2018 AFWA Climate Adaptation Surveys:

A REVIEW OF ACTIVITIES AT STATE FISH & WILDLIFE AGENCIES

A REPORT PREPARED BY THE CLIMATE ADAPTATION COMMITTEE OF THE ASSOCIATION OF FISH AND WILDLIFE AGENCIES

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Executive Summary

Introduction

State fish and wildlife agencies have long been on the front lines of responding to changing environmental conditions affecting natural resources. As the impacts of a changing climate become more severe, state agencies are continually challenged with designing and implementing the most effective adaptation strategies to safeguard the nation's fish and wildlife. Since 2011, AFWA has conducted surveys of state fish and wildlife agencies to better understand their needs, activities, and perspectives for fish and wildlife management in a changing world. The goal of the survey is to better understand state needs and help communicate those needs and activities within those agencies and with other partners. This report summarizes responses to the 2018 AFWA Climate Adaptation Surveys, compares them to past surveys, and provides some general recommendations for federal, state, and non-profit partners to target research needs, deploy management strategies, and consider future collaborative efforts. In 2018 two surveys were conducted, one to state fish and wildlife agencies in general and one specifically targeting marine components of state fish and wildlife agencies. The general survey was sent to 122 state climate contacts on August 1, 2018 and was closed on September 1, 2018. In total, the survey received 69 submissions with a response rate of 57%. Only nine states/jurisdictions did not submit survey responses (Arkansas, District of Columbia, Kansas, Mississippi, Nevada, New Mexico, New York, Oklahoma, and South Carolina). The marine and coastal survey was sent to 34 contacts from states or territories with a coastline. The survey received 15 submissions with a response rate of 44%.

Major Takeaways/Highlights for the General Survey

Agency perceptions of climate are complicated. For example, 65% reported that their agency has a program or position where at least some time is dedicated to climate-related work and that 57% reported that adaptation is being integrated into other programs or projects throughout their agency. However, only 29% of respondents have time allocated towards on-the-ground implementation, whereas 28% reported there was no time allocated to any climate-related work within their agency. Time is reportedly allocated towards learning, educating others, or capacity building (57%). Barriers that inhibit development or implementation include lack of staff time and capacity (82%), lack of funding (66%), and lack of staff expertise (53%).

Most states report that they access climate-related information from peer-reviewed journals (75%), academic institutions (74%), and the US Geological Survey (72%). When asked about specific federal programs, states reported using tools or information generated by the former Landscape Conservation Cooperatives (72%), the USGS Climate Adaptation Science Centers (62%), and NOAA's Regional Integrated Sciences and Assessments (31%). Identifying science and information needs, states reported a desire for more information/products on climate impacts for specific species or habitats (68%), guidance on incorporating climate adaptation into agency planning (58%), and translating data into a format that would be relevant for managers (55%). High priority information needs over the coming months and years were identified as invasive species movement and range expansion (81%), habitat connectivity (64%), and adaptive capacity of species (63%). Webinars (73%), online resources, such as databases (68%), and workshops or in-person trainings (61%) topped the list for preferred mechanisms for accessing climate information and tools.

Trends Over Time

AFWA has conducted similar surveys since 2011. However, survey content has not been consistent over time and makes comparison challenging. Only surveys from 2014, 2016, and the most recent 2018 surveys were assessed. Overall, the takeaway is that not much has changed over time. For example, goals that are being addressed under the National Fish, Wildlife, and Plants Climate Adaptation Strategy remain consistent. Goal 1: conserve habitat and connectivity, and Goal 2: manage species and habitat to protect ecosystem function, topped the list for most addressed goals while Goal 3: enhance capacity for effective management and Goal 6: increase awareness and motivate action to safeguard species, were least addressed. However, there was a significant shift in priority research areas. In 2016, 100% of respondents indicated that water quality and quantity were the highest priority climate-related research need for their agency. In 2018, this research area dropped to fourth (61%). In 2018, research priorities included invasive species movement and range expansion, habitat connectivity, and adaptive capacity of species.

Major Takeaways/Highlights for the Marine & Coastal Survey

Concurrent to the AFWA Climate Adaptation Survey, we also collected feedback on a similar survey targeted towards state agencies or departments that focus on marine and coastal resources. The survey was sent to states or territories with a coastline. The survey was sent to 34 individuals and had a response rate of 44% (15 individual responses). One major deviation between the surveys was in where staff time is allocated for climate-related work. In the main survey, most states indicated that they spent most of their time on learning, educating others, or capacity building. For marine and coastal survey respondents, the majority are focused on time for assessing climate impacts or conducting vulnerability assessments (64%) or time for adaptation planning or developing management responses to climate impacts (50%). This suggests that marine and coastal resource agencies may be further along in climate adaptation implementation than broader natural resource agencies.

Recommendations

Using the survey results, we can identify research gaps and needs that can be met, in addition to targeting specific Strategy goals that can be emphasized and better implemented. However, an overarching theme is a desire to elevate climate adaptation as a higher priority in state fish and wildlife agencies. Therefore, we recommend the priority focus over the next few years be two-pronged in order to meet this need. First, state leadership should be engaged to increase awareness and understanding of the importance of climate adaptation for fish and wildlife management. Second, greater coordination between federal, state, tribal, and non-profit partners will be critical in aligning priorities and developing a unified voice. In turn, these actions will help to raise the profile of climate adaptation for fish and wildlife across the nation and the world.

Conclusion

Overall, there is strong evidence that state agencies are engaging in a wide variety of climate adaptation work. Over the next few years, it will be critical to make climate adaptation for fish and wildlife a higher priority within the conservation community. To do so requires developing a roadmap to engage state leadership, as well as to develop mechanisms to increase coordination across federal agencies, state agencies, tribes, and non-profit partners. The next survey is scheduled to be conducted in 2020.

ASSOCIATION of FISH & WILDLIFE AGENCIES

This report was prepared by the Association of Fish and Wildlife Agencies
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Contents

2018 AFWA Climate Adaptation Surveys: A review of activities at state fish & wildlife agencies

Introduction

State fish and wildlife agencies have long been on the front lines of responding to changes in the local environment. Extreme weather events, land use change, and pollution have impacted management strategies, but in recent years, these challenges have been magnified by a changing climate. Today, climate change is a reality that can be felt across the world. In 2018 alone, the United States experienced the fourth hottest summer on record (NOAA 2018), above average Atlantic and Eastern Pacific hurricane seasons (Klotzbach & Bell 2018, Cappucci 2018), the most devastating wildfires in California's history (Meyer 2018), and one of the warmest and driest Alaskan falls on record (Samenow 2018). Recently, scientists are finding more evidence connecting these unpredictable and, at times, devastating weather events to climate change (NASEM 2016). The impacts of these events will touch all facets of life including fish and wildlife, human health, infrastructure, the economy, and more.

The past year also saw the release of significant reports on climate change. The International Panel on Climate Change (IPCC) released a *Special Report on Global Warming of 1.5°C* (IPCC 2018). The report documents the impacts and costs expected of planetary warming of 1.5°C above preindustrial levels, finding the impacts will be substantially worse than the 2°C target set by the 2015 Paris Agreement (UNFCCC 2018). Currently, it is estimated that human activities have caused approximately 1°C of global warming above preindustrial levels with a likely increase to 1.5°C between 2030 and 2052 if warming continues at the current rate. To stabilize global warming to the 1.5°C target would require historic efforts between international, national, state, and local partners. The scientific findings were approved by all representatives from 195 nations, including the United States.

Likewise, the US Global Change Research Program released the *Fourth National Climate Assessment* (NCA4) (USGCRP 2018). Like the IPCC report, the NCA4 warns of coming disaster if more is not done to mitigate and adapt to climate change immediately. According to the NCA4's models, the United States may experience a rise in global average temperatures of 3.6-9°F by mid-century. In their Assessment, adaptation implementation, particularly at the state, tribal, and local levels have been increasing since 2014 (when the NCA3 was published), but adaptation is still not yet common or unified across the Nation. The repercussions of climate change on the Nation's living natural resources may be devastating. Implementing adaptation strategies are critical to safeguarding fish, wildlife, and plants, and the myriad jobs, communities, and people they support.

The Association of Fish and Wildlife Agencies (AFWA) has been conducting surveys on climate adaptation efforts by state agencies since 2011. In this report, the 2018 survey results are summarized, and a few emerging trends are noted. The surveys are not intended to be exhaustive or comprehensive, nor do they necessarily follow a rigorous scientific methodology, but we hope that the results reported here provide a level of detail into state agency perceptions of climate work, agency progress towards implementation, and scientific data and information needs. These results complement recent climate assessments and provide a roadmap to shape research, communication, and management priorities for the coming years.

Methods

The 2018 AFWA Climate Adaptation Survey was developed to assess the status of climate adaptation efforts across state fish and wildlife agencies, identify information gaps and needs, and assist in the planning and prioritization of future adaptation work. Questions were pulled from previous surveys (2010-2016) and while questions have evolved over time, we have tried to be consistent with the types of questions and formats since 2014, adding or removing questions as needed to provide a more comprehensive assessment.

The survey was sent out to 122 state agency climate contacts on August 1, 2018. Multiple responses from the same agency were accepted and we encouraged the survey to be shared with colleagues. The survey was closed on September 1, 2018, with one exception caused by a technical malfunction in submission, so their response was incorporated after the closing date. We also received one submission from a tribal commission, but because there was only one, their response was removed from this survey's analysis. In future surveys, we would like to assess tribal efforts within climate adaptation for fish and wildlife, so this will be a focal area for the 2020 survey. In total, the survey received 69 submissions with a response rate of approximately 57%. We acknowledge, however, that this is likely an overestimation because we assume the survey was shared with more than the original 122-person contact list. Only nine states or jurisdictions did not submit survey responses including Arkansas, District of Columbia, Kansas, Mississippi, Nevada, New Mexico, New York, Oklahoma, and South Carolina.

In 2014 and 2016, the Survey had 39 and 34 responses, respectively. We believe the nearly doubling in responses may indicate that climate adaptation remains a priority among state agencies, perhaps even more so as federal priorities in this field have shifted.

The Survey included 33 questions which were broken down into six sub-topics: background information, agency perceptions, agency implementation, data and information access, science/information gaps and needs, and AFWA support. The complete survey can be found at the end of this report along with survey responses. All identifying information has been removed to maintain privacy.

Major Takeaways/Highlights

While this survey provides a wealth of information to dig into, this section will serve to point out some of the overarching takeaways that we feel should be highlighted. We strongly encourage readers to examine the entire survey at the end of this report (see Appendix) to get a more complete picture of the status of state climate adaptation efforts and future directions.

Agency perceptions and implementation

Agency perceptions of climate change and climate adaptation are complicated. For example, 65% reported that their agency has a program or position where at least some time is dedicated to climate-related work and that 57% reported that adaptation is being integrated into other programs or projects throughout their agency. However, only 29% of respondents have time allocated towards on-the-ground implementation, whereas 28% reported there was no time allocated to any climate-related work within their agency. Time is reportedly allocated towards learning, educating others, or capacity building (57%).

Barriers that inhibit development or implementation include lack of staff time and capacity (82%), lack of funding (66%), and lack of staff expertise (53%) (Figure 1). However, several respondents noted the existence of political challenges to undertaking climate adaptation work as well as a lack of support from agency leadership for this kind of work. Not surprisingly, these two points are often interwoven with one another, presenting not only challenges for state agency staff in getting work done on-the-ground, but also a palpable disconnect in direction and vision between leadership and management-level staff.

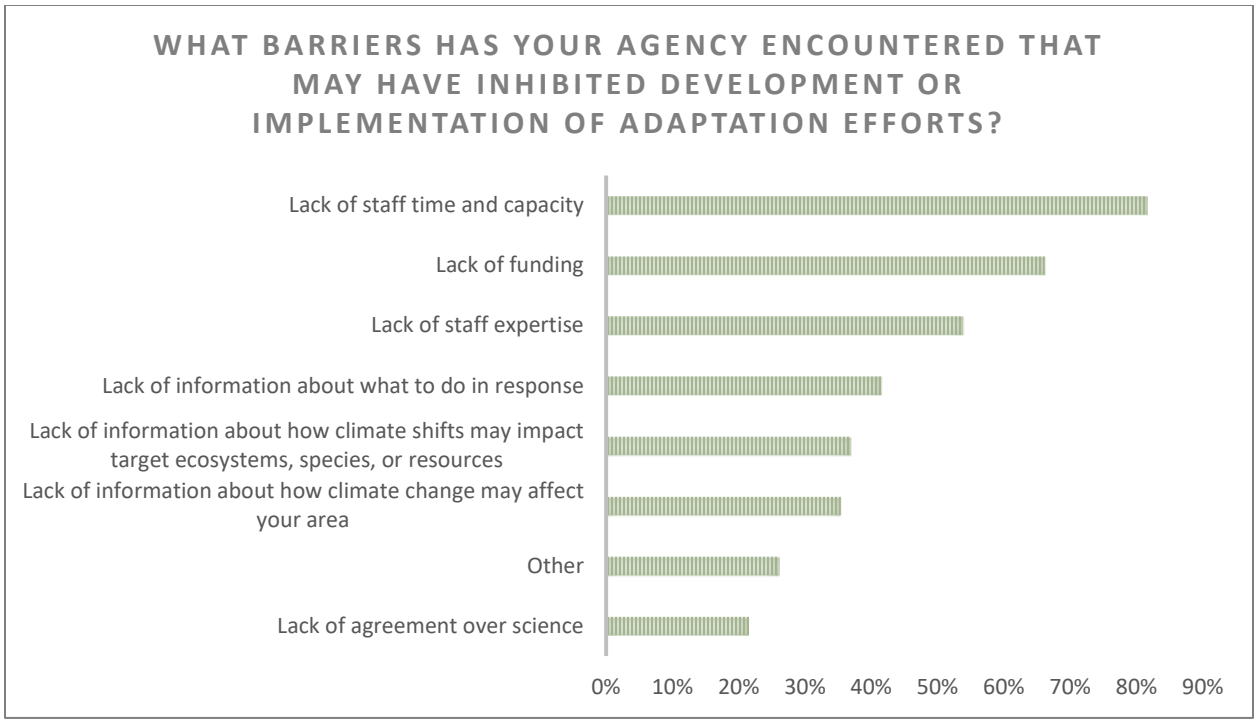

Figure 1. Percentage of responses from Question 18 from the 2018 Climate Adaptation Survey.

Science needs/information gaps

Most states report that they access climate-related information from peer-reviewed journals (75%), academic institutions (74%), and the US Geological Survey (72%). When asked about specific federal programs, states reported using tools or information generated by the former Landscape Conservation Cooperatives (72%), the USGS Climate Adaptation Science Centers (62%), and NOAA's Regional Integrated Sciences and Assessments (31%). Now that the Landscape Conservation Cooperatives are no longer operating, with a few exceptions, it is clearly a critical need for the US Fish and Wildlife Service to continue to provide quality climate science information to states and other partners. In addition to these federal programs, many states pointed to their own internal climate reports, such as New Jersey's coastal vulnerability mapping index (NJDEP 2018), the Oregon Climate Assessment (Dalton 2017), the Wisconsin Initiative on Climate Change Impacts (WICCI 2011), and the Florida Adaptation Guide (Florida DEP 2018), suggesting several states are working to synthesize climate-related information for their state and use those documents for management planning and decisions.

Identifying science and information needs, states reported a desire for more information/products on climate impacts for specific species or habitats (68%), guidance on incorporating climate adaptation into agency planning (58%), and translating data into a format that would be relevant for managers (55%). High priority information needs over the coming months and years were identified as invasive species movement and range expansion (81%), habitat connectivity (64%), and adaptive capacity of species (63%) (Figure 2).

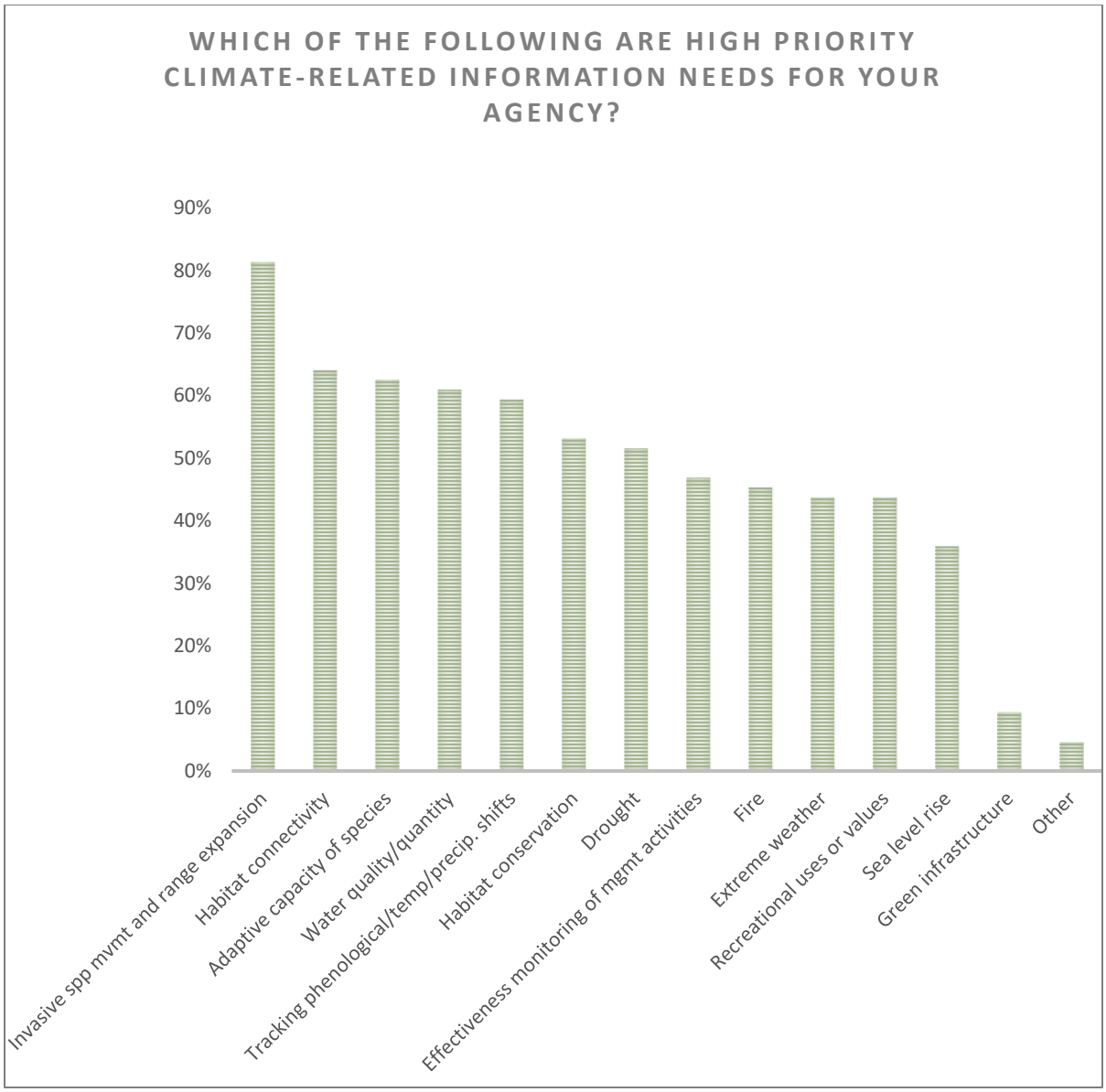

Figure 2. Percentage of responses from Question 29 from the 2018 Climate Adaptation Survey.

Webinars (73%), online resources, such as databases (68%), and workshops or in-person trainings (61%) topped the list for preferred mechanisms for accessing climate information and tools. Additionally, research synthesis on a topic (79%), workshops (48%), and local training (43%) were identified as the types of action needed to meet agencies' needs.

Thematic areas of interest

The National Fish, Wildlife, and Plants Climate Adaptation Strategy (Strategy) outlines seven goals to effectively address climate adaptation (NFWPCAP 2012; Table 1). Of the seven goals, 95% of respondents reported that their agency is addressing Goal 2: manage species and habitat to protect ecosystem functions. Closely following, 88% of respondents reported that their agency is also addressing Goal 1: conserve and connect habitat. The least addressed goal reported was Goal 6: increase awareness and motivate action – likely a result of agencies' desire to

stay under the radar with climate-related efforts. Another area that could benefit from increased attention is Goal 3: enhance management capacity.

The Strategy also recommends that agencies should work across sectors on climate-related issues, specifically to consider agriculture, energy, housing and urbanization, transportation and infrastructure, and water resources. According to the survey, 80% reported that they work with the water resource sector on interdisciplinary adaptation efforts. Energy made up the second highest cross-sectoral area (37%) followed by agriculture (30%), transportation and infrastructure (28%), and housing and urbanization (4%). Other responses included that very little cross-sectoral work is happening, but if it is, much of it is communication, not planning or implementation phases.

	Goals of the National Fish, Wildlife, and Plants Climate Adaptation Strategy
Goal 1	Conserve habitat and connectivity
Goal 2	Manage species and habitat to protect ecosystem functions
Goal 3	Enhance capacity for effective management
Goal 4	Support adaptive management
Goal 5	Increase knowledge and information on climate change impacts and responses to species
Goal 6	Increase awareness and motivate action to safeguard species
Goal 7	Reduce non-climate stressors

Table 1. Goals identified in the National Fish, Wildlife, and Plants Climate Adaptation Strategy.

Trends Over Time

There have been various surveys given since 2011. However, survey content has not been consistent over time and makes comparison challenging. In this section, only surveys from 2014, 2016, and the most recent 2018 surveys will be assessed as they are the most similar in content. It should be noted, however, that the 2014 and 2016 surveys had a smaller pool of respondents (39 and 34, respectively) which again may make meaningful comparisons difficult.

Overall, the main takeaway is that not a lot has changed over time. One of the biggest differences noted in the comment sections is that in 2018 there is a greater reluctance to talk about climate work. This is no doubt because of political realities, but while there may be a reluctance to discuss specific climate adaptation efforts, there is clearly a lot of work still being done on-the-ground.

Agency perceptions

Unsurprisingly, lack of staff time and capacity remains the top reported barrier that has inhibited greater agency action on climate adaptation efforts. Since 2014, there has been little change on what agencies are undertaking with regards to climate-related activities. Overall, most time has been put towards species-based and habitat-based climate vulnerability assessments (2014: 69% and 50%, 2016: 78% and 89%, 2018: 69% and 52%, respectively).

Science needs/information gaps

Most agencies continue to access climate-related tools and products predominately from the US Geological Survey, specifically from their Climate Adaptation Science Centers (formerly the Climate Science Centers) (2014:

53%, 2016: 78%, 2018: 62%), and from the former US Fish and Wildlife Service's Landscape Conservation Cooperatives (2014: 72%, 2016: 78%, 2018: 72%), as well as academia (2014: 75%, 2016: 67%, 2018:74%). Again, what agencies seem to need in information and products remains roughly consistent, with some decrease in 2016 and 2018, on climate impacts to specific species or habitats (2014: 84%, 2016: 67%, 2018: 68%).

Of priority research areas, there has been a significant shift between 2016 and 2018 (the question was not asked in 2014). In 2016, 100% of respondents indicated that water quality and quantity were the highest priority climate-related research need for their agency. In 2018, this research area dropped to the fourth most important area, garnering 61% support from survey respondents. Instead, the 2018 research priorities included invasive species movement and range expansion, habitat connectivity, and adaptive capacity of species.

Thematic changes

While not asked in 2016, goals that are being addressed under the National Fish, Wildlife, and Plants Climate Adaptation Strategy remain consistent between 2014 and 2018. In both cases, Goal 1: conserve habitat and connectivity, and Goal 2: manage species and habitat to protect ecosystem function, topped the list for most addressed goals while Goal 3: enhance capacity for effective management and Goal 6: increase awareness and motivate action to safeguard species, were least addressed. (Figure 3)

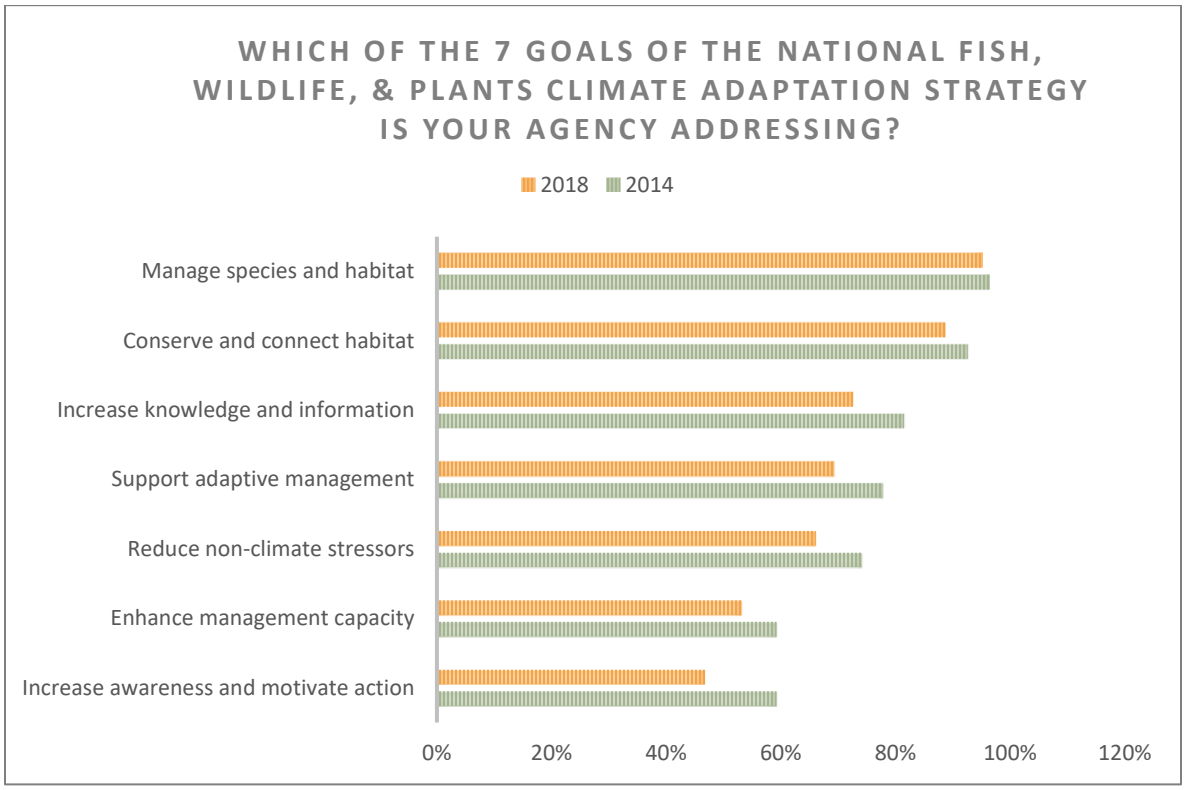

Figure 3. Percentage of responses comparing goals of the Strategy being addressed by state agencies in 2014 and 2018.

Marine & Coastal Survey

Concurrent to the Climate Adaptation Survey, we also collected feedback on a similar survey targeted towards state agencies or departments that focus on marine and coastal resources. The survey was sent to states or territories with a coastline. The survey was sent to 34 individuals and had a response rate of 44% (15 individual

responses). While many of the responses were similar to the results of the Climate Adaptation Survey, we will highlight a few key takeaways.

Agency perceptions

One major deviation between the surveys was in where staff time is allocated for climate-related work. In the main survey, most states indicated that they spent most of their time on learning, educating others, or capacity building. For marine and coastal survey respondents, the majority are focused on time for assessing climate impacts or conducting vulnerability assessments (64%) or time for adaptation planning or developing management responses to climate impacts (50%). This suggests that marine and coastal resource agencies are further along in climate adaptation implementation than where the broader natural resource agencies are focusing their climate work. However, this could also be an artifact of the lower response rate, perhaps biasing towards more engaged marine and coastal climate practitioners who would be more likely to take the time to respond to the survey. (Figure 4)

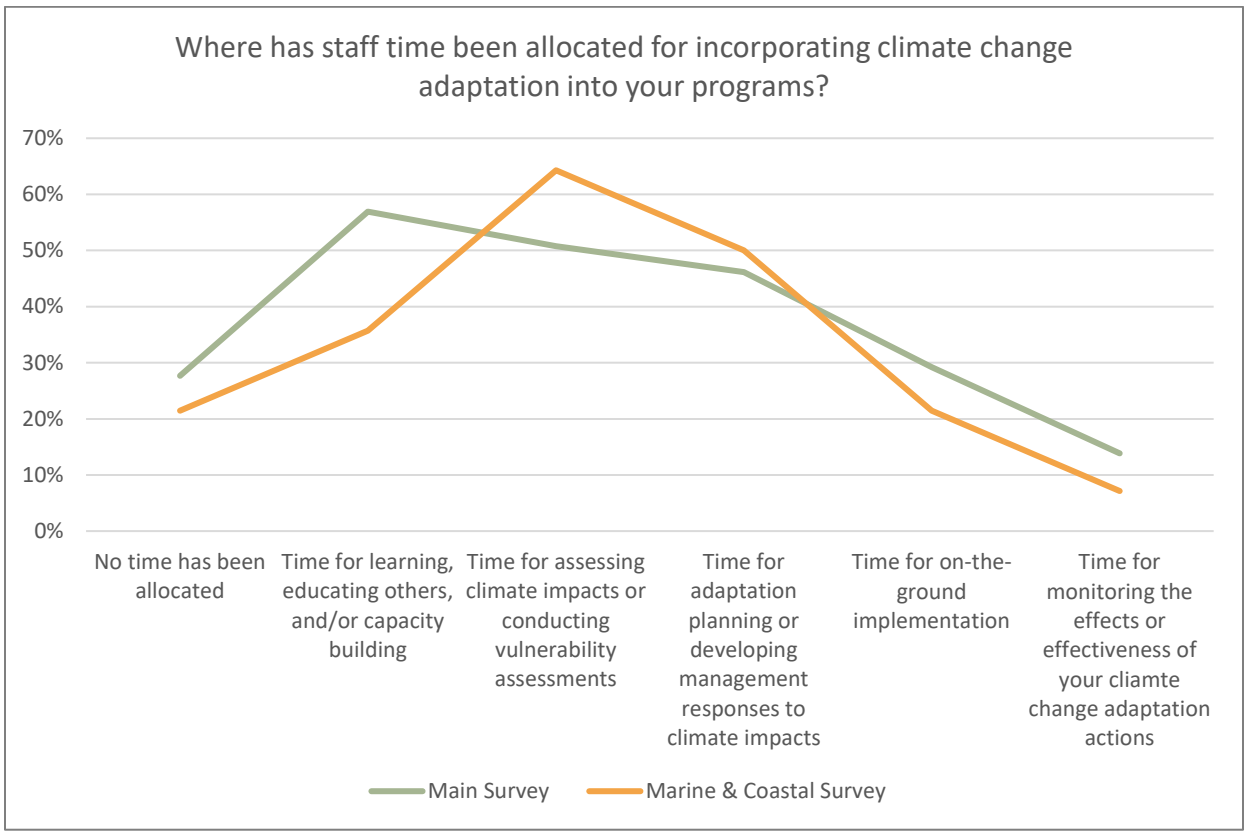

Figure 4. Comparison of staff time allocation to climate work between the main survey (more general natural resource management agencies) and the marine & coastal survey (programs focused specifically on marine & coastal natural resources) in 2018.

Science needs/information gaps

Marine and coastal respondents reported that their main sources of climate-related information are from NOAA (92%), academic institutions (83%), and a tie between peer-reviewed journals (75%) and conservation non-profits (75%). Within the main survey, NOAA and conservation non-profits did not rate nearly as highly (55% and 45%, respectively). When asked about specific government programs, the NOAA Fisheries Service was by far the most used program to access tools and information (72% use, 27% wasn't sure, and 0 reported they never accessed tools or information).

In addition, marine and coastal respondents identified different products or information that would assist with their climate adaptation work. This includes climate impacts on specific species or habitats (83%, also a top area identified in the main survey), followed by a three-way tie between biological response models (67%), habitat or species connectivity information (67%), and training/education (67%). The main survey focused more on translating data and integrating it into planning whereas marine and coastal programs may have a greater emphasis on developing or accessing specific types of information.

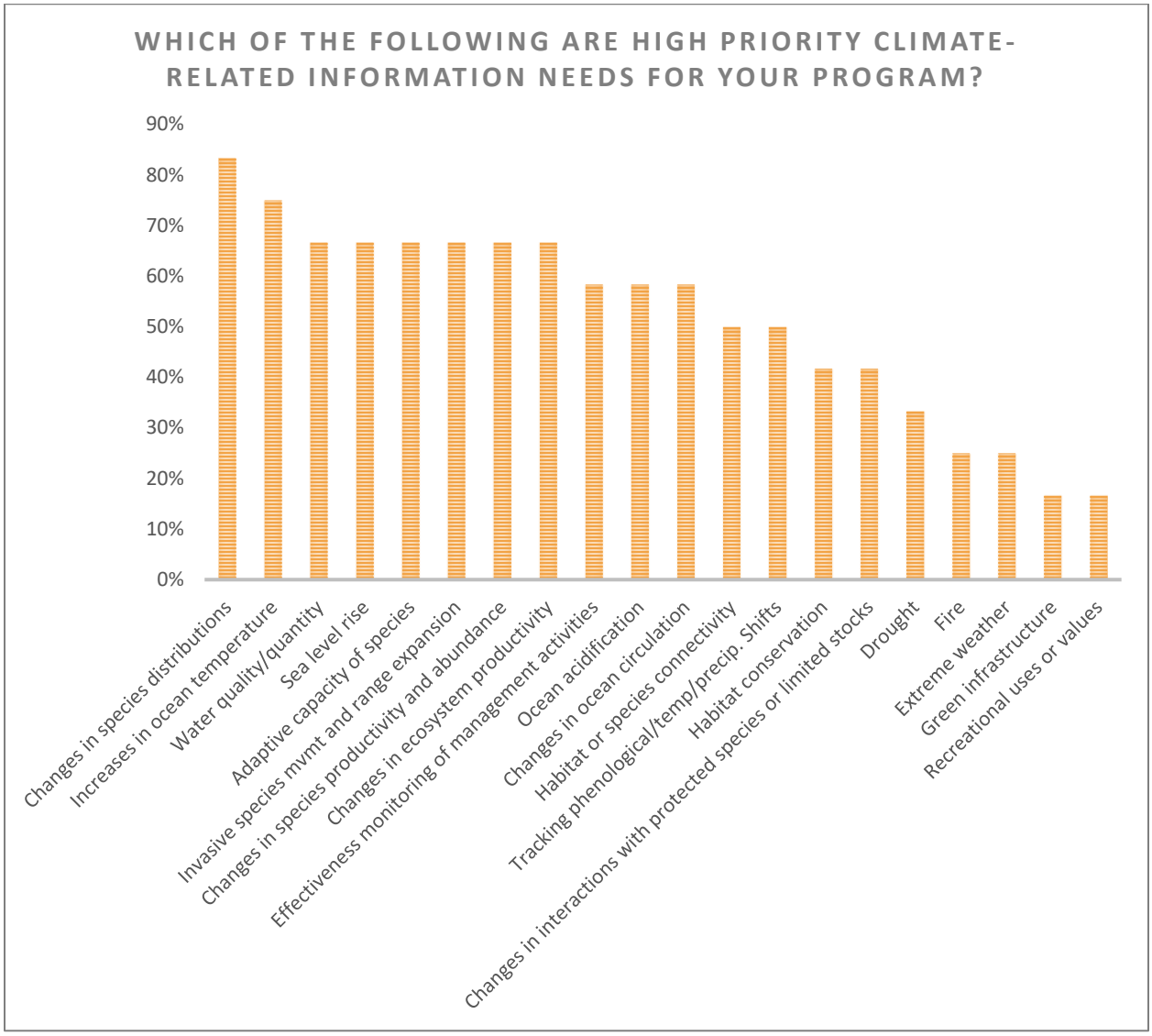

Figure 5. Percentage of responses for Question 25 for the 2018 Marine & Coastal Climate Adaptation Survey.

As for high priority information needs, changes in species distributions (83%) were identified as the most needed, followed by increases in ocean temperature (75%). Next was a six-way tie for a variety of different information needs. (Figure 5) As with the main survey, a synthesis of what is known about a topic (75%) was the most needed action to meet their program's climate-related information needs.

Thematic areas of interest

Of the seven goals identified in the National Fish, Wildlife, and Plants Climate Adaptation Survey, marine and coastal respondents are addressing different areas than what is being reported by the broader resource agency survey. For example, the main survey identified Goals 1 and 2 (conserve and connect habitat and manage species and habitat, respectively) as the top areas agencies are addressing. Marine and coastal responses indicated, however, that Goal 4: support adaptive management (86%) was most addressed, followed by a tie between Goal 2: manage species and habitat, and Goal 5: increase knowledge and information (79%). This alludes to overall management differences in marine and coastal programs versus more terrestrial-focused agencies. (Figure 6)

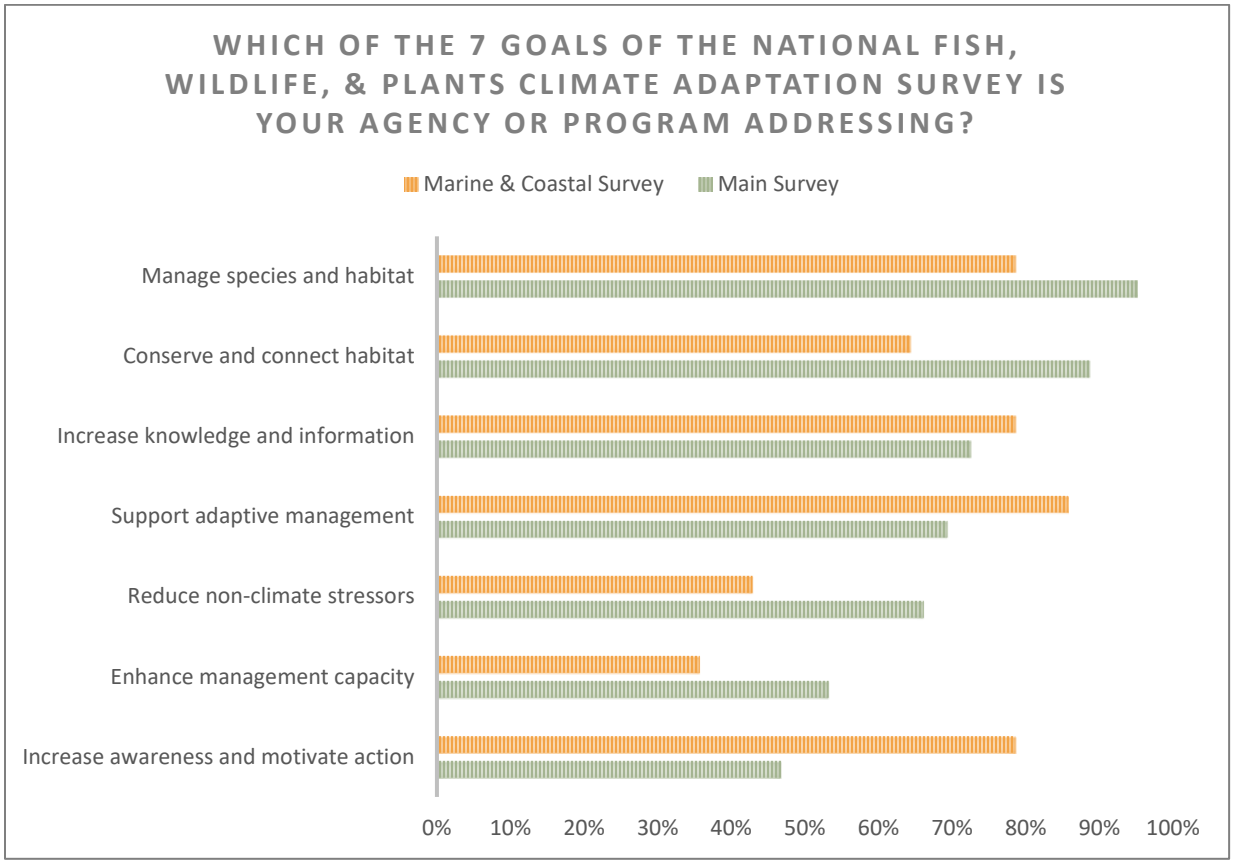

Figure 6. Comparison of responses between the main survey (more general natural resource management agencies) and the marine & coastal survey (programs focused specifically on marine & coastal natural resources) in 2018.

Another major area of interest for marine and coastal resource agencies is with communicating climate change and adaptation. For instance, when asked if their program needs assistance with climate change communication, 100% indicated that they did, compared to only 76% for broader natural resource agencies.

Recommendations

Based on responses from the 2018 Climate Adaptation Surveys, as well as trends from past surveys, this section will cover recommendations on next steps to encourage, coordinate, and implement climate adaptation strategies for fish and wildlife.

Strategy

The National Fish, Wildlife, and Plants Climate Adaptation Strategy was published in 2012, however in recent surveys, not much has changed with regards to which goals natural resource agencies are addressing most. This suggests that either these states are not getting enough support to implement the goals and are therefore stuck on the same ones, or, that states need more assistance and encouragement to tackle goals that they have historically not addressed. For example, a greater emphasis on enhancing management capacity (Goal 3) and increasing awareness and action (Goal 6), may help to advance the Strategy and help natural resource agencies achieve effective adaptation strategies for fish and wildlife. For marine and coastal programs, however, a greater emphasis on reducing non-climate stressors (Goal 7) may be more effective.

In addition, there is also a need to increase the interdisciplinary nature of natural resource climate adaptation activities since climate change will impact all facets of life. One way to achieve this is by focusing on more cross-sector collaboration as the Strategy calls out. Areas where more engagement is needed include agriculture, transportation and infrastructure, and housing and urbanization.

Marine & coastal needs

While many of the challenges and needs between marine and coastal programs and broader natural resource agencies are similar, there are some marked differences that should be considered for future research and support. Specifically, there is a need for more information and data products on marine and coastal habitat connectivity and range shifts/expansions. Another important area of interest is more training or products on increasing effective climate change communication, particularly with a public audience in mind.

Outcomes/Products

Since state agencies are on the front lines of implementing climate adaptation strategies for fish and wildlife, the AFWA Climate Adaptation Committee could provide the forum for tackling some of these challenges. For instance, some products that may provide value include white papers in areas of interest, such as guidance on incorporating adaptation into agency planning, making climate relevant to leadership, or developing syntheses of scientific literature on various topics. Another potential outcome could be the formation of working groups, or other teams, to work on thematic areas of interest, such as invasive species, habitat connectivity, or international climate adaptation efforts.

Priority focus

There are many ways that the AFWA Climate Adaptation Committee and AFWA staff can work to advance the Strategy as well as climate adaptation implementation and coordination among state agencies. Overall, the current thread of the survey indicates a need to make climate adaptation a higher priority. To do so requires developing a roadmap to (1) engage state leadership and gain buy-in and (2) develop a mechanism to increase coordination across federal agencies, state agencies, tribes, and non-profit partners. These should remain the priority focus for 2019-2020.

Conclusion

Climate adaptation provides the critical mechanisms needed to minimize the negative consequences of changes already happening on the landscape because of climate change. Choosing the right adaptation measures to deploy largely depends upon our understanding of the magnitude and timing of risks to our natural resources. State agencies have identified research and data needs to help them increase that understanding, as well as prioritized

future opportunities where they can affect the most change. There is a wealth of information that can be gained by reviewing the 2018 Climate Adaptation Surveys. By targeting state needs and directing support strategically, climate adaptation can be advanced most effectively over the coming years.

The next surveys are scheduled to go out in 2020.

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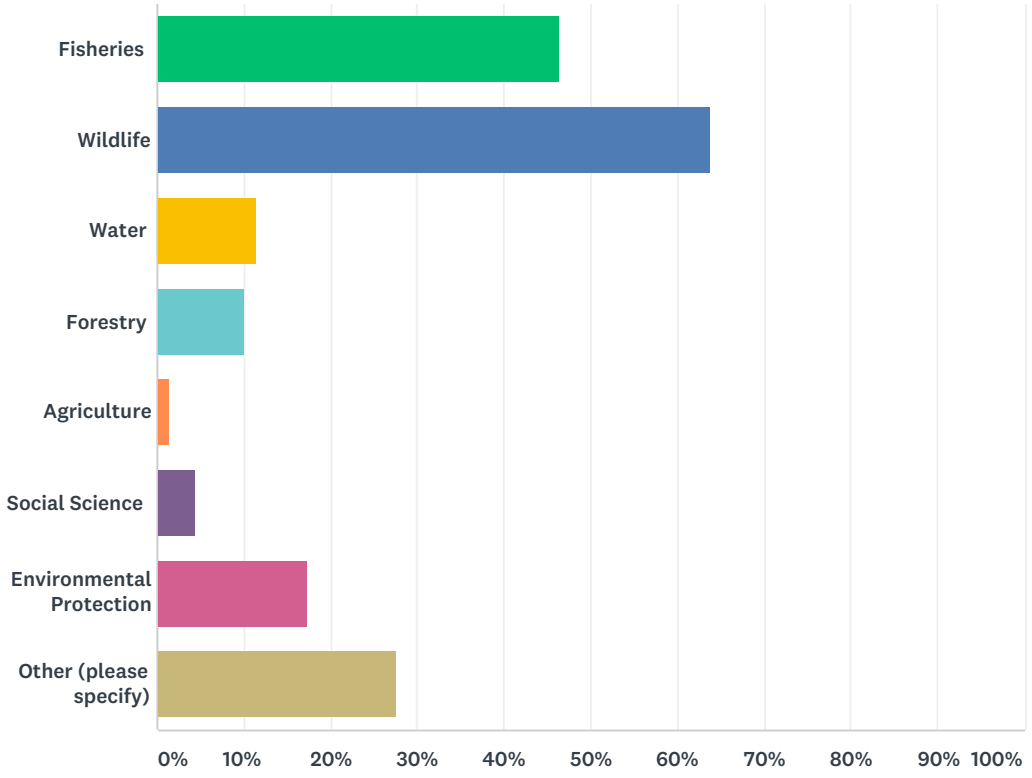
Appendix

The Appendix includes the full 2018 Climate Adaptation Survey. Questions 1-3 have been removed because they asked for identifying information including name, state, and email. All other questions remain unedited. In the comment sections, identifying information has been redacted as appropriate. Any remaining identifying information was left because it is part of a citation or is used as an example of another state (thus not revealing the commenter's state).

The 2018 Marine & Coastal Climate Adaptation Survey and the 2014 and 2016 Climate Adaptation Surveys have not been included in the Appendix, but are available upon request. Please email Maggie Ernest Johnson at mjohnson@fishwildlife.org for copies.

Q4 What is your primary concentration of management? (Check all that apply)

Answered: 69 Skipped: 0



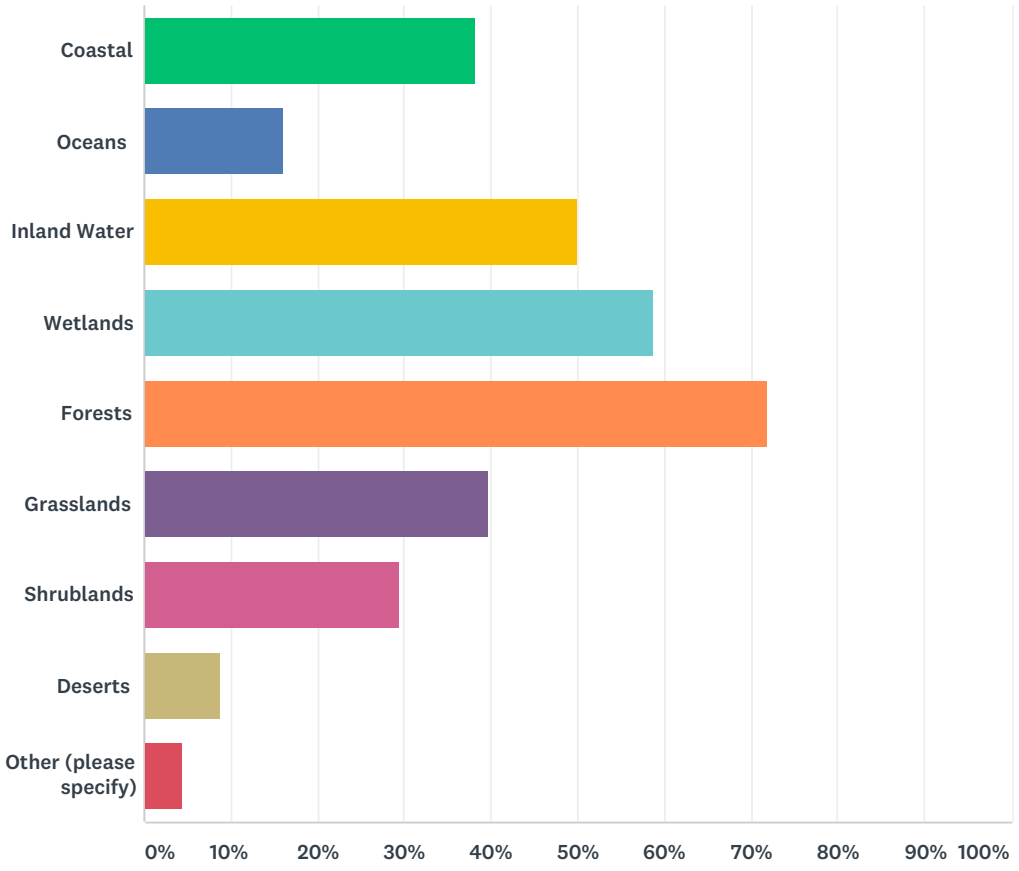
ANSWER CHOICES	RESPONSES	
Fisheries	46.38%	32
Wildlife	63.77%	44
Water	11.59%	8
Forestry	10.14%	7
Agriculture	1.45%	1
Social Science	4.35%	3
Environmental Protection	17.39%	12
Other (please specify)	27.54%	19
Total Respondents: 69		

#	OTHER (PLEASE SPECIFY)	DATE
1	Outreach for fish and wildlife conservation, primarily through SmarthGrowth planning, land/habitat conservation and management, and encouraging awareness/behavior changes	8/31/2018 3:43 PM
2	Habitat and Conservation Management	8/29/2018 2:49 PM
3	conservation policy (funding, strategic planning)	8/28/2018 4:37 PM
4	Specifically, I am in research, but agency is responsible for fish and wildlife management	8/22/2018 6:21 PM

5	Species conservation	8/22/2018 10:56 AM
6	I don't do management, but survey and characterize natural communities statewide for the [redacted].	8/22/2018 9:26 AM
7	NRDA	8/20/2018 2:01 PM
8	Invasive Species	8/20/2018 1:04 PM
9	Coordinate multidisciplinary climate adaptation program	8/17/2018 10:24 AM
10	Amphibians, reptiles, aquatic invertebrates	8/17/2018 9:52 AM
11	landscape conservation	8/16/2018 9:19 AM
12	Biodiversity	8/10/2018 11:01 AM
13	agency administration	8/6/2018 10:39 AM
14	Policy and Planning	8/3/2018 4:12 PM
15	Non-game. T&E, and Species of Conservation Priority	8/3/2018 1:29 PM
16	Habitat Restoration and conservation	8/2/2018 5:08 PM
17	Collaborative proactive conservation opportunities	8/2/2018 7:03 AM
18	Endangered Species	8/1/2018 1:28 PM
19	The broader agency handles, fisheries, forestry, and environmental protection (air, water, waste, etc.)	8/1/2018 12:09 PM

Q5 What ecosystems are you most familiar with? (Check all that apply)

Answered: 68 Skipped: 1



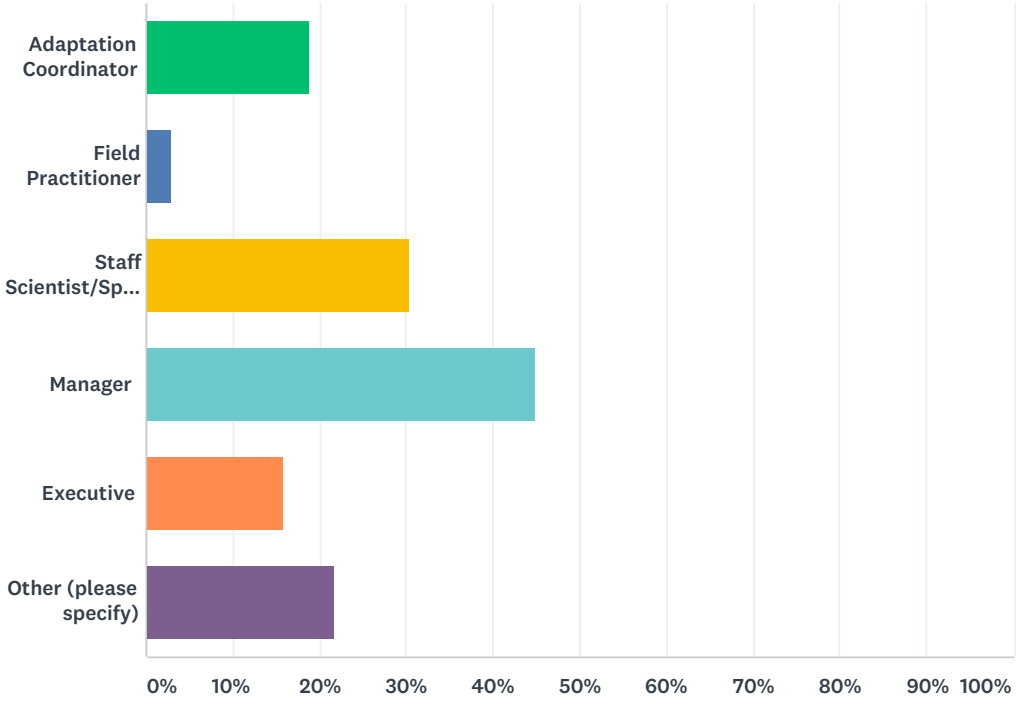
ANSWER CHOICES	RESPONSES	
Coastal	38.24%	26
Oceans	16.18%	11
Inland Water	50.00%	34
Wetlands	58.82%	40
Forests	72.06%	49
Grasslands	39.71%	27
Shrublands	29.41%	20
Deserts	8.82%	6
Other (please specify)	4.41%	3
Total Respondents: 68		

#	OTHER (PLEASE SPECIFY)	DATE
1	Advising on all [redacted] science endeavors	8/22/2018 10:56 AM
2	Rivers & streams	8/17/2018 9:52 AM

3	Longleaf Pine Systems	8/15/2018 7:55 AM

Q6 What role do you fill in your program? (Check all that apply)

Answered: 69 Skipped: 0



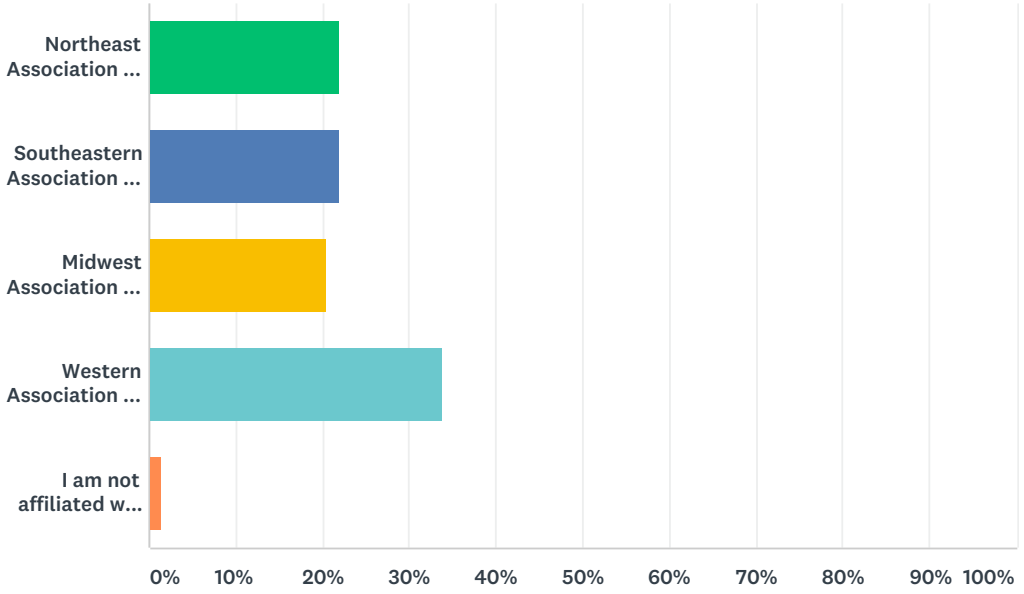
ANSWER CHOICES	RESPONSES	
Adaptation Coordinator	18.84%	13
Field Practitioner	2.90%	2
Staff Scientist/Specialist	30.43%	21
Manager	44.93%	31
Executive	15.94%	11
Other (please specify)	21.74%	15
Total Respondents: 69		

#	OTHER (PLEASE SPECIFY)	DATE
1	Conservation Planner	8/29/2018 2:49 PM
2	[redacted] Wildlife Action Plan Coordinator	8/23/2018 2:09 PM
3	Heritage ecologist; Co-Chair, [redacted] Plants & Natural Communities Working Group	8/22/2018 9:26 AM
4	Team Leader	8/20/2018 1:04 PM
5	Program Coordinator	8/17/2018 11:09 AM
6	Agency Conservation Coordinator	8/17/2018 9:52 AM
7	Section Supervisor/Bureaucrat	8/14/2018 2:27 PM
8	Natural Resource Program Coordinator	8/14/2018 1:02 PM
9	'Coordinator' in that I'm the Dept. rep for the Committee	8/14/2018 11:15 AM

10	coordinate field projects with biologists, liaison to climate adaptation	8/8/2018 12:51 PM
11	SWAP Implementation	8/8/2018 11:35 AM
12	Planner	8/7/2018 2:21 PM
13	agency coordinator	8/6/2018 10:39 AM
14	Part of my responsibilities have to do with coordinating the SWAP	8/3/2018 4:12 PM
15	Wildlife Diversity Program leader, SWAP Coordinator, Tech Assistance for field implementation, Outreach Program leader	8/1/2018 12:09 PM

Q7 Which regional association is your agency affiliated with?

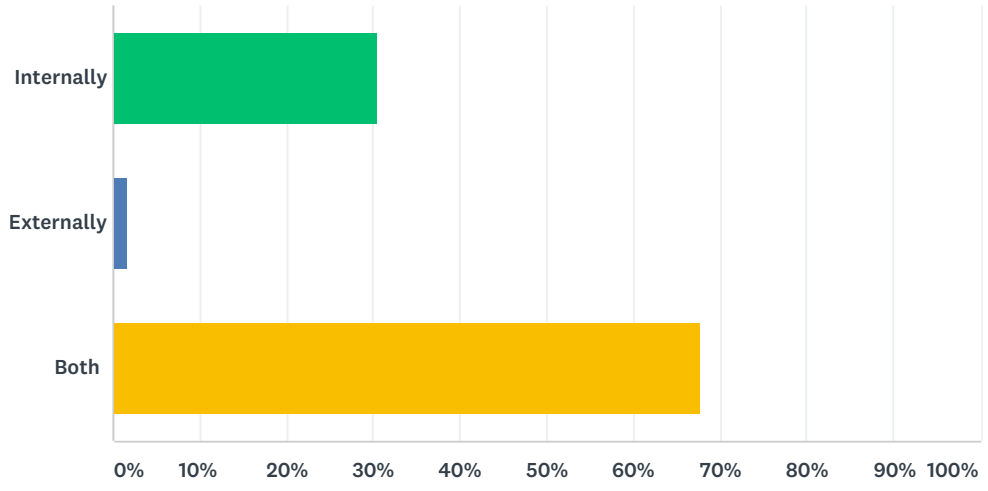
Answered: 68 Skipped: 1



ANSWER CHOICES	RESPONSES	
Northeast Association of Fish and Wildlife Agencies	22.06%	15
Southeastern Association of Fish and Wildlife Agencies	22.06%	15
Midwest Association of Fish and Wildlife Agencies	20.59%	14
Western Association of Fish and Wildlife Agencies	33.82%	23
I am not affiliated with any regional association	1.47%	1
TOTAL		68

Q8 Is your agency presently communicating about climate change?

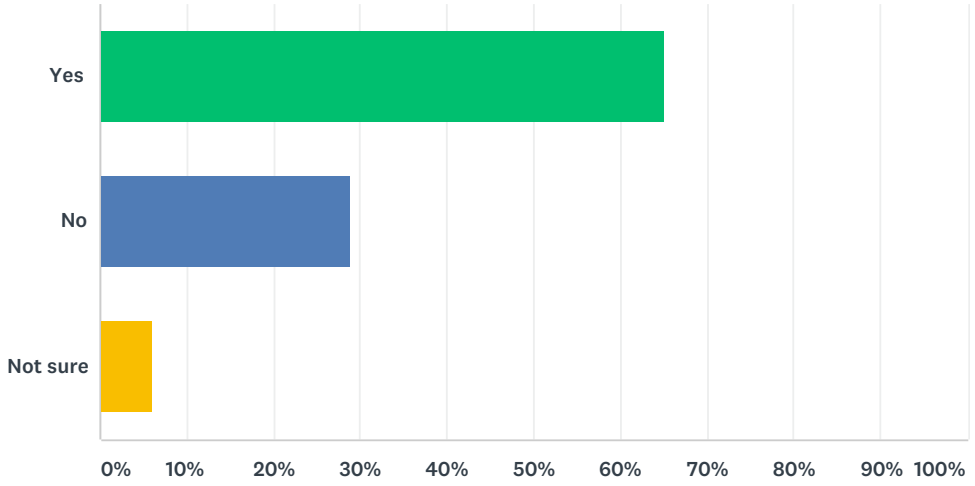
Answered: 59 Skipped: 10



ANSWER CHOICES	RESPONSES	
Internally	30.51%	18
Externally	1.69%	1
Both	67.80%	40
TOTAL		59

Q9 Do you have a program or position(s) in your agency where at least some time is dedicated to climate change/climate adaptation?

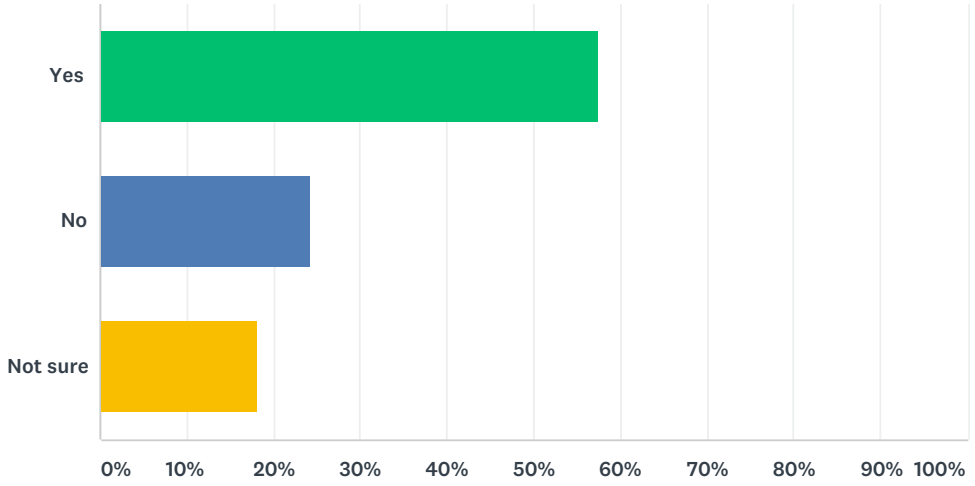
Answered: 66 Skipped: 3



ANSWER CHOICES	RESPONSES	
Yes	65.15%	43
No	28.79%	19
Not sure	6.06%	4
TOTAL		66

Q10 Is adaptation being integrated into other programs or projects throughout your agency?

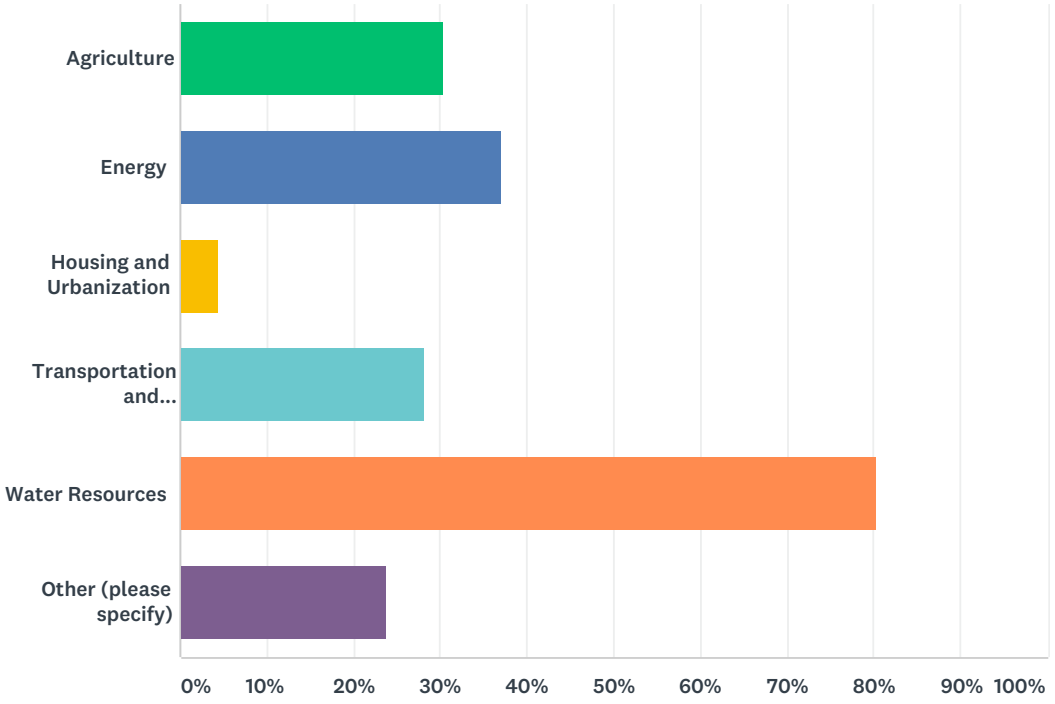
Answered: 66 Skipped: 3



ANSWER CHOICES	RESPONSES	
Yes	57.58%	38
No	24.24%	16
Not sure	18.18%	12
TOTAL		66

Q11 Is your agency working across sectors on climate-related issues? (Check all that apply)

Answered: 46 Skipped: 23



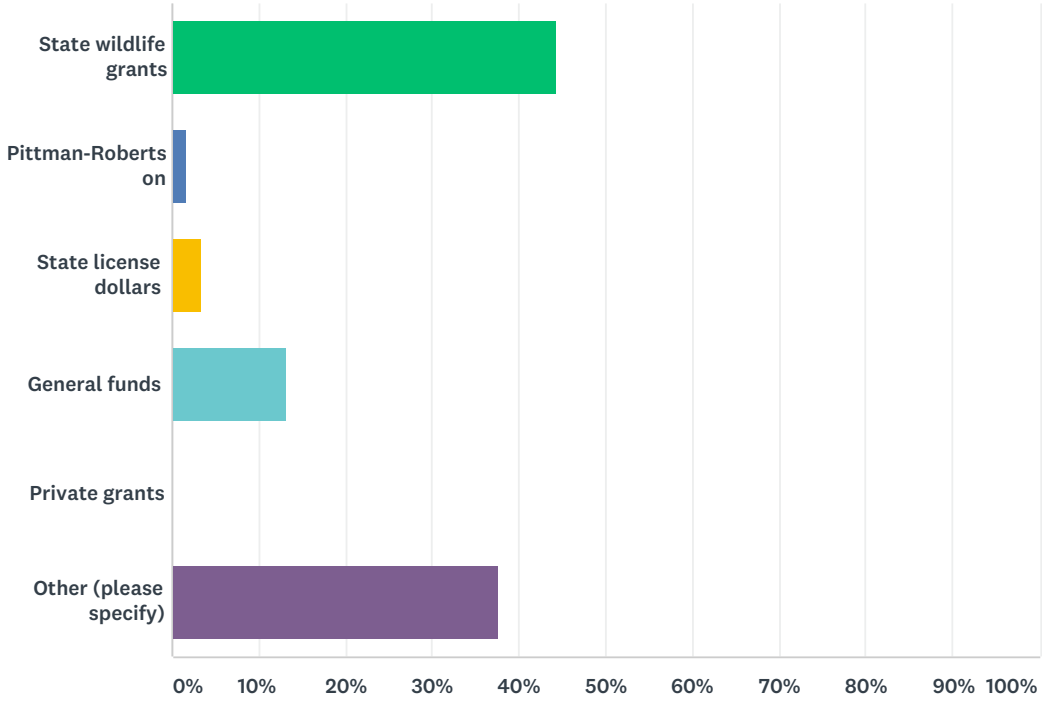
ANSWER CHOICES	RESPONSES	
Agriculture	30.43%	14
Energy	36.96%	17
Housing and Urbanization	4.35%	2
Transportation and Infrastructure	28.26%	13
Water Resources	80.43%	37
Other (please specify)	23.91%	11
Total Respondents: 46		

#	OTHER (PLEASE SPECIFY)	DATE
1	Very little outside work at this time.	8/23/2018 2:16 PM
2	Development project review	8/22/2018 6:27 PM
3	No	8/17/2018 5:49 PM
4	To some extent our agency is working with these industries, overall there is communication going on but not too much more than that	8/14/2018 10:55 PM
5	Not sure	8/13/2018 8:04 PM
6	Urban development	8/8/2018 7:07 PM
7	Environmental Conservation (invasive species and diseases)	8/8/2018 1:00 PM
8	Carbon Sequestration	8/7/2018 2:25 PM

9	Probably federal land management agencies but on a limited, topic by topic basis.	8/3/2018 4:16 PM
10	limited inter-aganecy collaboration currently	8/2/2018 10:52 AM
11	[redacted] has a statewide climate adaptation strategy that covers all sectors	8/1/2018 12:16 PM

Q12 How does your agency fund adaptation work?

Answered: 61 Skipped: 8



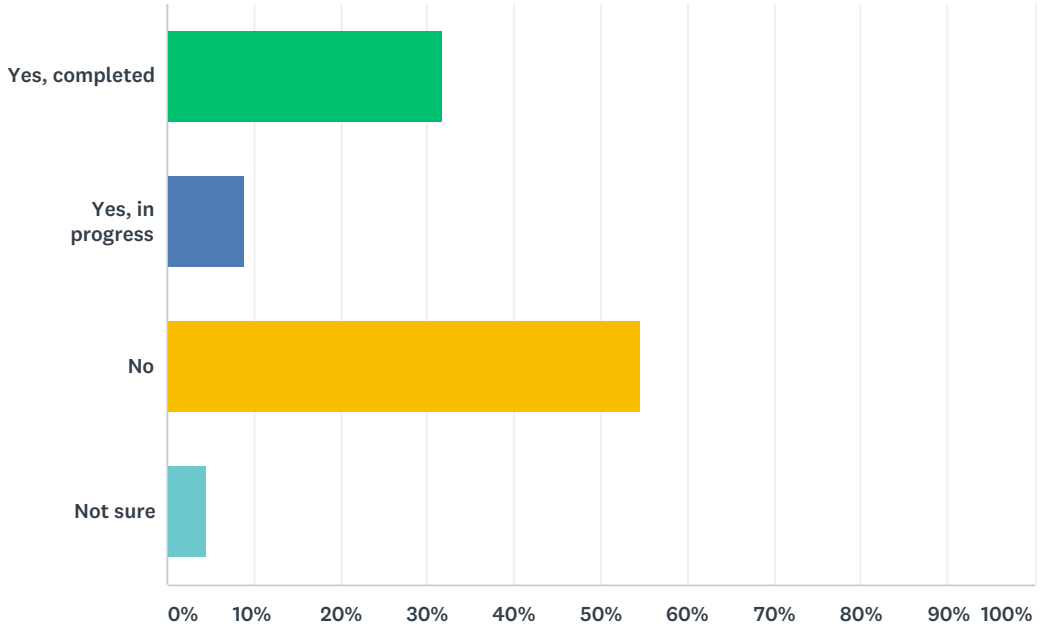
ANSWER CHOICES	RESPONSES	
State wildlife grants	44.26%	27
Pittman-Robertson	1.64%	1
State license dollars	3.28%	2
General funds	13.11%	8
Private grants	0.00%	0
Other (please specify)	37.70%	23
TOTAL		61

#	OTHER (PLEASE SPECIFY)	DATE
1	misc. SWG and P-R.	8/31/2018 3:43 PM
2	a combination of fund sources depending on species and habitat; Section 6 USFWS funds, SWG, PR, DJ, endowment funds	8/29/2018 2:53 PM
3	All of the above	8/28/2018 4:41 PM
4	(various)	8/22/2018 6:27 PM
5	General funds for 25% of my salary, private grants for specific projects.	8/22/2018 9:34 AM
6	Through a combination of funding sources, I believe.	8/21/2018 4:43 PM
7	Depends on the scope of the project; PR funds, state grants	8/21/2018 9:30 AM
8	Any adaptation related work is funded as part of other regular programs such as habitat or management, which are primarily license and PR	8/20/2018 10:38 AM

9	[redacted]	8/17/2018 10:42 AM
10	No funds are specified for adaptation work	8/17/2018 9:57 AM
11	mix of the above (except not private grants)	8/15/2018 8:25 PM
12	Combo of SWG and general/other funds	8/14/2018 3:29 PM
13	Multiple funding sources	8/14/2018 1:21 PM
14	Multiple funding sources	8/14/2018 11:18 AM
15	SWG, PR, WB, State License, General Funds	8/14/2018 10:18 AM
16	PR/DJ, state license and state wildlife grants	8/14/2018 8:44 AM
17	Aquatic Habitat Projects, including fish passage, improve resiliency and can be considered adaptation work though are not explicitly conducted under that label. This work is funded through a combination of DJ funding and federal fish passage funds, other state funds and private grants.	8/13/2018 5:20 PM
18	SWG and PR matched with state license dollars	8/8/2018 2:27 PM
19	All of the above	8/7/2018 2:25 PM
20	Some SWG funds some private grants	8/3/2018 4:16 PM
21	adaptation work is a by product of our wildlife management - not a focus	8/2/2018 10:58 AM
22	It is a mix depending on the project--PR, SWG, and General Fund are probably most common (but not equal in contributions)	8/1/2018 12:16 PM
23	Species Conservation Trust Fund	8/1/2018 12:02 PM

Q13 Does your state have a state climate adaptation plan? (other than your SWAP)

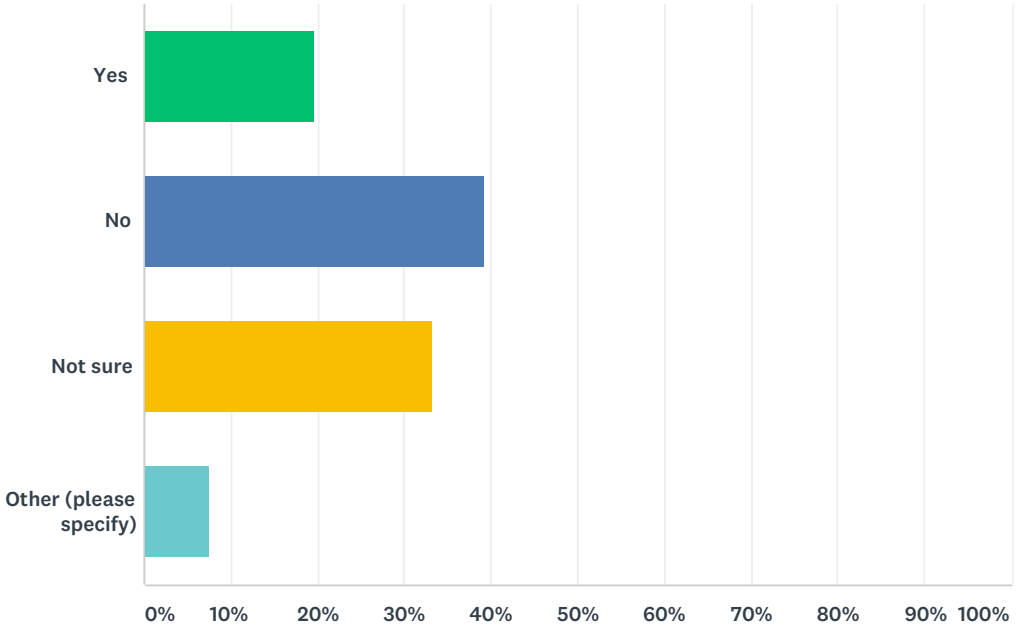
Answered: 66 Skipped: 3



ANSWER CHOICES	RESPONSES	
Yes, completed	31.82%	21
Yes, in progress	9.09%	6
No	54.55%	36
Not sure	4.55%	3
TOTAL		66

Q14 Has your agency adjusted hunting, fishing, or other regulations in response to observed changes in climate?

Answered: 66 Skipped: 3

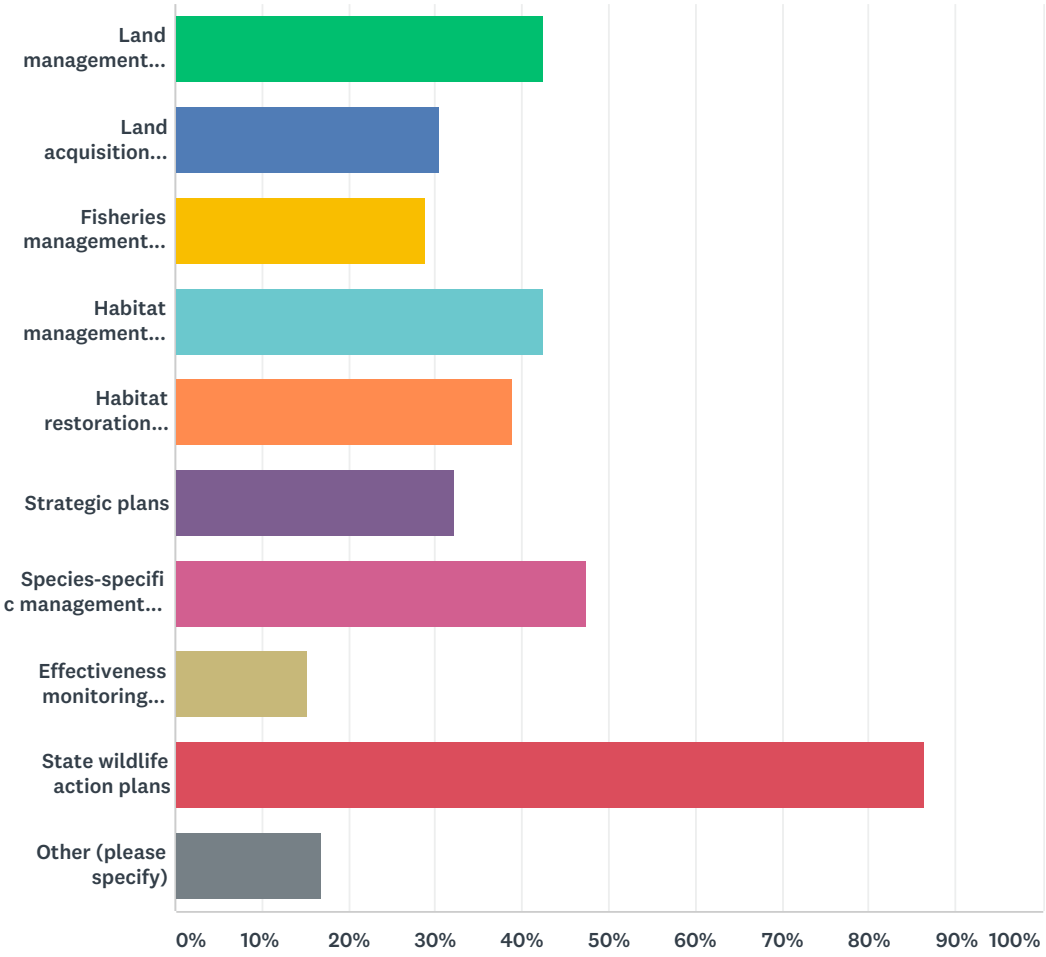


ANSWER CHOICES	RESPONSES	
Yes	19.70%	13
No	39.39%	26
Not sure	33.33%	22
Other (please specify)	7.58%	5
TOTAL		66

#	OTHER (PLEASE SPECIFY)	DATE
1	climate impacts are one of multiple stressors and not the only reason regulations are adjusted	8/29/2018 2:53 PM
2	Regulations on Marine species have been adjusted in response to range shifts.	8/14/2018 10:18 AM
3	Not specifically	8/8/2018 12:44 PM
4	We have discussed increasing big game permits as needed in areas with extreme drought although increases have not occurred yet.	8/2/2018 5:13 PM
5	Some temporary stream fishing closures due to elevated water temperatures.	8/1/2018 12:02 PM

Q15 Has your agency incorporated climate adaptation into any of the following or is planning to? (Check all that apply)

Answered: 59 Skipped: 10



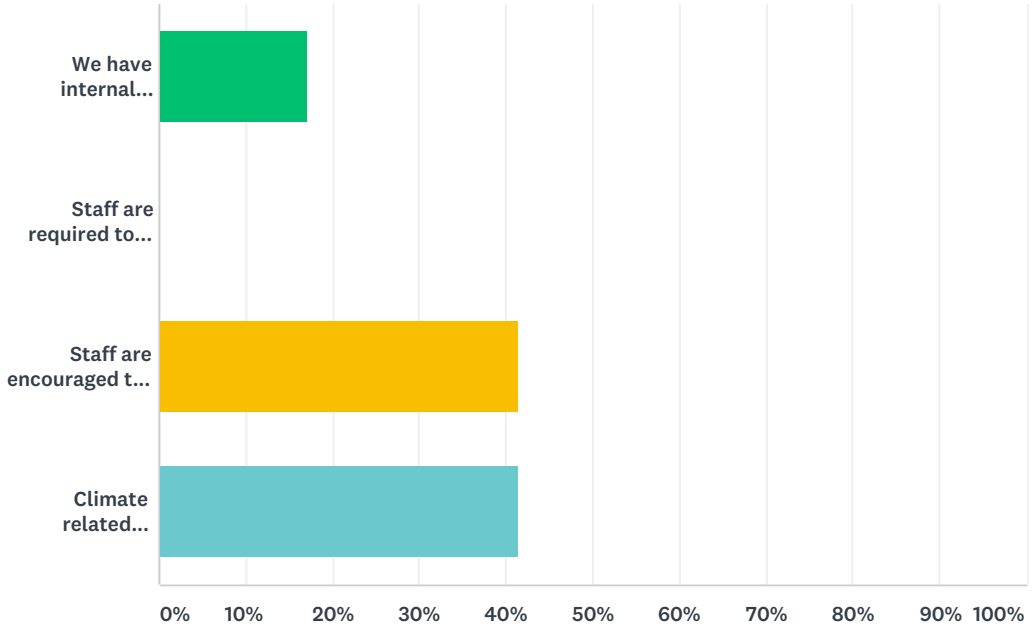
ANSWER CHOICES	RESPONSES	
Land management plans	42.37%	25
Land acquisition plans	30.51%	18
Fisheries management plans	28.81%	17
Habitat management plans	42.37%	25
Habitat restoration plans	38.98%	23
Strategic plans	32.20%	19
Species-specific management plans	47.46%	28
Effectiveness monitoring plans	15.25%	9
State wildlife action plans	86.44%	51
Other (please specify)	16.95%	10

Total Respondents: 59

#	OTHER (PLEASE SPECIFY)	DATE
1	To a varying degree - working on this	8/22/2018 11:01 AM
2	currently plans to incorporate are in line to be adopted	8/20/2018 2:04 PM
3	Wildlife Stewardship Plans	8/17/2018 10:42 AM
4	Monitoring to assess climate change impacts to inform decisions	8/15/2018 8:25 PM
5	Note sure - I do not directly prepare any of these	8/13/2018 8:04 PM
6	Imperiled species management plans	8/8/2018 7:07 PM
7	habitat enhancement plans	8/8/2018 1:00 PM
8	We talk about it some but frankly aren't sure how to add adaptation into the above listed plans effectively.	8/2/2018 5:13 PM
9	Tactical Plans	8/2/2018 11:29 AM
10	Some level of climate adaptation fits within almost all of the above	8/1/2018 12:16 PM

Q16 Does your agency offer the opportunity to take climate change or climate adaptation training for staff?

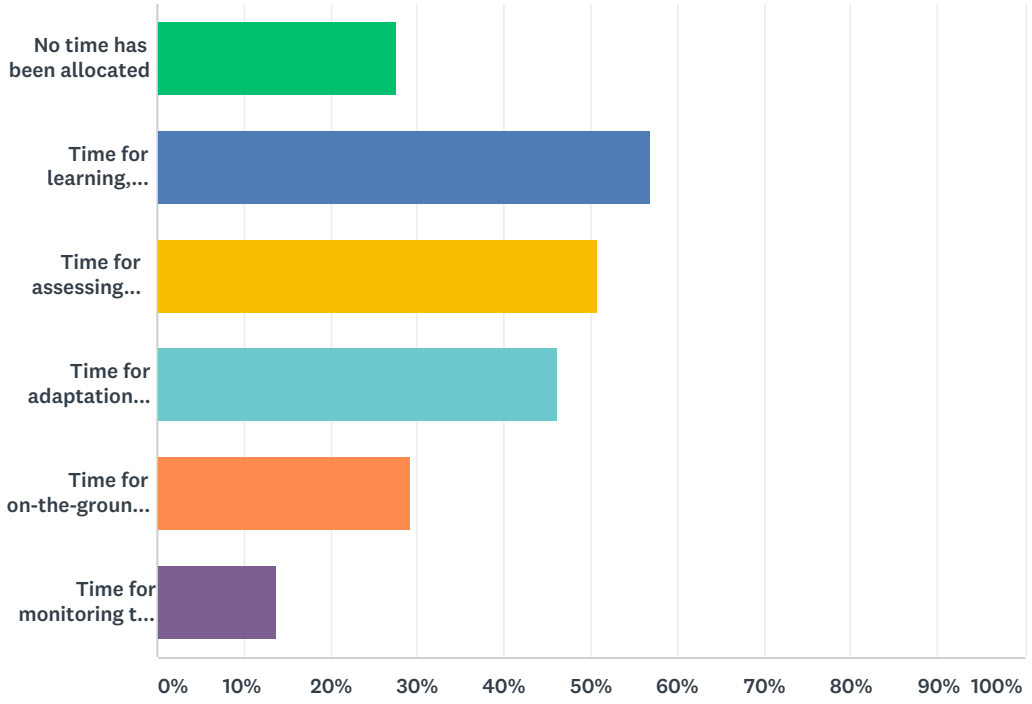
Answered: 58 Skipped: 11



ANSWER CHOICES	RESPONSES	
We have internal climate-related training available	17.24%	10
Staff are required to take climate-related training	0.00%	0
Staff are encouraged to take climate-related training	41.38%	24
Climate related training is not available to staff	41.38%	24
TOTAL		58

Q17 Where has staff time been allocated for incorporating climate change adaptation into your programs?

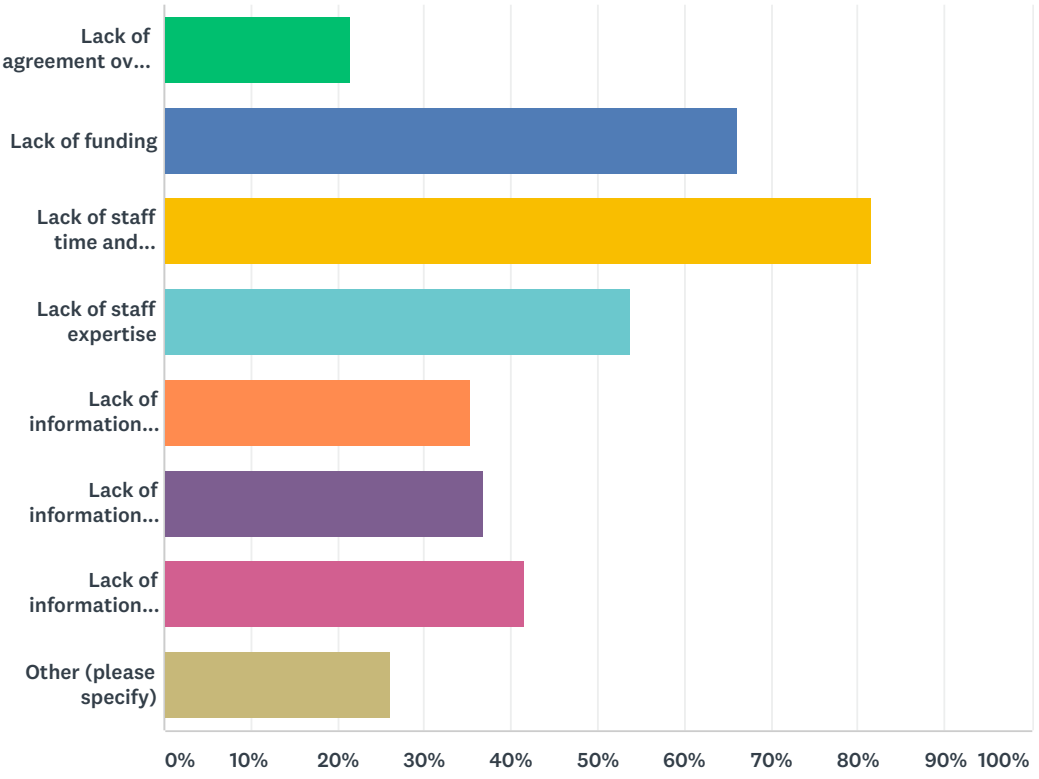
Answered: 65 Skipped: 4



ANSWER CHOICES	RESPONSES	
No time has been allocated	27.69%	18
Time for learning, educating others, and/or capacity building	56.92%	37
Time for assessing climate impacts or conducting vulnerability assessments	50.77%	33
Time for adaptation planning or developing management responses to climate impacts	46.15%	30
Time for on-the-ground implementation	29.23%	19
Time for monitoring the effects or effectiveness of your climate change adaptation actions	13.85%	9
Total Respondents: 65		

Q18 What barriers has your agency encountered that may have inhibited development or implementation of adaptation efforts? (Check all that apply)

Answered: 65 Skipped: 4



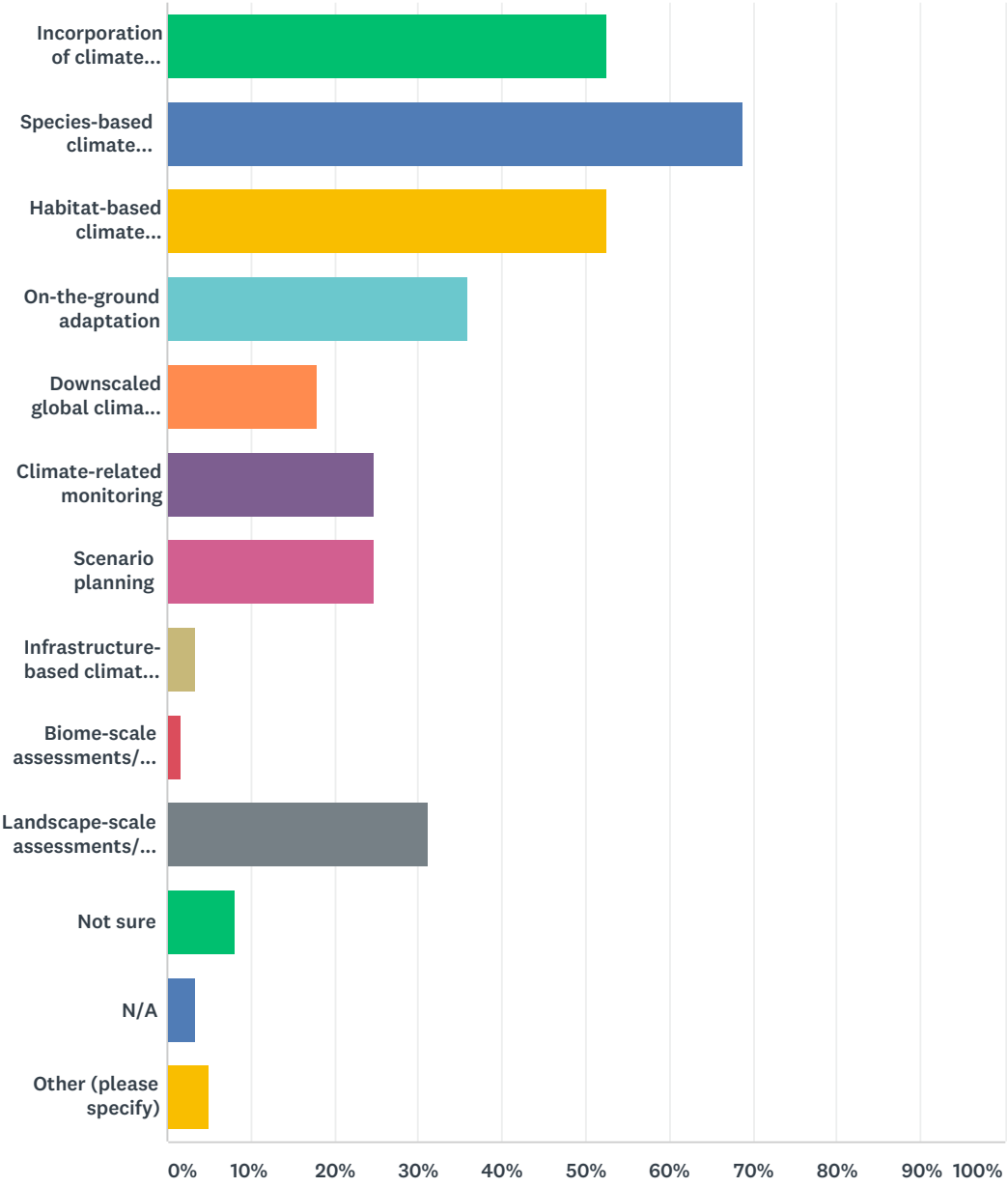
ANSWER CHOICES	RESPONSES	
Lack of agreement over science	21.54%	14
Lack of funding	66.15%	43
Lack of staff time and capacity	81.54%	53
Lack of staff expertise	53.85%	35
Lack of information about how climate change may affect your area	35.38%	23
Lack of information about how climate shifts may impact target ecosystems, species, or resources	36.92%	24
Lack of information about what to do in response	41.54%	27
Other (please specify)	26.15%	17
Total Respondents: 65		

#	OTHER (PLEASE SPECIFY)	DATE
1	Lack of top down direction to prioritize adaptation (until new Strategic Plan this year)	8/28/2018 4:41 PM
2	Disconnect between Agency leadership appointed by the Governors office and scientific concensus.	8/23/2018 2:16 PM
3	political climate in the state	8/20/2018 1:11 PM

4	Specific impacts of climate change on our terrestrial systems remains unclear, so how to respond also remains unclear. We know it will be warmer, but precip amount and timing is less clear.	8/20/2018 10:38 AM
5	lack of political will	8/17/2018 5:49 PM
6	Considered a lower priority relative to immediate resource managment needs.	8/17/2018 9:57 AM
7	Information may be available but not readily through land managers and decision-makers	8/14/2018 10:55 PM
8	Politics	8/14/2018 3:29 PM
9	Lack of political will from state-level leadership	8/14/2018 1:42 PM
10	Adaptation work is incorporated in subtle changes to our day-to-day work. Staffing limitations and fiscal constraints have made it impossible to have dedicated staff, projects, or programs.	8/14/2018 10:18 AM
11	[redacted] carbon producing state in the country, has a political structure that does not encourage tackling adaptation work. We work under the cover of drought planning. But top down encouragement to be proactive on adaptation issues has been lacking.	8/13/2018 5:20 PM
12	Climate change is not a social and political priority in our state at this time	8/8/2018 11:43 AM
13	political influences	8/8/2018 11:39 AM
14	Lack of leadership	8/7/2018 2:25 PM
15	Lack of political support to directly address climate change. Climate change is more addressed on an issue by issue basis.	8/3/2018 4:16 PM
16	Professional disagreement about what does and does not constitute climate change adaptation.	8/2/2018 7:07 AM
17	Time frame involved; diversity of impacts--sea level rise to marsh migration to species shifts to phenology concerns; lots of intersecting concerns to address	8/1/2018 12:16 PM

Q19 What climate-related activities has your agency implemented (or are implementing) to understand, prepare for, and/or respond to a changing climate? (Check all that apply)

Answered: 61 Skipped: 8



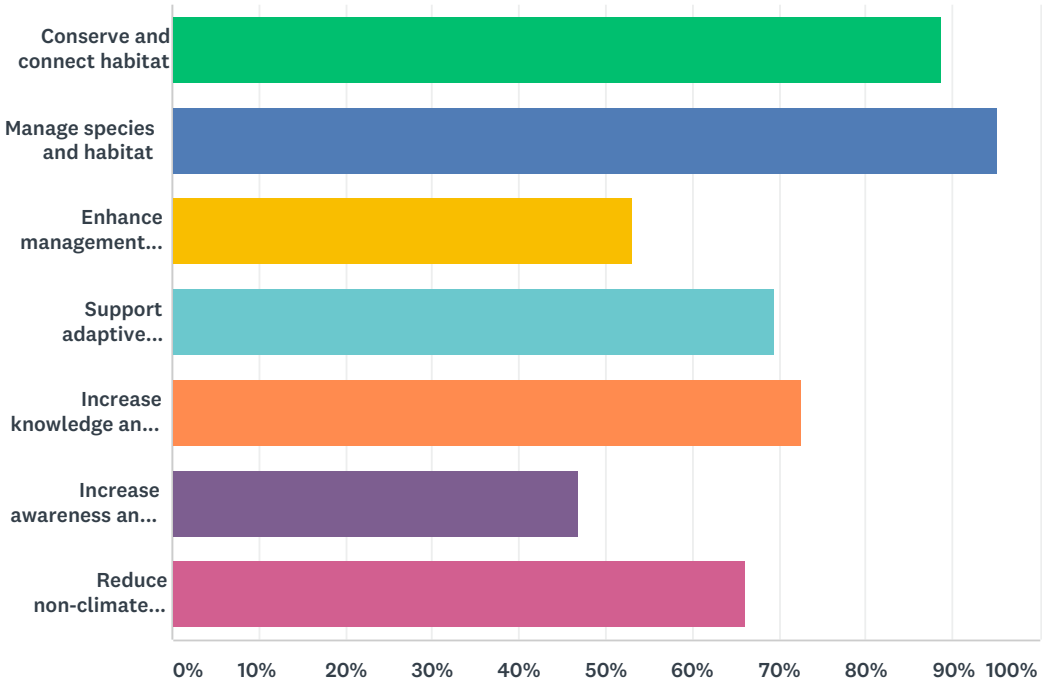
ANSWER CHOICES	RESPONSES	
Incorporation of climate adaptation into management plans	52.46%	32
Species-based climate vulnerability assessments	68.85%	42
Habitat-based climate vulnerability assessments	52.46%	32
On-the-ground adaptation	36.07%	22

Downscaled global climate models	18.03%	11
Climate-related monitoring	24.59%	15
Scenario planning	24.59%	15
Infrastructure-based climate vulnerability assessments	3.28%	2
Biome-scale assessments/analyses/designs	1.64%	1
Landscape-scale assessments/analyses/designs	31.15%	19
Not sure	8.20%	5
N/A	3.28%	2
Other (please specify)	4.92%	3
Total Respondents: 61		

#	OTHER (PLEASE SPECIFY)	DATE
1	We have visited with climate experts to try and gain a bettter understanding about possible impacts on differnt habitat types (e.g., shrublands vs. grasslands)	8/20/2018 10:40 AM
2	Many survey, monitoring, assessment and research projects are conducted not directly tied to climate change but could easily have a nexus.	8/14/2018 2:43 PM
3	We have participated in more work at the regional level due to our relatively small size	8/1/2018 12:17 PM

Q20 Which of the 7 goals of the National Fish, Wildlife, and Plants Climate Adaptation Strategy is your agency addressing? (Check all that apply)

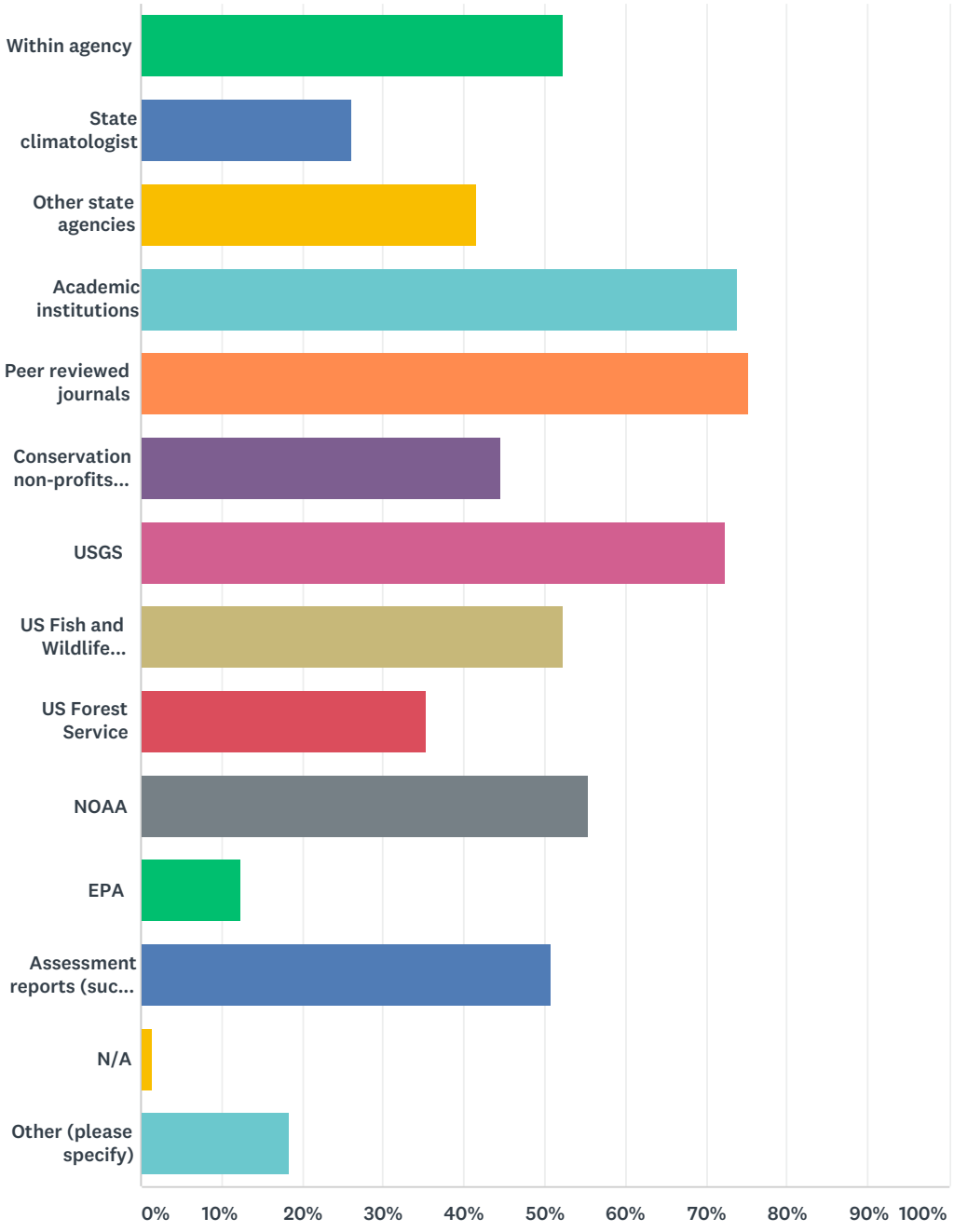
Answered: 62 Skipped: 7



ANSWER CHOICES	RESPONSES	
Conserve and connect habitat	88.71%	55
Manage species and habitat	95.16%	59
Enhance management capacity	53.23%	33
Support adaptive management	69.35%	43
Increase knowledge and information	72.58%	45
Increase awareness and motivate action	46.77%	29
Reduce non-climate stressors	66.13%	41
Total Respondents: 62		

Q21 Where does your agency get information on a changing climate? (Check all that apply)

Answered: 65 Skipped: 4



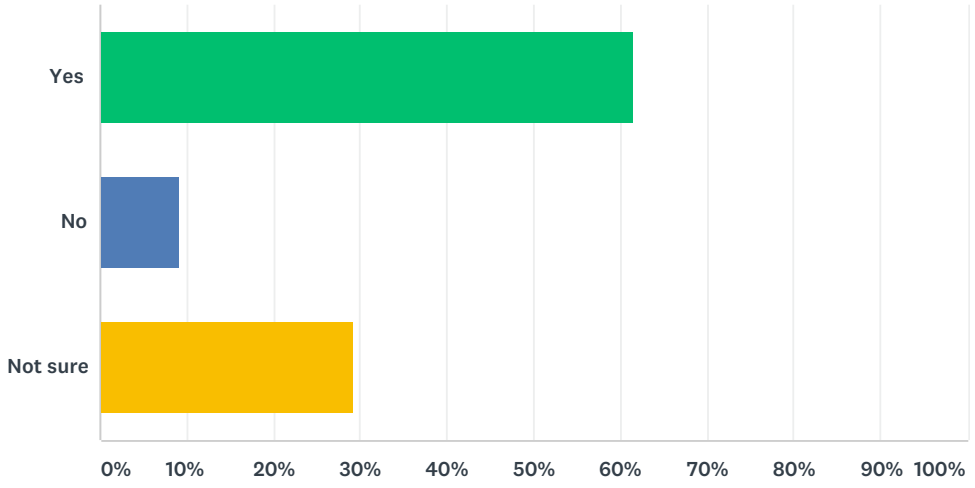
ANSWER CHOICES	RESPONSES	
Within agency	52.31%	34
State climatologist	26.15%	17
Other state agencies	41.54%	27
Academic institutions	73.85%	48

Peer reviewed journals	75.38%	49
Conservation non-profits (such as The Nature Conservancy, National Wildlife Federation, NatureServe, Wildlife Conservation Society, Defenders of Wildlife, etc.)	44.62%	29
USGS	72.31%	47
US Fish and Wildlife Service	52.31%	34
US Forest Service	35.38%	23
NOAA	55.38%	36
EPA	12.31%	8
Assessment reports (such as IPCC, NCA, NAS)	50.77%	33
N/A	1.54%	1
Other (please specify)	18.46%	12
Total Respondents: 65		

#	OTHER (PLEASE SPECIFY)	DATE
1	[redacted] Climate Change Research Institute	8/28/2018 4:43 PM
2	Individuals within the Agency use many sources to obtain information about climate change. However, it is not used progammatically but rather by a few individuals for specific purposes.	8/23/2018 2:21 PM
3	[redacted]	8/22/2018 9:37 AM
4	information gathering is largely left to the individual so not everyone will have the same level of information	8/21/2018 9:35 AM
5	likely majority but difficult to know for sure	8/20/2018 2:06 PM
6	[redacted], NatureServe	8/17/2018 10:45 AM
7	USGS-NE Climate Adaptation Science Center; Northern Institute of Applied Climate Science	8/17/2018 9:59 AM
8	[redacted] SNAP and Integrated Ecosystem Model	8/8/2018 1:16 PM
9	MAFWA Climate Change Working Group	8/8/2018 11:40 AM
10	Professional conferences	8/2/2018 11:31 AM
11	NASA, Tribes	8/1/2018 1:32 PM
12	NECSC has been a great resource	8/1/2018 12:20 PM

Q22 Does your agency use tools and information generated by USGS Climate Adaptation Science Centers (CASC; formerly Climate Science Centers)?

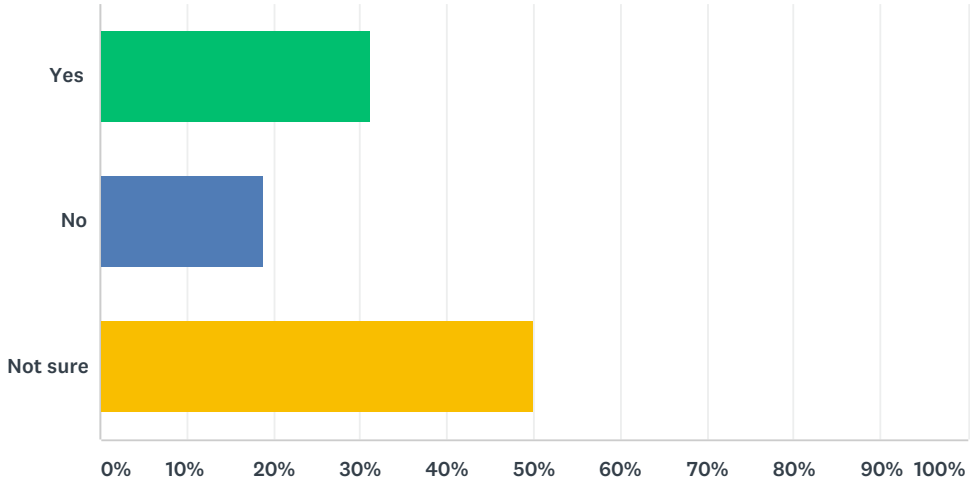
Answered: 65 Skipped: 4



ANSWER CHOICES	RESPONSES	
Yes	61.54%	40
No	9.23%	6
Not sure	29.23%	19
TOTAL		65

Q23 Does your agency use tools and information generated by NOAA's Regional Integrated Sciences and Assessments (RISAs)?

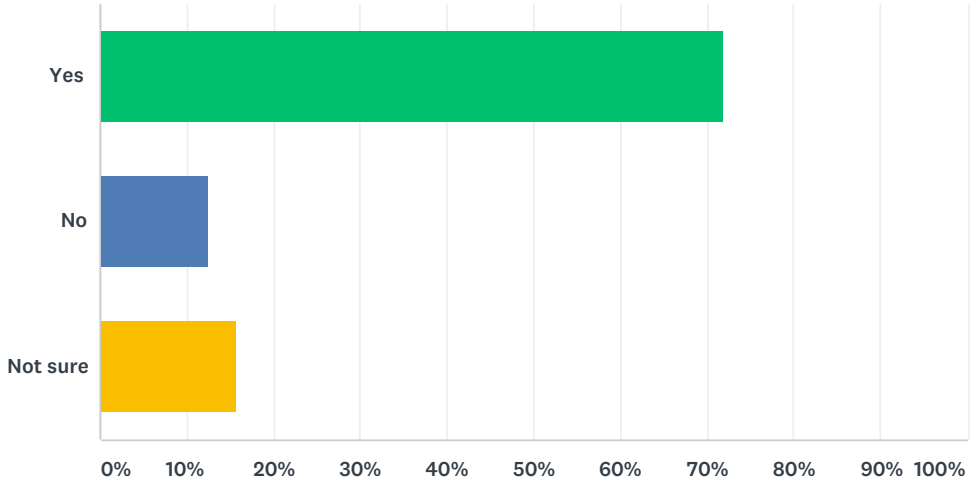
Answered: 64 Skipped: 5



ANSWER CHOICES	RESPONSES	
Yes	31.25%	20
No	18.75%	12
Not sure	50.00%	32
TOTAL		64

Q24 Does your agency use tools and information generated by the Landscape Conservation Collaboratives (LCCs)?

Answered: 64 Skipped: 5



ANSWER CHOICES	RESPONSES	
Yes	71.88%	46
No	12.50%	8
Not sure	15.63%	10
TOTAL		64

Q25 Of all the resources available, what is the most popular or exemplary climate adaptation product that your agency uses?

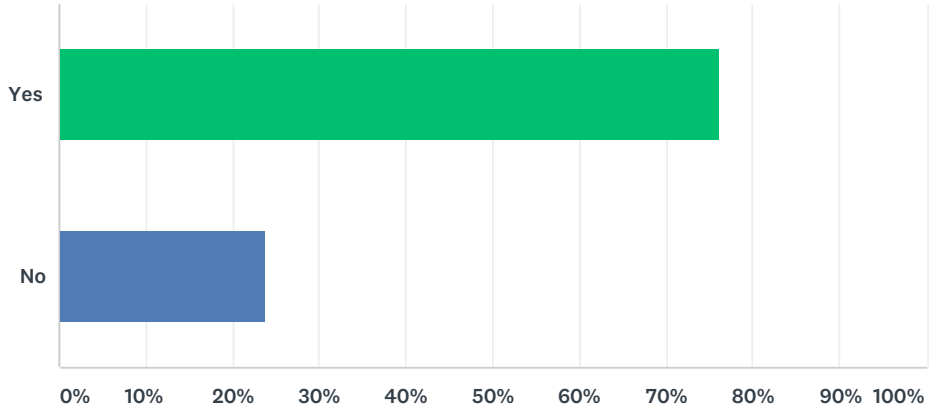
Answered: 38 Skipped: 31

#	RESPONSES	DATE
1	[redacted] coastal vulnerability mapping	9/21/2018 10:45 AM
2	We are using reports and maps produced by the SE Climate Science Center and SE Climate Adaptation Strategy as references but have not implemented specific climate related research at this time.	8/29/2018 3:33 PM
3	[redacted] Climate Assessment	8/28/2018 4:43 PM
4	I do not believe that any resources are officially used by the Department.	8/23/2018 2:21 PM
5	Reduce non-climate stressors, maintain and re-establish connectivity, protect habitat quality, and maintain healthy wildlife populations, all to increase wildlife resilience.	8/22/2018 6:35 PM
6	[redacted]	8/22/2018 9:37 AM
7	Our state's climate change assessments, which take place every few years, have generated high quality, accessible climate projections that we have utilized (see [redacted]). We have also relied heavily upon species- and habitat-based climate vulnerability assessments, and associated data products (e.g. information on potential refugia and landscape resilience). This information has mostly been produced by academic institutions and conservation non-profits, sometimes with funding or staff support from [redacted].	8/21/2018 4:55 PM
8	We've developed our own tools in collaboration with the Northeast Climate Adaptation Science Center; climateactiontool.org, climate project screening tool. We've also developed Priority Actions as part of our involvement with the state's Hazard Mitigation and Climate Adaptation Plan	8/21/2018 9:35 AM
9	Information from climate experts that can provide information at a scaled down level - from the state climatologist, academia, USGS, etc.	8/20/2018 10:42 AM
10	????	8/17/2018 5:52 PM
11	I don't think there's one product that stands out, it's more situation-specific. Also, my impression is that there are perhaps just a handful of staff using these products.	8/17/2018 11:15 AM
12	NatureServe CCVI	8/17/2018 10:45 AM
13	Staudinger, M. D., T. L. Morelli, and A. M. Bryan. 2015. Integrating Climate Change into Northeast and Midwest State Wildlife Action Plans. DOI Northeast Climate Science Center Report, Amherst, Massachusetts.	8/17/2018 9:59 AM
14	Not sure - across the agency	8/16/2018 9:25 AM
15	Research that informs management changes	8/15/2018 8:38 PM
16	USGS models and LCC information	8/14/2018 10:57 PM
17	We developed an adaptation guide to pull together the multitude of info. Sill refining it, but it is intended to be a one stop shop for employees	8/14/2018 3:31 PM
18	Not sure.	8/14/2018 2:44 PM
19	Many of the resources provided by NOAA are excellent and applicable to fisheries work.	8/14/2018 11:49 AM
20	Our '[redacted] Adaptation Guide"	8/14/2018 11:00 AM
21	USGS	8/14/2018 10:16 AM
22	Not sure	8/13/2018 8:05 PM
23	None	8/13/2018 5:21 PM
24	Climate Smart Conservation. National Fish, Wildlife and Plants Climate Adaptation Strategy	8/10/2018 11:18 AM

25	ClimateSmart guidance	8/8/2018 7:10 PM
26	Northern Institute of Applied Climate Science - Forest Adaptation Resources Workbook/Workshops	8/8/2018 2:30 PM
27	Specific to fishes, the Desert and Great Plains Landscape Conservation Cooperatives supported expansion of the University of Texas Fishes of [redacted] Project [redacted], including development of species distribution models and additional models that project changes in suitable habitat under various climate change scenarios (and other anthropogenic changes - e.g., increased water demands, changes in land uses). These products have been incredibly useful in identifying priority freshwater systems for investments in adaptation projects that increase the resiliency of species/ecosystems (e.g., watershed preservation, riparian restoration, flow restoration). These products resulted in [redacted] selection of 20 freshwater systems in the state, termed Native Fish Conservation Areas, that are considered "strongholds" for native fishes and priorities for investments in preservation of freshwater fish diversity.	8/8/2018 2:01 PM
28	[redacted] SNAP and IEM	8/8/2018 1:16 PM
29	I'd have to say USGS but that's only been limited use.	8/8/2018 11:47 AM
30	PICCC hired Eco adapt to develop vulnerability assessments for us and these have been the most useful.	8/7/2018 2:28 PM
31	None are popular, but we have consulted LCC products now and then.	8/6/2018 9:39 AM
32	Not sure.	8/3/2018 4:18 PM
33	we've recently contracted with our land grant university to build dozens of species distribution models for SGCN's and priority game and sportfish species. we plan to use those in restoration and habitat conservation planning.	8/2/2018 5:17 PM
34	Whitman, A., A. Cutko, P. deMaynadier, S. Walker, B. Vickery, S. Stockwell, and R. Houston. 2013. Climate Change and Biodiversity in Maine: Vulnerability of Habitats and Priority Species . Manomet Center for Conservation Sciences (in collaboration with Maine Beginning with Habitat Climate Change Working Group) Report NCI-2013-03. 104 pp. Brunswick, Maine.	8/2/2018 11:00 AM
35	The NE CSC's review of anticipated climate impact on wildlife - incorporated into our SWAP.	8/2/2018 7:10 AM
36	NatureServe Climate Change Vulnerability Assessments for SWAP. Had NWF Climate Change workshop for Biodiversity staff.	8/1/2018 1:35 PM
37	Reports from the Climate Impacts Group at the UW - technical summaries for Decision Makers. There is one for State of WA, and a more recent one for Puget Sound. My go to resource	8/1/2018 1:32 PM
38	NECSC provided some very specific information to states in our region for SWAP revision; they have also done an excellent job of reaching out to land trusts and land managers through annual conferences.	8/1/2018 12:20 PM

Q26 Does your agency need assistance with climate change communication?

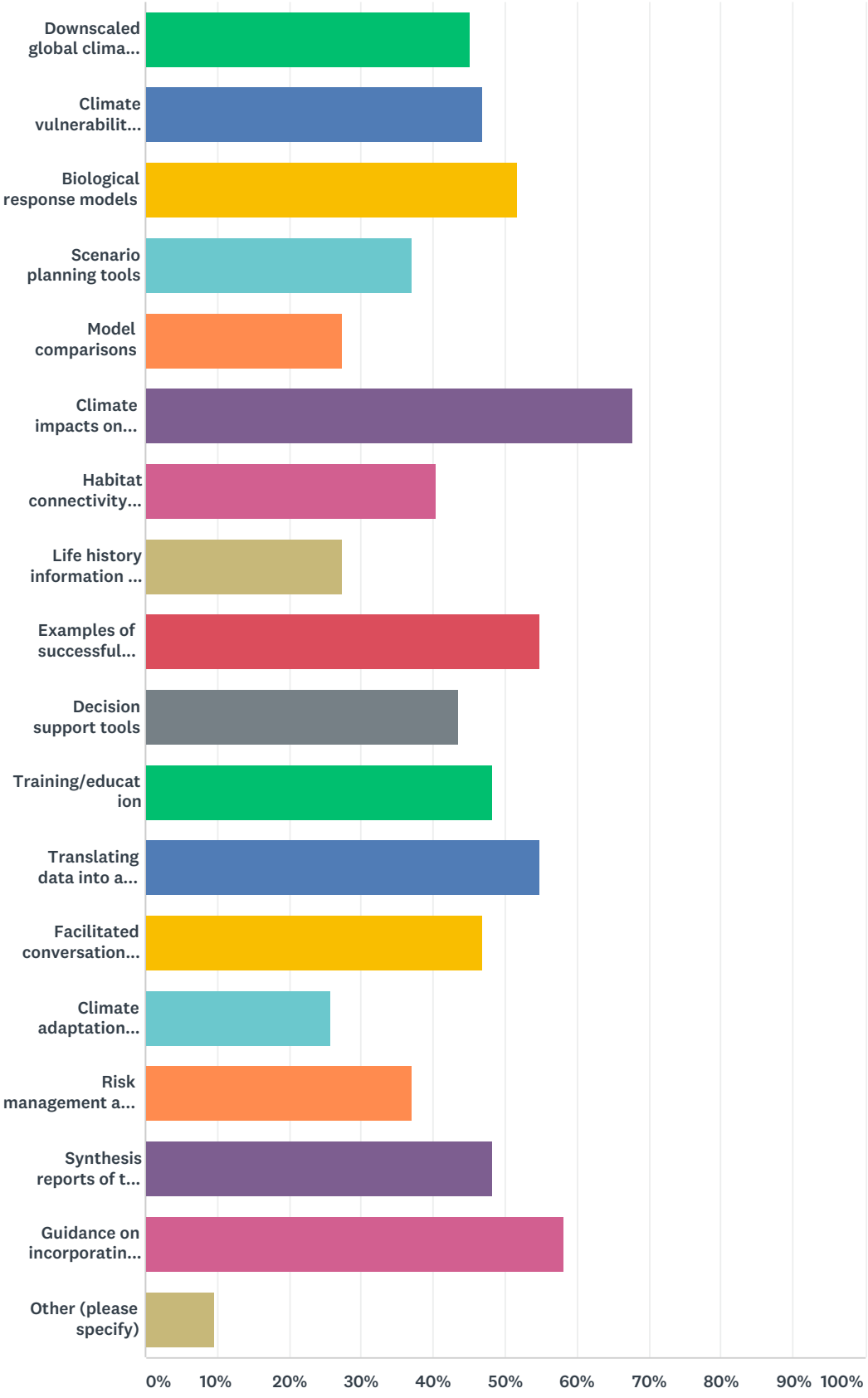
Answered: 63 Skipped: 6



ANSWER CHOICES	RESPONSES	
Yes	76.19%	48
No	23.81%	15
TOTAL		63

Q27 What products/information would your agency like to see that might assist with your climate adaptation work? (Check all that apply)

Answered: 62 Skipped: 7



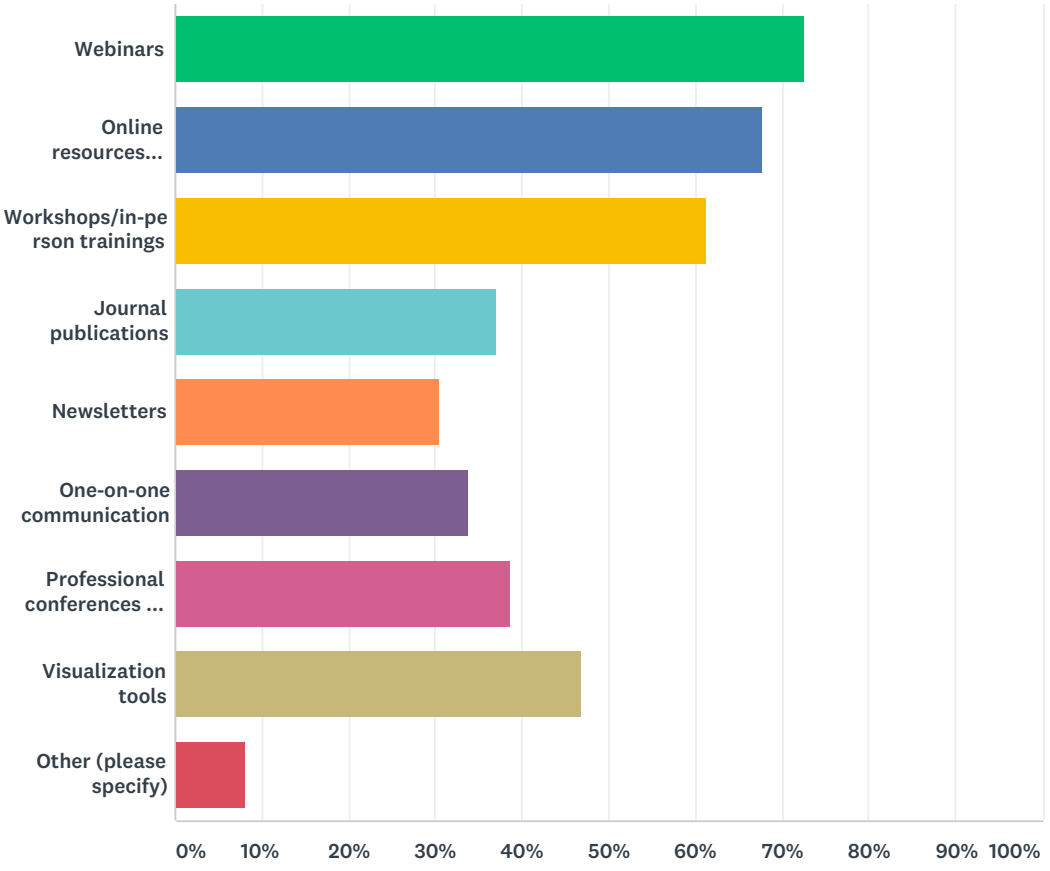
ANSWER CHOICES	RESPONSES	
Downscaled global climate models	45.16%	28

Climate vulnerability assessments	46.77%	29
Biological response models	51.61%	32
Scenario planning tools	37.10%	23
Model comparisons	27.42%	17
Climate impacts on specific species and/or habitats	67.74%	42
Habitat connectivity information	40.32%	25
Life history information and distribution of rare species	27.42%	17
Examples of successful adaptation strategies	54.84%	34
Decision support tools	43.55%	27
Training/education	48.39%	30
Translating data into a format that would be relevant to managers	54.84%	34
Facilitated conversations between climate scientists and natural resource managers	46.77%	29
Climate adaptation workbooks or templates	25.81%	16
Risk management and prioritization techniques	37.10%	23
Synthesis reports of the latest climate science applicable to management topics	48.39%	30
Guidance on incorporating climate adaptation into agency planning	58.06%	36
Other (please specify)	9.68%	6
Total Respondents: 62		

#	OTHER (PLEASE SPECIFY)	DATE
1	We have access to many of these types of information but their use is not supported programmatically.	8/23/2018 2:25 PM
2	Maps showing likely climate changes in our area	8/22/2018 6:41 PM
3	at this point most of barriers are internal	8/20/2018 2:07 PM
4	how to procure funding for land conservation	8/15/2018 8:04 AM
5	As of right now, climate change is not social or politcal high priority.	8/8/2018 11:52 AM
6	Practical applications on how we should manage our habitats to provide species with greatest chance to survive changing conditions.	8/2/2018 7:18 AM

Q28 What are the preferred mechanisms for accessing climate information and tools for your agency? (Check all that apply)

Answered: 62 Skipped: 7



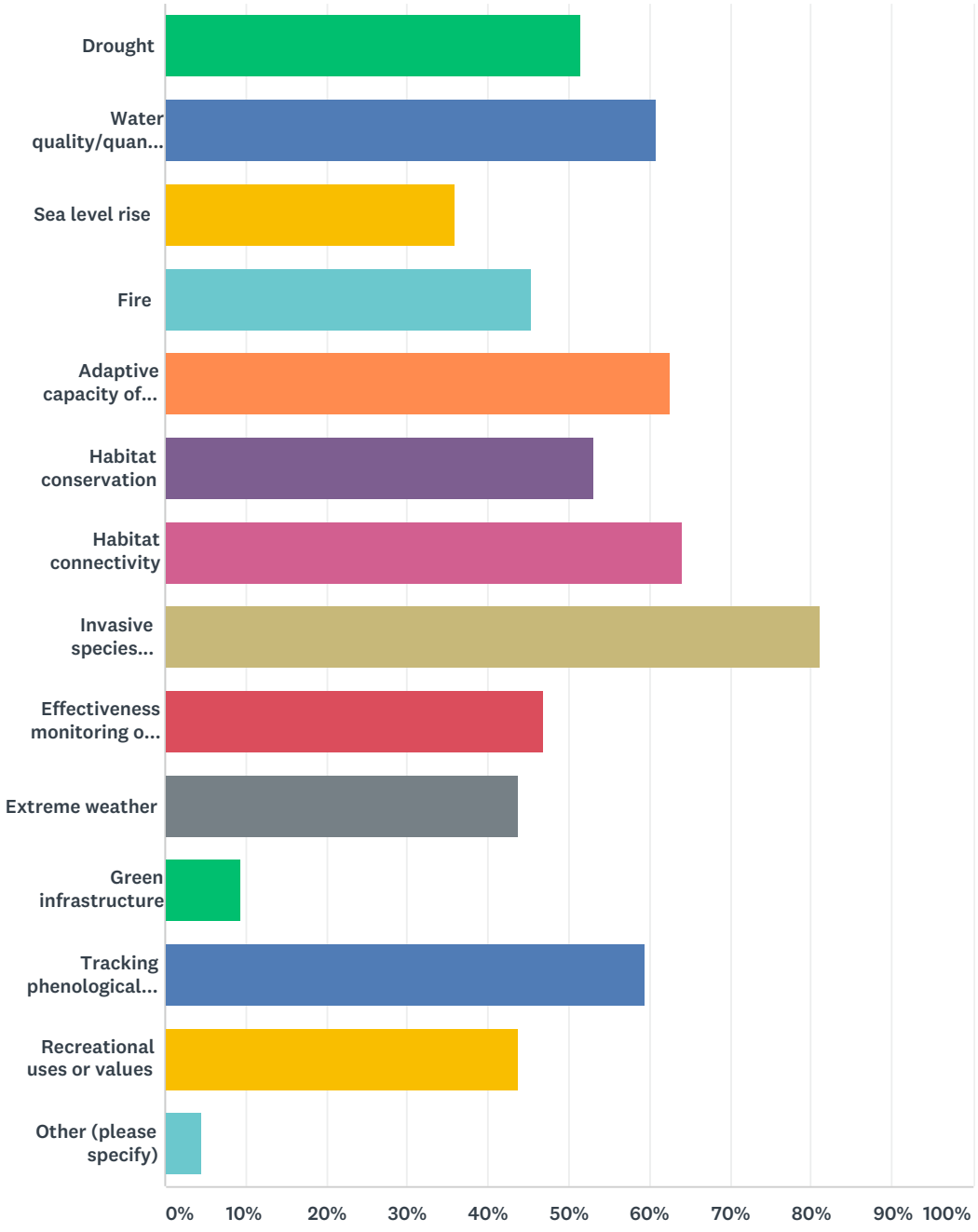
ANSWER CHOICES	RESPONSES	
Webinars	72.58%	45
Online resources (databases, libraries, etc.)	67.74%	42
Workshops/in-person trainings	61.29%	38
Journal publications	37.10%	23
Newsletters	30.65%	19
One-on-one communication	33.87%	21
Professional conferences or symposia	38.71%	24
Visualization tools	46.77%	29
Other (please specify)	8.06%	5
Total Respondents: 62		

#	OTHER (PLEASE SPECIFY)	DATE
1	There is no formal process for accessing, or even considering, climate information within the Department.	8/23/2018 2:25 PM

2	Demonstration sites	8/22/2018 9:44 AM
3	many	8/20/2018 2:07 PM
4	Partners or team members on specific projects	8/8/2018 2:46 PM
5	No idea. Agency leadership would need to be brought on board first.	8/8/2018 11:43 AM

Q29 Which of the following are high priority climate-related information needs for your agency? (Check all that apply)

Answered: 64 Skipped: 5



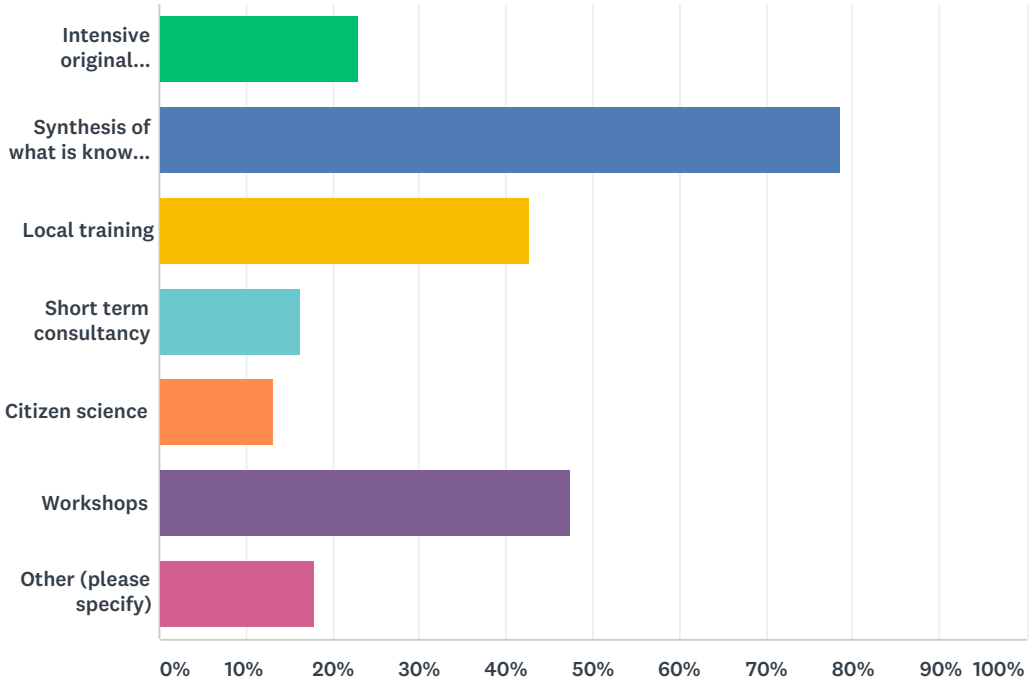
ANSWER CHOICES	RESPONSES	
Drought	51.56%	33
Water quality/quantity	60.94%	39
Sea level rise	35.94%	23
Fire	45.31%	29

Adaptive capacity of species	62.50%	40
Habitat conservation	53.13%	34
Habitat connectivity	64.06%	41
Invasive species movement and range expansion	81.25%	52
Effectiveness monitoring of management activities	46.88%	30
Extreme weather	43.75%	28
Green infrastructure	9.38%	6
Tracking phenological/temperature/precipitation shifts	59.38%	38
Recreational uses or values	43.75%	28
Other (please specify)	4.69%	3
Total Respondents: 64		

#	OTHER (PLEASE SPECIFY)	DATE
1	Ocean Acidification and Hypoxia	8/28/2018 4:48 PM
2	Balancing efficient management with fostering biological diversity	8/8/2018 2:46 PM
3	effective management strategies for habitats and rare species beyond our current efforts	8/2/2018 7:18 AM

Q30 What type of action do you think is needed to meet your climate-related information needs? (Check all that apply)

Answered: 61 Skipped: 8



ANSWER CHOICES	RESPONSES	
Intensive original research	22.95%	14
Synthesis of what is known about a particular topic	78.69%	48
Local training	42.62%	26
Short term consultancy	16.39%	10
Citizen science	13.11%	8
Workshops	47.54%	29
Other (please specify)	18.03%	11
Total Respondents: 61		

#	OTHER (PLEASE SPECIFY)	DATE
1	Long term monitoring of climate-related environmental conditions (or access to data from those who are already doing this monitoring)	8/28/2018 4:48 PM
2	Support from the Department Administration.	8/23/2018 2:25 PM
3	again, lack of internal coordination	8/20/2018 2:07 PM
4	Info from experts that understand the models, and can explaint them in understandable terms.	8/20/2018 10:45 AM
5	Area specific information for different ecosystems	8/14/2018 11:01 PM
6	use social science (not original research, use the social science tools beyond HD surveys)	8/8/2018 2:46 PM
7	We first need a broad public support/understanding/desire to address climate change	8/8/2018 11:52 AM

8	Basic information on proven science to counter climate change skepticism.	8/8/2018 11:43 AM
9	Staff time and funding	8/6/2018 9:42 AM
10	Intensive habitat conservation and restoration, enhance habitat connectivity, invasive species monitoring and control. Effectiveness monitoring and analysis. Practical applications are much more valuable than more models or white papers.	8/2/2018 7:18 AM
11	Most staff resources/time to devote to this	8/1/2018 12:24 PM

Q31 Are there any other science or information gaps that still need to be addressed for adaptation planning or implementation in your agency?

Answered: 26 Skipped: 43

#	RESPONSES	DATE
1	Predictions on changes in species ranges	9/21/2018 10:49 AM
2	Tools to help staff understand/address/process the "transition" phase of the resistance, resilience, and transition spectrum of climate adaptation.	8/28/2018 4:48 PM
3	There are many gaps but we have not systematically evaluated what is needed.	8/23/2018 2:25 PM
4	We could use maps of likely climate change in [redacted] and neighboring areas. We recognize that there are many models and many unknowns, but a synthesis of this information would be helpful.	8/22/2018 6:41 PM
5	How to effectively monitor how natural areas are changing in response to climate change and ongoing adaptation initiatives.	8/22/2018 9:44 AM
6	Not sure. We are in the process of planning extensive outreach to [redacted] staff across programs and regions to evaluate science and information uses and needs. We hope that this effort will shed light on any remaining information gaps related to climate science and adaptation.	8/21/2018 5:04 PM
7	We need to understand the concurrent of effects of different management actions and climate change effects	8/21/2018 9:37 AM
8	there is a need to convert science and climate models to relevant information for managers. There seems to be a large gap between climate scientists and managers.	8/17/2018 5:55 PM
9	Climate Change Vulnerability Assessments have not been completed for many species.	8/17/2018 10:02 AM
10	?	8/16/2018 9:27 AM
11	yes. [redacted] is changing rapidly and we are only starting to understand how individual species may respond. We have much less knowledge of how ecological communities and ecosystems may change. We know even less about how all of those changes may impact peoples access to wildlife resources.	8/15/2018 8:47 PM
12	Need information scaled down to management units, perhaps better, user-friendly models	8/14/2018 11:01 PM
13	yes	8/14/2018 2:48 PM
14	Economic and social consequences of climate change that could help to better inform fisheries management	8/14/2018 11:52 AM
15	While there are always information gaps, our biggest current challenge is communication and implementation	8/14/2018 11:02 AM
16	Interactions of multiple stressors. How to plan for novel communities.	8/14/2018 10:29 AM
17	Not sure	8/13/2018 8:07 PM
18	We need a synthesis of adaptation strategies for grassland ecosystems. Little has been done in this arena.	8/10/2018 11:22 AM
19	Empirical mapping of networks of *effective* information transfer for 1) agency managers and 2) partners. This needs to be done strategically (outside academia, such that the key nodes in the network are not anonymous.) Information can then be targeted to most efficiently to reach managers and the partners who create political or budgetary space for managers to achieve climate adaptive wildlife management.	8/8/2018 2:46 PM
20	Down-scaled climate models to specific geographic regions to assimilate predictions with current status of animals and habitat,.	8/8/2018 1:22 PM
21	We need tools to help us model the potential effects of climate change so we can plan for a variety of future scenarios.	8/7/2018 2:31 PM
22	Staff time and funding	8/6/2018 9:42 AM

23	We need innovative solutions to address the threats that climate change poses to species and habitats. We are already working to conserve and restore healthy habitats. So much of the research just confirms that we have a problem. I'm convinced. But if our current efforts are inappropriate, what else should we be doing? That's the research I need, now.	8/2/2018 7:18 AM
24	How to communicate Climate Change issues to governing bodies such as Commissions.	8/1/2018 1:38 PM
25	Phenological shifts for key species, and implications of those shifts. Monitoring for change. Examples of impacts on terrestrial species from Climate change, in [redacted].	8/1/2018 1:37 PM
26	Possibly, but we lack the capacity to quickly identify what gaps remain.	8/1/2018 12:24 PM

Q32 Are there any specific topics or opportunities that the AFWA Climate Change Committee should consider or focus on to better support your work?

Answered: 35 Skipped: 34

#	RESPONSES	DATE
1	Examples of how other wildlife agencies are planning for climate change	9/21/2018 10:50 AM
2	Opportunities to find beneficial habitat conservation outcomes while other programs/agencies aim to sequester carbon (green and/or blue carbon). Climate Communications - help with increasing internal capacity to understand and be able to communicate about the issues. Templates for external messages that defensibly draw citizen attention to the role of climate change in observed impacts (fish kills, extreme instream water temps, harmful algal blooms, domoic acid)	8/28/2018 4:59 PM
3	Defining and understanding historic climatic baselines, current conditions, and uncertainty in the future at fixed geographic locations. Planning for resilience and resistance at protected sites to landscape and climate change.	8/23/2018 2:30 PM
4	Communication of the latest climate change science in a format that wildlife managers can use.	8/22/2018 6:53 PM
5	Need for inter-agency collaboration (e.g. [redacted] Coastal Commission has needs for mitigation and public access issues which hamper SLR precautionary measures)	8/22/2018 11:11 AM
6	Help share the great resources that our [redacted] working group has developed, including CCVAs for [redacted] native plant communities [redacted]	8/22/2018 9:48 AM
7	None at this time.	8/21/2018 5:06 PM
8	How to organize the different agencies to approach climate adaptation at a regional scale	8/21/2018 9:39 AM
9	Yes, it could help highlight exemplary actions, plans, and approaches being taken by states. It could help facilitate discussions and info transfer between scientists and managers. It could facilitate cooperation between business and other natural resource users and f/w agencies and managers.	8/17/2018 5:57 PM
10	Continue to encourage and assist tribal and intertribal agency participation.	8/17/2018 10:48 AM
11	Develop case studies which help express the urgency and severity of the problems. If available, a comparison of the cost (ecologically, economically) of pro-active and re-active responses. Hopefully the outcomes will show the importance of pro-active activities. i.e., pay now or pay a lot more later. Consider regional examples so states can see their perspectives in the stories.	8/17/2018 10:09 AM
12	?	8/16/2018 9:28 AM
13	Providing guidance to wildlife managers on how to incorporate climate change information into their management.	8/15/2018 8:51 PM
14	1. invasive species 2. effects of climate adaptation on marine ecosystems (e.g., water temperature, water chemistry/ocean acidification, ocean currents, phytoplankton and zooplankton production, changes in food chain/webs) 3. effects of climate adaptation on arctic freshwater ecosystems (e.g., water temperature, timing/periodicity of ice-free vs. ice covered streams/lakes/wetlands, turbidity, glacial melt)	8/14/2018 2:54 PM
15	Looking at feasibility and impact of various climate adaptation strategies.	8/14/2018 1:27 PM
16	Bridging the gap between scientists and managers when it comes to climate adaptation is something we'd appreciate guidance on.	8/14/2018 11:03 AM
17	Destabilization of habitats by climate change leading to increased invasion/disruption by invasive species. Resulting impacts to ecosystem function and resilience ... and ability to support outdoor recreation. This topic needs more attention.	8/14/2018 10:28 AM
18	Not sure	8/13/2018 8:07 PM

19	Continue to make state Directors aware of the importance of this issue and the need to begin addressing it now.	8/10/2018 11:24 AM
20	Focus on actions for reducing non-climate stressors such as ways to deal with feral cats	8/8/2018 7:16 PM
21	1) start setting the groundwork for funding climate adaptation at a national level, because windows to achieve things are getting short and tend to be far left or right. One plans for summer in winter. 2) Foster networks and professional connections, especially with state level climate adaptation in other countries (e.g., the state of Victoria in Australia) 3) We need to find ways to engage and help states with little capacity in adaptation or for whom mentioning climate change is too politically charged to address adaptation explicitly. California does not need AFWA help. North Dakota does. (Ok, CA does need and want help, but marginally, there is bigger need and potential benefit in certain other states.)	8/8/2018 2:56 PM
22	Identify common themes across states, set up working groups as needed to tackle one issue at a time	8/8/2018 1:24 PM
23	making climate information easily understandable for land managers and the public.	8/8/2018 12:12 PM
24	In my opinion, at least in [redacted], impacts of Climate Change need to be better connected to the ag industry and water resources if there is ever going to be broad public support/recognition that CC is a threat. So, we need tools to help us talk to the ag community about CC and to find the common threats to ag and F&W conservation.	8/8/2018 12:01 PM
25	Engagement with directors so message can move from the top down in addition to the bottom up.	8/8/2018 11:44 AM
26	specific training on translating climate models to on the ground actions.	8/7/2018 2:33 PM
27	Increasing staff time and funding for climate change adaptation	8/6/2018 9:42 AM
28	Funding Opportunities to address State climate change issues (beyond SWG).	8/2/2018 12:22 PM
29	Training Webinars specific to wildlife taxonomic groups -- birds, mammals, fish, reptiles, amphibians, invertebrates, invasive species. For better or worse this is the way biological staff are organized in most fish and wildlife agencies	8/2/2018 11:07 AM
30	Political resistance to climate change work	8/2/2018 11:03 AM
31	Please press the CSCs and the academic community to shift some resources away from modeling and towards practical applications that field staff can implement. I have "climate model fatigue". But I get it. We have big looming problems. We need a conversation for actions. What do we do to address those problems. If our ongoing conservation and restoration efforts are inappropriate, what do they recommend? Likewise, with our very limited resources, how do we monitor the effectiveness of these efforts over the course of decades? What are the most important measurements we can take and how do we collect (and store) those data as efficiently as possible?	8/2/2018 7:25 AM
32	Reports on how Climate Change affects wildlife populations. Such as Ducks shortstopping before reaching the South or increased disease due to increase parasites and disease vectors such as no seeums and Epizootic Hemorrhagic Disease or tick born diseases, etc.	8/1/2018 1:41 PM
33	Sharing examples of how other agencies have implemented adaptation. And/or collecting examples of how climate change is affecting species life histories, distribution, right now.	8/1/2018 1:39 PM
34	Continue to support efforts of the Climate Adaptation Science center--they are a great resource for distilling data to management levels.	8/1/2018 12:26 PM
35	Encourage agency leadership to enable participation in workshops and conferences by agency experts.	8/1/2018 12:08 PM

Q33 Are there any additional highlights, accomplishments, new initiatives, or actions that you would like to share?

Answered: 21 Skipped: 48

#	RESPONSES	DATE
1	-[redacted] new strategic plan calls upon the agency to focus on developing a consistent, comprehensive approach to addressing climate change (adaptation and mitigation). -This summer, the agency had to close all cold water fishing after 2pm to protect fish during unusual heat waves that spiked stream temperatures. -The dungeness crab fishery this year was delayed by the presence of domoic acid as a result of harmful algal blooms in the Pacific. [redacted] and other state agencies worked together to modify regulations to allow for more traceability of crab through the market to be able to better catch future domoic acid spikes and protect the market. -[redacted] Marine Resources Program Director is the co-chair of the [redacted] Coordinating Council on Ocean Acidification and Hypoxia that will provide recommendations to the legislature in September.	8/28/2018 4:59 PM
2	[redacted] Science Institute is growing its capacity to better integrate climate adaptation into all our programs. Currently engaging in strategic planning and exploring funding options.	8/22/2018 11:11 AM
3	Our working group is currently moving toward publishing a menu of adaptation options for non-forested wetlands in collaboration with NIACS. We are also engaging Stantec[redacted] in a wetland adaptation demonstration site that uses our CCVAs and adaptation menu with the USFS FAR workbook process.	8/22/2018 9:48 AM
4	None at this time.	8/21/2018 5:06 PM
5	--	8/21/2018 9:39 AM
6	the 2017[redacted] Climate Summit[redacted]	8/17/2018 5:57 PM
7	Not at this time.	8/17/2018 10:48 AM
8	None.	8/17/2018 10:09 AM
9	No	8/16/2018 9:28 AM
10	not now but maybe soon	8/15/2018 8:51 PM
11	[redacted]government initiative to be Carbon Neutral by 2045 set last year; working on 2 trial state carbon sequestration projects (focused on reforestation); sea level rise report just finished showing impact to coastal communities, infrastructure, and environment; Government established [redacted] Climate Change Mitigation and Adaptation Commission that includes a Greenhouse Gas Sequestration Task Force	8/14/2018 11:05 PM
12	No	8/13/2018 8:07 PM
13	AFWA should look at TNC's Conserving Natural Stage regional assessments that identify climate resilient sites. Could be very useful for informing future SWAP revisions.	8/10/2018 11:24 AM
14	We are now focusing on overcoming barriers to implementing adaptation actions.	8/8/2018 7:16 PM
15	I have something going on every burner, but nothing is done yet and ready to share.	8/8/2018 2:56 PM
16	State of [redacted] will be publishing a State climate action policy in September. [redacted] will publish a new white paper identifying issues, applicable to our 2010 strategy in December.	8/8/2018 1:24 PM
17	WE are just starting a program to address the warming of our Cold Water Natural Lakes. We only have 7 coldwater lakes left and our Cisco populations in those lakes are in precipitous declines. This issue is largely a climate change issue, but there are some land use practices and social attitudes that we will be attempting to address in hopes of at least "slowing" the warming of the water.	8/8/2018 12:01 PM
18	[redacted] is working closely with multiple state agencies to increase carbon storage capacity in order to be carbon neutral by 2045	8/7/2018 2:33 PM
19	No. I've been told that our ongoing efforts aren't "climate change-y" enough for this discussion.	8/2/2018 7:25 AM

20	No	8/1/2018 1:41 PM
21	no	8/1/2018 12:26 PM