THESIS

STATE CLIMATE ADAPTATION POLICY AND FOREST MANAGEMENT

CASE STUDIES IN THE AMERICAN WEST: COLORADO AND WASHINGTON STATE

Submitted by

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ABSTRACT

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Climate change and past management practices are impacting and creating hazards for forests and forest-adjacent landscapes and communities. State governments are considered leaders in climate policy and increasingly are facilitating a state-led response to observed and predicted future impacts from climate-related hazards. Hazards and risks to forests and forest-adjacent communities include wildfire, insects and disease, drought, and a loss of economic and social goods and amenities. Adaptation facilitates a response to risks and provides opportunities to adjust to and become resilient to current and future hazards.

Utilizing a qualitative approach and a policy design framework, my research had two primary objectives: characterize state-level natural resource adaptation goals and objectives for forests and how these efforts are implemented by state agencies and with other actors (e.g., collaborative groups and non-governmental organizations (NGO's), other government entities, industrial and private forestry, etc.); and analyze the policy design utilized to address climate hazards through climate adaptation for forested landscapes. I interviewed 43 individuals, including state-level policy decisionmakers, federal and state land managers, local governments and utilities, industrial and private forestry entities, collaborative groups and NGO's, academics and practitioners from universities, other forestry-related professionals, and key partners.

This thesis explores state climate adaptation policies for forested and forest-adjacent landscapes in Colorado and Washington State through four chapters. Chapter 1 consists of a brief introduction to this study, including a literature review on relevant climate-induced impacts to forests and forest-adjacent lands, state-level climate adaptation planning, and policy design theory, along with other intersecting and sensitizing concepts important to facilitating a thorough and holistic approach towards climate adaptation. Chapter 2 is a practitioner report intended for federal and state policy decisionmakers, land managers and practitioners, and land management partners. In this chapter, I discuss key research findings and offer recommendations based on research outcomes. Chapter 3 highlights research findings in a product intended for a peer-reviewed journal utilizing the policy design framework. This chapter focuses only on findings from Washington State. Chapter 4 highlights the overall findings from this study, discusses study limitations, and offers recommendations for future research exploration.

My thesis contributes to the novel and growing area of literature working to understand climate adaptation and the role that state governments have in facilitating a future's thinking approach and response to climate hazards, particularly for forested and forest-adjacent landscapes and communities. The insights from my work help to inform policy decision-makers and land management practitioners on how states are facilitating climate adaptation through state policy, how states are working to implement climate adaptation actions, the perceptions of state climate adaptation policy, and the potential areas of growth and opportunity for climate adaptation efforts on forested lands. There are still gaps in knowledge that exist for state-related climate and adaptation policies, including how states are incorporating pillars such as equity and environmental justice, how recent federal law, legislation, and funding have increased or facilitated climate adaptation implementation through state partnerships, and future research can

further explore how states are working across boundaries to address climate hazards through adaptation.

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Thank you all – we did it.

DEDICATION

Lennon

I dedicate this thesis to the best companion one could ever ask for – Lennon.

We miss you every day.

I miss our road trip adventures and excursions in the mountains.

I miss taking walks in the park and playing in the river.

I miss your funny personality and goofy smile.

You taught us how to live life to the fullest and to always opt for French fries when appropriate.

There will never be another husky quite like you.

In Memory of Lennon - The Best Husky There Ever Was.

April 2023

My Fellow Appalachians

And to all first-generation college graduates – particularly those from Appalachia –

"The scholars from the holler and the red clay hills"

– Congratulations on your academic feats!

You are seen, heard, valued, appreciated, and have community here.

We belong.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ACRONYMS

BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CO	Colorado
CDFPC	Colorado Division of Fire Prevention and Control
CPW	Colorado Parks and Wildlife
C.R.S.	Colorado Revised Statutes
CSFS	Colorado State Forest Service
CSLB	Colorado State Land Board
DoD	United States Department of Defense
DOI	United States Department of Interior
DOLA-CRO	Department of Local Affairs Colorado Resiliency Office
EO	Executive Order
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
EQIP	Environmental Quality Incentives Program
Exec. Order No.	Executive Order Number
Fed. Reg.	Federal Register
H.R.	House of Representatives
IPCC	Intergovernmental Panel on Climate Change
IRA	Inflation Reduction Act
NPS	National Park Service
NEPA	National Environmental Policy Act

NIACS	Northern Institute of Applied Climate Science
NGO	Non-Governmental Organization
NWFP	Northwest Forest Plan
RCW	The Revised Code of Washington
SFAP	State Forest Action Plan
SWAP	State Wildlife Action Plan
TFPA	The Tribal Forest Protection Act
US	United States
U.S.C.	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
WA	Washington
WAC	Washington Administrative Code
WSDNR	Washington State Department of Natural Resources
WUI	Wildland Urban Interface

DEFINITION OF TERMS

Adaptation	"Adaptation refers to actions taken to reduce risks from today's changed climate conditions and to prepare for further impacts in the future. It includes diverse activities designed to reduce climate-related risks and increase capacity to prepare for climate impacts. Actions taken to adapt to climate change often provide major opportunities to create a healthier and more resilient future for generations to come. Through these actions, billions of dollars can be saved by investing now and avoiding future losses, new jobs can be created, innovative solutions can be realized, and productivity and efficiencies can be increased across all sectors. Done well, adaptation can protect human lives, improve quality of life, enhance social equity, reduce healthcare costs, and safeguard and restore the natural ecosystems on which society depends for its very survival" (Wasley et al., 2023, Chapter 31, p. 5).
Assisted Migration	Assisted migration is considered the facilitated process and movement of ecological species to replicate population and range expansion. Leech et al. (2011) argue this process as a climate change adaptation strategy.
Maladaptation	Maladaptation occurs when actions to address a climate hazard or vulnerability unintentionally increases vulnerabilities (Wasley et al., 2023).
Prescribed Fire	Prescribed fire can be defined between the range of purposeful ignitions from individuals to open containment plans to complex and organized operations (Hiers et al., 2020).
Resilience	"Resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change." IPCC AR4 Climate Change 2007: Synthesis Report (IPCC, 2007, p. 880).

CHAPTER 1 – INTRODUCTION

This study is reflective of an investigation into state-level climate adaptation policies for forested landscapes. Forests are important due to their diverse ecological and social values, and for the benefits they can provide in reducing climate impacts and hazards when they are healthy. Though the importance of forests in ecological and social frameworks is understood, there are gaps that exist in the literature regarding forest-based adaptation, state climate adaptation policies and planning, and the intersections of these subjects.

Climate adaptation is defined by the Intergovernmental Panel on Climate Change (IPCC) as “the process of adjustment to actual or expected climate and its effects.” The Panel explains, “In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects" (IPCC, 2014, p. 5). Climate adaptation, particularly under state leadership, has emerged as an important aspect of addressing a changing climate and its impacts on nature and society. While, historically, mitigation has been the focus of initiatives to address climate change, adaptation allows communities to adjust to and prepare for potential disturbances and harm.

Federal level guidance on climate adaptation and resilience has been variable over the past two decades, making state-guided adaptation critically important. During the Obama Administration, the federal government released several governing policies addressing climate adaptation such as the United States (US) Environmental Protection Agency Climate Change

Adaptation Plan[1] (United States Environmental Protection Agency [EPA], 2014), and the US Department of Defense 2014 Climate Change Adaptation Roadmap[2] (United States Department of Defense [DoD], 2014). During the last presidential administration, there was relatively little guidance at the federal level to promote climate adaptation and resilience. The current administration, under the leadership of President Biden, has led federal operations to revive and substantially expand actions to address climate challenges and facilitate climate-affiliated activities through Executive Orders (EO) such as EO 13990 (Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis)[3], EO 14008 (Tackling the Climate Crisis at Home and Abroad)[4], EO 14027 (Establishment of the Climate Change Support Office)[5], EO 14030 (Climate-Related Financial Risk)[6], EO 14037 (Strengthening American Leadership in Clean Cars and Trucks)[7], EO 14052 (Implementation of the Infrastructure Investment and Jobs Act)[8], EO 14072 (Strengthening the Nation's Forests, Communities, and Local Economies)[9], EO 14082 (Implementation of the Energy and Infrastructure Provisions of the Inflation Reduction Act of 2022)[10], and EO 14096 (Revitalizing Our Nation's Commitment to Environmental Justice for All)[11]. Additionally, Executive Order 14057 (Catalyzing Clean

[1] For more information on the 2014 EPA Climate Adaptation Plan, see: EPA. (2014). US Environmental Protection Agency Climate Change Adaptation Plan (Publication Number: EPA 100-K-14-001). US Environmental Protection Agency. https://www.epa.gov/sites/default/files/2015-08/documents/adaptationplans2014_508.pdf
[2] For more information on the 2014 DOD Climate Adaptation Roadmap, see: US Department of Defense Office of the Assistant Secretary of Defense (Energy, Installations & Environment) & Environment, Safety & Occupational Health Directorate. (2014). US Department of Defense 2014 Climate Change Adaptation Roadmap. US Department of Defense. https://www.acq.osd.mil/eie/downloads/CCARprint_wForward_e.pdf
[3] Exec. Order No. 13990, 86 Fed. Reg. 7037 (Jan. 20, 2021)
[4] Exec. Order No. 14008, 86 Fed. Reg. 7619 (Jan. 27, 2021)
[5] Exec. Order No. 14027, 86 Fed. Reg. 25947 (May 7, 2021)
[6] Exec. Order No. 14030, 86 Fed. Reg. 27967 (May 20, 2021)
[7] Exec. Order No. 14037, 86 Fed. Reg. 43583 (Aug. 5, 2021)
[8] Exec. Order No. 14052, 86 Fed. Reg. 64335 (Nov. 15, 2021)
[9] Exec. Order No. 14072, 87 Fed. Reg. 24851 (Apr. 22, 2022)
[10] Exec. Order No. 14082, 87 Fed. Reg. 56861 (Sep. 12, 2022)
[11] Exec. Order No. 14096, 88 Fed. Reg. 25251 (April 21, 2023)

Energy Industries and Jobs Through Federal Sustainability)[12] initiated the Federal Sustainability Plan through the Office of the Federal Chief Sustainability Officer in The White House Council on Environmental Quality (CEQ). The Federal Sustainability Plan has facilitated the development of federal agency climate adaptation and resilience plans which "evaluate the most significant risks and vulnerabilities for agency operations and missions, and identify actions to manage those risks and vulnerabilities" (Office of the Federal Chief Sustainability Officer, n.d.). More recently, the Biden Administration hosted the first-ever White House Climate Resilience Summit and announced the release of a National Climate Resilience Framework[13]. However, at the inception of this study in 2020, the vacuum of federal leadership in this critically important space left ample room for innovation and initiation of adaptation and resilience policies, planning, and implementation of efforts from states and local communities.

1. Literature Overview

This section begins with an overview of the literature relevant to climate-induced hazards and impacts on forests and forest-adjacent lands. I will then provide background on state-level climate adaptation policy and planning and move into the policy design literature. I will conclude by briefly discussing sensitizing concepts and other considerations relevant to this project.

1.1 Hazards and Impacts of Climate Change to Forests and Adjacent Lands

Climate hazards affect all sectors of society and are particularly impactful to forests and adjacent communities. In the American West, changes in natural resource conditions have begun to affect society in dramatic ways. For example, in Colorado, four out of five of the largest known wildfires have occurred between 2018 to 2020. Additionally, the five most destructive

[12] Exec. Order No. 14057, 86 Fed. Reg. 70935 (Dec. 8, 2021)
[13] The White House. (2023). National Climate Resilience Framework. The White House. https://www.whitehouse.gov/wp-content/uploads/2023/09/National-Climate-Resilience-Framework-FINAL.pdf

fires to homes have been within the past 12 years (Colorado Division of Fire Prevention and Control [CDFPC], 2024). For communities, climate change has and will continue to have adverse impacts on forested ecosystems in the US and on the benefits that communities derive from them (Vose et al., 2012).

A primary challenge in the West is the current and predicted changes in hydrological systems. The cycles of hydrological precipitation, snowpack, and decreased water availability initiated by climate-induced drought are and will continue to be a challenge (Gonzalez et al., 2018; Romero-Lankao et al., 2014). In general, ecosystems are projected to become increasingly stressed from warming, drought, and growing demands for water, and these effects are exacerbated by disturbances (Gonzalez et al., 2018; Romero-Lankao et al., 2014; Seidl et al., 2016). For instance, studies have shown that tree mortality associated with beetle infestations have led to increases in total runoff, earlier peak runoff, and changes in snow accumulation, snowmelt, and uptake by trees (Lukas et al., 2014). Pine beetle disturbances are only one example of disturbances poised to impact forests and watersheds that can affect the hydrologic cycle.

The current trends in the frequency, extent, and the severity of disturbances, effects of climate change, and anthropogenic stressors are putting increasing stress on forest ecosystems. These significant disturbances have increased in severity and frequency (Millar & Stephenson, 2015; Westerling et al., 2016). These “megadisturbances” include hotter droughts, outbreaks of insects, pathogens, disease, and fire, and make trees more susceptible to other disturbances (Millar & Stephenson, 2015).

Wildfire is one of the most significant disturbances that affects forests. Though wildfire is a natural process critical in establishing and maintaining ecosystem functioning, it can pose a

substantial threat to humans and to ecosystems. There has been an increase in large wildfire disturbance, frequency, and duration in the US along with lengthening fire seasons due to climate change (Jolly et al., 2015). Forests also are experiencing significantly less tree regeneration and tree seedling establishment after wildfire events (Stevens-Rumann et al., 2018). In the southwestern US, increased severity and length of droughts have caused large forest diebacks at regional scales (Romero-Lankao et al., 2014). As compounding disturbances become more common, forests are becoming less resilient to change and less effective in their ability to provide valuable ecosystem services, such as water provisioning or carbon storage (Millar & Stephenson, 2015; Romero-Lankao et al., 2014; vonHedemann et al., 2020). Disturbances in forests will also lead to decreases in other amenities, including economic and recreation opportunities and biodiversity protection; importantly, over 400 species listed under the Endangered Species Act (ESA) are found in national forests (Schultz et al., 2013). Southwestern ecosystems have shown geographic shifts in plant and animal communities, including habitat shifting and changes in plant and animal phenology that may affect species persistence (Friggens et al., 2013; Gonzalez et al., 2018).

Disturbances from climate change not only impact plant and animal communities but can also impact the ability for forests to provide ecosystem services to human populations in adjacent communities (Gonzalez et al., 2018; Millar & Stephenson, 2015). Population growth in the wild-land urban interface (WUI) has increased the risk of negative outcomes to communities (Mietkiewicz et al., 2020; Schoennagel et al., 2017). Increases in human mortality and illness from increased extreme heat, poor air quality, and catalyzing conditions for communicable pathogenic growth and chronic diseases make human populations vulnerable in the era of climate change (Gonzalez et al., 2018). Indigenous peoples’ and Tribal governments' traditional foods,

cultural and spiritual resources, and livelihoods also are affected by a changing climate (Gonzalez et al., 2018). Increasingly, research is identifying the disproportionate impacts of climate change on the most vulnerable in society, highlighting systemic economic and political inequities that are exacerbated by climate change. Impacts from climate therefore impact both the social and ecological benefits and livelihoods available to communities.

Addressing the threats to forests and forest-covered watersheds from climate change is a cross-jurisdictional challenge. For example, in Colorado alone there are over 24.5 million acres of forested acres which are managed by the United States Forest Service (USFS) (47% of forested acres), the United States Department of Interior's (DOI) Bureau of Land Management (BLM) (17%), the DOI National Park Service (NPS) (~2%), private landowners (30%), the Colorado State Land Board (CSLB) (~2%), and the Ute Mountain Utes and Southern Utes (~2%). This does not include ownership by other Tribal governments, other state agencies, and municipalities (Colorado State Forest Service [CSFS], n.d.). Colorado and western US forests' diverse ownership structures make multi-jurisdictional and multi-party management for climate adaptation increasingly relevant.

Adaptation actions and processes for forested landscapes are still in development, but beneficial actions have been identified. Practices that restore and protect watersheds, reduce erosion and hazardous fuels, and reintroduce beavers could improve water adaptability and quality (Halofsky et al., 2017). For timber, the promotion of resilient species, genetic diversity, and assisted migration have also been identified as beneficial (Halofsky et al., 2017). Hurteau et al. (2019) recommends mechanical thinning and prescribed and managed fire as a management tool for more resilient forests and carbon stores. The USFS has also been using vulnerability assessments to support adaptation planning on national forests (Timberlake & Schultz, 2019).

These assessments are tailored for different regions by groups of managers and scientists to assist in choosing the most appropriate approach to managing forests and land for climate change. The processes mentioned above can help relevant natural systems adapt to a changing climate.

Human and social systems also benefit from adaptation planning and actions. Lempert et al. (2018) identified several actions that would reduce risks from climate change. These actions include changes in business practices to changing land-use planning. Examples of adaptation actions which benefit communities include designation of green areas for heat relief, modifying building codes, and adjusting agricultural planting seasons and crop choice. Actions such as restoring wetlands not only benefit wildlife but provide flood protection and reduction of risk to neighboring communities (Lempert et al., 2018). Adaptation actions which provide benefits to both ecological and social communities provide co-benefits which can exceed the cost of implementation (Lempert et al., 2018).

1.2 State-Level Adaptation Planning

Research has found that state and local governments are incubators of innovation for adaptation planning (Ray & Grannis, 2015). State government entities may also act as catalysts and instigators of climate adaptation planning that then diffuses across state government and interacts with other levels of government (Koski & Keating, 2018). Continued state action is thus a critical component of adapting to climate change given state adaptation plans are typically heterogeneous, address relevant themes and issues within their state, and are state-specific in targeting their own government agencies (Ray & Grannis, 2015). Relatively few, if any, studies have investigated domestic state forest climate adaptation planning and implementation. Therefore, analyzing and understanding state-level climate adaptation policy and planning, as

they relate to forest management, can be critical in characterizing the implementation of adaptation for natural resources in a national response to climate change.

State-level implementation is not the only way to address climate adaptation, but it can create incubators for innovation and serves as a catalyst for change (Ray & Grannis, 2015). State-level adaptation policy design and implementation can spur climate adaptation planning at other scales, influencing both national and local (city or county) adaptation. The field of specific studies related to state adaptation planning is relatively new, and research on state-level adaptation development and policy is limited. There are a few exceptions, such as Ray and Grannis (2015) and Koski and Keating (2018).

Ray and Grannis (2015) assessed the progress that states were making on their climate adaptation plans. They analyzed states with established adaptation plans for plan development, plan content, and implementation progress (Ray & Grannis, 2015). They found that many factors can contribute to and affect state climate adaptation plans; these factors include the catalyst for the adaptation plans, number and type of goals, degree of political support, and time since development and implementation (Ray & Grannis, 2015). They also found evidence to suggest that adaptation plans can be stable over time, even as administrations change due to goal setting and activities within agencies (Ray & Grannis, 2015). Ray and Grannis (2015) suggest ongoing research at the state level to understand the development of adaptation plans and how states achieve implementation of climate adaptation plans through goals and objectives.

In states that had decided to act on climate adaptation, Koski and Keating (2018) investigated which actors states targeted with their plans and how governments intended to motivate target groups' behavior. They found overwhelmingly that states were typically the focus of their own targets (Koski & Keating, 2018). Using a policy design framework, they also

observed that states used authority tools to target state agencies, but capacity-building tools for private and local actors. This finding reveals that tool choice was determined by the target population, and that private actors were more likely than governmental actors to be rewarded for their change in behavior (Koski & Keating, 2018). They suggest there is a need to better understand the use of policy tools in adaptation planning, to investigate the links between state level and local level adaptation plans, and to understand the results of attempted coordination.

1.3 Policy Design

Relevant to state climate adaptation planning and implementation is the theory of policy design. Policy design is the identification of goals and appropriate tools for different targets; these tools are then applied in a process that is determined by context and level of governance (Howlett, 2019). Policy design is often an internally complex process conducted among government entities and policy targets (Howlett, 2009). Successful policy design includes two major components. These components include 1) *coherent* aims, objectives, and targets at all levels of policy, and 2) *consistent* preferences, tools, and calibrations; throughout and across all policy levels the aims, preferences, objectives, tools, targets, and calibrations must be cohesive and work together (Howlett, 2009). Ideally, these components work in unison to achieve a desired policy outcome determined by the authority body.

In policy design, policy tools and instruments can be used in a variety of ways which work together or separately to achieve the policy outcome. Policy tools are employed by governments at all levels to influence behavior and achieve desired policy goals and objectives (Schneider & Ingram, 1990). A mix of tools is commonly used in an iterative process that is calibrated for context across different levels of governance in a collaborative process (Howlett, 2019). Tools can be used to create incentives, build capacity, support education, or enforce

regulation. They also enable governments to encourage, enforce, and discourage the behavioral outcomes of specific policy targets by selecting tools that best address an issue (Howlett, 2009).

Policy tools are categorized into groups defined as authority, incentive, capacity, symbolic and hortatory, and learning based (Schneider & Ingram, 1990). Authority tools are typically used to direct the behavior of agents and officials at a lower level of government than the authority body. Incentive tools present positive and negative payoffs to induce utilization and encourage compliance, manipulating the associated costs, benefits, and probabilities that authority bodies determine relevant to the issue. Capacity building tools enable individuals, communities, and agencies to make decisions and carry out actions. These tools provide information, educate, train, and allocate resources. Symbolic and hortatory tools capitalize on heuristics by appealing to identities and using normative statements to promote activities that will further goals. Campaigns and slogans are examples of symbolic and hortatory tools that an authority body might use. Learning-based tools are adaptive in nature to responding to a problem and capitalize on uncertainty in target populations responses. Learning tools often rely on lower-agency and target groups experimenting with different approaches to solve a problem by drawing on lessons from experience (Schneider & Ingram, 1990). Policy tools target different populations and are chosen based on determined desired policy outcomes; they also can penalize or promote different groups depending on groups' position in society (Ingram & Schneider, 2007).

Policy tools are associated with pre-existing assumptions and depend on capacities of target populations and actors. All policy tools have implicit assumptions about what capacities are in place or what baseline conditions exist among policy targets (Schneider & Ingram, 1990). This includes assumptions about drivers of behaviors, capacities for implementation or

enforcement, and how groups will be affected (Schneider & Ingram, 1990). An example of an assumption is that economic incentives will motivate a private landowner or organization to act.

Due to the devolution and the transformation of governance, it is important to consider the capacity of governments and non-governmental partners in delivering goods and services as a part of policy design (Kettl, 2000). The federal government has increasingly shared management and responsibility of programs with states and for-profit and non-profit organizations (Kettl, 2000). Shared responsibility and management have resulted in an extended chain of implementation. At the state level, partnerships with governmental and NGO's have accelerated, requiring governments to create strategies that manage accountability and spur effective management to expand and build capacity (Kettl, 2000). These concepts are important to policy design as these relationships present more challenges to the implementation of adaptation goals and objectives, and present opportunity for collaborative management in resource planning. Without consideration of these relationships in the identification and planning process of policy development, there could be challenges in the implementation of adaptation. Therefore, it is critical to consider devolution, and the role of actors in the development of policy tools, and the diversity of tools selected to address adaptation challenges.

A diverse application of tools serves as a way for governments to achieve goals by reaching various target populations (Howlett, 2009). In the development and deployment of tools, there should be consideration of how different actors and intermediaries will translate and implement these different tools. Given cross-jurisdictional and multi-jurisdictional boundaries, and varying scales of management of natural resources and forests, cohesion and integration are a critical component of the policy design and tools process (Candel & Biesbroek, 2016; vonHedemann et al., 2020).

Cohesion and integration across scales is important in policy design; particularly, in sectors such as natural resources where there is a diversity of managing authorities and jurisdictions for large landscapes such as forests. Integration across jurisdictions and among different actors is a challenge and provides opportunity in the policy design process to leverage partnerships and collaborations (Cyphers & Schultz, 2019; Schultz et al., 2018). Synergies and conflicts can arise in places where goals or objectives are put in place, and in how tools are used. Understanding where there are current synergies across jurisdictions, or conflicts, can provide an understanding to better develop forest adaptation policy in the future, and offer a perspective on how different actors can work together.

Koski and Keating (2018) determined that there were a variety of tools utilized by states in state adaptation planning, and there was relative consistency among states in the tool choice that they used when discussing climate adaptation. They found that states themselves (i.e., their agencies and policy processes) are most often the direct targets of state-level adaptation planning efforts with authority and information-gathering tools (Koski & Keating, 2018). States created capacity tools for local governments given their importance in achieving state adaptation goals and targets. Overall, state adaptation plans did not target private actors (firms or individuals) or the public with mandates or authority tools (Koski & Keating, 2018). Private actors were most often targeted by incentive-based tools meant to alter their behavior (Koski & Keating, 2018). Koski and Keating (2018) also theorize that it is possible governments find it difficult to tell empowered groups (non-government/state actors) what to do, as governments rely on information from those same outside actors to make policy decisions.

States take on the burden of leading by example and use their own policies and planning documents as an opportunity to learn (Koski & Keating, 2018). Policy learning from states can

develop from the relationships they maintain with information disseminators and knowledge generators, such as academics and universities (Koski & Keating, 2018). Though most states are still in a learning phase, as they are determining the impacts of climate in their local areas, they are utilizing planning documents as "proto- policy" to gather information for future policy and planning (Koski & Keating, 2018).

1.4 Sensitizing Concepts

The primary framework utilized in this study is focused on the policy design literature, but I am aware of additional frameworks and sensitizing concepts which are relevant to emerging themes within this study. According to Charmaz (2003) and Bowen (2006), sensitizing concepts are concepts that inform a research problem and deepen the perception of a study. One important area of scholarship is the intersection of climate adaptation and environmental justice. As noted earlier, emerging research shows the most vulnerable communities are those that contribute the least to climate change and are the ones most impacted by climate hazards. In efforts to adapt to climate change, understanding vulnerability is a critical component to avoiding maladaptation. Vulnerability can be understood through factors such as race, poverty, and gender (Schipper, 2020). Vulnerability is not something that is inherent, but is created by social and cultural norms, contexts, and biases (Schipper, 2020). Maladaptation is typically defined as when an adaptation strategy makes a group of people or community more vulnerable to climate change than before (Schipper, 2020). The uncertainty of climate change and its impacts creates vulnerability for communities, so in developing adaptation strategies and planning and considering outcomes, vulnerability reduction with an eye towards ameliorating existing inequities is central to avoiding maladaptation.

To not depart too far from the framework utilized in the construction of this project, a brief list of other relevant sensitizing concepts includes interest group theory, adaptation frameworks (both for policy and landscape management), policy implementation, and goal ambiguity. Though it is not in the scope of my project to build on all sensitizing concepts, I have included them here to address their importance in analysis given the interactions of these concepts with one another and how they can impact policy design.

2. Research Methods

This research project included a state-level case study analysis of climate adaptation policies and policy implementation in Colorado and Washington State, with a focus on forest management. I utilized qualitative methods and data analysis to answer the research objectives. Through document analysis and stakeholder interviews, I pursued the following research objectives: (1) characterize state-level natural resource adaptation goals and objectives for forests and how these efforts are implemented by different state agencies and with other actors (e.g., collaborative groups and NGO's, other government entities, industrial and private forestry, etc.), and (2) analyze the policy design utilized to address climate hazards through climate adaptation for forested landscapes. To investigate these research questions related to climate adaptation, I utilized a case study design focused on Colorado and Washington State (Yin, 2018). The policy design literature informed the interview questions and framework of this study. The strength in using a case study design relied on its ability to accommodate a variety of different types of evidence. This study utilized two sources to build the case study: documents and interviews (Yin, 2018). In developing this case study, Colorado and Washington State were selected as study sites after considering states with climate-relevant plans that addressed natural resources and had taken leadership in the "climate action" sphere (i.e., having a state climate action plan, adaptation

policy, or executive-level campaign that addresses climate-related challenges). In the scoping process, I looked across all US states with the following questions in mind: 1) Does the state in question have a larger footprint of more than 20% of the landmass designated as public land? (Rasker, 2019; Vincent et al., 2017); 2) Does the state in question have a reported climate action plan? (Center for Climate and Energy Solutions, n.d); 3) Does the state in question have a reported state climate adaptation or climate solutions plan? (Georgetown Climate Center, n.d.); 4) Is the state in question currently a part of the US Climate Alliance? (US Climate Alliance, n.d.); 5) Does the state in question consider or focus on forests? The final selection of Colorado and Washington State as the ideal case study states are based on the established early and long-term reputation of Colorado and Washington State as states dedicated to addressing climate challenges, particularly as it relates to natural resources and working lands.

To capture adaptation goals, objectives, and design, our research team utilized a document review (Yin, 2018). I first investigated the different climate-relevant policies that existed for forest-covered lands and determined if the different goals and priorities associated with those policies could facilitate adaptation (Appendix A and Appendix B). This landscaping approach enabled me to characterize the types of plans that states might utilize in forest adaptation management and facilitated a general understanding of state goals and priorities.

To capture perspectives and management insights, this project relied on participant interviews. From state government, interviews include the executive branch of government — particularly, from state agencies such as the Department of Natural Resources (DNR), the Department of Fire Prevention and Control (for Colorado; [CDFPC]), the Department of Fish and Wildlife (or Parks and Wildlife), and the State Forest Service (also for Colorado). The non-state perspective includes interviews with collaborative groups and NGO's, other government

entities (federal, local and municipal governments and utilities, and other relevant governmental parties), representatives from industrial forestry and the private sector, academic and academic-adjacent staff, and other relevant parties. This study utilized interviews with these parties to understand how state agencies are facilitating the creation and implementation of adaptation goals and strategies for forested lands.

To field potential interviewees, I conducted an initial landscape analysis of Colorado and Washington State to determine the primary parties of interest from the above categories. We deployed a recruitment email developed from the initial landscape analysis to be sent to persons of interest. From there, we utilized a snow-ball sampling method where we asked participants to provide a list of other potential interviewees (Glesne, 2011). I conducted 43 interviews from Fall 2021 to Summer 2022 to achieve our objectives. In these interviews, 19 respondents were from Colorado, and 24 were from Washington State. Voluntary and confidential interviews with participants lasted between 30 and 105 minutes. Interviews were semi-structured and focused on the participants' knowledge, involvement, and familiarity with forest climate adaptation policy development, design, and implementation based on research objectives one and two. The semi-structured interview process established rapport with participants and allowed for well-developed and detailed responses (Yin, 2018). However, interviews followed interview guidelines (Appendix C) to ensure consistency among participants.

Raw data generated from this project was analyzed through a systemic process called coding. This process, defined by Charmaz (2006), categorizes segments of data into themes that simultaneously summarize and account for each data point. Coding of data was performed through *Dedoose,* a coding program. Pre-determined codes were designed based on the interview questions and emergent themes were added throughout the analysis process once they were

illuminated (Appendix D). These memos assigned meaning to our raw data (Charmaz, 2006). The coding process included sorting captured data into categories based on research objectives, questions, themes, and interesting factors that arose in the data collection process.

3. Outline of Chapters

My thesis contains two stand-alone but interconnected chapters to present my research findings. Chapter 2 consists of a practitioner report for Colorado and Washington State decision-makers, and land managers. The report is also applicable to state and federal agencies who may find it relevant to inform and assist with policymaking and climate adaptation efforts. This report has been purposely written with limited literature citations and academic jargon to be easily synthesized by practitioners. This chapter explores state policy and management strategies for forest-related climate adaptation mentioned by interviewees and overall perceptions of the policies and management strategies themselves. Additionally, it concludes with key suggestions and insights specifically for forest climate adaptation efforts. Chapter 3 is an article intended for a peer-reviewed publication. This chapter utilizes a policy design framework to identify key policy tools, capacities, and considerations for climate adaptation policy in the state of Washington. Findings were placed in the context of existing literature on policy design to offer insights into the tool choices and considerations necessary for the successful implementation of adaptation efforts. Chapter 4 offers a broader summary of key research findings, discusses the limitations of my research, and proposes future areas of research exploration.

CHAPTER 2 – STATE-LED FOREST ADAPTATION IN THE AMERICAN WEST: A BREIFING ON ADAPTATION PERSPECTIVES IN COLORADO AND WASHINGTON STATE

1. Executive Summary

1.1 Study Overview and Approach

This research project evaluated how state governments in Colorado and Washington State have developed and implemented climate adaptation policy for forests. Climate adaptation is defined by IPCC (2007, p. 869) as, "Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects."[14] The goals of this project were to: 1) characterize state-level natural resource adaptation goals and objectives for forests and how these efforts are implemented by state agencies and with other actors (e.g., collaborative groups and NGO's, other government entities, industrial and private forestry, etc.); and analyze the policy design utilized to address climate hazards through climate adaptation for forested landscapes and adjacent communities. During the analysis portion of this project, relevant and informative data emerged regarding climate adaptation and resilience[15] perceptions; that data informed the contents of this report focused on adaptation perspectives.

I conducted 43 semi-structured interviews from Fall 2021 to Summer 2022 across Colorado and Washington State, interviewing staff at local, state, and federal agencies, state

[14] "Adaptation: Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g., anticipatory, and reactive, private and public, and autonomous and planned." Definition from IPCC AR4 Climate Change 2007: Synthesis Report (2007), p. 869.

[15] "Resilience: The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change. Definition from IPCC AR4 Climate Change 2007: Synthesis Report (2007), p. 880.

government representatives, industrial forestry and private organizations, forest collaborative groups and NGO's, academic institutions, and other important partners.

1.2 Key Findings

In both Colorado and Washington, social and ecological impacts from climate, including catastrophic wildfire, changing forest landscapes, drought and heat, and impacts to and from water, are of greatest concern. Findings regarding impacts and hazards were consistent across states and organizations.

We identified, with interviewee confirmation, potential state policies and plans that could direct state-level climate adaptation for forests or facilitate a response to hazards (Appendix A and Appendix B). These plans included management goals and strategies to address climate vulnerabilities and potential hazards to forests. Plans ranged in their approach from naming climate impacts to forests, listing adaptation actions, creating strategic frameworks, and detailing intersecting impacts and collisions with other sectors. Interviewees also pointed to other plans they said should be revised to address adaptation or that they felt facilitated climate resilience.

Interviewees noted that there can be competing objectives, outcomes, or concerns among some adaptation actions, such as prescribed fire, assisted species migration, and forest thinning and density management. They also noted that there are often policy conflicts and challenges where there is goal ambiguity, perceived lack of transparency in management decisions, or there is a direct conflict with the goals and objectives of differing policies (i.e., lack of policy coherence and cohesion).

Other challenges included rates of environmental change, jurisdictional authority, and workforce capacity. Environmental and landscape change is happening quickly in both states, and interviewees said management direction, decisions and action do not always occur at the

necessary pace and scale. Jurisdictional boundaries and agency authority are challenging due to the inability to perform or manage in specific places or with specific adaptation actions. In both Colorado and the state of Washington, interviewees and participants spoke to the importance of workforce development and support for and of the forest industry and timber products to make adaptation and resilience efforts economically viable and sustainable.

1.3 Recommendations

Our recommendations, if climate adaptation and resilience are primary state objectives, are to: 1) revise all relevant state policies for forests and adjacent resources to include climate change and climate adaptation considerations (including preparing for future climate scenarios); 2) align all state strategic plans and policies to provide cohesion and clarity on adaptation goals and objectives relevant to forest management; 3) develop coherent, clear, and measurable metrics and targets, including robust monitoring and evaluation components (including outcome-based and process-based); 4) strengthen existing management partnerships and networks to facilitate adaptation collaboration across ownerships and jurisdictions while sharing targets and objectives, and providing increased capacity and support (sharing data, funding support, etc.); and 5) cultivate partnerships based on reciprocity, particularly with historically excluded and marginalized communities, that center environmental justice and equity to empower partners to achieve adaptation activity success and to avoid maladaptation. Recommendations one through four are shared in interviews by most research participants. Recommendation five was shared by a few participants and based on our knowledge of the literature and the current state of practice.

As a final note, interviews were conducted from Fall 2021 to Summer 2022, prior to significant funding from federal legislation, such as the Inflation Reduction Act (IRA)[16], and

[16] United States Congress. (2023). H.R. 812 (IH) - Inflation Reduction Act of 2023. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/BILLS-118hr812ih

guiding policies like the USDA USFS Climate Adaptation Plan[17]. We recommend ongoing research to understand how recent federal legislation and laws are influencing state climate adaptation efforts and implementation of adaptation actions for forests. Additionally, updated, and ongoing research that investigates state and federal policies over time can create an understanding of how adaptation is viewed and utilized by policymakers, land managers, and other partners, and how they learn and grow in their efforts. It will be helpful in creating beneficial and cohesive adaptation efforts across ownerships for ecosystems and communities.

2. Introduction

Given the increasing impact of climate change on ecosystems and communities, climate adaptation and resilience has become an increasingly critical aspect of addressing the changing climate. Importantly, adaptation allows landscapes and communities to adjust and prepare for potential disturbances and harm. At the inception of this study in 2020, there had been limited and inconsistent leadership by the federal government to promote, fund, and incentivize climate adaptation policies and on the ground management activities. Research has previously found that state and local governments were therefore incubators of innovation for adaptation planning (Ray & Grannis, 2015), and state government entities may also act as catalysts and instigators of adaptation planning that then diffuse across other levels of government (Koski & Keating, 2018). Thus, continued state action is a critical component of adapting to climate change (Ray & Grannis, 2014), and understanding state-level adaptation policies is a crucial component in characterizing the national movement and response to climate change and climate-imposed hazards.

[17] USDA Forest Service. (2022). *USDA Forest Service Climate Adaptation Plan*. https://www.usda.gov/sites/default/files/documents/4_NRE_FS_ClimateAdaptationPlan_2022.pdf

Climate adaptation affects all sectors of society but is particularly important for forests and public land management. In the American West, changes in natural resource conditions have had growing and negative impacts on society. For example, in Colorado, four out of five of the largest wildfires have occurred between 2018 and 2020. Additionally, the five most destructive fires to homes have occured within the past 12 years (CDFPC, 2024). Disturbances such as this can dramatically impact forests and forest-covered watersheds and cause a loss of social and ecological amenities.

A few of the challenges that western landscapes face include:

- Changes in hydrological cycles of precipitation, snowpack, variability, and decreased water availability initiated by climate-induced drought (Gonzalez et al., 2018; Romero-Lankao et al., 2014).
- Increased stress on ecosystems from warming, drought, and growing demands for water, and these effects are exacerbated by disturbances (Gonzalez et al., 2018; Romero-Lankao et al., 2014; Seidl et al., 2016).
- “Megadisturbances” which include hotter droughts, outbreaks of insects and disease, pathogens, and fire (Millar & Stephenson, 2015).
- Less tree regeneration and tree seedling establishment after wildfire events (Stevens-Rumann et al., 2018), and the increased severity and length of droughts have caused large forest diebacks at regional scales (Romero-Lankao et al., 2014).
- Increased impacts to Indigenous peoples’ and Tribal governments' traditional foods, cultural and spiritual resources, and livelihoods (Gonzalez et al., 2018).

- Decreased resilience of forests to change and reduction in effectiveness in their ability to provide valuable ecosystem services, such as water provisioning or carbon storage (Millar & Stephenson 2015; Romero-Lankao et al. 2014; vonHedemann et al. 2020).

Addressing threats to forests and forest-covered watersheds from climate change is a cross-jurisdictional challenge. For example, in Colorado, there are over 24.5 million acres of forested acres, which are managed by the USFS, BLM, NPS, private landowners, CSLB, and the Ute Mountain Ute and Southern Utes Tribes (CSFS, n.d.). This does not include ownership by other Tribal governments, other state agencies, and municipalities. The diversity of ownership structures of forested land makes multi-jurisdictional and multi-party management for climate adaptation increasingly relevant.

The field of specific studies related to state climate adaptation planning is relatively new, and research on domestic state-level adaptation policy is limited (but see Ray & Grannis (2015) and Koski & Keating (2018)). To address the gaps in the existing literature on state climate adaptation efforts, and to characterize state climate adaptation planning for natural resources and forests, this study implemented in-depth case studies of Colorado and Washington State focused on state policies for forest adaptation.

3. Research Approach and Methods

The research objectives below provided the foundation for this study:

> *Objective 1:* Characterize state-level natural resource adaptation goals and objectives for forests and how these efforts are implemented by different agencies and with other actors (e.g., collaborative groups and NGO's, other government entities, industrial and private forestry, etc.).

Objective 2: Analyze the policy design utilized to address climate hazards through climate adaptation for forested landscapes.

To answer these objectives, I utilized questions during interviews and data collection that would facilitate an understanding of the inquiry outlined below:

1. What are the adaptation goals and objectives that are written into [state] policies and plans for forests and adjacent resource-dependent communities?
2. How are higher goals and objectives then translated into specific policies (e.g., State Forest Action Plan)?
3. What is the role of other actors in implementing these objectives?
4. What types of policy tools are in place to advance adaptation efforts for forests in [state]?
5. Are there synergies or conflicts across sectors, agencies, actors, or tools?
6. Does any entity have a plan for monitoring or evaluating success?
7. Are there any other important considerations that are shared by participants?

For this study we focused on the western US. We identified possible state-level case studies based on participation in the US Climate Alliance and having a state-level climate action plan. Further, we focused on forestry and natural resources. The final selection of Colorado and the state of Washington was based on recent updates to their State Forest Action Plans in 2020.

To capture potential adaptation directive policies, we first utilized a landscaping document review. We investigated the different climate-related state-level policies that exist for forest-covered lands in each state and determined if the goals and priorities associated with those plans could facilitate climate adaptation. The identified policies enabled us to understand what policies and planning documents might direct state climate adaptation efforts for forests. Further,

we utilized agency planning documents to understand how agencies might develop, tier, and address state efforts (Appendix A and Appendix B).

To capture management insights and perspectives, this project relied on participant interviews. Data collection for this study was conducted from Fall 2021 to Summer 2022. We utilized semi-structured interviews to collect qualitative data (Appendix C). Our team developed questions for this project which reflected our research objectives and were structured to allow for a flexible inquiry. In selecting interview participants, we started with a list of key individuals and officials. Our list was informed by our policy review. As we advanced in the project, our sample grew based on recommendations from participants. Saturation (i.e., when we were not hearing significantly new information or had talked to all potential interviewees knowledgeable on our topic) for Colorado was reached at 19 interviews, and in Washington, 24, for a total of 43 interviews. Our list of participants includes representatives from federal and state agencies, collaboratives and NGO's, state government officials, industrial forestry and the private sector, academic institutions, and other relevant groups (Table 2.1).

Table 2.1. The Number of Participants in Each Sector Interviewed in Colorado and Washington State.

Participants	Colorado	Washington
State Agency	7	10
State Government	3	1
Academic / Affiliates	3	3
Collaboratives / NGO's	2	4
Other Key Partners	2	3
Private / Industrial	1	2
Federal	1	1
Participant Total	**19**	**24**

Interviews with participants were voluntary and confidential, and lasted between 30 – 105 minutes. Interviews took place via video chat or phone, and were recorded, transcribed, and analyzed for themes based on our research objectives and emergent topics. Descriptive quotes

from interviewees that illustrate perspectives and findings are indicated by an interview identifier (e.g., Interviewee #4).

4. Findings

Below, we present findings in the form of adaptation perceptions, across three major categories that emerged from our interviews, including: 1) climate impacts and challenges; 2) state policies and plans; and 3) observed perceptions and challenges.

4.1 Climate Impacts and Challenges

In both Colorado and Washington State, social and ecological impacts from climate, including catastrophic wildfire, changing forest landscapes, drought and heat, and impacts to and from water were of greatest concern (Tables 2.2 and 2.3). Interviewees from both states highlighted and recognized the need to address these impacts, but in Washington State, there was a notable recognition of differing impacts on the eastern and western regions of the state. Concern about the western region (or "Western Slope") of Colorado was mentioned, but primarily by respondents or individuals who work or live in the western region of the state. Their concerns were mostly focused on transparent management and decision-making, priorities, and the allocation of funding.

Table 2.2. Perceptions of Climate Impacts and Challenges to Colorado Forests.

Perception Category	Ecological	Social
General Perspectives	• Uncertainty of climate impacts, challenges, and disturbances • Increasing impacts on social and ecological indicators including forests, wildlife, agriculture, and hydrologic systems • More significant and intense weather impacts • Changing historical regimes • Hotter and drier • Increased need for "Shared Stewardship" across ownerships • Need for political will	

	• Impact of forest management (past forest management practices, and fire suppression) and interactions of those practices with a changing climate	
Wildfire	• Fire seasons are longer, hotter and drier • Fires are higher up in elevation, and with greater intensity • Long-term, multi-year post-fire impacts (i.e., soil erosion) • Insect and disease leading to increased wildfire fuels • Drying, densely packed forests with less diversity and an increased likelihood of wildland fires • More frequent, more extreme fire behavior • Increase in drought, impact on catastrophic wildfire	• Living with wildfire risks to safety and human infrastructure • Wildfire impact on water and drinking supply
Changing Forests	• Species moving up in range (i.e., migrating species) • Physical shifts in forests (i.e., latitude and longitude) • Species conversion • Changing landscapes from forests to range • Tree die-off • Increase in insects and pathogens	• Effects on forests, including recreation, hunting and forest economy (i.e., declines of elk, deer, goat and sheep, and habitat loss)
Drought and Heat	• Longer period of drought and stress • Increase in the evaporative demand on trees	• Decrease in water availability
Water	• Hydrologic variability • Variability of snow, snow melt and snowpack	• Lack of capacity for post-fire water treatment

Table 2.3. Perceptions of Climate Impacts and Challenges to Washington State Forests.

Perception Category	Ecological	Social
General Perspectives	• Two major climate zones: Western Washington ("wet forest") and Eastern Washington ("dry forest") - Eastern WA: Drought, insects, and fire; transition of forestland to rangeland - Western WA: Rising temperatures and heat domes; drying soils; tree die off • Uncertainty of climate impacts, challenges, and disturbances, particularly in western WA • Impact of forest management (previous 100 years, and fire suppression) and interactions with a changing climate • Overstocked forests	
Wildfire	• Increase in intensity, frequency, and severity of wildfire (i.e., hundreds of thousands of acres) • Fire seasons are longer, hotter and drier • Less moisture in combination with high fuel-loaded forests increases risk to wildfire • Change in natural fire regime to climate driven	• Increased urban development in WUI and increased risk from wildfire to safety and human infrastructure • Smoke from wildfire and impacts on downstream communities (i.e., health and recreation economy) • Increased soil erosion and decreased water quality from wildfire
Changing Forests	• Composition and types of forests are changing (i.e., in eastern WA a shift from forests to shrub steppe to range) • Forests have become homogenized and overgrown/ too dense • Decrease in forest productivity (ecological and social), and increase in tree mortality • Increases insects and pathogens • Changes in tree species • Shifts to younger forests • Dry soils	• Changes in social relationships to forest (i.e., economies, and recreation)

Drought and Heat	• Drought is a principal concern; more intense and longer • Hotter, and drier	• Impacts of heat on workforce
Water	• Warming water temperatures impact salmon and salmon reproduction • Changing precipitation patterns (i.e., snow arrives later in season and is wetter) • Flooding and loss of snowpack • Less water for wildlife and fish	• Impacts of climate on water affect downstream users and aquatic resources (i.e., less water for social and cultural uses like drinking water) • Lack of ability to manage near streams further complicates climate issues
Private Sector and Industrial Forestry	• Nonhistorical tree species planted by industrial forestry increase fire risk and are exacerbated by climate	• Change in industrial and private forestry, including workforce capacity

4.1.1 State Plans and Guiding Policy Documents

In our landscaping approach we identified potential state policies that could direct state-level climate adaptation for forests. These plans included goals and strategies that address climate vulnerabilities and potential impacts to forests.

Examples of Colorado's policies include: 1) Colorado Climate Plan: State Level Policies and Strategies to Mitigate and Adapt[18]; 2) 2020 Colorado Forest Action Plan[19]; 3) 2020 Colorado Resiliency Framework[20]; and 4) The Colorado Water Plan[21] (Appendix A).

[18] For more information on the Colorado Climate Plan, see:
State of Colorado. (2018). Colorado Climate Plan: State Level Policies and Strategies to Mitigate and Adapt. State of Colorado. https://drive.google.com/drive/folders/180akh2ZFmgNN-rjz2_RUBFyvoGG2nBFp

[19] For more information on the Colorado Forest Action Plan, see:
CSFS. (2020). *Colorado Forest Action Plan*. https://csfs.colostate.edu/wp-content/uploads/2020/10/2020-ForestActionPlan.pdf

[20] For more information on the 2020 Colorado Resiliency Framework, see:
DOLA-CRO. (2020). 2020 Colorado Resiliency Framework. The State of Colorado. https://static1.squarespace.com/static/5fd3ae01f8f3aa3014a8069a/t/60beac4c8ff8cb6a2171ea1d/1623108705479/Framework_Electronic.pdf

[21] For more information on Colorado's Water Plan, see:
Colorado Water Conservation Board. (2015). *Colorado's Water Plan*. https://dnrweblink.state.co.us/CWCB/0/edoc/199531/FinalCombinedCWPJune2016.pdf

Examples of Washington's policies include: 1) Preparing for a Changing Climate: Washington State's Integrated Climate Response Strategy[22]; 2) 2020 Washington Forest Action Plan[23]; 3) Wildland Fire Protection 10-Year Strategic Plan[24]; 4) 20-Year Forest Health Strategic Plan: Eastern Washington[25]; and 5) Safeguarding Our Lands, Waters and Communities: DNR's Plan for Climate Resilience[26] (Appendix B).

Colorado and Washington State plans ranged in their approach from naming climate impacts to forests, listing adaptation actions, creating strategic frameworks, to detailing intersecting impacts and collision with other sectors. One difference between the planning documents of Colorado and Washington State is that Washington has a strategic plan to address a region of concern—Central and Eastern Washington—in the 20-Year Forest Health Strategic Plan. Additionally, given the challenges to the Colorado River and other water resources in the state, Colorado has a strategic plan for Colorado water resources through the Colorado Water Plan. The listed plans above were identified in landscaping as the most relevant in guiding efforts, but all identified plans are not listed. The identified plans above were useful in providing

[22] For more information on WA's Integrated Climate Response Strategy, see:
Hedia Adelsman, Joanna Ekrem, Lara Whitely Binder, Kirk Cook, Kelly Cooper, Lynn M. Helbrecht, Rachael Jamison, Joyce Phillips, Paul Pickett, Carol Lee Roalkvam, Sandy Salisbury, Dan Siemann, & Pene Speaks. (2012). *Preparing for a Changing Climate: Washington State's Integrated Climate Response Strategy* (Publication No. 12-01-004). State of Washington Department of Ecology.
https://apps.ecology.wa.gov/publications/documents/1201004.pdf

[23] For more information on WA's 2020 Forest Action Plan, see:
WSDNR. (2020a). 2020 Forest Action Plan. State of Washington.
https://dnr.wa.gov/publications/rp_2020_forest_action_plan.pdf

[24] For more information on the 10-Year Wildfire Protection Plan, see: WSDNR. (2019). Washington State Wildland Fire Protection 10-Year Strategic Plan [Second
Edition]. State of Washington. https://www.dnr.wa.gov/publications/rp_wildfire_strategic_plan.pdf

[25] For more information on WA's 20-Year Forest Health Strategic Plan, see:
Washington State Department of Natural Resources. (2017). 20-Year Forest Health Strategic Plan: Eastern Washington. State of Washington.
https://www.dnr.wa.gov/publications/rp_forest_health_20_year_strategic_plan.pdf

[26] For more information on WA's Plan for Climate Resilience, see:
WSDNR. (2020b). Safeguarding Our Lands, Waters, and Communities: DNR's Plan for Climate Resilience. State of Washington. https://www.dnr.wa.gov/publications/em_climaterresilienceplan_feb2020.pdf

an initial understanding of climate, adaptation, and resilience framing for the research team in Colorado and Washington State.

Respondents listed many of the plans identified in the preliminary review. Interviewees also mentioned several additional plans that indirectly address climate impacts on forests. When respondents presented policies that they viewed managers could utilize in addressing climate change, many respondents offered how current plans might be altered or revised to encourage forest adaptation actions. Plans provided by respondents ranged from state plans that specifically addressed climate change (either from a climate adaptation or resilience lens), to those that could be updated to include climate and climate adaptation but currently have more indirect guidance, to plans that were relevant for management but were from non-state governments (Table 2.4 (Colorado) and Table 2.5 (Washington State)).

Table 2.4. Respondent Identified Policies (Plans) and Perception Category for Each in the State of Colorado.

PERCEPTION	COLORADO STATE POLICIES
Identified as a primary state climate directive plan	Colorado Forest Action Plan (CFAP)[27]
	Colorado Greenhouse Pollution Reduction Roadmap[28]
	Colorado's Water Plan[29]
	Colorado Climate Plan: State Level Policies and Strategies to Mitigate and Adapt[30]

[27] For more information on the Colorado Forest Action Plan, see:
CSFS. (2020). Colorado Forest Action Plan. https://csfs.colostate.edu/wp-content/uploads/2020/10/2020-ForestActionPlan.pdf

[28] For more information on CO's Greenhouse Pollution Reduction Roadmap, see:
State of Colorado. (2021). Colorado Greenhouse Pollution Reduction Roadmap: Executive Summary. The State of Colorado. https://drive.google.com/file/d/19pmqOzKV9ulXHHRyZz5egOBJWO0fPw-i/view?usp=embed_facebook

[29] For more information on CO's Water Plan, see:
Colorado Water Conservation Board. (2015). Colorado's Water Plan.
https://dnrweblink.state.co.us/CWCB/0/edoc/199531/FinalCombinedCWPJune2016.pdf

[30] For more information on CO's Climate Plan, see:
State of Colorado. (2018). Colorado Climate Plan: State Level Policies and Strategies to Mitigate and Adapt. State of Colorado. https://drive.google.com/drive/folders/180akh2ZFmgNN-rjz2_RUBFyvoGG2nBFp

Identified as a state plan or program that can be updated to better incorporate climate, adaptation, or resilience	Colorado Parks and Wildlife (CPW) State Wildlife Action Plan (SWAP)[31]
	Colorado State Land Board (CSLB) Stewardship Action Plans[32]
	CSFS Forest Ag Program[33]
	Principles and Practices for the Restoration of Ponderosa Pine and Dry Mixed-Conifer Forests of the Colorado Front Range[34]

Table 2.5. Respondent Identified Policies (Plans) and Perception Category for Each in the State of Washington.

PERCEPTION	WASHINGTON STATE POLICIES
Identified as a primary state climate directive plan	Washington State 2020 Forest Action Plan[35]
	Safeguarding Our Lands, Waters, and Communities: DNR's Plan for Climate Resilience[36]
	Washington State Wildland Fire Protection 10-Year Strategic Plan[37]

[31] For more information on CO's SWAP plan, see: CPW. (2015). Colorado Parks and Wildlife State Wildlife Action Plan. State of Colorado. https://cpw.state.co.us/Documents/WildlifeSpecies/SWAP/CO_SWAP_FULLVERSION.pdf

[32] For more information on CO's State Land Board Stewardship Action Plans, see: Colorado State Land Board. (2024). Stewardship Action Plans. Colorado State Land Board. https://slb.colorado.gov/stewardship-action-plans#:~:text=A%20Stewardship%20Action%20Plan%20(SAP,landscape%20scale%20on%20numerous%2C%20non.

[33] For more information on the CSFS Ag Program, see: https://csfs.colostate.edu/forest-ag-program/.

[34] For more information on the Front Range Restoration Practices, see: Addington, R. N., Aplet, G. H., Battaglia, M. A., Briggs, J. S., Brown, P. M., Cheng, A. S., Dickinson, Y., Feinstein, J. A., Pelz, K. A., Regan, C. M., Thinnes, J., Truex, R., Fornwalt, P. J., Gannon, B., Julian, C. W., Underhill, J. L., & Wolk, B. (2018). Principles and practices for the restoration of ponderosa pine and dry mixed-conifer forests of the Colorado Front Range (RMRS-GTR-373; p. RMRS-GTR-373). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. https://doi.org/10.2737/RMRS-GTR-373

[35] For more information on the WA 2020 Forest Action Plan, see: WSDNR. (2020). 2020 Forest Action Plan. State of Washington. https://dnr.wa.gov/publications/rp_2020_forest_action_plan.pdf

[36] For more information on the WA DNR's Plan for Climate Resilience, see: WSDNR. (2020). Safeguarding Our Lands, Waters, and Communities: DNR's Plan for Climate Resilience. State of Washington. https://www.dnr.wa.gov/publications/em_climaterresilienceplan_feb2020.pdf

[37] For more information on WA's Wildland Fire Protection 10-Year Strategic Plan, see:

	20- Year Forest Health Strategic Plan: Eastern Washington[38]
Identified as a state plan or program that can be updated to better incorporate climate, adaptation, or resilience	The Forest Practices Act and Forest Practice Rules[39]
	Washington State Sustainable Harvest Calculation[40]
	The Policy for Sustainable Forests[41,42]
	Washington State Department of Natural Resources (WSDNR) Natural Areas Program[43]
	Washington State Forest Practices Habitat Conservation Plan (FPHCP)[44]
	Washington Trust Lands Habitat Conservation Plan (HCP)[45]

Washington State Department of Natural Resources. (2019). Washington State Wildland Fire Protection 10-Year Strategic Plan [Second Edition]. State of Washington. https://www.dnr.wa.gov/publications/rp_wildfire_strategic_plan.pdf

[38] For more information on the WA 20-Year Forest Health Strategic Plan, see: Washington State Department of Natural Resources. (2017). 20-Year Forest Health Strategic Plan: Eastern Washington. State of Washington.

[39] For more information on The Forest Practice Rules, see: The Forest Practices Act, Title 222 WAC; RCW 76.09 – Forest Practice; RCW 76.13 – Stewardship of Nonindustrial Forests and Woodlands and the Forest Practice Rules at https://www.dnr.wa.gov/programs-and services/forest-practices and https://www.dnr.wa.gov/about/boards-and-councils/forest practicesboard/forest-practices-rules-and-board-manual-guidelines#Forest%20Practices%20Rules.

[40] For more information on the WA Sustainable Harvest Calculation, see: (RCW 79.10.300)(5), (RCW 79.10.320), and (RCW 79.10.310).

[41] For more information on the Policy for Sustainable Forests, see: Washington State Department of Natural Resources. (2006). Policy for Sustainable Forests. The State of Washington. https://www.dnr.wa.gov/publications/lm_psf_policy_sustainable_forests.pdf.

[42] In 2019, WA DNR amended the Policy for Sustainable Forests with the End of Decade Analysis: Arrearage. This policy can be found at: RCW 79.10.330.

[43] For more information on WA's Natural Areas Program, see: WSDNR. (2024a). Natural Areas. https://www.dnr.wa.gov/managed-lands/natural-areas

[44] For more information on WA's Forest Practices Habitat Conservation Plan and associated annual reports, cumulative 5-year reports and differing Forest Practices Habitat Conservation Plan sections, see (WSDNR, 2024b): https://www.dnr.wa.gov/programs-and-services/forest-practices/forest-practices-habitat-conservation-plan.

[45] For more information on WA's Habitat Conservation Plans, see: Washington State Department of Natural Resources. (1997). Habitat Conservation Plan. The State of Washington. https://www.dnr.wa.gov/publications/lm_hcp_plan_1997.pdf.

	Policy on Catastrophic Loss Prevention
Identified as a non-state policy and/or planning document utilized for climate actions	Good Neighbor Authority/Agreement (GNA)[46]
	Tribal Forest Protection Act (TFPA)[47]
	Environmental Quality Incentives Program (EQUIP)[48]
Identified non-state policy and/or plan that can be updated to include climate adaptation or resilience actions	Northwest Forest Plan (NWFP)[49]

Many respondents said states were working towards addressing climate and forest resilience; however, they would not always characterize state policies as specifically addressing adaptation. Some respondents thought specific policies guided resilience and adaptation, while others did not. Though most people agreed that both Colorado and Washington State are working to achieve forest resilience and address climate impacts and hazards, there was not a consensus on whether states were utilizing specific policies or plans to directly engage climate adaptation.

In Colorado, there is a shared view that state agency policies do not direct climate adaptation and there is a recognized need for policy that guides adaptation across multiple levels of government and agencies. We observed the following:

- Managers did not consistently view their actions as climate adaptation activities or management. They did characterize their actions as managing for forest resilience.

[46] For more information on The Good Neighbor Authority, see: 16 U.S. Code § 2113a – Good Neighbor Authority and Riddle, A. A. (2020). The Good Neighbor Authority. Congressional Research Service. https://crsreports.congress.gov/product/pdf/IF/IF11658/3.
[47] For more information on the Tribal Forest Protection Act, see: 118 Stat. 868.
[48] For more information on the Environmental Quality Incentives Program, see: 84 FR 69280.
[49] For more information on the NWFP, and the recent pending update, see the notice by the USDA Forest Service: 88 Fed. Reg. 87393.

- Managers lacked clarity about what might be metrics of success and whether there were enforceable metrics related to climate adaptation for forests in Colorado.
- Interviewees stated that national and regional policies are helpful to them because they provide a framework for local-level decision-making, and that without measurable state-level goals and targets, there is a lack of momentum or motivation to get adaptation work done.

One manager in Colorado shared "...**One of the biggest assumptions is that the state agencies work together and coordinate**. And I know that they don't…." [Interviewee #21]

In Washington, many respondents thought that state policy around climate adaptation is still in the concept and strategic planning phase, and they expressed a shared perspective that there is room for strengthened adaptation actions or modification for adaptation directives in state policies. We observed the following:

- Managers said that climate adaptation is not something they have been directed to manage for but is something that they feel is needed. They viewed state policies and plans as aspirational and driven by forest resilience, not adaptation focused.
- Interviewees said that Washington could focus state land management to be based on ecosystem services and holistic management practices versus state revenue production.
- Managers stated that there could be cultural and structural changes in policy to assist in implementing and managing for climate change adaptation. These changes included further integrating shared objectives into management, additional capacity (funding and workforce), support for forest-dependent and local economies (including mills), and management for local ecologies.

- Respondents shared that in Washington there is a need for adaptation actions, versus a "resilience only" approach, and state policies should include climate change in all forest management policies. Of the plans mentioned that could utilize revision, Forest Practice Rules was one of the most prevalent. Several respondents shared that there are needed changes for State Trust Lands and the Sustainable Harvest Calculation. Other commonly mentioned modifications include revising state replanting requirements.
- Outside of the scope of this project to assess state policy, some managers expressed concern and frustration regarding the Northwest Forest Plan (NWFP) and the impact of climate change in managing Northern Spotted Owl habitat. They shared the impacts of climate, wildfire, changing landscapes, and competition as reasons to revisit NWFP management requirements and to revise the plan to include climate and climate change adaptation.

Many of the policies and plans identified in our landscaping review were named in interviews as resilience plans that can ideally be utilized by managers. The utilization, extent, and perceptions of plans varied and there was lack of consensus on perceptions of state management for adaptation. Participants identified the importance of forest adaptation and agreed that forest resilience was assisting in meeting state goals.

4.2 Other Perspectives and Challenges

Perceptions of state policies and plans included assumptions of how state policies and plans are utilized, of what climate adaptation means, views on agency coordination, and other perceptions related to policy implementation, monitoring, and consensus of policy objectives. Some respondents commented that they were unsure if there was a consensus on what adaptation means and said that adaptation actions were not necessarily directed by state policies, and if an

action is being implemented, it is not always called an adaptation action. The focus of most forest management, for both Colorado and Washington State, is perceived to be from a lens of forest health and resilience.

Most interviewees did agree, however, on what adaptation actions are and what will enable more resilient forests. Examples of actions provided by participants in both Colorado and Washington State include:

- Adaptation actions for landscape management included prescribed fire, diversification of age class and species (i.e., through progeny selection, planting new species and assisted species migration, and using different phenotypes), thinning and forest density management, and watershed management and conservation practices. Additional actions include seed collections from hazard resilient trees, habitat and wildlife conservation, managing soil moisture, and wildfire management with additional fire and fuel breaks.
- Adaptation actions from a social lens included adaptation education for professionals and the public, workforce development, promotion of timber and forest-derived products, meaningful collaboration with partners, and meaningful engagement with the public.

Prescribed fire, assisted species migration, and density management are all actions that are viewed as beneficial adaptation actions, but there is noted friction that arises when these actions are discussed.

- Prescribed fire and assisted species migration are the most conflict-oriented actions that spurred conversations on the pace and scale of needed management and how to effectively achieve beneficial results while maintaining social license from the public.
- Participant noted considerations for prescribed fire implementation included impacts on downstream communities (to both health and tourism), public buy-in and safety.

- Assisted species migration presented varying views across the board. For private-affiliated partners and industrial managers, assisted species migration is perceived to be already being done. For government owned land and agencies, this action seems to be more slowly implemented.
- Many managers view the scientific data on assisted species migration as not yet where it needs to be to be implemented. But there does seem to be interest in further investigating and understanding the benefits and options for future implementation.
- Respondents in both states noted that thinning forests and reducing densities can cause public concern and can impact support for treatments due to the public perception of how thinning changes the landscape.
- Most interviewees do not view adaptation actions as causing challenges or conflict and instead view adaptation as providing cohesion and collaboration in forest management.

Environmental change is happening quickly in both states and management direction and decisions are perceived to not always be able to keep up. For example, Colorado and Washington State are both experiencing landscape transitions, notably from forests to rangeland. The decisions on how to manage these areas (such as how to manage for wildfire), and how to address issues such as funding constraints and state mandated funding requirements, need to be addressed. Additionally, considerations for environmental changes that impact fish and wildlife, and adjacent communities' economies and safety, creates urgency for adaptation actions.

Policy conflicts and challenges arise where there is goal ambiguity, a perceived lack of transparency regarding management decisions, or there is a direct conflict with goals and objectives of differing policies. For example, in Washington, some interviewees find challenges or conflict with state requirements for replanting trees where historical baselines are much lower.

Particularly, where potential climate impacts and adaptation would present opposing replanting forests at a higher density. In Colorado, a perceived lack of transparency regarding determining priority landscapes, and a perceived preference for Front Range and urban communities, for treatment and funding creates internal and external challenges.

Jurisdictional authority was a noted challenge**.** In Colorado, jurisdictional complexity and lack of partnership between agencies makes it difficult to implement consistent management actions across landscapes. Given the patchwork management design for forests between several agencies, and the noted lack of agency partnership, using certain management actions like prescribed fire can present a challenge. In Washington State, there seems to be more cohesion and collaboration happening across authorities than in Colorado. Conflicts occur more notably with differing goals, objectives, and mandated requirements of policies, such as reforestation versus density management.

In both Colorado and Washington State, participants spoke to the importance and need for additional capacity in workforce development, and support for the forest industry and forest-derived products. Types of support that were mentioned included support of the workforce (e.g., truck drivers, consulting foresters, prescribed fire burn crews, etc.), continuing education for those already in the workforce, additional mill capacity, locally based forest product development, and financial incentives for increased development and infrastructure. Interviewees spoke to the aging workforce, the impacts of the Great Recession on mills, and the scale of treatments that need to be done on the landscape as reasons for the needed additional capacity.

5. Summary

Our findings revealed that state climate adaptation for forests is diversified in direction and guidance, as well as in understanding, perceptions, and implementation for both Colorado

and Washington State. Though states have state policies that theoretically guide forest adaptation, the understanding, implementation, and responsiveness to action depend mostly on the individual. This highlights the question of who state policies and plans serve. Cohesive strategies and collaboration, with measurable targets and enforceable, but adaptable, indicators and metrics (both outcome-based and process-based), are recommended for adaptation success.

6. Recommendations

Interviewees offered several recommendations on improving state plans, policy cohesion, and partner collaboration. Specific recommendations include:

- Revise all relevant state policies for forests and adjacent resources to include climate change and climate adaptation (including preparing for future climate scenarios).
- Align state policies and strategic plans to provide cohesion and clarity on adaptation goals and objectives relevant to forest management.
- Develop coherent, clear, and measurable metrics and targets, including robust, but adaptable, monitoring and evaluation components (including outcome and process-based indicators and metrics).
- Strengthen existing management partnerships and networks to facilitate adaptation collaboration across ownerships and jurisdictions while sharing targets and objectives, and providing increased capacity and support (sharing data, funding support, workforce development, etc.).
- Overall, there was a consensus that adaptation actions and processes should be more direct, have embedded monitoring and evaluation components, and be supported with collaboration and partnerships.

In addition to the recommendations above, environmental justice and social vulnerability emerged as an area of concern that need to be addressed. Environmental justice and rectifying disproportionate impacts to vulnerable and underserved communities are widely considered integral components of adaptation planning and management. The USDA Forest Service Climate Adaptation Plan (2022) heavily integrates an environmental justice approach. Colorado and the state of Washington both have opportunities to further their responsibilities related to environmental justice and equity in their climate and climate adaptation efforts. Examples of these efforts include identifying and meaningfully engaging with disadvantaged communities (both rural and urban), deepening commitments to Tribal engagement and support, and improving communication and partnerships with diverse communities. Participant 16, from Washington State, captures a highlight of the shared sentiments from interviewees related to environmental justice.

> *"The majority of our landowners in Washington State are white and well off. In reducing fire risk and improving forest resilience and adapting our forests, we really want to do that on a meaningful scale. We're going to have to subsidize the management of lands that are owned and managed by white people. Is that a problem? … Should we be more focused on the urban environment and trying to address environmental justice and disproportionate impacts on urban communities? Or should we spend that dollar restoring forests in a rural place? Forest workers tend to be Latinx or other minorities, and they often face terrible working conditions and are not given the same level of benefits and support that other workers receive…when is that issue coming to a head? And how are we going to figure out [how] to pay people what they deserve to be paid? And ensure that they have good working conditions and benefits?" [Interviewee #16]*

Therefore, our final recommendation is for states to intentionally cultivate partnerships based on reciprocity, particularly with historically excluded and marginalized communities, that center environmental justice and equity to foster resilient ecosystems and communities and to avoid maladaptation.

CHAPTER 3 – A REVIEW OF WASHINGTON STATE FOREST-RELATED CLIMATE ADAPTATION POLICIES FROM 2021-2022: PERSPECTIVES ON FOREST ADAPTATION AND RESILIENCE

1. Overview

States are leaders in developing climate adaptation policy and implementing policy goals and strategies through management. Using the lens of policy design, we investigated state climate adaptation policies for forest management in Washington State. Our research questions were: 1) What are the policy tools that direct climate adaptation on forested ecosystems in Washington State? and, 2) What are the perceptions of these policy tools in terms of their efficacy for pursuing climate adaptation on forested lands? After reviewing state-level policies, we conducted 24 semi-structured interviews across the state with executive level policy experts, state agency managers and practitioners, collaborative group leaders and individuals from NGOs, other government entities (local and municipal governments, and federal), the industrial and private sector, academic researchers, and others. Utilizing the policy design framework, our findings suggest that there are diverse understandings of state-level policy and various approaches to implementation, which relies on a suite of other policy tools. Next steps to improve climate adaptation policy could include revisions to all relevant state policies for forests to include climate change and climate adaptation considerations; alignment of goals and objectives relevant to forest management; coherent, clear, and measurable metrics and targets; and increased capacity and partnerships to achieve adaptation activity success. Our study contributes to the broader literature on state-led climate adaptation policy and planning, an important nexus for climate adaptation and forest management.

2. Introduction

In response to the current and predicted impacts from climate change, the federal government and many states are developing policies and implementing activities to manage anticipated climate hazards. Climate change poses a threat and hazard to ecosystems, associated natural resources, and human communities. Observed changes in climate have been seen in all regions of the United States (Leung et al., 2023). Among these hazards and impacts are "mega" disturbances and wildfire (Jolly et al., 2015; Millar & Stephenson, 2018), increased temperature, more frequent and intense drought and changes in hydrological systems (Gonzalez et al., 2018; Lukas et al., 2014), shifts in plant and animal communities, and increased human mortality and illness (Gonzalez et al., 2018).

Climate adaptation and resilience are increasingly identified as activities that address climate impacts and mitigate predicted hazards. As such, adaptation is recognized as an essential action for the continuation of human and ecological survival (Wasley et al., 2023). As governments and communities move from awareness to planning and implementation, understanding the design and implementation of adaptation policies and activities are critical to a cohesive strategy and response. Furthermore, when individuals and decision-making communities understand the impact of policies and analyze potential conflicts or unforeseen consequences, they contribute to the prevention of maladaptation (Wasley et al., 2023).

We investigated state climate adaptation policies for forested landscapes and sought to understand how climate adaptation activities are led by a state government in a case study of Washington State. In this paper, we report on two research questions: 1) What are the policy tools that direct climate adaptation on forested ecosystems in Washington State? and, 2) What are the perceptions of these policy tools in terms of their efficacy for pursuing climate adaptation

on forested lands? This work contributes to the literature on governance and policy tools for natural resource-related climate adaptation.

3. Literature Review

In this section, we review the literature on ecosystem-related impacts from climate change and expand on state-level climate adaptation policy. We then examine relevant literature on policy design and implementation and conclude with a summary based on our research questions.

3.1 Climate Impacts and Adaptation: Ecosystems, Community and Policy

Across western landscapes, climate change and climate associated impacts are increasing hazards to both landscapes and communities. As a result, forest managers increasingly must pursue climate adaptation management activities to support ecosystem function and associated ecosystem services. Climate-related challenges in the West include changes to hydrological cycles, precipitation, and water quality; changes in the severity of drought and drought-driven disturbances like fire or insect and disease outbreaks; and impacts to snowpack, streamflow, and soil moisture (Gonzalez et al., 2018; Lukas et al., 2014). Warming is projected to make ecosystems more stressed and thus more susceptible to disturbances (Gonzalez et al., 2018; Romero-Lankao et al., 2014; Seidl et al., 2016). Specifically, so-called "mega"-disturbances have greater intensity and severity than what has occurred in the past, particularly in the form of droughts (Millar & Stephenson, 2015). Disturbances also can include insect outbreaks, disease, and fire, and these disturbances can compound over time (Buma, 2015). As large fire events and insect outbreaks increase, forests become less resilient to change, often with attendant negative effects to ecosystem services, such as water provisioning or carbon storage (Millar & Stephenson, 2015; Romero-Lankao et al., 2014; vonHedemann et al., 2020). Though wildfire is a

natural process in forest ecosystems, recent changes in wildfire pattern and behavior have posed a significant hazard to ecosystems and humans, due to increased frequency, severity, and duration, including longer wildfire seasons (Jolly et al., 2015). Tree regeneration and seedling establishment after wildfires have also decreased in western forests (Stevens-Rumann et al., 2018).

Disturbances from climate change affect adjacent and downstream communities in numerous ways, including increased human mortality and illness from extreme heat and smoke, changes in water availability, and poor air quality (Gonzalez et al., 2018). Impacts from disturbances also lead to decreases in other amenities, including economic and recreation opportunities, and as noted by Schultz et al. (2013), biodiversity protection. The convergence of all these challenges, from ecosystems to communities, presents a unique challenge, and opportunity, for managers to pursue climate-adaptive forest management to support the resilience of both ecosystems and communities.

Potential adaptation strategies depend on management goals but can include re-introduction of keystone species, planting of drought-adapted species or phenotypes, assisted migration of species to new habitats, restoration and protection of watershed attributes, and reduction of erosion and hazardous fuels, which improves water quality and ecosystem resilience more generally (Halofsky et al., 2017). Different techniques are useful for different management objectives. For example, the promotion of resilient species, genetic diversity, and assisted migration have been identified as beneficial for timber production (Halofsky et al., 2017). Mechanical thinning and prescribed fire support increased resilience to wildfire and other climate-driven hazards (Hurteau et al., 2019). The US Forest Service often undertakes vulnerability assessments to support adaptation planning on national forests (Timberlake &

Schultz, 2019); these vulnerability assessments and associated adaptation workshops can be tailored for distinct groups, regions, and land management objectives. For example, the US Forest Service employs the use of the "Adaptation Workbook" and associated workshops to support managers in exploring the most appropriate climate-adaptive approaches to use, depending on their objectives and potential stressors (Janowiak et al., 2012; Swanston et al., 2016). In brief, the Adaptation Workbook follows the following framework: 1) Define location, project, and time frames; 2) Assess site-specific climate change impacts and vulnerabilities; 3) Evaluate management objectives given projected impacts and vulnerabilities; 4) Identify adaptation approaches and tactics for implementation; and 5) Monitor and evaluate effectiveness of implemented actions (Janowiak et al., 2012). As demonstrated by the USDA Forest Service, climate adaptation and climate adaptive land management practices are increasingly important and present opportunities to address climate-driven changes in forests and forest adjacent ecosystems and communities.

While managers are the implementors of climate adaptation practices, state and local governments in the US are important for facilitating climate-related efforts, particularly given a historical lack of, or variability in, the presence of federal-level policy and leadership to address climate change (Koski & Keating, 2018). States can be incubators for innovation and catalysts for change (Ray & Grannis, 2015); however, the field of study on state-level adaptation policy development and planning is limited and new, especially for natural resources. Given the lack of scholarship in this field, we sought to understand state-level climate adaptation policy as it relates to forested ecosystems, to elucidate the role that state policy could play in supporting land managers working for all levels of government.

3.2 Policy Design Theory

First, it is important to understand policy in the context of this study. According to Cairney (2020), the term policy is difficult to define as with other important terms like democracy and power. This difficulty is due to differences in perspectives and identities. Cairney (2020) discusses that policy can refer to an intent, a decision, or a desired outcome. He also notes that frameworks, theories, and other forms of conceptualizing processes can make sense of how policy is made. In the context of this research, we viewed policy to be any action made by a body of government. To understand policies (including state plans, and the imbedded and defined goals and strategies), we used a policy framework to interpret and guide our understanding. Additionally, whether a particular plan coming from the government is a policy or implementation of a policy depends on where you sit in the governance system. In this case we viewed policies from the perspective of state government. Plans they issued were policies, as perceived by the state government and intended for actors in the field. We note that some of these policies were required by higher-level federal policies and could be considered policy implementation if one were evaluating them from the perspective of the federal government.

We utilized policy design theory (see Howlett, 2019) to undergird this study. We also utilize other key sensitizing concepts to inform our investigative process (Bowen, 2006; Charmaz, 2003). We chose to investigate policy tools and how these might be translated to on-the-ground management efforts. In the policy design literature, tools are categorized into groups defined as authority, incentive, capacity building, symbolic and hortatory, and learning-based (Schneider & Ingram, 1990). For example, authority tools can direct the actions and behavior of agents at lower tiers of government. Incentives typically are financial, either positive or negative, and induce utilization, encourage compliance, and manipulate the associated costs, benefits, and

probabilities that authority bodies determine as relevant to the issue. Capacity-building tools provide agencies, communities, and individuals with support to make decisions and then carry out actions. Policy tools can be utilized in a variety of ways, together or separately, to achieve the desired policy outcomes and are deployed at varying levels of governance to influence behavior (Schneider & Ingram, 1990).

Goals refer to the intended results that the government strives to attain with a compendium of policy tools. Targets are individuals, groups, or other parties whose behavior is meant to be influenced by policy tools. Agents are the officials and organizations responsible for utilizing these instruments to implement policy goals. Policy tools often target different populations and are chosen based on the determined desired policy outcomes; they can also penalize or promote different groups depending on groups' positions in society (Ingram & Schneider, 2007). All policy tools also have implicit assumptions about how and why they will work, based (ideally) on what capacities are in place or what baseline conditions exist among policy targets (Schneider & Ingram, 1990). This includes assumptions about drivers of behaviors, capacities for implementation or enforcement, and how target groups will be affected (Schneider & Ingram, 1990). Assumptions influence both the development and the long-term implementation of policies, creating the conceptual framework of the design of policy. For instance, a policy tool or law that relies on sanctions for non-compliance will only work if the tool's implicit assumptions hold true, which in this case would be that the government can monitor or enforce behavior and that the sanctions are severe enough to discourage people from breaking the law. Effective tools require careful calibration of underlying conditions and a clear-eyed assessment of whether those tools are likely to be effective, given baseline conditions; of

course, for a variety of reasons, tools can be mismatched with targets, capacities, and other factors that may affect their success in meeting policy objectives.

A fundamental assumption of many policy tools is that the capacity exists to enforce or implement the tool. It is important to consider the capacities that exist across levels of government and among non-governmental partners as part of policy design. In the US and elsewhere, government at the national level shares management and responsibility of programs with sub-national governments (i.e., states) and increasingly with non-government actors, such as for-profit and non-profit organizations (Kettl, 2000). This requires governments to create strategies that manage accountability and expand and build capacity (Kettl, 2000). Integration of policy across jurisdictions and among varying actors is a challenge but also provides opportunity in the policy design process to leverage partnerships and collaborations (Cyphers & Schultz, 2019; Schultz et al., 2018). Successful policy design involves coherency of policy end goals (e.g., aims, objectives, and intended targets' actions) across levels of government and inter-related policy domains. Policy coherence therefore pertains to the extent to which policies are implemented by various levels of government or differing agencies within the same level of government and how they align and support each other, as opposed to conflicting or contradicting one another (Henstra, 2016). Consistency of means, such as tools and their calibrations, can also be relevant (Howlett, 2009). These concepts are important to policy design as these relationships can present challenges to the implementation of adaptation goals and objectives, or present opportunities for collaborative resource management. Intersecting jurisdictions and varying scales at which forests must be managed make cohesion and consistency critical components of the policy design and tools process (Candel & Biesbroek, 2016; Schultz et al., 2019; vonHedemann et al., 2020).

It is important to note behavioral assumptions (Schneider & Ingram, 1990) and the social construction of target populations (Schneider & Ingram, 1993). These are seminal papers on the behavioral aspects of policy design but are only a sub-sect of the policy design literature (Aguiar et al., 2023). There are other frameworks from which to view policy design, and there are examples of how policy design has been viewed critically (Cairney, 2021). In this study, we utilized the policy design literature from Howlett (2009) alongside theories about behavioral assumptions, as a conjoined framework to understand state policy and the ways in which policy might be implemented through policy targets. The long-standing role of policy design in investigating policy, and its use in similar studies, provided a foundation to investigate our own data.

3.3 Summary and Research Questions

We sought to understand how state governments in the American West were using policy tools to direct climate adaptation efforts on forested landscapes. Policy design provided a framework and lens for our investigation. We focused on two primary research questions: 1) What are the policy tools that direct climate adaptation on forested ecosystems in Washington State? and, 2) What are the perceptions of these policy tools in terms of their efficacy for pursuing climate adaptation on forested lands?

4. Methods

We first conducted a review of western states in the US that had addressed climate change in state legislation, looking for whether the state had a climate-relevant or state-level climate adaptation plan, if the state was a member of the US National Climate Alliance (US Climate Alliance, n.d.), and if identified state policies considered forests and other natural resources related to forests such as water. We also considered if states had adaptation priorities,

or guidance that could be interpreted as adaptation actions, associated with those policies. Out of the 13 western states we investigated, we selected Washington State as an exemplary case study based on our initial assessment of their 2020 Forest Action Plan[50] and their stated commitment to further state-level climate efforts through other plans and policies.

To capture the potential adaptation directive policies in Washington State, we first reviewed climate-related state-level policies and plans that existed for forested lands and determined if the goals and priorities associated with those policies could be associated with climate adaptation. Such as, if state guidance was facilitating the production of resilient tree species or increasing the use of prescribed fire (Appendix B). The identification of state climate-related policies enabled us to understand what guidance state officials and practitioners might utilize in climate adaptation efforts for forests. This was background information for our interviews.

We then relied on participant interviews to answer our research questions by asking about all policy tools associated with climate adaptation and specifically those that support any policies that they mentioned. Interviews were conducted from Fall 2021 to Summer 2022. We utilized semi-structured, voluntary, and confidential interviews to collect qualitative data. In selecting interview participants, we started with a list of key individuals and officials.

Research participants included executive-level policy experts, state agency land managers and policy decisionmakers, representatives from forest collaborative groups and NGO's, other government entities (local governments and utilities, and federal agencies), industrial forestry and the private sector, academics and practitioners from universities, and other relevant parties

[50] WSDNR. (2020). 2020 Forest Action Plan. State of Washington. https://dnr.wa.gov/publications/rp_2020_forest_action_plan.pdf

and partners (Table 3.1). To identify participants, we identified policy experts and practitioners relevant to our study during our review of policy documents; this initial group totaled 5 people. Throughout our study and during interviews, we asked for recommendations of others that they felt would be beneficial to inform our study and who were knowledgeable of forestry, land management, and climate adaptation and resilience. Our sample grew from our initial key participants to 24 interviews, at which point we stopped interviews because we were no longer receiving new recommendations. We also reached saturation in that we were no longer hearing substantial new and relevant information on our focus topic.

Table 3.1. Number of Participants in Each Category Interviewed in Washington State.

Participant Categories	Washington
State Agency	10
Collaboratives / NGO's	4
Academic / Affiliates	3
Other Key Partners	3
Private / Industrial	2
State Government	1
Federal	1
Total Participants	**24**

Our interview questions reflected our research questions and were structured to allow for a flexible inquiry (Appendix C). The interview guide was designed to systematically explore participants' current professional roles, assess their general knowledge of adaptation, evaluate their comprehension and awareness of state climate adaptation policies for forested landscapes, and elicit their perceptions regarding the efficacy of said policies. Our interview guide aided in directing interviews but allowed for variation in participant responses. Interviews were conducted over the phone or by video chat and lasted between 30 – 105 minutes (about 2 hours). Interviews were focused on participants knowledge of adaptation, involvement, and familiarity

with forest adaptation policy development, design, and implementation; and were based on our research questions. All interviews were conducted in alignment with confidentiality procedures approved by Colorado State University's Institutional Review Board.

Interviews were recorded and uploaded to the third-party platform *Otter.ai* for transcription. We reviewed transcripts in *Otter.ai* to clean interviews of errors and to remove interview identifiers. Once cleaned, transcripts were uploaded into the qualitative research platform *Dedoose*, which we used to code our data. The research team utilized both emergent codes and predetermined codes to organize the data, the latter of which were based on the primary research questions (Appendix D). The first author developed a codebook and then established intercoder reliability with three additional coders from among their colleagues to finalize a codebook (Campbell et al., 2013). We then synthesized data excerpts which informed research outcomes and results. The outcomes from this analysis produced our research results and discussion in the following sections.

5. Results

We begin this section by discussing the state-level plans and policies that interviewees said direct climate adaptation for forested ecosystems, either implicitly or explicitly, in Washington State. We then discuss our findings on the perceptions and efficacy of these policies and the associated challenges or facilitating factors that support implementation. We include selected quotes to illustrate perspectives from interviewees and denote these with a unique identifier.

5.1 Policy Tools

The policy tools most clearly related to climate adaptation in Washington State were state-level plans, a kind of information tool to guide adaptation efforts in the field. We first

identified plans that could direct climate adaptation in Washington State and these included: Preparing for a Changing Climate: Washington State's Integrated Climate Response Strategy (Adelsman et al., 2012)[51]; Washington State Wildland Fire Protection 10-Year Strategic Plan (WSDNR, 2019)[52]; 2020 Forest Action Plan (WSDNR, 2020a)[53]; 20-Year Forest Health Strategic Plan (WSDNR, 2017)[54]; and Safeguarding Our Lands, Waters and Communities: DNR's Plan for Climate Resilience (WSDNR, 2020b)[55] (Appendix B). Throughout our interviews many respondents mentioned these policies and documents that we identified in our preliminary review.

The policies most highlighted by our interviewees included the 2020 Washington Forest Action Plan, Safeguarding Our Lands, Waters and Communities: DNR's Plan for Climate Resilience, the Wildland Fire Protection 10-Year Strategic Plan, and the Washington State Department of Natural Resources 20-Year Forest Health Strategic Plan for Eastern Washington. Interviewees identified these state policies as those that were climate-directive or hazard-responsive, meaning those that reduced risk to ecosystems and communities. Though most

[51] For more information, see: Hedia Adelsman, Joanna Ekrem, Lara Whitely Binder, Kirk Cook, Kelly Cooper, Lynn M. Helbrecht, Rachael Jamison, Joyce Phillips, Paul Pickett, Carol Lee Roalkvam, Sandy Salisbury, Dan Siemann, & Pene Speaks. (2012). Preparing for a Changing Climate: Washington State's Integrated Climate Response Strategy (Publication No. 12-01-004). State of Washington Department of Ecology. https://apps.ecology.wa.gov/publications/documents/1201004.pdf

[52] For more information, see: Washington State Department of Natural Resources. (2019). Washington State Wildland Fire Protection 10-Year Strategic Plan [Second Edition]. State of Washington. https://www.dnr.wa.gov/publications/rp_wildfire_strategic_plan.pdf

[53] For more information, see: WSDNR. (2020a). 2020 Forest Action Plan. State of Washington. https://dnr.wa.gov/publications/rp_2020_forest_action_plan.pdf

[52] For more information, see: Washington State Department of Natural Resources. (2017). 20-Year Forest Health Strategic Plan: Eastern Washington. State of Washington. https://www.dnr.wa.gov/publications/rp_forest_health_20_year_strategic_plan.pdf

[53] For more information, see: WSDNR. (2020). Safeguarding Our Lands, Waters, and Communities: DNR's Plan for Climate Resilience. State of Washington. https://www.dnr.wa.gov/publications/em_climaterresilienceplan_feb2020.pdf

respondents agreed that the identified policies addressed forest health and resilience, they would not always identify these policies as directing behavior or engaging climate adaptation directly. Instead of being directly authoritative in nature, the planning documents, according to interviewees, provided a framework for implementation and guided decision-making without strong enforceable mandates. Based on our review and feedback from participants, these policies appear to function as comprehensive, strategic tools that combine elements of several types of policy tools; including the provision of information and strategic considerations, support coordination, resource allocation, and a few general metrics.

Overall, there was no consensus on whether or which state policies direct or lead climate adaptation for forests. Most respondents agreed that state policies addressed forest health and resilience, but there was no agreement on whether these policies directed managers to manage for climate adaptation. Some interviewees expressed that state plans did direct climate adaptation, and some interviewees did not, therefore it was difficult for our research team to interpret state climate adaptation guidance.

As state governments regularly collaborate and coordinate shared management with federal entities, respondents mentioned several federal policies that are beneficial to achieving climate responsive management goals. These policies included the Good Neighbor Authority (GNA)[56], Tribal Forest Protection Act (TFPA)[57], and Environmental Quality Incentives Program (EQIP)[58]. These federal policies are important for the state, according to interviewees, because they foster shared stewardship and collaborative forest management, provide financial support,

[56] For more information on The Good Neighbor Authority, see: 16 U.S. Code § 2113a – Good Neighbor Authority and Riddle, A. A. (2020). The Good Neighbor Authority. Congressional Research Service. https://crsreports.congress.gov/product/pdf/IF/IF11658/3.
[57] For more information on the Tribal Forest Protection Act, see: 118 Stat. 868
[58] For more information on the Environmental Quality Incentives Program, see: 84 FR 69280.

and resource allocation, and enhance overall beneficial outcomes for ecosystem health and resilience. These policies, from the perspective of several interviewees, help to facilitate agencies working with external parties to achieve effective and sustainable outcomes in forest management across jurisdictional boundaries.

Respondents also identified state policies that they felt could be updated to include climate adaptation or resilience. These policies included the Washington State Forest Practice Rules[59], the Sustainable Harvest Calculation[60], The Policy for Sustainable Forests[61], Washington State Department of Natural Resources Natural Areas Program, Policy on Catastrophic Loss Prevention, Washington State Habitat Conservation Plans[62,63], Riparian Forest Management Rules, and the Washington State Trust Mandate[64]. Interviewees elaborated that updates to these state policies would help land managers proactively address hazards, and it also would address policy cohesion and conflict concerns between various policies. As an example, some adaptation efforts might require forest thinning and density management. There were concerns from some participants that the "Washington State Trust Mandate," a state funding provision that requires the state to support school construction and maintenance, conflicts with the ability for

[59] For more information on The Forest Practice Rules, see: The Forest Practices Act, Title 222 WAC); RCW 76.09 – Forest Practice Rules, RCW 76.13 – Stewardship of Nonindustrial Forests and Woodlands and the Forest Practice Rules at https://www.dnr.wa.gov/programs-and-services/forest-practices and https://www.dnr.wa.gov/about/boards-and-councils/forest-practices-board/forest-practices-rules-and-board-manual-guidelines#Forest%20Practices%20Rules.
[60] For more information on the WA Sustainable Harvest Calculation, see: (RCW 79.10.300), (RCW 79.10.310), (RCW 79.10.320), (RCW 79.10.330), and (RCW 79.10.340).
[61] For more information on the Policy for Sustainable Forests, see: Washington State Department of Natural Resources. (2006). Policy for Sustainable Forests. The State of Washington. https://www.dnr.wa.gov/publications/lm_psf_policy_sustainable_forests.pdf.
[62] For more information on WA's Forest Practices Habitat Conservation Plan and associated annual reports, cumulative 5-year reports and differing Forest Practices Habitat Conservation Plan sections, see: (WSDNR, 2024b) at https://www.dnr.wa.gov/programs-and-services/forest-practices/forest-practices-habitat-conservation-plan.
[63] For more information on WA's Habitat Conservation Plans, see: Washington State Department of Natural Resources. (1997). Habitat Conservation Plan. The State of Washington. https://www.dnr.wa.gov/publications/lm_hcp_plan_1997.pdf.
[64] For more information on the Washington State Trust Mandate, see the Enabling Act of 1889: 25 U.S. Statutes at Large, c 180 p 676.

Washington forests to adapt to climate change and impacts longer-term forest resilience given requirements of timber harvest for economic production.

Federal policies that were mentioned that would benefit from an update to include climate or present barriers to implementation include the National Forest Management Act (NFMA)[65], the National Environmental Policy Act (NEPA)[66], the Endangered Species Act (ESA)[67], and the Northwest Forest Plan (NWFP)[68]. The NWFP is a key federal framework that was established through a collaborative effort between federal agencies, states, tribes, and other stakeholders to assist in managing old-growth forests and protection of critical habitat for the Northern Spotted Owl. These interviewees viewed the NWFP as a restrictive policy which does not consider climate change, and in turn impacts their ability as land managers to collaboratively work on and near NWFP landscapes to support endangered species through an adaptive forest management approach.

One government official explained:

> *Observing how hard it is on the Northwest Forest Plan forests that have the Northern Spotted Owl to navigate meeting objectives associated with species recovery, while at the same time meeting our forest resilience and climate adaptation goals...those are in conflict with one another at times… And I don't think people really want to admit that. But that seems to be where we're at. [State government official, #16]*

5.2 Tool Perceptions

This section begins with discussion of our findings on general perceptions of policies, followed by discussion of findings on capacity, measurements of success, and discrepant understandings of policy, terminology, and management goals.

[65] For more information on NFMA, see: 16 U.S.C. §§472a, 1600-1606.
[66] For more information on NEPA, see: 42 U.S.C. § 4321 et seq.
[67] For more information on ESA, see: 16 U.S.C. §§1531-1544.
[68] For more information on the NWFP, and the recent pending update, see the notice by the USDA Forest Service: 88 Fed. Reg. 87393.

5.2.1 General Perceptions of Policy Guidance

Like the differing opinions and viewpoints regarding which state plans were climate or adaptation focused, the perspectives shared related to those state policies varied. These viewpoints encompassed perceptions of how the state government intends for their plans to be used and whether agencies are actively implementing or pursuing efforts based on plan guidance. Most felt that the policies were helpful in conceptualizing resilient forest management, but not all agreed that these policies always had a direct impact as they related to climate adaptation and their work. Responses ranged from people saying they were not utilizing planning documents to a perception that there was a general lack of specificity in policy guidance. Some practitioners believe that all the policies are generally saying the same thing and that they view the policies to be more beneficial to external observers. Nonetheless, almost all respondents shared that Washington State is proactively working towards facilitating healthy and resilient forests. Exemplifying these perspectives, two interviewees from state agencies shared the following:

> *There's an assumption that things in the policy or documents are going to be done or are going to be implemented. Whether that's integrating climate change thinking in our daily decision process … there's an assumption or expectation that it's either going to be done or is being done. And, I really haven't seen that at an agency level. I can't think of any agency that's really integrated that into their daily thinking. [State agency practitioner, #27]*

> *Admittedly, I don't read the plans to guide my day-to-day decision making, or even my long-range decision making. I think part of the thing is that there are many layers of plans… They're all saying roughly the same things. I think a lot of it is already kind of part of the vernacular for us…. I think part of the reason that I don't refer to those plans more often is that we've kind of gotten to a point where we don't need to look at the instruction book to know what a good forest health project looks like anymore. We've done enough of them…Those plans are, I believe, more beneficial to external facing observers then to our internal needs. [State agency practitioner, #42]*

Most interviewees agreed that adaptation actions, or managing for resilience, increases cohesion of management efforts, and they discussed knowledge and learning across agencies

surrounding forest health and resilience. Specifically, people said adaptation work brings together parties who are interested in and willing to "do the work" (fuels management, wildfire reduction, etc.). People said adaptation illuminates the benefits and co-benefits of different types and styles of management, and there has been more cooperation between different organizations and agencies than previously before. They also say there are productive conversations seeking to address hazards and impacts, and adaptation creates a greater sense of urgency for practitioners to act, as noted by an academic interviewee:

> *One of the biggest policies being trying to…improve forest health and large-scale treatments of fuels and vegetation to facilitate forest health, reduce wildfire risk. That's been a long-standing need. Climate adaptation becomes yet another reason to potentially bring other parties interested in that and seeing the need for it and increases the cohesion around the need to do that. [Academic and/or University Extension, #37]*

Most participants agreed on which management actions contribute to and are vital in creating healthy and resilient ecosystems, and communities. Successful management actions shared by participants for resilient landscapes and communities included: prescribed fire; diversification of age class and species (i.e., through progeny selection, planting new species and assisted species migration, and using different phenotypes); thinning and forest density management; and watershed management and conservation practices. Additional tools people noted occasionally included: seed collection from hazard resilient trees; managing for habitat and wildlife conservation; managing to consider soil moisture; and wildfire management with additional fire and fuel breaks. Social adaptation actions included: climate adaptation education for forestry professionals and the public; promotion of forest and timber products; building of workforce and capacity to support adaptation efforts (technical, and skills-based); and meaningful collaboration with partners, and engagement with the public. These actions were not

all specifically mentioned or listed by every interviewee, but there was shared agreement among participants, even through differing organizations, positions, and agencies.

Interviewees viewed the state government as responsible for achieving any adaptation goals facilitated by their own plans. However, there was a common shared view that climate adaptation and resilience is a shared responsibility by all land managers and that to achieve success, all jurisdictions and managers will need to work together. The shared approach of an "all lands, all hands" was described many times.

As shared by one participant from a state agency:

> *"It's an "all lands, all hands" kind of approach, or strategy. Where they're trying to…have everybody involved to whatever degree is consistent with their management objectives." [Private and/or Industrial representative, #24]*

5.2.2 Capacity Needs

Most respondents shared that there was a need for additional capacity and support from the state to achieve adaptation and resilience outcomes. Areas of additional needed capacity included: funding to support staff and programs to facilitate adaptation and resilience (e.g., climate adaptation specialists, extension programs and foresters, resource assessments, prescribed fire training and programs, etc.); support for additional research on adaptive management and regional climate projections; and support for forest-dependent economies and workforce development (e.g., heavy equipment operators (loggers, and mills), truck drivers, silviculturists, and technicians [small business owners and industrial], and continuing education for forestry professionals). Interviewees shared the following thoughts:

> *I think capacity and funding are important. The fact that this new legislation is giving us more people and more money to invest in work seems to be out of recognition that it's a big problem—we've got a long way to go if we're going to solve it. So that makes me hopeful…You know, the states play a role as a land manager, but our own land management is often kind of been framed within the context of economic objectives. And I think there's an exciting opportunity to*

> *think about how we marry our economic objectives with…climate resilience and adaptation related goals. [State government official, #16]*
>
> *I think certainly [there needs to be] support to the agencies. I mean, they still need more capacity. And, to provide funding to cover staff time, not just additional people, but for people in existing positions to also be able to do climate resilience work within their positions so that they can implement it. I mean, a lot of these plans have great actions, but the people who would be responsible for doing those actions don't have time to do that amongst all the things that they need to be doing. I think that's one of the biggest barriers. [Academic and/or University Extension, #37]*

Though many interviewees shared that there has been increased funding and support for adaptation and resilience related work, there was a sense that many of these sources of funding were short-term and not adequate. Funding support was commonly recognized by participants as a limiting factor in their ability to achieve desired goals and objectives for the adaptation and resilience of Washington forests. The need for long-term, and sustained investments was made clear by most participants. Interviewees referred to significant state funding made available in legislation passed prior to interviews but noted that the complex structure of mandates and funding schemes for forest management in Washington left room for improvement and continued investment, which might include incentives for internal and external stakeholders to participate in advancing key goals.

5.2.3 Measuring Success

We asked interviewees how they were assessing progress and whether such assessment was required in policy. Interviewees consistently shared that they were familiar with metrics of success for forest resilience in Washington, but overall, they had difficulties naming specific metrics and objectives when asked to elaborate on them further. Interviewees did mention monitoring components that could be associated with metrics, but there was not consistent

knowledge or ability to name specific metrics, target objectives or monitoring components of adaptation policies. One academic interviewee shared:

> *I can't remember what they are exactly, but it's like "treat 1.2 million acres per year" or something like that. Maybe it's not per year, but it's like 1.2 million acres every few years or something like that. But that's stated right up in the very front of the action plan of what the goal is. [Academic and/or University Extension, #38]*

Though this interviewee noted that managers can revisit targets and metrics in the associated state plans, many said that they do not actively utilize plans in the course of their daily work and practice.

An interviewee from the private sector highlighted the critical importance for the state to invest in relevant, up-to-date data on forest inventory and climate to assist in achieving their goals. This adds to a point made by other interviewees that understanding the gaps in data and investing in assessment tools will help the state learn about what the best actions are to take in moving forward. They said:

> *I feel that to make informed decisions about the effects of climate change and what is required to mitigate the deleterious effects and to even understand how adaptation plays out, you need good information about your forests. And I, speaking from my company's perspective, we spend a lot of time and invest a lot of money in getting that data. The state has not invested a lot in that effort. They've taken approaches to do the best they can. But it's pretty lean, and not data rich. For instance, if our company was in the position of having the data that the [WA Department of Natural Resources] had, we would not be able to operate properly, at least to the standards that we feel that we need to operate. And so, good forest inventory information, forest health information is critical. The state would need to up its game to really understand where it sits with regard to climate change and its effects and what to do about it. [Private and/or Industrial Representative, #28]*

Another participant shared:

> *Just like we have economic measures of success, we could have adaptation measures of success. And, we don't have those. I don't know how many agencies have those throughout their entire agency structure or even in specific programs. But, without measures of success, and linking those measures of*

> *success with outcomes for society as a whole, so those benefits of change can be shown to directly or indirectly influence other values that people care about, I don't know how likely success will be. [State agency practitioner, #27]*

Most interviewees agreed that Washington State is still in the planning and implementation stage of addressing forest climate adaptation, and it is too early to determine if the current efforts and activities are successful. They did agree, however, that Washington is making earnest efforts to make forested landscapes more resilient to climate change.

5.2.4 Divergent Understandings of Policy, Terminology, and Management Goals

We found that people had divergent understandings of policy, terminology, and management goals for adaptation actions for forests. Interviewee perspectives indicated that there is disagreement surrounding the foundation of adaptation policy. Some interviewees expressed that there was an expectation that ecosystems will revert to their "natural" state over time after management efforts are completed. However, the managers who shared this view emphasized that managing for climate change and pursing climate adaptation will be an on-going effort and will not solely be completed after "treating the acres" or after the completion of any state plan or project. Interviewees shared adaptation will be responding to on-going and future changes in natural conditions and hazards.

Within a subset of our participants, a few of them noted the presence of an assumed consensus regarding the scope and definition of climate adaptation and resilience. This result highlights a presumption in the policymaking and practitioner community, an underlying assumption of shared comprehension and knowledge of adaptation. Additionally, some interviewees challenged the assumption that all adaptation challenges for Washington forests arise from climate-related factors, which suggested the need to consider the broader spectrum of influences that impact resilient forests, such as the impacts of historical management rules and

practices. These perspectives were shared across interviewees when we asked about success or challenges that assisted or hindered the implementation of climate adaptation actions.

Some interviewees expressed frustrations related to management efforts, including prescribed fire, assisted species migration, and forest density management. Consensus and support for these actions varied among interviewees, who recognized and acknowledged their importance. However, interviewees noted concerns and barriers to the application of these actions. Perceived barriers to the adaptation action of prescribed fire included concerns about smoke impacts on the health and tourism of adjacent and downstream communities, constraints on liability and implementation capacity, limitations associated with acceptable burn windows, restrictions on who and how they can burn acres, and limited access to prescribed fire training. Barriers to density management included perceived conflicts with removing trees from the landscape and the social impacts to management support. Interviewees discussed actions resembling assisted species migration, but they would not always describe them as such. There is interest in assisted migration activities, but state policies are not perceived to currently support these efforts. Private and industrial landowners do seem to be engaging in this work, as indicated by one interviewee with experience working with a diverse range of landowners:

> *When we talk with people about assisted migration, and the concerns we might have, you hear from local landowners that they've done it for the past 10 years. They started planting very different species without guidance, basically, but on a hunch. I think locally, you see the practice being more advanced in small landowners rather than larger landowners. They move faster. So… the whole discussion about the ethics of ecological changes, or assisted migration, we've had those discussions five or six years ago. Many of the people who are now involved in the discussions about assisted migration are not really concerned about the ethics anymore. It's surprising to me, but you don't hear that as much… we've largely heard from vital participants that it's important to do adaptation and assisted migration to not lose the cultural resources that are important [State agency practitioner, #26].*

The need to undertake adaptation and resilience-focused forest management actions was an area where there was consistent agreement and consensus. However, despite the acknowledged significance and role of actions such as prescribed fire, assisted species migration, and density management, some interviewees expressed the need for extra precautionary considerations regarding the use of these actions in management. Interviewees emphasized the need for pre- and post-activities that would need to be made for these actions to be considered before, during, and after implementation. As the implementation of actions is what facilitates adaptation, it is important to share that these actions were noted as presenting potential challenges.

6. Discussion

6.1 Summary

In this study, our primary objective was to understand the state policies that facilitate climate adaptation actions for forest management in Washington State. We aimed to illustrate how practitioners translate these state policies into practicable and effective adaptation efforts. Our findings reveal a tapestry of nuanced perspectives, that are occasionally divergent among stakeholders, contributing to the intricate landscape of state climate adaptation policy for forested landscapes in Washington State.

Our findings revealed a varied grouping of state-level policies that could promote or direct climate adaptation and resilience on forested landscapes in Washington State. While we considered state plans to be the leading state policies on climate change, participants shared a lack of consensus on whether state policies specifically fostered adaptation or resilience. Our research respondents recognized state policies as working to facilitate a state response to hazards.

Participants recognized the need to update state policies to be holistic and include defined climate change and climate adaptation considerations throughout.

In addition, our study explored the perceptions and presumed efficacy of these policy tools along with their associated internal instruments. Research insights highlighted the nuanced understandings of state policy as it relates to climate adaptation, the identification of capacity needs, a recognition and need for clear and coherent measurements of success (including monitoring and evaluation), and illuminated discrepant understandings of policy, terminology, and management goals. Findings included a general perception that state policies do facilitate resilient forest systems, but interviewees would not always describe management as adaptation related. Interviewees agreed on and supported the actions that facilitate forest adaptation, such as diversification of age class and species (i.e., through progeny selection, and using different phenotypes) and wildfire management, as they viewed them as contributing to a healthy and resilient system. Participants also agreed that adaptation actions and managing for resilience increases cohesion of management goals and actions. Research respondents agreed that the state government is responsible for achieving any adaptation goals or objectives that were facilitated by state plans but acknowledged the importance of the "all lands, all hands" approach. A shared need for additional capacity and support from the state to achieve adaptation and resilience outcomes was discussed, including increased funding and support for adaptation and resilience related workforce and work. Participants shared that there was a sense that many of these sources of funding were short-term and inadequate. Participants had difficulty naming specific metrics of success and objectives for forest adaptation. Overall, there was not a consistent knowledge and ability to name target objectives or monitoring components of state policies. Some interviewees

expressed frustrations related to management actions, but there was shared agreement about adaptation actions that facilitate resilient forests.

6.2 From the Lens of the Literature

Our research team initially reviewed state plans as potential authority tools that direct Washington State's response to climate impacts to forests and natural resources. We found through participant interviews, however, that these tools are viewed as and mostly function as symbolic communication and informational devices (Schneider & Ingram, 1990). State plans provide opportunities for the implementation of learning and communication of guidance to support land management activities but offer minimal descriptions of determined monitoring and evaluation components. Given participant responses that they do not always utilize these plans as directing management actions, and that there are minimal enforceable metrics, we determined that state plans provide an idealistic outline of state goals and provide information on how the state intends to reduce resource and community risk and hazards.

In consideration of the five general adaptation stages (awareness, assessment, planning, implementation, and monitoring and evaluation) (Lempert et al., 2018), Washington State appears to be aware of and have assessed the potential hazards due to climate change and other influencing factors. Though state plans mostly function as communication and informational tools, the state is working to facilitate actions that reduce hazardous risks to landscapes and communities. Our assessment determines that Washington has not yet successfully implemented the described actions in their plans, and that there is a need for more thoroughly integrated, and facilitated, monitoring and evaluation components that focus on both outcome- and process-based approaches.

It became evident that as communication and informational tools, the state policies were viewed as ambiguous in how they planned to achieve climate adaptation of forested lands from the participant perspective (i.e., lack of clear, measurable, and targeted indicators and metrics). This ambiguous approach created an inconsistent understanding of state policies and fostered a general lack of consensus of objectives and adaptation actions. As Dupuis and Knoepfel (2013) describe from Hupe (2011), policies are often not realized because of obstacles in the implementation process. This "implementation deficit" in adaptation creates a scenario where a policy becomes more symbolic than solving a problem (Dupuis & Knoepfel, 2013). Ford et al. (2013) highlight approaches that seek to solve how to track adaptation progress due to its complex nature and uncertainty. A key to evaluating adaptation policy implementation, they argue, is highlighted in both outcome (metrics measured over time, and quantification of progress) and process-based approaches (not dependent on visible outcomes) (Ford et al., 2013). A few of the state policies we reviewed, but not all, included both outcome- and process-based goals and strategies; however, real evidence of the implementation of those goals and strategies were missing from participant interviews. The divergent understandings of state policy, terminology, and the management goals and strategies of planning documents, which were effectively intended to facilitate climate action and potential adaptation actions in the state, highlight the need for specific, clear, and direct holistic metrics to promote greater clarity and accountability. Without the incorporation of effective monitoring components or other accountability measures, whether outcome or process-based (Ford et al., 2013), the execution of adaptation actions risks becoming ambiguous and creating an implementation deficit (Dupuis & Knoepfel, 2013). In turn, whether there is cohesion and coherence among policy end goals and

means remains to be determined (Howlett, 2009), as does if policy targets were effectively collaborated and communicated with.

Many respondents shared that they were engaging with diverse landowners on forest resiliency, and that there was education for external partners; however, internal participants did not always deeply discuss education as it relates to climate adaptation for forests. If the intent for the state is to facilitate an "all lands, all hands" approach, there first needs to be internal consensus and alignment on goals and objectives, and metrics of success which include clear, coherent, and measurable targets. The Northern Institute of Applied Climate Science (NIACS) facilitates workshops, seminars and trainings which assist diverse stakeholders in incorporating climate change considerations into natural resource management (NIACS, n.d.). The state of Washington could use an expert cross-boundary facilitator like NIACS or provide additional funding and capacity to their own Washington State Extension Forestry Program to assist in internal cohesion, learning, and capacity-building needed to meet their goals. Participants in our study shared that adaptation actions had already created education and knowledge exchange when they could engage with their internal partners. A formal workshop or series of workshops designed to facilitate this learning in a holistic manner internally will be beneficial.

State plans add value as they outline overarching objectives and priorities for the state. However, through interviews, we learned that there was a need for cross-agency collaboration and alignment. Without these overarching state plans, it is difficult to envision a scenario where there would be an alignment of differing agency goals and objectives and how to facilitate resilient forests across state agency boundaries. Plans in addition to a mix of tools, and appropriately calibrated across various levels and agencies of state government, could be highly effective in achieving state objectives. For example, respondents noted the need for funding and

legislative incentives for adaptation-related work. Additional funding incentives relevant to target populations could be added to policy considerations for effective forest adaptation. For example, funding direct support and incentives for forest-dependent economies and workforce development (e.g., heavy equipment operators (loggers, and mills), truck drivers, silviculturists, and technicians) could provide longer-term stability to resilience actions and facilitate social co-benefits in forest-dependent communities. Facilitating support for adaptation research could assist the state in addressing data gaps and could provide capacity for adaptation actions.

While some policies mentioned equity, most notably in 'Safeguarding Our Lands, Waters and Communities: DNR's Plan for Climate Resilience' by the Washington State Department of Natural Resources (WSDNR, 2020b), respondents did not significantly emphasize or were familiar with state equity and environmental justice targets. A few interviewees discussed state efforts but expressed the need for more substantial actions. Most respondents lacked awareness of the state's engagement with Tribal governments or underserved communities, except where mandated by law or where they were implementing equity through their own role. Recent discussions and literature highlight the importance of environmental justice in natural resource policy and adaptation planning. Juhola et al. (2022) defines just climate adaptation as "adaptation planning and implementation, which 1) recognizes past and current disadvantages in society, 2) identifies the potential unequal way in which climate impacts and costs and benefits of adaptation measures are distributed, 3) is based on inclusive processes throughout planning, implementation, monitoring, and evaluation, and 4) restores past inequalities through adaptation." The USDA Forest Service (2022) recognizes vulnerabilities and disproportionate impacts in the *USDA Forest Service Climate Adaptation Plan*, emphasizing the delivery of environmental justice as a key objective. Our findings underscore the need for significant growth

in Washington State's incorporation of measurable equity and environmental justice targets into forest policy and planning efforts.

Based on our study and the literature, we recommend the following steps for Washington State to improve their policies for forests and adjacent lands and resources: 1) revisions to all relevant state policies for forests and adjacent resources to include climate change and climate adaptation considerations (including preparing for future climate scenarios); 2) alignment of state strategic plans and documents to provide cohesion and clarity on adaptation goals and objectives relevant to forest management; 3) coherent, clear, and measurable metrics and targets, including robust monitoring and evaluation components (both outcome-based and process-based); 4) strengthen existing management partnerships and networks to facilitate adaptation collaboration across management ownerships and jurisdictions, while sharing targets and objectives, and providing increased capacity and support (sharing data, funding support, etc.); and 5) cultivating partnerships based on reciprocity with historically excluded and marginalized communities center environmental justice and equity to empower partners to achieve adaptation activity success and to avoid maladaptation.

By aiming for consistency and revising all forest relevant plans and policies to include climate responsive actions such as adaptation, the state of Washington can enhance the overall effectiveness and efficacy of their efforts, which will create a cohesive and more synergistic approach to achieving their desired outcomes for ecosystem and community resilience.

6.3 Implications for Policymakers

Our findings illuminate critical insights for state leaders and decisionmakers, as well as federal policymakers, to consider in the development of future forest-related climate adaptation policy. These findings support directive policies which are coherent and consistent (Howlett,

2009). The importance of a well-crafted, targeted, and informed adaptation policy includes a thorough and thoughtful engagement with the policy design process. As the federal government increasingly shares management with states and for-profit and non-profit organizations (Kettl, 2000), tools should be crafted through collaboration and calibrated to work across differing levels of governance (Howlett, 2019). Collaboration among federal land management agencies, state governments and agencies, partner organizations and communities to determine state, regional and local adaptation actions could increase the ability for cross-boundary alignment and provide support for the implementation of adaptation actions.

6.4 Implications for Practice

This study and the research outcomes exhibit the importance of understanding policy design and implementation, particularly in designing a cohesive, efficient, and effective response to the changing climate. The outcomes of this research demonstrate the relevance of goal clarity and policy consistency, and the inclusion of capacity-building instruments, metrics, and incentives. The impact of inadequate or ambiguous desired outcomes and the need to consider attending assumptions about policy target communities are also highlighted. Based on our findings, we contend that desired adaptation outcomes for Washington forests will be most successful if climate goals and objectives for forests are consistent throughout all relevant state policies. Success will be more likely if: policies include climate and climate adaptation considerations; there are coherent, clear, and measurable targets and metrics; and states develop stronger capacity-building partnerships with diverse landowners.

6.5 Study Introspection

Finally, we note that there remains little research on how states are facilitating climate adaptation activities (Koski & Keating, 2018; Ray & Grannis, 2015), specifically, for forested

landscapes and natural resources. In planning for and determining future land management activities, states must understand the impact of policy design in the creation and implementation of climate adaptation activities. Our study highlights the necessity of future research endeavors that are dedicated to understanding how state governments engage with and cultivate relationships with individuals and organizations (state and federal agencies, local municipalities and utilities, non-profits, for-profit organizations) who own, inhabit, work in, and manage forests across diverse boundaries, jurisdictions, and ownerships. Subsequent research could contribute to expanding our knowledge of adaptation goals across ownerships, demographics, and communities. Additionally, research could illuminate the extent to which regional and local community efforts are supported through state policy. This study assists in building the research and literature in this novel and developing area.

Due to the time constraints of our own research and the inherent complexity of developing relationships of trust and reciprocity, our study was limited in its ability to include perspectives from private landowners, forest-dependent communities, and other historically underserved or marginalized demographics. We recognize that the thoughtful incorporation of these communities, and others, is of paramount significance within the realm of climate adaptation research, given that these communities experience the burden of climate change the most. Ensuring the representation of such communities is essential for achieving positive outcomes and avoiding maladaptation.

Additionally, data collection for this project was conducted during the COVID-19 pandemic. We contacted and conducted interviews during a time when interviews could only be completed through phone or video chat. Given limited connectivity to some of the communities that potential respondents lived in, and the limited capacity of interviewees during the pandemic,

we hypothesize that in-person interviews might have provided additional valuable insights. Data collection for this project was also performed from Fall 2021 to Summer 2022, prior to the implementation of significant funding from federal legislation, such as the Inflation Reduction Act (IRA)[69], and federal plans and policies such as the USDA Forest Service Climate Adaptation Plan[70] (USDA Forest Service, 2022) and the National Climate Resilience Framework[71] (The White House, 2023). Since the completion of this study, there have also been pertinent developments in federal and Washington State policy related to this project. An updated investigation of the policy changes could provide longer-term insights into how adaptation policies change and develop over time. One example of a policy change is the proposed update by the USDA Forest Service for Region 5 and Region 6 (California, Oregon, and Washington) for a Forest Plan Amendment for Planning and Management of Northwest Forests Within the Range of the Northern Spotted Owl[72]. We recommend ongoing research to understand how recent federal legislation and policies are supporting state climate adaptation actions and directing tools for implementation through state collaboration. Following federal and state policy updates will help facilitate expanding the novel and interesting field of climate adaptation research. Additionally, understanding how adaptation policies are viewed and utilized by policymakers, land managers, and other partners or stakeholders will be helpful in creating

[69] For more information on IRA, see: United States Congress. (2023). H.R. 812 (IH) - Inflation Reduction Act of 2023. [Government]. U.S. Government Publishing Office. https://www.govinfo.gov/app/details/BILLS-118hr812ih
[70] For more information on the USDA Forest Service Climate Adaptation Plan, see: USDA Forest Service. (2022). USDA Forest Service Climate Adaptation Plan. https://www.usda.gov/sites/default/files/documents/4_NRE_FS_ClimateAdaptationPlan_2022.pdf
[71] For more information on the National Climate Resilience Framework, see: The White House. (2023). National Climate Resilience Framework. The White House. https://www.whitehouse.gov/wp-content/uploads/2023/09/National-Climate-Resilience-Framework-FINAL.pdf
[72] 88 FR 87393 – Region 5 and Region 6; California, Oregon, and Washington; Forest Plan Amendment for Planning and Management of Northwest Forests Within the Range of the Northern Spotted Owl

beneficial and consistent domestic adaptation actions across ownerships for large landscapes and communities.

Outside of the US, international efforts for climate adaptation and resilience are being supported by frameworks such as PREPARE[73] (The White House, 2022), President Biden's Emergency Plan for Adaptation and Resilience abroad. Understanding domestic natural resource and environmental adaptation and resilience achievements in the US can be shared in international scenario planning and can contribute to learning and knowledge exchange in the field of climate adaptation.

[73] For more information on PREPARE, see: The White House. (2022). Prepare Action Plan. The White House. https://www.whitehouse.gov/wp-content/uploads/2022/09/PREPARE-Action-Plan.pdf

CHAPTER 4 – CONCLUSION

This thesis explored state climate adaptation policy for forested and forest-adjacent landscapes, focusing on the case study states of Colorado and Washington State, in the context of policy design theory. The objectives were to: (1) characterize state-level natural resource adaptation goals and objectives for forests and how these efforts are implemented by state agencies and with other actors (e.g., collaborative groups and NGO's, other government entities, industrial and private forestry, etc.); and (2) analyze the policy design utilized to address climate hazards through climate adaptation for forested landscapes. I addressed these objectives through qualitative analysis using semi-structured interviews with participants and representatives from state executive-level offices, federal and state land managers, local government and utilities, private and industrial forestry entities, collaborative groups and NGO's, academics from universities, forestry-related professionals, and other key partners.

In Chapter 2, I discussed the overall findings for research objective one through a practitioner report intended for relevant interested parties including state policymakers and agencies, federal agency collaborators, local governments and utility land managers, collaborative groups, private and industrial forestry entities, and other key partner groups. Our study identified potential state plans that could provide state guidance on climate adaptation actions and forest management activities. Through interviews, we identified the perceived climate impacts in Colorado and Washington State, characterized the state policies and planning documents that participants identified as managing for climate and adaptation, and assessed other important and relevant perspectives on challenges to the implementation of adaptation efforts.

In Chapter 3, an article intended for submission to a peer-reviewed journal, my co-author and graduate advisor Dr. Schultz and I utilized a policy design framework to analyze the climate adaptation policies for forests in Washington State. We elaborated on the findings from Chapter 2 with a specific focus on Washington State. Utilizing the framework of policy design, we expanded on the relevant policy tools for forest adaptation and identified challenges to the implementation of climate adaptation efforts in the state. This research serves to inform policy and decisionmakers in how climate and adaptation policies are facilitated through state policy and how practitioners interpret and utilize state-led guidance. Further, we discuss the importance of equity and environmental justice in state climate and adaptation efforts. Future research can expand upon understanding how state governments are engaging and cultivating relationships with individuals and organizations who own, inhabit, work in, and manage forested landscapes, and how states are measuring success through monitoring and evaluation components. We also recommend ongoing research to understand how recent federal legislation and policies are supporting state climate adaptation actions and directing tools for implementation through state collaboration. Following policy updates will help facilitate expanding the novel and interesting field of climate adaptation research. Additionally, we contend that research in this area could expand our knowledge of the differing or similar adaptation goals that exist across ownerships, demographics, and communities. Subsequent research could further explore how regional and community efforts are supported through state policy in this developing and novel area.

My research offers valuable perspectives from state government officials, federal and state land managers, local government and utilities, private and industrial forestry organizations, collaborative groups, academics from universities, forestry-related professionals, and other important partners. Though my research had informative insights, there are limiting factors. This

study focused on only two states to analyze state-led climate and adaptation efforts for forests. Due to the COVID-19 pandemic and the limited capacity of government offices and key participant communities, I may have missed some individuals' perspectives if they did not respond to my initial outreach. Additionally, due to the limited virtual and remote connectivity to some stakeholder communities, there could have been a greater response if in-person interviews were allowed at the time. Due to the time constraints in conducting a master's level research project, I was not able to build relationships of trust or reciprocity with key partner communities. Given the importance of underserved and historically marginalized communities in adaptation and resilience efforts, representation and inclusion of these communities is important to incorporate in future research efforts. Lastly, my research approach for this project utilized a qualitative research design. As Lempert et al. (2003, p. 3) state, "long-term policymaking takes place when the menu of near-term policy options considered by decision-makers and the choices they make from that menu are significantly affected by events that may occur 30 or more years into the future." Future research could incorporate a mixed-tool approach utilizing quantitative policy analysis such as long-term policy analysis (LTPA) to help systematically investigate policies and assist in managing biases and flaws in the research process (Lempert et al., 2003). This framework, and other similar quantitative approaches, are not without flaws but could allow for a multi-dimensional approach to understanding the complex interactions of policy decision-making and an uncertain future.

Future research should expand on understanding the knowledge gaps that exist in state-related climate adaptation and resilience policies, including how recent federal legislation and policies influence state climate adaptation efforts and implementation of adaptation actions for forests. Additionally, continuing to investigate how adaptation is viewed and utilized by

policymakers, land managers, and other partners will be helpful in creating cohesive and beneficial actions across all ownerships and jurisdictions in the future. Since the completion of this study, there have been pertinent developments in both Colorado and Washington State related to the results of this project. An updated investigation of the changes in each state could provide longer-term insights into how adaptation policies change and develop over time. One example of a policy change is the proposed update by the USDA Forest Service for Region 5 and Region 6 (California, Oregon, and Washington) for a Forest Plan Amendment for Planning and Management of Northwest Forests Within the Range of the Northern Spotted Owl[74]. Following state and federal policy updates will help facilitate expanding the novel and interesting field of climate adaptation research. For a comprehensive approach, it is vital for differing levels of government and partners to collaborate to ensure the success of adaptation and resilience efforts. Additional research could illuminate the extent to which local, regional, and community efforts, particularly those that have been historically underrepresented, are supported through state policy, such as through capacity-building, learning, and innovation tools.

Thoroughly exploring the complex intersection of state policy, climate adaptation, and policy design offers insights into the management of forested and forest-adjacent lands. As it remains unclear what variables shape how states are developing climate adaptation policies (outside of impacts from hazards) and implementing them, there are many other contributing areas of theory and research questions to be explored in this field. I hypothesize that utilizing a mixed-method approach and incorporating quantitative policy analysis, such as LTPA (Lempert et al., 2003), would be beneficial to illuminate additional insights and expand this area of study. As multi, trans, and interdisciplinary collaboration becomes more relevant to address wicked

[74] 88 FR 87393 - Region 5 and Region 6; California, Oregon, and Washington; Forest Plan Amendment for Planning and Management of Northwest Forests Within the Range of the Northern Spotted Owl

environmental and social challenges posed by climate change, using dynamic and creative processes and analyses allows for a more holistic approach that enables long-term, adaptive, and inclusive research and policy outcomes. This process should enable future researchers to explore an ever-evolving policy landscape from a systems-enabled approach from differing fields. Continued research in this growing field will benefit and foster a responsive and future's thinking approach in land management decisions.

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APPENDIX A – COLORADO POLICY REVIEW

Policy	2020 Colorado Forest Action Plan	2020 Colorado Resiliency Framework	Colorado Climate Plan: State Level Policies and Strategies to Mitigate and Adapt	The Colorado Water Plan
Year	2020	2020	2018	2015
Plan Themes / Vision	1. Forest Conditions 2. Living with Wildfire 3. Watershed Protection 4. Forest Wildlife 5. Urban and Community Forestry 6. Forest Products (pp. 4-5)	1. Adapting to Our Changing Climate 2. Understanding Risks from Natural and Other Hazards 3. Addressing Social Inequities and Unique Community Needs 4. Pursuing Economic Diversity and Vibrancy (p.13)	1. Water (p.7) 2. Public Health (p.17) 3. Energy (p.25) 4. Transportation (p.37) 5. Agriculture (p.49) 6. Tourism and Recreation (p.57) 7. Ecosystems (p.63) 8. Partner Efforts (p.71)	1. Colorado's Legal and Institutional Setting (p.2:1) 2. Overview of Each Basin (p.3:1) 3. Water Supply (p.4:1) 4. Water Demands (p.5:1) 5. Water Supply Management (p. 6:1) 6. Water Resource Management and Protection (p. 7:1) 7. Inter-basin Projects and Agreements (p. 8:1) 8. Alignment of State Resources and Policies (p. 9:1) 9. Critical

				Action Plan (p. 10:1) 10. Updating Colorado's Water Plan (p. 11:1)
Adaptation/ Resilience Defined	Adaptation not defined. Resilience defined in table on p. 20 as, "Accommodates some degree of change » Return to prior condition after disturbance." Adaptive management defined. On p.33 as, "Adaptive management is a structured, iterative process for decision making to reduce uncertainty through structured hypothesis testing and monitoring of outcomes. This approach supports decision making that meets resource management	"The ability of communities to rebound, positively adapt to, or thrive amidst changing conditions or challenges including human-caused and natural disasters — and to maintain quality of life, healthy growth, durable systems, economic vitality, and conservation of resources for present and future generations." — Colorado House Bill 18-1394 (p.1)	"Adaptation planning at the local, state, and national levels can limit the damage caused by climate change, as well as reduce the long-term costs of responding to the climate-related impacts that are expected to grow in number and intensity in the decades to come." (p.54) Adaptation and resilience were not clearly defined elsewhere in the plan.	"Resilience of a stream or watershed can be measured as an ecosystem's ability to recover function after a disturbance, whether acute or chronic." (p.8-16) Adaptation and resilience were not clearly defined elsewhere in the plan.

	objectives while simultaneously accruing information to improve future management (as defined by the U.S. Forest Service)."			
Goals and Outcomes	1. Identify areas of greatest need and opportunity for forests. Based on this, three of the six themes were selected to develop a priority composite map for Colorado: forest conditions, living with wildfire and watershed protection. (p.19)	1. Identify and mitigate risk to Colorado communities. (p.8)	Water: 1. Water Supply (p.7) 2. Water Demands (p.9) 3. Water Quality (p.11) 4. Extreme Events (p.12)	1. Meet the Water Supply Gap (p. 1:12)
Goals and Outcomes (continued)	2. Develop a long-term strategy to address areas of greatest need and opportunity. The CSFS action plan team worked across the five	2. Enhance resiliency planning and capacity in Colorado communities through equitable engagement and regional collaboration. (p.8)	Public Health: 1. Actions to Mitigate Greenhouse Gas Emissions (p.17) 2. Colorado Greenhouse Gas Inventory (p.19) 3. Climate Change	2. Defend Colorado's Compact Entitlements (p.1:12)

	CSFS divisions: Administration, Communications and Communities, Forest Planning and Implementation, Forestry Services, and Science and Data, as well as with partners across the state to achieve this goal. (p.19)		and Air Quality (p.20) 4. Vector-borne Disease (p.21) 5. Public Health Aspects of Emergencies and Disasters (p.21)	
Goals and Outcomes (continued)	3. The 2020 Colorado Forest Action Plan highlights statewide, cross-theme resource strategies that will be implemented to address goals in priority subwatersheds, as well as the gap between existing and necessary programs needed to achieve these goals. (p.19)	3. Develop, align, and streamline policies to empower resiliency. (p.8)	Energy: 1. Electricity Generation (p.26) 2. Electricity Demand (p.29) 3. Water-Energy Nexus (p.30) 4. Energy Production (p.31)	3. Improve Regulatory Processes (p.1:12)
Goals and Outcomes (continued)		4. Create a culture of diversity, inclusivity, and	Transportation: 1. Land-based	4. Explore Financial

		equity that fosters resiliency, engagement, holistic solutions, and an inherent sense of responsibility to one's community. (p.8)	Transportation (p.38) 2. Air Transportation (p.41) 3. Mitigation (p.42) 4. Adaptation (p.44)	Incentives (p.1:12)
Goals and Outcomes (continued)		5. Ingrain equity and resiliency into investments in Colorado. (p.8)	Agriculture: 1. Irrigation (p.49) 2. Production (p.51) 3. Soil Health and Conservation (p.53)	
Goals and Outcomes (continued)			Tourism and Recreation: 1. Summer Recreation and Tourism (p.58) 2. Winter Recreation and Tourism (p.59) 3. Mitigation (p.59)	
Goals and Outcomes (continued)			Ecosystems: 1. Forest Health and Wildfire (p.64) 2. Fish and Wildlife (p.66)	

Goals and Outcomes (continued)			Partner Efforts: 1. Local Communities (p.71) 2. Colorado Business Community (p.75)	
Priorities and Strategies	*Forest Conditions*: 1. Keep Forests as Forests (p.31) 2. Improve Forest Productivity (p.31) 3. Promote Adaptive Management (p.33)	*Future-Ready Economy and Workforce*: Fortify Colorado's workforce to support a future-ready, regenerative, circular economy. (p.51)	**Water*: 1. Promote and encourage water efficiency and/or conservation at the local and state agency level. 2. Encourage water providers to do comprehensive integrated water resource planning, geared toward implementing the best practices at the higher customer participation levels to achieve state endorsement of projects and financial assistance. 3. Support water sharing agreements where feasible and cost effective. 4. Explore options to increase reuse of fully consumable water. 5. Encourage opportunities for reservoir... (p.13)	*Supply-Demand Gap*: Colorado's Water Plan sets a measurable objective of reducing the projected 2050 municipal and industrial gap from as much as 560,000 acre-feet to zero acre-feet by 2030. (p. 10:5)

Priorities and Strategies (continued)	*Living with Wildfire*: 1. Promote Community Fire Adaptation (p.37) 2. Reduce the Risk of Uncharacteristic Wildfire (p. 38) 3. Promote the Role of Fire in Ecological Processes (p.39)	*Climate and Natural Hazard Resiliency*: Reduce Colorado's risk from climate change and natural hazards through integrated land use, ecosystem, and natural resource planning, management, and investment. (p.55)	**Public Health*: 1. Coordinate with the Public Utilities Commission, the CEO, and additional stakeholders to develop and implement a Colorado-specific plan to substantially reduce carbon dioxide emissions from fossil fuel fired EGUs, in accordance with the EPA's Clean Power Plan. 2. By 2016, adopt an ozone State Implementation Plan with sufficient control measures to demonstrate attainment of the current ozone standard by 2017. 3. Fully implement Colorado's 2014 oil and gas emission regulations, evaluate the resulting reductions of methane and other pollutants, and evaluate potential refinements to those regulations. (p.22)	*Conservation*: Colorado's Water Plan sets a measurable objective to achieve 400,000 acre-feet of municipal and industrial water conservation by 2050. (p. 10:5)

Priorities and Strategies (continued)	*Watershed Protection*: 1. Improve and Maintain Water Quality and Quantity (p.43) 2. Improve Resiliency of Critical Water Infrastructure (p.43) 3. Sustain or Restore Fundamental Ecological Functions for Watershed Health (p.45)	*Building and Infrastructure Sustainability*: Reimagine and modernize Colorado's built environment to be both climate and hazard resilient and environmentally sustainable. (p.57)	**Energy*: 1. Assure the timely and complete attainment of the state's RES 2020 goals. Assist all utilities (investor-owned, municipal, and cooperative) in identifying and implementing best practices for integrating cost-effective renewable resources, both utility-scale and distributed. 2. Assist all electric utilities in incorporating all feasible energy efficiency activities into resource planning and EPA air quality compliance plans. 3. Integrate cost-effective water savings into all energy efficiency programs administered by the state. 4. Engage with energy companies to encourage and promote the most water-efficient technologies for energy extraction. 5. Encourage	*Land Use*: Colorado's Water Plan sets a measurable objective that by 2025, 75 percent of Coloradans will live in communities that have incorporated water-saving actions into land-use planning. (p. 10:5)

			energy companies to continue collaborating with agricultural and environmental interests when managing their water portfolio. (p. 32)	
Priorities and Strategies (continued)	*Forest Wildlife*: 1. Conserve, Enhance, and Protect Critical Habitat (p.49) 2. Integrate Habitat Considerations into Forestry Activities (p.50) 3. Increase Public Understanding of the Connections Between Forestry and Habitat (p.50)	*Agriculture and Food Security*: Cultivate a robust state and local food system — from agriculture to distribution and consumption. (p.60)	**Transportation*: 1. Promote and encourage fuel-efficient vehicle technologies and programs to reduce vehicle emissions. 2. Encourage local, state, and federal entities to assess climate-related risks to transportation systems and take action to improve their resilience. 3. Improve communication, data sharing, and collaboration between local, state, and federal entities related to climate change mitigation and adaptation programs and activities for transportation. 4. Work to promote education of the traveling public on	*Agriculture*: Colorado's Water Plan sets an objective that agricultural economic productivity will keep pace with growing state, national, and global needs, even if some acres go out of production. To achieve this objective, the State will work closely with the agricultural community, in the same collaborative manner that has produced agricultural transfer pilot projects, to share at least 50,000 acre-feet of agricultural water using voluntary alternative transfer

			the impacts of GHGs associated with transportation while concurrently educating and training local, state, and federal entities and their staff on climate change adaptation concepts and strategies. (p.45)	methods by 2030. (p. 10:5)
Priorities and Strategies (continued)	*Urban Forestry*: 1. Promote the Role and Infrastructure Development of Urban and Community Forests to Advance Public Health, Wellness, and Safety (p.55) 2. Promote and Increase Public Awareness, Leadership Diversity and Equity Within the Urban Forestry Community (p.55) 3. Improve and Enhance Ecosystem Health and Biodiversity for Long-term Resilience by	*Housing Attainability*: Increase the supply of attainable housing throughout Colorado, including affordable housing options for workforce populations and those who most experience marginalizing. (p.63)	*Agriculture*: 1. Promote increased water storage solutions that help producers adapt to changing conditions and decrease production losses due to lack of water availability. (p.53) 2. Partner with research institutions and federal agencies to support producers' efforts to mitigate and adapt to climate change through improved irrigation efficiency and enhanced tillage practices. 3. Support federal and state programs that improve soil health, such as by increasing soil organic carbon and sequestration,	*Storage*: Colorado's Water Plan sets a measurable objective of attaining 400,000 acre-feet of water storage in order to manage and share conserved water and the yield of IPPs by 2050. This objective equates to an 80 percent success rate for these planned projects. (p. 10:6)

	Integrating Urban and Community Forest Management, Maintenance and Stewardship Into All Scales of Planning (p.56)		promoting long-term research into land management practices that build soil health, and examining state and local land-use policies that reduce soil erosion on arable lands. (p.53)	
Priorities and Strategies (continued)	*Wood Products*: 1. Maintain and Develop More Resilient Industry Capacity Required to Meet Forest Management Needs (p.61) 2. Increase the Number of Forested Acres Treated Annually Through Cost Offsets of Increased Utilization (p.61)	*Community Capacity*: Empower and support Colorado communities to improve local resilience, equity, and capacity. (p.66)	**Tourism and Recreation*: 1. Partner with federal and local agencies to preserve and protect forest health and wildlife habitat, and to reduce wildfire risk. 2. Examine National Park Service climate preparedness activities for possible collaboration. 3. Frequently update a strategic marketing plan for the tourism industry that addresses natural hazards and climate change. 4. Encourage diversification of activities at recreational areas statewide... (p.61)	*Watershed Health, Environment, and Recreation*: Colorado's Water Plan sets a measurable objective to cover 80 percent of the locally prioritized lists of rivers with stream management plans, and 80 percent of critical watersheds with watershed protection plans, all by 2030. (p. 10:7)

Priorities and Strategies (continued)			**Ecosystems*: 1. Continue to support funding and technical support for homeowners who live in areas with high risk of wildfire. Focus efforts on mitigation and the reduction of hazardous fuels around homes. 2. Develop and improve incentives for homeowners to encourage personal responsibility for risk reduction. Combine incentives with robust outreach and education. 3. Enhance the availability of parcel-level data, so that homeowners and potential homebuyers can accurately assess the level of risk associated with a given property. Make data available to insurance companies, emergency personnel, and local governments. 4. Submit a State Wildlife Action Plan to the U.S.	*Funding*: Colorado's Water Plan sets an objective to sustainably fund its implementation. In order to support this objective, the State will investigate options to raise additional revenue in the amount of $100 million annually ($3 billion by 2050) starting in 2020. Such funds could establish a repayment guarantee fund and green bond program focused on funding environmental and recreational projects. In addition, such funds could further support conservation, agricultural viability, alternative transfer methods, education and outreach, and other plan implementation

			Fish and Wildlife Service by the end of September 2015 that includes a vulnerability assessment of 13 priority habitats based on projected climate change. (p.67)	priorities. (p. 10:7)
Priorities and Strategies (continued)				*Education, Outreach, and Innovation*: Colorado's Water Plan sets a measurable objective to significantly improve the level of public awareness and engagement regarding water issues statewide by 2020, as determined by water awareness surveys. Colorado's Water Plan also sets a measurable objective to engage Coloradans statewide on at least five key water challenges (identified by CWCB) that should be addressed by 2030. (p. 10:7)

Contributors	Federal, State Agencies, Tribal/Sovereign Government, Academia, Private Sector, Local/Municipal/Utilities, Non-profit/NGO's (p.83)	Federal, State Agencies, Academia, Private Sector, Local/Municipal/ Utilities, Non-profit/NGO's (Appendix A)	State Agencies, Academia, Private Sector, Local/Municipal, Utilities, Non-profit/NGO's (p.84)	State Agencies
Target Audience / Partners	The CSFS will support crossdisciplinarity partnerships and collaborative work among federal, state and local agencies, nongovernmental organizations, communities and public volunteers to implement the Forest Action Plan. (p.66)	All Coloradans: Colorado State Agencies, Colorado Resilience Office, Colorado Resiliency Working Group, Colorado Communities, Colorado Stakeholders and Organizations. (pp. 69-72)	Policy decisionmakers and partners (p. 2)	Federal; State Agencies; Local Governments; Water Providers; Colorado Communities (p. 31; p. 34)

Required or Mandated	State forest action plans are mandated by the Cooperative Forestry Assistance Act of 1978 (as amended by the 2008 and 2014 farm bills) in order to receive federal State and Private Forestry funds. Several competitive funding opportunities require applicants to address priorities identified in the Forest Action Plan. (p. 64)	Colorado Resilience Office (CRO) was initiated by Governor Hickenlooper post the 2013 flooding in Colorado. The Colorado Resilience Framework (2015) was a product of that office. In 2018, the CRO was permanently moved and housed in the Colorado Department of Local Affairs through HB 18-1394. (p. 2).	This plan has been developed to meet the requirements of Colorado House Bill 13-1293 codified as C.R.S. 24-20-111, which calls for the development of a state climate plan that sets forth a strategy to address climate change and reduce greenhouse gas emissions, while taking into account previous state actions and efforts. (p.2)	In May 2013, Governor Hickenlooper issued Executive Order D 2013-05, which directed the CWCB to prepare a water plan for Colorado. (p.1:15)
Monitoring and Reporting	Unspecified goals for monitoring are integrated as resources that are necessary to achieve the State Forest Action Plan. (e.g., pp. 66 - 68)	Monitoring and reporting based on: 1. Implementation monitoring 2. Performance monitoring 3. Community resilience metrics Includes, implementation timelines on the short-term (1 year), medium-term (2-3 years), long-term (years	Briefly discussed. (pp. 79-83)	Monitoring briefly mentioned throughout.

		3+), and ongoing. (pp. 73-82).		
*** List is non-exhaustive. Please continue reading the Plan to learn more.**				

APPENDIX B – WASHINGTON STATE POLICY REVIEW

Policy	Safeguarding Our Lands, Waters and Communities: DNR's Plan for Climate Resilience	2020 Washington Forest Action Plan	Wildland Fire Protection 10-Year Strategic Plan	20-Year Forest Health Strategic Plan: Eastern Washington	Preparing for a Changing Climate: Washington State's Integrated Climate Response Strategy
Year	2020	2020	2019	2017	2012
Plan Themes / Vision	1. A Call to Action 2. DNR's Role in Advancing Climate Resilience 3. Tribal Nations and Climate Resilience 4. Equity, Environmental Justice, and Climate Resilience 5. Reversing Greenhouse Gas Trends 6. Resource-Specific Climate Resilience Challenges and Opportunities	1.Forest Resource Assessment 2. Cooperative Forestry Programs 3. Strategies 4. Plan Implementation (p.2)	1. The fundamental need to change our practices and increase our collective knowledge to be able to adapt to more frequent and intense wildland fire. 2. The important but challenging step of shifting our state's approach to wildland remanagement to be more proactive.	1.Accelerate the pace and scale of treatments. 2. Strategically focus work to protect communities and values at risk. 3. Promote rural economic development and use of restoration by-products. 4. Respect and integrate diverse landowner objectives. 5. Monitor progress and adapt strategies over time to	1. Human Health 2. Ecosystems, Species, and Habitats 3. Ocean and Coastlines 4. Water Resources 5. Agriculture 6. Forests 7. Infrastructure and the Built Environment 8. Research and Monitoring 9. Climate Communication, Public Awareness,

	7. Institutional and Systems-Level Responses 8. Near-Term Implementation Steps (p.3)		3.Improved coordination and collaboration across agencies and jurisdictions at all levels and across time scales. 4. The desire of communities to be more fully engaged and better supported in reducing risks before, during, and after wildland fires. 5. The need to prepare for expected inceases in wildland fires in future years. 6. The importance of maintaining a highly capable, well-	ensure treatment effectiveness. (p.16)	and Engagement (p.6)

			trained, and supported workforce to fight wildland fires and address resilience, preparedness, fire-adapted communities, recovery needs and goals, with adequate equipment and infrastructure now and for the future. (pp. 9-10)		
Adaptation/ Resilience Defined	Resilience defined: "Being prepared for, and adapting to, current and future climate-related changes." (p.8) Adaptation defined: "The process of adjustment to actual or expected climate and its effects. In human	Resilience is defined in the context of resilient landscapes. "The DNR Forest Health and Resiliency Division de-nes landscape resilience as the ability of a landscape to sustain desired ecological functions, robust native biodiversity,	Resilience is defined in the context of resilient landscapes. Resilience defined: "Ecosystems that resist damage and recover quickly from disturbances (such as wildland -res) and	Adaptation is defined in the context of adaptive management. Adaptation defined: "Adaptive management —the process of planning, implementing, monitoring, and integrating new information into land management	Adaptation defined: "Adaptation – Adjustment in natural or human systems in response to actual or expected climatic changes and associated effects that minimizes harm or takes advantage of beneficial opportunities." (p.90)

	systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects." (p. 89)	and critical landscape processes over time and under changing conditions." (p. 54)	human activities." (p. Appendix B:5)	practices over time." (p.37)	Resilience defined: "Resilience – The ability of a population or system to bounce back to something like its previous state following disturbance or change. Resilience can also apply to managing ecosystems and species to make them more able to recover from disturbance." (p.91)
Goals and Outcomes	1. Tribal Nations and Climate Resilience (p.20)	1. Landscape Resilience (p.54)	1. Washington's preparedness, response, and recovery systems are fully capable, integrated, and sustainable. (p.21)	1. Conduct 1.25 million acres of scientifically sound, landscape-scale, cross boundary management and restoration treatments in priority watersheds to increase forest and watershed resilience by 2037. (p.17)	1. Protect people and communities from climate change impacts. (p. 20)

Goals and Outcomes (continued)	2. Equity, Environmental Justice, and Climate Resilience (p.22)	2.Community Wildfire Preparedness and Wildfire Suppression (p.68)	2. Landscapes are resilient. In the face of wildland fire, they resist damage and recover quickly. (p.21)	2. Reduce risk of uncharacteristic wildfire and other disturbances to help protect lives, communities, property, ecosystems, assets and working forests. (p.25)	2. Reduce the risk of damage to buildings, transportation systems, and other infrastructure. (p.20)
Goals and Outcomes (continued)	3. Reversing Greenhouse Gas Trends (p.26)	3. Keeping Forests as Forest: Risk of Conversion to Non-Forest Uses (p.74)	3. Communities are prepared and adapted for current and future re regimes. (p.21)	3. Enhance economic development through implementation of forest restoration and management strategies that maintain and attract private sector investments and employment in rural communities. (p.29)	3. Reduce forest and agriculture vulnerability to climate change impacts. (p. 21)
Goals and Outcomes (continued)	4. Resource-Specific Climate Resilience Challenges and Opportunities (p.32)	4. Urban and Community Forest Resilience (p.78)	4. Response is safe and effective. There is zero loss of life of firefighters or the public,	4. Plan and implement coordinated, landscape-scale forest restoration and management treatments in a manner that	4. Improve water management to address climate-related supply reductions. (p.22)

			from wildland fires. (p.21)	integrates landowner objectives and responsibilities. (p.33)	
Goals and Outcomes (continued)	5. Institutional and Systems-Level Responses (p.76)	5. Rural Economic Development (p.80)		5. Develop and implement a forest health resilience monitoring program that establishes criteria, tools, and processes to monitor forest and watershed conditions, assess progress, and reassess strategies over time. (p.37)	5. Safeguard fish and wildlife and protect critical ecosystem services that support human and natural systems. (p. 23)
Goals and Outcomes (continued)	6. Near-Term Implementation Steps (p.84)	6.Stewardship of Family and Working Forests (p.82)			6. Reduce the vulnerability of communities, habitat, and species. (p.23)
Goals and Outcomes (continued)		7. Wildlife and Salmon Recovery (p.84)			7. Support the efforts of local communities and strengthen capacity to respond and

					engage the public. (p.24)
Goals and Outcomes (continued)		8. Water Quality and Quantity (p.88)			
Priorities / Strategies	*Tribal Nations and Climate Resilience*: 1. Commitment to consultation on next steps, regular and consistent communication with all tribes. (p.21)	*Landscape Resilience*: 1. Priority Actions for Statewide Landscape Resilience (p. 54) 2. Priority Actions for Central and Eastern Washington (p.58) 3. Priority Actions for Prescribed Fire (p.60) 4. Priority Actions for Western Washington (p.61)	*Washington's preparedness, response, and recovery systems are fully capable, integrated, and sustainable* 1. Provide leadership and coordination to guide implementation and facilitate agency alignment. 2. Use risk assessment to inform mitigation and protection planning and to establish priorities. 3. Enhance and sustain	* *Conduct 1.25 million acres of scientifically sound, landscape-scale, cross boundary management and restoration treatments in priority watersheds to increase forest and watershed resilience by 2037*: 1. Prioritize Forest health treatments in landscapes with the highest need and relative risk. 2. Conduct landscape evaluations that utilize the best available science and analytical tools to	*Protect people and communities from climate change impacts*: 1. Enhance core public health capacity. 2. Enhance emergency response to address increasingly extreme floods and fires. (Appendix C - p.1)

			a highly capable workforce. 4. Advance sustainable funding. (p.24)	produce landscape-level forest health data that stakeholders and agencies use to efficiently prioritize and design forest health treatments to improve forest conditions and enhance ecosystem values across landscapes. 3. Implement a wide range of treatment types, including mechanical treatments and prescribed fire, to increase tree vigor and reduce vulnerability to uncharacteristic levels of damage from forest insects (such as bark beetles), pathogens (for example, root disease or dwarf	

				mistletoe), drought and wildfire. 4. Maximize the extent and effectiveness of treatments through consideration of the relative cost, efficacy, and effective duration of treatment methods. 5. In priority landscapes, work with landowners and agencies to coordinate activities across boundaries and select the most effective treatment approaches relative to the unique needs of the prioritized landscapes and landowner objectives. (p. 20)	

Priorities / Strategies (continued)	*Equity, Environmental Justice, and Climate Resilience*: 1. Convene an Equity and Environmental Justice Advisory Committee. DNR will form an Equity and Environmental Justice Advisory Committee in 2020 to help the agency develop its approach to these efforts. 2. Identify highly impacted communities. DNR will conduct a preliminary review to identify highly impacted communities that are at the intersection of DNR's authorities and responsibilities and the agency's climate	*Community Wildfire Preparedness and Wildfire Suppression*: 1. Reduce risk of wildfire to lives, communities, property, ecosystems, and working forests and ensure wild-fire suppression response is safe and effective. (p. 69) 2. Communities are prepared and adapted for wildfire. (p.70) 3. Washington's wildfire preparedness, response, and recovery systems are fully capable, integrated, and sustainable. (p.70) 4. Develop post-wildfire recovery and restoration	*Landscapes are resilient—in the face of wildland fire, they resist damage and recovery quickly.* 1. Expand programs and practices to manage fuels and vegetation. (p.24)	*Reduce risk of uncharacteristic wildfire and other disturbances to help protect lives, communities, property, ecosystems, assets and working forests*: 1. Support Fire-Adapted Communities and landowner assistance programs that provide resources to coordinate risk reduction activities including defensible space near homes and structures. 2. Support the development and integration of Community Wildfire Protection Plans (CWPP) with state and federal	*Reduce risk of damage to buildings, transportation systems, and other infrastructure*: 1. Reduce flood damage by restoring floodplains and capturing more water. 2. Support local efforts to prepare for coastal flooding and storm surges. 3. Consider climate change impacts when sitting new development and infrastructure. 4. Plan for relocation if structures are damaged by floods or other impacts. (Appendix C - p. 1)

	response actions. 3. Create an Environmental Justice and Equity Strategy. In collaboration with the Equity and Environmental Justice Advisory Committee and other partners, DNR will create an Environmental Justice and Equity Strategy for the agency, which will help guide implementation of plans such as this Plan for Climate Resilience, the Wildland Fire Protection 10-Year Strategic Plan, and others. 4. Collaborate to assess our progress. DNR will engage with the Equity and Environmental Justice	strategies. Assess high-risk burned areas for risks to public safety and adverse impacts to public resources. (p. 71)		resources and priorities. 3. Conduct mechanical treatments and controlled burns in the wildland urban interface (WUI) to increase firefighter safety and reduce risks to communities. 4. Reduce risk of conversion of forestland to non-forest uses. 5. Communicate relevant and timely information about wildfire risk to landowners, policy makers, and the public. Assist communities in planning for future wildfire events. (p.26)	

	Advisory Committee and other orgs and partners to help the agency assess progress toward the goals and strategies we establish in our Environmental Justice and Equity Strategy. Accountability is a critical part of any strategy, and it will be important for the communities that DNR identifies in its review of frontline communities connected to DNR actions and resilience strategies to be involved in helping DNR to assess progress. (p. 25)				

Priorities / Strategies (continued)	*Reversing Greenhouse Gas Trends*: 1. Washington State Emissions a. Renewable Energy (p.27) b. Development and Construction (p.28) c. Wildfire and Forest Health (p.29) 2. DNR Emissions a. Fleet and Facilities (p.29) b. Communications and Travel (p. 30)	*Keeping Forests as Forests*: 1. Expand efforts to ensure sustainable food and ber production by conserving working farms and forests, securing water resources, and protecting high-productivity soils in the face of population growth. (p. 74) 2. Enhance retention of working forestland held by small forest landowners. (p.75) 3. Enhance and develop incentives, ensure effective administration of regulations, and foster sharing of information among	*Communities are prepared and adapted for current and future wildland regimes.* 1. Establish and sustain re-adapted communities. 2. Reduce human-related wildfire fire. 3. Meet post-fire recovery needs, building on current capacity and capabilities. (p.24)	*Enhance economic development through implementation of forest restoration and management strategies that maintain and attract private sector investments and employment in rural communities*: 1. Increase timber supply and produce a consistent and reliable supply of timber volume to maintain and increase forest products industry infrastructure to levels required to meet forest health objectives. 2. Support continued innovation and investment in	*Reduce forest and agriculture vulnerability to climate change impacts*: 1. Enhance surveillance and eradication of pests and disease. 2. Promote identification of and transition to plant species that are resilient to new climate conditions. 3. Conserve productive and adaptive farmland and forests. 4. Reduce forest and wildland fire risk in highly vulnerable areas. (Appendix C - p. 2)

		relevant agencies and partners that protect and restore ecologically important forestlands. (p. 75)		the forest products sector to utilize and add value to restoration by-products and small diameter wood, including cross-laminated timber (CLT), mass timber, biochar, and biofuels and associated co-products. 3. Assess forest management contracting capacity and infrastructure required to meet forest health objectives. Support investments in worker training for forest health treatment and prescribed fire crews. 4. Implement a local wood marketing campaign to connect urban and	

				rural communities to address forest health issues. 5. Support the development of wood energy systems at meaningful and appropriate scales. Expand Washington Department of Ecology Wood Stove Change-Out Program… air quality, provide a market for forest restoration by-products, and stimulate local economic development. (p.30)	

Priorities / Strategies (continued)	**Resource-specific climate resilience challenges and opportunities*: 1. Wildfire Management a. Reduce human-caused wildfire ignitions and address increasing wildfire risk in the wildland-urban interface (WUI). (p.35) b. Enhance and sustain a wildfire workforce to support increased fire response. (p.36) 2. Forest Management A. Forested Trust Land Management a. Develop climate-resilient seed management and reforestation approaches. (p.40) b. Promote climate-	*Urban and community forest resilience*: 1. Promote and enhance the health and resilience of forests in urban centers to be prepared for climate change and help support environmental justice. (p. 78) 2. Work with partners to increase forest-based outdoor recreation opportunities and investments while respecting the land's purpose and cultural uses. (p. 79)	*Response is safe and effective. There is no loss of life, of firefighters or the public, from wildland fires*.	*Plan and implement coordinated, landscape-scale forest restoration and management treatments in a manner that integrates landowner objectives and responsibilities*: 1. Assess landowner objectives and build the capacity to plan and implement accelerated, cross-boundary management and restoration treatments. 2. Respect the management responsibilities and trust mandates on federal and state lands. Support sustainable forestry and use of prescribed	*Improve water management to address climate-related supply reductions*: 1. Promote integrated water management in vulnerable basins. 2. Implement enhanced water conservation and efficiency programs. 3. Ensure sufficient cold water in salmon-bearing streams during critical seasons. 4. Incorporate climate change realities into agency decision-making. (Appendix C - p. 2)

	suitable strategies for atrisk species. (p.41) c. Prepare for increased variability in harvest opportunities under changing climate conditions. (p.42) d. Design and maintain forest roads to be resilient under current and projected climate conditions. (p.42) B. Forest Health and Resiliency (p.43) e. Support implementation of DNR's 20-Year Forest Health Strategic Plan, the Wildland Fire Protection 10-Year Strategic Plan and the Forest Action Plan. (p.43) f. Address forest health and increased wildfire risk on eastern Washington			fire as appropriate on industrial and private forestland. 3. Develop a strategy to manage wildfire in wilderness areas, reserves, and roadless areas on national forest system lands and national parks. 4. Support development and scaling of emerging funding mechanisms to accelerate forest and aquatic lands management to reduce risk and support sustained provision of ecosystem services from forestlands. 5. Provide technical assistance, financial resources, and education	

	forestlands. (p.43) .... 3. Agriculture, Grazing, and Leased Trust Management 4. Ecosystem Conservation and Natural Lands 5. Aquatic Resources and Coastal Management 6. Landslides, Tsunami, and Groundwater 7. Recreation			and outreach in priority landscapes to encourage the adoption of voluntary forest health treatments with willing private landowners. 6. Collaborate with local governments and partners in priority landscapes to provide incentives to discourage conversion of existing forest to non-forest uses. (p.34)	
Priorities / Strategies (continued)	*Institutional and systems level responses*: 1. DNR Agency-Level Responses a. Incorporate Climate Resilience into Authority Structures (p.77) b. Enhance Capacity to Address Climate Risks	*Rural economic development*: 1. Strengthen and build partnerships with federal, state, and local stakeholders and tribes in order to help address community economic development issues. (p. 80)		*Develop and implement a forest health resilience monitoring program that establishes criteria, tools, and processes to monitor forest and watershed conditions, assess progress, and reassess*	*Safeguard fish and wildlife and protect critical ecosystem services that support human and natural systems*: 1. Protect and restore habitat and improve the ability of species to

	and Resilience Opportunities (p.77) c. Incorporate Climate Resilience into Knowledge and Learning Structures (p.78) d. Incorporate Climate Resilience into Motivation and Accountability Structures (p.79) 2. Statewide Systems-Level Needs and Opportunities a. Establish and Interagency Climate Resilience Leadership Structure (p.80) b. Provide State-Supported Climate Impacts Projections to Support Risk Assessment, Planning, and Regulatory Systems			*strategies over time*: 1. Collect, map, analyze, and report on forest health conditions, forest restoration and management activities, and trends in forest health and wildfire risk over time across all land ownerships. 2. Identify metrics to measure progress against specific management goals and objectives. 3. Create a forest health tracking system that includes spatial and tabular data describing forest health treatments conducted by federal agencies, state	migrate to more suitable habitat as the climate shifts. 2. Protect sensitive and vulnerable species and their habitats. 3. Reduce existing stresses on fish, wildlife, plants, and ecosystems. (Appendix C - p. 3)

	(p.80) c. Establish Mechanisms for Funding and Financing Resilience Investments (p.82) d. Support and Facilitate Community-Level Resilience Planning and Implementation (p.82) e. Enhance Education, Outreach, and Engagement on Resilience Needs and Opportunities (p.83)			agencies, tribes, and other willing landowners. 4. Support effective fire management actions and integrate Qualitative Risk Assessment (QRA) and treatment data into the Wildland Fire Decision Support System (WFDSS). 5. Provide regular forest health treatment progress reports to the legislature and communicate results to partner agencies, county governments, communities, conservation groups, timber industry, tribes, and other stakeholders. 6. Provide	

				regular forest health treatment progress reports to the legislature and communicate results to partner agencies, county governments, communities, conservation groups, timber industry, tribes, and other stakeholders. 7. Develop standardized, science-based mapping of wildland urban interface (WUI) zones in Washington State, including better characterization of current land use within WUI zones. (p.38)	
Priorities / Strategies (continued)	*Near-term implementation steps*:	*Stewardship of family and working forests*:			*Reduce the vulnerability of communities,*

	1. Initiate Responses That Can be Implemented Within DNR's Authorities and Resources (p.84) 2. Seek Legislative Support to Implement Responses Requiring Additional Authorities and Resources (p.85) 3. Support Implementation of Statewide Systems-Level Climate Resilience Responses (p.85)	1. Plan and implement coordinated landscape-scale forest restoration and management treatments in a manner that integrates landowner objectives and responsibilities. (p. 82) 2. Explore regulatory and financial incentives to support small forest landowners. (p.83)			*habitat, and species*: 1. Protect people, property, and infrastructure from coastal hazards and avoid new development in highly vulnerable areas. 2. Prevent coastal habitat degradation and destruction and seek opportunities for upland habitat creation as sea levels rise. 3. Reduce shellfish vulnerability to ocean acidification by reducing land-based contributions of carbon and polluted runoff to the marine environment. (Appendix C - p. 3)

Priorities / Strategies (continued)		*Wildlife and salmon recovery*: 1. Restore and protect ecosystem health to support fish and wildlife habitat and biodiversity. (p. 85) 2. Enhance climate resilience for the state's plants, animals, and ecosystems, prioritizing immediate action and assessments on public forestlands. (p.86) 3. Assesses species and landscape conservation needs using species recovery and management plans, habitat conservation plans, biodiversity conservation frameworks, habitat connectivity analyses, and			*Support the efforts of local communities and strengthen capacity to respond and engage the public*: 1. Identify existing and new funding mechanisms to support adaptation work at the local level. 2. Develop an institutional structure to improve coordination and support an integrated approach. 3. Support information-gathering on climate impacts and ensure scientific information is easily accessible. 4. Engage the public in determining appropriate responses to

		other data. (p.87)			climate change. (Appendix C - p. 4)
Priorities / Strategies (continued)		*Water quality and quantity*: 1. Enhance watershed health and forest drought mitigation. Develop drought mitigation strategies at the landowner and landscape scales to reduce forest health vulnerabilities. (p. 89)			
Contributors	Federal, State Agencies, Tribal/Sovereign Government, Academia, Private Sector, Local/Municipal/Utilities, Non-profit/NGO's (p.86)	State agencies; included a survey of partners, direct outreach to partners and resource specialists, presentations and meetings with numerous standing committees and advisory groups, and public webinars. (p.11)	Federal, State (Legislature and Agencies), Tribal/Sovereign Government, Academia, Private Sector, Local/Municipal/Utilities, Non-profit/NGO's (p.3) (p. Appendix C)	Federal, State Agencies, Tribal/Sovereign Government, Academia, Private Sector, Non-profit/NGO's (p.4)	The WA Department of Ecology, State agencies, Federal, Private Sector, Academia, Tribal/Sovereign Government, Local/Municipal/Utilities, Non-profit/NGO's (Appendix A - pg.203)

Target Audience	Partners in natural resource management including state agencies, Tribal governments, cities, counties, and other stakeholders. (p. 8)	Government and public agencies, non-profit organizations, industry, tribes, and others… At DNR, we'll collaborate internally across programs, divisions, and regions as well as with partner organizations and individuals, and through our advisory committees. (p. 93)	Federal, State, Local, Tribal governments, Private sector, NGO's. (p.18)	The plan relies on a commitment from all interested parties – state and federal agencies, conservation groups, timber industry, private landowners, tribes, and other stakeholders —to take an approach that emphasizes strategically focused forest health treatments in priority landscapes to achieve the mission, goals and overarching strategy of the plan. (p. 11)	State agencies; Local governments (pp.26-27)
Required or Mandated	Unspecified in plan.	The Forest Action Plan lets the state receive funding from the U.S. Department of Agriculture (USDA) Forest Service's state	Unspecified in plan.	Prompted by: RCW 76.06; ESHB 2376 Sec. 308; SB 5546l; and HB 1711. (p. 11)	Prompted by: RCW 43.21M.040. This climate change response strategy establishes a framework

		and private forestry programs. (p.9)			for state action. (p.26)
Monitoring and Reporting	Unspecified goals for monitoring and accountability are integrated as goals throughout. Accountability structures are discussed more thoroughly as a need in "Institutional and Systems-Level Responses." (e.g., pp. 76-79)	Monitoring and reporting discussed in Plan Implementation (pp. 93- 97). Monitoring of forest health and wildfire strategies is being led by the Forest Health and Resilience Division and Wildfire Division, respectively. (p. 96). Includes: 1. Forest Health Treatment Tracker 2. Wildfire and Forest Health Multi-Party Monitoring Framework 3. Ecological Integrity Assessment (EIA)	Monitoring and adaptive management is incorporated throughout, particularly through the holistic planning and quantitative assessment in Strategy #2. Metrics to measure progress are included in Appendix E. Metrics. (p. 25)	The first report on the status of the 20-Year Forest Health Strategic Plan will be presented to the State Legislature on December 1, 2018, and each subsequent even-numbered year on the same date. The report will include: 1) request for appropriations designed to implement the plan including assessment work and implementing treatments; 2) prioritized list and brief summary of planned treatments with the appropriations request; 3) list and brief summary of treatments	The actions identified are broad and do not address who, when, and where to implement actions. Action plans with near and long-term steps to implement the strategies and the broad actions should be developed by various lead agencies. In many cases, the advisory group reports identify more specific near-term actions that could be included in future action plans. (p. 26; pp.172 - 174)

				completed, total funding available, cost for completed treatments, and outcomes; and 4) summary of trends in forest health conditions. (p.13)	
*** List is non-exhaustive. Please continue reading the Plan to learn more.**					

APPENDIX C – INTERVIEW GUIDE

Background, Introduction and Warm-up

1. Briefly describe your current position or role with your agency or organization.
2. Can you tell me about your professional background, in a minute or so?
3. How does your current position and work relate to climate adaptation for forests?
4. Have you had other positions in [State], or the US, where you worked on climate, adaptation, or forest policy?

General Adaptation

1. What are the primary social and ecological adaptation goals related to forests in [state]?
2. How would you explain what climate adaptation means for [state] forests?
3. How is adaptation different from "business as usual" or just "good forest management"?

Policies and Policy Landscape

1. How are these adaptation goals described and/or written into state-level policies or more specific resource plans for the state? (ex. the [state] Forest Action Plan)
2. Are there any other plans that you are aware of that manage climate adaptation for forests in [State]?
3. Who is responsible for meeting these adaptation goals? Is it the federal government, state government, local government, industry, and/or private citizens?
    1. Is there added capacity to do this work?
        a. Such as new money, or new positions?
    2. Are there any measurable objectives, metrics, or targets?
4. Are there other policies in place for other landowners, agencies, and/or jurisdictions?

5. Are there specific objectives or activities related to these goals that are currently taking place?
    1. Are there any activities that you work on or are a part of implementing?
6. Does climate adaptation for forests cause cohesion or conflict with existing policy? Or existing management activities?
7. Follow up on policy tools (incentive, authority, capacity, learning, and symbolic):
    1. How is [state] engaging private citizens on climate adaptation for forests?
    2. How is [state] engaging local governments?
    3. How is [state] engaging Tribal governments?
    4. Is there any additional funding or education in place for this work or collaboration?
    5. Are there any assumptions that are made about the plans, policies, practices, or actions related to forest-related climate adaptation in [state]?

Follow Up

1. Do you feel that the policies that you interact with are successful at meeting the goals and objectives for forest adaptation in [state]?
    1. In your perspective, which policies are the most successful?
    2. Which ones are not successful?
    3. How could the state enable greater success?
2. Is there anything else you want to tell me or that we should talk about regarding climate adaptation for forests in [State] that would be helpful for us to know?
3. Do you have any recommendations of other people or organizations we should contact?

APPENDIX D – CODEBOOK

*Bold denotes parent code.

Code Name	Description
Colorado	**Code to denote CO Case Study**
Washington	**Code to denote WA Case Study**
Climate Impacts and Challenges	**More related to "general issues" associated with climate change; and/or non-specific to ecological and social**
Child code to climate impacts/challenges: Ecological challenges	Focused on climate-induced ecological challenges. • Such as, a named ecological challenge to climate (migrating species, drought, fire).
Child code to climate impacts/challenges: Human social challenges	Focused on climate-induced human social challenges. • Such as, a named human social challenges to climate (smoke from wildfire, and water quality).
General Challenges	More related to "general challenges." • Such as, when an individual mentions challenges with out-of-date research, outdated policy, social license issues, or other relevant challenges that are not climate specific.
Adaptation Goals	Stated as something that could be done. • Could sound like an "action" but is non-specific or is unknown if currently being done/ has been done previously. Typically, answer to: Could you briefly explain what climate adaptation means for [state] forests, and what are the primary social and ecological adaptation goals for those forests?

Child code to climate impacts/challenges: Ecological adaptation goal	Ecological specific adaptation goal. • Such as, stated specific ecological adaptation goals (adapting forests to a world of fire, changing management practices).
Child code to climate impacts/challenges: Human social adaptation goal	Human social specific adaptation goal. • Such as, stated specific human social adaptation goal (living with fire, infrastructure for water resources).
Adaptation Actions	Known **specific action** (could be a current or noncurrent action): • Being done or has been done. • If they talk about a time and place where an action is being done. • If they think something is currently being done or could be being done • Could be sub-coded with implementation or other relevant codes.
Child code to adaptation actions: Assisted migration/Changing species	When assisted migration is mentioned as a tool. Might be being done or could be being done. *I added this action as it kept specifically coming up in interviews.*
Child code to adaptation actions: Industry/Products	When industry or wood products is mentioned as a tool. Might be being done or could be being done. *I added this action as it kept specifically coming up in interviews.*
Child code to adaptation actions: Prescribed fire	When prescribed fire is mentioned as a tool. Might be being done or could be being done. *I added this action as it kept specifically coming up in interviews.*

Adaptation Perspectives	When interviewee gives a personal position on adaptation or work being done. When participant states how they view adaptation goals or actions, how they think more could be done. Typically, answer to: How is adaptation different from business as usual or just good forest management? Or do you feel that the policies that you interact with are successful at meeting the goals and objectives for forest adaptation in [state]? In your perspective, which policies are the most successful? Which ones are not successful? How could the state enable greater success?
Policy	**Generally, relates to policy and adaptation.**
Child code to policy: Plans/guidance docs	When a participant mentions where goals are included in current planning documents, guidance docs, or over-arching guiding policy. • Includes planning processes. Typically, answer to: How are these goals described/written into state level or more specific resource plans for the state? Or are there any other plans that manage climate adaptation for forests in [State]?
Child code to planning: Other specific policy tools	Mentions of other policies, like funding development, incentives, education, landowner assistance, formation of advisory groups, allocation of money, etc. • Specifically, highlighting the specific plans, documents, participants, and actors.
Child code to policy: Actors/ stakeholder roles	Includes, who is involved in the planning processes.

	• Such as when a participant mentions a collaborative process and lists off groups and individuals. • Could also be partners mentioned when describing which partners/ non-partners oversee specific planning documents, or practices. Typically, answer to: How were these policies and plans formed? Who were the main actors involved in determining the goals and objectives?
Child code to policy: Responsibility	When stated who is responsible for meeting adaptation goals and actions. Typically, answer to: Who is responsible for meeting these goals or objectives? Is it the federal government, state government, local government, industry, or private citizens?
Child code to policy: Capacity	When the interviewee specifically mentions a capacity issue, challenge, or hurdle or when there is collaboration to meet capacity needs. • Ex. Lack of resources, tools, infrastructure, or ability to communicate due to capacity constraints.
Child code to policy: Measurable Objectives/Targets/Metrics	Denotes measurable objectives or targets. Can denote monitoring or evaluation. Could be something that could be metric, discussions concerning potential metrics, or lack thereof. -Typically, answer to: Are there any measurable objectives or targets?
Child code to policy: Other policies (not State specific)	Mention of other policies. • Ex. Good Neighbor Authority, local and municipal policies, and laws, Federal tribal laws, and regulations. Could also be funding mechanisms utilized by other non-state specific entities and organizations.

	Typically, answer to: Are there other policies in place for other landowners, agencies, and jurisdictions in the state?
Child code to policy: Implementation	How goals are being implemented/or have been, including process or people doing it (could also subcode with responsibility, capacity, or other code related to implementation). Typically, answer to: Are there specific objectives or other activities related to those goals that are taking place, that you work on or are a part of implementing?
Child code to policy: Cohesion/ conflict	When someone mentions a specific action that is associated with a conflict or with group cohesion/alignment (Ex. when participants state social license issues, prescribed fire outreach, assisted migration as a conflict/potential cohesion opportunity). Typically, answer to: Does climate adaptation for forests cause cohesion or conflicts with existing policy? Or existing management activities?
Child code to policy: Engagement	How agencies or policymakers engage and/or interact with the public/stakeholders (could be sub-coded with implementation or capacity). Could also relate to how organizations communicate and engage with stakeholders. • Ex. Outreach and communication with landowners and working together to meet needs. Typically, answer to: How are we engaging private citizens? Local government? Tribal governments? Or is there any funding or education in place for engagement?
Child code to policy: Assumptions	Assumptions stated that were in response to policies, plans or adaptation actions.

	Assumptions about policies and how they'll work. Other items that people say will be necessary for policies to work or might impede policy effectiveness. Typically, answer to: Are there any assumptions made about these policies or tools?
Job Description	Typically, answer to: Can you tell me about your professional background and then discuss how your current position and work relates to climate adaptation for forests?
Great quotes	Interesting quotes worth noting.