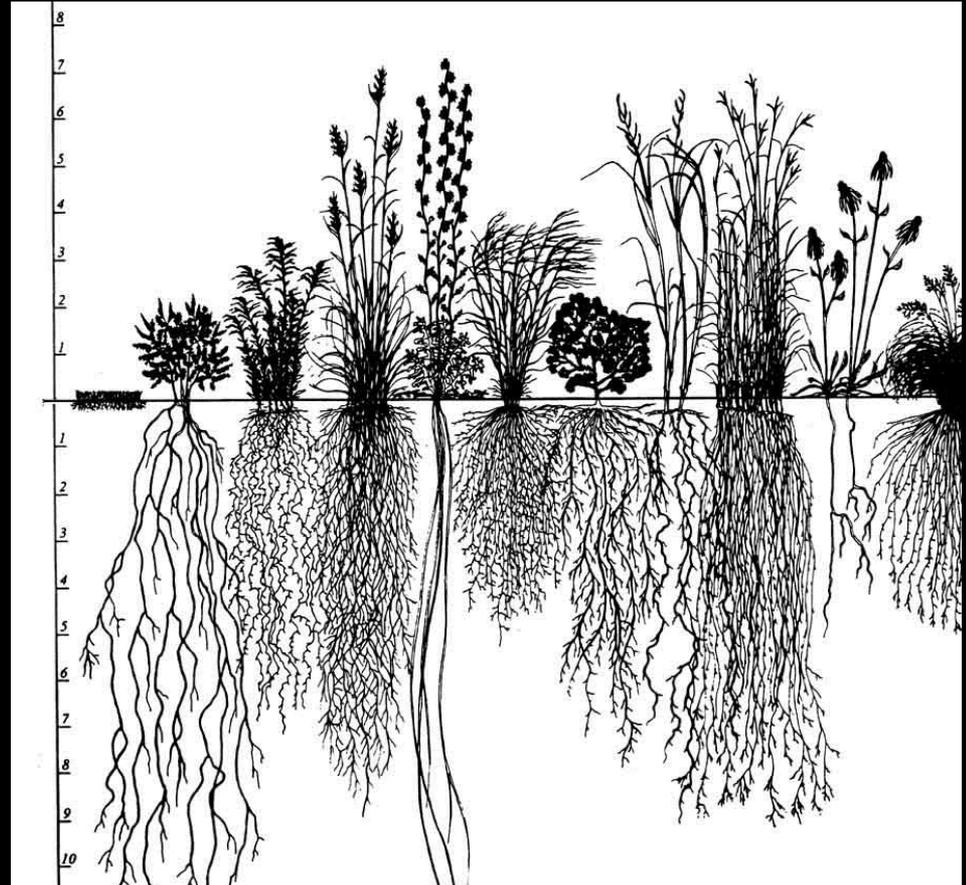


# Strategies for Resilient Landscapes

## Preserving and Restoring Soil Health



Cover Crops



Prairie Grasses and Flowers

# Strategies for Resilient Landscapes

## Managing Invasive Species Across Boundaries

along with fragmentation and climate change can be a tipping point for communities

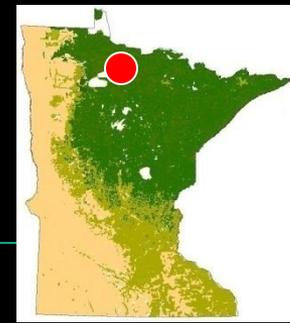


# Strategies for Resilient Landscapes

## Practicing Adaptive Management



# Beltrami County- Shrub/deciduous swamp

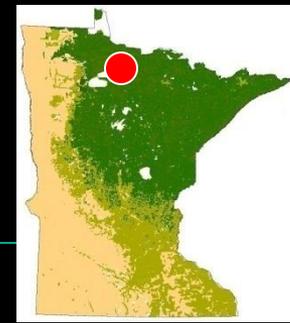


## Restoration Goals:

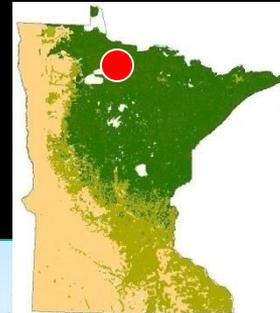
- Restored Connectivity
- Local Ecotype Seed
- Restored Natural Hydrology
- Secondary Succession
- Restored Wildlife Diversity
- Landscape Resiliency



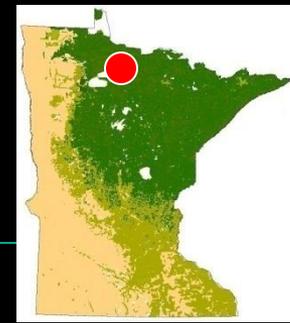
# Beltrami County



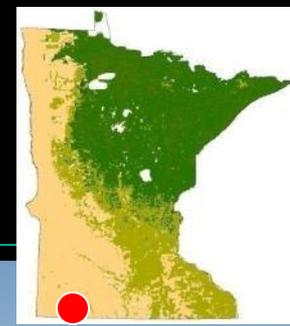
# Beltrami County



# Beltrami County



# Murray County- Fen/Prairie Pothole Restoration

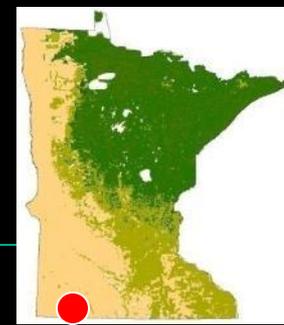


## Restoration Goals:

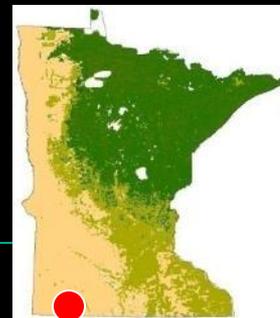
- Natural Hydrology
- Local Ecotype Seed
- Restoration of Fen Vegetation
- Natural Disturbance Regimes



# Murray County



# Murray County



# Strategies for Resilient Landscapes

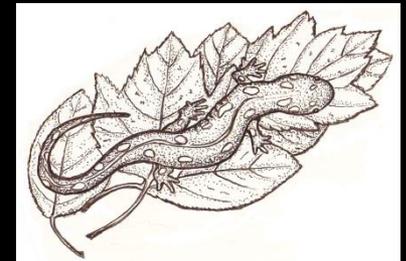
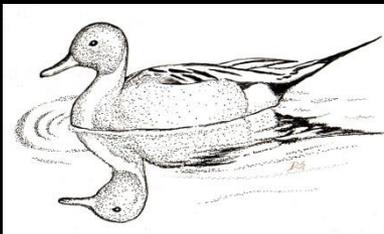
## Learning from Front-line Experience



### What's Working

#### Contents

- Overview
- Conservation Project Planning and Promotion
- Vegetation Establishment and Maintenance
- Invasive Species Control



# Thank You!



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[www.bwsr.state.mn.us/native\\_vegetation/](http://www.bwsr.state.mn.us/native_vegetation/)



# Resources

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