



## Climate Change in County Forest Plans in Wisconsin

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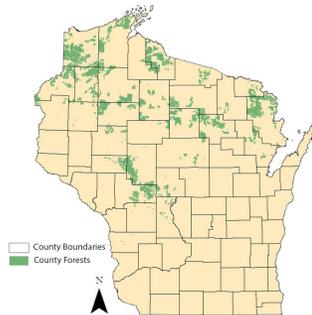
### Abstract

Climate change is projected to shift ecosystems in northern Wisconsin bringing profound change to forests including altered forest structure and habitat loss for vulnerable species. These changes will pose management challenges that could be addressed in forest plans. Wisconsin counties manage the largest public forest acreage and thus, county forest plans are a good tool to gauge climate change preparedness. We examined current county forest plans for inclusion of climate change adaptation, but most 2005-6 plans do not address it. We surveyed county foresters to investigate if climate change adaptation will be incorporated into plans and if so, to what extent.

### Climate Change and Forest Ecosystems

Climate change is projected to influence forested ecosystems in northern Wisconsin as species composition is affected by higher temperatures, increasingly severe and frequent storms and longer growing seasons (Janowiak et al., 2014). As the climate changes, old management practices may no longer yield the same results due to new conditions.

The literature suggests that adaptive, flexible management informed through frequent monitoring will become increasingly important due to climatic uncertainties (Janowiak et al., 2014; Millar et al., 2007). Planning for and protecting against increased disturbances, such as wind, fire and invasive species (Janowiak et al., 2014; Joyce et al., 2009) are recommended practices. Literature regarding how climate change information is being incorporated into forest management practices is largely focused on public land in general or National Forests (Petersen et al., 2013; Anhalt-Depies et al., 2016; Laatsch and Ma 2015). There is a lack of research specifically on county forest adaptation.



### Wisconsin's County Forests

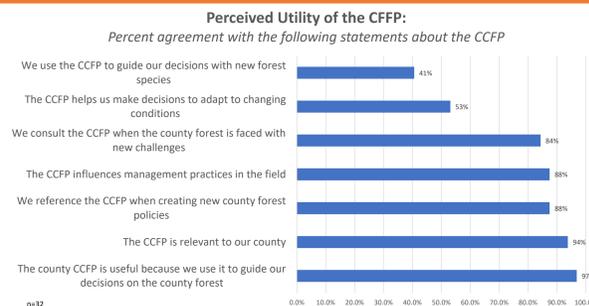
Understanding how county forests are preparing for climate change is particularly important as county forests are the largest public landowner in Wisconsin (Haines et al., 2005). In fact, county governments hold 15% of forested land in Wisconsin, amounting to about 2.4 million acres (Haines et al., 2005). Therefore, county forest management plays a critical role in the health of Wisconsin forests and the state at large. Indeed, county forests bolster the economy through recreation, tourism and forest products. County timber sales alone, amount to as much \$30 million each year (WI DNR). Wisconsin is home to 29 county forests, most of which are concentrated in the North (WI DNR). These county forests are required by state statute to complete 15-year land use plans to guide operations (WI State Statute 28.11). Since these plans are intended to guide management, they could incorporate climate change information to facilitate adaptation to future conditions.



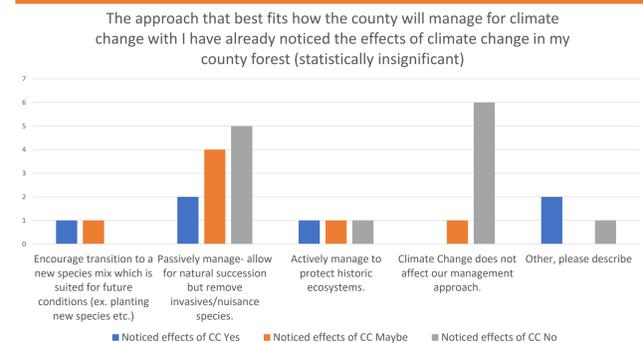
### Methods

- Current county forest plans were analyzed for reference to climate change by searching for key phrases associated with climate change such as climate change, adaptation, resilience, carbon, etc.
- We scoured the literature to create a list of possible strategies which forest plans could include to adapt management to climate change from which we designed a survey.
- Survey questions were designed to evaluate which strategies were being implemented by managers. The survey was administered through Qualtrics.
- The survey consisted of 72 questions. Most questions were multiple choice, using a 5-point Likert scale. Several open-ended questions were also included to allow greater flexibility.
- The survey was sent by email to county forest staff, representing all 29 county forests in Wisconsin. 74 emails were sent directly to employees along with 4 website-based emails, three emails were undeliverable resulting in a total sample size of 75 survey recipients.
- We used IBM SPSS Statistics software to analyze the data. The results show frequency distributions from selected questions and cross-tabulations.

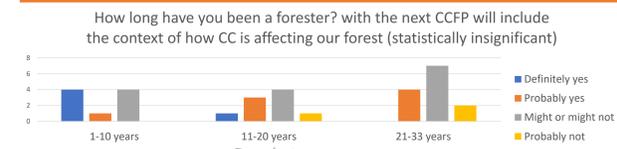
And, they see the forest plan as a useful document including as conditions change.



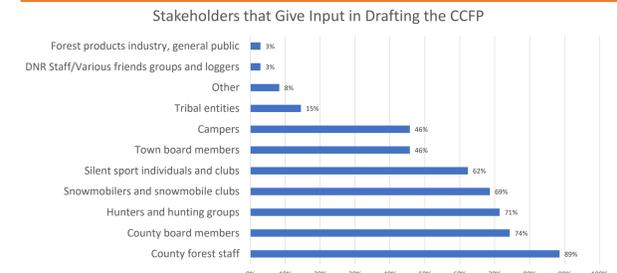
For those who observed climate change, none of them responded that CC does not affect their management approach. For those who did not observe CC, none of them responded to encourage a transition strategy.



None of the highly experienced foresters think the next plan will definitely include the CC context.



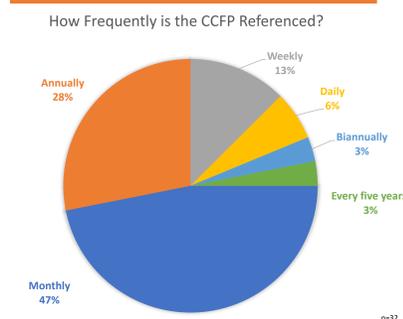
We wanted to understand who provided input to forest plans and we find a broad range of stakeholders.



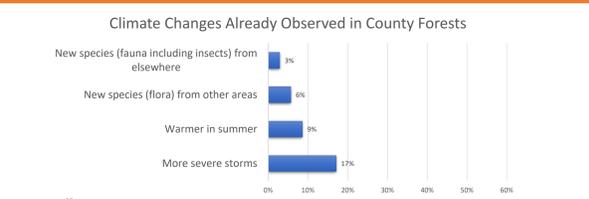
### Results

- **Preliminary Assessment of Current CCFP:**
  - Our analysis found no references to climate change in any of the current plans evaluated
- **Survey Responses:**
  - Responses received from March 27, 2019 to April 11, 2019
  - 35 responses
  - Response rate 47%

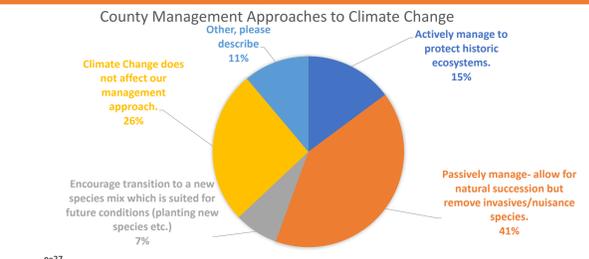
The Comprehensive County Forest Plan (CCFP) is referenced relatively often by the responding foresters.



But, less than 1/5 of foresters observe more severe storms and other CC effects.



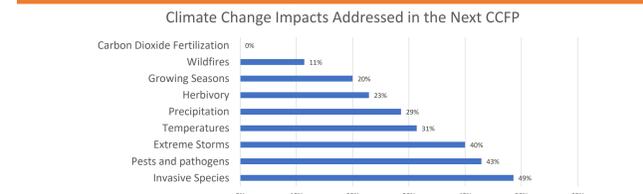
1/4 of the foresters believe that CC does not affect their management approach while another 40% will passively manage.



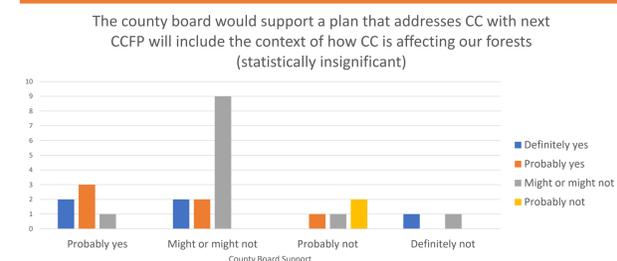
Foresters assume that the next plan will address factors exacerbated by CC and affect forest management.



Except for CO2 fertilization, the next plans will address many of the impacts of CC, including extreme storms (40%)



With county board approval over the county forest plan, we wanted to see how foresters perceived county board support. None of the foresters perceive county boards' definitely supporting a plan that addresses CC.



### Select Resources of Interest

Anhalt-Depies, C.M., Knoot, T.G., Rissman, A.R. et al. (2016) Understanding Climate Adaptation on Public Lands in the Upper Midwest: Implications for Monitoring and Tracking Progress. Environmental Management (2016) 57: 987. <https://doi.org/10.1007/s00267-016-0673-7>

Janowiak M. K., Iverson, L. R., Mladenoff, D. J., et al. (2014). Forest Ecosystem Vulnerability Assessment and Synthesis for Northern Wisconsin and Western Upper Michigan: A Report from the Northwoods Climate Change Response Framework Project. USDA. [https://www.fs.fed.us/nrs/pubs/gtr/gtr\\_nrs136.pdf](https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs136.pdf)

Janowiak, M. K., Swanson, C. W., Nagel, L. M., et al. (2014). A practical approach for translating climate change adaptation principles into forest management actions. Journal of Forestry, 112(5), 424-433. <https://doi.org/10.5849/jof.13-094>

Joyce, L. A., et al. (2009). Managing for Multiple Resources Under Climate Change: National Forests. Environmental Management 44(6),1022-1032. <https://doi.org/10.1007/s00267-009-9324-6>

Laatsch, J., Ma, Z. (2015). Strategies for Incorporating Climate Change into Public Forest Management. Journal of Forestry, 113(3),335-342. <http://dx.doi.org/10.5849/jof.14-128>

Millar, C., Stephenson, N., & Stephens, S. (2007). Climate Change and Forests of the Future: Managing in the Face of Uncertainty. Ecological Applications, 17(8), 2145-2151. Retrieved from <http://www.jstor.org/stable/40061917>

### Discussion and Conclusions:

This study held surprises for us. We expected to find more support for addressing climate change impacts and context from foresters than we found through our anonymous survey. We had thought that while county foresters are under pressure to create revenue for their county, we assumed that because they are long-term thinkers, and given the nature of growing and managing trees and forests, that they would consider how future environmental conditions (broadly defined) might impact the forests they manage. However, we found wide variation about how they will approach climate change adaptation planning. Most county foresters were unsure whether they would include the context of climate change's impact on forests in future plans. While it appears that less experienced foresters are more likely to include the climate change context, it is not statistically significant. It may be that because foresters are not observing CC and county boards are unsupportive that they are taking the safer, more passive path in the short-term in terms of management and planning decisions. Thus, we find that climate change is not greatly impacting current thought in forest planning.

### Thank you!

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