

Practical Guidance for Using Climate Projections in Adaptation Planning

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NORTH CENTRAL
Climate Adaptation
Science Center

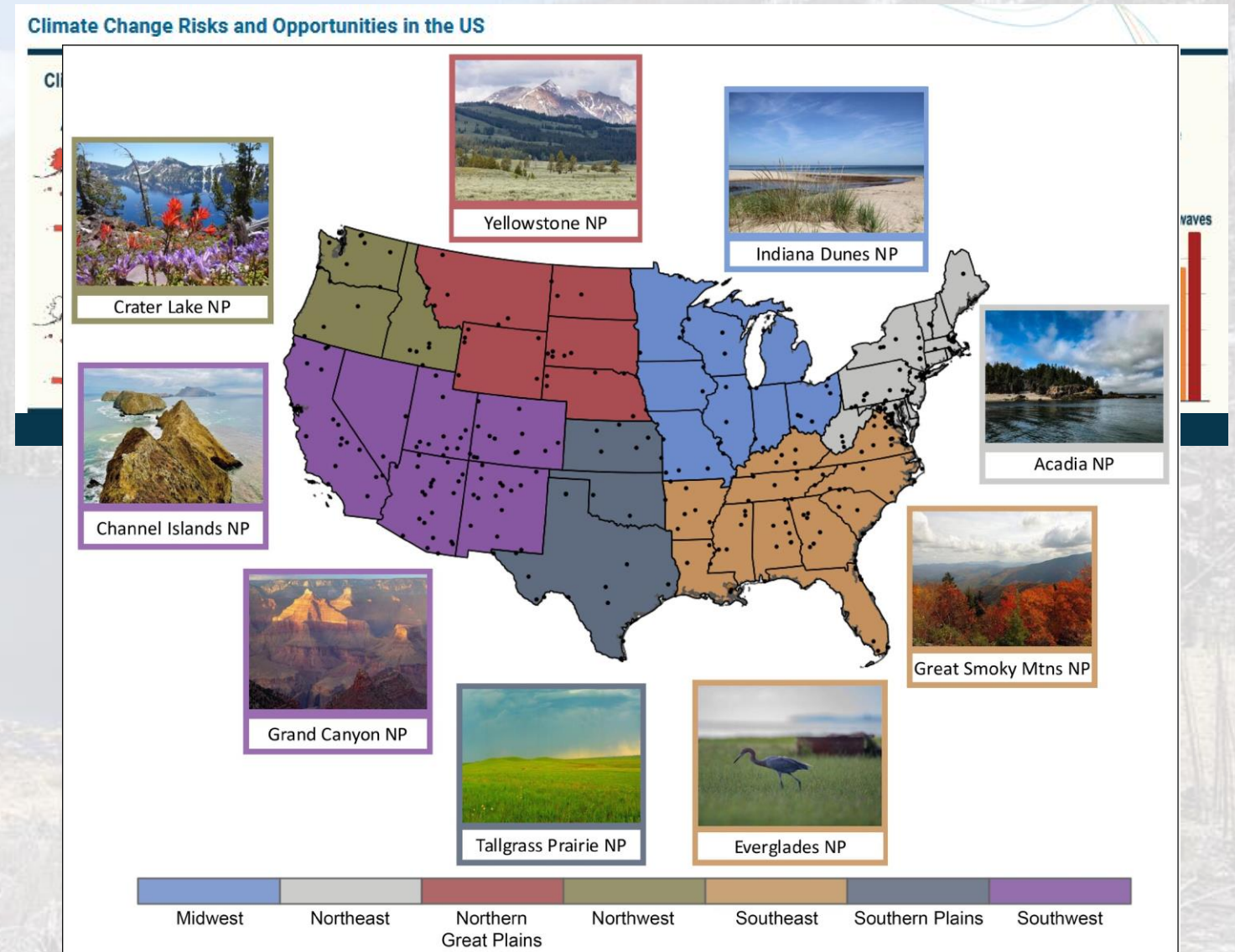


Using climate model projection data in adaptation planning

We start with the recognition that a **warming climate** has impacts on our **ecological, hydrologic, and human systems**

But a **persistent challenge** in **assessing local climate risk** to support adaptation is how to determine:

- (1) **What data exist?**
- (2) **Which data should I use?**
- (3) **How will my choices of data impact my assessment?**



The challenge of the decision space

Decision points about data needs

What part of the climate system do I need to evaluate?
Variables

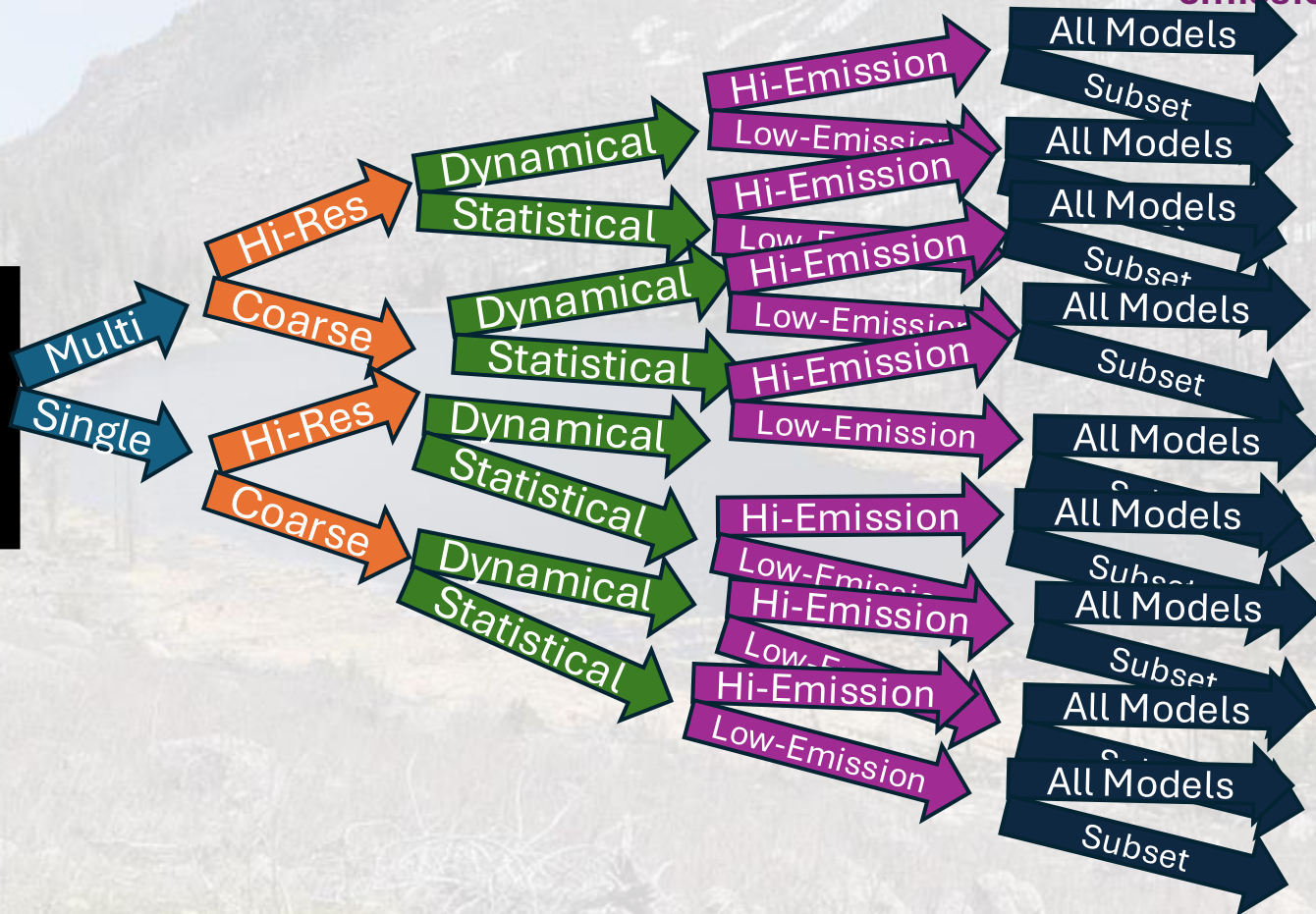
What resolution of data do I need?
High resolution vs coarse resolution

What kind of downscaling is needed?
Dynamical vs. Statistical

How many emission scenarios do I use?
High vs. low future emissions

How many model ensemble members?
Full ensemble vs. subset

Initiated the process for using climate data in planning



So many possible versions of an analysis, it becomes overwhelming!

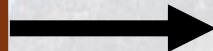
Response to decision space and impact on adaptation

Worst Case Scenarios

Common Scenarios

Decision

Too overwhelming,
let's not spend our
time on this

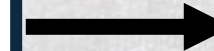


Result

No adaptation

Decision

Let's just use the
data we already
have

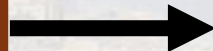


Result

Data fit for one
assessment might
skew the results for
another

Decision

Let's just pick
some options, it'll
be better than
nothing



Result

Adaptation based
on limited or
misleading
information
(maladaptation)

Decision

Misplaced
confidence in
commonly used
climate data
product



Result

Results of analysis
might have
unintended but
avoidable biases

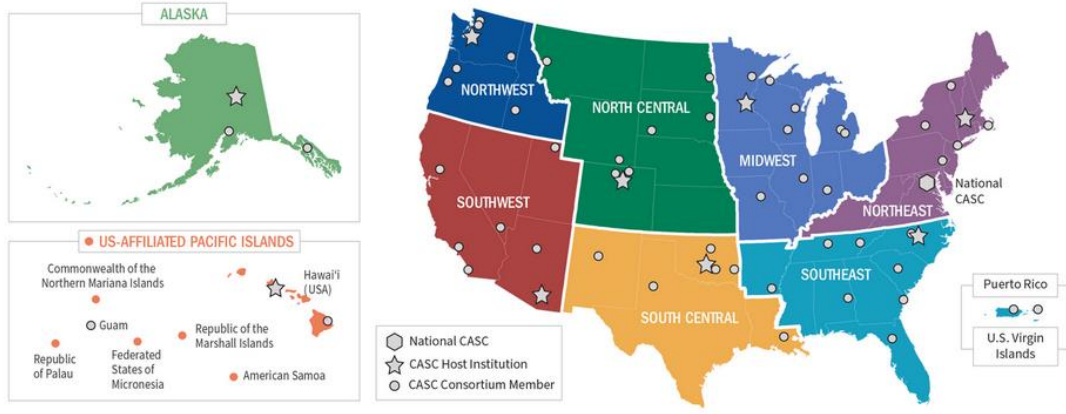
Climate services and decision making

Climate Adaptation Science Centers (USGS)



Climate Adaptation Science Center (CASC) Regions

The CASCs collaborate across boundaries to address shared ecosystems, watersheds, and landscapes



Climate Adaptation Partnerships/ Regional Integrated Science Assessment (NOAA)

Currently Funded CAP/RISA Teams and Expansion Activities



Climate Hubs (USDA)



10 years of USDA Climate Hubs

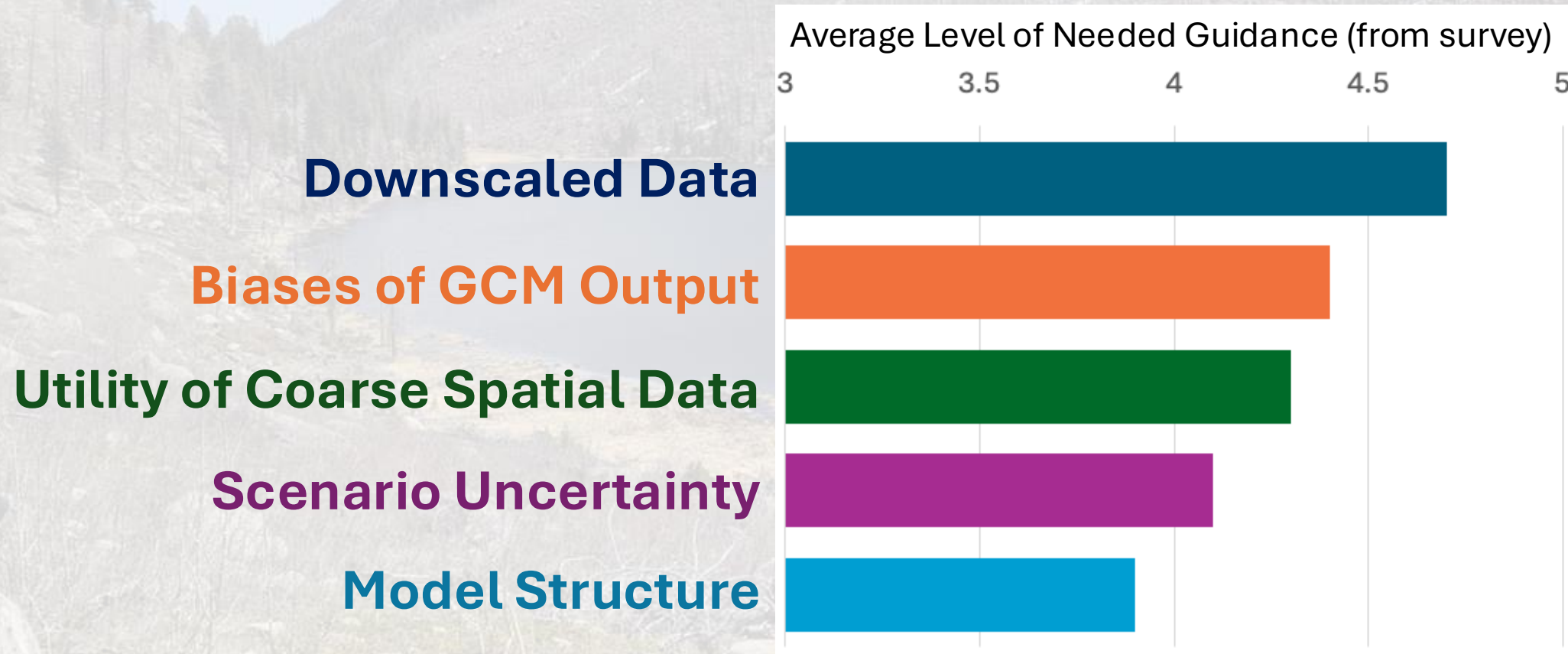
Empowering land managers to build a climate-resilient future

USDA Press Release

[Leer en español](#)

Developing Practical Guidelines – Our Approach

Started this process by engaging with climate, hydrology, and ecology experts within the **Climate Adaptation Science Centers** team to determine: **What are the most pressing challenges when approaching climate projection data for use in adaptation planning?**



Building Practical Guidelines

When developing a structure for **practical** guidelines, we need to consider both the scientific questions of uncertainty **AND** the very real challenges of limited resources

Decisions for uncertainty

- Model bias
- Downscaling methodological effects
- Scale issues



Practical Considerations

- May not have capacity to use all models or data products
- May not have the expertise or time to diagnose model uncertainty
- TIME!

Gathering other federal agency perspectives – National Park Service



Using climate futures for
adaptation planning
National Park Service

Precipitation at Big Bend NP using two summarization approaches

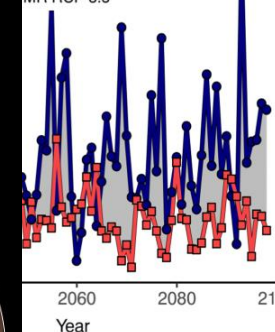
RCP ensemble

Divergent projections

RCP 4.5

INM-CM4 RCP 4.5

MR RCP 8.5



Key lessons (and challenges)

Location matters! Park-specific
information is needed for adaptation

Emphasizing uncertainty is critical
for adaptation (not reducing it)

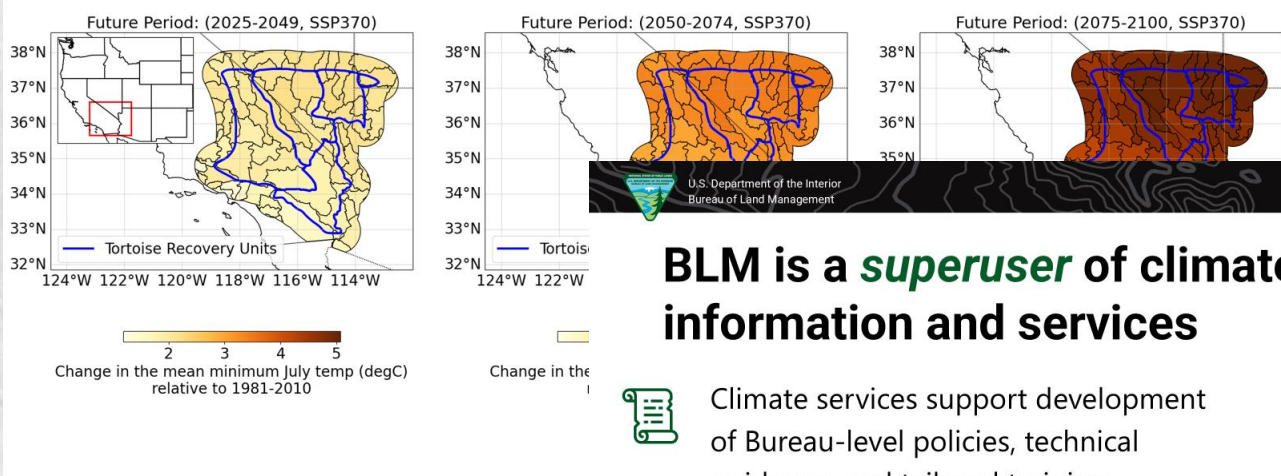
Useful climate metrics represent
resource sensitivities

Best projections

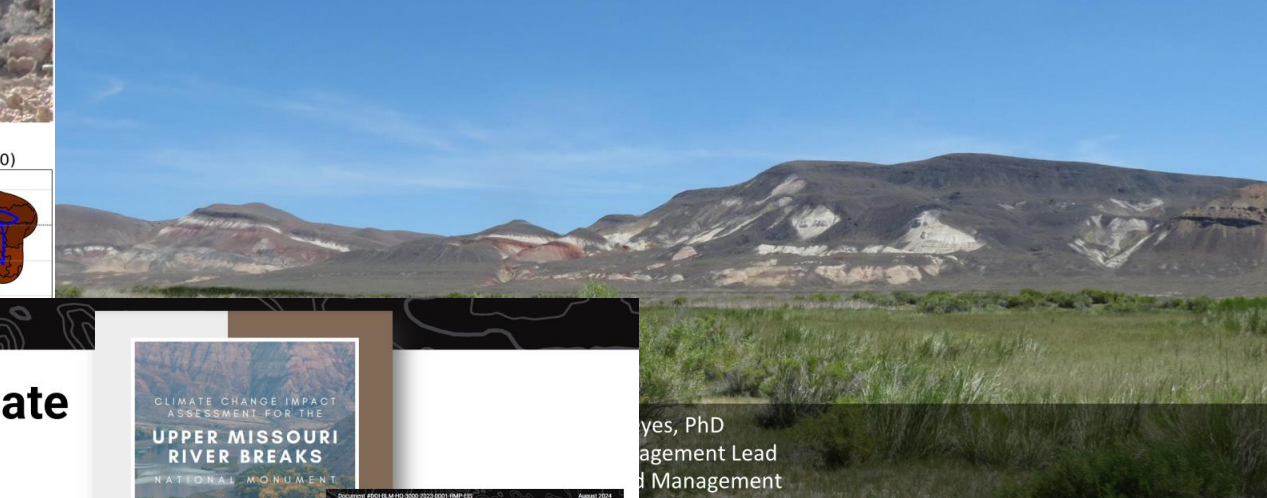
Uncertainty space characterized
by projection uncertainty, extremes (and consequences)
are present

[Lawrence et al. \(2021\)](#)




Gathering other federal agency perspectives – Bureau of Land Management

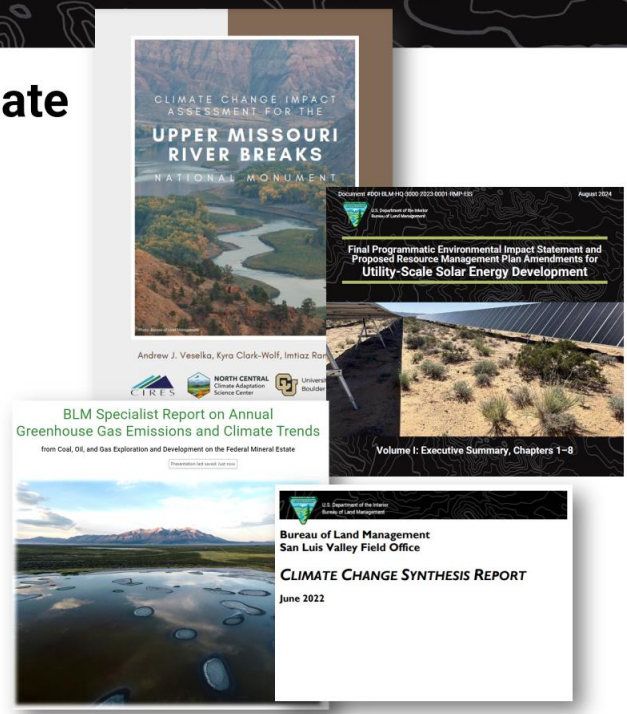


Climate tools and information for planning and decision-making at BLM



BLM is a *superuser* of climate information and services

-  Climate services support development of Bureau-level policies, technical guidance, and tailored training.
-  BLM relies on climate impacts and adaptation information from science agencies.
-  Therefore, BLM must leverage existing partnerships and relationships with *producers* of climate services to maximize benefit to BLM.



CLIMATE CHANGE IMPACT ASSESSMENT FOR THE UPPER MISSOURI RIVER BREAKS NATIONAL MONUMENT

Final Programmatic Environmental Impact Statement and Proposed Resource Management Plan Amendments for Utility-Scale Solar Energy Development

BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends from Coal, Oil, and Gas Exploration and Development on the Federal Mineral Estate

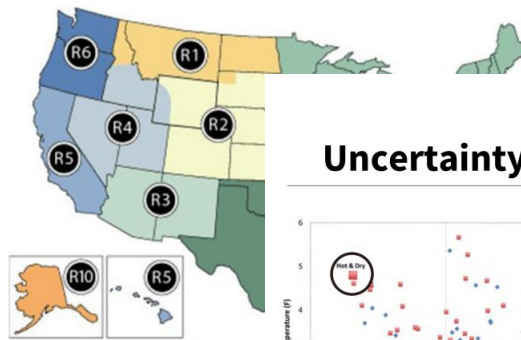
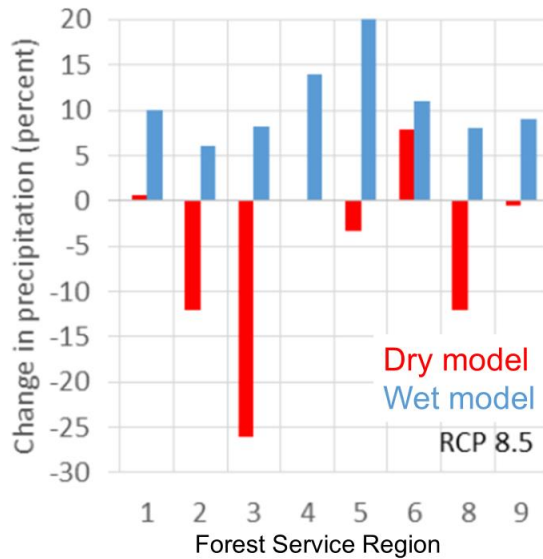
CLIMATE CHANGE SYNTHESIS REPORT June 2022

...yes, PhD
...agement Lead
...d Management

Gathering other federal agency perspectives – US Forest Service

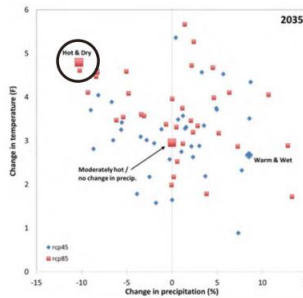
Using Climate Model Projections for Assessing Future Resource Conditions and Adaptation Planning

Regional analysis may require different models



Joyce and Coulson 2020 F

Uncertainty in resource projections can multiply plausible futures



Crausbay et al. 2022 *BioScience*

Ecological scenarios for a hot and dry climate future

Ecological difference

Time



Jen Costanza
t, USDA Forest Service
tern Research Station
December 13, 2024

a Joyce, Claire O'Dea
USDA Forest Service

Determining how best to make a product that is usable

A useful guide would consider **both the practical and scientific aspects** of climate data selection and be **ACCESSIBLE**

So... We developed a web-based guidance document!

Practical Considerations for Climate Data Selection

Developed by climate adaptation experts in partnership with the United States Geological Survey (USGS), Climate Adaptation Science Centers (CASC) Climate Scenario Working Group, the North Central CASC, University of Colorado Boulder, and the Cooperative Institute for Research in Environmental Sciences (CIRES).



The Need for Practical Guidance in Climate Planning

The rapid expansion of climate data availability has created what Barsugli et al. (2013) describe as the "Practitioner's Dilemma." This dilemma arises from the tension between the a decision maker's need for locally specific projection data to inform long-term management decisions and the scientific limitations and uncertainty of projection data at fine spatial scales. Planners often prefer data products that are downscaled and bias corrected to resembles the spatial heterogeneity and historical climatology of the landscape they

Wrap up and Conclusions

- **The decision space** for how to effectively conduct a climate risk assessment **is complex**, but we can use the experience of climate services to guide the use of climate data in adaptation
- We can **leverage expertise from ecologists, hydrologists, and climatologists** to provide guidance for **commonly experienced challenges** in climate data analysis
- We have developed a **web-based guide** that will be widely accessible for **planners and scientists** to understand data challenges and availability



Questions?

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