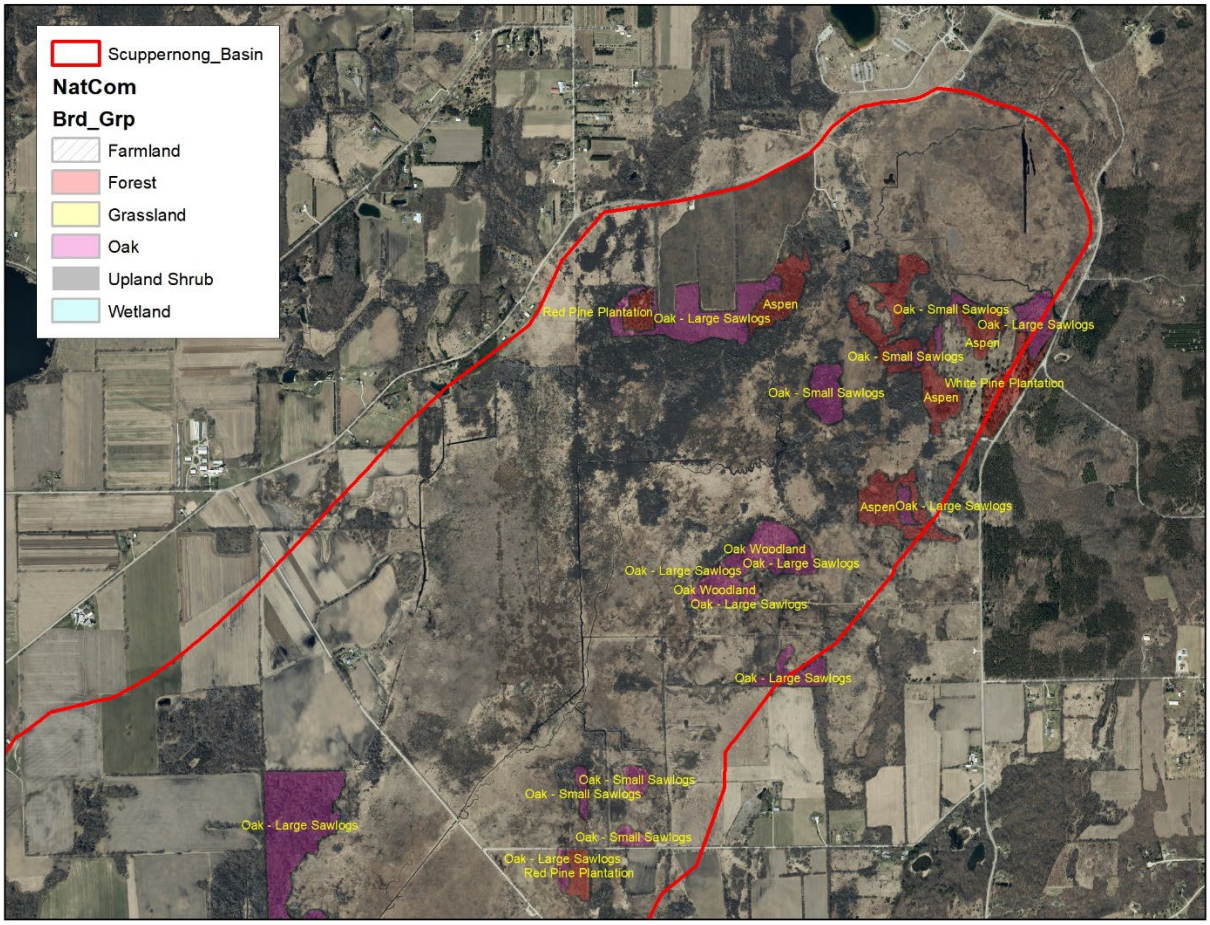
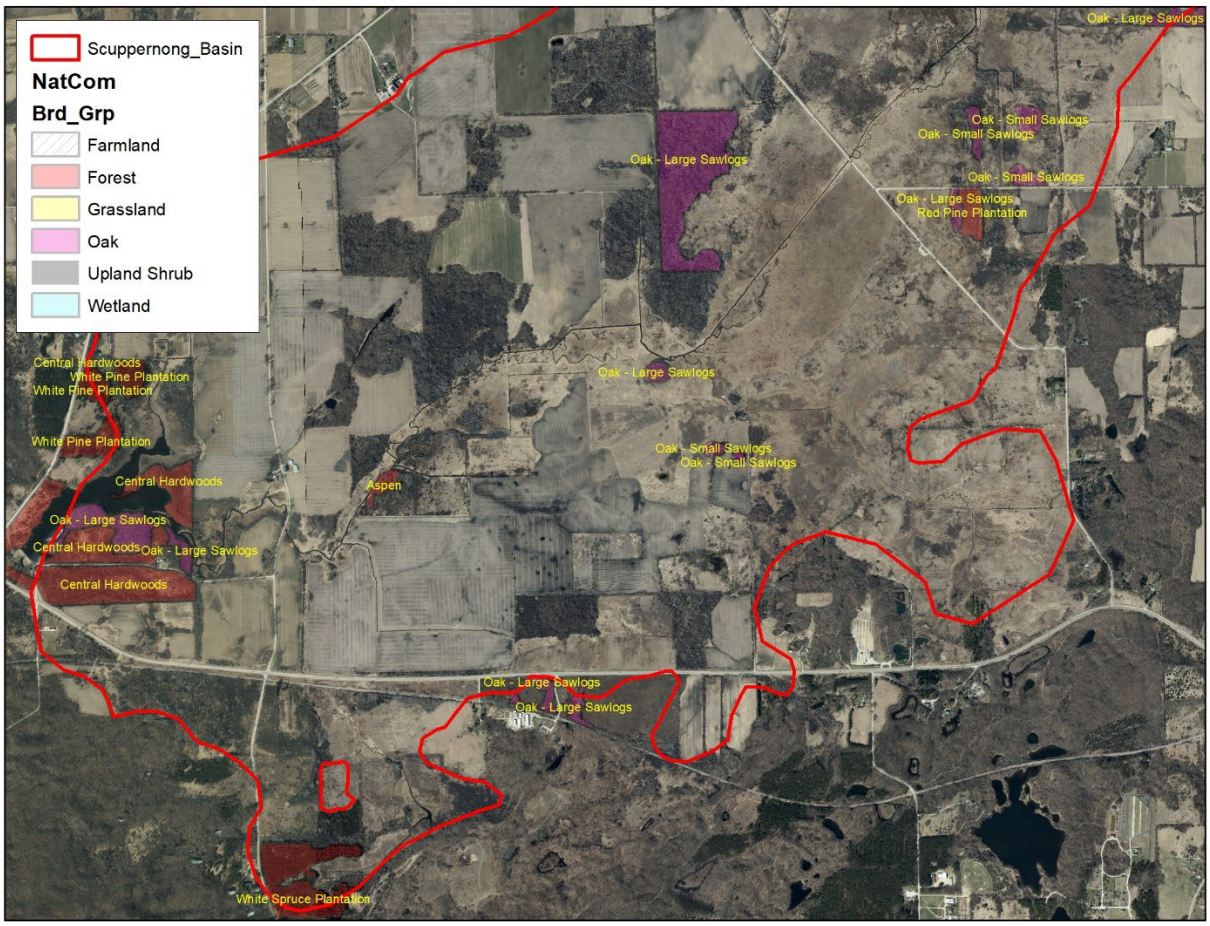
Addressing Climate Change in Scuppernong Basin: FORESTS

Forests represent a small but important habitat component in the Scuppernong Basin. Conifer plantations (red and white pine, spruce) occupy 54 acres, while scattered blocks of oak-dominated forest occur across about 13% of the project area (some 'oak' stands may actually be degraded oak savanna). Maps showing northeast and southwest parts of project area follow.





CLIMATE IMPACTS: INCREASING NON-NATIVE INVASIVES, CHANGES IN THE APPLICATION OF PRESCRIBED FIRE, INCREASING TREE STRESSORS, PESTS AND DISEASES

Non-native invasives may benefit from more favorable growing conditions as growing seasons become longer and winter snowpack is reduced. Common buckthorn and other woody species (both native and non-native) may also become more competitive with CO_2 enrichment. Doing prescribed burns in spring is getting harder due to more unusually wet springs and early green-up. Managers may do fewer burns, or may need to explore opportunities to burn in non-traditional seasons such as fall or winter.

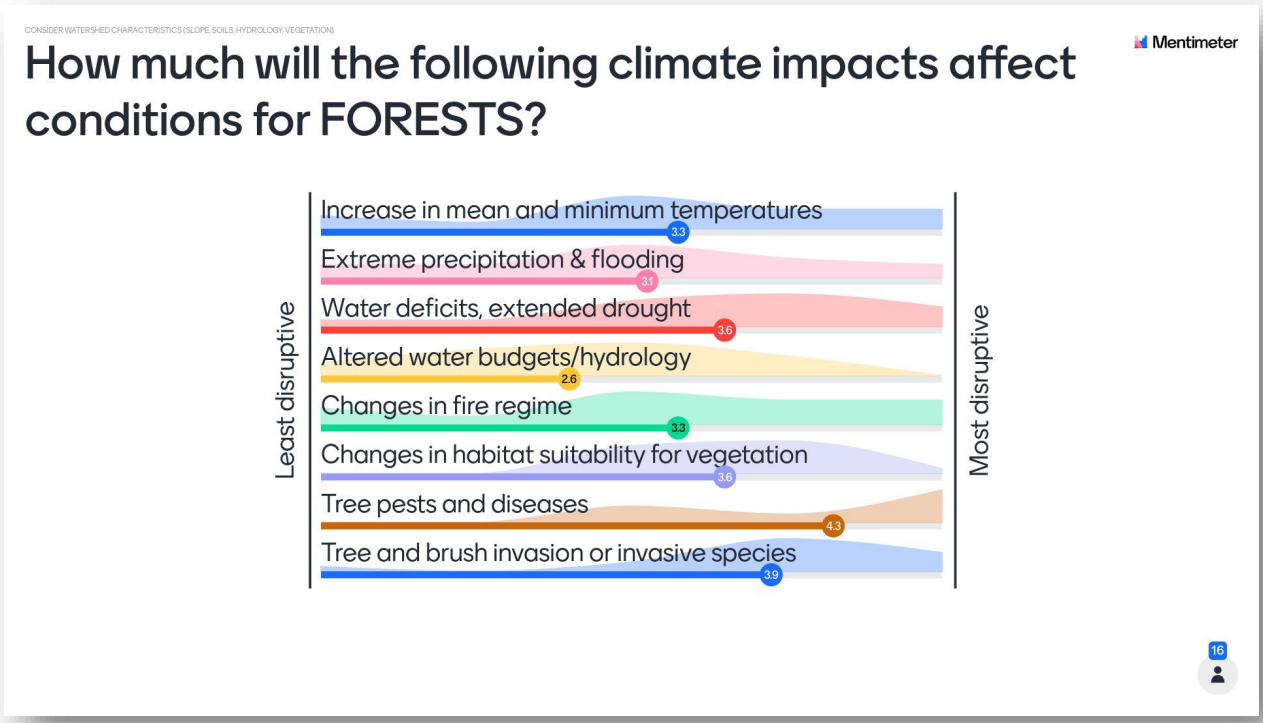
The Forest Breakout Group reviewed the Climate Change Field Guide for Southern Wisconsin Forests and Climate ChangeTree Atlas results for the Scuppernong Basin at a 1x1 degree grid (latitude 48, longitude 88) under a high emissions scenario (RCP 8.5). These data indicate that white spruce, red pine and eastern white pine are projected to have very poor capability to cope with climate change based on suitable habitat, adaptability, and abundance. American

basswood, black cherry and bigtooth aspen are projected to have poor capability. In contrast, all oaks are projected to have good to very good capability, along with black walnut, red maple, American elm, shagbark hickory, and quaking aspen.

Some upland hardwood stands have been altered due to past timber harvesting, grazing, and fire suppression. Here, oaks and other typical tree species are greatly diminished, shade-tolerant species are dominant, and oak regeneration is poor or lacking. While warmer, drier conditions may favor oaks and their regeneration (particularly when coupled with prescribed fire), this positive effect may be neutralized where oak is greatly diminished or absent and shade-loving species are driving changes in shade regime, leaf litter characteristics, nutrient cycling, and microclimate. Sites that support a relatively intact canopy and subcanopy will show the greatest adaptive capacity and may be most able to take advantage of enhanced suitable habitat. Blocks with diverse tree sizes and ages, along with diverse ground flora will also be better able to adapt to a changing environment.

Landscape context matters a great deal: Forested stands that are part of a large forested landscape such as the Kettle Moraine may provide options for species to shift to more suitable microhabitats in response to a changing climate. Unfortunately, many of the tree-dominated stands are small and isolated, with fewer options for shifting – these will be more vulnerable to detrimental external forces such as wind throw, invasive species, etc.

During the Scuppernong Basin Adaptation Workshop, participants ranked relative disruptiveness of the following impacts (faint colored graphics show distribution of responses, circled numbers show the means, number in lower right indicates total number of responses):



POSSIBLE ADAPTATION ACTIONS

Project participants used the Forest Adaptation Menu and Climate Change Tree Atlas data downscaled to the Scuppernong Basin region to develop adaptation actions for this project. Some examples follow (Forest Adaptation Menu references in parentheses at end of each action). This does not include benefits and drawbacks identified during the workshop, and represents early discussions and ideas that may be explored as part of a larger master planning process for Kettle Moraine State Forest-Southern Unit in the future.

- Convert or gradually transition vulnerable/declining conifer stands to species or natural communities that are more likely to do well in a changing climate. Consider how replacement tree selection might intersect with diverse objectives (sustainable forestry, wildlife management, natural community management, rare species management). *(9.5: Disfavor species that are distinctly maladapted)*
    - Consider local native species with favorable climate projections (white oak, burr oak, etc.). *(9.1: Favor or restore native species that are expected to be adapted to future conditions)*
    - Consider experimenting with species that would be new to the region (e.g., southerly oaks, chinquapin oak, black jack oak). *(9.7: Introduce species that are expected to be adapted to future conditions)*

    - Consider local natives and new species that together will promote a healthy mixed-forest. *(9.2: Establish or encourage new mixes of native species)*
- Use mulching mower to mulch invasives and aggressive natives, follow up with herbicide to kill resprouts. *(1.1: Reduce competition for moisture, nutrients, and light; 2.2: Prevent the introduction and establishment of invasive plant species and remove existing invasive species.)*
- Apply prescribed fire in oak stands to manage invasives, open up gaps for regeneration. *(1.5: Restore or maintain fire in fire-adapted ecosystems; 2.2: Prevent the introduction and establishment of invasive plant species and remove existing invasive species)*
- Control deer herbivory and its impacts on tree regeneration. *(2.2: Manage herbivory to promote regeneration of desired species.)*
- Reduce competition, open up light and forest gaps to promote oak regeneration. *(1.1: Reduce competition for moisture, nutrients, and light.)*
- Consider unique management goals and objectives for stands where rare species or important natural communities are present. *(4.1: Prioritize and maintain unique sites; 4.2: Prioritize and maintain sensitive or at-risk species or communities; 4.3: Establish artificial reserves for at-risk and displaced species.)*

ADAPTATION MONITORING

Project participants identified monitoring items that could help inform future management, including:

- Symptoms of tree decline in conifer stands
- Non-native invasives: extent and impacts, applying variable metrics based on unique stand goals
- Oak regeneration
- Stocking standards per DNR specifications
- Tree survival
- Deer browse: extent and impacts