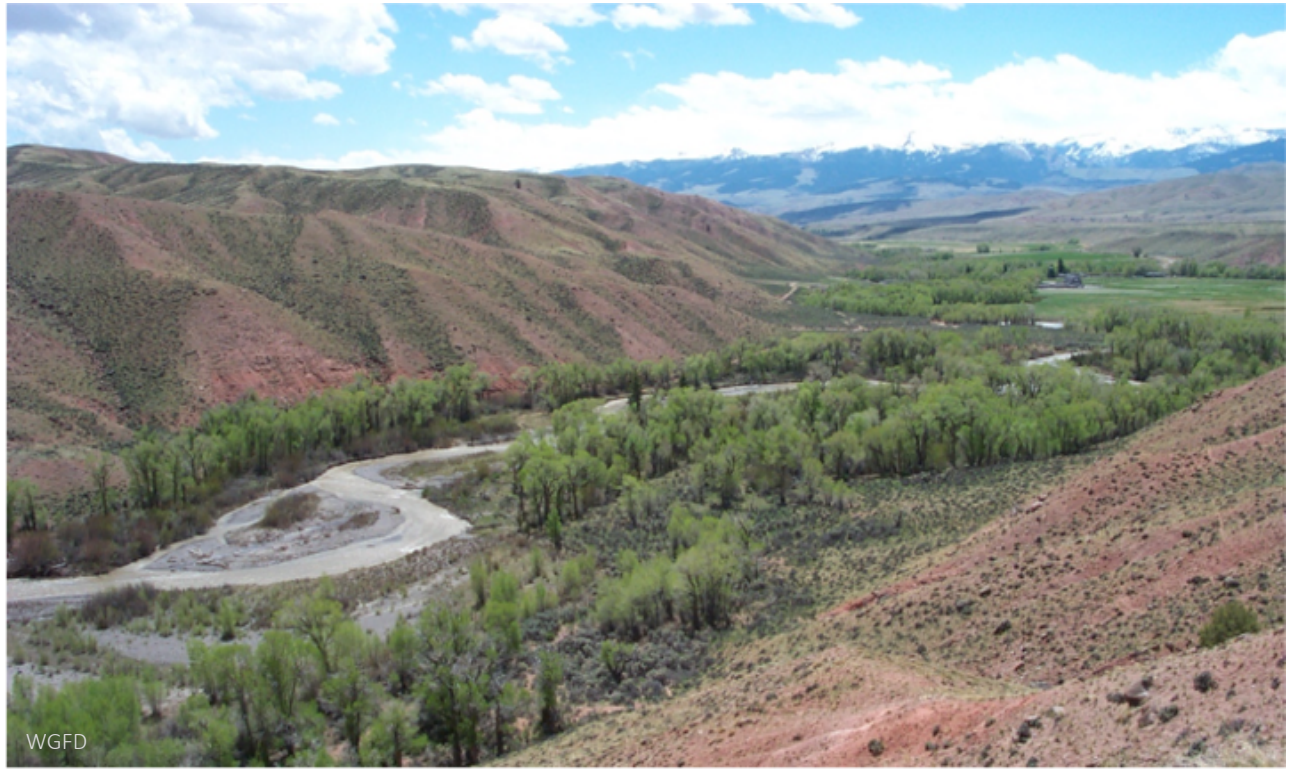
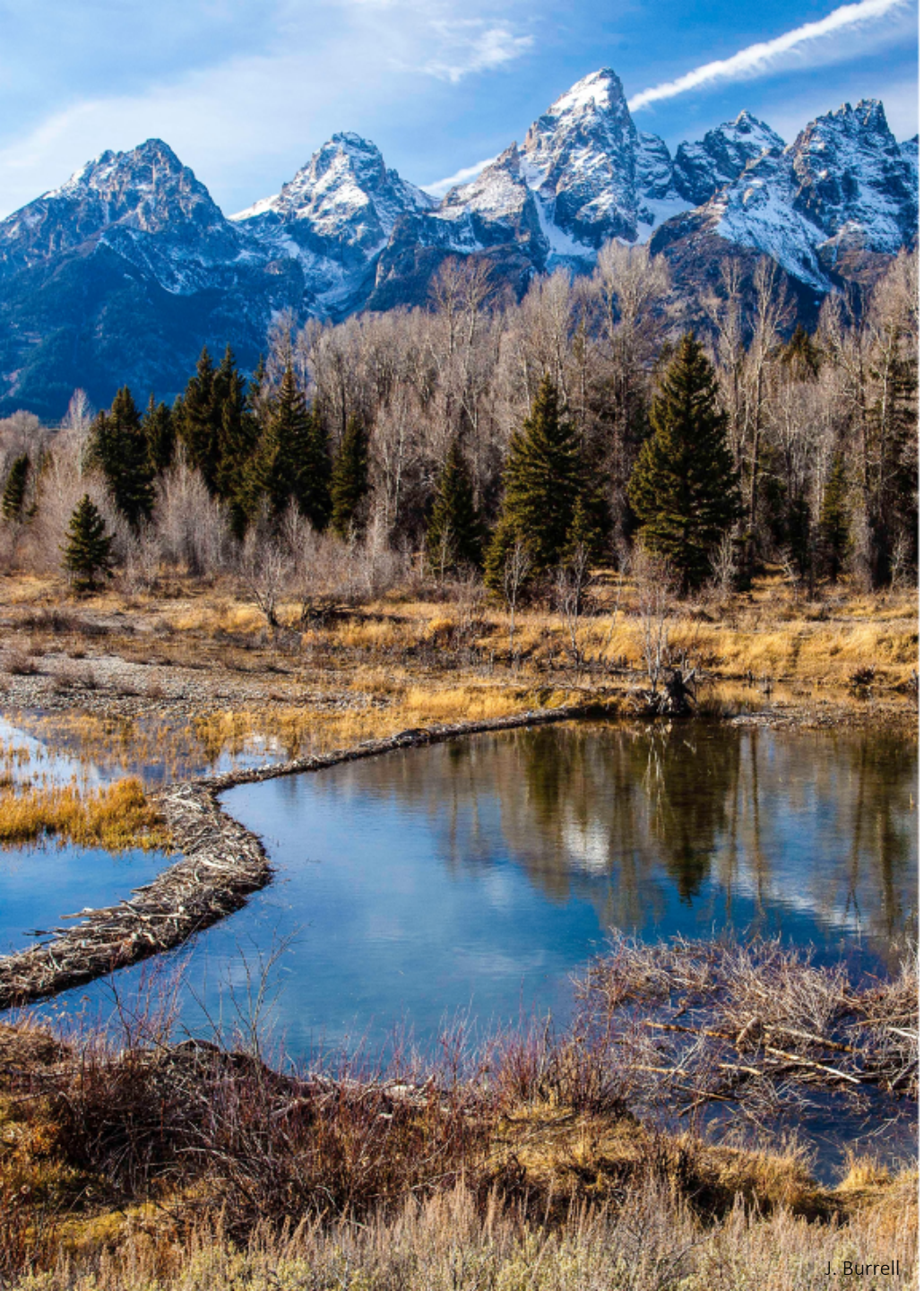
Setting Habitat Protection and Restoration Priorities in a Warming World: Lessons from Wyoming



Paul Dey (paul.dey@wyo.gov) | Molly Cross (mcross@wcs.org)

Funded by:

North Central Climate Adaptation Science Center



Management Planning Opportunity

Wyoming Statewide Habitat Plan (SHP)

- Led by Wyoming Game and Fish Department (WGFD)
- Sets priorities for habitat protection and restoration across the state (state-managed lands and other lands)
- Updated every ~5 years
- Has not previously considered climate change, but WGFD wanted to include in 2020 update

Goals for WCS-WGFD Collaboration

(via 1:1 interviews and group discussion with core team at WGFD)

- **Increase knowledge** of climate change impacts; climate-informed planning and actions; and relevant climate change experts
- **Incorporate climate-informed actions** into the Statewide Habitat Plan
- **Identify management-relevant gaps** in climate information
- **Advance learning on methods** for linking climate research with natural resource management decision-making

Co-Production Process & Methods

Clarify decisions & decision context

Review previous Statewide Habitat Plan;
Discussions with WGFD core team

Synthesize available climate science

Discussions with core team at WGFD and climate experts;
Synthesis of projections led by Dr. Imtiaz Rangwala (NC-CASC)

Co-produce climate-informed actions & information gaps/needs

Participatory climate change planning workshop; Online survey

Use co-produced information in near-term planning

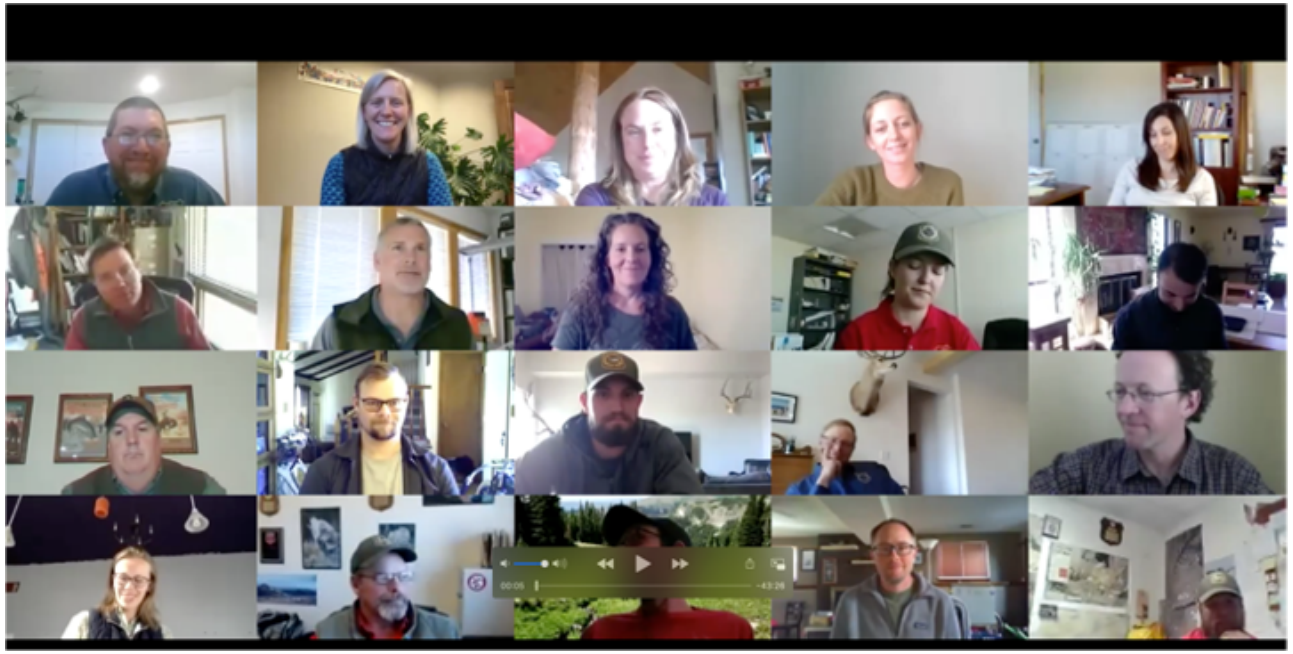
Meetings with WGFD core team

Evaluate outcomes & methods

Online surveys; Semi-structured interviews; Document analysis

Participatory Climate Change Planning Workshop

Virtual (thanks, COVID!)



Attendees: 25-55 WGFD staff & 10-14 external climate experts (varied by day & session)

Format: 3-hour climate science webinar followed by 2 days of interactive breakout discussions (4 geographies)

Goals:

1. Learn about the best-available climate change projections relevant to river, riparian, and wetland habitats in Wyoming;
2. Explore the ecological consequences of those climate changes;
3. Identify climate-informed habitat protection and restoration actions relevant to the WGFD Statewide Habitat Plan (SHP); and
4. Develop a list of data, information, and analyses that would be useful for making climate-informed habitat management decisions.

Participatory Climate Change Planning Workshop

How might climate change affect WY river, riparian and wetland habitats?

Excerpt from Google Doc worksheet

Completed by workshop participants

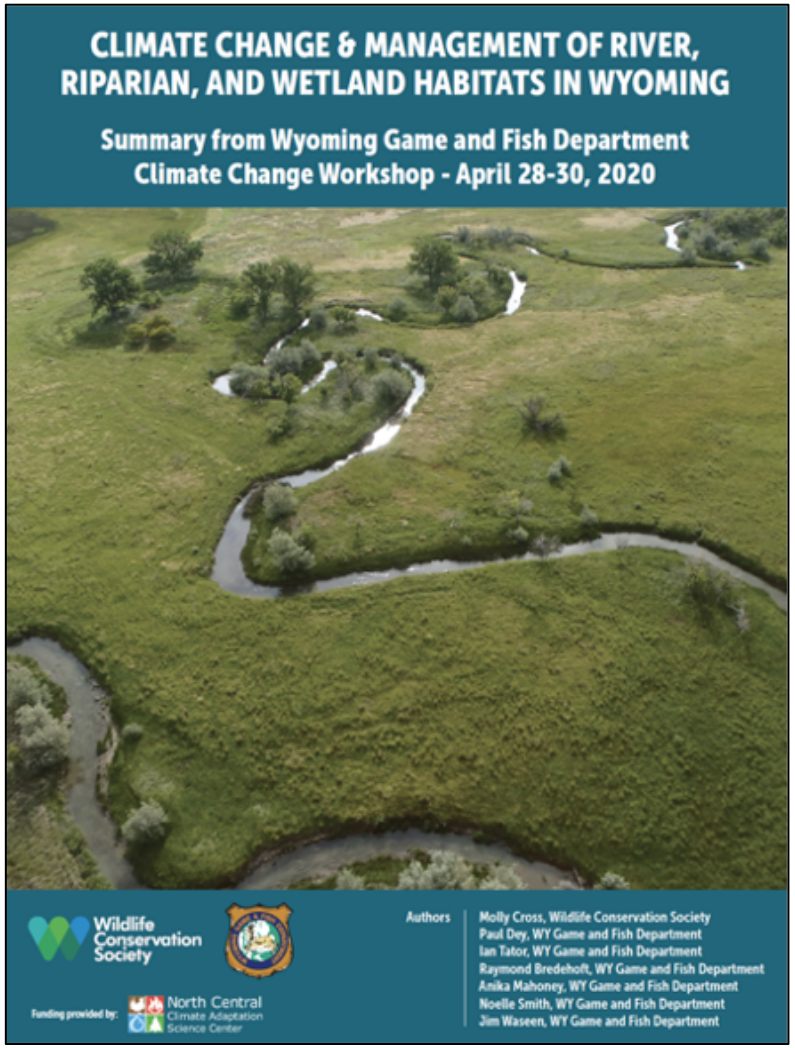
Climate projections provided by Dr. Imtiaz Rangwala

Geography: Horse Creek watershed

Climate/ Hydrological Variable	Future Projected Changes *2040-2069 relative to 1971-2000*				Ecological Consequences to Rivers, Riparian Areas, Wetlands
	Range across all models + emissions	Mean RCP 4.5	Mean RCP 8.5	Model Agreement	
Mean Temperature (F)	Annual: +3 to +7 °F Winter: +3 to +8 °F Spring: +2 to +8 °F Summer: +3 to +8 °F Fall: +3 to +7 °F	+4.4 °F +4.3 °F +4.2 °F +4.6 °F +4.3 °F	+5.9 °F +5.6 °F +5.4 °F +6.4 °F +6.1 °F	All models project increases	• Horse Creek is a unique stream system as it transitions from a cold water stream to a warm water stream throughout its course. In addition, Horse Creek has many diversions that influence connectivity and stream temperatures. These diversions not only divert water from the system, but some diversions add water to the stream. The section of Horse Creek that harbors the most diverse assemblage of fishes, is also the warmest. If this section warms, these fishes will need to move to find appropriate habitat. • September low flows when augmentation goes away = increased temps • Increased algal blooms? • Connectivity will be important • Increase in spread of nonnative bullfrogs.
Days w/ Heat Index > 90F *(5 days/year historically)*	Increase to a Total of 15 to 40 days/year	+22 days	+30 days	All models project increases	• Whereas mean temperatures may not become stressful for many native prairie stream fishes, hot periods where temperatures spike for 2-3 days at same time of low flows and low oxygen levels could be very impactful (and difficult to detect without extensive monitoring data) • Will an increase in increased air temps result in an increased demand for water based on new crops? • More rattlesnakes??
Precipitation (%)	Annual: -5 to +20% Winter: 0 to +40% Spring: 0 to +40% Summer: -15 to +10% Fall: -5 to +20%	+7% +15% +15% -2% +5%	+9% +25% +15% -2% +7%	High (+) High (+) High (+) Medium (-) Medium (+)	• With an increase in water volume moving through stream channels an increase in channel incision/erosion could occur if channels are denuded of wood and or beavers • Increased sediment

Continued on multiple pages…

Participatory Climate Change Planning Workshop



WGFD staff & external climate researchers co-produced:

- 70 climate change impacts of concern
- 75+ habitat management actions to help address climate change impacts
- 44 statements of info needed to make climate-informed management decisions in the next 5 years

https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/2020-WGFD-WCS-Workshop-Report.pdf

Goals for WCS-WGFD Collaboration

- Increase knowledge of climate change impacts; climate-informed planning and actions; and relevant climate change experts
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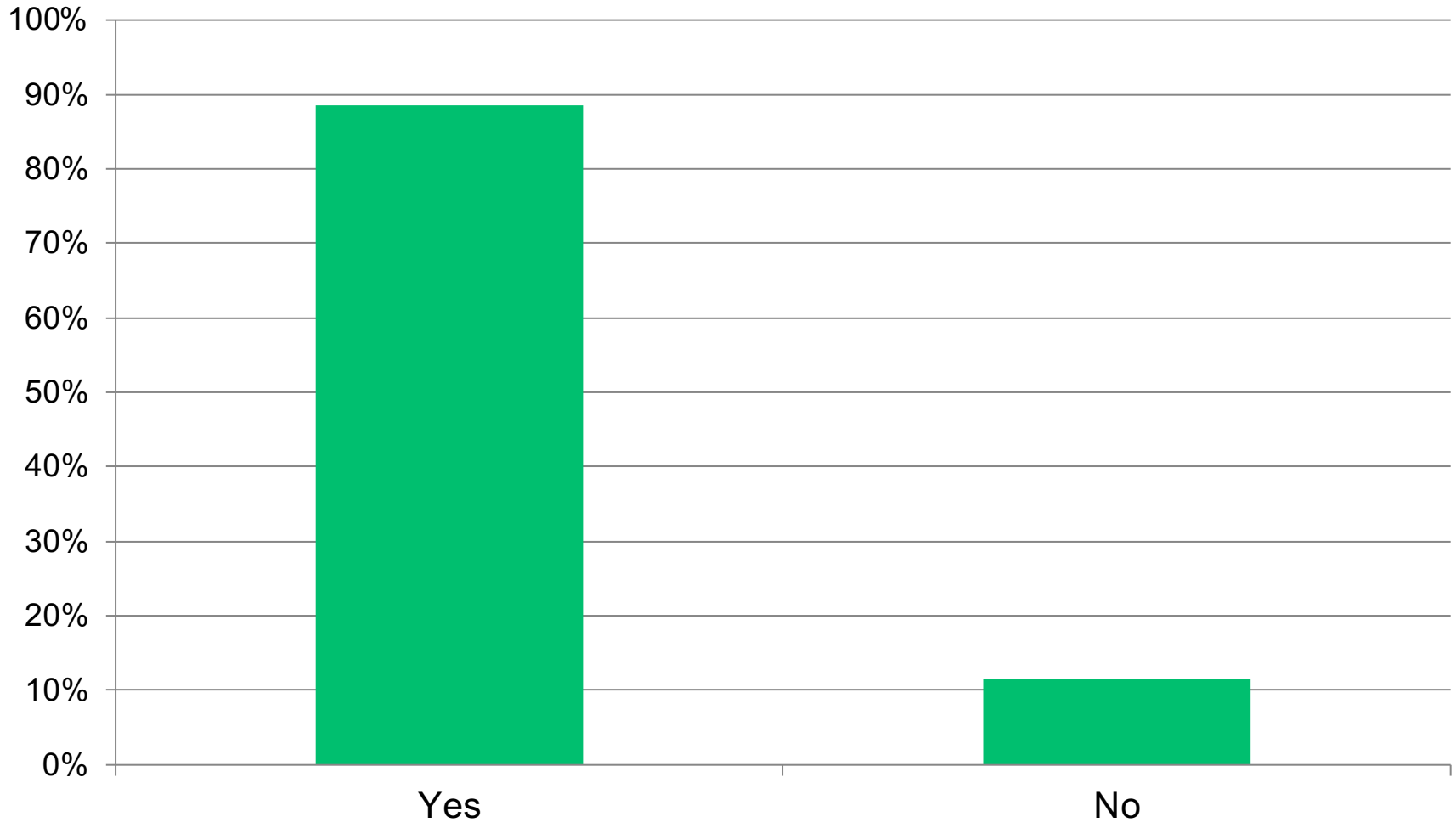
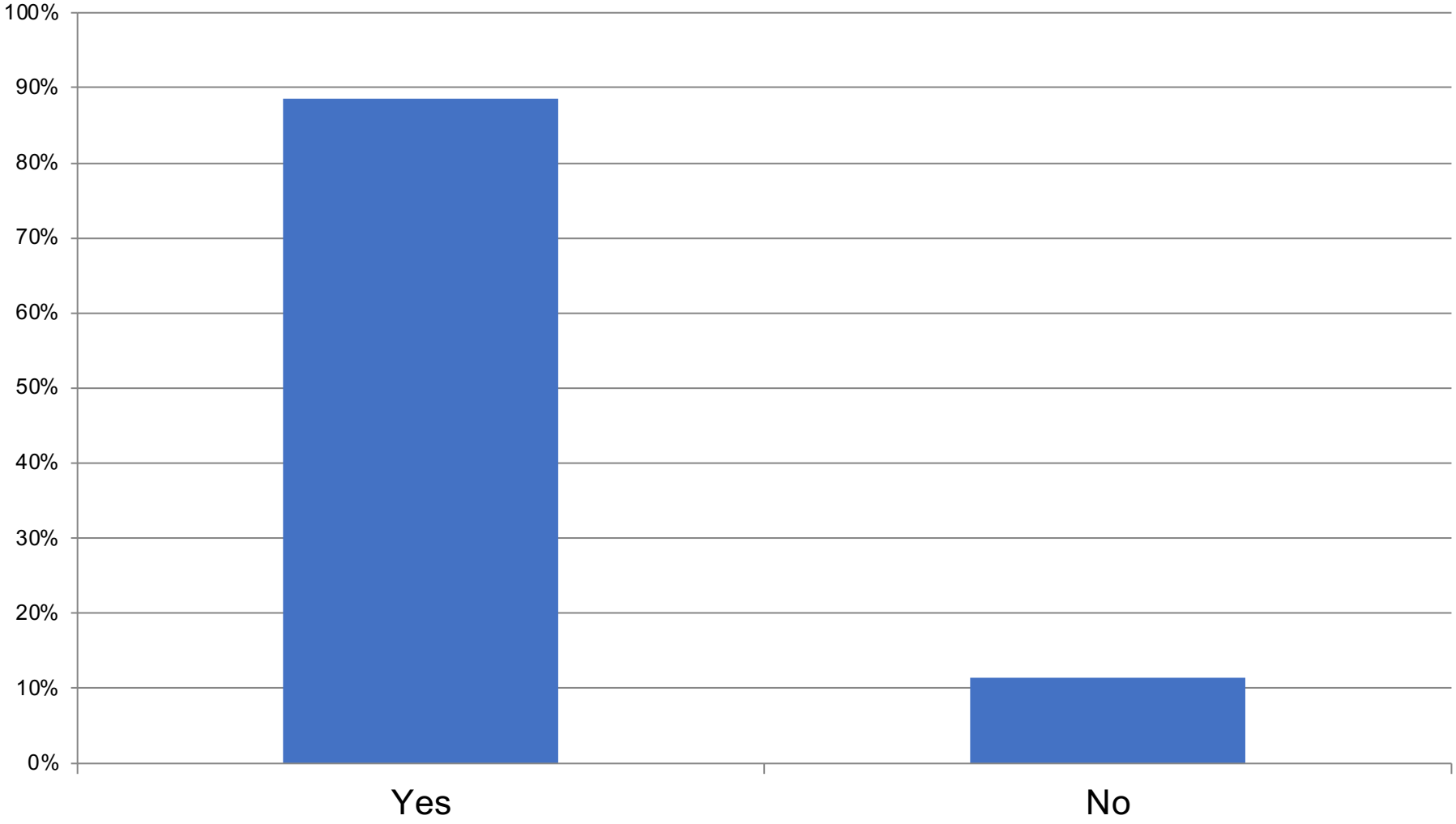
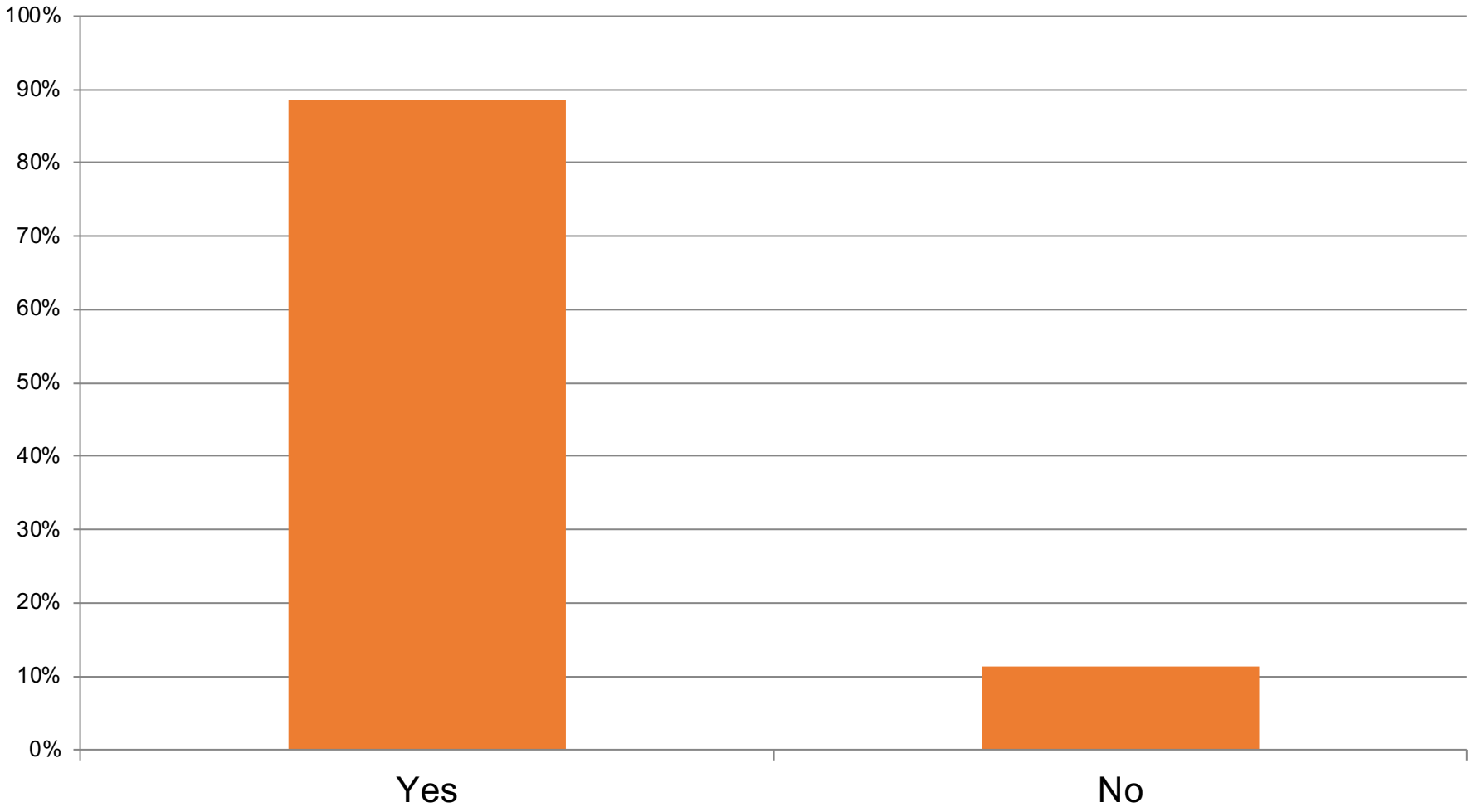
As a result of the workshop, did you **gain new knowledge about climate change projections and impacts**? (n=35)



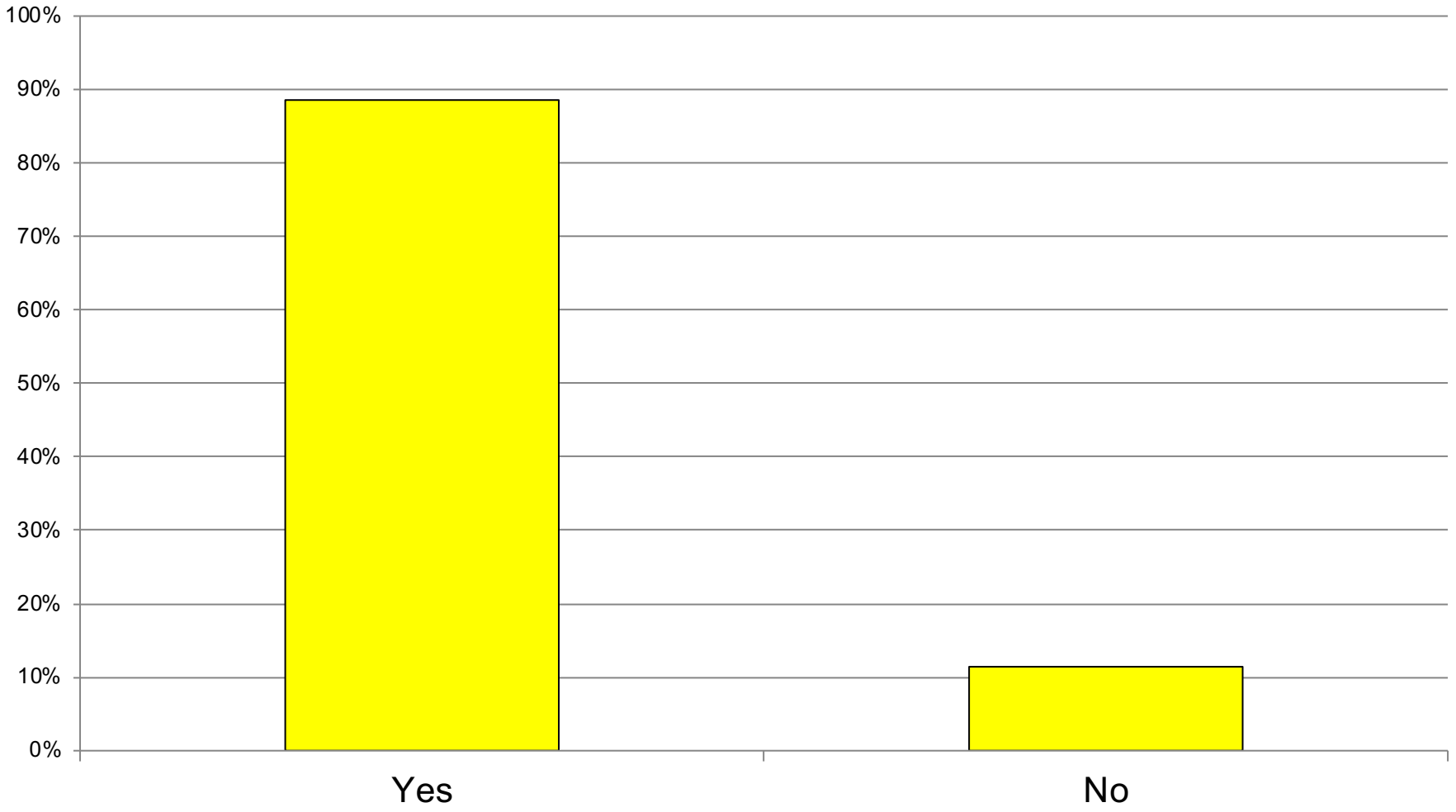
As a result of the workshop, do you **feel more comfortable integrating climate change information into your work**? (n=35)



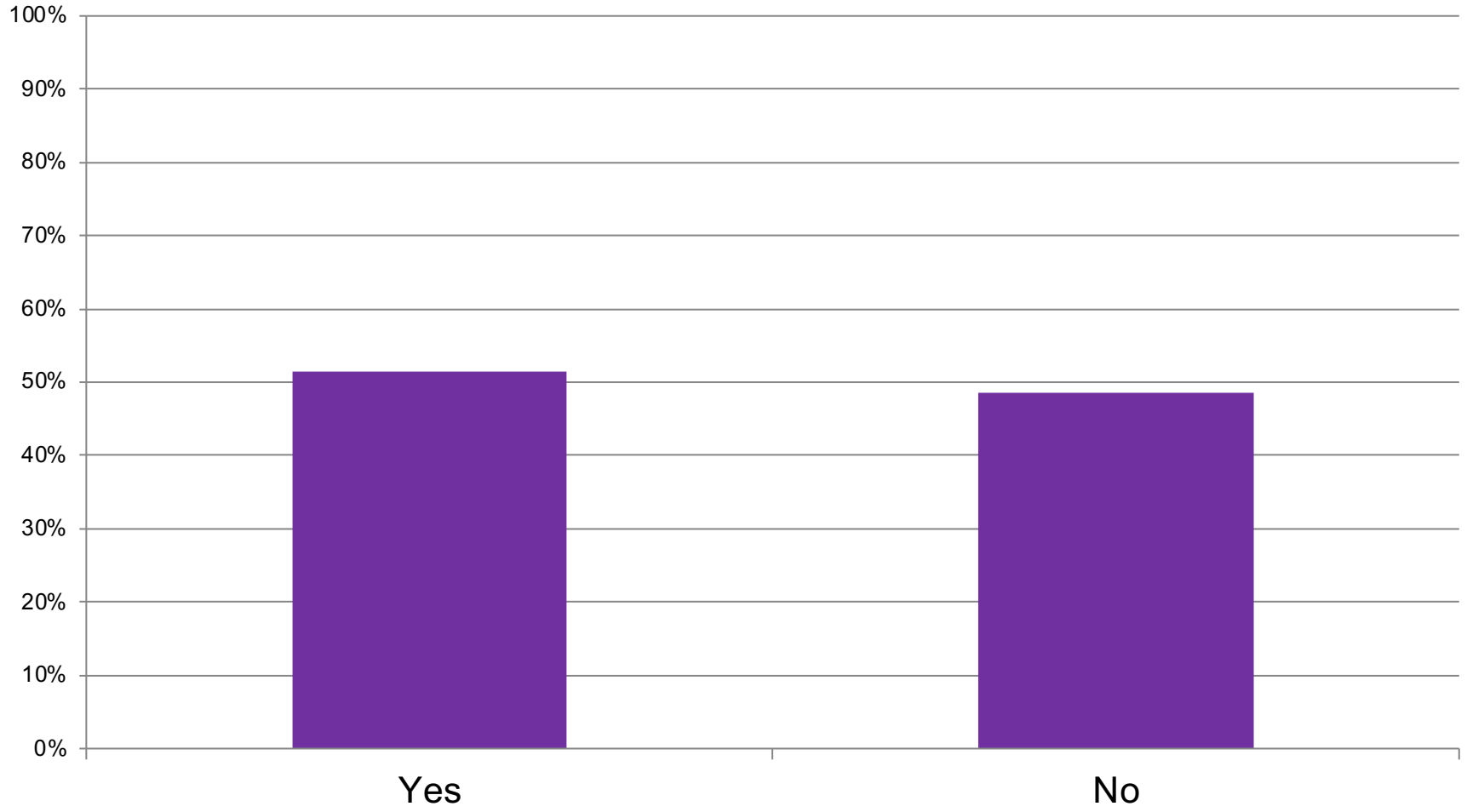
As a result of the workshop, do you **feel more familiar with approaches and tools for climate change-informed conservation planning?** (n=35)



As a result of the workshop, do you **feel more familiar with climate change adaptation strategies or actions that are relevant to your work**? (n=35)



As a result of participating in this workshop, did you **“meet” any new individuals with whom you will likely develop or share information about climate science in the future**? (n=35)



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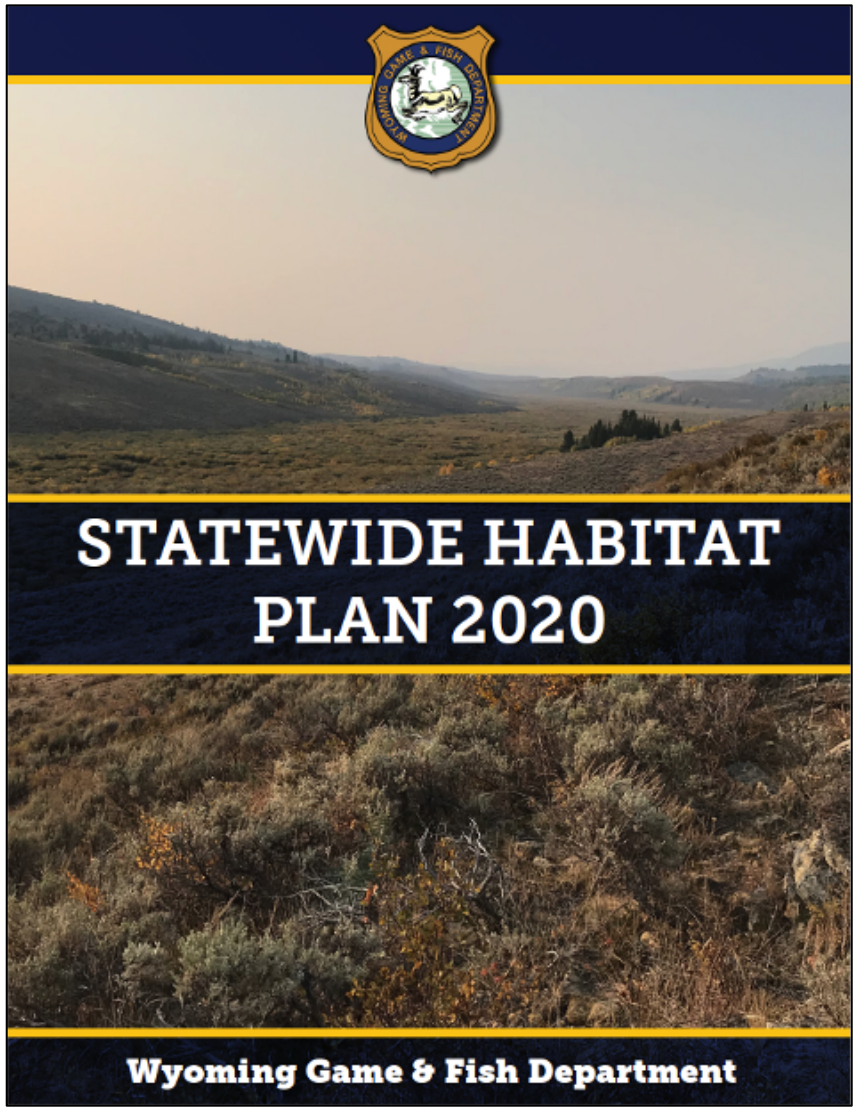
Incorporating Climate Change into WY Statewide Habitat Plan (SHP)



- In 2015 SHP, “climate” is mentioned **1 time**.
- In 2020 SHP, “climate” is mentioned **63 times**.
- There is a 3-page section on Climate Change that summarizes key points from workshop.

https://wgfd.wyo.gov/getmedia/8ba62756-6d1c-4257-8644-82383dfa605a/SHP2020_Final

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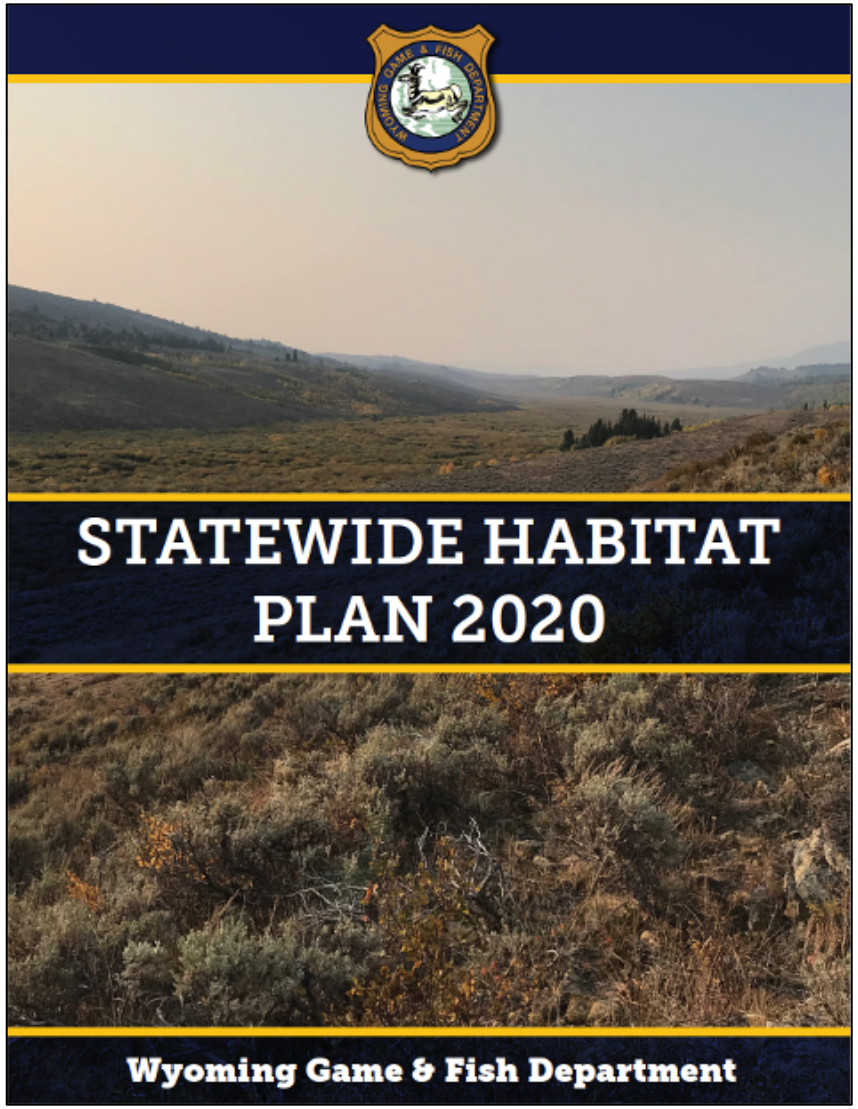

- Climate change is not just mentioned as a threat, but also explicitly included in Strategies and Actions.

- 5 out of 30 Strategies (17%) and 30 out of 76 Actions (40%) were flagged as addressing climate change.

https://wgfd.wyo.gov/getmedia/8ba62756-6d1c-4257-8644-82383dfa605a/SHP2020_Final

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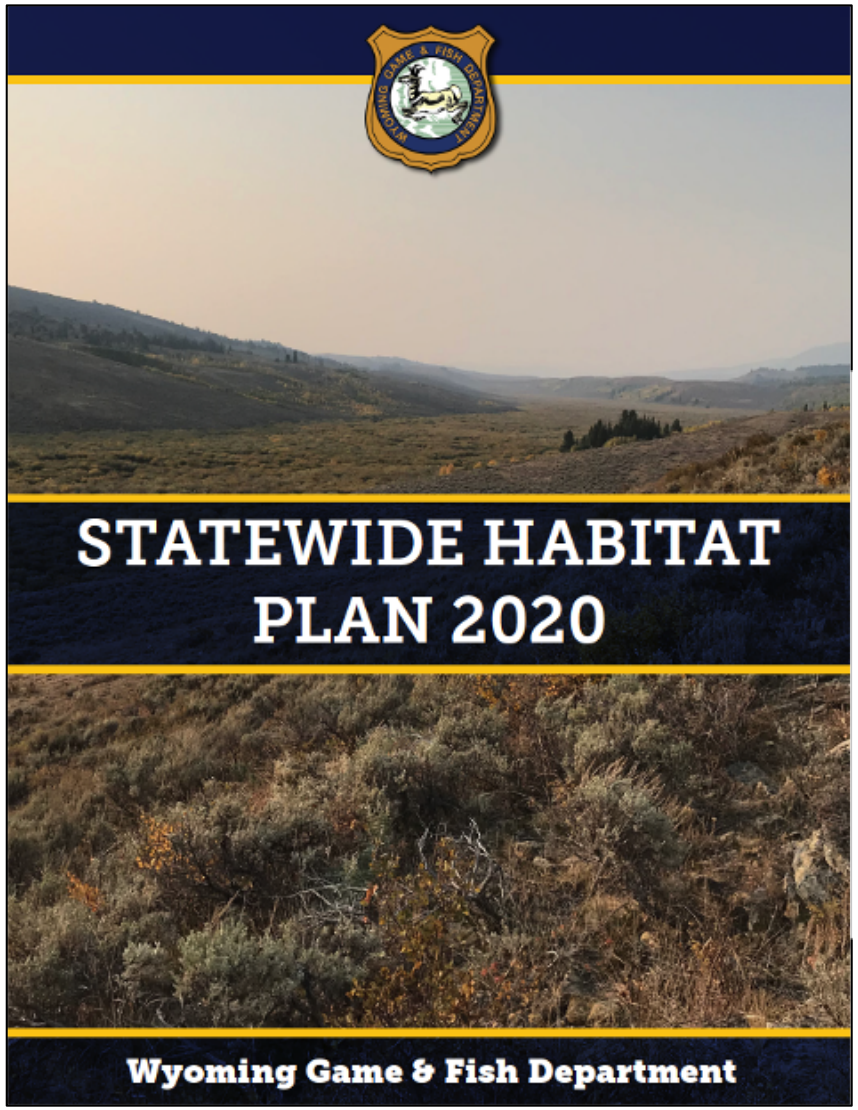

GOAL 2: STRATEGIES AND ACTIONS

Strategy VI) Promote functioning stream channels that maintain natural processes and aquatic habitat.

The following new or specific actions will be pursued or emphasized:

- **Action a)** Use staged channels to accommodate higher high flows and lower low flows than historically common.
- **Action b)** Enhance and maintain floodplain connectivity on Shoshone and Big Horn Rivers. Emphasize enhancing floodplain connectivity for all river restoration projects.
- **Action c)** Enhance spring creeks and cold water areas as potential cool water refugia and reconnect these systems.
- **Action d)** Develop new projects or build into existing projects an appropriate emphasis on managing irrigation return water to reduce stream temperature increases.
- **Action e)** Plant woody species within the riparian corridors to reduce stream temperature fluctuations and reduce erosion.

https://wgfd.wyo.gov/getmedia/8ba62756-6d1c-4257-8644-82383dfa605a/SHP2020_Final

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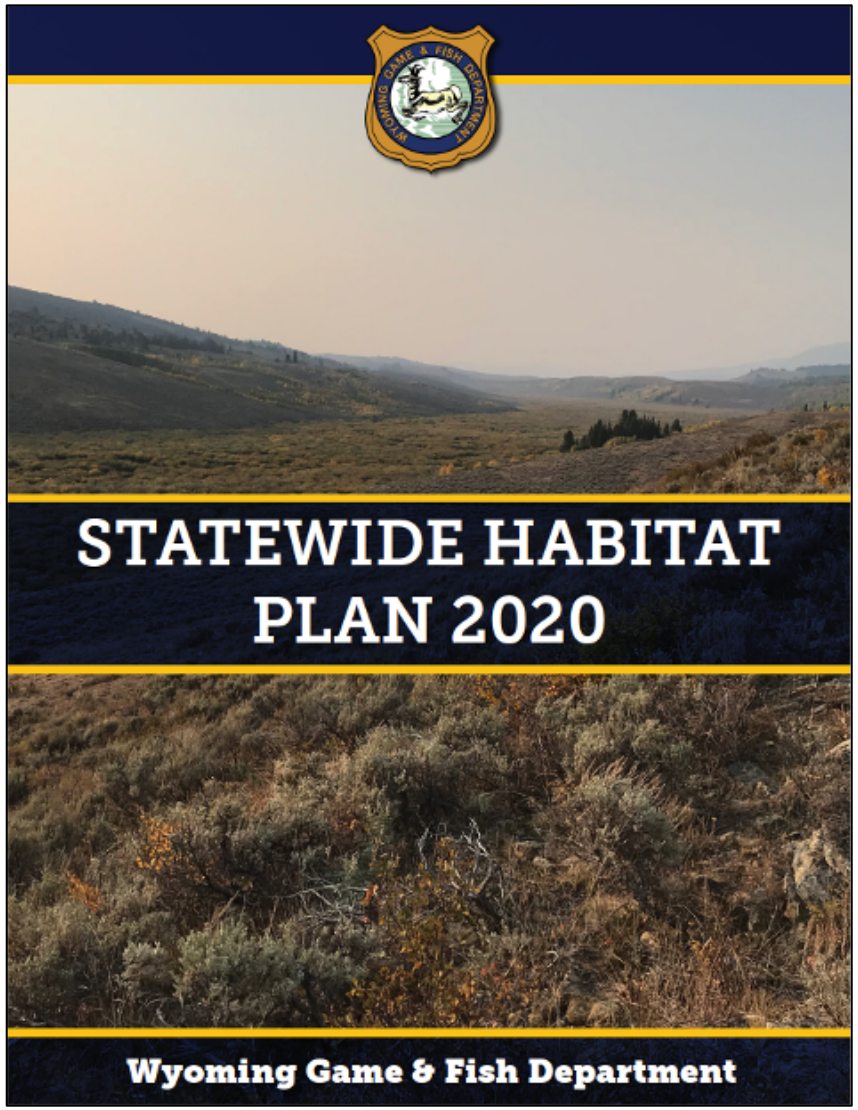

- For annual funding decisions, projects that address climate change receive a bonus point.

https://wgfd.wyo.gov/getmedia/8ba62756-6d1c-4257-8644-82383dfa605a/SHP2020_Final

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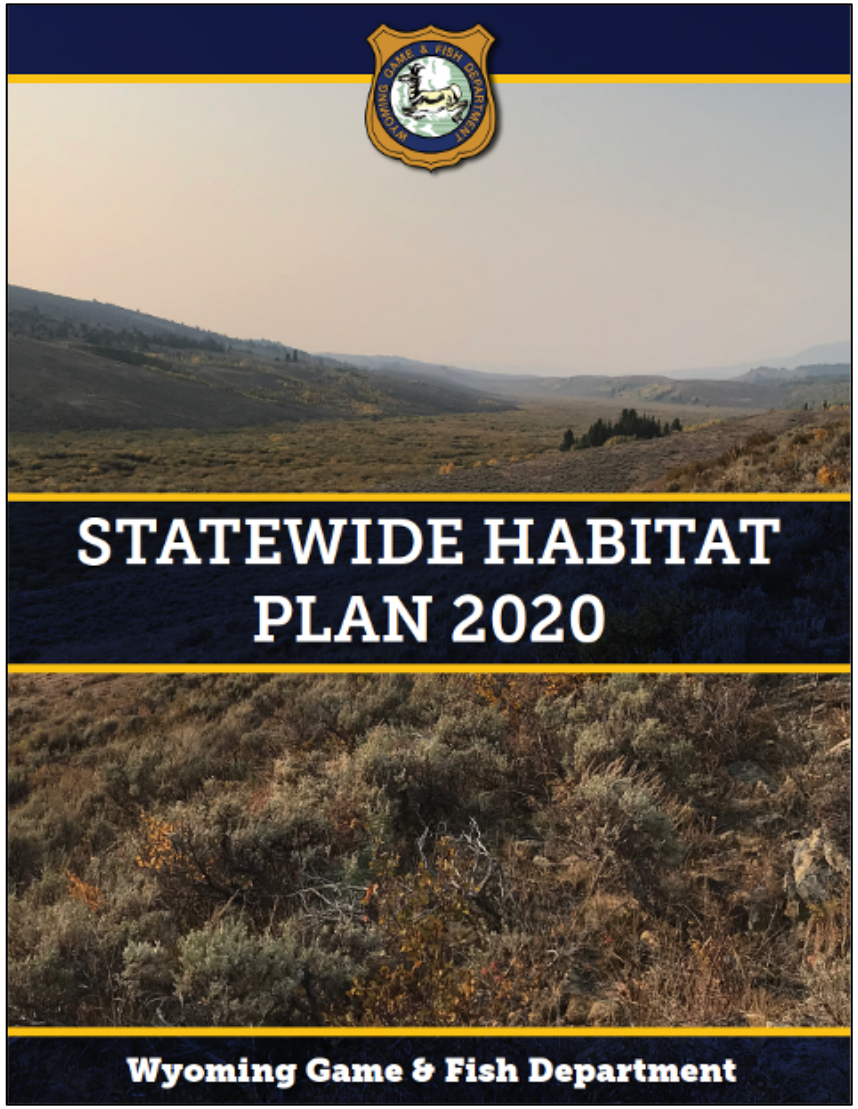

- Plan includes a strategy to “pursue new research and synthesis of available research to address key climate change vulnerability and adaptation information needs”.

https://wgfd.wyo.gov/getmedia/8ba62756-6d1c-4257-8644-82383dfa605a/SHP2020_Final

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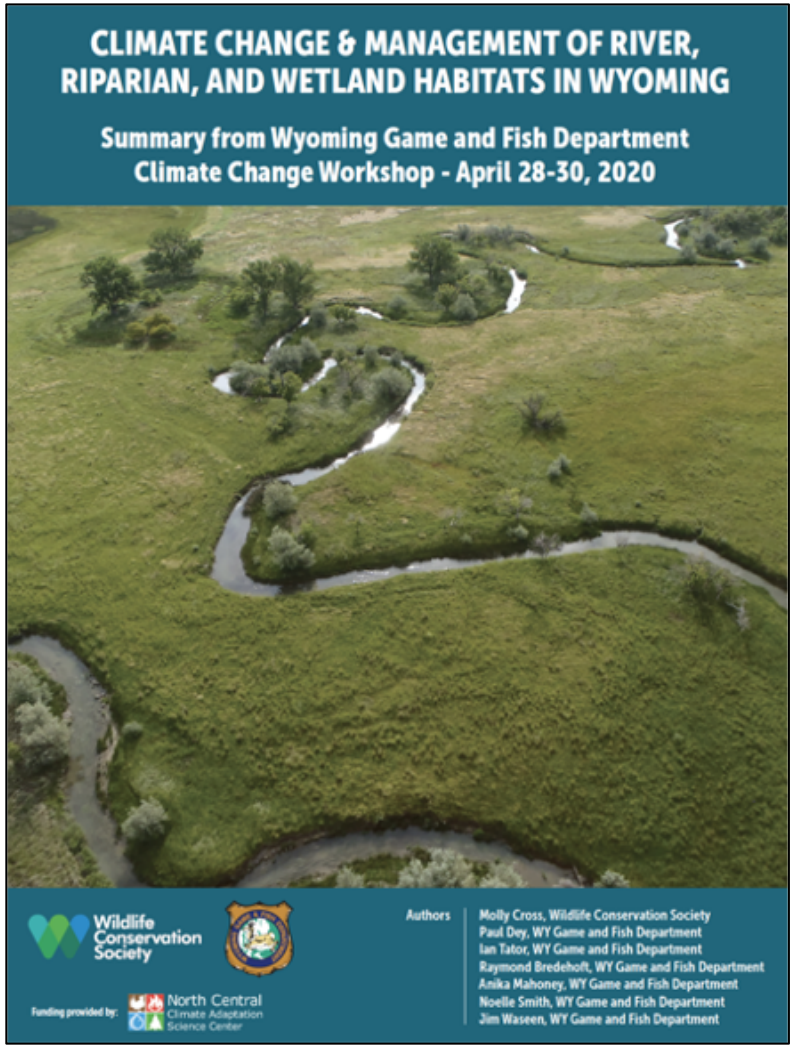
Management-Relevant (Salient) Information Needs



What does the Agency need to know in order to make better climate-informed decisions in the next 5 years?

Workshop participants identified 44 information needs related to several themes:

- Riparian and wetland ecosystems;
- Aquatic habitat and fisheries;
- Beaver and other process-based restoration approaches;
- Assessments of climate change vulnerability & refugia, and climate-informed prioritization/planning;
- Invasive species;
- Fish passage and stream connectivity;
- Hydrology and water balance;
- Stream restoration;
- Water management;
- Baseline data and monitoring

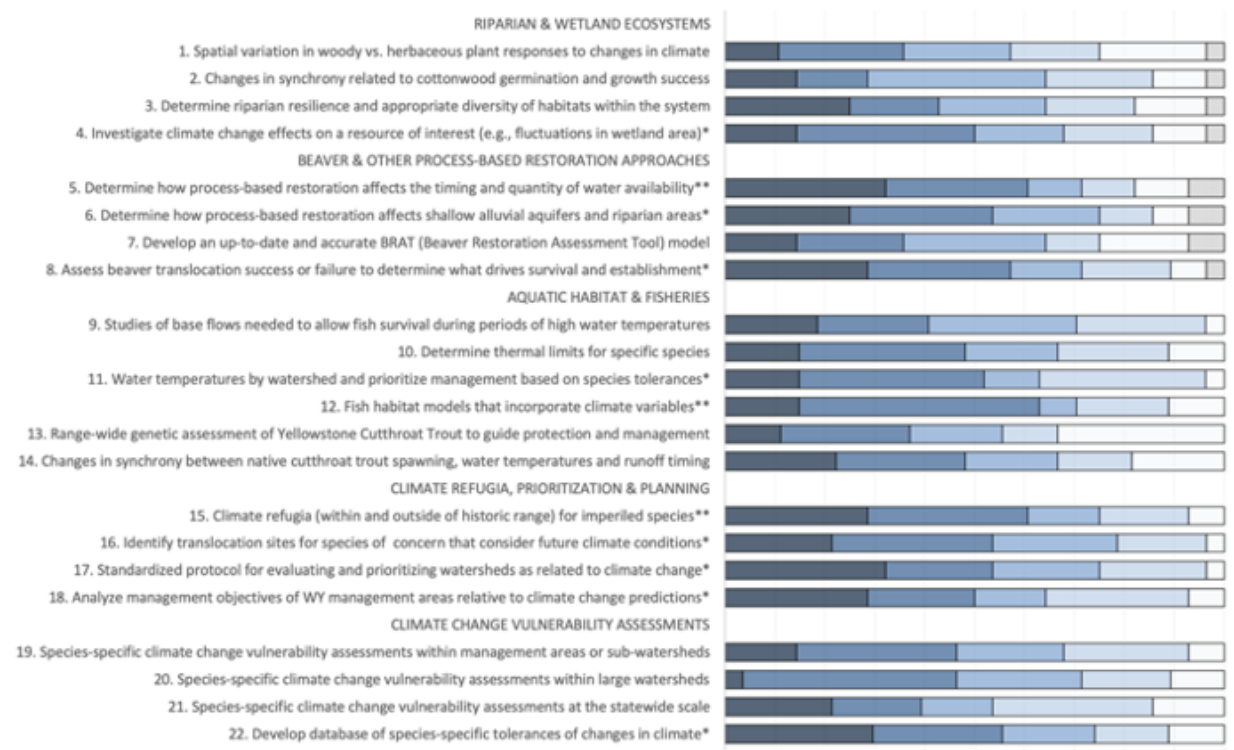
Management-Relevant (Salient) Information Needs

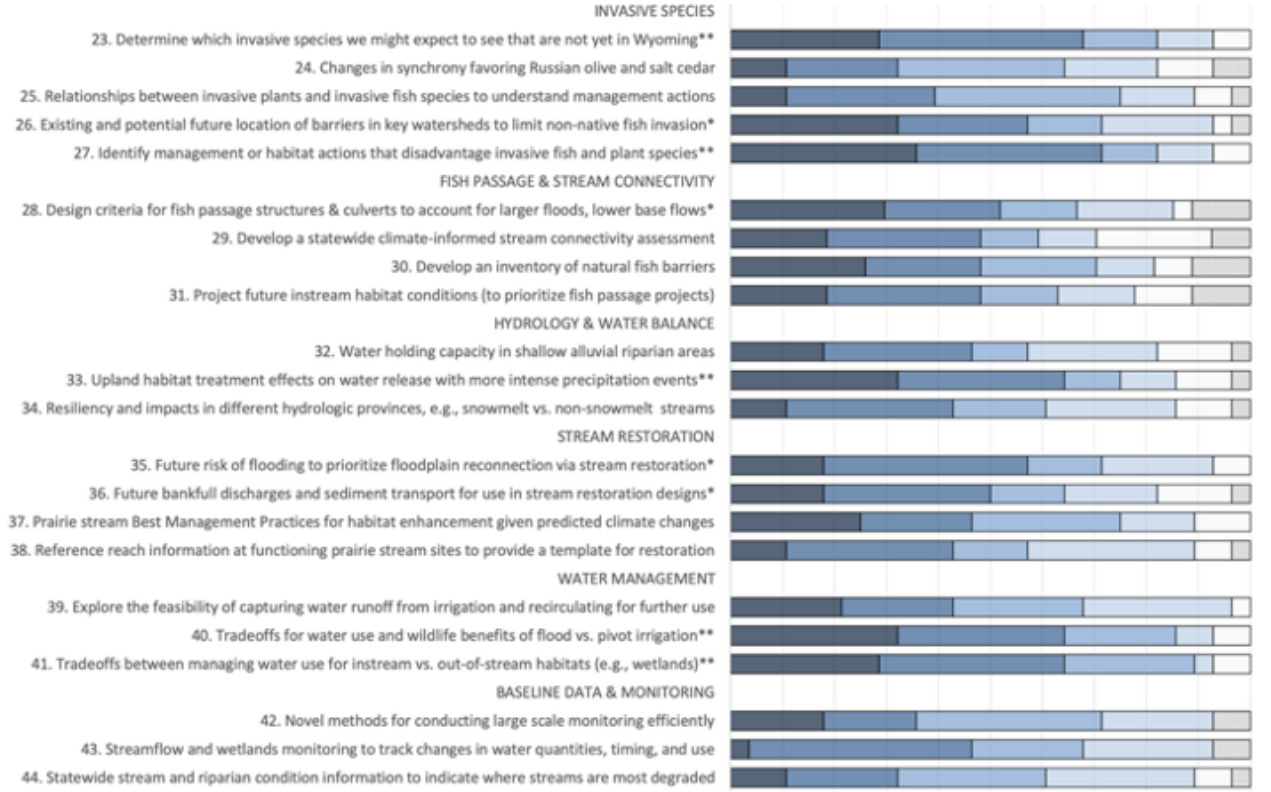
Online Survey on Information Needs

3. Please indicate how useful each of the following information needs **related to Riparian & Wetland Ecosystems** are to your ability to consider the effects of climate change in your work on river, riparian, or wetland habitats.

	Not Sure	Not At All Useful	Slightly Useful	Moderately Useful	Useful	Very Useful
Determine whether there is spatial variation across Wyoming in woody vs. herbaceous plant responses to changes in climate.	○	○	○	○	○	○
Determine whether there are likely to be significant changes in synchrony related to cottonwood germination and growth success.	○	○	○	○	○	○
Conduct habitat assessments to determine riparian resilience and appropriate diversity of habitats within the system (could include incorporating climate vulnerability into existing habitat assessment protocols).	○	○	○	○	○	○

HOW USEFUL ARE EACH OF THE FOLLOWING INFORMATION NEEDS TO YOUR ABILITY TO CONSIDER THE EFFECTS OF CLIMATE CHANGE IN YOUR WORK ON RIVER, RIPARIAN, OR WETLAND HABITATS





Management-Relevant (Salient) Information Needs

"Salient" Information Needs **(≥60% "Useful" or "Very Useful" Responses)**

Beaver and other process-based restoration approaches:

- Determine how process-based restoration approaches (e.g., beaver dam analogs, beaver, Zeedyk structures, etc.) affect the timing and quantity of water delivered to downstream water rights holders.

Aquatic habitat and fisheries:

- Develop fish habitat models that incorporate climate variables into stream suitability/vulnerability analyses for species and assemblages; Identify streams that could become suitable under future climate scenarios.

Climate refugia, prioritization, and planning:

- Identify climate refugia (within and outside of historic range) for imperiled species that may serve as key source populations and allow habitat limitations to be addressed.

Invasive species:

- Determine which invasive species we might expect to see that are not yet in Wyoming.
- Identify management or habitat actions that disadvantage invasive fish and plant species.

Hydrology and water balance:

- Understand how upland habitat treatments (juniper removal, sagebrush mowing, etc.) link to water release into the watershed and system impacts with more intense precipitation events.

Water management:

- Develop a better understanding and examples of tradeoffs for water use and wildlife benefits for flood versus pivot irrigation.
- Analyze tradeoffs between managing water use for instream vs. out-of-stream habitats (e.g., wetlands) (i.e., determine habitat and ecosystem function gains and losses per cfs).

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Post-Project Interviews

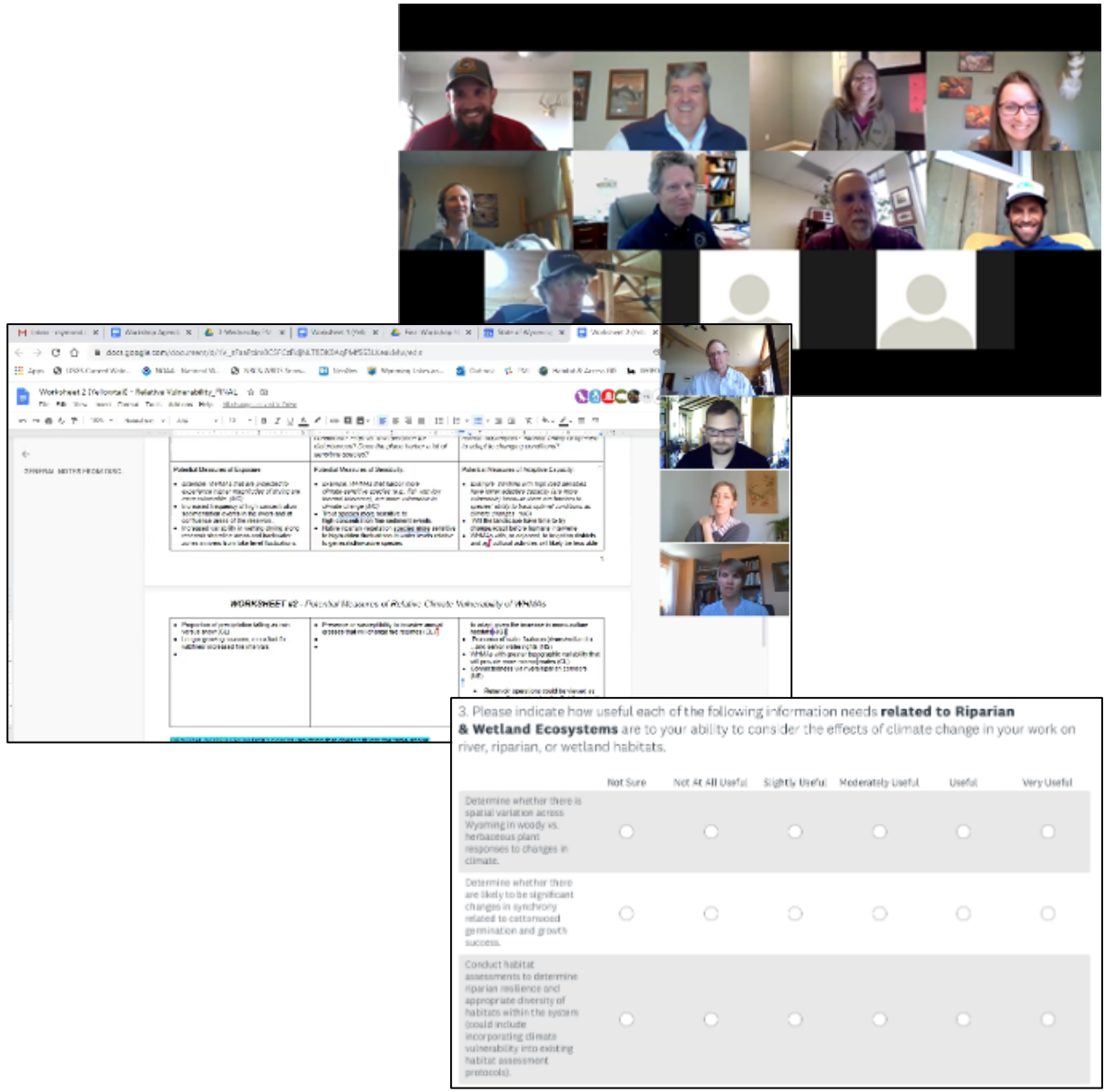
Interviewees = 6 WGFD managers on the Core Project Team

Interviewers = 2 WCS researchers not involved in project activities

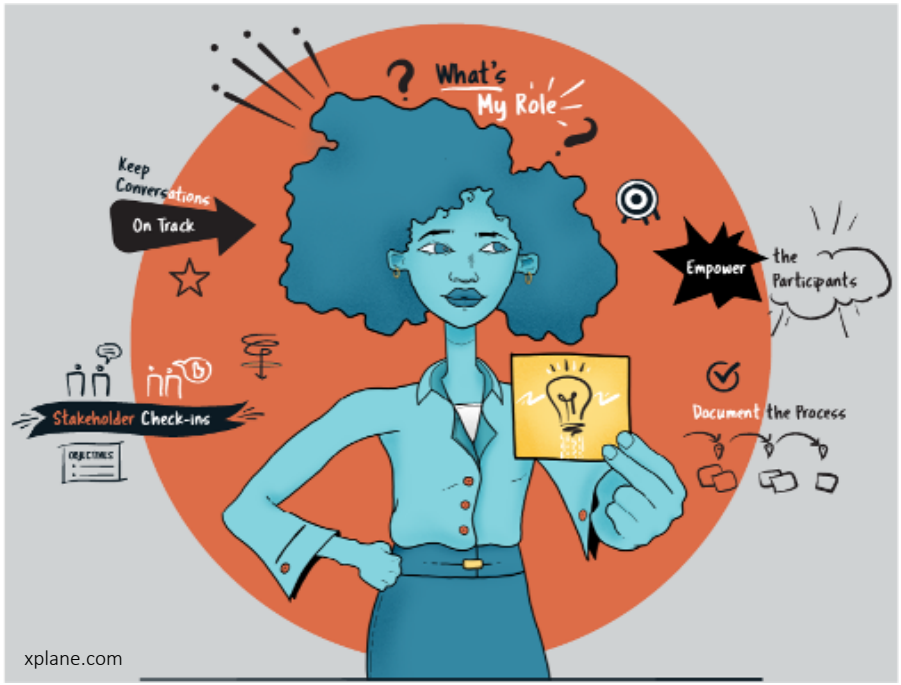
- Perceptions about the project's methods (including replicability)
- Role of the "boundary actor" (Molly)

Post-Project Interview Results – Process & Methods

- The process provided lots of opportunities for WGFD input and adjusting to meet desired outcomes.
- Workshop format was effective – participation was strong and shared Google docs encouraged inclusivity and generated a lot of information.
- Climate data specific to the region made the impacts more tangible & promoted better engagement.
- The approach that we used to arrive at higher priority information needs (workshop; survey) was effective.
- Overall, the process and activities were seen as replicable by others…especially with the support of a "boundary actor".



Post-Project Interview Results – Boundary Actor Role



Boundary actor was seen as pivotal to the process

- **Time commitment:** Able to engage in the process over time.
- **Ideas on methods:** Laid out specific steps for engaging staff at the workshop and soliciting further input in follow-up surveys.
- **Help drive the process:** Asked the right questions to push the group along; but everyone contributed to the design.
- **Substantive contributions:** Assisted the core WGFD team in processing information provided by staff and outside experts.
- **Relevant knowledge & expertise:** Knowledge about climate adaptation, and connections to other experts, that were local and relevant.

Boundary actor = helpful, but not sufficient → Outcomes from this project were dependent on WGFD engagement

Take-Home Messages

- State wildlife agencies like WGFD manage wildlife and habitat based on science…incorporating information about climate change can be challenging and hard to know where to begin – but there are practical ways to get started:
  - Workshop was a feasible way to get input from a lot of people
  - The Zoom meeting format spread over several days provided a convenient and effective venue for participation AND information consolidation
  - If possible, seek support from “boundary actors” & regional experts – but agency engagement is also necessary

- A plan is only useful when it is actually USED – need to “keep the foot on the gas”

Thank you! Questions?

Link to 2020 Wyoming Statewide Habitat Plan: https://wgfd.wyo.gov/getmedia/8ba62756-6d1c-4257-8644-82383dfa605a/SHP2020_Final

Link to 2020 WGFD Climate Change workshop report: https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/2020-WGFD-WCS-Workshop-Report.pdf

Acknowledgements:

- WGFD core team: Anika Mahoney, Jim Wasseen, Noelle Smith, Ian Tator and Raymond Bredehoft
- WGFD staff and external climate experts that attended the climate change planning workshop in April 2020 (see report above for participant list)
- Lauren Oakes & Heidi Kretser (WCS); Imtiaz Rangwala (CU Boulder, NC-CASC); Aparna Bamzai-Dodson, Alisa Wade & Robin O'Malley (NC-CASC); Shelley Crausbay & Rob George (CSP)
- This project was supported by USGS Cooperative Agreement No. G19AC00001