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State Wildlife Action Plans Adaptation to Climate Change

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ABSTRACT

Early conservation efforts were focused on setting aside lands to remain undeveloped and for plant and animal species to have a protected zone. Shifting environmental problems such as climate change have created a need for conservation efforts to adapt to continue to protect these important resources. This paper compares how each Great Lakes state's wildlife action plan accounts for climate change, and how those plans have changed over time. Each state wildlife action plan (SWAP) was inventoried based on climate change topics for both the 2005 and 2015 action plan. Overtime the mention of climate change increased in each state's plan. Not only was there an increase in total mentions but there was also a diversification in what areas of conservation climate change activities are affecting. This research helps policymakers understand that language and wording help to set the tone and message of policies. Properly mentioning and associating climate change creates a better understanding among politicians and the public.

INTRODUCTION

eighteen scientific associations and academies agree that anthropogenic climate change is occurring with a range of adverse effects. Current atmospheric carbon levels are at an 800,000 year high, warming the Earth's surface and causing a rise in global sea level (NASA, 2018).

Earth's changing climate can affect more bodies of water than the ocean. The Midwest is home to the Great Lakes which contains the largest ecosystem for waterfowl, fish, and mammals in the mid-west (Environmental Law & Policy Center, 2019). These waters, plants, and animals are all targeted by the threats of climate change. Due to temperature increases and fertilizer runoff, algal blooms in Lake Erie have continued to grow each year. In 2014, 500,000 residents of Toledo went seventy-two hours without clean drinkable water because of the toxic chemical of the algae blooms (ELPC, 2019). With continued heavy rains and rising temperature, algal blooms will grow exponentially. Changing temperatures can also cause adverse effects on the wildlife of the Great Lakes. With temperatures rising due to climate change, animals will need to move to colder habitats causing imbalance to current ecosystems (ELPC, 2019).

Current state wildlife action plans (SWAPs), required by the U.S. Fish and Wildlife Service, layout specific detailed statements on how they plan to carry out conservation within a given time frame. Each state's resource department is responsible for drafting the state wildlife action plan. Plans must address ongoing problems with species and habitats in need (Association of Fish & Wildlife Agencies, 2019). This could be through the protections of individual species or lands. Management plans could also define guidelines for future investment into climate change policies, though not required by the U.S. Fish and Wildlife Service. Great Lakes states have similar habitat and species, but their conservation leadership is made up of different groups

of people with unique problem-solving ideas. This paper compares how each state's wildlife action plan accounts for climate change, and how those plans have changed over time.

LITERATURE REVIEW

Most of the research involving conservation policy and procedures tends to fall into two main categories. The first subset of research is focused on existing and newly created policies. The research examines if the policy is accomplishing what was intended and how efficiently it is doing so. While the second subset also looks at existing policy, its focus is on how the policies and plans have changed over time.

Existing Policy Success

Before climate change was a well-established scientific consensus, in 1964 Congress passed the “Wilderness Act” which created the first protections for lands and ecosystems. A recent study by Dietz et al. (2015) looked at whether the act was successful in protecting lands. The authors state that the success of a protected area depends on the amount of ecological diversity, which is dependent on the preserve location not just its size. For preservation to successfully fulfill its job to protect and preserve wildlife it must encompass the entirety of an ecosystem. The researchers used surveying data as well as published federal land records to calculate the percent of ecological representation each protected wilderness area contained and what type of ecosystem it was. Their findings had shown that in total, public lands (40% national park, 18% national forest, 16% wildlife refuge, 5% BLM lands) encompassed 436 of 553 wilderness ecological systems in the United States (Dietz et al., 2015). Another important finding the researchers had was the change in diversity over time. That data had shown much of the diversity came at the initial passage of the 1964 Wilderness Protection Act, however, in the last

15 years, the 2 million hectares added have only included one new protected ecological system (Dietz et al., 2015). This research data shows that the 1964 Wilderness Protection Act may not be continuing to protect changing ecosystems.

Some researchers are investigating how currently protected lands are encompassing ecosystems. Work by Clinton et.al (2015) highlights that protected lands policy in the US may not be protecting the most important ecosystems. To illustrate their point, the researchers mapped diversity by combining species richness maps of mammals, trees, birds, fish, reptiles, and amphibians (Clinton et al., 2005). The results found that only 7.8% of the protected lands in the United States fall within an IUCN (International Union for Conservation of Nature) categorized protected area, 2.5% below the global average (Clinton et al., 2015). This data shows that compared to the rest of the world the U.S. protects fewer lands identified as a high priority by the IUCN. The researchers also found a disconnect between the amount of land and species protected. Most of the land that is protected is located in the western region of the United States. The west also contains the most species diversity for mammals. On the other hand, the Southeast and Midwest have very little protected areas compared to the west but contain the greatest species richness of trees, freshwater fish, reptiles, and amphibians (Clinton et al., 2015).

The Midwest is also home to a large group of migratory species. Since migration typically takes place over large sections of land it can be difficult for government public lands and state protections to cover entire migration pathways. The authors of a recent paper look at current protected, public, and private lands and compare them to the previously researched species migration patterns (Tack et al., 2015). They identified the total migration land as well as popular species stopover points using tracking collars and identification checkpoints. Tack et al.

(2015) found that half of each sage-grouse migration pathway, except two, are encompassed by private, public, and protected lands. Private land management coalitions can be of major support to government conservational plans. The data had also shown that there is some species overlap in protected migration pathways (Tack et al., 2015). To further explain, if these multispecies areas were protected it would lead to better species conservation on smaller plots of land. While protected areas might protect typical stationary habitats, it is also important to protect the migration pathways of species and to assess how an increase in global temperature might affect their current migration habitat in relation to protected lands.

One important example of private land management projects supporting government policy is that of the Canadian boreal forest. The Canadian boreal forest spans from Alaska to the Atlantic shores of Canada and is one of the largest biomes in the world. Currently, only 8.1% of the boreal forest is protected by traditional parks and reserves (Murray et al., 2015). Even with national protections, 28% of the forest is commercially logged with about .5% being removed from the forest annually (Murray et al., 2015). In 2010, 21 companies and nine non-government environmental agencies came together to form the Canadian boreal forest agreement protecting 29 million hectares of forest from logging (Murray et al., 2015). Since there is no government involvement or legal protections the researchers found there is nothing binding any company to stay within the CBFA guidelines. With a changing ecosystem, conservation management plans will need to adapt and think outside of traditional ways. Private protected areas (PPA) could be a revolutionary way to provide protection, but without proper planning and governmental oversite, PPA could fall short of their goals.

Changing Policy Examination

Understanding what a policy has accomplished after implementation is an important part of the policy review process. This could lead to a change in policy to better suit its goals or implementation of the policy in new areas if it is found to be successful.

Over time, some protections have had to change to account for urban development and climate change. In a review of marine mammal protection policy, Meek et al. (2011) focused on the extent to which the protection plans of marine animals were changed and adapted. The researchers first reviewed older marine life policies that focused on a zero-take aspect such as being unlawful to kill or harm seals. These older policies fail to recognize problems like how the development of coastland might affect marine mammals. One specific case of adaptive marine mammal policies in the United States is that of the polar bear. In 1972 the Marine Mammal protection act limited the number of polar bears Alaskan natives could harvest in a year (Meek et al., 2011). Then in 2008, due to the loss of habitat from global warming, polar bears were placed on the endangered species list. Once these national protections were in place any control from the local Alaskan Government was taken away. For instance, local governments were no longer able to sedate bears for relocation which could end with dangerous human-bear contact (Meek et al., 2011). The researchers suggest that policies that are integrated on a local level are more beneficial because of their local knowledge on the issues. Local-level could result in better conservation of marine wildlife.

Understanding how conservation planning evolve is vital to where the future of conservation will be heading. Meretsky & Fischman (2014) examine how legal policy and conservation reform have changed refuge management plans. The researchers inventoried every

comprehensive conservation plan (CCP) between 2005 and 2011 and noted important details such as strategies and goals. Comprehensive conservation plans review the policies of the public lands set aside for the National Wildlife Refuge (Meretsky & Fischman, 2014). The researcher tracked these target areas laid out by the CCPs and compared them over time. One of the largest upward trends in action goals revolved around climate-change. In CCPs between 2005 and 2011, actions and goals were placed to respond to the threats of climate change on habitat and plant community (Meresky & Fischman, 2014). Another trend the researchers noticed was that a majority of CCPs discussed plans for development but only a quarter of CCPs laid out plans on how to carry the task out. Two-thirds of all CCPs called for some type of action outside of the protected area but had decreased from 2010-2011 (Meresky & Fischman, 2014). These adaptive management plans are important pieces of policy and need to continue to adapt as the world does.

Furthering Research

Early research conducted on conservation action tends to focus on increasing land area protections to combat habitat loss from urban development. Conservation data also has a tendency to focus on outcomes of plants, animals, and lands rather than actual policy changes. For instance, Dietz et al. (2015) researched how effective the Wildness Act of 1964 was by examining the total count of ecological systems and species covered by the protections. Shifting environmental problems such as climate change have created a need for conservation efforts to adapt to continue to protect these important resources from a multitude of factors. This paper will look to move past these limitations and further conservation research by answering the question

of “How have wildlife action plans in Great Lakes states evolved in how they acknowledge or address adapting to climate change?”

METHODS

To understand how SWAPs have framed policy around climate change, this paper inventoried state wildlife action plans mentions of climate change. State wildlife action plans cover all land and ecosystems of a state and were required in 2005 to receive funding from the U.S. Fish and Wildlife Service (Association of Fish & Wildlife Agencies, 2019). Most plans provide goals for the ten years following the plan’s issue date. These goals can be a multitude of things such as threats currently happening or problems that could arise and need to be assessed in the future. In 2015 each state reissued a revised wildlife action plan for 2015 through 2025.

This paper was limited in geographical scope to the Great Lake states in the Midwest region as defined by the U.S. Fish and Wildlife regional map in Figure 1 (U.S. Fish and Wildlife Service, 2020). This paper further filtered the Midwest Region states to those that contain portions of Great Lakes’ shoreline such as Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

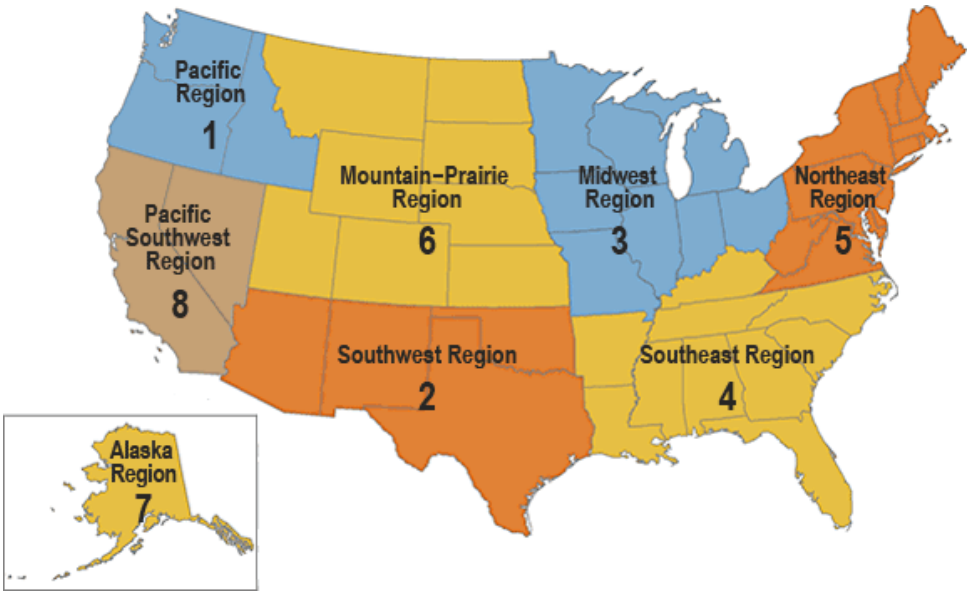


Figure 1. U.S. Fish and Wildlife Service planning divisions: Region 3 Midwest Region: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin (regional and planning office in Fort Snelling, Minnesota)

For every Great Lakes state selected, two SWAPs were reviewed. The first plans reviewed were the initial installments of each state's SWAP in 2005. The second set of plans reviewed were ten-year revisions (2015) of the original plan. Altogether, twelve state wildlife action plans were used in this inventory. The SWAPs were collected online and can be found in appendix C. Each plan was reviewed individually and in its entirety. Some plans, like that of Michigan, have their state wildlife action plan broken down into separated segments. In that case, each individual portion of the plan was examined using the control find word searching method.

The key focus of this paper's inventory starts with the presence or absence of climate change mention and the total number of times it is mentioned within a state wildlife action plan, excluding the appendix. To establish presences or absence, each plan (both 2005 and 2015) was

searched for “climate change”. While the key phrase “climate change” was searched for, some other searches were conducted for phrases such as “adaptation”, “warming temperatures”, and “mitigation”. One major challenge that comes with a keyword search is that sometimes a phrase might contain different verbiage and could be excluded. For example, in the keyword search for “adaptation” the phrase “adapting” might be excluded from the original search. To help combat this problem searching for terms was conducted using root word analysis such as searching for “adapt” and then distinguishing context. Along with individual mention count, number of paragraphs related to the four climate change phrases were counted.

If the mention of any of the four climate change topics’ context is deemed relevant its paragraph was then assigned to one of the state wildlife action plans legal requirements mandated by Congress. This data is important to see what key legal area of the state wildlife action plan each individual state thinks is most affected by climate change. These legal requirements were set by Congress and must be included in each state wildlife action plan (2005 and 2015). The federal mandates represent species of need as well as wildlife-related issues the U.S. Fish and Wildlife Services would like states to address and create action plan polices for. Some of these requirements this paper reviewed are species of greatest conservational needs (SGCN), key habitats and communities (Habitats), problems adversely affecting species (Problems Caused by Change), and conservation action (Actions Implemented) to conserve identified species and public participation (State Wildlife Action Plans, 2020).

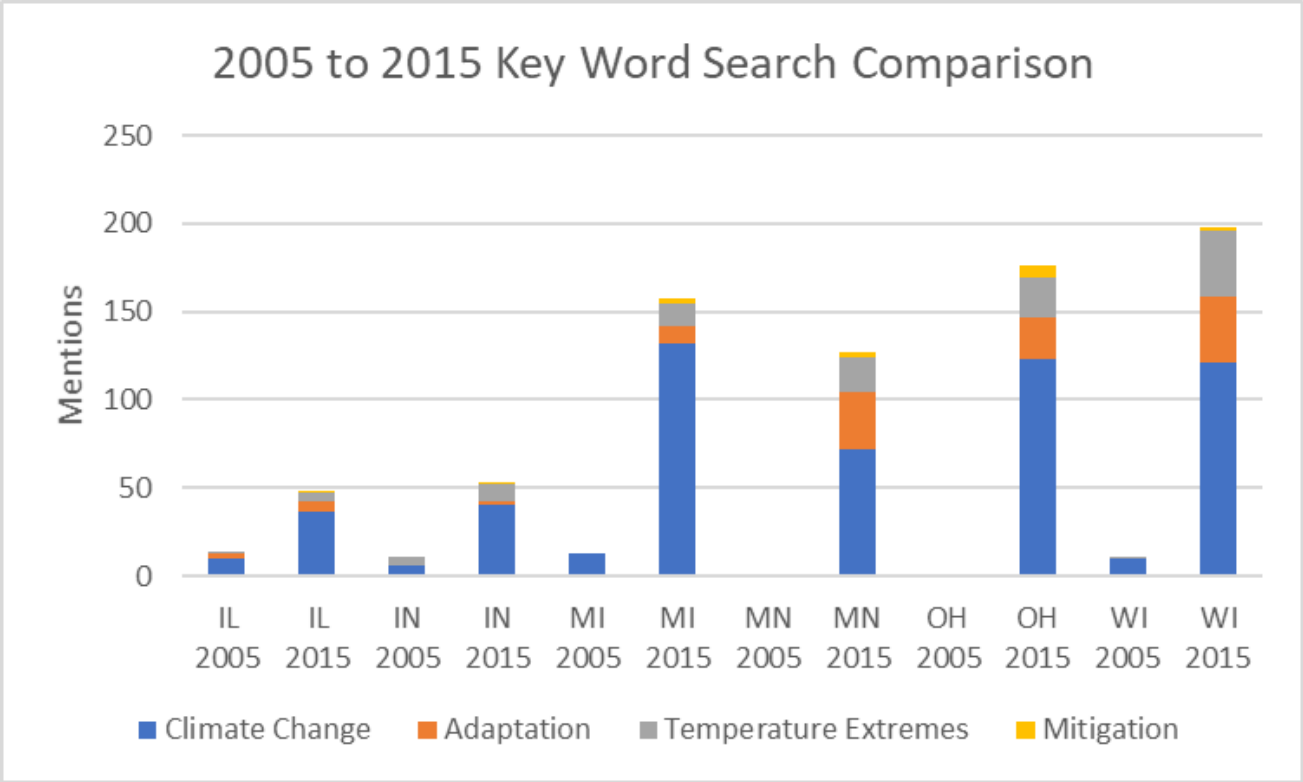
In conjunction with a keyword search, this paper will also include an important contextual variable. One contextual variable that provides support to this paper is the governor’s political party association. Political party association could cause differences in how a state

drafts a wildlife action plan. With midwestern states typically being swing states, changes in governor political party could cause large changes from 2005 to 2015 SWAPs. Murray et al. (2015), mentions that in recent years policies and all parties have continued to trend towards more action to address climate change.

RESULTS

Located below is the data from the results of this paper's inventory. The data is reorganized into tables and charts for better understanding and clarification. The full inventory data set can be found in the appendix A and B.

TABLE 1: 2005 to 2015 Key Word Search Comparison



This comparison graph in Table 1 includes the six 2005 state wildlife action plans and the six 2015 wildlife action plans of the Midwest. Each bar represents the total number of mentions of the four climate change related keywords: “climate change”, “adaptation”, “temperature extremes”, and “mitigation”. The total is then broken down and color-coded for each keyword and every state wildlife action plan (2005 and 2015). This data shows two important trends. First, from 2005 to 2015 each Great Lakes state had an increase in the total of mentions in their state wildlife action plans. Second, the 2005 SWAP with the most mentions (IL-14) had four times fewer mentions than the 2015 SWAP with the fewest mentions (IL-48). These trends show that there was a substantial increase in climate change mentions in each SWAP.

TABLE 2: 2005 SWAP Key Word Search

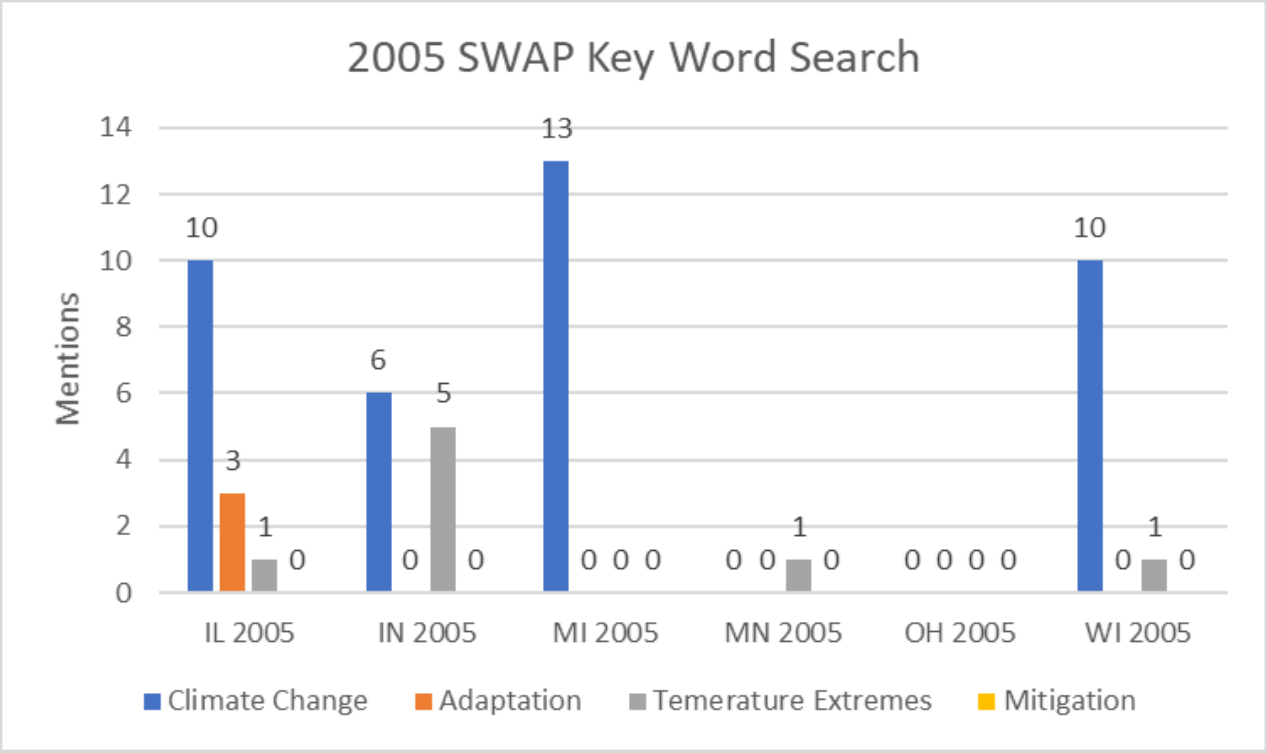


Table 2 shows the further breakdown and comparison of the four climate change related keywords in each 2005 state wildlife action plan. Each keyword was broken down into separate bars for better comparison between the plans. Most plans had mentions of “climate change” and “temperature extremes” but only Illinois had mentions of “adaptation”. None of the 2005 state wildlife action plans contained any mentions of “mitigation” in relation to climate change. No state had a total higher than fourteen and Ohio was the only state to record zero mentions in any of the four climate change key words.

TABLE 3: 2015 SWAP Key Word Search

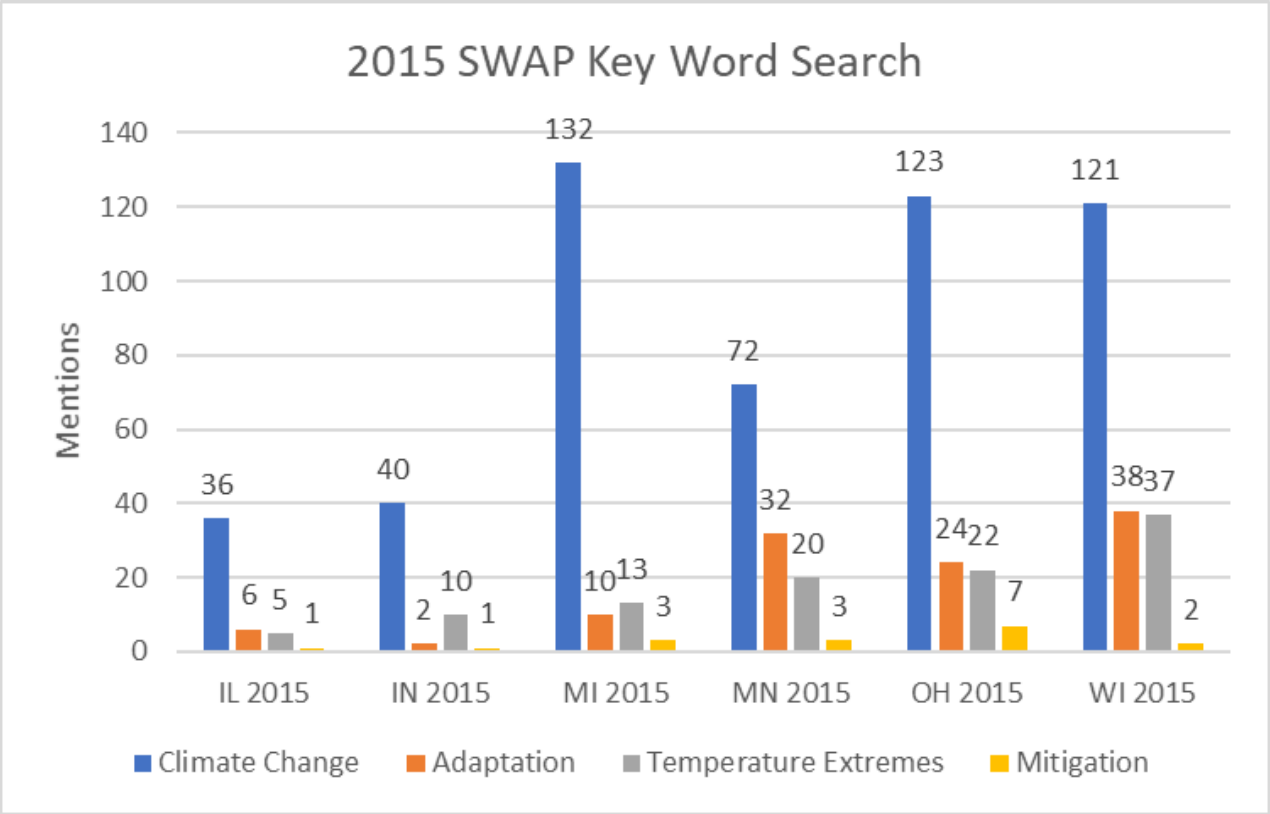
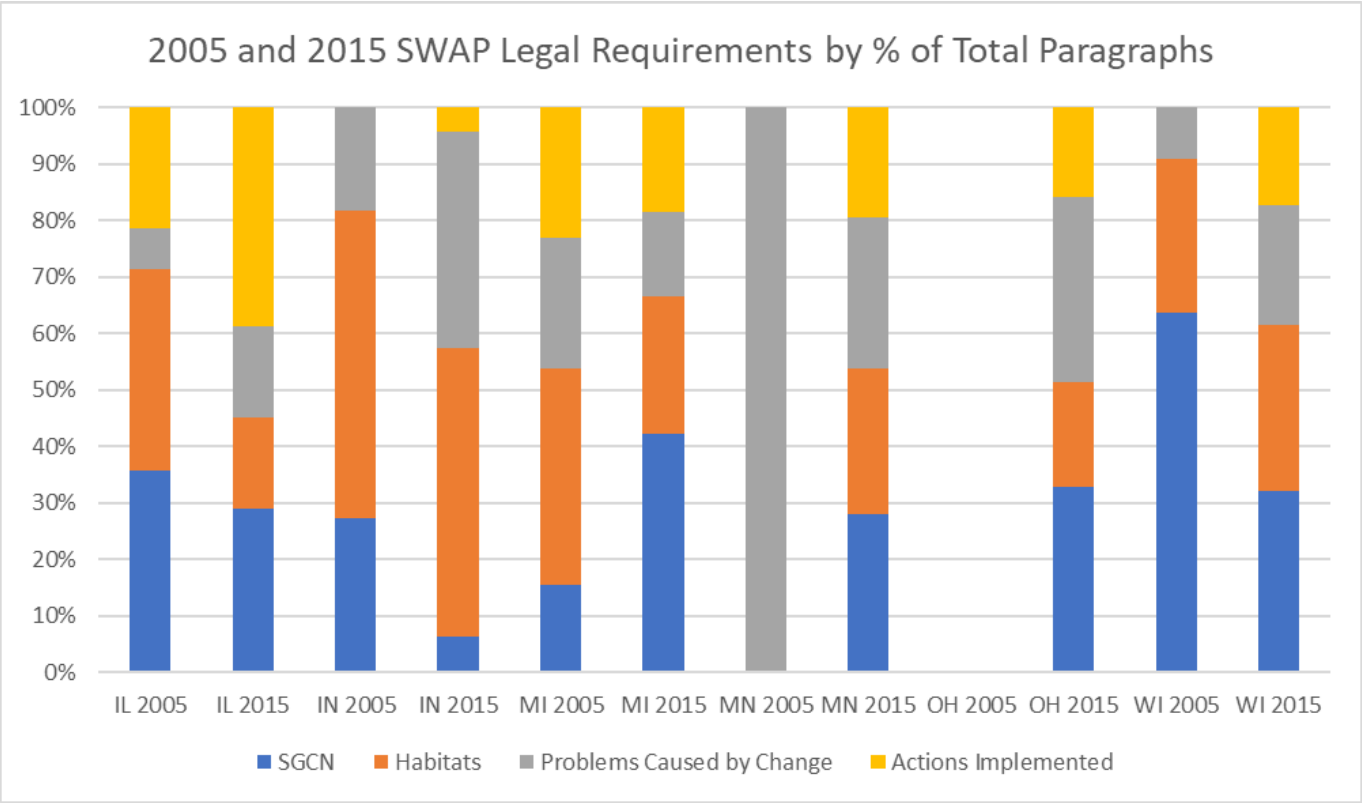


Table 3 shows the breakdown of the four keyword searches for each 2015 plan in the same way the 2005 plans were displayed. Each state had at least one mention of each of the four climate change related keyword searchers. “Climate change” recorded the highest total of mentions, followed by “adaptation” and “temperature extremes” as shown in Table 3. The state wildlife action plan of Illinois recorded the lowest counts of all climate change keyword searches except for “adaptation” in which Indiana had the lowest count. On the other hand, Wisconsin’s action plan recorded the highest numbers of mentions for “climate change”, “adaptation”, and “temperature extremes”, while Ohio had the highest mentions of climate change mitigation.

TABLE 4: 2005 and 2015 SWAP Legal Requirements by % of Total Paragraphs



The legal requirements mandated by the U.S. Fish and Wildlife Service were also represented by the state wildlife action plans. Table 4 allows for the comparison between the two state wildlife action plans for each state and for comparison between other states. This comparison shows what percent of climate change paragraphs focused on each of the U.S. Fish and Wildlife Service legal requirements. In all but four wildlife action plans (all in 2005) each of the four legal requirement topics were represented by a percentage of climate change paragraphs. As mentioned above the 2005 plan of Ohio did not have any mentions and 100% of the climate change paragraphs in Minnesota's plan focused on the legal requirement of "problems caused by change". The 2005 plans of Wisconsin and Indiana did not have climate change paragraphs relating to the requirement of "actions implemented". The 2005 state wildlife action plan of

Wisconsin also had a significantly large percent of "SGCN" related climate change paragraphs compared to the more balanced 2015 state wildlife action plans of the Great Lakes states.

TABLE 5: State Mentions and Governor Political Party

State	Total Mentions	Governor Political Party
WI 2015	198	R
OH 2015	176	R
MI 2015	158	R
MN 2015	127	D
IN 2015	53	R
IL 2015	48	R
IL 2005	14	D
MI 2005	13	D
IN 2005	11	R
WI 2005	11	D
MN 2005	1	R
OH 2005	0	R

Table 5 shows the relationship between the total number of mentions for each state plan (2005 & 2015) and the political party of the governor during that time. On average, in 2005, the states with Democratic governors had higher total mentions than that of the Republican ran state. However, in the 2015 plans, the top three climate change mention totals were in states with a Republican governor. The data from the 2015 state wildlife action plans shows that there is little correlation between climate change mention totals and political partisanship.

ANALYSIS

Climate is a major threat to wildlife and their habitats, which is why each of the Great Lakes state's SWAP saw an increase focus on climate change from 2005 to 2015 as shown in Table 1. This threat of climate change has forced each state's wildlife action plan to adapt and change to fit current climate data and to better advise protections for U.S. wildlife.

To illustrate this point, in 2005, Michigan had 13 mentions of the keyword "climate change". There were no mentions of the three other important topics such as adaptation, temperature extremes, and mitigation. With only mentioning climate change, Michigan's 2005 SWAP begins the process of climate change recognition but does not illustrate the scope of effects associated with climate change. In Michigan's 2015 SWAP there was an increase of total climate change keyword mentions by a factor of twelve. Not only is there a larger total sum, but the total mentions for "temperature extremes", "adaptation", and "mitigation" all increased between the 2005 and the 2015 state wildlife action plan. This increase led to Michigan's wildlife plan to cover a broader range of topics on the effects climate change and not simply just the presences of climate change.

This trend in total count of SWAPs was not found exclusively in Michigan. In Ohio's 2005 plan there were no recordable mentions of any of the four keyword searches. Then in 2015, Ohio's SWAP had a total of over 170 mentions of the climate change related searches. Large increases were also observed in Wisconsin and Minnesota. Wisconsin's state wildlife action plan saw the highest total of mentions at 197. Wisconsin's plan also had the highest mentions of "temperature extremes" and "adaptation". Minnesota went from a total of one mention of "temperature extremes" in 2005, to 127 total mentions of the four climate change key words in 2015. In total,

each state wildlife action plan had shown substantial growth in climate change mentions from the 2005 plan to the 2015 SWAP. This observation of increased climate change mentions through time is not a new one. Meretsky & Fischman (2014) similarly found an increase in the mentions of climate change in their analysis of comprehensive conservation plans spanning from 2005 to 2011.

Diversification of climate change mentions through time was another similarity found between the Meretsky & Fishman (2014) analysis of comprehensive conservation plans and state wildlife action plans. Data from table 1 and table 4 show the increase in diversification of climate change mentions through time in Great Lake SWAPs. In 2005 Minnesota's SWAP only contained climate change paragraphs focused on problems that are caused by climate change such as increased lake or river water levels and differences in precipitation. This type of state wildlife action plan change was also observed in the plans of Indiana, Wisconsin, and Ohio. Each of these states saw a large diversification to include all the legal requirements investigated in this paper. In the case of Ohio, their 2005 SWAP did not describe any of the four U.S. Fish and Wildlife Service legal requirements, but their 2015 SWAP included relevant numbers of paragraphs of each of the four requirements.

Observations and comparisons of the Governor's political affiliation and total mentions of climate change did not lead to any major trends. In 2005 SWAPs, the average total count for Republican-affiliated states was four mentions. On the other hand, the 2005 Democratic affiliated states had an average of thirteen total mentions. This slight difference could be attributed to early action on climate change from Democratic leaders. In 2015 there was only one Democratic-controlled state, Minnesota. Minnesota had a total of one hundred and twenty-seven mentions, while the average of the rest of the Republican states was one hundred and twenty-seven mentions

as well. This data shows that there is no obvious trend or comparison between the governor's political affiliations and total mentions of climate change but does show an increase in total action for both parties as Murray et al. (2015) suggested.

CONCLUSION

This paper suggests that Great Lakes states' wildlife action plans have changed from 2005 to 2015 to better adapt to threats of climate change. However, this paper does have some limitations. Due to time constraints, every state wildlife action plan in the U.S. could not be collected and properly assessed for instances of climate change mentions. The idea of collecting all SWAPs mandated by the U.S. Fish and Wildlife Service from 2005 and 2015 could be a possible outlet for further research. Comparisons could be made across the U.S. or between different U.S. Fish and Wildlife regions in Figure 1. Another limitation of this paper was the available data. There are only two time points of state wildlife action plans which severely limit the ability to track data over a long period. Continuing to observe climate change counts of future SWAPs (2025 and 2035) could better illustrate trends in the research.

Along with future research, this paper highlights some important language takeaways for policymakers. Language and wording help to set the tone and message of policies. To elaborate on this idea, Meretsky & Fischman (2014) also found that without associating certain environmental problems (habitat, temperature extremes) to climate change, policymakers cannot easily create resolutions. When state wildlife action plans were written in 2005, they did not have many associations of climate change. This does not help further the message of climate change in regard to public understanding of the problems and solutions associated with climate change. In 2015, the SWAPs increased the total mentions of climate change but also began to talk about

problems associated with climate change and actions taken to help mitigate effects. This, in turn, gives the public a better understanding of what climate change is and how it can affect multiple systems. Moving forward politicians can focus on their language use to send the proper message of climate change action to both their peers and to the general public.

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Appendix A: 2005 State Wildlife Action Plan Dataset

	IL 2005	IN 2005	MI 2005	MN 2005	OH 2005	WI 2005
Climate Change	10	6	13	0	0	10
Climate change-paragraphs	9	6	13	0	0	10
Adaptation	3	0	0	0	0	0
Adaptiaton paragraph	3	0	0	0	0	0
Temperature Extremes	1	5	0	1	0	1
Temperature paragraph	1	5	0	1	0	1
Mitigation	0	0	0	0	0	0
Mitigation Paragraphs	0	0	0	0	0	0
Political Party of Gov	D	R	D	R	R	D
SGCN	5	3	2	0	0	7
Habitats	5	6	5	0	0	3
Problems Caused by Change	1	2	3	1	0	1
Actions Taken	3	0	3	0	0	0

Appendix B: 2015 State Wildlife Action Plan Dataset

	IL 2015	IN 2015	MI 2015	MN 2015	OH 2015	WI 2015
Climate Change	36	40	132	72	123	121
Climate change-paragraphs	20	35	89	53	59	93
Adaptation	6	2	10	32	24	38
Adaptiaton paragraph	5	2	10	19	21	32
Temperature Extremes	5	10	13	20	22	37
Temperature paragraph	5	9	12	16	20	29
Mitigation	1	1	3	3	7	2
Mitigation Paragraphs	1	1	3	3	7	2
Political Party of Gov	R	R	R	D	R	R
SGCN	9	3	48	26	35	50
Habitats	5	24	28	24	20	46
Problems Caused by Change	5	18	17	25	35	33
Actions Taken	12	2	21	18	17	27

Appendix C: State Wildlife Action Plan Links

State	Link
IL 2005	https://www2.illinois.gov/dnr/conservation/IWAP/Documents/IllinoisCWCP.pdf
IL 2015	https://www2.illinois.gov/dnr/conservation/IWAP/Documents/IWAPImplementationGuide2015.pdf
IN 2005	https://www.in.gov/dnr/fishwild/files/CWS_MANUSCRIPT.pdf
IN 2015	https://www.in.gov/dnr/fishwild/files/SWAP/fw-SWAP_2015.pdf
MI 2005	Data sent in personal email
MI 2015	https://www.michigan.gov/dnr/0,4570,7-350-79136_79608_83053_83059---,00.html
MN 2005	https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/tomorrows_habitat.pdf
MN 2015	https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/mnwap/wildlife-action-plan-2015-2025.pdf
OH 2005	https://www.sciencebase.gov/catalog/item/5787d03ce4b0d27deb37553e
OH 2015	http://wildlife.ohiodnr.gov/Portals/wildlife/pdfs/proposed%20rule%20changes/OHIO%202015%20SWAP.pdf
WI 2005	https://dnr.wi.gov/files/PDF/pubs/ER/ER0641.pdf
WI 2015	https://dnr.wi.gov/topic/wildlifehabitat/actionplan.html