

A Review of Management Options for Improving Climate Resiliency in the Huron River Watershed's Forest and Tree Resources

Executive Summary

Introduction

Climate change can have many implications for overall forest health within the Huron River Watershed. With drastically different climate conditions, tree species that evolved to tolerate the historic temperature and precipitation ranges of this area may no longer be suited to live here or may experience a change in abundance. Despite these predictions, it is possible to improve the resiliency of forests of the Huron River Watershed to the impacts of climate change if action is taken by key decision makers and environmental managers. Ecological resilience is the capacity for an ecosystem to absorb disturbance without shifting into a qualitatively different state.

Given the nature of climate change and environmental variability, the inevitability of novelty and surprise, and the range of management objectives and situations, it is important to remember that no single approach will fit all solutions. A toolbox approach recognizes this and arms managers with a range of options. It is up to the manager to decide which combination of these options makes the most sense based on their unique understanding of their forest resources and the associated vulnerabilities to climate change.

This report presents a summary of climate adaptation strategies emerging for forest and tree management. Summaries are intended to introduce the array of possible approaches being discussed in the literature to improve the resilience of forests impacted by climate change. The paper does not attempt to recommend particular strategies as most lack significant supporting evidence due to the long-term nature of climate change as a stressor.

Long-term planning and policy formulation

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LAND PLANNING

Reserve planning: The ecologically informed acquisition of land for conservation management.

Protecting refugia: The preservation of natural areas known to be resistant to the climatic changes affecting surrounding regions.

Improving landscape connectivity: Creating and maintaining habitat linkages between natural areas to reduce the negative impacts of fragmentation.

Inventory urban forest resources: The inventory and mapping of urban trees by a municipality to allow for more informed management practices of their tree resources.

Balanced approach to urban forest planning: Planning for both “wild” forested areas and more intensively managed forest areas (i.e. street trees) in urban settings.

Long-term seed banks: The creation of a long-term seed bank to re-establish populations in new and more appropriate locations.

POLICY

Anticipate future constraints to the timely establishment of resiliency-based management strategies following disturbances: A strategy for municipalities and land management organizations who may feel that the uncertainties related to climate change impacts make immediate investment in climate resiliency measures for forests too risky. They choose to react once the problem is evident.

Development ordinances that promote resiliency: Ordinances could include a climate resilient tree species list for new plantings, minimum tree canopy standards in new developments, protection of natural areas, etc.

Protection of existing trees: The development of a planning program and policy to protect urban trees from removal during new development and from indiscriminant removal.

MODELS AND TOOLS

Be wary of relying on historical tree species ranges in planning efforts: This does not allow one to account for climate change and associated changes in weather.

Cross-scale integration of ecosystem models and data: The coupling of forest inventory with maps and data at different scales to better understand and predict tree species distributions.

Establish an organizational framework for management decisions: The use of a framework/methodology for making management decisions a less overwhelming ordeal.

COMMUNICATION AND EDUCATION

Improving stakeholder communication: Good communication is important for insuring that all stakeholders are operating with common goals and objectives, while also increasing support for climate resilient forestry programs.

Community engagement: Working with the public to educate and advocate for the preservation of ecologically valuable natural areas on private land.

Development of open-access information systems: Open-access information systems can help decision makers learn and share lessons in forest management and climate changes.

Site Scale Recommendations for Natural Areas

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PROMOTING DIVERSITY

Increase tree species diversity: This can help maintain resilience to mortality and reduction in growth rates of trees in response to diseases and other climate change impacts like drought stress.

Use of multi-aged management systems: A multi-aged forest management program can buffer against stressors that might affect trees differently based on size and age. This also balances a higher carbon stores in retained mature trees with higher sequestration rates in younger trees.

Increasing genetic diversity: Increasing the genetic diversity of tree types used for local restoration projects to enhance forest disease resistance and tolerance to environmental stresses.

ESTABLISHING NEW TREES

Natural regeneration: Allowing an ecosystem to follow a successional pathway back to its original stable state following a disturbance. This is more often used in highly resilient systems.

Enrichment planting: The planting of seedlings within a forest where natural regeneration is poor or non-existent.

Assisted migration: The intentional, human-assisted range expansion of selected biota to avoid decline and extinction.

MAINTENANCE

Thinning and pruning: These practices can lessen the risks posed by disturbances associated with climate change such as pests and diseases (lower stand density decreases spread and increases resources available for tree defenses) and drought stress (less competition for water).

Minimizing thinning: This allows for the maximization of aboveground carbon stores.

Increasing canopy cover: Increased canopy cover in forests can create microclimates favorable for species at risk to stressors related to climate change.

PROCESSES

Manage for processes instead of species and manage for ecosystem redundancy:

Management goals and approaches should not focus on the health of specific tree species, but instead determine the ecological role that the species and encourage additional species that fulfill a similar niche.

MISCELLANEOUS

Controlled burns: The use of human induced and controlled fires to promote forest health.

Irrigation systems: The installation of irrigation systems for particularly drought-intolerant tree species.

Hunting seasons for troublesome game populations: Changes in game population may be required for sustainable forest management.

Site scale recommendation for urban areas

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PROMOTING DIVERSITY

Increase the biodiversity of urban forests: Increasing the diversity of tree family, genus, and species raises the odds that at least some of the tree species will thrive in future climates and protects against disease or pest outbreaks targeting specific types of trees.

Ensure that there are a healthy distribution of age classes and growth rates: This helps to maintain a relatively constant canopy cover over time and safeguards against high proportions of trees reaching the end of their lifespan simultaneously.

TREE SPECIES SELECTION

“Right tree, right place”: Matching tree type to the appropriate urban planting site based on conditions such as underground and overhead utilities, above and below ground space, light, soil and drainage conditions, and existing right-of-way infrastructure. Trees are planted to achieve the maximum benefit.

Maximize benefits: Choosing large trees over small trees will provide the most benefits. Some trees are also disproportionately valuable for biodiversity.

Plant native species: Some experts argue that because native plants are adapted to the local climate and site conditions they will be more resistant to drought and will require less nutrient inputs. In addition, natural wildlife habitats will be preserved.

Plant drought resistant species: This practice can allow communities to anticipate increased summer drought likely to be associated with climate change and to reduce irrigation needs.

PESTS, DISEASES, & INVASIVES

Prepare for high incidences of pests and disease: Proactive measures and monitoring can help mitigate the impacts of climate change and associated increases in pest insect populations and added stress on trees that makes them more susceptible to pathogens.

Proper pruning technique and sanitation to prevent disease spread: Most pathogens need some way of entering the tree to cause disease, and fresh wounds offer an ideal opportunity for infections to begin.

Be wary of planting invasive species: If trees are not native to the area, consider before planting if they exhibit any characteristics that give them the potential to become invasive.

Planting cultivars: If an invasive species must be planted, a cultivar of that species could be used because it may lack invasive potential, as many tree cultivars do not produce viable seed.

EXPERT OPINION

Seek expert opinion: Collaborating with experts on the creation of urban forest management plans aimed at resiliency is an ideal option for municipalities with ample financial resources.

Evaluating and adapting existing conservation plans

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ACTING WHEN WE DON'T HAVE ALL THE ANSWERS

Incorporate climate data and models into conservation plans: This allows for better understanding of the types and ranges of climate change impacts predicted for an area. It helps identify ranges of potential management options to reduce vulnerability risk from uncertainty.

Use adaptive management framework for planning: A systematic and iterative approach for improving resource management by emphasizing learning from management outcomes.

PRIORITIZING RESOURCES

Prioritize management responses in situation of resource scarcity – the triage approach: An approach to forest management that sorts management situations into categories according to urgency, sensitivity, and capacity of available resources to achieve desired goals (i.e. survival).

Management plan audits: utilized by land managers as a means of quickly prioritizing what aspects of current management plans need to be updated to increase climate resiliency.

MANAGEMENT PLANS FOR PRIVATE LANDOWNERS

Federally assisted establishment of forest management plans: Federally subsidized assistance for writing conservation management plans is available to private landowners.