HOW CAN LAWS, INSTITUTIONS, AND PLANS FACILITATE ALASKA NATIVE VILLAGE ADAPTATION TO CLIMATE CHANGE?

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Abstract

While many communities are struggling with the effects of climate change, Alaska Native Villages (ANVs) are facing particular challenges. These 229 federally recognized tribes are typically small, remote, subsistence-dependent, and lack the resources, capacity, and jurisdiction to undertake large-scale adaptation actions. Climate change, among other changes brought by colonization, development, and laws, poses threats to the ANV subsistence lifeway. The traditional lands and waters of ANVs are warming more rapidly than many other parts of the world. Permafrost and ice is melting, flooding and erosion are increasing, and subsistence is becoming more difficult.

This research explores how ANVs are adapting to and planning for climate change (specifically, flooding, erosion, and subsistence impacts), and how different strategies, laws, and institutions help or hinder these processes. Research is based on (1) legal analysis of state and federal laws and institutions, (2) content analysis of plans applicable to 59 selected ANVs, and (3) interviews with participants in these ANVs as well as participants outside ANVs who make or influence laws and plans that affect ANVs. Findings are divided into three articles.

In the first article, I ask whether a new law or agency should be created to address climate change and whether greater jurisdiction over resources helpful to adaptation should be transferred to ANVs. I find that such a law or agency would not necessarily be helpful. Further, I find that a transfer of jurisdiction to ANVs without efforts to increase their capacity to navigate and take advantage of Western laws and funding opportunities would not be helpful. Rather, there is a need for better understanding and coordination among existing agencies, programs, and ANVs, and incremental changes to existing laws.

In the second article, I identify the types of adaptation planning processes taking place across ANVs and analyze their contribution to community resilience. I find that while there are many planning efforts related to adaptation, particularly through hazard mitigation plans, the manner in which these plans are created and the resulting products are not necessarily preparing ANVs for climate change impacts. Planning processes could be improved by organizing around cultural events to increase community engagement, and by scaling down plans to better focus on community needs and community capacity to implement these plans.

In the third article, I consider how laws and agencies specific to subsistence hinder adaptation by their inflexibility and limited opportunities for participation in decision-making. I find that meaningful co-management opportunities in which ANVs could cooperate with agencies are limited due to the lack of Western science capacity expected by agencies. I find a need for strategies for building Western science capacity of ANVs while also recognizing the importance of their traditional and indigenous knowledges. I also suggest incremental legal changes to increase flexibility and participation.

Several reoccurring themes emerge from this research. One is that adaptation obstacles are not primarily of a legal nature, but more so related to a lack of political will, understanding, and capacity. There is a need not just for adaptive capacity on the part of ANVs, but also for capacity to navigate existing laws, institutions, and processes that rely on Western science. Building self-reliance is an important part of building capacity, as is social capital in the form of partnerships within ANVs and with those in a position to help. Better collaboration is important not only for ANVs, but also for the many agencies that have some responsibility for assisting communities with adaptation. Improved understanding of opportunities and collaboration to

achieve them may not overcome problems related to political will, but could improve adaptation within the existing legal system.

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Article 1: The Role of Government in Fulfilling Climate Justice and Supporting Adaptation for Alaska Native Villages

Abstract

Climate change has had significant impacts on lands and communities across the United States, particularly on Alaska Native Villages (ANVs). These Arctic and sub-Arctic indigenous communities, which are often remote and rural, depend on the land and water for their nutritional and cultural survival. My research draws from 153 interviews and conversations with ANV residents and those who make or influence policy for ANVs, along with local, state, and federal plans and laws relevant to ANVs and climate change. I consider the current and potential role of the federal and State of Alaska governments in assisting ANVs and other communities to adapt to climate change, as well as the role that ANVs themselves could take. I found general agreement that the federal and state governments have some responsibility to assist with adaptation. But this does not mean that a new overarching federal or state law or agency devoted to adaption would be necessary or successful. There are already many laws that can facilitate adaptation and should be better understood and utilized. Also, there are already many agencies and programs related to adaptation that need to be better coordinated, perhaps by a coordinating entity without a regulatory role. Given the unlikeliness of sweeping change at the state or federal level, incremental change to existing laws is important. Likewise, it is important for ANVs to exercise a role in their own adaptation. Constraints on this role include laws limiting actions that ANVs can take and the lack of capacity to carry out large-scale adaptation actions on their own. ANV adaptation may require greater self-reliance as well as partnerships with government and non-government entities who can help ANVs build their capacity.

1. Introduction

From severe weather to flooding and rising sea levels, climate change has begun to affect the wellbeing of communities across America (Walsh et al. 2014). Alaska has distinct impacts, as it is warming far more rapidly than other parts of the United States (Chapin III et al. 2014). Also, Alaska is home to 41% of the nation's federally recognized tribes (BIA 2017), many of whom rely on subsistence hunting and fishing for their nutritional and cultural well-being (Ristroph, 2010, p. 49). Alaska Native Villages[1] (ANVs) are grappling with changes in flooding and erosion, changes to the species on which they subsist, melting permafrost, and later formation of ice along their shores each fall—ice that used to serve as a protective barrier from destructive fall storms (Chapin III et al., 2014; Field 2014, p. 32; Ristroph 2010, pp. 51-58).

[1] This term refers to the federally recognized tribe as well as its village site. Most residents of an ANV are citizens of the affiliated tribal nation as well as citizens of the United States.

Climate change impacts and ANVs' ability to respond to them is not uniform. ANV geography varies greatly, from the rainforests of southeast Alaska to the treeless tundra of the North Slope. About half of all ANVs are on rivers, while the rest are on the coast (AK Division of Community and Regional Affairs 2018). Only about two dozen ANVs are connected to the Alaska road system, while the rest are not accessible by roads. A small handful directly benefit from oil development income, while around three dozen still have no running water in their homes. Many have small populations (in the dozens) and few human resources to draw on, while some "hub" communities are home to thousands of residents and have local businesses. Thirty-one ANVs have been described as "imminently threatened" by climate change, while other ANVs have less visible or immediate climate change impacts (GAO 2009, 2003).

ANVs along with other communities across the nation have increasingly turned to state and national governments for help in the face of flooding disasters and severe storms (FEMA 2018; Cavallo 2015; Lindsay 2014; Daniels 2013; Reeves 2011; McCarthy 2010). In the law review literature, some call for major legal and institutional changes to facilitate adaptation, including the establishment of a new agency to lead or coordinate adaptation (Moser et al., 2017, p. 8; Flatt 2014, p. 171, 2012, p. 285; McDonald 2011, p. 285; Craig 2010, p. 39; Leonard 2009, p. 561). Short of major change, laws and government entities can facilitate adaptation by providing access to resources important for adaptation, building local adaptive capacity, and offering incentives for adaptation actions (Noble and Huq 2014, p. 848; Moser et al., 2012, p. 64; Engle 2011, p. 652; McDonald 2011, p. 284; Munaretto and Klostermann 2011, p. 220).

In this article, I consider what role federal, state, and local government should have in facilitating adaptation, and whether there should or could be an overarching adaptation law or agency. I limit my focus to how the existing legal and institutional system provides for community adaptation, rather than addressing how the system as a whole might be more flexible (e.g., Craig and Ruhl 2014; Flatt 2012; Craig 2010). Section 2 summarizes my methods. Section 3 is a literature review of arguments regarding government responsibility for adaptation assistance and how these might apply to ANVs. Section 4 outlines the failed efforts to build a coordinated adaptation legal framework at the state and federal level and provides an overview of the uncoordinated adaptation efforts of agencies under existing laws. Section 5 lays out key findings regarding how my research participants view the roles of federal, state, and ANV government. I describe the tension between ANVs' desire for state and federal government assistance and the sense that state and federal agencies already interfere too much with ANV lifeways. In Section 6, I discuss the implications of my findings. I argue that a new overarching adaptation law or agency would not be practical, although more coordination is desirable, perhaps in the form of a coordinating entity. Finally, I consider the need for greater ANV self-reliance as well as partnerships with entities that can aid in a manner that avoids further colonization.[2]

[2] By colonization, I mean the occupation of Alaska by non-Natives as well as laws and social practices imposed on ANVs.

2. Methods

My research involves four approaches, each of which I cover in more detail in Appendix A. The first approach was to review literature related to studies of adaptation, studies of Alaska Natives, and commentary on laws. The second approach was to review relevant laws themselves.

The third approach involved 153 interviews and conversations[3] with ANV residents as well as those outside ANVs who make or influence laws that affect ANVs. Half of these communications, including 53 semi-structured interviews and 23 informal conversations took place with residents from 59 different ANVs across the State.[4] Rather than randomly selecting participants, I sought information-rich "cases" (individual participants) whose experience and knowledge captured the main themes of my research questions across a varied group (Bernard and Ryan 2009, p. 365; Corbin and Strauss 2007, p. 318; Creswell 2007, p. 75; Patton 2001, pp. 234-351; Stake 2000, pp. 447). I contacted about 200 tribal administrators to ask for references to knowledgeable informants and kept recruiting participants until I had at least one participant from each of Alaska's twelve cultural/geographic regions, and participants from ANVs with a diversity of economic, political, and development characteristics.

I had 61 semi-structured interviews and 16 informal conversations with participants from outside of ANVs, including staffers from Alaska's Congressional delegation, Alaska State legislators and staffers, representatives from state and federal agencies responsible for disaster management, wildlife management, fishing, hunting, housing, community infrastructure, and flooding and erosion control and assistance, researchers who had published articles related to ANV adaptation, lawyers who worked with ANVs on subsistence and other matters, and planners who facilitated plans for ANVs. I initially selected these outside participants from the agencies that play a role in ANV adaptation to flooding, erosion, and subsistence impacts and used a "snowball" technique to get recommendations for additional participants (Jacobs and Brooks 2011, p. 95; Bernard and Ryan 2009, p. 367).

The fourth approach was to analyze community plans relevant to the 59 ANVs from which I selected participants, including hazard mitigation plans required by the Federal Emergency Management Agency (FEMA) for certain kinds of disaster assistance (42 U.S.C. § 5165(a)) and plans related to economic development and land use. The review included hazard mitigation plans (HMPs) pertaining to 43 ANVs and 70 other plans made within the last 20 years that pertained to 35 ANVs. My review documented community hazards (comparable to climate change impacts), climate-related disasters, and adaptations/hazard mitigation measures that ANVs had considered (but not necessarily implemented). The review helped me understand the

[3] Some participants did not want to be formally interviewed, but had interview-like conversations with me that answered many of my interview questions.

[4] By "interview-like conversations," I mean encounters where a participant was aware of my research purpose and had information to share and essentially answered many of my interview questions, but did not want to be formally interviewed.

kinds of planning processes ANVs are engaging in, and who is leading them (i.e., ANVs themselves or certain outside contractors).[5]

I used qualitative content analysis (Corbin and Strauss 2007; Miles and Huberman 1994, p. 56) to identify major adaptation actions, relevant laws and agencies, facilitators, barriers, recommendations for change, and other themes that arose from interviews and those conversations that covered interview questions, as well as in community plans. The differences in the questions answered by different participants (despite starting out with just two questionnaires—one for each set of participants) limited the ability to quantitatively compare responses between different participants. Given this limitation and the subjectivity of my coding, I decided that using inferential statistics was not appropriate (Bernard and Ryan 2009, p. 288; Zhang and Wildemuth 2005, pp. 2, 5). I thus avoid referring to specific numbers of participants in this article. To give an order of magnitude of the responses I got, I refer to "a few" (about 2 to 5), "several" (about 6 to 10), "a number of" (10-30), or "many" (more than 30). These categorizations are not statistically meaningful and should not be interpreted in that manner.

Combining these various methodologies allowed me to get a view of adaptation strategies, barriers, and relevant laws beyond the vantage of any one community, government entity, or body of literature. It also allowed me to compare my findings regarding ANVs with what has been reported in the literature. The following section outlines arguments from the relevant literature.

3. Arguments for a Government Role in Addressing Climate Change

As the impacts of climate change have increased, researchers have considered what laws and government entities should be doing to facilitate adaptation. This section summarizes arguments in the law review literature and other literature regarding government responsibility for adaptation and explains how these arguments may be more nuanced in the context of ANVs.

3.1. Appropriate Level of Government

This subsection summarizes the debate in the literature regarding which level of government should assume responsibility for climate change adaptation. Many emphasize the benefits of a local government role, including the greater sense of community ownership and responsibility (Arroyo and Cruce 2012, p. 570; Flatt 2012, p. 272; Lemieux et al., 2012, p. 181; Moser et al., 2012, p. 67; American Planning Association 2011, p. 14); the ability to incorporate local knowledge and tailor adaptation to local needs (Byrne and Grannis 2012, p. 267; Richardson 2012, p. 12; Kofinas and Chapin 2009, p. 55; Ostrom 2005, pp. 281-282); and the potential for being closer to people and hence more participatory and democratic (Flatt 2012, p. 272; Richardson 2012, p. 12). But others have pointed out the disadvantages of local control, including the lack of local capacity and resources (Osberghaus et al., 2010, p. 837). There is also concern that local control could result in an unfair distribution of adaptation costs, benefits, and

[5] In addition to my interviews and literature reviews, information in this article on stems from the legal work I did for Newtok in 2018 to assist with relocation efforts.

risks by excluding traditionally marginalized actors and vulnerable populations (Kaswan 2014, p. 396; Ostrom 2005, p. 282; Lane 2003, p. 367) or by imposing negative externalities on other localities (Kaswan 2014; Glicksman 2010, p. 1176).

Some commentators call for an overlapping "polycentric system," where each level of government has some authority to prescribe rules for how resources are used, and no single level has primary authority (Kaswan 2014, pp. 438-439; Gremellion 2011, p. 1231; Huang et al., 2011, p. 311; Ostrom 2005, p. 283; Ruhl 2011, pp. 1396-97). For example, Leonard (2009, p. 561) calls for new overarching law on climate change adaptation that integrates planning between different levels of government, similar to the principle of cooperative federalism carried out through the Coastal Zone Management Act (16 U.S.C. §§ 1451–1464).

Others call for a larger private sector role, noting the need for private citizens to take ownership of adaptation problems and to avoid "moral hazard" where government bailouts reduce incentives for personal responsibility (Moser et al., 2012, p. 67; Driessen and van Rijswick 2011, p. 563; Osberghaus et al., 2010, p. 836). There is also a view that addressing climate change is both a public and a private responsibility, where the government must work with non-government entities (Innes et al., 2011, p. 2; Munaretto and Klostermann 2011, p. 249; Weber 2011, p. 187; Sussman 2009, p. 34).

3.2. Government Role in the Alaskan Native Village Context

In this subsection, I explain how state and federal government responsibility may differ for ANVs, given the unique geography of Alaska; the limited capacity of small, remote tribes to orchestrate large-scale infrastructural projects; and the significance of climate justice and colonization.

3.2.1. Alaska's Distinct Geography and Land Ownership

First, the geography: Alaska is a vast, sparsely populated state far from the nation's capital and centers of commerce. Since becoming part of the United States, Alaska has relied on the federal government for support (Goldsmith and Larson 2003), even while resenting the federal government's control over the state (Haycox 2016, pp. xv, 316). The era when oil brought great profits to Alaska (from the 1970s to the 2000s) seemed to provide a pathway for a larger state role, as well as a role for county-level governments taking in tax dollars from commercial and industrial development (Ristroph 2017b, p. 262; Haycox 2016, p. 301). In the current era of low oil prices (the 2010s), the State has relatively limited resources to address large-scale problems not perceived as immediate crises (Ristroph 2017b, p. 263). Aside from the few county-level governments in the State (none of which have climate change adaptation programs or plans), most local governments are small cities or tribes without a tax base (AK Division of Community and Regional Affairs 2018).

The private sector in Alaska is relatively small compared to other states, with only around 12% of the land held by non-government entities (Alaska Department of Natural Resources 2000). Much of this (about 11% of all Alaska lands) is owned by Alaska Native regional and village corporations (Alaska Department of Natural Resources 2000). Native corporations are a creation of Congress that are not tribally owned entities but are supposed to provide dividends to those

tribal members who are shareholders (43 U.S.C. §§§ 1603, 1606, 1607).[6] Native corporate representatives have emphasized that these entities are "for profit"—not charities in a position to address climate change (e.g., "Tales of Atlantis," 2015).

3.2.2. Adaptive Capacity of ANVs

Larger, regional Native corporations have significant financial resources and skills that could support adaptation. Regional Native non-profit entities, created by the same Congressional Act that established Native corporations (43 U.S.C. § 1606), may also have financial resources and skills to support adaptation. But small, village-based Native corporations and tribes have relatively limited adaptive capacity.

The term "adaptive capacity" is frequently used in adaptation literature in reference to the ability to adjust, to take advantage of opportunities, or to cope with consequences (Jones et al. 2014, p. 214; Nelson et al. 2010, p. 20). For ANVs, "capacity" is broader than adaptation, since small, remote, and cold communities are in a constant struggle just to maintain working infrastructure (Loring et al., 2016, p. 110), let alone navigate the laws and grant opportunities from Western-style agencies many miles away (Cameron 2012, p. 110; McNeeley 2012, p. 838). Indigenous peoples who have adapted to their environments for centuries would seemingly have high adaptive capacity and self-reliance. But this capacity has declined in the face of social, political, economic, and environmental changes related to colonization (Abate and Kronk 2013, p. 4; Hausam 2013, p. 170; Wildcat 2013, p. 509; Nakashima et al., 2012, p. 6). For example, most ANVs rely on Native regional non-profit entities to provide training and assistance with village housing, grant-writing, and community planning; while federal and state entities provide for roads and education and support environmental management.

3.2.3. Climate Justice and Related Arguments for ANV Assistance

Some commentators have argued that in the interest of climate justice, ANVs and other indigenous communities are entitled to external assistance (Forsyth 2014; Knodel 2014; Marino 2012, pp. 375-376). Climate justice is a broad concept that include principles for how the burdens of climate change should be distributed and mitigated, as well as principles providing for climate-vulnerable communities to participate in decisions regarding their fate (Burkett 2008, pp. 193-199; Paavola and Adger 2006, pp. 594-596). Here, I focus on the principle that those who have the most responsibility for greenhouse gas emissions should assist less responsible, at-risk populations in adapting to climate change and with low-carbon development (Nelson et al., 2007, p. 410). Most ANVs have had minimal greenhouse gas emissions compared to the rest of the United States, yet they are at a greater risk of losing their homes and lifeways than most Americans (Hanna 2007, pp. 268-271). Because the American people as a whole have benefited from the United States' historic and current contributions to climate change, the federal government arguably has a responsibility to support the adaptation of America's vulnerable, place-based communities (Brooks 2013; Kronk Warner and Abate 2013, pp. 120, 135; Paavola and Adger 2006). Likewise, the State of Alaska, which has benefited from the greenhouse-gas-emitting oil and gas industry (Alaska Department of Revenue 2014; McDowell Group, Inc. 2014), arguably has a responsibility to support ANV adaptation.

[6] Not all tribal members within an ANV are shareholders of the corporations associated with that ANV. Also, a number of shareholders live outside of ANVs and Alaska and may not have a direct interest in the ANV.

With ANVs and other Native American tribes, climate justice takes on another angle: a number of tribes were relocated, pushed to the edge of their former domain, or made to settle permanently in places not meant for year-round habitation (Ford and Giles 2015, p. 521; Abate and Kronk 2013, pp. 5-6; Ford et al., 2010, p. 187). There is an argument that because the federal government contributed to placing some ANVs in vulnerable locations, the government is responsible for assisting and even relocating those who are willing to relocate (Scott 2014, p. 381; Bronen 2013, p. 5; Martin 2012). Some have advocated for the establishment of a lead federal or state agency to guide the relocation process (Maldonado et al., 2013, p. 610; Bronen 2011, p. 401).

Aside from climate justice, another argument for federal climate change assistance to ANVs and other Native American tribes relates to the federal trust doctrine. This doctrine stems from case law establishing a federal political responsibility to Native American tribes as "dependent sovereigns" (Case and Voluck 2012).[7] Since the United States usurped lands and natural resources that tribes needed for their survival, it arguably has a duty to protect these lands and compensate for harm (Wood 2009, pp. 93-94). While the literature seldom discusses the federal trust doctrine in the context of climate change adaptation (but see Kronk Warner and Abate 2013), this doctrine could be a basis for federal assistance to ANVs with relocation to higher ground and other adaptive actions.

A third argument for assistance to ANVs concerns the extent to which federal (and to some degree, state) laws have limited ANV access to resources needed for adaptation. As a result of the 1971 Alaska Native Claims Settlement Act (ANCSA), ANVs do not own their traditional lands and waters and are not free to simply pick up and move wherever they want (see 43 U.S.C. §1603).[8] Nor do they have control over their traditional subsistence resources (see 43 U.S.C. §1603), which are regulated by state and federal fish and game laws (16 U.S.C. §§1801, 3101; Alaska Stat. § 16.05.255). This has left many ANVs far from the road system and access to material, health, and education resources enjoyed by their urban counterparts (Cochran et al., 2013, p. 562; McNeeley 2009).

3.2.4. Colonization Concerns and the Need for Self-Reliance

While there are strong arguments for providing ANVs with adaptation assistance, there is a danger that assistance can have the effect of further "colonizing" ANVs by reducing their ability to make decisions about their own fate (Cameron 2012, p. 104; Marino 2012, p. 380; Wildcat 2009, p. 39) and increasing their dependence on government resources (Huntington et al., 2009, p. 125; 2005, p. 91; McNeeley, 2009 p. 37). ANVs are still struggling with the impacts of colonization—not only those related to land loss through ANCSA (The Indian Law and Order

[7] Cases describing the federal trust doctrine include Choctaw Nation v. United States, 119 U.S. 1, 28 (1886), Seminole Nation v. United States, 316 U.S. 286, 296 (1942), United States v. Sioux Nation of Indians, 448 U.S. 371 (1980); Morton v. Mancari, 417 U.S. 535, 555 (1974).

[8] Land ownership by Alaska Native corporations does not necessarily facilitate relocation. While Alaska Native corporations own a significant amount of Alaska lands, corporations are separate entities from tribes and can have different goals regarding development and adaptation. Also, corporate lands may not be the most desirable place to relocate.

Commission 2015, p. 47), but also what Napoleon (2014) refers to as a "spiritual, social, cultural and economic storm that was set in motion by historical forces and governmental policies of the last century." There is a history of "assistance" to ANVs from missionaries, the Bureau of Indian Education, and other proponents of American culture and capitalism that some believe has done more harm than good (Wexler 2014, p. 80; Berger 1999, p. 130). For example, Marino (2012, pp. 375, 378) suggests that the colonial history of Shishmaref (a west-coast ANV seeking to relocate) reduced adaptive capacity by discouraging a traditional adaptation strategy of high mobility, excluding local experts from early development decisions, relocating decision-making power over infrastructure outside of the community, and creating a dependence on modern, fossil-fuel powered western infrastructure.

Climate change adaptation measures that ignore the legacy of colonialism may perpetuate colonialism through Western interventions that do not serve the long-term needs of indigenous communities (Cameron 2012, p. 112). Adaptation assistance needs to take place in a manner that avoids interfering with indigenous sovereignty (Kronk Warner and Abate 2013, p. 127). This concern might be addressed by adhering to the procedural aspects of climate justice, which provide for indigenous community participation in climate change adaptation planning (Theriault 2012, p. 244; Paavola and Adger 2006, p. 596). This engagement is consistent with efforts to "decolonize" interactions with indigenous communities by acknowledging the validity of indigenous lifeways and epistemologies (Maldonado 2014, p. 255; Smith 2012, p. 101; Aruskevich 2010, p. 117; Kawakami et al., 2008, p. 344).

Adaptation assistance should also promote self-reliance, which is a cultural value among many Alaska and Arctic indigenous groups (Chapin and Cochran 2014, p. 2; Reid et al., 2014, p. 411; McNeeley 2009, p. 37). While self-reliance may mean different things to different ANVs, I use the term to refer to adaptive actions that are within an ANV's authority to take, such as building greenhouses or establishing a local lumber mill to build homes. I do not mean to imply that ANVs should return to an era of no electricity, running water, or contact with the outside world.

To summarize, there are arguments for government responsibility for adaptation assistance at the federal, state, and ANV level. In this section, I have argued that the federal and state obligations to ANVs may be stronger than obligations to non-Native communities, but fulfilment of obligations to ANVs should avoid diminishing ANV adaptive capacity and sovereignty.

4. Outline of the Past and Current Federal and State Role in Climate Change Adaptation

In this section, I summarize the key existing laws, agencies, and programs relevant to ANV adaptation to changes in flooding, erosion, disasters, and subsistence. I highlight past efforts to form a coordinated adaptation policy at the state and federal levels. I show that there is currently no cohesive adaptation policy, and many agencies are simply researching climate change rather than addressing it. Still, there are a number of uncoordinated efforts by different agencies to facilitate community adaptation to climate change.

I begin with the advance and retreat of national climate change adaptation policy under the Obama and Trump presidencies. In 2009, President Obama signed Executive Order 13,514,

requiring agencies to evaluate climate-change risks and vulnerabilities, and establishing a task force to develop policy recommendations (Obama 2009). In 2013, President Obama issued a Climate Adaptation Plan along with Executive Order 13,653, which called for agency adaptation plans and established a new federal interagency, the Council on Climate Preparedness and Resilience ("the Resilience Council") (Obama 2013). In response to the 2013 Executive Order, 38 federal agencies submitted adaptation plans (Conners, White, and Arnold 2015). A subsequent executive order established an Arctic Executive Steering Committee to coordinate federal Arctic policies (Obama 2015). This Committee formed a coastal erosion subcommittee focusing specifically on village relocation in Alaska. But after taking office, President Trump revoked Obama's climate change adaptation plan and Executive Order 13653 (Trump 2017b). The Trump Administration also removed webpages referring to the Resilience Council. Effectively, there is no active, overarching federal plan, law, or agency, dedicated to assisting communities with climate change adaptation (Moser, Coffee, and Seville 2017).

At the state level, there has been a similar advance and retreat of adaptation policy. Governor Sarah Palin formed a Climate Change Sub-Cabinet in 2007 to prepare Alaskan communities for climate change impacts (Palin 2007). The Sub-Cabinet formed an Adaptation Advisory Group to recommend adaptation policies and an Immediate Action Work Group (IAWG) to address impacts to vulnerable communities (Immediate Action Workgroup 2008). IAWG identified six communities—all ANVs—in need of immediate action and met with these communities to identify adaptation strategies. In 2008, based on IAWG's recommendations, the Alaska Legislature established the Alaska Climate Change Impact Mitigation Program to provide vulnerable communities with adaptation funding (Bronen and Chapin 2013; Cox and O'Brien 2009).

In 2010, the Adaptation Advisory Group produced an incremental plan for adaptation called "Alaska's Climate Change Strategy: Addressing Impacts in Alaska" (Alaska Climate Change Sub-Cabinet 2010). The recommendations concern infrastructure, natural systems, economic activities, and health and culture. They generally suggest monitoring and gathering more information, rather than specific adaptation *actions to* change or protect infrastructure and communities. By "adaptation action," I mean changes in human behavior and measures that change or protect infrastructure, buildings or development, beyond just information gathering and planning. The most far-reaching recommendations call for one or more coordinating entities to liaise between Alaskan communities and between agencies working on issues relevant to climate change (Alaska Climate Change Sub-Cabinet 2010, p. 8-5).

Governor Sean Parnell disbanded the Sub-Cabinet in 2011. The following year, the Alaska legislature ended the Alaska Coastal Management Program (ACMP), making Alaska the only coastal jurisdiction in the entire United States to opt out of the Coastal Zone Management Act (Bradner 2012; Demer and Hopkins 2012). The loss of this program is notable for three reasons. First, ACMP provided for an entity (originally known as the Division of Governmental Coordination, within in the Office of the Governor) to coordinate federal, state, and local review of proposed offshore and coastal projects (Alaska Stat. §46.40.096 (repealed 2012); 16 U.S.C. §1456). This entity could have carried out the coordinating function suggested by the Adaptation Advisory Group. Second, the loss of the program reduced the control of coastal communities (mostly ANVs) over projects that could aggravate or ameliorate climate change impacts. For

example, the former Alaska Statute 46.40.070 allowed coastal districts to create "enforceable policies" that could be incorporated into state law and considered by state and federal agencies during permit approvals. Third, the loss ended the opportunity for funding that could have assisted with climate change adaptation (16 U.S.C. §§ 1456a, 1456b).

When elected in 2014, Governor Bill Walker promised action to address climate change. In 2017, he established a Climate Action Leadership Team charged with developing another plan on what to do about climate change (Walker 2017). On September 26, 2018, the Team produced a report with a broad array of unprioritized recommendations pertaining to six areas--Communities and Partnerships (agency and community coordination), Human and Ecosystem Health, Economic Opportunity (including technology to reduce emissions), Clean Energy (a plan to slowly transition to renewables), Outreach and Education, and Investment (in low carbon and energy efficient technology) (Climate Action for Alaska Leadership Team 2018). Governor Walker assembled a Climate Cabinet, a working group of state agencies, which developed a much smaller list of actions the State will take to implement the report (Alaska Climate Cabinet 2018). One of the most significant actions adopted pertains to a coordinating agency similar to what the Adaptation Advisory Group recommended in 2010. It is unclear whether the proposed actions will result in administrative and policy change, as Governor Walker's term ends in November 2018. Thus, as of this writing, neither the United States nor Alaska has a single, overarching law, agency, or program specifically devoted to climate change adaptation.

The lack of a cohesive federal or state adaptation framework does not mean that there is no framework at all—it just means that there are many agencies and programs separately working on various aspects of adaptation under existing laws. Problematically, many of these agencies and programs are dedicated to gathering more information on climate change rather than actually taking adaptive action based on information available (Brunner and Lynch, 2010, p. 63). Examples of agencies that are largely concerned with data collection rather than adaptive action are the U.S. Global Change Research Program (USGCRP), which issues a National Climate Assessment every four years, and the National Oceanic and Atmospheric Administration's Climate Program Office coordinates research on climate change impacts and adaptation.

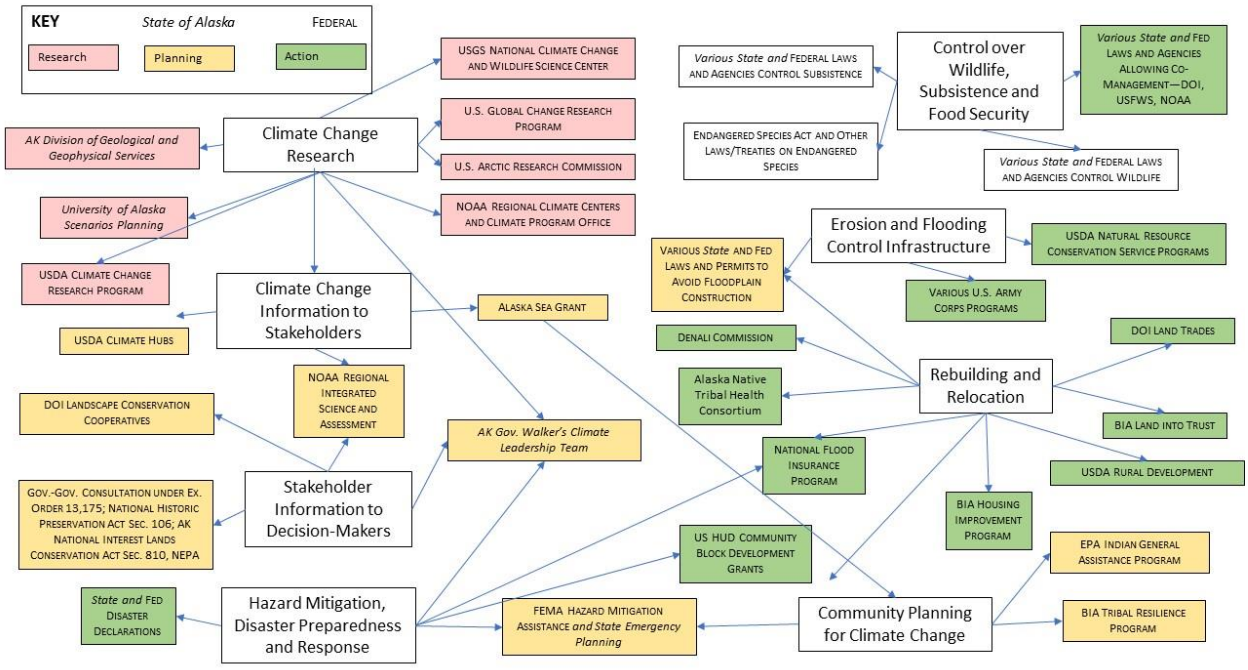

Figure 1.1: Agencies and Laws for ANV Adaptation to Flooding, Erosion, and Subsistence Impacts

Figure 1.1 is a simplified graphic to show the key areas of adaptation in which state and federal agencies participate. The graphic is color-coded to show which agencies or programs are more geared to research, as opposed to community planning or carrying out adaptation actions.

Despite the emphasis on research over action, a number of agencies have facilitated the adaptation of ANVs and other communities through existing laws and programs (Gerrard, Kuh, and American Bar Association 2012). For the remainder of this section, I briefly summarize the main agencies, laws, and programs relevant to ANV adaptation to increased flooding, erosion, disasters, and reduced opportunities for subsistence.

Flooding Disaster Assistance: One of the key agencies is the Federal Emergency Management Agency (FEMA), which is tasked with advising the President under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) as to whether to declare a disaster after a severe weather event or flood (42 U.S.C. §§ 5122(1), 5191; 44 C.F.R. § 206.37(c)). The Stafford Act provides for disaster prevention funding that can facilitate adaptation and relocation (42 U.S.C. §§ 5133, 5170c; 44 C.F.R. §206.436), although much more funding is available *after* a disaster has already occurred (GAO 2015).

Erosion Assistance: For slower moving "disasters" related to erosion, the U.S. Army Corps of Engineers has played a critical role, with projects that attempt to stabilize Alaskan shorelines (GAO 2009).[9] Lesser known agencies such as the U.S. Department of Agriculture's Natural

[9] The U.S. Congress specifically authorized Army Corps to assist ANVs with erosion through Consolidated Appropriations Act, 2005, Pub. L. No. 108-447, Div. C, Title I, § 117, 118 Stat. 2944-45 (2004). Congress revoked this authority through Pub. L. No. 111-8, Div. C, Title I, § 117, 123 Stat. 524 (2009) and partially replaced it with

Resource Conservation Service have also overseen erosion control programs (see 16 U.S.C. §§460d, 1001-1012, 2203-2205; 33 U.S.C. §701b-1).

Land and Species Management: Agencies with responsibility for managing public lands, including the Department of Interior's (DOI) Bureau of Land Management (43 U.S.C. §1701), U.S. Fish and Wildlife Service (USFWS) (16 U.S.C. §668dd), and National Park Service (54 U.S.C. §100101), as well as the U.S. Forest Service (16 U.S.C. §1600), and, in Alaska, the Department of Natural Resources (Alaska Stat. § 38.05.035), have had to address changes in landscape management in light of climate change. Agencies with responsibility for wildlife management, fishing, and hunting, including USFWS (16 U.S.C. § 3101; 50 C.F.R. Part 100), the National Marine Fisheries Service (16 U.S.C. § 1801), and, in Alaska, the Department of Fish and Game (Alaska Stat. § 16.05.255; 5 Alaska Admin. Code Part 92), have had to determine how to adjust fishing and hunting allocations in response to shifts in species migrations and populations (McNeeley, 2012, p. 847; Loring et al., 2011, p. 79). In particular, USFWS has wrestled with whether to list species as "threatened" (see 16 U.S.C. §1533) due to climate change (USFWS 2008, 2013).

Community Infrastructure and Planning: The U.S. Department of Housing and Urban Development (HUD), the Bureau of Indian Affairs or BIA (for ANVs), and the Alaska Division of Community and Regional Affairs have considered how to provide funding for new infrastructure to communities affected by climate change and those seeking relocation. In addition to its standard community block development grant (42 U.S.C. §5301 et seq.; 24 C.F.R. part 100), HUD has provided for post-disaster grants (24 C.F.R. §1003.400) and created a one-time competition for communities seeking to increase their resilience (HUD 2016). BIA has assisted communities with funding for new housing as well as planning (25 C.F.R. § 256.21). The Environmental Protection Agency, while focused on water and air quality, has similarly assisted ANVs with adaptation planning through its Indian General Assistance Program (42 U.S.C. §4368b).

Denali Commission: In Alaska, the Denali Commission has taken on a large role in the relocation of Newtok and adaptation planning and projects for 30 other villages deemed "imminently threatened" by the Government Accountability Office (GAO, 2009, p. 12). Congress established the Denali Commission in 1998 to provide critical utilities, infrastructure, and economic support throughout Alaska, focusing on Alaska's remote communities (Pub. L. No. 105-277). In 2015, President Obama announced that the Denali Commission would play the lead coordination role to assist ANVs with adaptation. But federal funding never followed the announcement, and Trump's budgets for Fiscal Years 2018 and 2019 proposed eliminating the agency (Trump 2017a, 2018). The Denali Commission has nevertheless persisted, with much of its limited budget (around $15 million annually[10]), dedicated to climate change-related planning and projects through its Village Infrastructure Protection Program for the 31 imminently threatened communities (Denali Commission 2017).

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the Energy and Water Development and Related Agencies Appropriations Act, Pub. L. No. 111-85 (2010), § 116, codified at 33 U.S. Code § 2213, which required a financial contribution from communities.

[10] A $15 million budget is relatively small for an agency tasked with ANV infrastructure. For example, based on my experience working with ANVs, a single new house in an ANV off the road system can cost between $350,000 and $750,000.

To summarize, although there is no single, overarching law or agency to address climate change adaptation, many laws and agencies have some role in researching, guiding, or assisting adaptation actions.

5. Key Findings on Alaskan Attitudes toward the Government's Role in Climate Change Adaptation

Thus far, I have discussed the government's actual and potential role in climate change adaptation based on a review of literature and laws. In this section, I shed light on the human factors relevant to ANV adaptation by summarizing the viewpoints of my research participants and their community plans.

5.1. Who Should Do What and Why

In this subsection, I discuss participants' views on the appropriate roles of federal, state, and ANV governments as well as non-government entities in facilitating climate change adaptation. While the vast majority of my participants suggested that government entities do have a role, there was no consensus on what kind of role each level of government should have. Nearly two thirds of all participants suggested a need for some sort of external government role beyond that of the ANV government. About one third of that two thirds discussing this need for a government role (two ninths of all interviewees) were from ANVs. It is noteworthy that no one specifically stated that government should *not* be involved in adaptation.[11]

5.1.1. Climate Justice and Related Arguments for Assistance

No one specifically referred to the term "climate justice," but it was indirectly referenced when some, including a few in ANVs, discussed government responsibility for relocation due to forced settlement. About a third of those who discussed government roles noted that ANVs were traditionally nomadic, but now they must stay in flood-prone areas. A few participants (generally from non-State entities outside of ANVs) referred to the federal trust responsibility to tribes. One participant (from a federal agency) suggested that the doctrine makes federal responsibility to tribes clearer than that toward other communities. Another participant (also from a federal agency) suggested that tribes should be viewed as sovereign nations and treated the same as any other nation asking for assistance.

5.1.2. Feasibility of Federal and State Government Assistance

Despite calls for government-assisted community relocation in the literature, participants had doubts about its feasibility. More than half of all participants (mostly those outside ANVs) discussed this issue, and they offered reasons why such relocation should or could take place. But almost half of these participants (again, mostly those outside ANVs) raised points as to why this relocation might not occur—namely the expense. As one state official said, "There's a 'should' question—who should? And then there's a 'can' question—who can? The state

[11] I did not find notable differences in viewpoints toward government responsibility between different types of ANVs (i.e., regional differences or differences based on wealth).

government can't. Legislators from the Lower 48 are not going to be concerned enough about this issue to appropriate funding to move a few people in Alaska."

Lack of political will to proactively address climate change adaptation for ANVs was the most frequently cited barrier to adaptation and relocation (noted by several ANV participants and a number of those outside of ANVs). A number of participants (mainly outside of ANVs) said that state and federal decision-makers either did not believe in climate change or did not want to believe in it. A few said that these decision-makers would not take any action that could jeopardize fossil fuel production. Some referred to legislative gridlock in Congress, as well as the limited political power of Alaska compared to more populous states, along with the limited political power of ANVs compared to the more populated urban regions of Alaska.

5.1.3. Responsibilities of Each Level of Government

Most participants did not articulate the appropriate role for each level of government, although they generally referred to federal agencies rather than other entities as the source of assistance they had received. Federal assistance has involved Army Corps assistance with erecting flooding and erosion barriers; FEMA disaster assistance; Environmental Protection Agency funds from the Indian General Assistance Program for climate change planning and monitoring; and funds from other agencies to move or build infrastructure or carry out projects.

Several participants (mostly from state government) suggested a specific role for the State, including coordinating other entities on climate change, or taking on a larger role in disaster management. Others said that the State no longer has funding to give in light of reduced oil revenue, such that funding would have to come from federal government. A few ANV representatives said the federal government was more helpful than the State, and a few referred to the problem of the State not recognizing ANVs as sovereign entities.

Several participants mentioned the need to work with the private sector, particularly Native Corporations. Several said that Native Corporations had been helpful with funding or providing land for a potential relocation. A number of participants (half of whom were in ANVs) suggested that Native Corporations should do more, although one who served on a corporation board emphasized their "for profit" nature.

Universities and other non-profit entities have filled in some of the gaps left by state and federal government. Several participants referred to technical and research support that universities had provided with climate change adaptation projects, including climate change planning and researching options to improve food security. Several participants mentioned the importance of Native regional non-profit organizations, while a few suggested that these organizations should be doing more in terms of assisting ANVs with adaptation. A few Native non-profit organizations[12] have a strong focus on climate adaptation, as evidenced by their plans and publications. But other Native regional non-profit organizations have very little in the way of climate change programs.

[12] These include Kawerak, Inc. (a Native regional non-profit organization for the west coast of Alaska), the Aleutians Pribiloff Islands Association, and the Alaska Native Tribal Health Consortium (which provides for the entire state).

As in the literature, there was sense among many participants (a third of whom were in ANVs) that a collaborative effort between government entities as well as non-government entities is needed to address climate change adaptation. For example, some ANV participants expressed frustration that agencies do not coordinate their meetings in an ANV, such that ANV residents must attend multiple meetings with different agencies who may not be aware of each other's programs. Many participants (a third of whom were in ANVs) referred to the importance of partnerships to leverage resources.

To summarize, most participants did not clearly single out a specific role for each level of government, but discussed the unlikelihood of obtaining a great deal of state or federal adaptation assistance and the need for collaboration among sources of assistance.

5.2. Need for Financial Assistance vs. Greater Autonomy

In this subsection, I consider two different ways in which federal and government might increase ANVs' adaptation capacity. One way is by providing financial resources that could facilitate adaptation actions. Another is by increasing ANV control over non-financial resources that could facilitate adaptation actions, including land and wildlife.

5.2.1. Potential for and Drawbacks to More Financial Assistance

Particularly among ANV participants, there is a tension between the need for more financial assistance to carry out adaptation actions such as relocation and the desire for more self-reliance or greater jurisdiction over resources that are important to ANVs. While a number of ANV participants referred positively to external assistance and emphasized the importance of asking for help, others shared negative views. Several said that getting help is a long, bureaucratic process with strings attached. Several expressed a sense of helplessness with what they perceived as a lack of assistance, and a few suggested that their ANVs were not getting sufficient help because the government could not afford it or did not care. One ANV resident said, "I know funding is limited, but at least give us a fighting chance. … There are villages here that are going to disappear." A resident from another ANV expressed a similar sentiment: "It shouldn't get to the point where a village is falling into the ocean before you get help."

Despite the desire for more external financial assistance, there is a sense that assistance that can be "colonizing" or heavy-handed. Several ANV participants said they felt exploited by their lack of power relative to outside government and researchers, and a few said that the outside government should step back and take cues from the ANV communities. One supporter of indigenous rights from a federal agency conveyed this sense of exploitation:

> The US government has been involved, influencing the indigenous peoples' inherent rights and powers for 400 years now…I'm not sure that …solutions we come up with…are the right solutions. I'm not sure that …it's best to leave it up to the policy influencers and lobbyists in DC but if the federal policy makers took a true listen to ANVs on what their needs are, a better solution could be drawn.

One ANV resident wanted to convey this message to federal and state government: “Leave us alone, let us regulate our own laws.” He explained, “They get in there and just screw everything up for us …. Everything they tell us to do, we’ve been doing for 14,000 years. And we can do it for another 14,000 years.”

5.2.2. Potential for Greater ANV Control over Other Resources

Views were mixed on whether ANVs could or should have more jurisdiction over land and subsistence resources or other areas of law to help them adapt. Nearly a third of all participants (mostly outside of ANVs) shared their opinions on this theme. A number of participants (mostly in ANVs) referred to the lack of tribal jurisdiction over land and subsistence resources due to the Alaska Native Claims Settlement Act along with federal and state laws regulating subsistence. Nearly half of participants sharing views on jurisdiction suggested that ANVs should have more jurisdiction, yet more than half offered reasons why greater jurisdiction might not be desirable or beneficial.

Similar to reasons expressed in the literature for more local jurisdiction (Berkes 2002; Loring et al. 2011; Peel, Godden, and Keenan 2011), supporters of greater ANV jurisdiction suggested that it would be essential to adaptation; that a community would be more likely to adhere to a law if it had a hand in creating it; that an ANV would know best how to manage; or that they simply wanted to see less bureaucracy or big government. Of those who offered reasons for not increasing ANV jurisdiction, a few expressed concerns about mismanagement and unfairness; while others believed there was already sufficient tribal control and Native representation or just wanted to see better communication and balance within the existing laws. About two thirds of those who offered reasons for not increasing jurisdiction said that more jurisdiction would not help due to a lack of tribal capacity i.e., the ability of an ANV to navigate the federal and state system of laws and grant opportunities.

5.2.3. Importance of Self-Reliance

Regardless of jurisdiction, about a fifth of all participants (with the majority of these in ANVs) mentioned the need for ANVs to take some sort of role in their own adaptation. Almost the same number of participants emphasized the importance of self-sufficiency (even though I did not directly ask about this) and the need for ANVs to do more on their own given the limitations in outside funding. Participants with this opinion were often older ANV male residents from the generation that was sent to schools run by BIA and forced to speak English (La Belle 2006; Evans-Campbell et al. 2012). These were people that grew up before the era of big oil profits, when there was less financial assistance available from the government.

A few ANV participants said their community was already self-sufficient or independent, while a number of participants (mostly from outside of ANVs) described ANVs as too dependent on government assistance. The Hydaburg Community Plan, for example, conveys the sensitivity of this issue and the difficulty in distinguishing personal responsibility from the lingering impacts of colonization:

> Over time, local, state, and federal actions have diminished the economic sovereignty of the Haida. The once self-sustaining Haida was forced to try and adopt and live within the standards of the "white man's" customs and livelihood. Subsistence activities and the ability of the people to engage in barter or trade of

> customary resources have become restricted and, in some cases, totally disallowed. The changing circumstances have forced the Haida to become more dependent upon outside assistance and have reduced the ability of the Haida to be self-sustaining and independent from the necessity of outside assistance. This affects the well-being of all Hydaburg residents, both Native and non-Native.

(GT Consulting 2002, p. 11)

One ANV resident focused more on the need for personal responsibility, stating: "If people want electricity they have to learn to pay bills instead of running to the bingo halls…they have to be responsible. …Tribes shouldn't need outside help unless there are events beyond their control." This individual referred to an elder who had said that the government tried to take everything away and figured out that the best way to do this was to throw money at people. "Instead of fighting with us, they give us everything. Now kids get up and go to the store with their [food stamps]. What's going to happen when this shuts down?" Another ANV commenting on the need for self-reliance said with resignation, "It took generations to become dependent, it's going to take generations to become independent."

To summarize, while many within and outside of ANVs recognize the importance of financial resources in supporting adaptation, there is concern that adaptation assistance can have a colonizing effect that reduces self-reliance.

5.3. Potential for a New Law or Agency

The preceding section examined the interplay between the need for assistance to facilitate ANV adaptation versus the importance of self-reliance. I now turn to the question of whether a new state or federal law or agency should be established to facilitate adaptation for ANVs and other communities. While my participants expressed a range of views on this subject, the prevailing views leaned against creating a new law or agency and towards better coordination and communication and better use of existing laws.

5.3.1. Challenges of Creating a New Law

More than a third of my participants discussed whether there should be a new law.[13] A number of them called for an overarching law to address climate change and/or relocation, while several called for changes to existing laws to direct agency action on adaptation. A few suggested that change should be "bottom-up," rather than coming from a national law. A number of participants suggested there was no need for a new law. Many of those who discussed this topic had conflicting views, for example, saying that no new laws were needed, yet calling for some sort of mandate for agencies to act.

Many participants offered reasons against having new laws, including resistance to the idea of more laws or bureaucracy that may not serve the particular needs of Alaska, and a lack of confidence in laws to address climate change problems in ANVs. One view expressed by a number of participants is that all the necessary laws and plans are already there—they just need

[13] I only asked those outside ANVs about the potential need for a new law or agency (I asked ANVs more generally what they would like to see the government do or change) but a few in ANVs volunteered their opinions.

to be better implemented. Related views included the need for better cooperation under existing laws and revised interpretations of laws.

Another view is that laws are irrelevant to indigenous lifeways. One ANV resident explained to me that there is no Western law that will protect a hunter out on the land and river—the hunter depends on his own knowledge system to survive. His people understand that "Corporations come and go, governments come and go. But the people, and what we do, remains." Another ANV resident said, "I would venture to say that 90% of our lifestyle is illegal in some fashion or another." A number of participants suggested that they would do what they needed to continue their lifeway, regardless of the law. This outlook came up more in the context of hunting and fishing, where decisions are made at the individual and family level, rather than in the context of flooding and erosion. This outlook suggested a sense that new laws and agencies would be futile, as they would not be followed.

One barrier to implementing laws that I observed in the course of my interviews and conversations was the lack of understanding of what the laws actually said. A number of participants, including those from outside of ANVs, gave incorrect statements about the law. Those in villages sometimes thought that subsistence laws were more restrictive than they actually were. Those outside of villages were more likely to misunderstand tribal sovereignty and rights. Beyond misunderstanding the laws, many simply do not know options available under existing laws. As one ANV resident said, "If there are any laws or regulations related to climate change that can and will impact our area we are not aware or have any knowledge of them. … Are there any laws[?] [W]e need to get educated by either the state of the federal government [on laws] that will assist us in the long run on climate change."

This ignorance is not limited to ANV residents. Neither I (prior to this research) nor several of the lawyers I interviewed was aware that laws already provide for uneven land trades between the federal government and villages in order to facilitate relocation (43 U.S.C. § 1621(f); 16 U.S.C. § 3192). One Elder poignantly summed up this lack of capacity among those who should have capacity: "White people are starting to realize that what they're doing is not right, and they want to right it, but they don't know how." In other words, there may be a need to raise awareness of existing laws and programs that facilitate adaptation, rather than inventing new laws.

5.3.2. Challenges of Establishing a New Agency

A question related to the need for a new law, discussed by more than a quarter of my participants, is the need for a new agency to guide ANVs through the process of adaptation and relocation. Several expressed a desire for a new agency, while a number opposed a new agency, and a similar number were ambivalent. A few emphasized the need to identify one agency to take the "lead" on issues such as relocation, and several noted that the Denali Commission is already serving as an unfunded lead agency for relocation in Alaska.

Regarding the potential responsibilities of a new federal agency, a few referred to the need for a new federal agency to deal with all aspects of climate change (including greenhouse gas mitigation); a few called for a new federal agency to deal with relocation; and a few called for a new bureau within an existing federal agency. Several expressed a desire to revive the Alaska Sub-Cabinet on Climate Change; and almost as many called for a formal federal coordinating

agency/task force to coordinate existing agencies (not unlike that Resilience Council under the Obama Administration that none of the participants had heard of). One suggested that a coordinating agency needed bureaucrats rather than just political appointees, so the agency can keep running though administration changes:

> Task forces are filled by political appointees—administrators who come and go—rather than long-term bureaucrats who are going to get things done. Administrators are surrogates for elected politicians and don't want to make the elected person look bad. Bureaucrats don't have that worry. The key is getting good bureaucrats.

Nearly three quarters of participants who discussed the potential for a new agency gave reasons why a new agency would not be effective. One legislative staffer said that "getting money is hard enough—starting a new bureaucracy is even harder." A few expressed concern over too much governance and the need for informal coalitions to avoid bureaucracy.

About half of those who discussed the potential for a new agency suggested that the new agency's mission would overlap with or duplicate the expertise and missions of existing agencies such as the Denali Commission. Participants described conflicts between different agency rules, difficulties in moving money between agencies, and difficulties in getting agencies (and legislators) to communicate and align priorities. Some offered concerns about "silo-ing" and the need to mainstream climate change into all decisions. As one federal agency representative said, "Climate is a consideration. It's not its own thing. It's cross cutting."

In summary, while a number of participants expressed support for a new over-arching law or agency devoted to climate change, many more believed that such a direction would not be practical or helpful to ANV adaptation. Participants referred to the existing laws and agencies, which are uncoordinated, but are already facilitating adaptation actions.

6. Discussion: What Change is Desirable and What is Feasible

While the vast majority of my participants saw a need for government involvement in adaptation, views on this role differ depending on whether the government is spending money to assist an ANV or regulating resources needed by ANVs for adaptation (i.e., subsistence), and whether one is living in an ANV or outside of it. Within ANVs, there is generally a desire for more federal assistance to address flooding and erosion, but there is some resistance to interventions that would interfere with subsistence lifeways. Among those outside of ANVs (who may be more supportive of ANVs than the general population, given my selection process), there is also a desire for federal as well as state assistance in climate change adaptation. But, both within and outside of ANVs, there is a strong sense that this assistance is not forthcoming due to lack of political will. To a lesser degree, there is a sense that creating a new agency or law to direct assistance is not desirable, given the current agencies and laws already in place (particularly the Denali Commission). In this section, based on participants' views as well as my own analysis, I consider the potential for external government as well as ANVs to better provide for ANV climate change adaptation in a feasible manner that avoids further colonization.

6.1. Difficulties of Creating a New Law or Agency

The majority of my participants suggested that creating a brand-new overarching federal law or agency may not be practical, regardless of how much climate change has impacted ANVs and the need for climate justice. A new legal framework would face many challenges, including the reluctance of state and federal government as well as the public to accept responsibility for climate change (Berke and Lyles 2013).[14] Even where the need for political change is acknowledged, there is little incentive to proactively pay adaptation costs, especially when future risks are uncertain and seemingly remote to those in power (Munck af Rosenschöld et al., 2014; Berke and Lyles 2013, p. 182; Serrao-Neumann et al., 2013, p. 441; Moser 2013, 2009; Munaretto and Klostermann 2011, p. 220; Kofinas and Chapin 2009, p. 72). Absent a disaster that threatens those with political power, sudden change is unlikely (Boyd et al., 2014; Garmestani and Benson 2013; Smit and Wandel 2006, p. 289). Congress has not created anything resembling a new agency since the Department of Homeland Security, which was fashioned out of existing agencies after the September 11, 2001 disaster.

Even if a new climate change adaptation agency were created, it would face challenges to carrying out its mission. It would have to find a way to integrate its regulations and policies with the ongoing efforts of the Denali Commission, FEMA, the Army Corps, and other major players in ANV adaptation. It would have to compete with existing agencies and programs for limited funding.

If created at the national level, a new agency might not be able to adequately provide for the unique needs of Alaska related to its Arctic terrain; sparsely populated, remote villages; and the large percentage of federally recognized tribes. The Denali Commission may be better suited to addressing these needs within the State of Alaska, avoiding the need for a separate, stand-alone state climate change agency. The flexibility of its enabling law and the inclusion of state and federal agency representatives in its governing board have allowed it to play a lead role in coordinating and carrying out adaptation actions in ANVs—most notably the relocation of Newtok. The Commission can combine and transfer different sources of funding available to communities more easily than other agencies can. Also, the Commission has been able to pursue an equitable agenda where communities throughout Alaska are entitled to similar services, regardless of their remoteness.[15]

My research suggests that there is a contrast between calls in the literature for a new legal and institutional framework for climate change adaptation and relocation and what is actually

[14] Governor Sarah Palin, who established Alaska's Climate Change Sub-Cabinet in 2007, subsequently denied the existence of climate change. Governor Walker has called for more oil and gas drilling (which could exacerbate climate change) to raise money for communities needing to relocate due to climate change.

[15] I recognize that the Commission is not a scientific research agency capable of setting projections for future climate change. I argue that such projections may do little to aid adaptation for ANVs for two reasons. Based on my interviews, I found that, for the most part, ANVs demonstrate an awareness of what parts of their communities are most vulnerable to climate change. Second, many of the most severe changes relate not to sea level rise but to episodic and unpredictable erosion events (deGrandpre 2015; Lynch and Brunner 2007, p. 102; Army Corps 2006). For example, during an 18-day period in the autumn of 2018, Newtok Village lost 42 feet of its shoreline (LeMay, Patrick, Pers. Com. Oct. 12, 2018). The Commission was able to provide financial assistance to move affected residents out of their homes.

feasible to accomplish. It may be that climate change and the need to adapt is simply one of the latest "wicked problems"[16] to face the legal and planning community, similar in scope to the problems of homelessness and alcoholism that have plagued humanity for millennia (Crane and Landis 2010, p. 389; Ford et al., 2016, p. 176; Head 2014, p. 663; Lazarus 2009, p. 1160). Because I see adaptation as a wicked problem, I feel that advocating for an entirely new legal and institutional framework to address it would be as idealistic an unsuccessful as the 18th amendment (prohibiting alcohol). My suggestions in the following section for incremental change do not provide an ideal solution to this wicked problem, but they may be more likely to succeed than efforts for wholescale change (Cumming 2013, p. 16; Garmestani and Benson 2013; Lemieux et al. 2012, p. 179; Moser 2009, p. 19).

6.2. Need for Incremental Change and Better Coordination and Understanding

My finding that there is relatively little support (at least among my participants) for a new overarching climate change law or agency does not leave ANVs with nothing in place to facilitate climate change adaptation and relocation. As I outlined earlier in this paper, there are many existing laws that can be used to support adaptation actions (Ristroph 2016), though they are not streamlined and may be unfamiliar to the public.[17] As I discuss elsewhere and in forthcoming articles, there are feasible, incremental changes that could be made to existing laws in a manner that would not require significant political change (Ristroph 2017a, 2017b; Ristroph 2016; Ristroph 2010). In this subsection, I briefly summarize key areas for incremental legal change and explore the potential for a coordinating entity.

Based on my assessment of laws and conversations with those in position to make or influence laws, I find that some laws could be changed incrementally without significant political objection. For example, changes could be made to Stafford Act to better focus on pre-disaster management;[18] and amendments could be made to the Alaska Native Claims Settlement Act and other laws to ease the procurement of new land for community relocation and construction.[19]

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[16] Churchman (1967) introduced the concept of wicked problems as a class of social system problem that are ill-formulated, where the information is confusing, there are many clients and decision makers with conflicting values, and the ramifications in the whole system are thoroughly confusing. Rittel and Weber (1973) distinguished "wicked" problems from relatively "tame" problems, characterizing wicked problems as those for which there is no definite formulation or stopping point; where solutions are neither true nor false, but just good or bad.

[17] The Outline of the Current Federal and State Role in Climate Change Adaptation earlier in this article provides a general sense of how government agencies are already carrying out climate change research and planning and assisting communities with adaptation.

[18] These laws include the Stafford Act at 42 U.S.C. §§ 5170, 5170c(a), 5122, 5174(c), 5204, 5305, and 5306; 44 C.F.R. §§ 206.117, 206.119, 206.432 and 206.48; 42 U.S.C. § 5306; MMPA 16 U.S.C. § 1371(a), and the Interjurisdictional Fisheries Act, 16 U.S.C. §§ 1802, 1861a, 1864.

[19] These laws include the Alaska Native Claims Settlement Act (ANCSA) 43 U.S.C. §§ 1613 and 1621(f); the National Environmental Protection Act (NEPA) 42 U.S.C. § 4332(C); the Clean Water Act §404, 33 U.S.C. § 1344; the Alaska National Interest Lands Conservation Act (ANILCA)16 U.S.C. §§ 3111, 3114, 3119, 3170 and 3192(a) and (h); the Stafford Act, 42 U.S.C. § 5170c and 5174(c)(4); the Magnuson-Stevens Act, 16 U.S.C. §1855 (i)(1)(D); Bureau of Indian Affairs Housing Regulations, 25 C.F.R. § 256.21; FEMA regulations 44 C.F.R. Parts 80 and 206;

Other changes that could be made incrementally include changes to federal laws that assume stationary ecosystems to address rapidly changing wildlands and species threatened by climate change;[20] and changes to state and federal laws governing subsistence to improve the ability of fish and game managers to respond to rapid climate change,[21] and to improve ANV representation in resource management decisions that affect their well-being.[22]

Even if federal and state statutes laws remain the same, there is potential for change in the executive branch to better facilitate adaptation. Though it is unlikely that the Trump Administration would make such changes, a future administration could continue the movement of the Obama Administration toward more acknowledgement of climate change in agency planning and programs, and more collaboration and coordination (Arroyo and Cruce 2012, p. 578; Fischman and Rountree 2012; Craig 2010, p. 53; Moser 2009, p. 19; Healey 1996, p. 212). A new administration might create a coordinating entity similar to the existing White House Council on Environmental Quality, which issues regulations and guidance for environmental reviews conducted by all federal agencies under the National Environmental Quality Act (42 U.S.C. § 4321). Alternatively, the short-lived Obama-era Council on Climate Preparedness and Resilience,[23] which had no power to issue regulations, could be revived relatively easily. Given that none of my participants had ever heard of the Council on Climate Preparedness and Resilience, the new entity would need funding to raise awareness of its existence and function. The entity could offer guidance and promote mainstreaming in existing agency programs.

It would be helpful for each federal and state agency to establish a civil servant "point person" to connect with the federal coordinating entity and serve as an ombudsman for public concerns

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Alaska hunting laws at A.S. §16.05.258(c) and 5 Alaska Admin. Code 99.015; and Alaska Administrative Order 224.

[20] These laws include Executive Order 13751 (2016) Safeguarding the Nation from the Impacts of Invasive Species; Executive Order 13112 (1999) Invasive Species; Executive Order 11987 Exotic Organisms (1977), National Park Service Organic Act, 54 U.S.C.§ 100101; Wilderness Act, 6 U.S.C. § 1131(a); and the Endangered Species Act, 16 U.S.C. §§ 1531(c)(1), § 1538. This paper lacks a discussion of the need for laws to be more adaptive, but there is a growing area of law review literature addressing the problems with stationarity in environmental law.

[21] These laws include Magnuson Stevens Act 16 U.S.C. §1855 (i)(2); the Marine Mammals Protection Act (MMPA) 16 U.S.C. § 1371(b); ANILCA 16 U.S.C. § 3113 and36 C.F.R. §§§242.10(d)(5)(ii), 242.23-.27/50 C.F.R. §§ 100.10(d)(5)(ii), 100.23-.27, 216.23, 300.65; and Alaska hunting laws at A.S. §§ 16.05.258, 16.05.940 (32-33), and 16.40.020 and 5 Alaska Admin. Code §§ 92.011, 92.200, 99.021, 99.015, 92.072.

[22] These laws include the Magnuson Stevens Act, 16 U.S.C. § 1852(b)(5) (A), § 1861a(d); Alaska laws on hunting, A.S §§ 16.05.221, 16.05.260, 46.40 5 Alaska Admin. Code 96.010; and Exec. Order 13,175, 65 Fed. Reg. 67249 (Nov. 9, 2000).

[23] Using the term "resilience" instead of "climate change" in the name of the entity could allow for it to consider a broader range of issues related to community well-being in the face of climate change. It could also help the entity gain support with those who do not wish to acknowledge climate change. For example, the Trump Administration's 2018 Draft National Mitigation Investment Strategy refers to "resilience" 33 times and fails to mention "climate change," even though much of it relates to climate change adaptation.

about how that agency addresses climate change. The idea of having a point person in each agency could be feasible even under the Trump Administration, as this was suggested in its 2018 Draft National Mitigation Investment Strategy. At the state level, the recommendation of the Sub-Cabinet from 2010 and the Climate Action Leadership Team from 2018 regarding coordination could be implemented, whereby a designated person or office of the Governor (perhaps a revival of the previous Division of Governmental Coordination under the Alaska Coastal Management Program) could serve as a point person among all state agencies.

Better coordination among government entities and stakeholders would not overcome political will problems, particularly as a coordinating entity would not have the power to compel another entity to act. Still, it would enable limited resources to be used more efficiently and potentially increase awareness of programs and actions that could aid community adaptation. Similarly, better understanding of existing laws and programs on the part of agencies as well as ANVs could improve adaptation within the existing system.

In summary, while dramatic change is unlikely, it is important for federal and state governments to take incremental and feasible steps forward in addressing climate change adaptation (Moser et al., 2012, p. 64). Some of these steps will require legal change, while many others require changes in practices (agency culture), improved understanding of the law and of other stakeholders' needs, and the desire to make a difference (Moser, Williams, and Boesch 2012, p. 69; Chapin et al. 2009, p. 329; Innes et al. 2011, p. ix; Ostrom 2005, p. 238; Sandercock 2004, p. 96). I discuss the need for improved understanding and mobilization further in the next subsection in the context of ANVs.

6.3. Potential for More Local Autonomy

I now turn to the issue of what change would be desirable and feasible at the ANV level, starting with the question of whether ANVs could get more jurisdiction over resources needed for adaptation. For the reasons suggested by participants in favor of increasing ANV jurisdiction as well as the principle of climate justice, I argue that there *should* be more jurisdiction given to tribes of the lands that surround them and the subsistence resources on which they depend. For example, there *should* be more meaningful subsistence co-management arrangements in which ANVs have some authority for decision-making, as opposed to just consultation on decisions made by agencies (Richmond 2013; Marine Mammal Commission 2008, p. iv; Meek et al., 2008; Spaeder 2005, p. 173).

But, as recognized by a number of my participants, what *should* happen may not currently be feasible. I found that, particularly among those outside of ANVs, there is relatively limited support for changing laws to increase ANV jurisdiction. As I discussed above in the context of a new over-arching law or agency, there is a great deal of inertia in the laws that currently control ANV jurisdiction over land and wildlife management system (Starkey 2016). For example, despite nearly five decades of criticism of the Alaska Native Claims Settlement Act, and some incremental amendments to adjust it, a new settlement has not emerged to take its place (Indian Law and Order Commission 2015, p. 47; Chaffee 2008, p. 129; Berger 1999, p. 105). ANVs

lack the political clout to significantly change the existing regime (McNeeley 2012, p. 841; Loring et al., 2011, p. 79; Kofinas et al., 2010, p. 1354).

At least among those I interviewed, the lack of support for significant change to ANV jurisdiction relates more to concerns about ANV capacity limitations than to resentment or prejudice toward ANVs. The concern about capacity stands out, since, while it has received attention in the context of adaptation needs, it has received relatively little attention in literature discussing decolonization and the need for greater tribal sovereignty (Cameron 2012; Hibbard, Lane, and Rasmussen 2008; Anderson 2005; Sandercock 2004).

As discussed in the previous subsection, I am reluctant to advocate for wholesale change that is unlikely to occur, as I would rather suggest practical steps that ANVs and others will be able to accomplish. Self-governance is not a panacea for climate change impacts if ANVs are unable to carry out government functions. Efforts to "decolonize" adaptation and community planning may need to consider the importance of building ANV "capacity" and self-reliance. There is also a need to build cooperation between ANVs and outside partners, to the extent that cooperation supports local capacity and avoids "colonizing" assistance. ANVs should develop a vision of how they want to build their capacity and self-reliance, so that efforts to build these assets do not denigrate ANVs' knowledge and cultures.

7. Conclusion

The existence of a moral obligation for government entities to assist ANVs with adaptation does not mean that such assistance is guaranteed in the near future. The reluctance of those outside ANVs to give ANVs more financial support or resource jurisdiction may mean that ANVs have to shoulder more responsibility for their adaptation using resources currently available to them (i.e., increased self-reliance). Some of the views expressed in this article on the need for more self-reliance are seldom seen in the literature, which tends to refer to the problem of colonization without providing a pathway forward short of complete government reorganization. I argue that complete government reorganization—whether this involves creation of a new climate change agency or meaningful "decolonization"—is unlikely. Thus, it behooves ANVs to draw upon self-reliant traditions and partnerships to implement low-cost community adaptations that do not require significant outside intervention.

Increasing self-reliance is easier said than done, given that ANVs have become increasingly dependent on outside financial capital and lack the means to directly control the natural capital that has traditionally been a source of resilience. It will be important for ANVs to form relationships with those outside ANVs in a position to help build their capacity. Alaska Native Corporations should do more to provide this help, and agencies should take advantage of relatively low-cost methods (i.e., phone calls) to better collaborate with ANVs on adaptation and other community goals.

Even if the federal and state governments decide not to form coordinating agencies at the federal and state levels, agencies and ANVs can still find ways to collaborate. Examples include the Climate Change Water Working Group, an informal federal agency group including the Bureau of Reclamation, USGS, NOAA, FEMA, EPA, and USDA that collaborates on water

management in a changing climate; the Army Corps' "Silver Jackets" teams, which work in almost every state to share knowledge between state, federal, tribal, and local agencies to reduce disaster risk; and the Newtok Planning Group, an informal organization consisting of about 25 state, federal, and tribal entities that voluntarily began collaborating Newtok's relocation in 2006 (Bronen and Chapin 2013).

My emphasis on the need for both self-reliance and partnerships suggests that laws alone will not address climate change adaptation. As much as there is a government role in climate change at the federal, state, and ANV level, simply adding a new law will not necessarily change behavior or ensure adaptation action. One federal agency representative I interviewed captured the lack of faith that many participants felt in the potential for new laws: "How do you legislate climate change? Laws that would be effective are along the lines of things we're already trying to do. I can't imagine what kind of law you would be passing." As this quote suggests, any new law or agency would have to interface with the existing "multiple bureaucracies" that relate to climate change adaptation issues. Indeed, there are already a large number of laws, programs, and agencies that play a role in addressing climate change, even though many people are unaware or seem unable to take advantage of them. Adding a new climate change adaptation law and agency, without addressing problems related to capacity, political will, and coordination not resolve the challenges ANVs and other communities face regarding climate change. A more practical way forward should strive for incremental changes to existing laws, better coordination among adaptation efforts through the revival of state and federal coordinating entities, and support that builds ANV capacity while avoiding further colonization.

Article 2: Moving from Planning *FOR* Alaska Native Villages to Planning *WITH* Them

Abstract

Alaska Native Villages (ANVs) are trying to adapt to some of the most extreme climate change in the nation. But the planning systems in place for these communities are not necessarily leading to adaptive actions or building connections that facilitate adaptation. Based on reviews of existing plans as well as interviews and conversations with 153 people that live in ANVs or influence ANVs plans and policies, this article describes how climate change adaptation and hazard mitigation planning is taking place and provides suggestions for improvement. Planning processes in ANVs are generally initiated and overseen by outside entities and have limited community participation, as they are disconnected from community events and activities. This results in generic plans that serve the purpose of enabling communities to get funding for particular projects, but fail to address important ANV concerns, such as subsistence, and may never be implemented. A more participatory approach that engages ANV residents by building on existing indigenous community practices and providing for community oversight may be more helpful in developing a common vision for adaptation. While planners must grapple with limitations in time and funding as well as rigid requirements for certain types of plans, they could improve planning by spending more time talking to community members, better incorporating community knowledge and lessons from past planning processes, mentoring leadership to better engage in the process, and formatting plans so they are more accessible and useful. ANVs could improve planning by providing for activities that foster connectivity and a common vision and supporting efforts to build community leadership.

1. Introduction

Alaska Native Villages (ANVs)—federally recognized tribes and the communities in which they are based-- are grappling with climate change. Many are experiencing changes in flooding and erosion, changes to the species on which they subsist, melting permafrost, and later formation of ice along their shores each fall—ice that used to serve as a protective barrier from destructive fall storms (Chapin et al. 2014; Field et al. 2014; Ristroph 2010). Responding to these changes is difficult for a number of reasons. Many ANVs are located in remote, Arctic or sub-Arctic areas off of the road system and far from centers of power and commerce (Cochran et al. 2013, p. 560; McNeeley 2009, p. 6). Most have few resources to implement large-scale infrastructure to address climate change and related natural hazards (Klein, Midgley, and Preston 2014, p. 907). Further, most ANVs rely on a traditional hunting and fishing lifeway ("subsistence") for which there is no readily available substitute (Cochran et al. 2013; Loring et al. 2011; Ristroph 2010, p. 49). Recognizing these limitations, the State of Alaska and other entities have made efforts to assist ANVs with plans to address climate change, natural hazards, and other community

concerns.[24] Since climate change impacts and ANVs' ability to respond to them is not uniform, there should not be a one-size-fits-all model for ANV planning. Yet ANVs have been subject to externally led and implemented plans that fails to account for their particular geographic conditions, population numbers, cultures, political systems, and degrees of development.

In this article, I consider how a more community-oriented planning approach and other efforts to foster social connections within and beyond an ANV could facilitate adaptation beyond than a plan developed solely by outside entities. Specifically, I explore the following questions: How are ANVs planning for flooding, erosion, and subsistence impacts? How are these planning efforts contributing to community resilience in the face of climate change? What is the role of the indigenous community in planning for adaptation and what is the role of external government?

Section 2 weaves together the separate bodies of literature on climate change planning, indigenous planning, and collaborative planning. It outlines planning challenges faced predominantly by non-indigenous U.S. communities, additional challenges faced by indigenous communities, and how collaborative planning could help address these challenges. Section 3 summarizes the methods I used for reviewing ANV plans and interviewing participants. Section 4 lays out key findings on the failure of current planning efforts to create feasible plans that reflect community needs and values. In contrast to literature hailing the benefits of adaptation planning (e.g., Head 2014, p. 664; Berke and Lyles 2013, p. 183; Hirokawa and Rosenbloom 2013, p. 344; Pearce et al. 2012, p. 826; Bajracharya, Childs, and Hastings 2011, p. 4; Huang et al. 2011, p. 305; Crane and Landis 2010, p. 398; Schmidt 2009, p. 308), I find that the current process of planning is not particularly useful to ANVs, and the result is an overly long document that can garner funding for projects that may or may not help with adaptation. I explore the need for something beyond the current planning processes to build a common vision, as well as leadership and partnerships to execute this vision. My finding regarding this need is notable because I did not ask participants about their community's social connections and leadership—participants volunteered this information. In Section 5, I explore how external entities as well as communities themselves could work towards a common vision for adaptation. I then provide suggestions on how communities and planners could create plans that better reflect community needs and values and are more likely to be understood and implemented by communities and their external partners.

[24] The Alaska Division of Community and Regional Affairs (ADCRA) community plan library contains all of the hazard mitigation and other plans that communities have submitted to ADCRA (AK Division of Community and Regional Affairs 2018). As I will discuss later in this article, the vast majority of these plans are prepared by the State, contractors, and Native non-profit entities.

2. Theory on Climate Change Planning and Indigenous Communities

2.1. Background on Climate Change Planning

Climate change is associated with problems planners have grappled with for the past century, from damage to infrastructure and housing to public health and safety concerns. (Donaghy 2007, ii). What makes climate change planning different from other types of planning is the degree of uncertainty of future climate scenarios, uncertainty regarding human behaviors responding to changing conditions, and policies and funding that may emerge to address climate change (Foss 2018, p. 333; Stults and Larsen 2018; Kettle and Dow 2014; Hirokawa and Rosenbloom 2013, p. 326; Verschuuren 2013, p. 10; Camacho 2011, p. 1839; Bedsworth and Hanak 2010, pp. 478, 485; Snover et al. 2007, p. 28).[25] Researchers have called for scenario planning[26] to account for uncertainty (Boyd et al. 2015, p. S153; Berke and Lyles 2013, p. 194; Serrao-Neumann, Harman, and Low Choy 2013, p. 456; Quay 2010, p. 496; Trainor et al. 2009, p. 109), but this kind of planning is relatively limited outside of large municipalities.

In the absence of federal (or State of Alaska) law to provide guidance on scenario planning or climate change planning, there is no standardized method for how state and community planning processes take climate change into account (Stults 2017; Werner and Svedin 2017). Some communities are adopting stand-alone adaptation plans, while others have mainstreamed climate change considerations into other plans and programs (Hamin, Gurran, and Emlinger 2014, pp. 112, 119; Hirokawa and Rosenbloom 2013, p. 347; Arroyo and Cruce 2012, p. 574; American Planning Association 2011, p.20). A number of communities address aspects of climate change through hazard mitigation plans (HMPs) (Hamin, Gurran, and Emlinger 2014, p. 119), which may or may not mention the words "climate change" (Stults 2017, p. 28). Finally, there are a number of communities that have no form of climate change planning at all (Foss 2018, p. 334; Susskind 2010, p. 219).

One challenge to climate change planning, as with any other form of planning, is that a plan may not lead to action if it lacks community participation and fails to reflect a community's needs and limitations (Foss 2018; Haverkamp 2017; Horney et al. 2017; Frazier et al. 2013; Sager 2009; Corburn 2003; Godschalk, Brody, and Burby 2003; Brooks 2002; Forester 1999; Healey 1999). There is little research on the adequacy of stand-alone climate change adaptation plans in addressing community needs, but several studies call attention to deficiencies in HMPs

[25] There are exceptions to this common theme. *E.g.*, Nelson, Adger, and Brown (2007, p. 396) (suggesting that many future environmental risks are now more apparent and predictable than ever, and that risks are significant enough to warrant present action); Brunner and Lynch (2010, p. 18) (noting that "scientific excellence is no guarantee that an assessment of climate impacts will inform decisions on the ground. Conversely, a scientific assessment is not necessary for successful adaptations on the ground, though it can help.")

[26] Scenario planning uses a wide range of possible futures to anticipate adaptation strategies, and then monitors change and uses these strategies to guide decision making (Quay 2010, p. 496). Contingent policies are implemented when an anticipated scenario (such as a worst-case scenario) becomes reality (Berke and Lyles 2013, p. 196).

concerning climate-related hazards. Part of the problem is that HMPs tend to follow a narrow template that includes hazard identification, a vulnerability assessment, and a list of hazard mitigation actions that will garner the Federal Emergency Management Agency's (FEMA) approval (FEMA 2011, 2017a). Particularly for small or rural communities that rely on external consultants, HMPs may be "copy-and-paste" documents that do not sufficiently reflect local hazards (Horney et al. 2017, p. 63; Frazier et al. 2013, p. 53). Relying on external consultants without sufficient local input may limit the view of hazards and mitigation actions to those of consultants rather than tailoring adaptation solutions to particular communities (Arctic Council 2017, p. 14). There can be a disconnect between a community's goals, the mitigation actions proposed to carry out these goals, and the resources available to do so (Horney et al. 2017, p. 62; Lyles, Berke, and Smith 2014, p. 96; Frazier et al. 2013, p. 53).

There can also be a disconnect between HMPs and other community plans (Lyles, Berke, and Smith 2014, p. 2; Smith 2014, p. 306), including adaptation plans (Stults 2017, p. 28). This may relate to a lack of political will and funding (Frazier et al. 2013, p. 57) or the fact that HMPs are often prepared by risk managers rather than those who prepare other community plans (Horney et al. 2017, p. 62). FEMA itself has acknowledged the lack of integration between planning efforts (FEMA 2013, p. 2-2), although it requires HMPs to incorporate existing plans where appropriate (see 42 C.F.R. §201.6(b)(3)).

Even where plans do reflect community needs, they may not be carried out if action items are not prioritized, lack sufficient detail, or extend past the political terms of those who support the plans (Woodruff and Stults 2016, p. 800; Frazier et al. 2013, p. 57). Insufficient political prioritization, leadership, and funding are additional barriers to implementation (Dilling et al. 2017, p. 2639; Meerow and Mitchell 2017, p. 2622; Frazier et al. 2013, p. 57; Ostrom 2004, pp. 1, 151; Flo and Smith 1999, p. 28).

2.2. Planning for Indigenous Communities

Literature on indigenous planning suggests that the externally driven planning processes referenced in the previous subsection can be particularly problematic for indigenous communities. By "externally driven," I mean a planning process that is guided by (and often initiated by) a private or government planning entity not based in the community. The community approves the plan but may have had limited participation in drafting it. I provide more detail in Section 4.2 on how planning is externally driven for ANVs.

Problems with externally driven processes relate to paternalistic planning approaches that disregard indigenous knowledge, cultural goals, planning traditions, and concepts of space[27]

[27] Porter (2010, pp. 3, 17) argues that modern planning is the product of colonialism, which ordered space in a manner designed to support colonial modes of production (in contrast to indigenous formations of space). Under this view, indigenous peoples could be contained within reserves through a system of land zoning (Porter 2010, p. 74). This colonial view of space is related to the colonial concept of sovereignty, which colonists based on the

(Hibbard, Lane, and Rasmussen 2008, p. 142; Lane 2003, p. 365; Sandercock 2004, p. 95; Matunga 2013, p. 4; Porter 2010, pp. 4, 17; Ostrom 2004, p. 2). Such approaches can perpetuate outside intervention and control, entrenching disparities and repressing tribal capacity (Ford et al. 2016, p. 179; Mannell, Palermo, and Smith 2013, p. 116; Jojola 2008, p. 41). The literature also refers to a lack of indigenous planners or attention to indigenous issues in the planning field (Hibbard, Lane, and Rasmussen 2008, p. 136; Sandercock 2004, p. 95). Finally, even where planning efforts attempt to avoid these problems, they fail to address the legacy of post-settler[28] states' usurpation of indigenous land rights (Hibbard, Lane, and Rasmussen 2008, p. 139). In other words, poor planning can prolong injustice. This injustice takes on another angle in the context of climate change, as many indigenous communities are trying to plan for changes resulting from greenhouse gases emitted primarily by non-indigenous populations (Whyte 2013, p. 523).

Researchers have suggested ways to improve indigenous community planning. One is for planning processes to take into account an indigenous community's existing cultural practices, decision-making structures, and local leaders (Chapin et al. 2016, p. 67; Adger et al. 2012, p. 115; Minerbi 2003). Such processes can be oriented around cultural events and supported by community and elder knowledge (Hardess 2013, p. 145; Matunga 2013, p. 20; Jojola 2008, p. 42). Rather than simply relying on public planning meetings in an official setting, planners can take a more flexible approach that fosters conversation with indigenous community members when and where they are available (Pearce et al. 2012, p. 834; Jacobs and Brooks 2011, p. 112). In terms of crafting a plan, visual representations and stories may be a more conducive way to deliver information than lengthy documents and presentations (Pearce et al. 2012, p. 834; Forester 1999, pp. 134-138).

Planning challenges related to disparities between communities and external planning entities can be even more problematic for indigenous communities, as they often have a history of external intervention. While all planning processes should take into account community needs and values, this is especially important for indigenous communities, since their needs and values may be distinct from those of non-indigenous communities.

2.3. Planning Collaboratively with Indigenous Communities

The previous subsection reviewed lessons learned from the indigenous planning literature. Much of this literature is focused on past mistakes and how indigenous communities could plan for themselves, rather than focusing on the potential for collaborative planning and partnerships with

"improvement" of land (Porter 2010, p. 26). Colonial powers did not see indigenous people as improving their lands, such that these peoples could not be recognized as sovereigns.

[28] The term "post-settler state" refers to a state in which the majority of residents no longer consider themselves migrants from the colonial power but instead "natives" of the state, while indigenous peoples may be a minority (Lane 2006, p. 386).

external entities.[29] In this subsection, I apply themes from the collaborative planning literature to ANV planning. I focus on social capital, a concept that is important to collaboration even though much of the literature on social capital is separate from that on collaborative planning.

2.3.1. The need for external planning assistance and potential for collaboration

I begin with an explanation of why collaboration is needed. While Alaska Native families and clans have planned for their own well-being for thousands of years, the current circumstances (outlined as follows) may require assistance from external entities to plan for climate change (Stoyanova 2013, p. 310; Wildcat 2013, p. 511). First, ANVs lack jurisdiction over their traditional lands and natural resources (see 43 U.S.C. §1603), such that they must cooperate with local, state, and federal entities regarding land use or game management. Second, ANVs are often small and impoverished communities without their own tax base (AK Division of Community and Regional Affairs 2018). Many have little in the way of environmental staff, let alone climatologists, planners, or engineers to develop adaptation plans. Hence, many ANVs that want climate change adaptation plans or HMPs must rely on external funding and consultants. Third, climate change in ANVs is occurring much more rapidly than elsewhere in the United States, contributing to significant flooding, erosion, and impacts to subsistence hunting and fishing (Chapin et al. 2014, p. 536; Field et al. 2014, p. 32; Stewart et al. 2013). Even if ANVs had the means to draft plans, they often lack the resources needed to carry out large-scale adaptation measures such as relocation (Klein, Midgley, and Preston 2014, p. 907).

The need for external assistance does not necessitate a repeat of past planning mistakes. Instead, planning can be a collaborative process that harnesses the resources of external entities as well as those of the community. According to the collaborative planning literature, this kind of collaboration generally requires a process of consensus building between participants who have roughly equal authority in the collaboration and are committed to working together (Margerum 2008, p. 487; Focht and Trachtenberg 2005, p. 124; Lubell et al. 2005, p. 262; Sabatier et al. 2005, p. 4; Sabatier, Weible, and Ficker 2005, p. 24). Particularly with indigenous groups, planning processes need to recognize community knowledge and values alongside Western science (Berkes, Kofinas, and Chapin 2009, pp. 124, 141; Kofinas 2009, p. 79).

It is important to not confuse true collaboration with other forms of interaction that may fail to adequately integrate ANV needs, knowledge, and values. Arnstein (1969) pointed out that not all forums for public participation are really meaningful. Rather, she described a "ladder" of participation with eight levels, ranging from "non-participation" (including manipulation and therapy), followed by the "tokenism" levels (informing, consultation, and placation), and

[29] There is relatively little literature on collaborative planning processes between U.S. indigenous groups and external entities, although there is research on indigenous co-management of game (Howitt et al. 2013, p. 315; Theriault 2012, p. 250; Pinkerton 2009, p. 251; Nelson, Adger, and Brown 2007, p. 409) and on collaborative planning with indigenous peoples outside of the United States (Saenz Quitian and Rodríguez 2016; Smyth et al. 2016; Barry 2012).

finishing with citizen power (partnership, delegated power, and citizen control). True collaborative planning would be closer to the top of the ladder.

2.3.2. The need for social capital to support collaboration

Generally, planning collaborations are more effective if social connections and trust are already present among the participants or are formed during the process (Innes et al. 2011, p. ix; Johnston et al. 2011, p. 700; Ansell and Gash 2007, p. 544; Healey 2006, p.57; Innes and Booher 2003, p. 8; Winer and Ray 1994, p. 138). There is an entire body of literature on the formation and importance of these connections and trust, known as "social capital" (Adger 2003; Putnam and Goss 2002; Coleman 1988). Social capital theory explains how individuals use their connections for their own and for the collective good (Adger 2003, p. 389). Aside from facilitating planning processes, social capital can boost community resilience in the face of climate change (Arctic Council 2017, p. 14; Nilsson et al. 2016, p. 169; Cutter et al. 2008, pp. 601, 604; Norris et al. 2008, p. 136; Western et al. 2005, p. 1103) and establish a basis for the kinds of collective action needed for community adaptation (Kofinas 2009, p. 85; Norris et al. 2008, p. 141; Lubell 2005, p. 263; Adger 2003, p. 389; Ostrom and Ahn 2003, p. 3; Grootaert and Bastelaer 2002, p. 8; Reid and Salmen 2002, p. 89). The rest of this subsection briefly summarizes the relevance of social capital to ANV adaptation planning.

In order to be heard by external government agencies and obtain resources needed for adaptation, connections between indigenous communities and external entities (known as "linking" social capital) are important (Klein, Midgley, and Preston 2014, p. 907; Matunga 2013, p. 27). Building this capital can be challenging given the legacy of colonization and the power imbalance between indigenous participants and external agents (Ford et al. 2016, p. 178; Sandercock 2004, p. 108; Wuttunee 2004, p. 187). ANVs face the additional challenge of being remote and rural, far from urban-based state and federal decision-makers (McNeeley 2009, p. 15). Agencies in Alaska have traditionally not incentivized relationship-building between employees and communities, and most employees do not stay at one post where they work with the same set of communities year after year (Jacobs and Brooks 2011, p. 106). Some rural communities and individuals feel that they have no control over government decisions or that their voice is not be heard (Knapp et al. 2014).

In addition to connections with external agents, connections within ANVs (known as "bonding" social capital) are important to enable an ANV to act with a common vision (Ritchie and Gill 2010, p. 58; McNeeley 2009, p. 138). Strong and respected leaders are often essential in fostering and implementing this vision among stakeholders (Garmestani and Benson 2013, p. 11; Olsson, Folke, and Berkes 2004, p. 83; Winer and Ray 1994, p. 25). Yet building a common vision in an ANV can be challenging due to disputes that sometimes exist between different families or entities. This issue has received very limited attention in the literature on ANVs (with the exception of Brunner and Lynch (2010, p. 221) but has been noted in reports (Gray 2010) and news articles (DeMarban 2015; Demer 2015). For the remainder of this section, I provide background on the distinct political situation within many ANVs that can make community collaboration different.

An ANV is not always a single indigenous people. ANVs have often formed from different clans or bands that came together in a single settlement.[30] In addition to historical divisions, there may be political divisions exacerbated by Alaska state and federal law. An example is the 1971 Alaska Native Claims Settlement Act (ANCSA), 43 U.S.C. §§ 1603, 1606, 1607,[31] which has led to three different spheres of power in most ANVs: the tribal government, the city government, and the village corporation leadership (Chapin and Cochran 2014; Ristroph 2010). The tribal government has no jurisdiction over land, only over tribal members. It is often the receiving entity for federal grants for health, housing, and roads. Many but not all ANVs are associated with an incorporated city, which is a political subdivision of the state that may receive some grants for community development. The city council may consist of non-Native members elected by residents, while the tribal council consists entirely of Native residents. Some communities have leadership challenges when the tribal council and the city government do not agree on (or even talk about) matters of mutual concern (Chapin and Cochran 2014, p. 20).

In addition to the tribe and city, most ANVs are associated with a third entity—the village corporation—which often owns most of the land in and around the village. If the village is in a resource-rich area, the village corporation may drive development of a lands important to the tribe (Chaffee 2008, p. 143), and it have an office and business outside of the village (Ristroph 2010, p. 20). This can lead to political differences between the tribe and corporation. While some corporations allow tribal members born after the enactment of ANCSA to become shareholders at birth, others allow new membership only through inheritance of shares. This can lead to a situation where many people receiving corporate dividends live outside of the community, while many people living within the community do not receive dividends at all. In short, political, economic, and historical differences within ANVs can impede the development of a common vision on climate change adaptation and other community concerns.

In summary, while there is a need for collaboration within and beyond ANVs to create and carry out climate change adaptation plans, this may be easier said than done. The history of colonizing planning assistance and the remoteness of ANVs impede relationships with external entities that could support planning efforts. And the fractured political nature of some ANVs can hinder the community's ability to come together and adopt a common vision for climate change planning and adaptation.

3. Methods

To get an understanding of the kinds of plans being produced for ANVs, I searched the Alaska Division of Community and Regional Affairs library of plans (AK Division of Community and

[30] For example, the South Fork or Bear Paw Clan band joined the Caribou Clan to establish the ANV of Allakaket (AK Division of Community and Regional Affairs 2018).

[31] Native corporations are distinct entities from tribes, and not all tribal members within an ANV are shareholders of the corporations associated with that ANV. Also, a number of shareholders live outside of ANVs and Alaska and may not have a direct interest in the ANV (Ristroph 2010, pp. 76-77).

Regional Affairs 2018) (as well as conducting a more general Internet search) for all ANV plans as of 2017. The library of plans contains various types of community-level plans dating as far back as 1959 for Alaska communities that have chosen to submit plans to the Division (674 plans at the time of review). I generally limited my analysis to plans produced in the previous 20-years for the 59 ANVs from which I drew my research participants. In situations where a similar plan existed for different years (HMPs are typically renewed every five years in accordance with 44 CFR §201.6(d)(3)), I only focused on the most recent plan. This resulted in a review of about 70 plans, with some plans (such as the North Slope Borough HMP) applying to more than one ANV. Additional details regarding plans I reviewed appear in Section 4.1.2.

To better understand how planning is being carried out for ANVs, I had 153 interviews and conversations[32] with ANV residents as well as those outside ANVs who make or influence ANV plans and policy. Questions related to adaptation actions observed and recommended, adaptation obstacles, knowledge of adaptation plans, the role of planning in facilitating adaptation, and the roles of different entities in facilitating adaptation planning and actions. About half of my communications, including 53 semi-structured interviews and 23 informal conversations, took place with residents from 59 different ANVs across the State. Rather than randomly selecting participants, I sought information-rich "cases" (individuals) whose experience and knowledge captured the main themes of my research questions across a varied group (Bernard and Ryan 2009, p. 365; Corbin and Strauss 2007, p. 318; Creswell 2007, p. 75; Patton 2001, pp. 234-351; Stake 2000, pp. 447). I focused on getting at least one participant from each of Alaska's twelve cultural/geographic regions, and on having ANVs with a diversity of economic, political, and development characteristics.[33]

I also had 61 semi-structured interviews and 16 informal conversations with participants from outside of ANVs, including legislative and agency representatives, researchers who had published articles related to ANV adaptation, lawyers who had worked with ANVs on subsistence and other matters, and planners who had facilitated plans for ANVs. I initially selected these outside participants from the agencies that play a role in ANV adaptation and used a "snowball" technique to get recommendations for additional participants (Jacobs and Brooks 2011, p. 95; Bernard and Ryan 2009, p. 367; Tongco 2007, p. 152). I had different sets of interview questions for ANV residents and for those outside of ANVs, and most participants did not answer all the questions I asked. Still, almost all interviews and conversations included a

[32] Some participants did not want to be formally interviewed but had "conversations" with me that answered many of my interview questions. Interviews followed standard university protocols for obtaining permission from participants. For the less formal conversations, consistent with guidelines in Mack et al. (2005, pp. 16-19), I identified myself and the purpose of my research as soon as possible in the conversation.

[33] For example, I ensured that some participants came from ANVs with greater economic development and income, while some came from ANVs with no running water in the homes. Some had only a few dozen residents, others had a few thousand (most had a few hundred). Some had only a tribal council as their governing structure, while others also had a city and/or county-level government. Some had extensive experience with disasters and adaptation efforts, while others had relatively less climate risks.

discussion on the role of planning in facilitating ANV adaptation, as well as challenges to adaptation and suggestions for changes in the ways that external entities facilitate adaption.

I used qualitative content analysis (Corbin and Strauss 2007; Miles and Huberman 1994, p. 56) to identify major adaptation actions, relevant laws and agencies, facilitators, barriers, recommendations for change, and other themes that arose from interviews and those conversations that covered interview questions, as well as in ANV plans. Themes arose deductively from the questions I asked in my interviews (based on concepts in the literature) as well as inductively from new themes raised by participants (Bernard 2006, p. 402; Ryan and Bernard 2000, p. 781; Miles and Huberman 1994, p. 58).[34]

The differences in the questions and themes each participant chose to discuss limited my ability to quantitatively compare responses between different participants. Given this limitation and the subjectivity of my coding, I decided that using statistical analysis was not appropriate (Zhang and Wildemuth 2005, pp. 2, 5; Bernard and Ryan 2009, p. 288). I thus avoid referring to specific numbers of participants, except to give the reader a general sense of how many participants provided a similar comment. To give an order of magnitude of the responses I got, I refer to "a few" (about 2 to 5), "several" (about 6 to 10), "a number of" (11-30), or "many" (more than 30). These categorizations are not statistically meaningful and should not be interpreted in that manner.

4. Key Findings on Adaptation and Hazard Mitigation Planning in ANVs

There is a great deal of planning concerning key aspects of climate change such as flooding and erosion. But the manner in which these plans are created and the resulting products are not necessarily preparing ANVs for climate change impacts—especially those related to subsistence. Later in the section, I discuss shortcomings of the externally led planning processes as well as the need for connections and leadership to support a collaborative planning process.

4.1. Many Plans Refer to Climate Change Impacts

4.1.1. Summary of Publicly Available Plans

I begin with an overview of the plans I found pertaining to climate change and other ANV concerns. Most ANVs that still have residents living at their village sites have some form of written community plan on file with the Alaska Division of Community and Regional Affairs.[35]

[34] For purposes of this article, there are a few instances where I have supplemented my research findings with my experience as a lawyer and planner for the North Slope Borough, a county-level government in Arctic Alaska (2007 to 2011), and for the ANVs of Allakaket (2016 to 2018) and Newtok (2017 to 2018).

[35] Some village sites have been abandoned due to disasters or economic reasons. Examples include Belkofski (moved after collapse of commercial otter industry in early 1900s), Pauloff Harbor (people gradually relocated to the existing community of Sand Point), Ohogamuit (only used for subsistence camps), Portage Creek (people gradually moved away since the 1980s), Solomon (people gradually moved away since the early 1900s), Unga (people

Of the 59 ANVs from which my participants were drawn, 38 had plans providing for land use and economic development, and 43 had their own HMP or were part of a multi-jurisdictional HMP. Thirty-five ANVs had other types of plans related to economic development, tourism, transportation, relocation, housing, infrastructure, and emergency preparedness. Only four of the 59 ANVs lacked publicly available plans of any kind. Climate change is mentioned in many recent ANV plans: HMPs for 26 ANVs and four other plans refer to climate change as contributing to hazards, while three relatively recent HMPs (from 2015) refer to climate change as a stand-alone hazard.[36] Even where HMPs do not specifically mention climate change, almost all refer to flooding, erosion, and severe storms—key hazards associated with climate change in Alaska (Chapin et al. 2014).

For the remainder of this subsection, I review the highlights of ANV plans specifically related to climate change adaptation. Two ANVs, Shaktoolik and Nome, had stand-alone climate change adaptation plans as of 2017, and participants from some other ANVs said they were working on adaptation plans.[37] Shaktoolik's plan was written in 2014 with help from Alaska Sea Grant, a private consultant, and input from the community's Tribal Council, City Council, and Village Corporation (Johnson and Gray 2014). The plan is relatively simple, with nine key adaptation measures (Johnson and Gray 2014, p. vi). The three most concrete measures call for construction of protective infrastructure, including a coastal berm. Other measures include consideration of relocating infrastructure, guidelines for future development, monitoring, research, looking for funding, and updating Shaktoolik's HMP. The plan does not provide specific measures related to subsistence.

The Nome adaptation plan, written in 2017, is the effort of four ANVs (the Nome Eskimo Community and three ANVs whose residents mostly live in Nome), along with Alaska Sea Grant and the University of Alaska (Kettle, Martin, and Sloan 2017). Like the Shaktoolik plan, the Nome plan was relatively simple, with eight key measures supported by more detailed strategies. Four are specifically related to subsistence, including a call for increased tribal representation in subsistence management. Other measures include increased awareness, protecting tribal cemeteries from erosion, research and monitoring, and building capacity for addressing concerns about increased shipping.

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gradually relocated to the existing community of Sand Point), King Island, (people gradually relocated to the existing community of Nome in the mid-1900s), and Afognak (which successfully relocated to Port Lions following the destruction caused by a 1964 earthquake and tsunami). (AK Division of Community and Regional Affairs 2018). Tribal governments of these ANVs continue to exist.

[36] In 2015, for the first time, FEMA's State Mitigation Plan Review Guide required state risk assessments to consider "changing environmental or climate conditions that may affect and influence the long-term vulnerability from hazards in the state" in spite of the "inherent uncertainty about future conditions." (FEMA 2015, 3). There is not a similar requirement for local HMPs.

[37] There are a number of community-specific reports about climate change impacts that are sometimes characterized by the literature and websites as climate change plans, but are not actually plans. An example is "Climate Change in Nuiqsut, Alaska, Strategies for Community Health," which describes climate change impacts and potential adaptations but contains no goals or action items (Brubaker 2014). I did not consider these to be adaptation plans in my study.

The Norton Bay Watershed Council, a non-profit tribal entity for the west coast villages of Shaktoolik, Unalakleet, Koyuk, and Elim, worked with the Model Forest Policy Program and others on a project to explore climate change impacts and potential adaptations. This led to a lengthy report with a section on adaptation-related goals, including obtaining funding for emergency preparedness, obtaining water quality data, increasing access to and protecting subsistence, increasing climate change awareness, and improving economic conditions (Murray, Shepherd, and Ryan 2013).[38]

Newtok has a written plan to relocate to a new settlement known as Mertarvik.[39] Outside consultants prepared the plan in 2011 for the State of Alaska Division of Community and Regional Affairs, which was actively assisting Newtok with relocation efforts at that time (Agnew Beck Consulting, PDC Engineers, and USKH, Inc. 2011). While the plan does a strong job of providing guiding principles for the relocation and contains clear graphics, it does not begin to delve into the complexity of relocating through the federal grant programs currently available to the community (Ristroph 2017b).

In short, though there are only a few stand-alone climate change adaptation plans for ANVs,[40] climate change impacts are raised in many plans, and there are few ANVs that lack any plan whatsoever.

4.1.2. Planning Traditions May Tell a Different Story

As I will discuss in Section 4.2., all of the plans I described in the previous subsection were developed by or with the help of entities outside of ANVs (either contractors, higher-level government entities, or regional Native non-profit entities), and all take relatively similar formats (written documents with background information, goals, and action items). It is important to point out that, consistent with the literature on indigenous planning, there is some tradition of "indigenous" planning among ANVs that may differ from the type of plans I reviewed. I presume that some form of community-level planning or a common vision facilitated past community relocations in response to flooding,[41] although this kind of planning was likely

[38] The 2014 Shaktoolik Adaptation Plan mentions the Norton Bay report but notes that it mostly relates to Elim (Johnson and Gray 2014, p. 10). The only other community plan I found that mentioned the Norton Bay report was Shaktoolik's 2015 HMP, which included it in a list of previous plans (LeMay Engineering 2015a, p. 5).

[39] Two studies of potential relocation sites for Shishmaref (Bristol Environmental & Engineering Services Corporation 2010) and for Kivalina (Hayes 2006) are entitled "plans" but provide no definite planning goals. Shishmaref does have a Relocation Plan setting forth goals for identifying sites, timelines, goals, and other plans—it is essentially a plan to plan (Shishmaref Erosion and Relocation Coalition 2002).

[40] I did not find any stand-alone adaptation plans for ANVs not in my study.

[41] The Alaska Division of Community and Regional Affairs community database contains brief histories of each ANV (AK Division of Community and Regional Affairs 2018). There are 25 references to communities relocating due to flooding prior to the Alaska Native Claims Settlement Act in 1971, when land ownership became more solidified and dependence on stationary, Western-style infrastructure increased. Many more communities and tribal

unwritten and consensus based. For example, several participants referred to unwritten understandings in modern times about what a community would do in the event of a disaster. Two from the same community referred to an understanding that their community would move as far inland as needed, with guidance from elders.

A few participants, all older Native men, referred to their indigenous planning history. One said, "We're the best planners in the world. We plan…because we have to." Another participant said that planning has traditionally occurred on a family level (i.e., preparing for a memorial potlatch celebration) rather than at a community level. Another contrasted traditional planning with modern planning, "Families plan based on their own situations. Community planning can take responsibility away from people. People will give away their responsibility to a planning contractor." In other words, there is a gap between the kind of planning that traditionally facilitated adaptation by Alaska Native families and clans, and the Western-style planning that is broadly occurring across Alaska.

4.1.3. Scenario Planning

None of the plans I reviewed contained any form of scenario planning. Given the attention in the literature and at the University of Alaska Fairbanks[42] to scenario planning as a means for addressing climate-related uncertainties, I asked a number of participants (about half in ANVs) whether this could be useful for ANV planning. Those outside of ANVs seemed enthusiastic about the potential for scenario planning to help adaptation in the face of uncertainty, and it is already being used in some agency planning processes.

While there was interest among ANV participants in scenario planning, there was little understanding of how it had been or could be used. One agency representative offered a suggestion for improving understanding:

> Scenarios lend themselves to storytelling. You can say to a village council: "Let me tell you a couple of alternative stories about your grandchildren," then ask what they think about the benefits of each story. You can lay out three to five stories and ask how it affects their grandkids and their values. … Stories connect with people's culture. You can then present the plan and show where these stories fit in.

Thus, there is potential for using scenario planning to help ANV adaptation planning, but it has not yet been embraced by ANVs.

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groups that relocated may not have been listed. This kind of historic relocation differs greatly from the manner in which ANVs are currently seeking to relocate in response to climate change (Ristroph 2017b).

[42] The university has a division devoted to scenario planning in Arctic Alaska (University of Alaska Fairbanks 2018).

4.2. How Planning Is Actually Occurring

In this subsection, I outline some of the pitfalls of the externally driven planning processes taking place for ANVs.

4.2.1. Limited Community Participation and Lack of Common Vision

Based on my conversations with participants and my review of community plans, I found that planning for ANVs is generally initiated, led, and may be carried out by people outside of ANVs. No plan that I reviewed was developed solely by an ANV. For hazard mitigation planning, the process typically starts with the State of Alaska's Division of Homeland Security, which contacts communities regarding the need to update their local hazard mitigation plans and provides a contractor to do so. These contractors ensure that the plans conform to specific federal regulations (44 C.F.R. §201.6). As I describe later in this section, the results are long, complicated plans with limited community input. These plans may then support the State's application to FEMA for local hazard mitigation funding.[43]

Other planning processes (outside of HMPs) may be less formal, yet no less externally driven. For example, "comprehensive" or "local economic development" plans may be initiated by regional Native non-profit entities,[44] whose staff complete the plans based on a standard template.[45] Alternatively, for ANVs situated within a county-level government (known as a borough[46]), plans may be initiated by the borough and completed by contractors.[47]

A number of ANV participants were unaware that their communities had plans. Only a few referred to their communities' HMPs, though HMPs are in place for 43 of the ANVs from which participants came. Several (twice the number referring to HMPs) referred to Small Community Emergency Response Plans (SCERPS), which are simple flipbooks with emergency shelter, evacuation, and contact information (see Figure 2.1). These may be more accessible than other types of plans.

[43] Local communities are generally "subapplicants" when a state is an applicant for hazard mitigation funding. The local community is required to have its own plan to be a subapplicant. 42 U.S.C. § 5165

[44] These entities were established by ANCSA to administer federal money for health and other programs on behalf of ANVs (43 U.S.C. § 1606; Worl 2016).

[45] Examples of this are community plans produced by Tanana Chiefs Conference for ANVs in interior Alaska and local economic development plans produced by Kawerak, Inc. for ANVs in the Bering Strait region.

[46] A borough is a municipal corporation and political subdivision of the State of Alaska. It is similar to a county, but often encompasses a region much larger (94,770 square miles in the case of the North Slope Borough). There are 16 organized boroughs in Alaska encompassing about 43 percent of the geographic area. The rest, the "unorganized borough," has no county-level government but includes city and tribal governments. (Alaska Department of Community and Economic Development 2004).

[47] An example of this is the comprehensive plans produced by North Slope Borough contractors for ANVs on the North Slope.

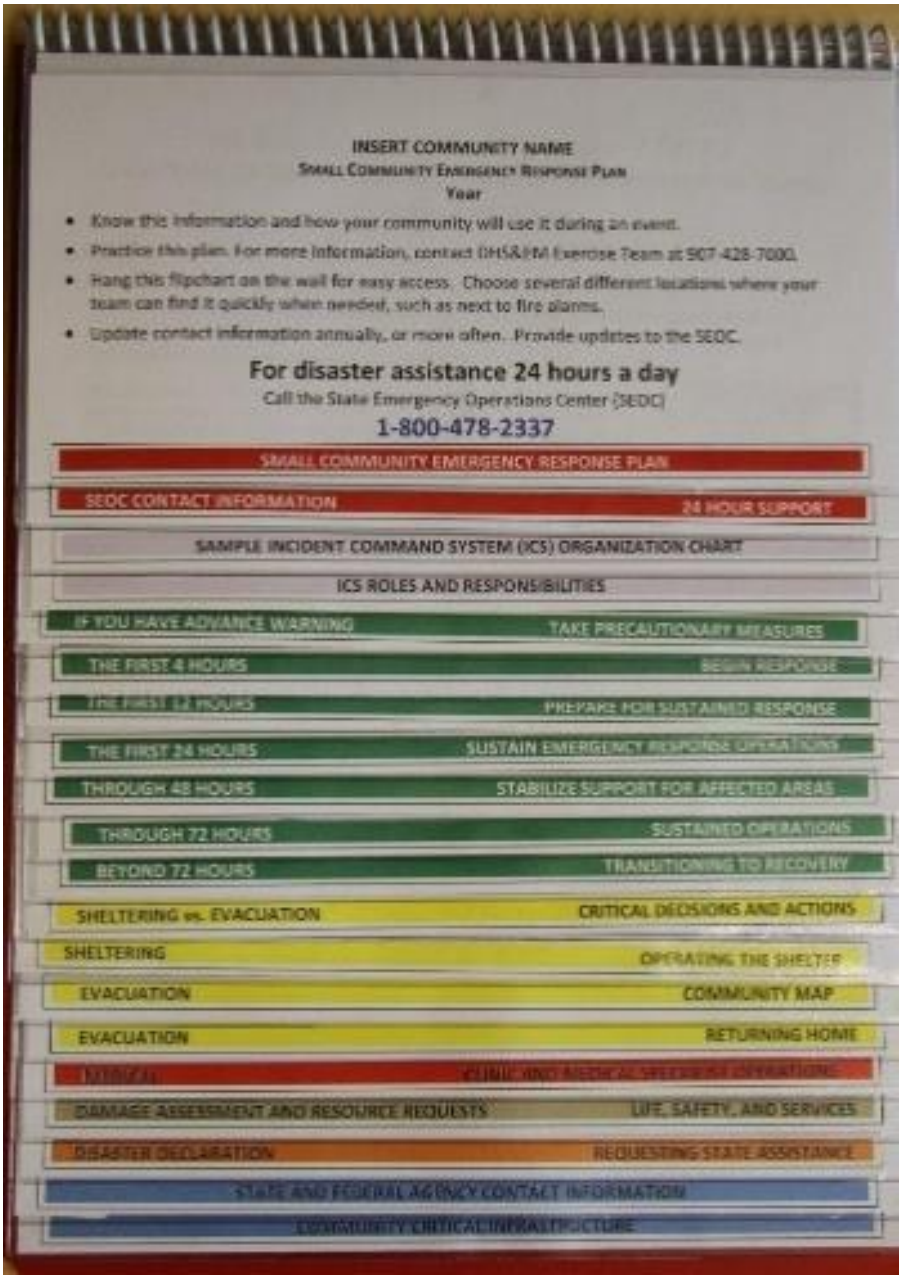

Figure 2.1: Small Community Emergency Response Plans (Alaska Division of Homeland Security 2010)

Often only a small segment of the community comes to planning meetings and is engaged in the planning process.[48] One community leader acknowledged the need for getting "the whole community to be working on a plan," but said, "It's hard to get the whole community involved. Community meetings work well in smaller communities. In larger communities, only the people

[48] This finding is based on participant statements, list of attendees in community plans, and my own work on community planning through the North Slope Borough (prior to my Ph.D. research).

really interested will go." A planning consultant described attendance at an ANV planning meeting he coordinated as follows: "During the consultant's first visit to [the community] for this project, it became clear that most residents did not attend public meetings." While this could be said for many communities, it is noteworthy because the community in question is small (a few hundred people) with little in the way of employment or entertainment options to otherwise occupy residents.

Part of the problem, as described by Jacobs and Brooks (2011, p. 100), is that communities with disagreements may not want to sit together in public meetings (though none of my participants directly stated this). More than a fifth of all participants (with half of these in ANVs) cited community disagreement as a barrier to adaptation. One ANV resident put it this way: "People get excited about a project, but years go by and nothing happens. People start squabbling. It's hard to get consensus. People are mad about things that happened a long time ago." This lack of connectivity not only hinders planning, but also reduces the likelihood of gaining outside support for community adaptation. A few state and federal agency representatives told me that when a community is in dispute and there is no clear leader, agencies do not want to invest in the community.

Aside from connectivity, another barrier to participation in meetings may be that people are simply involved in their own lives and do not get sufficient benefits from public meetings to warrant coming. A few participants specifically referred to a sense of fatigue with meetings and research led by outsiders. Yet, based on my review of HMPs, contractors rely on public meetings (sometimes only with teleconference participation) and newsletters rather than more personal engagement. This meets FEMA's public involvement standard, which does not even require any sort of meeting (44 CFR § 201.6(b)). As one participant that worked on HMPs told me, "The contractors that write these plans end up (myself included) writing them without too much input from village. There's public input requirement, you have to let them know you're writing the plan during the drafting process; then you have to have them review the final draft, but that's it."

A few participants and plans offered strategies for achieving better input. The aforementioned contractor told me that he was able to get more information by having smaller group meetings as well as surveys. The community leader quoted above (who was from a hub community with a few thousand residents and numerous community organizations) suggested,

> There's a need to bring in all the organizations in the community. Use mailers and word of mouth. It might help to do this outside as a summer barbecue. If you get all the organizations involved, they will tell their employees, who will tell their families. Then this town becomes a little smaller. Use the right words—word will get around in about an hour.

A number of people specifically called for planners and researchers to listen to elders and not disregard their traditional knowledge. Nearly half of all my research participants (most of whom

were Native and/or in ANVs) talked about the role of this knowledge in adaptation, with the majority describing it as useful. Nearly an eighth of all participants (mostly Native and/or in ANVs) expressed frustration that this knowledge is not considered on par with Western science in decision-making and planning.

On the other end of the spectrum, several participants, mostly in ANVs, suggested that youth should be more involved in planning and other climate change adaptation actions. The Kwethluk community plan provides an example of how this involvement could occur: planners held meetings with high school classes and asked students to list their likes and dislikes about the community, offer ideas on how the dislikes could be changed, and then select their top three priorities from the list of ideas (The Arcturus Group 1998). This information was shared at the plan development work sessions and incorporated into the community needs section of the plan.

Participants offered various strategies for building connections and fostering a common vision at the community level. An important one was regular community meetings—especially between the tribe, city, and corporation—to build togetherness and work through problems. Another approach involves continuing or revitalizing cultural practices, knowledge, or language as a way to build togetherness. One elder explained, "Eating together is where all of the good feeling and friendship and renewal of life come from, that's why we have potlach.[49]" A number of participants (mostly Alaska Natives) stressed the importance of long-standing cultural traditions that had helped Alaska Natives weather tough times in the past, and several suggested learning and practicing traditional skills and lifeways as a means to adapt. In addition to participant remarks on this theme, 28 community plans called for activities to promote culture. Nineteen plans called for regular community meetings to address planning issues, and nine plans called for other actions to bring the community together (including culture camp). In short, there are strong links between culture-building and togetherness.

Hydaburg Mayor Tony Christianson described how his community was able to come together to create an effective plan:

> We just did a week-long community planning session to prioritize what our issues are in the community and drafted a new 10-year plan for the community. In 2005 we did a 15-year plan and we accomplished everything. We took a week to go back and think about the next 10 years. I think in 10 years we'll be a self-sustaining community.

Christianson's description suggests that the time and effort that community members put into their planning process contributed to its successful implementation. But the community's willingness to work on the plan did not arrive magically through the planning process. Christianson described how Hydaburg (with a population around 400) had worked to build

[49] Potlatch is a memorial to celebrate the life of a deceased love one.

connections among community entities despite the fractured leadership caused by the Alaska Native Claims Settlement Act. Residents formed what they call "the Unified Front" for all the different community entities to work together. Christianson suggested that this has moved them forward compared to similarly sized communities.

Nenana Chief Don Charlie spoke with a similar degree of dignity about his community. He described Nenana's development plan, which had 11 actions items, seven of which had already been accomplished. Like Hydaburg, Nenana has built social connections in the community outside of the planning process. Charlie described the community's quarterly dinners:

> We call it Community Safety and Village Pride. People go there and they don't drink, they don't smoke. We have food and door prizes. All the entities are invited, the city, the school, the churches, the corporation, the tribe, and then we each give a report on what we're doing. We have it every three months. I think one of the reasons communities are bickering against each other is that they don't know what this part of town is doing, all they hear is rumors.

The social connections that ANVs like Hydaburg and Nenana have created among themselves *outside* of the planning process may help foster a common vision and participation *in* the planning process. This kind of social and cultural capital within an ANV is particularly important given the limitations of other kinds of capital (i.e., financial and human resources). It may also help to translate a community's planning traditions (such as those pertaining to subsistence) into the kind of written plan that supports external funding of projects that are important to the community.

4.2.2. Cookie-cutter, Check-box Plans

Contractor-prepared HMPs are quite similar to each other.[50] Despite Alaska's diverse geography, just about all HMPs list the same five hazards—earthquakes, floods, fire, severe weather, and erosion—each with a similar description of these hazards. HMPs lack an explanation of how and why these hazards were selected, instead of hazards more closely tied to permafrost melt and thin ice. It is difficult to sort out which particular hazards actually affect a community, since there is so much background information on various types of natural hazards. For instance, the St. Paul HMP spends a great deal of time talking about permafrost before noting that St. Paul is in a "zone is classified as having 'zero percent' permafrost." (AECOM 2016, p. 5-9).

Shishmaref's 2015 HMP is an example of an apparent mismatch between listed hazards and actual circumstances. The plan profiles wildfires as a hazard, even though the community is on a treeless island with little vegetation and no record of wildfire anywhere in the vicinity (LeMay

[50] Plans prepared by a Native non-profit organization for communities within the same region can also be similar, but not to the degree of HMPs.

Engineering 2015b, p. 60). Yet permafrost degradation is not profiled as a hazard, despite the fact (admitted in the HMP) that it is a major contributor to erosion (*Ibid*, p. 50).

Hazard mitigation actions (action items that are supposed to address the hazards identified for the community under 44 C.F.R. 201.6 (c)(3)(ii)) are similarly generic. It appears that the contractor often presents the village planning team with a list of generic mitigation actions to choose from, without thought for whether these are most relevant to ANV problems.[51] Many ANVs have selected actions to mitigate fire (i.e., become a "Fire Wise" community) even though they may be located in humid or treeless places (including islands) that have not experienced fires since settlement. For example, Shishmaref's HMP calls for five fire mitigation actions (LeMay Engineering 2015a, p. 90).

FEMA requirements may contribute to this "cookie-cutter" nature. A planner for the State described HMPs as following very particular criteria in the Code of Federal Regulations: "FEMA requests for the plans to follow this order so they can more easily check them." A planner that has worked on HMPs told me, "Some of the federal requirements for hazard mitigation plans are just ridiculous. There's pretty much a script to follow, so they're all alike. FEMA wants them that way."

The requirements do not lend themselves to "thinking outside of the box." One planner described his experience working on a HMP for a Lower 48 tribe as an example of this kind of mentality. The draft plan included non-natural (manmade) hazards to address interstate and rail lines passing through the tribe's reservation. FEMA determined that the plan did not meet its standards due to the inclusion of non-natural hazards, even though the planner felt that the plan was meeting the letter of the regulations and serving the tribe's needs.[52]

In addition to FEMA's standards, another factor that contributes to "cookie-cutter" plans is that HMPs for ANVs are done by the same handful of contractors. A State of Alaska official explained to me the State puts out a request for proposals to renew HMPs that are expiring at the end of their five-year terms. [53] A single planning firm is hired to work on 12 to 15 local plans at a time for about a quarter million dollars. Of the HMPs I reviewed for 43 ANVs, 17 were done by the same contractor. All are professionally put together with extensive data sets, photographs, charts, and action items. They look great on paper but do not comport with real life in ANVs.

[51] For example, Teller's 2013 HMP says, "On May 2, 2013, the Planning Team reviewed and considered potential mitigation actions from a comprehensive list" (URS 2013, p. 7-3).

[52] This plan was drafted prior to the Disaster Mitigation Act of 2000, Pub. Law No. 106-390, 114 Stat. 1552 (106th Congress Oct. 30, 2000), which allowed non-natural hazards to be included in the scope of FEMA disaster relief.

[53] This may not happen exactly every five years. Allakaket's 2010 HMP expired in 2015 (URS 2010a), and the State put out a request for proposals to work on the update for Allakaket and other communities in 2016 (Alaska 2016).

In some cases, a contractor's cutting and pasting between plans may have led to inaccuracy. Ice jams are listed as a hazard in the Angoon and Hydaburg HMPs even though there are no ice jams there (URS 2012, p. 5-15; E & E 2011, p. 3-3). Eagle's HMP suggests that there are still houses next to the river at risk of flooding, yet the entire village relocated in 2009 (URS 2014, p. 5-11). The relocation should have significantly reduced flood/erosion risk, but the plan doesn't reflect this. Ruby's 2010 HMP calls for educational pamphlets "to facilitate continued compliance with the NFIP [National Flood Insurance Program]" despite the fact that Ruby does not participate in NFIP (URS 2010b, p. 7-5).

In summary, HMPs for ANVs are similar, formulaic, and fail to account for the diverse needs of different ANVs across the state.

4.2.3. Not Holistic or Integrated

In this subsection, I describe the lack of integration between planning processes and plans that focus on narrow sets of issues. An elder from Southeastern Alaska shared his attitude regarding this disconnect when I asked him if his community had a plan: "A written plan is for people who need to compartmentalize. Western Society does not have a holistic view."

The lack of holism is apparent in the division between HMPs and other types of community plans. HMPs do not really address economic issues, infrastructure needs (unless they relate to hazard mitigation), subsistence, building social connections, or other aspects of community wellness. "Comprehensive plans" that cover land use do better at addressing these issues, but they typically do not incorporate hazard and emergency preparedness concerns (Berke and Smith 2009, p. 6). Sixteen HMPs brought in some information from comprehensive plans, while only two comprehensive plans considered information from their corresponding HMPs. Many HMPs simply listed other plans for the community rather than drawing material from these plans. This disconnection between plans seems to violate the FEMA requirement for HMPs to incorporate existing community plans (42 CFR §201.6(b)(3)).

Part of the disconnect may relate to the fact that HMPs are often done for the city government by state-hired contractors, while many comprehensive plans are done for the tribal council with help from the regional Native non-profit. This is not so dissimilar from the Lower 48, in the sense that HMPs may be handled by emergency managers, while community plans are handled by planners (Lyles, Berke, and Smith 2014, p. 2; Smith 2014, p. 306).

But for ANVs, two major problems relate to the lack of integration between HMPs and other plans. One is that, if the mitigation actions from a HMP do not make their way into a community plan that form the basis for community expenditures, these mitigation actions may not be implemented in the absence of a specific hazard mitigation grant (which is difficult to get). For example, mitigation actions such as community education about hazards (mentioned in all HMPs reviewed) and studies of infrastructure or environmental conditions (mentioned in HMPs for 30

ANVs) do not appear in other community plans and are unlikely to be carried out, since they are not the kind of infrastructure-related project typically supported by FEMA hazard mitigation grants (FEMA 2017b).

A second problem, which is especially significant to ANVs and other indigenous communities, is that activities supporting the ANV lifeway—namely subsistence, traditional values, and cultural continuity—are left out of hazard and disaster planning. Thirty-five out of the 43 HMPs I reviewed and 11 plans for ANVs without HMPs described the importance of subsistence to the communities, yet mitigation actions in HMPs did not really address subsistence. An important exception to this trend is Nome's adaptation plan, where half of the key measures relate to subsistence (Kettle, Martin, and Sloan 2017).[54]

The plans for Shaktoolik provide an example of the lack of integration between different planning processes. The planning process for the 2014 adaptation plan considered but rejected the idea of an evacuation road as being technically difficult and far too expensive to accomplish (Johnson and Gray 2014, p. vi). Instead, it called for a coastal berm and an evacuation mound, similar to the concept of tsunami mounds in Japan. It stated, "If a large storm was to occur with short notice, evacuation from the current village to higher ground in the Foothills more than a dozen miles away would not be possible, but the entire population could find safety on the mound from rising sea waters in less than an hour" (Johnson and Gray 2014, p. 21). The mayor of the City of Shaktoolik took steps to implement the adaptation plan almost as soon as it was written, starting by building a coastal berm with funding from small grants and local employees (Associated Press 2014).

Planning and adaptation efforts went in a different direction with the 2015 HMP (LeMay Engineering 2015a) and the 2016 Strategic Management Plan (SMP) (HDR Consulting 2016a). Both of these plans, which were produced by different entities from the team that worked on the adaptation plan, reinvoked the evacuation road, calling for a 17-mile road that would end in an undeveloped location inland with no facilities. The 2015 HMP refers to the discussion of the mound (LeMay Engineering 2015a, p. 44) but does not include this as a mitigation action, instead opting for the standard copy-and-paste action items such as structural elevation and relocation, which were not considered in the 2014 plan. The 2016 SMP buries the mound as one of 26 actions to increase emergency preparedness, and one of about 97 action items overall.

A participant familiar with the 2014 adaptation planning process commented on the 2016 SMP process: "They were really basically starting some aspect of the planning process all over again." He said that part of the problem concerned the funding opportunity for the plan: "If you offer someone a quarter million dollars to do a plan, they're going to use all of it." He described

[54] Measures included adapting food preservation techniques for changing weather and climate conditions; promoting the use of traditional food preservation techniques that are less energy intensive than freezers; reconnecting families to subsistence resources; and increasing tribal representation in subsistence management.

another problem relating to outsiders who come into a community, lead a planning processes, and then leave: "If outsiders come in and do a plan, they really don't have much invested in it, and it's really easy for them to change their minds." Referring to a planner who later convinced the community of the necessity of an evacuation road, this participant said, "If you go in there with a preconceived idea, you can always find someone to support it."

4.2.4. Lack of Implementation

In the previous subsections, I focused on problems in the planning process and the resulting plans. In this subsection, I discuss my finding regarding the lack of plan implementation and what impedes implementation.

Although my study did not evaluate whether any measures called for in HMPs and other plans were actually implemented, I got the sense from participants and from the list of uncompleted/ongoing items in HMPs that many measures are not ever implemented. A FEMA regulation requires the HMP to explain how it will be implemented (42 CFR §201.6(c)(4)(ii)). This requirement tends to be fulfilled by a very brief section on implementation—less than a page out of one or two hundred pages. A staff member from an ANV that was about to complete an updated HMP told me that the updated version was almost exactly the same as the previous version—none of the mitigation measures had been completed.

Implementation failure is not limited to HMPs. A federal agency representative noted that some ANVs have been talking about and planning for relocation for 50 to 60 years. A federal agency participant said that "Shishmaref has spent about $42 million since the 1990s on studies—with this money they probably could have moved a third of the village." A lawyer for one ANV said angrily,

> Money is not being spent on adaptation. Money is going into planning—the planners are being bought off. There comes a time when you have to say you planned enough, and you need to get in there and implement. The imminently threatened villages all suffer from over-planning and lack of implementation. The Subcabinet put in place by [Governor] Sarah Palin was an excellent start, but there was no agency charged with implementation and no resources were committed.[55]

Part of the implementation problem may be that plans are too long, with numerous actions items that are not sufficiently prioritized or championed. A single ANV may have multiple, 200+ page plans full of technical background information on the community and potentially conflicting action items, with no clear direction on how to put these plans together and implement them. An

[55] Having worked as a lawyer and consultant on the Newtok relocation, I can attest to the millions of dollars spent on a range of projects and planning efforts. In my tenure, the 2012 Newtok relocation plan has never been referenced, and the date for completion of relocation (2015) has long since passed.

example is Kivalina's 2016 Strategic Management Plan (HDR Consulting 2016b). It has 93 action items—hardly consistent with being "strategic"—although seven are considered "critical." One of the action items is basically planning to plan: "3.7.7. Identify and Prioritize Community Needs." Item 3.7.15 calls for the formation of a Relocation Committee, which already exists.

The HMP process take a stab at prioritization by subjecting potential mitigation actions to a cost-benefit analysis (see 42 CFR §201.6(c)(3)(iii, iv)). But many HMPs identify ***all*** actions as feasible and beneficial, even though there is no way a community could realistically pay for all these actions.

Another problem may be the vagueness of some hazard mitigation actions. For example, Fort Yukon's 2010 HMP says, "Integrate the Mitigation Plan findings for enhanced emergency planning." (Boutet' Company, Inc. 2010, p. 7-3). If this was intended to mean that the HMP be integrated into the comprehensive plan, this did not occur—the 2016 Fort Yukon comprehensive plan does not mention the 2010 HMP or anything about emergency planning (Tanana Chiefs Conference 2016). Another example of vagueness can be found in Lake and Peninsula Borough's 2015 HMP, which says: "Create detailed plan to address erosion damages." (AECOM 2015, p. 7-7). And McGrath's 2008 HMP 2008 simply says, "Flood control measures" (Rural Alaska Mitigation Planning 2007). It seems unlikely that such vague actions would be carried out.

Assuming mitigation actions can be succinctly articulated and prioritized, there is still the problem of funding for implementation. Although there are grants available to implement HMP measures, there is nothing in the HMP process that rewards or assures implementation. Without financial capital or other forms of capital to facilitate action (i.e., social capital and leadership), it is doubtful that many of the costly plans for ANVs will ever be implemented. In the following subsections, I provide more detail on barriers to forming the linking social capital and leadership needed to facilitate implementation.

4.2.5. Need for Linking Social Capital to Improve Collaboration and Plan Implementation

As discussed in Subsection 2.3.1, there is a need for stronger connections between a community and those outside of the community that are in a position to collaborate and provide resources (linking social capital). A number of participants (with the majority in ANVs) referred to a lack of communication or cooperation between ANVs and outside government as an impediment to implementing adaptation strategies. Participants talked about poor information sharing and communication between the community and outside entities that are not aware of what is happening "on the ground." One ANV resident described state and federal agency biologists as "computer biologists." He said, "They need to feel the pulse of what's happening—numbers on the computer don't tell that much."

The sheer size and high price tag of travel in Alaska impede relationship-building between agencies and ANVs. Limited agency budgets mean limited trips to ANVs. When trips occur, they are short. Opportunity for meaningful conversation is limited. As a representative from a Department of Interior Landscape Conservation Cooperative (LCC) explained, "The challenge for the LCC is that it works with 68 tribes and 17 First Nations, most of whom are off road, and there are only two full-time staff. So they can't go into villages and make face-to-face relationships. They know face-to-face is the way to do co-management, but they can't do it regularly." While in this example the issue was co-management of game, the problem of limited time in communities also applies to collaborative planning.

Another problem in building rapport with external entities is that there are some still language barriers in Alaska, particularly with elders in remote areas. An Interior Alaska elder said that agencies who visit his village tended to talk with younger people, not elders, because it is easier for agencies to communicate with people whose first language is English. This reduces the likelihood that traditional community knowledge will find its way into plans.

Other problems described by participants included lack of communication by agencies regarding the reasons for regulatory change, agencies only meeting with part of the community (i.e., the tribe and not the city), agency staff turnover, and a general sense of fatigue on the part of ANVs with agency- and researcher-led meetings.

About a quarter of all participants (mostly in ANVs) offered suggestions for ANVs to build relationships with external entities.[56] Strategies included having an advocate or village liaison to interface with external entities; educating and re-educating new government officials about ANV challenges, participating in regular inter-agency meetings; showing external entities that the ANV has the capacity and willingness to contribute to its own adaptation; and getting publicity through bringing in media and agency representatives for tours or attending conferences. One ANV representative told me,

> Forming a relationship is a good strategy. Taking the time to talk with people about their day before talking about the work that needs to be done helps …most of the agency folks I do talk to are more like friends than they are agency staff. A lot of the time they are just doing their jobs and are bound by laws, rules and regulations. We need to understand that as well. Sometimes it is the agency folks being a******s but there are good people out there who are doing the best they can with what they are limited to do.

About a fifth of all participants (with a third of these in ANVs) offered suggestions for external entities to improve their cooperation and communication with ANVs, including providing interpreters or liaisons. A representative from one agency referred me to a Native from a Yupik village (on the southwest coast) that worked for the Bureau of Indian Affairs and other federal

[56] These suggestions were generally offered outside of the context of writing a plan but described as helpful in the adaptation process.

agencies. The representative described this person not only as an English-Yupik interpreter, but as someone who made sure communities could understand the bureaucratic process. When I interviewed this interpreter, she explained

> Village residents and agency representatives are each intelligent in their own ways but there's a need for someone in the middle who can help them communicate—someone who knows the community well and can be both a translator and an advocate who relays important information. This can't just be any translator, it has to be someone who understands the grant procedures and can explain them. It doesn't have to be someone from the same village, but it should be someone from the same region/language background.

This kind of liaison could be useful in collaborative planning to make sure that information is clearly conveyed to all stakeholders.

Other suggestions for external entities to improve collaboration included requiring government-to-government consultation in more situations; coordinating meetings among different agencies so they occur together at a time that is convenient for the ANV (or meeting during conferences); spending more time in ANVs building relationships and meeting with all the entities there; increasing cultural sensitivity; and hiring more Native employees.

One federal agency representative described the importance of having a flexible outlook in spite of being a "bureaucrat": "When I go to public meetings to talk about things, it's easy for me to just go in there and talk like a bureaucrat for a scheduled time on specific points. That doesn't work in Alaska. A meeting scheduled for an hour can last four hours." Such willingness to spend time with the community could improve relationships that are needed for successful collaboration.

In summary, there is a history of poor communication and collaboration between ANVs and external entities with responsibility for planning and decision-making relevant to ANVs. The result is that plans are, for the most part, initiated and made by outsiders without a great deal of input from ANVs. To the extent ANV plans are implemented, implementation may be on the terms of those outsiders.[57] Improved collaboration will be needed to ensure that ANVs are equipped and invited to sit at the decision-making table, rather than just watching from the side. This collaboration will require time and willingness on the part of external entities as well as ANVs.

[57] An example is the relocation of Newtok. In 2018, a federal agency (the Denali Commission) was able to garner $15 million in Congressional funding to assist with the relocation. Pub. L. No. 115-141, Sec. IV (2018). The Denali Commission decided that, rather than giving the money to the Village Council, it would give the money to a Native non-profit entity (Alaska Native Tribal Health Consortium or ANTHC) to manage relocation on behalf of the village. ANTHC's priorities are not necessarily the same as those of Newtok.

4.2.6. Need for Community Leadership

While the previous subsection focused on the need for those outside of ANVs to do more, this subsection emphasizes the need for local leadership to build a common vision and carry it out. I did not ask my research participants about leadership, yet a number of participants (about half in ANVs) described leadership problems as impediments to adaptation. For example, participants noted the lack of resident initiative to serve as leaders or take action; lack of support for leaders or jealousy from the community; inadequate community representation by leaders; incompetence; corruption; and the inability of leaders to unite the community.

Participants offered no suggestions to improve leadership beyond building the capacity of those in position to lead and carry out adaptation actions. More than a fifth of all participants described strategies such as participating in training led by outsiders to increase the capacity of tribal staff. One leader offered a more creative strategy:

> Instead of sending tribal staff out for training, have the instructor come to your town and tailor the program, including the manual, to your village. Then, through the class exercises, you can actually accomplish something for your community. Think about your ultimate goal, i.e., making maps for your area, as opposed to just learning GIS, and match your programs to this.

Improving leadership and capacity for leadership will be particularly important to crafting a common vision, conveying this vision to outside entities involved in planning, and ensuring that plan implementation can occur on ANV terms.

To summarize, planning for ANVs often fails to reflect the whole community's needs (particularly those related to subsistence), knowledge, and values. It is incumbent on those outside of ANVs who wish to facilitate ANV planning and adaptation to build the connections needed for creating and implementing plans. Just as important is the need for an ANV to build the community connectivity and leadership necessary for a common vision. My finding on the importance of social connections is significant because participants raised this issue on their own more than twice as often as any other adaptation strategy.

In the next section, I suggest that many of those who have taken responsibility for ANV planning may not recognize how poorly current planning processes are serving ANVs.

4.3. Ambivalence toward Planning

In this subsection, I outline the range of viewpoints shared by nearly three quarters of all participants on the utility of planning, and I highlight the differences between those in ANVs and those outside. Nearly half of those who shared views (nearly three eighths of all participants) made ambivalent statements about planning, with nearly half of the ambivalent views coming from ANV participants. Nearly half who shared views (with a slight majority in ANVs)

described plans as useful, while several (almost all in ANVs) expressed serious doubts about the value of the planning that has occurred for their communities.

About half of all participants (including some who were ambivalent on the utility of planning) referred to beneficial aspects of plans. Many offered reasons frequently cited in the literature for planning, i.e., preparing for emergencies and hazards and guiding future growth and development. A number of participants noted the importance of plans in guiding community relocation and determining which land would be suitable for settlement. But the primary benefit of planning expressed by participants was to show outside entities what an ANV wants so it could get funding. This response was provided by about half of those who described benefits of planning, with a slight majority in ANVs.

A number of participants (but only one in an ANV) suggested that the process of planning is helpful even if the plan is not, because the process can be useful for networking and collaborating. As one federal agency representative said, "Planning is essential even if plans are useless." Another suggested that, "The hazard mitigation plan is super valuable because of the process of going through it." Those who made such positive statements generally did not acknowledge problems with plan quality or implementation.

About a quarter of those who discussed the utility of planning (with a slight majority in ANVs) offered criticisms of planning. One ANV resident explained, "Planning is just a buzzword. It doesn't have any practical application out there where we're from." A few felt that, now that so much infrastructure has been put in place throughout rural Alaska, it is too late for planning. One elder from interior Alaska said,

> Planning should have been done in 1980s and 1990s, at this point it is moot. The question is how much will it cost to deal with it, not how to plan to deal with it. It's like when your car breaks down, you don't plan to fix it, you hope someone is around that can fix that particular car. The problem is that the infrastructure in rural Alaska is old and people can't fix it, it's too outdated.

A few said that there were too many uncertainties to plan. Several (mostly in ANVs) said that Western-style planning did not match with traditional planning or did not take into account tribal concerns. A number (mostly outside of ANVs) expressed a sense that there are too many plans and studies, and not enough action. A few (mostly in ANVs) said people didn't have time to look at plans, so they weren't used.

To summarize, those outside ANVs tend to see planning as being more useful than those within ANVs who are stuck with plans that may not reflect their communities' true needs, values, and traditions.

5. Discussion: Pathways toward More Effective ANV Adaptation Planning

My findings on planning pitfalls raise concerns similar to those raised by Godschalk, Brody, and Burby (2003), Frazier et al. (2013), and Horney et al. (2017) for the contiguous United States regarding the utility of plans for achieving community goals. Yet the concerns presented here are all the graver, given the disparity between the remote, indigenous communities in my study and the planners and decision-makers (who are typically urban and non-Native) that drive planning processes for ANVs.

The problem is not just that plans are written by outsiders—many U.S. cities contract planning consultants to help with HMPs and other community plans. Rather, the problem is that planning efforts are initiated and overseen by outsiders, and ANV councils may not really understand or even have read the long and technical plans that they are asked to approve. ANVs have no planning departments or planners on staff to produce the complex planning documents that are required for HMPs and are perceived as necessary for other types of plans. Particularly for small and remote ANVs that have only a few hundred (or a few dozen) residents, there may be no one in the local government with the capacity to ensure that consultant-led plans reflect community knowledge, needs, and values. Nor do most ANVs have the capacity to implement plans and large-scale adaptation measures on their own. In short, planners are getting away with poor planning for ANVs.

In this section, I suggest ways to improve planning processes so they are more inclusive and better reflect community needs, knowledge, and values. I begin with my finding that the planning process alone—at least the way it is currently occurring—is insufficient to foster the social connections needed to develop a common vision and an implementable plan.

5.1. Building a Common Vision Outside of an Adaptation Plan

It is significant that so many participants outside of ANVs thought that the Western-style planning process itself (regardless of the resulting plan) was helpful to adaptation, yet only one ANV participant expressed this view. To the extent possible, adaptation planning should better mesh with the local social practices and cultural traditions that have contributed to ANV adaptation for millennia in the absence of Western-style planning (Nilsson et al. 2016, p. 172; Groulx et al. 2014; Norris et al. 2008, p. 141; Healey 2006, p. 286).

A repeated theme in my interviews was the importance of engaging in shared community meals and traditional activities involving the tribal government, city government, village corporation, and other ANV entities, which can build “bonding social capital” (community connections). This is a strategy that an ANV can engage in with little to no outside support. A community leader could facilitate a discussion during such a traditional activity (i.e., a shared community meal)

that could lead to a shared planning vision. This could then form the basis for a community plan. Traditional community activities such as culture camps and sled dog races or even church groups could also be venues for fostering young leaders, rather than relying on some sort of outside training to build leadership "capacity."

An example of an activity designed to build connections is the Ahtna Search Conference, a 2.5-day event organized by tribes in the Ahtna region of Alaska to develop goals and strategies, overcome conflicts, and address important issues (Innovative Solutions 2011). One of my research participants who also participated in that process said that, although such a traditional planning model could not be fully implemented in today's world, it did allow the Ahtna Native Corporation to enter into a collaborative agreement with the Department of the Interior for managing subsistence (DOI and Ahtna 2016). In other words, the traditional planning process was able to generate a common vision that galvanized cooperation with an external entity.

Another example may be the guiding principles that the Newtok Council passed to govern its relocation (mentioned in its 2011 relocation plan),[58] which emphasized the importance of Yupik cultural values that foster togetherness. While the Newtok relocation was significantly delayed due to a community dispute and change in governance, the current tribal council and corporation have emphasized the importance of these values and have made an effort to avoid disputes that could further delay the move.[59]

External entities can support traditional activities that build bonding social capital. For example, federal and state agencies have sponsored ANV culture camps. This investment, if supported by the community, could not only foster connections, but also build "cultural capital" that contributes to resilience (Arctic Council 2017, p. 15; Nilsson et al. 2016, p. 172).

Another way for external entities to assist with bonding social capital could be to offer mediation to help communities with internal struggles work out their differences. This would have to be a process initiated by a community that desires mediation (not by an external entity), involving a mediator supported by all parts of the community. It is especially incumbent on the federal government to provide a mediator, if desired by the community, rather than simply step aside and ignore its federal trust responsibility.[60]

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[58] See Newtok Traditional Council Resolution 11-30 (Agnew Beck Consulting, PDC Engineers, and USKH, Inc. 2011, A-8). The adaptation plans for Shaktoolik and Nome also have guiding principles. Shaktoolik's principles focus on feasibility (Johnson and Gray 2014, p. 18), while Nome's focus on using traditional and local knowledge and expertise (Kettle, Martin, and Sloan 2017, p. 23).

[59] This is my personal opinion based on working with the Newtok Village Council as a lawyer.

[60] This doctrine stems from case law establishing a federal political responsibility to Native American tribes as "dependent sovereigns" (Case and Voluck 2012, p. 21) *citing* Choctaw Nation v. United States, 119 U.S. 1, 28 (1886), Seminole Nation v. United States, 316 U.S. 286, 296 (1942), United States v. Sioux Nation of Indians, 448 U.S. 371 (1980); Morton v. Mancari, 417 U.S. 535, 555 (1974).

ANVs can take steps on their own to organize activities that could build connections and foster a common vision. Outside entities can provide financial support for these activities and in some instances may be able to help mediate disputes that divide communities.

5.2. Improving collaboration to create plans that better reflect community needs, knowledge, and values

Throughout this article, I have described planning processes that are externally driven and not really reflective of community needs, knowledge, and values. Recognizing that ANVs will likely continue to need external assistance with planning, I advocate a planning process that is truly collaborative, harnessing the resources of external entities as well as the insight of ANVs. This process should attempt to build the capacity of local residents to meaningfully participate in decision-making regarding planning goals and action items. As it stands, ANV planning is closer to "manipulation" or "consulting" on Arnstein's ladder than it is to citizen control or true collaboration. In this subsection, I offer a couple of suggestions for better collaboration.

A repeated theme in my interviews was that outside decision-makers and planners should spend more time in communities, rather than hoping that social capital will blossom during a single public planning meeting. In my own experience as a planner and lawyer, I have been a part of many meetings where a large number of representatives from an outside entity took a charter flight into an ANV and stayed only for a three-hour public meeting, leaving questions and concerns of ANV residents unaddressed. A better use of money could be for just one or two representatives to take a commercial flight into the ANV and stay for a few days, holding a public meeting as well as spending time in people's homes.

Another repeated theme was the apparent disregard of community and traditional knowledge by outside entities. This knowledge should merit more consideration in HMPs and other plans, where community information can be fairly generic. Bringing in community knowledge could make plans more specific to communities and increase the likelihood of community members reading them.

Finally, external entities could better support ANVs by providing mentoring and training to community members who are willing to lead planning processes. For example, Native non-profits could train young people to interview elders and go door to door to administer surveys regarding resident needs and values. Rather than hiring consultants to crank out HMPs in batches based on teleconferences and newsletters, the State of Alaska Division of Homeland Security could consider hiring a planning consultant to mentor community-based planners.[61] It is important to provide ANV leadership with enough training on the nature and purpose of a planning process so that the ANV can meaningfully vet and amend a consultant-prepared plan.

[61] While it may not be feasible for every small ANV to have its own planner, it is possible that several ANVs could share a planner or at least a person from an ANV could be part of the state agency staff responsible for these plans.

Otherwise, an ANV council's approval of a plan that it may not have even read amounts to token participation.

My suggestions to external entities and planners for creating plans that are better tailored toward community needs and values are easier said than done for several reasons. First, external entities may have limited budgets and limited time to spend ensuring that all of a community's voices are heard. Second, those who fund plans (particularly HMPs) may have narrow visions of what the plans should look like, such that a planner has little room for variation. Third, some communities may have little interest in developing a robust plan—they may want a HMP for the sole purpose of getting funding for hazard mitigation actions (even if such actions may not be the most needed adaptation for the community in question).[62] These limitations increase the importance of the relatively low-cost strategies that can be taken by both ANVs and external entities, such as coordinating around a community meal and engaging in frequent communication by phone.

In summary, planners should spend more time in communities to improve relationships and make efforts to bring more community knowledge regarding climate change and adaptation into plans, although funding to make these goals a reality may be limited.

5.3. Improving the format of plans

In the first part of this section, I discussed strategies for improving collaboration to facilitate adaptation planning. I now turn to strategies for improving the quality of plans so that they are more likely to be used and implemented by ANVs. In this subsection, I focus on the format of plans, which can be inaccessible or uninviting to many ANV residents. Relatively few ANV participants referred to their communities' plans and even fewer referred to the contents of these plans. This is significant, since those who I interviewed were among the most knowledgeable in their community about climate change impacts and adaptation.

Most of the plans I reviewed, particularly HMPs, were quite lengthy. They were heavy on information about the region and light on the actions that the community wanted to take to address climate change and other problems. It is notable that twice as many participants referred to SCERPs as HMPs—SCERPS are short, direct, and easy to flip through.

Plans should be scaled to fit community needs. If the only purpose of a plan is to get a grant for a project, it may be more cost effective to pass a council resolution describing the project as a priority than to spend thousands of dollars for a plan saying the same thing. Or, as one state agency planner suggested, "A plan could just be one or two pages to provide to an agency to show priorities." On the other hand, if the community goal is relocation, a more extensive plan will likely be needed. As one state representative said, "The State government can't really allocate the investments required to initiate a move until villages have been engaged in and

[62] See 44 CFR 201.6: "(a)Plan requirements. (1) A local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants."

committed to a plan." Regardless of length, planning goals and action items should be more clearly and realistically prioritized, so that the greatest community needs are more likely to be addressed with the limited funding and human resources available.

Plans might be more accessible and useful if they included more audio or visual components, like the diagram in Figure 2.2 from Newtok's relocation plan. These components could take the form of a website or app. Where Internet service is lacking, visual and audio components could be structured like a museum exhibit in the tribal hall. This sort of visual display could facilitate scenario planning, which has thus far not played a meaningful role in ANV planning.

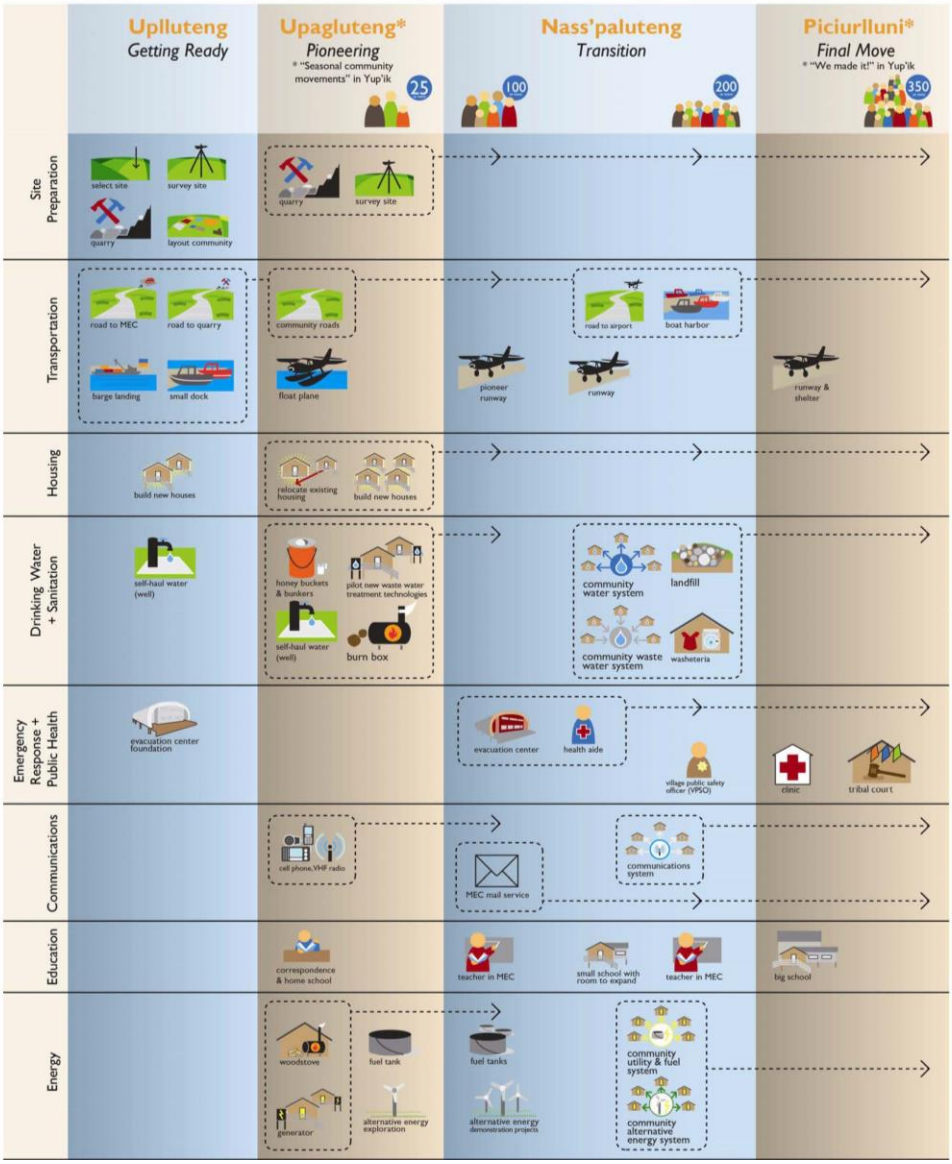

Figure 2.2: Diagram of the planned process for relocating from Newtok to Mertarvik, Relocation Report: Newtok to Mertarvik (2011)

Community ownership may be more likely to rally around a community-based display or an app shared by many young people, as opposed to a written plan on a shelf.

5.4. Toward more holistic planning

In this subsection, I wrap up my discussion of strategies for improving plans and planning processes by addressing the compartmentalized nature of planning and the lack of provisions for subsistence in HMPs and other ANV plans.

FEMA's rigid format for HMPs has the effect of segregating hazard mitigation analysis from the rest of community planning. If ANVs or other communities want to develop comprehensive plans that weave hazard mitigation into other goals, such plans should be accepted by FEMA, as long as the required HMP components[63] appear in the plan. FEMA should use its HMP regulations as a floor, not a ceiling to stifle integrated plans. While it is true that a community can develop a separate comprehensive plan that incorporates an existing HMP, it would be a better use of community and external resources to combine these planning processes.

Even with its rigid format, an HMP should be able to accommodate mitigation action items related to subsistence. It is significant that subsistence is mentioned as an important value in so many ANV plans, yet very few plans contain strategies for addressing climate change impacts to subsistence. One way to better provide for subsistence resources in HMPs is to include them in the community assets section and put a value on them, so that they can be analyzed in the cost-benefit analyses required for HMPs. For example, McGrath's 2007 HMP lists the Kuskokwim River Watershed as a subsistence resource under a section called *Cultural and Historical Assets* (Rural Alaska Mitigation Planning 2007). HMPs could also describe thinning ice as a natural hazard and suggest mitigation action items that increase hunter safety in the face of thinning ice (i.e., portable beacon locator devices or VHF radios that hunters could check out from a community bank). For plans that do not require a specific format, the Nome Adaptation plan serves as an example of how subsistence could be incorporated into actionable goals.

Finally, there is a need for planners to fully read and integrate past plans, rather than just citing their titles to satisfy the requirements for HMPs (see 42 CFR §201.6(b)(3)). While it is true that community needs and values may change over time, reading past plans could give insight into why some action items were considered but ultimately rejected.

In summary, although planners and ANVs may be forced to grapple with fragmented planning processes, they should strive to bring together the goals and knowledge that emerge from these separate processes and not lose sight of important community needs such as subsistence.

[63] See 44 C.F.R. 201.6 (Local Mitigation Plans) and 201.7 (Tribal Mitigation Plans).

6. Conclusion

ANV climate change planning is underway. Often this planning is done *for* communities, with little actual community involvement, more so than *in and by* communities, at least when it comes to formal, written plans. Written plans addressing climate change impacts and adaptation most often take the form of HMPs rather than stand-alone adaptation plans or comprehensive plans. As with a number of other U.S. communities, ANV HMPs are often done by contractors with little community involvement or specificity. There is not a holistic effort to plan for the range of climate change impacts experienced by an ANV, particularly those related to subsistence. Many plans seem inaccessible to community members and unlikely to be implemented.

There is a need for a more collaborative effort that uses the Western knowledge and funding of outside entities, but includes and builds community knowledge. Both those within ANVs and those outside can take steps to build connections that will facilitate collaboration. Within ANVs, leaders can facilitate collective action by bringing community members together around traditional meals and activities. Outside entities and planners should recognize the importance of traditional meals and activities and incorporate climate change planning into collaborations that have already withstood the test of time. Building connections is not an event, but an ongoing process that can facilitate the creation of adaptation plans as well as the implementation of adaptation actions.

Many of my suggestions relate to the need for outside planners and decision-makers to come closer to ANVs, improve understanding of community needs, and allow planning processes that better accommodate these needs. My suggestions also relate to the need for ANVs to find some way to maintain the ties that hold their communities together, so they can act collectively to plan for and adapt to climate change. These suggestions are generally consistent with the findings in the collaborative planning literature on the importance of connections, trust, and meaningful participation in planning processes. They are also consistent with findings in the indigenous planning literature that much of the mainstream planning literature does not sufficiently account for the particular situations of marginalized populations.

What perhaps sets my findings apart from other studies on planning processes is the stark difference between the participants in the Alaska planning processes that I studied. At one end are ANVs—often small and remote, with distinct values, needs, and lifeways that persist in the face of climate change and colonization. At the other end are urban-based planners and decision-makers leading Western-style planning processes with little oversight or evaluation across this expansive state. ANVs have little involvement in the initiation and process of outside-led planning, and they lack the means to implement these plans on their own terms. Thus, even while some outside planners see the process of planning as helpful to ANVs, the current process is not translating traditional means of indigenous planning into planning documents that serve the ANV needs. Rather, it produces plans that may be factually inaccurate and impossible to implement and amounts to a failure of climate justice.

ANVs adaptation to climate change will be achieved not by external entities cranking out generic plans for ANVs. Each ANV will need to come together with a common vision and support local leadership to build on that vision in collaboration with external partners. In turn, external partners should make the effort to ensure that planning is carried out in a manner that fosters meaningful participation from ANVs.

Article 3: Alaska Tribes' Melting Subsistence Rights: How Climate Change and Subsistence Laws Constrain Adaptation

Abstract

Subsistence hunting and fishing practices are essential to maintain the physical, economic, and cultural continuity of Alaska Native Villages (ANVs). The combination of rapid climate change, laws that restrict hunting and fishing, and systems for participating in decision-making about hunting and fishing all limit the ways in which ANV residents can legally adapt their subsistence practices to fluctuations in species populations and location. This article outlines impacts to subsistence experienced by ANV residents, legal and institutional constraints to adaptation, and recommendations for change. A key finding is that subsistence-oriented adaptation takes place more often at an individual or household level, rather than at a community level. This is significant because, even though the acts of hunting and fishing may be at the individual and household level, the subsistence lifeway involves exchange with people in and beyond the community. At the community level, ANVs are hindered by their lack of jurisdiction over fish and game and the difficulty participating in state and federal decision-making, including co-management opportunities. Short of legal change, agencies could increase ANV participation by spending more time in ANVs and making efforts to increase involvement and employment of ANV citizens. ANV governments could improve food security by subsidizing and seeking funding to support subsistence, food storage, and other forms of food production.

1. Introduction

Alaska Native Villages (ANVs) are federally recognized tribes located in Arctic and sub-Arctic village sites that are often distant from urban centers. The residents and families of many ANVs depend on subsistence[64] practices for their nutritional and cultural needs (Cochran et al. 2013; Loring et al. 2011). Given the high costs of flying commercial foods into remote villages off the road system, subsistence helps ensure food security[65] (Holen 2014, p. 4; Cochran et al. 2013, p.

[64] I use the State of Alaska's legal definition for subsistence:

> the noncommercial, customary and traditional uses of wild, renewable resources by a resident domiciled in a rural area of the state for direct personal of family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption.

Alaska Stat. § 16.05.940. This definition does not convey the significance of subsistence to many Alaska Natives, who value it as a fundamental part of their culture (Ristroph 2010).

[65] By "food security," I mean "a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life."(Food and Agriculture Organization of the United Nations 2002) (Engler-Stringer 2014) In the context of ANVs, "preference" is particularly important since Western foods may be culturally unacceptable

560; McNeeley 2009, p. 6). In addition to providing for food security, subsistence enables families to spend time together and pass down knowledge and values (Holen 2014, p. 1; Hibbard and Adkins 2013, p. 108; Hanna 2007, p. 11; Nuttall et al. 2005, p. 654).

But this lifeway faces challenges, including the rapid climate change that has been occurring since the late 20th century (Stewart et al. 2013; Field et al. 2014, p. 32). Climate change has contributed to species shifts—changes in species abundance or migration routes that affect ANV subsistence practices (Wilson 2014, p. 95; McNeeley 2012, p. 839; 2009, p. 95). Not only are species shifting, access to species has become more difficult (Brinkman et al. 2016). During the summer, low river water levels impede boat travel (McNeeley 2009, p. 129). During the fall and winter, snowmachine travel can be complicated and dangerous due to a decrease in snow coverage, and rivers that remain unfrozen late in the season (Knapp et al. 2014; Kofinas et al. 2010, p. 1350). Hunters can adapt by using bigger snowmachines and boats that are safer and can travel farther, but this results in greater dependency on fossil fuels (Lynch and Brunner 2007, p. 96; Huntington and Barry 2006, p. 209) and greater susceptibility to fluctuations in the market economy (Wilson 2014). Some hunters may not be able to travel as much due to high fuel costs (Brinkman et al. 2014).

In addition to shifting species and impeding access to these species, climate change complicates food preservation (McNeeley 2009, pp. 5, 129). On the North Slope, melting permafrost has made it more difficult to store food in traditional ice cellars (Ristroph 2010). As soil temperatures rise, the cellars are less likely to protect food from pathogens that cause foodborne illness (Brubaker et al. 2010, p. 26).

These obstacles may reduce subsistence participation, which may contribute to health problems by increasing consumption of more commercial foods (Brubaker and Chavan 2011, pp. 10-12; Wernham 2007, p. 507; Ballew et al. 2004, p. 81), reducing physical exertion (Hanna 2007, 11), and increasing stress (Nilsson et al. 2013, p. 113; Ristroph 2010; Wernham 2007, p. 506). Reduced subsistence participation may result in a loss of community knowledge associated with traditional subsistence practices (Bennett et al. 2014, p. 301; Ristroph 2012; McNeeley 2009, p. 13; Ford et al. 2007, p. 155).

Alaska Natives have a long history of adapting their subsistence practices to climate variability and other challenges (Loring et al. 2011, p. 76; Wenzel 2009, p. 97). Strategies adopted by individuals and families have included flexible hunting practices (i.e., hunting in different times or places or for different species) (Rosales and Chapman 2015, p. 824; Pratt, Stevenson, and Everson 2013, p. 45; Berkes and Jolly 2001; Wenzel 2009, p. 9); monitoring weather conditions more closely (Ford and Smit 2004, p. 392); using traditional environmental knowledge (Berkes and Jolly 2001) as well as modern technology (Ford and Smit 2004, p. 392); sharing and trading

(Nuttall et al. 2005, 654). Also important is the "active and healthy life" component, since subsistence supports an active and healthy lifeway (Wernham 2007, 507).

(BurnSilver et al. 2016, p. 2; Ritchie 2012, p. 194; McNeeley 2009, pp. 65-66; Theriault et al. 2005, p. 54; Berkes and Jolly 2001); hunting illegally (Spaeder 2005, p. 167); and eating more store-bought food[66] (Stevenson et al. 2014, p. 272; Hansen et al. 2013; Loring and Gerlach 2009). The aforementioned research demonstrates that ANVs and their residents are clearly capable of adapting. But the magnitude of today's rapid climate change, along with socio-economic pressures and the restrictions posed by the Western legal system on when and where hunting takes place, present a bigger adaptation challenge to Alaska Native subsistence than ever before (Marino 2012, pp. 375, 378; Loring et al. 2011, p. 8; Ristroph 2010; Wenzel 2009, p. 96).

Ristroph (2010) called attention to ways in which laws and climate change constrain Alaska Natives' subsistence opportunities and rights. The current article provides a more in-depth analysis informed by interviews with subsistence participants and regulators, and captures additional research and the changes that have occurred in the intervening decade. It adds to the work of others who have highlighted subsistence obstacles for Arctic indigenous groups (e.g., Loring et al. 2011; Kofinas et al. 2010; Theriault et al. 2005) by considering all of the state and federal laws that affect ANV participation in subsistence—not just those pertaining to a specific species or regions of Alaska. This article contributes to the literature by going beyond general recommendations for participatory, adaptive management and suggesting specific legal and institutional actions that could be taken on the federal, state, and community level, from establishing community hunting quotas to using tribal ordinances to regulate access. Specifically, the article aims to answer the following questions:

1. How are ANVs and their members adapting their subsistence practices in response to climate change?
2. How are U.S. and Alaska laws and institutions impeding subsistence adaptation and what might be done by ANVs and external entities to facilitate adaptation and sustainable, participatory management of fish and game populations?

Section 3 of the article briefly outlines the highly complex legal regime that governs subsistence, and describe how this regime poses obstacles to ANV adaptation. For each set of obstacles identified in Section 3, Section 4 summarizes the views of my research participants regarding how they are affected, how they are responding, and what legal and institutional changes they would like to see. Section 5 discusses potential remedies for each set of obstacles. It suggests that state and federal decision-makers need to work with ANV stakeholders on a more adaptive approach to subsistence management that increases flexibility and stakeholder participation. At the same time, ANVs may need to take a community-level approach to ensuring their food security, rather than just relying on individual and household adaptation strategies.

[66] Consumption of commercial foods is not a preferred strategy for many Alaska Natives (Grossman 2014; Willox et al. 2012; Ristroph 2010) but may be a better alternative than risking an expensive, unsuccessful, or potentially illegal hunt (Loring et al 2014, p. 81).

2. Methods

To understand how ANVs are adapting to subsistence changes and other impacts related to climate change, I had 153 interviews and conversations[67] with ANV residents as well as those outside ANVs who make or influence ANV policy and planning relevant to climate change and subsistence. About half of these communications, including 53 semi-structured interviews and 23 informal conversations, took place with residents from 59 different ANVs across the State. Rather than randomly selecting participants, I sought information-rich "cases" (individual participants) whose experience and knowledge captured the main themes of my research questions across a varied group (Bernard and Ryan 2009, p. 365; Corbin and Strauss 2007, p. 318; Creswell 2007, p. 75; Patton 2001, pp. 234-351; Stake 2000, pp. 447). I contacted about 200 tribal administrators to ask for references to knowledgeable informants and kept recruiting participants until I had at least one participant from each of Alaska's twelve cultural/geographic regions, and participants from ANVs with a diversity of economic, political, and development characteristics.

I also had 61 semi-structured interviews and 16 informal conversations with participants from outside of ANVs, including legislative and agency representatives (i.e., U.S. Fish and Wildlife Service and Alaska Department of Fish and Game), researchers who had published articles related to ANV adaptation, lawyers who had worked with ANVs on subsistence and other matters, and planners who had facilitated plans for ANVs. I initially selected these outside participants from the agencies that play a role in ANV adaptation and used a "snowball" technique to get recommendations for additional participants. I asked all participants for examples of how ANVs and their residents have adjusted their subsistence lifeways in response to climate change, adaptation obstacles, and what might facilitate adaptation at the community, state, and federal levels.

In addition to my interactions with participants, to get an understanding of how climate change and subsistence concerns are reflected in community planning, I searched the Alaska Division of Community and Regional Affairs library of plans (as well as a more general Internet search) for all ANV plans as of 2017. I reviewed about 70 plans pertaining to the 59 ANVs from which participants came. These included plans related to hazard mitigation, land use, economic development, and adaptation. I tracked whether each plan listed subsistence as a community concern or value, and whether any action items were devoted to protecting or promoting subsistence.

I used qualitative content analysis (Corbin and Strauss 2007; Miles and Huberman 1994, p. 56) to identify major adaptation actions, relevant laws and agencies, facilitators, barriers,

[67] Some participants did not want to be formally interviewed but had "conversations" with me that answered many of my interview questions. Interviews followed standard university protocols for obtaining permission from participants. For the less formal conversations, consistent with guidelines in Mack et al. (2005, pp. 16-19), I identified myself and the purpose of my research as soon as possible in the conversation.

recommendations for change, and other themes that arose from interviews and those conversations that covered interview questions, as well as in ANV plans. Themes arose deductively from the questions I asked in my interviews (based on concepts in the literature) as well as inductively from new themes raised by participants.

One limitation to my methods is that there are many factors that can impede subsistence success, and I did not attempt to quantify how much climate change, as opposed to social, cultural, legal, population, and economic factors, have affected subsistence. Nor did I attempt to assess the degree to which subsistence has declined as a result of these factors. Quantifying changes to subsistence is challenging, as subsistence participants are reluctant to share information about their harvests for a variety of reasons (Jos and Watson 2016, p. 13; Jacobs and Brooks 2011, p. 104; Kofinas et al. 2010, p. 1355; McNeeley 2009, p. 165), and there seems to be a reluctance among researchers who work with ANVs and ANV community members to assert that subsistence is now practiced less than before (Holen 2014, p. 5).

The differences in the questions answered by different participants (despite starting out with just two questionnaires—one for each set of participants) limited the ability to quantitatively compare responses between different participants. Given this limitation and the subjectivity of my coding, I decided that using statistical analysis was not appropriate (Bernard and Ryan 2009, p. 288; Zhang and Wildemuth 2005, pp. 2, 5). I thus avoid referring to specific numbers of participants, except to give the reader a general sense of how many participants provided a similar comment. To give an order of magnitude of the responses I got, I refer to "a few" (about 2 to 5), "several" (about 6 to 10), "a number of" (10-30), or "many" (more than 30). These categorizations are not statistically meaningful and should not be interpreted in that manner.

3. How the Subsistence Legal Regime Can Impede Adaptation to Climate Change

In this section, I outline the major state and federal laws that affect how most ANV residents engage in subsistence, starting with the laws that wrested management responsibilities from ANVs and placed them in the hands of state and federal agencies. While there have certainly been efforts to involve ANVs in agency decision-making and to adjust rules in response to changing climate conditions, ANVs and Alaska Natives have less ability under the current legal regime to adapt than they did prior to colonization. I argue that this loss of control and the restrictive nature of some laws impedes the ability of ANV residents to adapt their subsistence practices to climate change.[68]

[68] I have narrowed the scope of this discussion to the laws and issues most relevant to adaptation—participants raised many additional concerns about conflicts between subsistence and other kinds of hunting and fishing, as well as conflicts between traditional practices and the Western, paper-intensive system of regulation.

3.1. Limited Jurisdiction and Opportunities for Meaningful Co-management by ANVs

While Alaska tribes retain some of the inherent sovereign powers held by all U.S. tribes,[69] they generally lack jurisdiction over their traditional lands, fish, and game.[70] The 1971 Alaska Native Claims Settlement Act (ANCSA) provided for portions of these lands to be transferred to regional and village Native Corporations in fee simple.[71] ANCSA not only purported to extinguish aboriginal title over Alaska lands, it also sought to end aboriginal hunting and fishing rights in Alaska (43 U.S.C. § 1603(b)). As a result of ANCSA, Alaska tribes have limited opportunities to manage traditional hunting and fishing in ways that would facilitate adaptation (Starkey 2016; Spaeder 2005, p. 166).[72] No longer are there clearly delineated areas of land over which ANVs might have control.

The 1981 Alaska National Interest Lands Conservation Act (ANILCA)[73] was an effort to provide some subsistence rights to those who had traditionally depended on this lifeway.[74] It prioritized subsistence over other consumptive uses of fish and game and gave rural subsistence users priority over urban users in terms of areas that may be hunted and numbers of animals that may be taken (16 U.S.C. § 3114). The federal government determines which communities are

[69] *See* 25 U.S.C. § 476 (h)(1) ("each Indian tribe shall retain inherent sovereign power to adopt governing documents under procedures other than those specified in this section"); Indian Tribal Justice Act, Pub. L. No. 103-176, 107 Stat. 2004 (1993) (codified at 25 U.S.C. §§ 3601 et seq. (2010) ("Indian tribes possess the inherent authority to establish their own form of government, including tribal justice systems."); *Delaware Indians v. Cherokee Nation*, 193 U.S. 127 (1904) ("A tribe may determine who are to be considered members by written law, custom, intertribal agreement, or treaty with the United States."); *Kimball v. Callahan*, 590 F.2d 768, 777-78 (9th Cir. 1979) (inherent power to determine membership does not depend on having a territorial base, so even tribes with no Indian country may retain this power); *John v. Baker*, 982 P.2d 738 (Alaska 1999) (holding that ANCSA did not extinguish tribal sovereignty); Act of May 1, 1936, ch. 254, 49 Stat. 1250 (codified at 25 U.S.C. § 473a) (amending the Indian Reorganization Act of 1934 to include Alaska Natives).

[70] Pub. L. No. 280, Act of Aug. 15, 1953 (codified at 18 U.S.C. § 1162, 25 U.S.C. §§ 1321-1326, 28 U.S.C. §§ 1360).

[71] 43 U.S.C. §§ 1611, 1613, 1618. These corporations are owned by Native shareholders, but not all members of an ANV may be shareholders of the corporation associated with that ANV, and shareholders may live outside the ANV or even outside Alaska. This disparity of membership and the fact that corporations are private entities rather than governments mean that ANVs are no longer in control of their traditional lands.

[72] This contrasts with many tribes in the Lower 48, who maintain rights to regulate hunting, fishing, grazing, zoning, and water use and quality within their reservations. *See* Merrrion v. Jicarilla Apache Tribe, 455 US 130 (1982); City of Albuquerque v. Browner, 97 F.3d 415, 418-19 (10th Cir. 1996); Morris v. Hitchcock, 194 U.S. 384 (1904), United States v. Wheeler, 435 U.S. 313, 322 n.18 (1978).

[73] Pub. L. No. 96-487, 94 Stat. 2371, Dec. 2, 1980 (codified as amended at 16 U.S.C. §§ 410hh–3233, 43 U.S.C. §§ 1602–1784).

[74] ANILCA expresses an intent "to provide the opportunity for rural residents engaged in a subsistence way of life to continue to do so." ANILCA § 101; 16 U.S.C. § 3101(c).

"rural" based on population as well as community characteristics (i.e., economy and integration with urban centers).[75]

ANILCA has been a disappointment to Natives who feel that the preference should have been "Native," not "rural" (Anderson 2016, p. 215; Starkey 2016, p. 319; Strong 2013, p. 83). As Natives have moved toward urban areas and the percentage of non-Natives in rural areas has increased, the rural preference has been less beneficial to Alaska Natives as a whole (Thomas, Savatgy, and Klimovich 2016, p. 302).

Federal laws, including ANILCA Section 809 (16 U.S.C. § 3119), Indian Self-Determination Act. 25 U.S.C. §§5361-5638, and the Marine Mammals Protection Act Marine Mammal Protection Act (16 U.S.C. § 1388) do provide opportunities for some shared management responsibilities in the form of "co-management" and "collaborative management" of subsistence, which can facilitate adaptation and power-sharing by integrating community knowledge into decision-making (Ristroph 2016; Hanna 2007, p. 47).[76] Co-management is a legislatively authorized relationship between subsistence participants or stakeholders (such as ANVs or Native non-profit entities) and a government agency in which some degree of responsibility and or authority is conferred to both parties (Pathmanandakumar 2017). Collaborative management is the term used by agencies for arrangements that are similar to co-management, but may lack a specific legal mandate and may be more flexible (Jewell 2016). It is important to emphasize that no laws relevant to Alaskan subsistence *guarantee* co-management rights—they only provide the *opportunities* for ANVs and Native entities to enter into agreements with managing agencies.

Literature describes benefits of co-management, including a better understanding of the resource that draws on local knowledge, better compliance, increased sustainability and community empowerment (Trimble and Berkes 2015; Berkes, Kofinas, and Chapin 2009; Diver 2009; Kruse et al. 1998; Peter and Urquhart 1996; Pinkerton 1992). But some literature is critical of how co-management has been carried out, suggesting that it has led to co-optation and conflict more so than empowerment (Howitt et al. 2013, p. 35; Watson 2013; King 2007, p. 490). Further, there is literature suggesting the co-management can fail in the absence of clear rules, trust, technical and financial capacity to fully participate in managing and monitoring resources, political power of those desiring co-management, and an understanding by resource users that benefits exceed costs (Vaughan and Caldwell 2015, p. 56; Richmond 2013, p. 1080; Armitage et al. 2011, p.

[75] 36 C.F.R. §242.15/50 C.F.R. §100.15 (rural determination process); 36 C.F.R. §242.23/50 C.F.R. §100.23 (identifying nonrural areas). The federal government (NMFS) also has non-subsistence areas for halibut fishing around Ketchikan, Juneau, Valdez, and Anchorage. 50 C.F.R. 300.65(h)(3).

[76] State law does not specifically provide for co-management but it does provide for cooperative agreements (see A.S. 16.05.050(12)) and agreements have emerged organically in several situations. For example, the Kuskokwim River Salmon Management Working Group formed in 1988 by the Alaska Board of Fisheries in response to requests from local fishermen (ADFG 2018c). The Western Alaska Brown Bear Management Area Working Group formed in 1999 to give local input on brown bear regulations for Game Management Unit 18 that were inconsistent with Yupik customs (Healy 2001).

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1003; Napier, Branch, and Harris 2005, pp. 172-175; Olsson, Folke, and Berkes 2004, p. 83; Ostrom et al. 1999, p. 279; Pinkerton 1992, p. 340).

Co-management in Alaska has been impeded for several reasons. One, mentioned earlier, is that ANVs and Native entities have no rights under state or federal law to manage land or resources, such that they have little bargaining power in developing co-management agreements. Second, there is a lack of trust between the traditional Native resource users and the non-Native settlers who tend to govern the resources and may be competing for some of these same resources (Marine Mammal Commission 2008, p. iv; Spaeder 2005, p. 173). Third, ANVs—many of which only have a couple hundred residents in the village and few with college education— lack the technical and financial resources to carry out agreements (Marine Mammal Commission 2008, p. iv). The result is that where co-management exists, it is often done by regional tribal entities that can pool human resources and finances rather than single tribes .[77]

An important exception is that of the Alaska Eskimo Whaling Association (AEWC), a Native non-profit entity that co-manages Alaska's bowhead whale hunt in cooperation with the National Oceanic and Atmospheric Administration (NOAA) pursuant to the Marine Mammal Protection Act.[78] What has made AEWC different is the meaningful devolution of authority to tribal entities (Meek et al. 2008, p. 1082), ample funding (including support from industry and the North Slope Borough (NSB)), the longevity of cooperation between AEWC and NOAA, Western scientific expertise (provided by NSB Wildlife Management, which is also composed of indigenous subsistence users) (NOAA Fisheries 2013, p. 10), and the feasibility of regulating a limited harvest (less than a hundred individuals of a single species) where there is limited competition (in contrast to land animals along the road system) (Ristroph 2016, pp. 96-97). Many of these factors have also helped the Alaska Beluga Whale Committee use community knowledge in its regulation (Fernandez-Gimenez, Huntington, and Frost 2006).

In summary, even though state and federal laws do provide for co-management, there is a lack of authority allocated to tribal entities and a lack of tribal capacity to meet Western management expectations. As a result, true co-management is limited, and ANVs generally have less ability to control fish and game management than they did prior to colonization.

3.2. Dual Management System by State and Federal Government

Another institutional challenge to adaptation is the confusion and fragmentation of the subsistence regime, which impedes understanding of what kind of hunting and fishing are allowed where. This subsection outlines the relevant agencies and laws governing subsistence to give the reader a sense of the complexity of this regime.

[77] Examples include is the 1991 agreement under ANILCA 809 between FWS and the Tanana Chiefs Conference to document subsistence uses in four villages and report subsistence harvests of caribou in three villages and the 2004 agreement under the Tribal Self-Determination Act between the Council of Athabascan Tribal Governments and FWS for the Yukon Flats Wildlife Refuge.

[78] Marine Mammal Protection Act, Pub. L. No. 103-238, Oct. 21, 1972, §119, 16 U.S.C. § 1388.

ANILCA was originally intended to be implemented by the State of Alaska (through the Alaska Department of Fish and Game or ADFG) throughout the entire state 16 U.S.C. § 3115(d). Consistent with ANILCA, the State of Alaska adopted laws that provided for a subsistence priority over other consumptive uses (Ch. 151, Alaska Session Laws 1978), and later for a rural priority over urban subsistence participants.[79] After the Alaska Supreme Court determined that the rural priority established under ANILCA violated the Alaska Constitution,[80] Alaskans were left with a dual state and federal management system where the rural priority under ANILCA would only apply to federal lands.

For some time, there was an expectation that the state would regain management, but this has not occurred (Kimmel 2014; McGee 2010; Theriault et al. 2005). Thus, ANILCA applies to most federal public lands[81] and all waters that flow in or adjacent to most federal wildlife refuges, parks and preserves, conservation areas, recreation areas, and national forests.[82] State law governs subsistence on state and private lands, including those owned by Native Corporations.[83] State law also applies to waters on general public domain lands managed by the Bureau of Land Management as well as waters on or adjacent to Native allotments.[84] There has been confusion among ANV residents regarding where the different laws apply (McNeeley 2009, p. 170).

To help carry out ANILCA, the Secretaries of the Interior and Agriculture established the Federal Subsistence Management Program and the Federal Subsistence Board (FSB) (36 C.F.R. § 242.10; 50 C.F.R. § 100.10). Initially, FSB adopted the state's hunting and fishing subsistence regulations. Since then, FSB has been revising regulations biennially (with subsistence hunting and trapping regulations in even-numbered years and subsistence fishing and shellfish regulations in odd-numbered years) based on proposals from ten Regional Advisory Councils as well as the public.[85] The four land management agencies in Alaska (Fish and Wildlife Service or

[79] This was adopted first through regulations, 5 Alaska Admin. Code § 01.597, which were invalidated by Alaska v. Madison, 696 P.2d 166 (Alaska 1985) for inconsistency with the 1978 statute. After *Madison*, the state legislature revised the 1978 statute to add a rural preference (Ch. 52 SLA 1986; AS 16.05.90).

[80] McDowell v. State, 785 P.2d 1, 10-11 (Alaska 1989).

[81] ANILCA §§ 102(1), (2), and (3) (16 U.S.C. §§ 3102(1), (2), and (3)) (defining "land," "Federal land," and "public lands," respectively). Regulations are issued jointly by the Interior and Agriculture Departments; two identical sets of regulations appear in 36 C.F.R. §§ 242.1-242.28 and 50 C.F.R. §§ 100.1-100.28, respectively.

[82] 36 C.F.R. § 242.3 (listing each federal land unit); John v. U.S., 720 F.3d 1214 (9rh Cir. 2013), cert. denied Alaska v. Jewell, 134 S. Ct. 1759 (2014) (upholding 1999 federal regulations on which 36 C.F.R. § 242.3 is based).

[83] State v. Morry, 836 P.2d 358, 367 (Alaska 1992).

[84] John v. U.S., 720 F.3d 1214 (9th Cir. 2013), cert. denied Alaska v. Jewell, 134 S. Ct. 1759 (2014). The *John* case upheld 1999 federal regulations on which 36 C.F.R. 242.3 is based. That regulation delineates the federal lands with waters subject to ANILCA. It includes reserved BLM lands (i.e., the National Petroleum Reserve-Alaska and the Steese National Conservation Area), but not general, undesignated BLM lands.

[85] Regional advisory councils were established under 36 C.F.R. §242.11/50 C.F.R. §100.11. There is a provision under 36 C.F.R. §242.12/50 C.F.R. §100.12, for local advisory councils, but these have not been established thus far.

FWS, National Park Service or NPS, Forest Service, and Bureau of Land Management or BLM) retain the ability to issue regulations based on the various statutes that govern public lands in Alaska, such that hunting and fishing rules differ depending on the land manager and the status of the land. In addition to these laws, other key federal laws affecting subsistence are the Migratory Bird Treaty Act,[86] the Marine Mammal Protection Act (16 U.S.C. § 1362(12)), the Endangered Species Act,[87] and the Magnuson-Stevens Act.[88] The latter act, which regulates commercial as well as subsistence fishing offshore, is administered by the North Pacific Fishery Management Council for waters offshore of Alaska.

At the state level, Alaska's Board of Game (BOG) regulates hunting seasons, limits, and methods (Alaska Stat. § 16.05.255), while the Board of Fisheries regulates fishing seasons, limits, and methods (Alaska Stat. § 16.05.251). The Alaska Boards issue regulations for all types of hunting and fishing, not just subsistence. BOG has divided Alaska into 26 game management units (with various subunits) (5 Alaska Admin. Code 92.450) and issued hunting regulations specific to each unit, as well as general regulations for all fishing districts (the equivalent of game management units) (ADFG 2018b). Likewise, the Board of Fisheries has issued unique regulations for each unit. The significant differences in regulations for each unit represent an adaptive approach that considers the geographical, biological, and cultural differences across Alaska, though they add to the complexity of the subsistence regime.

The Alaska Boards are advised by 84 Fish and Game Advisory Committees statewide (ADFG 2018a). Proposals to change regulations may come from federal agencies, ADFG, the public, or in rare cases, the Boards themselves.

In the early 1980s, ADFG signed general management agreements with FWS and BLM, in which the federal agencies recognized ADFG as the primary agency responsible for management of use and conservation of fish and wildlife resources on FWS and BLM lands within Alaska (BLM 1983; USFWS 1982). While such agreements cannot supersede federal laws, they are an effort to harmonize management. Federal hunting regulations initially aligned with state regulations in terms of seasons, hunting methods, and limits, but this changed in the 2000s with the State's intense focus on eliminating predators (Langlois 2014; McNeeley 2012).

Intensive management rules authorized by BOG have consisted of predator culling by authorized parties as well as measures that ease or encourage predator hunting by hunters (i.e., eliminating bag limits and permits, allowing baiting and feeding, and allowing the sale of skulls) (Spraker

[86] Act of July 3, 1918, ch. 128, 40 Stat. 755, 16 U.S.C. §§ 703 *et seq.*; Migratory Bird Treaty with Great Britain (as signatory for Canada) (1916); Migratory Bird Treaty with Mexico (1937); Migratory Bird Treaty with Japan (1974); Migratory Bird Treaty with the Soviet Union (now Russia) (1976). The Migratory Bird Treaty Act exempts Alaska Native subsistence hunting from a prohibition on the take of migratory birds during the spring and summer seasons. 16 U.S.C. § 712.

[87] Pub. L. No. 93-205, 87 Stat. 884, Dec. 28, 1973 (codified as 16 U.S.C. §§ 1531-1544).

[88] Pub. L. No. 94–265, 90 Stat. 331, Apr. 13, 1976 (codified as 16 U.S.C. §§ 1801-1883).

2016; Lurman and Rabinowitch 2007, p. 156). Federal use of intensive management is limited by the purposes of the National Park Service Organic Act, 54 U.S.C. §§ 100101, 100502 (for NPS), the National Wildlife Refuge System Improvement Act, 16 U.S.C. §§ 668dd(a)(2), 668ee(4) (for FWS), and ANILCA[89] (for all federal lands in Alaska), the Wilderness Act, 16 U.S.C. §§ 1131-1134 (for federal lands declared "Wilderness") (Lurman and Rabinowitch 2007; Joly 2010), though there have been exceptions (Joly 2010, p. 30).

In summary, subsistence is highly regulated in Alaska by numerous entities and laws. On the one hand, this contributes to adaptive management by tailoring rules to the particular circumstances of each species in each area. On the other hand, it complicates adaptation because subsistence participants trying to adapt their practices must understand all these rules and risks significant penalties for noncompliance (McNeeley 2012, pp. 836, 840).[90]

3.3. Obstacles to the Participation of ANV Members in Agency Decision-Making

Merely understanding the subsistence regime is already a challenge. As this subsection shows, trying to change this regime by participating in decision-making processes can be even more challenging. Both state boards and FSB accept proposals from the public, unlike fish and wildlife management systems in many other states. But not all see the subsistence rule-making process as being truly open to participation by ANVs and their citizens. The Alaska Board of Game (BOG) has traditionally been composed of primarily urban, non-Natives with commercial interests (McNeeley 2012, p. 841; Kofinas et al. 2010, p. 1354). Loring et al. (2011, p. 81) describe the culture of agencies charged with subsistence management as exclusionary and constrained by bureaucratic processes, which limits those within the agency who do want to collaborate with subsistence participants.

Even when ANV members are present in decision-making forums, they may find that their views and knowledge are not really taken into consideration (Starkey 2016, p. 318). Community knowledge regarding hunting and fishing activity may not meet agency standards, and agencies may try to pick out small pieces of it that do not tell the whole story (Jos and Watson 2016, p. 19; Howitt et al. 2013, p. 330; Ristroph 2012; Brelsford 2009, p. 385; Charnley, Fischer, and Jones 2008, p. 14). Agency decisions are often made in forums with language and procedures that can marginalize ANV knowledge and participation (Jos and Watson 2016, p. 22; McGregor 2013, p. 418; Watson 2013; Porter 2010, p. 87).

[89] ANILCA § 815(1); 16 U.S.C. §3125(1); 36 C.F.R. § 242.4; 50 C.F.R. § 100.4.

[90] See, e.g., 5 Alaska Admin. Code §§39.002, 92.002, 92.049, 92.050(a)(8), 92.072(f), 36 C.F.R. §242.25(h)(5)/ 50 C.F.R. §100.25(h)(5); 36 C.F.R. §242.8/50 C.F.R. §100.8.

The literature offers few specific recommendations for increasing ANV participation in state and federal agency decision-making regarding subsistence (Wilson 2014, p. 97). For example, Loring et al. (2011, p. 83) speak generally to the idea of decentralizing management in a way that would expand collaboration and the use of local information, but it is not clear how this would be carried out. Similarly, much has been written about the need to incorporate traditional and indigenous knowledge in state and federal agency decisions, but there is not a clear way to do this (e.g., Arctic Council 2017, p. 14; Ristroph 2012; Wildcat 2009, p. 34; Sandercock 2004, p. 115) In short, while agencies and researchers have acknowledged the social, cultural, and financial barriers to ANV participation, they remain significant challenges.

3.4. Lack of Flexibility

Even when laws provide for ANV subsistence and participation in decision-making, they can be problematic if they cannot timely change in response to climate change. As climate change shifts habitats and species across the United States, there has been recognition that wildlife and natural resource laws are overly stationary (Army Corps 2014; Trouwborst 2013, p. 298; Fischman and Rountree 2012, p. 22; Alaska Department of Fish and Game 2010, p. 13; Craig 2010, p. 29; Chapin, Folke, and Kofinas 2009, p. 18). In Alaska, stationary laws can reduce the flexibility of subsistence participants to adapt by adjusting the time, manner, and place of their practice (Wilson 2014, p. 95; Pratt, Stevenson, and Everson 2013, p. 45). This is especially problematic when the times that hunting and fishing are legally allowed are inconsistent with the times that fish and game are appearing (McNeeley 2012, p. 836; Ristroph 2010).

As I mentioned earlier in this article, both the State Board of Game (BOG) and the Federal Subsistence Board (FSB) have mechanisms in place to revise regulations in response to species changes. Both provide for proposed revisions to go through advisory boards prior to consideration at BOG or FSB meetings,[91] and both allow emergency petitions to be reviewed outside of the normal meeting process (Alaska Stat. §44.62.230, 5 Alaska Admin. Code §96.625; 36 C.F.R. §36.19(a)/ 50 C.F.R. §100.19(a)). But hunters interviewed by Loring et al (2011, p. 79) stated that BOG meets well before anyone could know about local weather conditions during the hunting season, such that advanced regulation may be inconsistent with actual weather patterns. Also, a state "board may decline to act on a subsistence proposal for any reason" (5 Alaska Admin. Code §96.615(c)). McNeeley (2012, p. 847) describes a perception among ANVs that emergency petitions to the state and federal boards are not often granted. As McNeeley (2009, p. 174) explains, "This has fueled a cycle of unintended stress and mistrust, which delegitimizes the systems for local stakeholders and breeds more resentment between tribes and agencies, which in turn breeds more incentive for noncompliance with the regulations." Still, there have been some successes. An example is the proposal adopted by BOG at its February 2015 meeting to extend the winter moose season in Unit 17A (Alaska Board of Game 2015).

[91] Proposals can also come directly from members of the public. Alaska Stat. §44.62.220; 5 Alaska Admin. Code §96.625(a).

Another legal constraint on flexibility relates to limitations on who exactly can hunt and how much they can take. Historically (and in many parts of Alaska today), an ANV's subsistence needs have often been met by a small group of hunters who provide for the entire community (BurnSilver et al. 2016, p. 2; Guettabi, Little, and Joly 2016, p. 18; Reyes-García and Pyhälä 2016, p. 165). Essentially, this group of hunters serves as "proxies" for other community members who are not as well positioned to hunt. But in many cases under both state and federal law, Alaska's land mammal subsistence hunters and fishers are subject to bag limits (e.g., 5 Alaska Admin. Code 92.130) and permits or licenses for each individual hunter. Limits under the federal and state systems generally cannot be added together to increase individual entitlement (36 C.F.R. § 242.27(a)/ 50 C.F.R. § 100.27(a); Department of the Interior 2015).

Both the state and federal systems provide for proxy hunting and fishing to a limited degree that is inconsistent with how subsistence has traditionally taken place. Under state law, it is possible for one individual to hunt on behalf of one other person only where the beneficiary is blind, physically disabled, or 65 years or older (Alaska Stat. §16.05.405(b), 5 Alaska Admin. Code 92.011(a, d)) and only for certain animals (5 Alaska Admin. Code 92.011(k)). Proxies are somewhat more flexible under the federal system (36 C.F.R. §242.10(d)(5)(ii)/ 50 C.F.R. § 100.10(d)(5)(ii); 36 C.F.R. §242.25(a)/ 50 C.F.R. § 100.25(a); 36 C.F.R. §242.25 (d,e) / 50 C.F.R. § 100.25 (d,e)), except for halibut fishing, where proxies are not allowed (NOAA Fisheries 2016). Both systems have permit and reporting requirements for proxies.[92]

In the 2010s, the State attempted to implement a land mammal hunting program more responsive to community needs—community subsistence harvest permits (5 Alaska Admin. Code §92.072). Once a community harvest area is created, a person representing 25 or more residents may apply for a community harvest permit. The permit has extensive reporting requirements for each participating household or resident as well as limits on other types of hunting (i.e., on individual hunts for the same species.). The community harvest permit generally does not expand the hunting season or increase the overall number of animals that may be taken. The Ahtna Group (a collection of tribes and Native corporations in Interior Alaska) obtained community moose and caribou hunt permits through this program (Ahtna, Inc. 2015). But the program had unintended consequences. As the program because more attractive, it went from 6 to 73 groups. Applicants could team up and apply for a permit without even knowing each other. A 2016 Memorandum of Agreement between the Department of Interior and Ahtna, Inc. attempts to better provide for Ahtna's subsistence users by including them in a new rule-making process and advisory committee (Department of the Interior 2016). But it only applies to federal lands in the Ahtna people's traditional usage area.

In summary, while there are efforts to provide for rule change in response to changing climate and species conditions, the rules continue to constrain the flexibility of subsistence participants

[92] 5 Alaska Admin. Code §92.011 (b, h); 36 C.F.R. §242.10(d)(5)(ii)/ 50 C.F.R. § 100.10(d)(5)(ii) (Board authority to allow hunting designation); 36 C.F.R. §242.25(a)/ 50 C.F.R. § 100.25(a) (definition of designated hunter); 36 C.F.R. §242.25 (d, e) / 50 C.F.R. § 100.25 (d, e) (hunting and fishing by designated hunter).

to adapt because they cannot keep up with species shifts and they are overly rigid in terms of who can participate.

4. Key Findings on Participants' Views Regarding Climate Change, Adaptation, and Obstacles

This section starts with an overview of how climate change has affected my research participants' subsistence practices, and how they have attempted to adapt. It then presents participants' observations on the obstacles discussed in the previous section.

4.1. Climate Change Impacts to Subsistence

I found three main types of impacts to subsistence related to climate change: species shifts (subsistence species coming at different times and in different places), access barriers (mainly due to reduced ice and snow cover), and health problems as well as cultural deterioration related to loss of traditional foods and practices. Figure 3.1 shows these and other impacts along with adaptation strategies for addressing them and legal obstacles to carrying out strategies. Strategies that are undesirable to most participants appear in italics.

Climate Change Impacts	**Adaptation Strategies**	**Legal Obstacles**
Species shift	Individuals and households can conduct subsistence at different times and places, traveling farther and going for longer times, using different species, using better technology, and *hunting illegally*; communities can make trails, subsidize subsistence, and seek regulatory change	Hunting different times, places, or species may be illegal; the law is confusing; changes to the law cannot keep up with environmental changes; it is difficult and expensive for ANVs to participate in processes to change the law, particularly as ANVs often lack Western science support; and ANVs lack co-management capacity
Difficult access		
Food preservation (food spoils more easily)	Individuals and households can rely on freezers; communities can build collective ice cellars	
Sense of food insecurity	Individuals and households can *eat store-bought food; moving to urban settings*; communities can raise and store food	
Health problems		
Loss of lifeway and knowledge	Individuals and households able to hunt and fish can share their harvest	Laws on proxies constrain the ability of one person to hunt for others

Figure 3.1: Climate Change Impacts, Adaptation Strategies, and Legal Obstacles

My research participants described shifts in subsistence species similar to what has been described in the existing literature. Nearly two thirds of the participants from ANVs and a few[93] from outside of ANVs referred to animals, blossoms, or leaves coming at different times, as well as change in migration and trees growing at different latitudes. Several described changes in animal behavior regarding mating, hibernation, and the phenomenon of predators coming into ANVs more often. A number referred to reductions in animal or plant populations; an increase in diseased or stressed animals; and/or an increase in insects or invasive species. Several described more brush, ground cover, bigger plants, and treelines shifting to higher elevations and latitudes.

More than one third of the ANV participants and several outside of ANVs described impacts on subsistence access and safety similar to those described in the literature (e.g., Brinkman et al. 2016; Wilson 2014; McNeeley 2012). A number described difficulty accessing hunting, trapping, or gathering areas due to less snow or ice (which impedes overland vehicular travel), shallow water (which impedes boat travel), or fire, or having to go farther out to get game. Several described hunting as less safe, due to people falling through ice. Several, mostly from the north, said that food harder was harder to keep fresh. On the North Slope, ice cellars are melting and filling with water. A few from interior Alaska noted that it is harder to hunt moose because leaves are still on the trees during moose season, so moose are more difficult to see. A few from west coast villages described damage from storms to their subsistence camps and infrastructure.

In contrast to literature focusing only on obstacles to subsistence (e.g., Brinkman et al. 2016; Brinkman et al. 2014; Ford and Smit 2004; Nuttall et al. 2005), a number of participants mentioned positive impacts, including easier boat travel, having a longer hunting or growing season, fewer bears around, and increases in the abundance of deer and berries.

Some participants described impacts beyond just not being able to eat their preferred food. A number specifically used the word "food security" or described a sense of food insecurity. Several referred to an increase in health problems such as diabetes and cancer.

Nearly half of ANV participants spoke about threats to subsistence that they had to deal with in addition to climate change. For instance, a number referred to competition from commercial fishermen and sport hunters, and several talked about industrial development or increased Arctic shipping. As I indicated earlier in this article, I cannot discern the extent to which these threats, as opposed to climate change, restrictive laws, or other factors have impeded subsistence. But regardless of which threat is most significant, the result seems to be less participation in subsistence now than in previous times. Several participants specifically mentioned the reduction in participation, and several referred to a loss of knowledge, cultural practices, and values (such as the language and respect for elders) that are intertwined with subsistence. For example, a participant from northeast Alaska said, "My grandfather told me, 'You gotta learn to live on the

[93] I only asked ANV participants (not those outside of ANVs) how climate change had affected their lifeways, although a few participants from outside of ANVs provided information on this topic.

land.' That's part of the culture that's slowly going by the wayside. Values that were passed down are deteriorating."

One Native now living in Anchorage described the combination of climate change and other impacts to subsistence this way:

> Colonization is intertwined with the challenges created by climate change. Young Native men have been hit the hardest because their lifestyle has changed the most. There are fewer subsistence resources to go around and people have to spend much more to pursue them. No longer can a man just go outside his home and harvest all the food his family needs. Unhealthy foods like Lunchables are now being marketed as "cool." In any society, when there are too many restless young men without meaningful work, there is a danger of societal collapse.

Yet despite the various threats to subsistence and reduced participation levels, it still holds great importance to many participants. In the words of one subsistence hunter from northern Alaska that I interviewed:

> If we couldn't go whaling … if nobody were speaking Inupiaq …I might just relocate to Anchorage. …The reason I want to live here is because I can get on my snowmachine, drive 5 minutes away, and hunt caribou. Or I can take my kids out on the ice and teach them whaling. … If you don't [get out on land], what's the point of living here?

While moving to urban settings is certainly an adaptation strategy that many Alaska Natives (including some of my participants) have taken in response to various challenges, subsistence continues to be a basic component of the ANV lifeway. Thus, the increasing changes in species and difficulties in accessing these species is a significant problem for ANV members, and the need for legally allowable adaptation strategies is important.

4.2. Adaptation Strategies

Consistent with the literature (e.g., Pearce et al. 2015; Berkes and Jolly 2001; Berkes 1998), much of the subsistence adaptation my participants described occurs at the household level in response to reduced harvest levels, rather than at the level of a community anticipating and preparing for future losses. This is significant because, as a number of participants emphasized, subsistence is much more than the individual acts of hunting and fishing. It is a lifeway that involves sharing within and beyond a community and embracing values related to patience, upholding traditions, and self-reliance. About two thirds of all ANV participants described individual and family strategies concerning subsistence, while half that number mentioned community-level strategies for subsistence and other ways to promote food security (such as gardening).

Plans for 49 out of the 59 ANVs whose plans I reviewed mentioned subsistence as being important to their community. This includes hazard mitigation plans for 35 ANVs and more

general plans for 29 ANVs, as well as the adaptation plan for Nome. Nineteen plans suggested action items to address subsistence impacts and food security, but there were no mitigation action items connected to subsistence in hazard mitigation plans (which are required for getting hazard mitigation assistance from the Federal Emergency Management Agency, see 42 U.S.C. § 5165(a)). Action items included seeking regulatory change, raising food locally, conservation and habitat creation, improving trails to access to subsistence, and storing food.

Many participants demonstrate the kind of flexibility described in the literature, where they are able to alter hunting and fishing patterns to some degree to accommodate climate change. As on subsistence participant from northwest Alaska explained, this flexibility involves

> doing what you can when you can. … It's not a whole lot different than in the past as far as the environment dictating people's activities, it's just that the timing of the activities are changing, as are some of the opportunities themselves, which may no longer be available, or if they are at a very reduced time period, or quantity.

A number of participants referred to hunting or fishing in different places, using different access routes or modes of transportation, at different times or for longer. "Western" resources help to some degree: a few described using more fuel to travel farther out or using better technology (snowmachines and GPS) to increase their hunting range and reduce travel time. One participant referred to programs in the ANVs of Chenega and Kotzebue that subsidize the cost of fuel and ammunition, and a few indicated a desire for similar programs in their communities. At the same time, a few participants said they were prepared to return to "old ways" of doing things if Western resources were not available.

While most Alaska Natives have whole-heartedly embraced Western technology as a means of surviving and thriving in a colonized society, there is a perception among some non-Natives that Natives are somehow cheating the system when they use such technology. This view is seldom expressed in the literature but frequently appears in the "comments" section after news articles in the Anchorage Daily News on Alaska Natives and subsistence (e.g., O'Malley 2017; Friedman 2016). I did not hear much of this viewpoint among my participants, perhaps due to selection bias or perhaps because this viewpoint is usually not expressed among educated, "elite" people. But one planner I interviewed said, "You can't say they're living a traditional native lifestyle anymore because they're their riding snowmachines and eating white people's food." In other words, there is a perception that adapting to Western technology and foods means that a person is no longer living a Native, subsistence-based lifeway.

Several people said they were eating different animals or using new subsistence resources (i.e., bison or invasive species), though one person said that reliance on different subsistence resources puts a strain on these other resources. Several said they were eating more store-bought foods. A few said they were sharing more and relying on others to hunt.

Several participants suggested that hunting out of season or beyond the legal limit ("doing what one needs to do") is a strategy that hunters sometimes must consider. One said, "There's a difference between 'hunting-hunting' and 'feeding-our-families-hunting'" (the latter being illegal). None of my participants said that they had personally sold food harvested under the subsistence regime,[94] but a few participants from outside ANVs suggested that this was a strategy for individuals to be able to afford to participate in subsistence.

At the community level, the main strategy I found for addressing subsistence impacts was to seek regulatory change in hunting and fishing seasons and limits. A number of participants who worked for ANVs referred to conducting their own research to suggest different regulations and filing petitions to change hunting seasons. Along these same lines, eight community plans called for more active participation in agency decision-making processes on subsistence.
This participatory approach is more common among ANVs that have more funding and can afford to have Western scientists (who tend to be non-Native) on their staff, since, as several ANV participants explained, state and federal boards may not accept "traditional knowledge" as a basis for changing rules.

Other community-level adaptation measures included facilitating access to subsistence through improving or maintaining trails and developing better ways to store foods, such as community ice cellars. Four plans and a few participants referred to supporting subsistence indirectly through conservation and habitat creation.

Some communities are seeking to increase food security by means that do not involve subsistence fishing or hunting. Five plans and several participants talked about the potential for gardening, farming, hatcheries, herding. But few ANVs have been able to assemble the equipment and supplies needed for large-scale gardening or herding, and only one participant (a non-Native ANV resident) referred to having his own garden. A few ANV residents referred to having some sort of food bank available in ANVs. Finally, a few participants suggested that game management agencies could help food security by stocking waterbodies with fish or introducing a new subsistence species. Alaska Department of Fish and Game has done this in the past, most recently by reintroducing bison to Interior Alaska.

To summarize, adaptation to climate-related changes in subsistence continue to take place at the individual and family level as they traditionally have, with some help from modern technology. Subsistence adaptation at the community-level is more limited and focuses on changing state and federal rules. There is interest but little movement towards increasing food security beyond subsistence hunting and fishing.

[94] Different types of harvest (i.e., commercial, sport, personal use, and subsistence) are governed by different rules with different types of permit and license requirements. Some species (most marine mammals) are only supposed to be harvested for subsistence purposes, but can be sold under limited circumstances 16 U.S.C. §1371(b)(2). In many cases, sales of game are prohibited. 5 Alaska Admin. Code §92.200.

4.3. Experiences and Obstacles Described by Participants

4.3.1. Limited Opportunities for Meaningful ANV Management

Among my participants, a number (largely Natives) identified ANVs' limited jurisdiction over lands and wildlife as a barrier to adaptation. Some Native participants described the effect of the ANCSA and ANILCA as follows:

> "ANCSA, ANILCA, those are bad things for the Alaska Natives."
>
> "The local people did not cede the land or fight for it. They did not vote in favor of ANCSA."
>
> "Natives didn't understand about owning land and got cheated out of their land."

In short, while ANCSA may be settled law, it is not perceived by all as a fair settlement of Native land and subsistence rights. Participants, particularly those from ANVs, had few suggestions for crafting a fair remedy. A few from outside of ANVs called for methods to allow regional tribal groups or partnership of tribes and state to regulate hunting and fishing.

Few, even those I interviewed from outside ANVs, offered praise for current co-management and collaborative management practices. A few participants said it is not working, or gives limited jurisdiction at great cost. One participant from the State's subsistence division said, "There is no real co-management under state or federal law, outside of that for marine mammals." An environmental manager from an ANV described co-management as an agency saying, "'We manage, you cooperate.' There seems to be more 'give' on the community end. If we all had equal seats at the table, that would be perfect."

Some offered reasons why co-management is easier said than done: namely the need for funding and staff to conduct the Western science that agencies feel is required. One agency scientist said, "If ANVs did have co-management, they would have to hire people to do it—it requires a scientific and technical background. But educated Natives tend to leave the villages. If people have enough ambition to get a master's degree, they're not going to stay in the villages." Another agency official described collaborative managements opportunities as "great ideas but really unfunded mandates. … I would have to cut people or programs to pay for them."

Still, a number of participants (all Native, mostly from ANVs) suggested that entering into co-management agreements or other arrangements for ANVs to carry out state and federal functions could be an adaptation strategy. Several ANV representatives indicated that they had been able to develop monitoring programs that followed Western science protocols, and this increased agency willingness to share management responsibilities.

In summary, co-management opportunities involving state and federal agencies and Native entities have not enabled ANVs and their members to manage subsistence in ways facilitate

climate change adaptation, though ANVs able to "adapt" to agency expectations of Western-science-based management have achieved greater control over subsistence.

4.3.2. Challenges of the Dual State-Federal Management System

Several of my participants cited the lack of a rural priority under the State of Alaska system and the complications of the dual system as barriers to adaptation. A few ANVs participants as well as agency participants commented on the lack of clarity regarding the application of state and federal rules and occasional conflicts between different rules. Regarding the rural priority, a former ANV resident now living in Anchorage said, "People should not lose their rural preference because they move to a city, the same way an American does not lose citizenship when moving to Europe." This same person and a few others noted that ANILCA does not help urban Natives, and wished ANILCA would have a Native priority rather than a rural priority. Thus, while the rural priority under the federal regime generally helps those who reside in ANVs (which are generally rural), it does not help Alaska Natives who adapt by moving to urban settings.

A few senior state officials said they would support changing the Alaska Constitution to provide for a rural priority. One offered the caveat that such an amendment would need to result in the State taking over all subsistence management, which he thought could be difficult considering how vested federal agencies have become in this arena. The participants who discussed potential amendments to the Alaska Constitution or ANILCA viewed them as unlikely, given the influence of urban, non-Native hunters.

While rural ANV residents who benefit from the federal rural priority may prefer the federal regime, this does not amount to clear-cut support for federal management. Some believe the state's more intensive predator management increases their likelihood of getting moose or caribou. One said, "We take great respect harvesting our animals. We've always harvested bears in their dens in the fall. We have been doing it and we're going to continue to do it."

One researcher told me that intensive management can serve as an adaptation strategy for Alaska Natives grappling with social, economic, and environmental change. This person noted that in the twentieth century, a trapping economy kept the wolf population lower. This economy is much more limited today.[95] Also, this person noted there are fewer moose today, given the increasing number of hunters and the loss of moose habitat with changing hydrology.

A scientist with the National Park Service took a more nuanced view. This person said that implementing intensive predator management without adequate study could be a maladaptation. "In some extreme cases involving transformational changes [where the current system can't be resilient], more intensive management could be appropriate. But it is generally a last resort for NPS."

[95] BOG made a similar observation in its justification for establishing a wolf predation control area in Unit 13 of Interior Alaska. 5 Alaska Admin. Code §92.121(b)(1)(H).

To summarize, uniting the subsistence regime under a single manager could simplify management in ways that might facilitate adaptation, but this is infeasible as long as federal and state law conflict and neither seek to resolve the issue. It is not clear which regime (state or federal) would be more beneficial to ANV and Alaska Native adaptation—the federal regime often gives ANVs a greater share of subsistence resources while the state regime may (or may not) increase the availability of game.

4.3.3. Limited ANV Collaboration in Agency Decision-Making

Despite the challenges of co-management, it is theoretically possible for ANVs and their members to collaborate in agency decision-making processes. But I found three main obstacles to such collaboration: political and economic difficulties on the part of ANVs and their members; agencies' inability to appreciate or adequately address ANVs' knowledge and concerns; and mutual distrust. Many of my participants expressed frustration with the lack of influence and participation of ANVs and their members in agency decision-making. More than a fifth of all participants (including a number of those outside ANVs) referred to the lack of political influence of ANVs and rural areas compared to that of urban areas, corporations, and other interests. A lower-level agency manager said,

> An obstacle to change is the anti-rural subsistence sentiment and the urban influence at regulatory meetings. There is not a lot of accurate information and education about the realities of rural life.

Several participants noted that ANV residents have difficulty participating in state and federal advisory board meetings and other public meetings of decision-makers. One village elder from Western Alaska said

> A lot of regulations are made far away, it's very hard to go there and testify. It can cost $180 to get to Nome, and then $500-600 to get to Anchorage, and you have to get a hotel. Then you only get three minutes to testify. It's not effective to talk on the phone. Face to face is more effective to convey feelings and get the point across. It's bad because we can't see each other on equal footing.

Still, a number of participants (mainly in ANVs) saw enough value in participating in regulatory/advisory boards and public meetings to suggest this as an adaptation strategy.

A number of participants (half in ANVs) referred to the distrust between ANVs and outside government entities. One ANV environmental coordinator[96] said,

> People in agencies have a mental block when Natives are trying to explain their way of life. It would be good for them to have some sort of cultural acceptance training, where they learn to listen and absorb knowledge rather than trying to counter or debate it.

[96] This is a tribal staff position that is funded by the U.S. Environmental Protection Agency for most tribes.

A number of participants expressed frustration with agencies not considering community knowledge on par with Western science. A southeastern tribal leader referred to the gaps in knowledge that come with failure to consider community knowledge:

> The combination of "so-called" science and indigenous science can be useful. If you're really a scientist, why would you leave any knowledge out? It's essential to incorporate local people into research, not just if you happen to have funding. To not include them would be like leaving out beakers from a lab experiment. All of this has to be planned at the beginning. Elders can't be hired as an after-thought. This is not good science.

Yet bridging community knowledge with Western science continues to be more aspirational than reality, as described by a lower-level agency manager:

> Agencies talk about how valuable it is but don't really use it. All biologists have done is casually ask people if there are more or less of a species. I proposed using it once three years ago and got shot down.

As in the literature, a few participants from outside ANVs thought it would be helpful to give more authority to lower-level decision-makers, game managers, and advisory boards; however, they were not sure how to accomplish this. For example, a senior state official said, "It helps to push down law to the lowest level possible." He paused and then admitted, "The State asks for this [from the federal government] but doesn't give it."

A few participants noted that some lower-level agency staff can be supportive of ANV subsistence, but upper-level staff are not supportive. An ANV environmental coordinator and a lower-level agency staff member offered similar views on this. From the former,

> There's people closer to the ground level who understand the difficulty but they can't do anything about it because they need their jobs. People at the top level aren't taking action. Many of the on-the-ground game management staff are good people who help the tribe in every way they can.

From the latter,

> On-the-ground cooperation between federal and state game management agencies has improved in the last decade, but there is still a lot of tension at the upper levels that handle policy issues. A lot of the on-the-ground issues get replaced by upper level policy issues.

To summarize, within in the literature and among participants (at least those in ANVs and lower level agency manager), there is recognition of the challenges ANVs face in influencing decisions regarding subsistence management and the need for better use of ANV knowledge. Yet there is not a clear pathway forward to increase ANV participation.

4.3.4. Lack of Flexibility

A number of my participants (mostly in ANVs) referred to overly strict laws controlling time, place and manner of subsistence as barriers to adaptation. One ANV participant described it this way: "It's kind of like having to ask [the agency] permission to have to go to the bathroom." Several participants (half in ANVs) said they would like to see easier mechanisms to adjust season dates, where fish and game managers can start and stop seasons in response to climate rather than on specific dates.

Among the participants I asked for examples of flexible laws (all outside ANVs), a few referred to the use of emergency petitions to state and federal boards and petitions to change the agenda of regular board meetings. One agency representative characterized the petitions as an example of adaptive management. But another agency representative suggested that the petitions are not adequately resolving subsistence problems associated with climate change:

> Since the mid-2000s, local advisory committees and councils have been submitting emergency petitions and letters to the Board of Game and the Federal Subsistence Board asking for an extension in the moose season. Most are rejected as not fitting emergency criteria. This is becoming a regular event that ADFG needs to take seriously.

Still, as noted in Section 4.2 above, a number of participants (mostly in ANVs) referred to conducting research and filing petitions to change regulations as an adaptation strategy. Thus, the process of allowing subsistence participants to seek changes in rules and meeting agendas can help adaptation, but the petition rules may need to be re-examined to improve the efficacy of the process.

5. Discussion: The Best Adaptation Strategies under Existing Law and the Potential for Legal and Institutional Change

ANVs are experiencing impacts to subsistence not only from climate change, but also from laws that constrain adaptation, as well as industrial development and increased competition for fish and game from a growing population. There is no turning back the clock to precolonial times when there were far fewer stakeholders (hunters as well as institutions and commercial development entities) to satisfy. While legal and institutional change to increase the ANV role in decisions about fish and game resources would be ideal from the standpoint of ANVs, such change is not easy. Among the barriers to adaptation cited my participants, lack of ANV political influence was second only to lack of political will of state and federal decision-makers to address ANV climate change impacts. In this section, I evaluate subsistence adaptation strategies in the context of these political limitations, and offer modest recommendations that may be more likely to garner political acceptance than those requiring greater change (Garmestani and Benson 2013; Moser and Ekstrom 2010, p. 22029). I focus my analysis on strategies for ANVs and state and federal agencies to increase ANV participation in planning processes and reduce restrictions to adaptation that are not necessary to conserve subsistence resources. These recommendations could benefit ANVs regardless of climate change, but several

of them (particularly those related to increasing flexibility and intensive predator management) are particularly relevant to the need for adaptation strategies in the face of climate change.

5.1. Addressing the dual regulatory regime

As discussed in Section 4.3.2., several participants expressed confusion in regard to navigating separate state and federal rules on hunting and fishing, along with frustration regarding the lack of a Native or rural priority under state law. Based on my interviews and literature review, it seems unlikely that the State would change its Constitution to regain control over subsistence management and implement a rural priority.[97] Since participants had few easily achievable recommendations for change, the recommendations in this subsection come from my own perspective and interpretation of the law.

A relatively feasible legal change would be to adjust federal board rules specifying which communities are "rural," entitled to the federal rural subsistence preference, as well as state board rules specifying which areas are "urban" such that they get no preference for subsistence over other types of hunting. Expanding "rural" and limiting "urban" could increase participation of Alaska Natives and ANVs that are closer to urban centers, but still have a subsistence lifeway. On the other hand, such a change could increase competition from non-Native urban users. Whether the change benefits a particular ANV depends on whether the board considers the ANV in question to have a more "rural" character than non-Native communities in the area.[98]

Assuming the dual regime stays in place, there are ways to reduce the confusion. The State has already developed a program for making custom hunting maps to print or use on a mobile device, showing what animals can be hunted on what lands under different types of hunts (Alaska Department of Fish and Game 2016). One must still refer to the Alaska Hunting Regulations booklet for hunting limits, seasons, and additional regulations concerning this hunt. I would urge the State to incorporate this additional information into the maps, if possible. Ideally, a hunter/fisher could see, based on his GPS location, what rules apply based on the target species and the type of hunt. The state and the federal government should cooperate to create a joint system, rather than having a separate federal system (which has yet to be developed).

[97] As discussed in Section 3.2, in order for the State to gain control over subsistence on federal lands, it would need to amend Section VIII of the State Constitution (which provides for equal access to subsistence resources by all residents) so as to accommodate the rural priority under ANILCA. Several participants suggested that such a change would be unlikely so long as there are urban hunters and fishers with significant political influence and voting power who do not wish to see a rural priority. I speculate that these constituents could be convinced of the benefits of an amendment if they believed that the state provisions on predator management (allowing for more predator hunting with the goal of increasing the number of caribou and moose) would take effect statewide.

[98] For example, a 2007 decision reclassifying various communities hurt the Native Village of Saxman in southeast Alaska, because the board decided that it was "urban" (U.S. Forest Service and U.S. Fish and Wildlife Service 2007). The same decision may have helped ANVs on the Kenai Peninsula, since several non-Native communities were reclassified as urban. A decision that would be more beneficial to ANVs would automatically consider them "rural" if they have subsistence traditions, even if they are not far from urban areas.

As climate change brings more species changes and greater difficulties in accessing species used for subsistence, there may be a need for more rule changes to reflect environmental circumstances. Ensuring that subsistence participants understand what the rules are can help the subsistence management system as a whole better adapt.

5.2. Increasing ANV Participation and Collaboration

As participants suggested, one way to increase ANV participation in decision-making is to get more ANV residents to serve on decision-making boards and within agencies. The Federal Subsistence Board (FSB) provides an example in that two seats on the board are specifically reserved for rural subsistence users. As of this writing, FSB is headed by the mayor of the ANV of Hydaburg. Implementing a similar requirement for the Board of Game and the Board of Fisheries could be difficult, since these boards allocate game among *all* hunters, not just subsistence users. Even in the absence of a requirement, however, ANVs should encourage their citizens to seek these positions.[99]

Another entity that could benefit from ANV representation is the North Pacific Fishery Management Council, one of eight governing bodies that controls ocean fisheries under the Magnuson Stevens Act (16 U.S.C. §1852). The Act currently provides for tribal representation only for the Pacific Council (not the North Pacific) for tribes with federally recognized fishing rights from California, Oregon, Washington, or Idaho (16 U.S.C. § 1852(b)(5)(A)). A change could be made to this law to provide for ANV representation on the North Pacific Fisheries Management Council.

Another way to supports ANV input is to give deference to the findings made by local advisory committees. Under ANILCA Sec. 805(c), FSB must defer to committee findings unless they are not supported by substantial evidence, violate recognized principles of fish and wildlife conservation, or would be detrimental to the satisfaction of subsistence needs. A similar provision for the state boards could be useful.

There are a number of ways for ANVs to increase their participation in decision-making even without legal change. These include entering into agreements with agencies under laws that allow for co-management, participating in agency decisions as a "cooperating agency" under the National Environmental Policy Act, and engaging in government-to-government consultation (Ristroph 2016). That said, despite the literature describing the benefits of co-management (;), the reality in Alaska is that co-management and related strategies are expensive and time-consuming, and the ANV voice may not be heard if it is not supported by some form of Western science. State and federal agencies should provide funding and training for ANVs that desire and can commit to participation in co-management or collaborative management opportunities. So long as there is no legal obligation on the state or federal government to provide for or fund co-

[99] Following this paragraph, the remaining recommendations in this subsection come from my own perspective and interpretation of the law.

management, ANVs may need to rely on bridging organizations such as Native non-profits, who have more funding and Western science capacity to bargain for and implement co-management agreements. This is not an ideal long-term solution, as bridging organizations may (and perhaps already have) become indispensable, such that ANVs may never build the capacity required for co-management (Vaughan 2015, 56).

It is important to note that ANVs and Native entities with strong environmental management programs often have non-Native Western scientists on their staff or as consultants, and these people may not live in ANVs. For example, one environmental coordinator I talked to in the course of my research lived in Anchorage rather than the remote ANV she worked for. While it might be ideal to get Natives with master's degrees to come back to ANVs, a second-best alternative may be to have urban-based scientists willing to work for ANVs, and willing to take seriously their community knowledge and values. Such scientists serve a bridging role but are responsible directly to the ANV rather than an external entity. Where ANVs cannot afford Western scientists and higher levels of participation, they are at least entitled to government-to-government consultation (at the agency's expense) for federally sponsored or permitted activities that affect tribal resources (Clinton 2000; Babbitt 1997).

ANVs cannot be saddled with all the burden for increasing their participation—agencies should also do their part. Some of the disconnection and mistrust between agencies and ANVs could be addressed by having outside decision-makers spend more time in communities. This is particularly important for upper-level agency officials who, unlike some of the lower-level staff, have not spent any time in ANVs and do not understand the concerns about food security or the importance of the subsistence lifeway.

An example of the significance of having upper-level officials visit ANVs is President Obama's September 2015 visit to several ANVs, where he met with subsistence participants and ate their food. During the visit, he announced that the Denali Commission would play the lead coordination role for Federal, State and Tribal resources to assist communities with climate change adaptation (White House 2015). Sometime after the visit, over the protest of Alaska's Congressional delegation, President Obama issued an executive order related to subsistence (Obama 2016). The order provided for some of the principles outlined in this article, including the creation of a co-management entity known as the Bering Task Force to incorporate ANV input and traditional knowledge regarding management of the Bering Strait region. While the President's visit to ANVs is an ideal example, social connections can also be fostered by regular phone contact between staff and ANV leaders, and ensuring that upper level staff attend key Native events such as the annual statewide Alaska Federation of Natives conference.

Overall, while some legal changes could allow greater deference to ANV perspectives, laws providing for more ANV authority may not be helpful if ANVs lack the capacity (from a Western point of view) to administer subsistence management. ANVs may need to resort to hiring non-ANV staff if they are not able to get local staff with the capacity needed for co-management. In turn, state and federal agencies should support capacity-building efforts

(including funding for ANVs) and at the very least spend more time in ANVs to better understand their subsistence concerns.

5.3. Increasing Flexibility

Responding to climate change may require the law to provide decision-makers, communities, and individuals with greater flexibility so that they have a reservoir of options from which to choose when environmental conditions change (Chapin and Cochran 2014, p. 1; McNeeley 2012, p. 837). There is more than one way to approach this. As participants had few easily achievable suggestions for improving flexibility, the suggestions in this suggestion are based on my own interpretation of the relevant laws and literature.

One suggestion concerns change to the laws that govern land mammal hunting and fishing to allow for more flexibility, similar to that of ocean mammals and fish. Three examples follow, first, the marine mammal regime (particularly whaling) under the Marine Mammal Protection Act (16 U.S.C. § 1362(12)). The Alaska Eskimo Whaling Commission (AEWC) has a cooperative agreement with the National Oceanic and Atmospheric Administration to manage the annual bowhead whale hunt in Alaska (NOAA 2013). The International Whaling Commission allocates a certain amount of bowhead whale strikes to AEWC, which in turn allocates the strikes among Alaska's eight whaling villages. Each strike at a whale that a hunter takes will count against that village's quota for that year, whether or not the whale is successfully landed. One village may share its quota with another village, and AEWC has previously shared its quota with Siberian Yupik Eskimos. There are no government-imposed seasonal limits to whaling. This has allowed St. Lawrence Island whalers to take advantage of later fall freeze-up to pursue bowhead whales later in the year, offsetting some of the difficulties they have experienced during the traditional period for whaling (Cochran et al. 2013, 562).

A second example of flexibility is the Community Development Quota (16 U.S.C. §1855 (i)(2)(B)(iii)), designed to give western and Aleutian ANVs a stake in commercial Bering Sea fisheries (Richmond 2013; Loring et al. 2011). The coastal system allows fishers to meet their ground-fish quotas at any time during an extended fishing period (Loring et al. 2011, p. 81). Coastal subsistence fishers described the benefits of the longer open seasons, which reduce the incentive to take unsafe, risky actions in order to obtain adequate catch within a short season (Loring et al. 2011, p. 81).

A third example is the National Marine Fisheries Service's Community Harvest Permit (50 C.F.R. §300.65 (j)). The program allows certain coastal and rural communities and tribes to appoint individuals from their communities or tribes to harvest subsistence halibut from a single vessel under reduced gear and harvest restrictions (50 C.F.R. §300.65 (i)).

A fourth example, which has not enjoyed the success of the other three, is the State's community subsistence harvest permits described in Section 3.4. While that program had unintended consequences, it, along with the other three examples, should be viewed as learning processes for

how to make a better community quota program. It is also necessary to understand that the success of the first three examples may be more challenging for land mammals and fish so long as there is a dual management regime, because an animal population will likely move across federal and state land and there will be conflict between the federal rural preference and the state provision for equal access.

A revised "pilot" program for a community quota might start with a species like elk, which has a limited range and is large enough to count with relative ease. The management board could assign an annual quota to village within the limited range, and each village could develop its own system for allocating the hunt among village residents. A village could trade or share a quota with another village. Perhaps seasonal limits could be relaxed, with a given starting point, and an ending point when the quota is used up. Such a program would work only if there is no competition from subsistence participants outside of the limited range, and if the participating village is able to fulfil the potential tracking and reporting requirements of the program.

If shifting quotas from individuals to communities proves too politically difficult, a simpler change could involve liberalizing the proxy system to better enable individual hunting and fishing on behalf of others. One should not have to be blind, elderly, or disabled to get a proxy hunter, but this is the current standard under the state system.

Aside from community quotas and proxies, another approach to increase flexibility is to grant lower level staff more authority to make adjustments and exceptions. McNeeley (2009, p. 184) suggests that regulatory managers should work with weather and climate forecasters and subsistence specialists to try to both anticipate and respond to both climate conditions and village harvest success during each season. This may already be occurring to some degree, according to state and federal agency participants I interviewed. Managers for both the state and the federal government have occasionally lengthened a season or expanded a usage area for fishing and hunting, though there is nothing in the regulations directly providing for such a decision.

Another way to increase flexibility relates to the timing of seasons. The State already regulates vehicular travel across the tundra, based on the occurrence of an event (sufficient snow thickness and temperature) rather than a calendar date.[100] Ideally, such logic could be applied to establish thresholds for opening and closing hunting seasons for prey and fish, rather than relying on calendar dates or emergency petitions. Hunting and fishing seasons could be opened and closed when agency biologists, in cooperation with ANV residents, document certain activities occurring (i.e., the presence of a population of X size in a certain area).

[100] The tundra is open to off-road travel in coastal areas when the soil temperature at a depth of twelve inches reaches -5˚C and when there is six inches of snow on the ground. In the foothills areas, tundra opening occurs when the soil temperature reaches -5˚C and when there is nine inches of snow on the ground. The date of tundra opening has ranged from as early as November 4 to as late as January 27. (Alaska Department of Natural Resources 2015).

Another option regarding timing would be to allow for a longer regulatory open season (say May 1 to September 1) and limit a user to a certain number of consecutive days (say 60 within that season). In this example, if the species does not arrive until June 1, a hunter could start on that day and continue until the end of July.

In short, there are already tools that state and federal game agencies have used that facilitate flexibility in terms of expanding quotas to include more hunters and providing for longer seasons. In using these tools, the aim is not so much to increase the overall harvest. Rather, the aim is to ensure that ANVs have the chance to obtain the harvest levels to which subsistence participants are legally entitled, but are not able to achieve due to climate change and other obstacles. Further, empowering subsistence participants to have more control over their practices may create more "buy-in" to the rules and avoid illegal harvest (Chapin, Folke, and Kofinas 2009, p. 328; Pinkerton 2009, p. 251; Ostrom 2005, pp. 230, 260, 2000, p. 147). Agencies should explore pilot projects using the existing tools for more flexible management in other areas with other species.

5.4. Intensive Predator Management as a Form of Adaptive Management

Regardless of its ethics or efficacy, intensive management is an example of adaptive management, since it only takes effect when biologists have data showing reduced populations of big game prey (Alaska Stat. §16.05.255(e-f)). The regulatory agency establishes a threshold for action, and implements a different hunting regime when the threshold is reached (5 Alaska Admin. Code § 92.111(c)(4) (C, E)). Both state and federal agencies should better consider the long-term effects of intensive predator management to determine whether this is effective adaptive management or just unnecessarily decreasing predator populations. If it is an effective tool, then it is already well within the mission of the State to use it. There is potential legal conflict with its use on federal lands, but less so for lands managed under the "multi-use" regime of the Forest Service and the Bureau of Land Management. [101] Some of the conflict may be reduced with the Trump Administration. While the Obama Administration resisted efforts to apply intensive predator management tactics in National Parks and Refuges, the Trump Administration and Congress have shown their support for the state view by invalidating federal regulations that limited intensive management in Refuges (Pub. L. No.115-20 (2017)) and proposing new rules allowing predator control in Parks (National Park Service 2018).

5.5. Other ANV Actions

This subsection discusses additional strategies raised by participants concerning actions that ANVs can take with or without outside help. Since ANVs retain sovereignty over their members,

[101]BLM operates under Federal Land Policy Management Act, which directs multi-use management. 43 U.S.C. §§1701(a)(7), 1702(c). The Forest Service operates under the National Forest Management Act, which has a similar directive, 16 U.S.C. §1600(3).

ANV councils can pass ordinances governing members' subsistence actions. This can be effective to regulate resource access if there is no competition from those outside the community (Ostrom 2005, p. 261). One of my research participants (himself a researcher) described how the ANVs of Nanwalek and Port Graham outlawed freezing bidarki (a mollusk) to limit the harvest, and put a temporary moratorium on harvesting eelgrass near the village. The State of Alaska had no regulations dealing with these resources, so it did not object to the ANV law.

Another action that ANVs can take on their own is to develop community strategies to support subsistence. This may involve subsidizing fuel and ammunition, as a couple ANVs have done, or it may involve creating a community space for food processing and storage.

Finally, ANVs should consider increasing food security in ways other than to subsistence, such as community greenhouses. Government entities like the U.S. Department of Agriculture and the Bureau of Indian Affairs as well as Native non-profit entities responsible for Native health and welfare could providing equipment and training for this. Agencies should recognize that some of these ways may seem "colonial" and inconsistent with traditional practices (Stevenson et al. 2014; Loring and Gerlach 2010, p. 190). But, just as ANV residents have embraced the best of technology for their own hunting and traveling, they may embrace gardening if it is their own program rather than one imposed by outsiders.

6. Conclusion

Subsistence is an integral part of ANVs' physical and cultural continuity that must not be overlooked in efforts to assist ANV adaptation. Many subsistence participants are concerned about obstacles to subsistence not just from climate change, but also from development, increased competition, and inflexible laws. There is some flexibility at the household level to legally adapt subsistence practices to climate change and other constraints, though not all adaptations (such as reliance on more fossil fuels and imported foods) may be sustainable in remote locations.

Compared to strategies at the individual and household level, relatively little is being done at the community level in terms of planning for or carrying out adaptation actions. ANVs that can afford to hire Western scientists have been more successful than other ANVs with changing or influencing fish and game management. Overall, however, few participants had concrete suggestions for increasing ANV jurisdiction over fish and game management. If desired by ANV community members, ANV governments could improve food security by subsidizing and seeking funding to support subsistence, other forms of food production, food storage, and participation in state and federal advisory boards. Outside entities might be more willing to assist with such efforts than with efforts that would require regulatory change.

I do not mean to suggest that ANVs should simply accept top-down control of fish and game management by Western-science-based state and federal agencies. But management shifts are more likely to go towards larger entities with more ability to navigate Western laws and science,

and with a larger territory for a management unit. In other words, co-management is more likely to occur with a regional Native entity (such as the Native regional corporation Ahtna or the North Slope Borough) than with a small tribe. Native entities with sufficient capacity to do so should push for greater co-management power through existing laws that have been underutilized, such as the Indian Self-Determination Act, 25 U.S.C. §§ 5361-5638, or ANILCA Section 809. This strategy depends on the willingness of state and federal government entities to actually collaborate rather than just consult or inform, and to invest limited budgets into coordinating co-management.

Lastly, though participants in my study were reluctant to discuss illegal hunting as a strategy, and it is seldom discussed in the literature, it is a strategy nevertheless, particularly where laws are perceived as inflexible. Removing factors that impede ANVs from participating in law-making could help bridge the gap between laws that exist on the books and the unwritten laws that exist out on the landscape (Ostrom 2005, p. 259). Again, it would be ideal if state and federal lawmakers pursued legal changes to increase the jurisdiction and participation of ANVs and rural residents as well as the flexibility of subsistence laws. But even without legal change, game management agency representatives could increase ANV participation in decision-making by spending more time in ANVs and making efforts to increase involvement and employment of ANV citizens.

Appendix A: Detailed Description of Methods

1. Introduction to Methods

My methods aim to capture the climate change adaptation actions and obstacles for a diversity of Alaska Native Villages (ANVs) across the State of Alaska. Within a total of 229 ANVs, there are at least 11 distinct cultural groups of indigenous peoples and at least 20 different languages across the state (Alaska Native Heritage Center 2017). About half of all ANVs are on rivers, while the rest are on the coast. Only about two dozen ANVs are connected to the Alaska road system, while the rest are not accessible by roads. A small handful directly benefit from oil development income, while around three dozen still have no running water in the homes. There are different percentages of people who self-identify as Alaska Natives within different ANVs, ranging from less than 10% to nearly 100%. In addition, the type of local government varies. Seventy ANVs have no city or county-level government at all and are led by a tribal council. An additional thirty or so lack a city-level government but are part of a county-level government (known as a borough). Others have a city-level government in addition to their tribal councils. Among those with city-level governments, some are also part of boroughs. (AK Division of Community and Regional Affairs 2018) Thirty-one ANVs have been described as "imminently threatened" by climate change, while other ANVs have less visible or immediate climate change impacts (GAO 2009, 2003). Figure A.1 gives the reader a sense of the sheer size of Alaska in relation to the Lower 48.

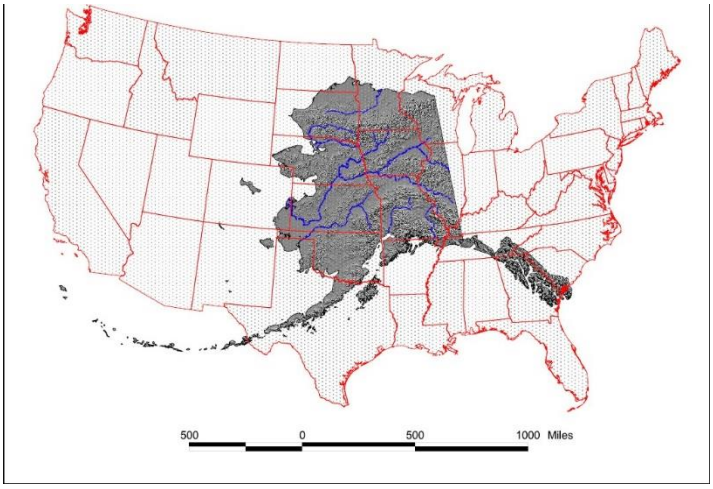

Figure A.1: Alaska in relation to the Lower 48 (NRCS Alaska n.d.)

Despite substantial differences within ANVs, there are several important commonalities. All ANVs are within a piece of land that was purchased from Russia as a colony in 1867 and made into a state in 1959 (Worl 2016; Hitchins 2011; Haycox 2006). Though they may not be bound together by culture or language, they are all subject to laws. There are several laws that are unique to Alaska, including the Alaska Statehood Act, the Alaska Native Claims Settlement Act, the Alaska National Interest Lands Conservation Act, and Alaska's complex subsistence hunting and fishing regime. Each of these laws constrains adaptation in a manner that is different from constraints in other jurisdictions. Any changes to state or federal policy to facilitate adaptation should take into account the diversity and needs of ANVs across the entire state, to avoid benefiting some at the expense of others. As it stands,

many important climate change conversations are being held in forums such as the Alaska Marine Policy Call, [102]which tends to exclude Interior communities suffering from climate change impacts. Likewise, residents from some ANVs in Southeast Alaska have told me that they feel left out of statewide climate change and environmental considerations, to the point where they have developed their own annual environmental forum.[103] My research is the first that I am aware of that attempts to document adaptation actions of ANVs across the state, rather than just focusing on a few case studies.

In this appendix, I will describe the four approaches I took to obtain a statewide picture of climate change adaptation actions, strategies, obstacles, plans, and relevant laws, both from the viewpoint of those in ANVs and those outside ANVs. The first approach was to review literature related to studies of adaptation, studies of Alaska Natives, and commentary on laws. The second approach was to review relevant laws themselves. The third approach involved interviews and conversations with people in ANVs as well as those outside of ANVs who affect or influence ANV policy. The fourth approach was to analyze written plans and disaster declarations related to participants' ANVs.

2. Scope of Literature Review

I reviewed literature from peer reviewed journals, law reviews, and books relevant to climate change adaptation, law, planning, and Alaska Natives. Figure A.2 shows the key words that I searched in various combinations using a database for academic journals. I used references from the initial articles I read to find additional articles. I focused on articles pertaining to ANVs and similarly situated communities across the United States and the Arctic. I repeated my search several times from 2014 to 2017 until I felt that I had exhausted the relevant literature.

Climate change	Adaptation	Adaptive Capacity
Adaptive management/gov.	Vulnerability	Resilience
Scenario planning	Indigenous planning	Collaborative planning/ governance
Hazard mitigation planning	Disaster declarations	Natives/tribes
Social capital	Collective action	Climate justice
Subsistence	Community relocation	Maladaptation
Institutionalism	Alaska/Arctic	Social learning

Figure A.2: Key words searched

I reviewed several textbooks on U.S. climate change adaptation law (e.g., Verschuuren 2013; Gerrard, Kuh, and American Bar Association. Section of Environment 2012; Wold 2009), which

[102] This is a bi-monthly phone call where state and federal decision-makers in Alaska along with leaders from non-profits and the private sector discuss events and opportunities related to Alaska's environmental issues and policies.

[103] The Central Council of Tlingit and Haida Indian Tribes of Alaska hosts the annual Southeast Environmental Conference to address climate change and other environmental issues of concern to the southeastern region.

identify American laws relevant to climate change adaptation. I also reviewed Case and Voluck (2012) and similar authorities on Alaska Native law who have published in the State's only law review journal, *Alaska Law Review* (e.g. Anderson 2016; Starkey 2016).

3. Scope of Law Review

Based on this literature, I identified an initial set of laws and policies that could be relevant to climate adaptation for ANVs. These included state and federal statutes, state and federal regulations, executive orders, and state and federal agency plans related to flooding, erosion, subsistence, relocation, disasters, environmental/administrative decision-making procedures and community control over resources needed for adaptation. I read through each of these laws in their entirety and interpreted them in the context of each other, relevant case law, and how they have been carried out in regard to ANVs. The initial laws referenced other relevant laws, which I similarly reviewed. I created a chart to identify key federal and state laws, agencies that have a role in carrying out these laws, and agency programs. I used this chart to help guide my selection of agency participants, as discussed in more detail in the following section.

4. Interviews and conversations with research participants

4.1. Two types of participants

ANV adaptation actions are not always written down, and where written plans exist they are not necessarily being implemented. Thus, talking with community members is critical to understand the actual actions and strategies of ANVs to adapting to a changing environment. Community knowledge can fill gaps in Western science and written records maintained by agencies and researchers (Burkett 2013, p. 99; Ristroph 2012; Moller et al. 2004, p. 9; Berkes and Jolly 2001). ANV input on potential changes to laws on climate change is likewise important for two reasons. First, ANV citizens are more affected by climate change than the lawmakers and agency representatives who live in urban settings and do not depend on the land for their physical and cultural continuity (EPA 2014, p. 49; McNeeley 2009, p. 21; Turner and Berkes 2006, p. 476; Huntington 1998). Second, ANV citizens have traditionally had little influence over the state and federal laws that affect them because they are often far from power centers and lack experience in Western decision-making forums (Thomas, Savatgy, and Klimovich 2016; Worl 2016; Thompson 1999). Including their input can help address climate change risks in a more equitable way (Anderson 2012, p. 14; Weber 2011, p. 193).

In addition to interviews and conversations with ANV community members, I talked to lawmakers, agency representatives, and others outside of ANV with the power to affect adaptation policies relevant to ANVs. Talking to those outside of ANVs was important to better understand the policies and plans within the outside participants' areas of expertise, and to understand the institutional challenges these participants face (Loring et al. 2011, p. 76). Talking

to people outside of ANVs also helped me get a sense of how outsiders perceive ANVs and climate change impacts affecting ANVs. The disparity of views between ANV community members and outsiders can be an adaptation barrier in itself (McNeeley 2009, p. 15; Lane 2003). Where there are agreement on barriers and facilitators to adaptation, solutions may be more feasible to implement (Innes et al. 2011, p. 58; Focht and Trachtenberg 2005, p. 96).

4.2. Format of Interviews, Conversations, and Participant Observation

For my research I made five trips to the northern interior village of Allakaket (March, May, and July 2015; and March and August 2017), along with visits to the southeast villages of Sitka (October 2016) and Ketchikan (September 2016), the Aleutians village of Unalaska (August 2016), the west coast village of Nome (January 2017), the interior village of Nenana (October 2016), and the north coast village of Utqiagvik/ Barrow (February 2016), where I had lived for four years prior to this work. I also traveled to the State capitol in Juneau (March 2017) to talk with legislators and to Anchorage to talk with federal and state agency representatives. I attended conferences and workshops in Fairbanks and Anchorage, and other communities[104] with sessions related to climate change and/or Alaska Native policy. Interviews and conversations took place in person at these locations or by phone.

A challenge to interview people within ANVs is that people are often tired of being "put in the aquarium" by outside, non-Native researchers. Consistent with prior researcher experience (Smith 2012, p. 1; Bernard 2006, p. 354), I found that though many participants within the ANVs had lots to say, not all were willing to be formally interviewed. This may be related to having had a bad experience with past research (Smith 2012) and the legacy of the U.S. Atomic Energy Commission's secret research on the North Slope of Alaska (Egan 1992). As such, I used field observation and less formal conversations to supplement my semi-structured interviews (Loring, Gerlach, and Penn 2016, p. 122; Bixler 2013, p. 275; Creswell 2007, pp. 75, 131; Bernard 2006, p. 384; Miraglia 1998, p. 19). These conversations allowed me to verify or vet information with people who had particular knowledge on specific aspects of adaptation strategies and obstacles (Mack et al. 2005, p. 16; Patton 2001, pp. 342-43).

[104] These included the Tanana Chiefs Tribal Court Conference, Aug. 4-6, 2016, Fairbanks, Alaska; Aleutians Life Forum, Aug. 17-20, 2016, Unalaska, Alaska; Southeast Environmental Conference, Sep. 20-23, 2016, Ketchikan, Alaska; Arctic Council Senior Arctic Official meeting, Oct. 4-6, 2016, Portland, Maine; Alaska Federation of Natives, Oct. 20-22, 2016, Fairbanks, Alaska; Alaska Tribal Conference on Environmental Management, Oct. 26, 2016, Anchorage, Alaska; Tanana Chiefs Tribal Government Symposium, Nov. 15-17, 2016, Fairbanks, Alaska; Bureau of Indian Affairs Providers Conference, Nov. 28-Dec. 1, 2016, Anchorage, Alaska; Symposium on Climate Change Migration and Relocation, Honolulu, Hawaii, Dec. 13-14, 2016; Norton Sound Climate Change Adaptation Workshop, Jan. 24, 2017; Alaska Forum on the Environment, Feb. 6-10, 2017.

In total, I had 23 informal conversations with ANV participants and 16 with those from other entities (39 conversations total). There were 114 more formal interviews, including 53 with ANV participants and 61 with those living elsewhere.

4.3. Selection of ANV participants

I aimed to select participants that reflected the diversity of ANVs across Alaska, in order to gain an understanding of how adaptation actions are occurring statewide. I did not attempt to get a random sample of ANV residents, as not all residents had the kind of information I sought, and because of the need to build a relationship of trust with most participants prior to obtaining information from them (Jacobs and Brooks 2011, p. 96; Sandercock 2004, p. 108; Corburn 2003, p. 425). Instead, I used maximum variation purposive sampling, which aims to select information-rich cases that capture the main themes across a varied group (Bernard and Ryan 2009, p. 365; Creswell 2007, p. 75; Corbin and Strauss 2007, p. 318; Patton 2001, pp. 234-35; Stake 2000, p. 447; Kerlinger 1986, p. 287). My sampling approach was similar (though at a much larger scale) to that described in Loring, Gerlach, and Penn (2016, p. 122) (perspectives from purposively selected infrastructure operators in four Southwest Alaska villages); Bixler (2013, p. 275) (collecting information from caribou stakeholders in British Columbia); and Huntington (2000, p. 1217) (collecting traditional ecological knowledge from purposively selected Alaska beluga hunters).

I sent letters of introduction to 1) 200 tribal administrators[105] whose contact information was publicly available, 2) the president of each of the 12 regional tribal non-profit entities in Alaska,[106] and 3) 40 people I already knew in ANVs who attend conferences related to climate change, the environment, and tribal management and have knowledge of climate change impacts. In each letter, I asked if the recipient could identify a person knowledgeable about climate change issues affecting his or her their ANV. Sending a postal mail letter to a tribal administrator was an approach recommended to me by several Alaska researchers that I contacted for advice (Huntington, Henry, Pers. Com. Sep. 4, 2014; Gray, Glenn, Pers. Com. Sep. 2, 2014; Knapp, Corrie, Pers. Com. Sep. 4, 2014; Watson, Annette, Pers. Com. Mar. 23, 2016).

Nine tribal administrators responded to my letters with a specific recommendation for someone to interview. I interpreted the low response rate as a reflection of the need to build trust before participating in an interview. I then began follow-up emails and calls. Consistent with maximum variation purposive sampling (Kerlinger 1986, p. 287), I focused on getting at least one participant from each of the 12 cultural regions, and on having diversity in terms of ANVs with

[105] Each ANV generally has a tribal administrator selected by the tribal council to handle day-to-day tribal business.

[106] The Alaska Native Claims Settlement Act recognized 12 geographic/ethnic regions across the state and created a regional corporation and non-profit entity for each one. 43 U.S.C. § 1606. (Worl 2016). The non-profits assist tribes with planning and health services, while the for-profits seek to make money for tribal member shareholders.

different economic, political, and development characteristics. I also aimed to get participants from communities that had experienced flooding disaster declarations and those who had made an effort to relocate. In most cases, I contacted each prospective participant by phone or email three to ten times before conducting an interview.

I continued interviews and conversations until I felt that I had a sample representing the diversity of ANVs across Alaska, and I was not getting any new information. In sum, I had interviews or conversations with 76 people from 59 ANVs. In most cases, there was one participant per community. Cases in which there was more than one participant per ANV occurred where I felt that a single interview would not fully reflect the complexity of the ANV's situation (for example, a community involved in relocation), or where more than one person from the same community volunteered to participate. Figure A.3 shows the ANVs from which participants came. My participants included people from communities that differed in terms of ethnicity (type of Alaska Native and percentage of Alaska Native residents relative to non-Native residents); geography (riverine or coastal; Arctic, Interior, West Coast, Aleutians, South Central, and Southeast); connection to Alaska's road system; political system (presence of incorporated city, location within an incorporated borough (county-level government)); wealth; experience with flooding and erosion disaster declarations; relocation status; and experience with planning (some ANVs had no plans, while others had numerous types of plans). I gathered demographic information on each community to reflect these differences (see **Appendix B, ANV Characteristics**).

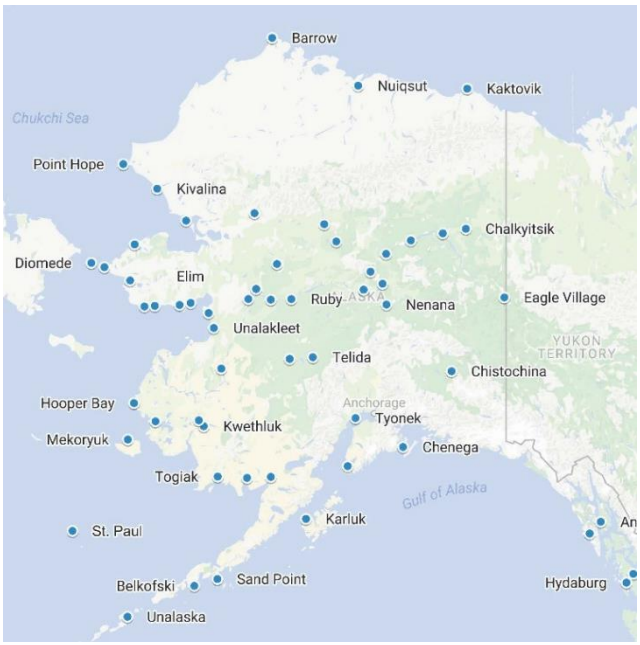

Figure A.3: ANVs from which participants came (Google Maps)

It is important to emphasize that each participant was not necessarily representative of his or her ANV as a whole. Several participants specifically stated that they were not speaking on behalf of their ANVs. There is a variation among residents within a given ANV, particularly in terms of epistemological difference between elders and youths (Wexler 2014), and different degrees of involvement in subsistence (BurnSilver et al. 2016, p. 2). The aim of my study was to get a diversity of participants representing ANVs across Alaska, not to compare and contrast different ANVs. **Appendix C, Participant Characteristics**, shows the diversity among participants in terms of age, gender, race, and other variables.

4.4. Selection of participants outside ANVs

To better understand adaptation strategies, barriers, and relevant laws from the perspective of those outside ANVs, I had interviews or conversations with 77 individuals associated with entities outside of ANVs. I first identified representatives from the agencies that play a role in ANV adaptation to flooding, erosion, and subsistence impacts, making a chart of key state and federal agencies, laws, and programs authorized by the relevant laws. From there I identified additional interviewees using a "snowball" technique, where I got recommendations from previous interviewees for additional participants (see Jacobs and Brooks 2011, p. 95; Bernard and Ryan 2009, p. 367; Tongco 2007, p. 152). Figure A.4 shows the type of outside ANV participants and why I selected them.

Outside ANV Participant Type	Reason for Selection
Staffers from Alaska's Congressional delegation	To understand perspective of federal legislators who make policy affecting adaptation
Alaska State legislators and staffers (focusing on those who introduced bills relevant to climate change and adaptation as well as those that have made media statements against such bills)	To understand perspective of state legislators who make policy affecting adaptation and laws directly affecting ANVs
Representatives from state and federal agencies responsible for disaster management, wildlife management, fishing, hunting, housing, community infrastructure, and flooding and erosion control and assistance	To understand perspective of state and federal agencies that carry out legislation and that make their own policies through regulations
Researchers who had published articles related to ANV adaptation	To understand obstacles and barriers from the perspective of a researcher, including those that researchers may not have published on
Lawyers who worked with ANVs on subsistence and other matters	To get a legal perspective on barriers and facilitators to adaptation, understand what lawsuits and legal changes have been or might be initiated
Planners who facilitated plans for ANVs	To get a planning perspective on barriers and facilitators to adaptation, understand how planning is occurring in ANVs

Figure A.4: Selection of Participants outside ANVs

4.5. Interview/conversation process

Interviews followed standard university protocols for obtaining permission from participants. For conversations, consistent with guidelines in Mack et al. (2005, pp. 16-19), I identified myself and the purpose of my research as soon as possible in the conversation.

As recommended by Huntington (1998) (collecting traditional ecological knowledge from Alaska beluga hunters) and (Miraglia 1998, p. 17) (collecting traditional ecological knowledge from communities affected by Exxon Valdez spill), I had semi-structured interviews with participants. To avoid questions that would be too "outsider" oriented, I vetted draft questions with Alaska Native individuals from three different regions of Alaska (Smith 2012, p. 141). I

either read the questions out loud to the individual by phone, or sent the individual an email with the questions, and adjusted the questions in response to these individuals' feedback.

I developed two questionnaires—one that aimed to capture the knowledge of ANV residents regarding their communities and another seeking the various types of knowledge of those outside ANVs. Some of the questions were similar for both groups. Both questionnaires appear in **Appendix D, Interview Questionnaires**. The major themes, which were based on themes covered in the literature, raised in each appear in Figure A.5.

Participants in ANVs	**Participants Outside of ANVs**
Climate change impacts observed	Potential for new laws or agency
Adaptation plans	Challenges related to inflexibility of laws and potential for adaptive management
Potential for giving ANVs more political control	
Adaptation actions observed and recommended	
Unsuccessful adaptation actions	
Adaptation obstacles	
Potential for relocation	
Roles of different entities in facilitating adaptation	
Role of planning in facilitating adaptation	
Suggestions for change	

Figure A.5: Questionnaire Themes

Given the exploratory, descriptive nature of the study, it was important to avoid strict adhesion to the questionnaire (Bixler 2013, p. 275; Miles and Huberman 1994, p. 35). Interviewees differed significantly in their expertise and on what areas they wanted to focus (Corbin and Strauss 2007, p. 152). Some ANV interviewees (often elders) responded to my questions with their own narratives that were not directly relevant to the questions from a Western point of view, although the responses were still informative. These interviews were similar to the "testimonial" or "story-telling" approach described by Smith (2012, p. 145).

I created a set of field notes for each interview based on the recorded transcript (or based on notes taken when I did not have permission to record) (Bernard 2006, p. 388). I used the questionnaire as a "form" to organize the field notes. Most interviews left some questions unanswered, and some generated new themes, which I recorded at the top of the notes.

I created a similar set of field notes for each conversation that covered the major topics of the relevant questionnaire. I then organized the notes according to the questions used for interview participants, although many conversations only responding to a few questions and covered themes outside of my initial questions (Patton 2001, p. 343). As I explain below, while I took notes on almost all conversations, I only coded those that responded to multiple questions from my questionnaire.

I provided each participant (ANV residents as well as outsiders) with an interview or conversation summary and asked for confirmation (as recommended by Corbin and Strauss 2007, p. 273). Many participants did not respond, while 16 confirmed the summaries and 42 offered minor edits.

5. Analysis of Interviews and Conversations

My aim was not so much to generate quantitative results, but to find themes and determine whether generalization across interviewees would be appropriate for any theme (Corbin and Strauss 2007, p. 71; Miles and Huberman 1994, p. 253). The differences in the questions answered by different participants (despite starting out with just two questionnaires—one for each set of participants) limited the ability to quantitatively compare responses between different participants. Given this limitation and the subjectivity of my coding, I decided that using inferential statistics was not appropriate (Bernard and Ryan 2009, p. 288; Zhang and Wildemuth 2005, pp. 2, 5). Throughout this Dissertation, I refer to specific numbers of participants to give the reader a general sense of how many participants provided a similar comment. These numbers simply serve to give an order of magnitude of the responses I got—they are not statistically meaningful and should not be interpreted in that manner.

I used what I call "numeric qualitative content analysis" to analyze interview and conversation summaries. Generally speaking, content analysis refers to "any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings" (Patton 2001, p. 453). Like grounded theory, which is an inductive approach to arriving at themes following participant observation or exchanges (Creswell 2007, p. 189), qualitative content analysis involves identifying and coding themes and patterns (Cho and Lee 2014, p. 17). Unlike grounded theory, qualitative content analysis allows the researcher to use a combination of both inductive and deductive approaches in data analysis (Cho and Lee 2014, p. 4). The researcher can reduce data into meaningful categories by limiting the analysis to what is relevant to research questions (Cho and Lee 2014, p. 5).

Coding themes can arise inductively from data collected, or deductively from a prior theoretical understanding, observation, or common sense (Bernard and Ryan 2009, pp. 55, 266). There are "many recipes for arriving at a preliminary set of themes" (Bernard and Ryan 2009, p. 56). As recommended by Miles and Huberman (1994, p. 58), I started creating codes deductively and "etically" (from the researcher's point of view) with themes already identified in the relevant literature, on which I based my interview questions (i.e., adaptation actions occurring in the community, the presence of community plans) (see Bernard 2006, p. 402; Ryan and Bernard 2000, p. 781). This emphasis on coding with "theory-related material" (Bernard and Ryan 2009, p. 62) contrasts with the grounded theory approach, where categories and codes are generated after data is collected and reviewed (Miles and Huberman 1994, p. 58). The aim of my coding

was to convert open-ended responses into categories of adaptation actions, policies, barriers, and remedies.

Some new themes (including "emic" themes from the participants' points of view) emerged inductively as I conducted and reviewed more and more interviews, while some of the initial "etic" themes became insignificant (Bernard and Ryan 2009, p. 56; Corbin and Strauss 2007, p. 150; Miles and Huberman 1994, p. 61). Thus, I revised the codes over time (Bixler 2013, p. 276; Bernard 2006, p. 404; Silverman 2000, p. 831). This iterative coding process is in itself a form of analysis (Miles and Huberman 1994, p. 56).

Rather than coding particular statements, I coded the interview or conversation as a whole based on whether statements made therein corresponded to any of my themes. I did not code every single conversation—only those that addressed several of the major topics of my questionnaires (as shown in Figure A.5).[107] I tracked the coding using both a spreadsheet and a document that corresponded to all of the column headings within my spreadsheet. This resulted in a "case-by-variable matrix" where each row corresponds to one participant or "case" and each column corresponds to a theme or "variable" (Bernard and Ryan 2009, p. 290). Variables include coded themes as well as (a) background information gathered on participants' villages from census information (i.e., average income, geographic region, flood declarations, existence of hazard mitigation plan); (b) personal information on participants (i.e., gender and approximate age). I often had two layers of themes. For example, under the larger theme of "community adaptations," I had sub-themes with specific strategies for flood management, subsistence, and other areas.

Figure A.6 shows the major (first-level) themes. Etic themes that I created based on my interview questions (which were based on the literature) are shown in Roman, while emic themes that arrived inductively are *italicized*. Themes based on questions targeted to ANV residents or more often raised by ANV residents are shown in SMALL CAPS. Themes based on questions targeted to those outside ANVs or more often raised by those outside ANVs are shown as <u>underlined</u>. Themes based on questions targeted to and discussed by both ANV residents and those outside ANVs are shown in standard Roman font.

[107] About 8 communications with ANV residents and 15 communications with those outside were informative but were not coded.

View on existence of clim. change	*View on climate change mitigation*	*View on race and racism*
Incorrect statements of law	Community level climate change adaptation strategies (current and suggested)	*REASONS TO ADAPT*
Maladaptations	View on role of government agencies and private entities	View on role of planning
Suggested time frame for plans	Barriers to adaptation	Laws that are too rigid
Laws that are flexible	Suggestions for improving flexibility	*VIEWS ON COLONIZATION*
SOCIAL PROBLEMS IN ANVS	Ways for government to facilitate adaptation	*Views on commercializing subsistence*
View on community relocation	Suggested alternatives for community relocation	Suggestions for what to do with old community site
CLIMATE CHANGE IMPACTS EXPERIENCED IN ANV	*PERSONAL/FAMILY-LEVEL ADAPTATION STRATEGIES*	*STATUS OF ANV PLANS*
TYPE OF OUTSIDE ASSISTANCE RECEIVED BY ANV	*ATTITUDE TOWARD OUTSIDE ASSISTANCE*	*ROLE OF COMMUNITY KNOWLEDGE (TRADITIONAL ECOLOGICAL KNOWLEDGE)*
STATUS OF ANV RELOCATION	View on need for new law	View on need for new agency
View on adaptive management	View on whether plans should be required	View on whether plans should be funded
View on whether ANVs should have more jurisdiction	Suggestions for preventing maladaptations	View on how to prioritize ANV relocations
View on how to identify which ANVs are most threatened by climate change	View on source of land for relocation	

Figure A.6: Major themes in participant coding

6. Review of Community Plans and Disaster Records

I reviewed hazard mitigation plans (HMPs) (required by FEMA for certain kinds of disaster assistance) and other plans (i.e., economic development, land use) for the 59 ANVs from which participants were drawn. This included 43 HMPs and community land use or economic development plans made within the last 20 years for 35 ANVs. The review documented community hazards (comparable to climate change impacts), climate-related disasters, and adaptations/hazard mitigation measures that ANVs had considered (but not necessarily implemented). It also helped me understand the kinds of planning processes ANVs are engaging in, and who is leading them (i.e., ANVs themselves or certain outside contractors).

As with the analysis for research participants, I created a case-by-variable matrix where each row corresponded to an ANV each column corresponded to a theme or variable. As shown in Figure A.7, variables included community/demographic information on each the ANV as well as plan characteristics. Underlined variables were structured to mirror variables coded for research participants: subthemes for these variables were coded similarly for both matrices.

Type of publicly available[108] plans that ANV has	Presence of adaptation plan	Presence of hazard mitigation plan (HMP)
Years of latest plans	Name of HMP preparer	Entity that adopted HMP (tribe or city)
Mention of subsistence	Mention of climate change	Mention of resilience
Cross-referencing between community plan and HMP	Hazards identified (compare to climate change impacts)	Mitigation measures (compare to community adaptation strategies)

Figure A.7: Major themes in plan coding

I initially planned to triangulate climate change impacts and adaptation strategies in village plans with those expressed by participant summaries. But, as I explain in Article 2 on planning, plans seemed to be so aspirational and disconnected from participants' experience that this triangulation was not effective.

7. Identification of Barriers, Facilitators, and Potential Changes to Law

Based on my literature, plan, and law reviews and interviews/conversations with research participants, I identified barriers to adaptation, actions that could be taken under the existing law to facilitate adaptation, and potential changes to laws to facilitate adaptation. I created a chart with these components that helped me structure my dissertation. Based on this chart, I developed **Appendix E, Proposed Law Changes**.

[108] By publicly available, I mean plans submitted to the Alaska Division of Community and Regional Affairs and posted on this agency's website, or plans readily available through an Internet search.

Appendix B: Community Characteristics

Key

- REGION: Geographic region (based on regional Native corporation): 1=Doyon (Interior), 2=Ahtna, 3=Arctic Slope, 4=NANA (Northwest Arctic), 5=Bering Strait, 6=Calista (Southwest), 7=CIRI (Anchorage), 8=Bristol Bay, 9=Aleut, 10=Chugach, 11=Sealaska, 12=Koniag (Kodiak)
- ROAD: Degree to which community is on the statewide interconnected road system: 0 = Communities not on Alaska State Highway or Marine Highway System (although there are roads within the communities). These remote communities can obtain supplies only by plane or summertime barge shipments, and are characteristically and economically distinctive from the rest of the state; 1 = Communities on Alaska Marine Highway System that can obtain supplies by ship year-round; 2 = Communities on Alaska State Highway System that can obtain supplies by road except when road closed in winter; 3= Communities on Alaska State Highway System that can obtain supplies by road throughout the year.
- COAST: Coastal or riverine community: 0=not on coast or river, 1=coastal, 2=riverine
- POP: 2014 Population (number)
- INCOME: Per capita income (number)
- CITY: Whether ANV is associated with incorporated municipality: 1=Unincorporated CDP (no municipality); 2=Second class city; 3=first-class city; 4=Home rule municipality
- BOROUGH: Within incorporated borough (like county, more access to help): 1=yes, 0=no
- CORP: Whether ANV is associated with a Village Corporation: 0 = No, 1 = Yes, 2= Village corporation merged with regional corporation, 3= village corporations merged together.
- EROSION: Erosion threat level: 0=no recorded threat, 1=presence of erosion threat noted in GAO (2003); 2=imminent erosion threat noted in GAO (2009), 3=communities funded by State of Alaska to address immediate erosion threats
- NFIP: NFIP member: no=0, 1=yes (city is member), 2=borough is member, 3=limited coverage, only in emergency program
- ADAPTPLAN: Internet search or conversation with community revealed a plan with "adaptation" in the title for one or more neighboring communities: 0=none known, 1=known plan

- COMMPLAN: DCRA Alaska and Internet search reveals plan(s) developed by tribe and/or city that addresses land use and other community goals (whether entitled “land use,” “comprehensive,” or “community development”; it does not include capital improvements: 0=none known, 1=known plan of this type, 2=multiple known plans of this type
- HMP: Hazard Mitigation Plans: 0 = no local hazard mitigation plan (though there may be a county-level plan in some cases);1 = hazard mitigation plan in place as of 2017, 2= no HMP specific to town, but eligible to apply directly for FEMA grants requiring HMPs through Borough HMP which has specific mitigation actions for community, 3=not eligible to apply directly to FEMA for hazard mitigation, but covered indirectly through Borough plan.
- The number “-9999” means no data

COMMUNITY	REGION	ROAD	COAST	POP	INCOME	CITY	BOROUGH	CORP	EROSION	NFIP	ADAPT PLAN	COMM PLAN	HMP
Akiachak	6	0	2	696	14076	1	0	1	1	0	0	0	1
Alatna	1	0	2	26	-9999	1	0	3	1	0	0	1	1
Allakaket	1	0	2	169	16690	2	0	3	1	0	0	1	1
Ambler	4	0	2	277	15141	2	1	2	1	2, 3	0	0	2
Angoon	11	1	1	426	30009	2	0	1	1	0	0	2	1
Anvik	1	0	2	77	15787	2	0	1	1	0	0	1	0
Barrow	3	0	1	4933	27696	3	1	1	2	0	0	2	2
Beaver	1	0	2	72	18519	1	0	1	0	0	0	0	0
Belkofski	9	0	1	0	-9999	1	1	1	0	0	0	0	0
Chalkyitsik	1	0	2	79	15013	1	0	1	1	0	0	1	0
Chenega Bay	10	1	1	56	14365	1	0	1	0	0	0	1	0
Chistochina	2	3	2	87	24429	1	0	2	1	0	0	1	0
Dillingham	8	0	1	2386	30727	3	0	1	2	1	0	2	1
Diomede	5	0	1	94	11415	2	0	1	1	0	0	0	0
Eagle Village	1	2	2	69	16400	1	0	1	0	0	0	0	1
Elim	5	0	1	340	11961	2	0	1	1	0	0	0	1
False Pass	9	1	1	73	33445	2	1	1	1	0	0	0	2
Fort Yukon	1	0	2	564	23989	2	0	1	1	1	0	2	1
Galena	1	0	2	484	26854	3	0	3	1	1	0	2	1

COMMUNITY	REGION	ROAD	COAST	POP	INCOME	CITY	BOROUGH	CORP	EROSION	NFIP	ADAPT PLAN	COMM PLAN	HMP
Golovin	5	0	1	185	14216	2	0	1	2	0	0	0	1
Hooper Bay	6	0	1	1210	8956	2	0	1	1	0	0	1	1
Huslia	1	0	2	326	12254	2	0	3	2	0	0	2	1
Hydaburg	11	0	1	402	17834	3	0	1	0	0	0	1	1
Kaktovik	3	0	1	262	20782	2	1	1	1	0	0	1	2
Karluk	12	0	1	39	7180	1	1	2	1	0	0	1	0
Kasaan	11	0	1	86	21393	2	0	1	0	0	0	1	0
Ketchikan	11	1	1	8277	27842	4	1	0	0	1	0	2	2
Kivalina	4	0	1	412	13794	2	1	2	3	2, 3	0	1	1
Kotzebue	4	0	1	3267	28419	2	1	1	1	1	0	1	1
Koyukuk	1	0	2	96	15047	2	0	3	1	3	0	1	1
Kwethluk	6	0	2	793	11592	2	0	1	1	3	0	1	1
Levelock	8	0	1	99	11342	1	1	1	1	2	0	1	3
Manley Hot Springs	1	3	2	130	31960	1	0	1	1	0	0	0	0
McGrath	1	0	2	327	26377	2	0	3	2	1	0	2	1
Mekoryuk	6	0	1	222	16711	2	0	1	1	0	0	1	1
Minto	1	3	2	210	13544	1	0	1	0	0	0	1	0
Nenana	1	3	2	380	27174	4	0	1	1	1	0	2	1
Newtok	6	0	1	396	9257	1	0	1	3	0	0	0	1
Nome	5	0	1	3819	30087	3	0	1	1	1	1	2	1
Nuiqsut	3	0	2	446	26861	2	1	1	1	0	0	0	3
Nulato	1	0	2	236	16446	2	0	3	1	0	0	0	1
Point Hope	3	0	1	711	19497	2	1	1	1	0	0	0	3
Rampart	1	0	2	39	38907	1	0	1	0	0	0	1	0
Ruby	1	0		191	12435	2	0	1	0	0	0	1	1
Saint Paul	9	0	1	427	23303	2	0	1	1	0	0	1	1
Sand Point	9	1	1	860	26266	3	1	1	1	0	0	2	2
Seldovia Village	7	1	1	169	35729	1	1	1	0	1	0	0	2
Shaktoolik	5	0	1	274	13648	2	0	1	3	0	1	1	1

COMMUNITY	REGION	ROAD	COAST	POP	INCOME	CITY	BOROUGH	CORP	EROSION	NFIP	ADAPT PLAN	COMM PLAN	HMP
Shishmaref	5	0	1	574	9724	2	0	1	3	1	0	1	1
Sitka	11	1	1	8929	33920	4	1	1	1	1	0	2	1
Solomon	5	0	1	0	0	1	0	1	0	0	0	0	0
Stevens Village	1	0	2	39	5087	1	0	1	0	0	0	0	0
Telida	1	0	2	2	-9999	1	0	3	0	0	0	0	0
Teller	5	0	1	261	10752	2	0	1	1	0	0	0	1
Togiak	8	0	1	888	12907	2	0	1	1	1	0	2	1
Tyonek	7	3	1	175	22086	1	1	1	0	0	0	0	3
Unalakleet	5	0	1	745	27619	2	0	1	3	0	0	1	1
Unalaska	9	1	1	4605	32705	3	0	1	0	0	0	1	1
Wales	5	0	1	171	12524	2	0	1	1	0	0	0	0

Appendix C: Participant Characteristics

Key

- Position: position/title/leadership role.
- POS-TYPE: type of position/title/leadership role: 0=current or former tribal leader (chief or council) or mayor, 1= current or former tribal employee, 2=tribal citizen, 3=agency or non-profit leader (i.e., division director), 4=other agency or non-profit position (i.e., program manager, advisor), 5=professor/researcher, 6= current or former legislator, 7=legislative staff, 8=former member of Alaska Sub-Cabinet on Climate Change, 9=private planner, 10=private lawyer, 11=other private sector
- ENT-TYPE: 0=ANV, 1=state agency, 2=state legislature, 3=federal agency, 4=Congress, 5=Native non-profit, 6=private, 7=university
- SUBJECT: area of expertise or main theme of discussion (for those outside village): 0=just speaking on issues relevant to interviewee's village, 1=Adaptation (general), 2= relocation, 3=hazard mitigation and disasters, 4=subsistence, 5=policy (general) and policy-making, 6=Native policy and law, 7=flooding/erosion, 8=natural resource management
- AGE: given or estimated age
- SEX: sex: 0=F, 1=M
- ETHNIC: ethnicity: 0=Alaska Native, 1=non-Alaska Native
- RESIDE: time spent in village (more time may mean greater understanding of climate change impacts and other ANV challenges): 0=resident now; 1=spent time in village; 2= spent little to no time. This categorization is somewhat porous. There are people from the village that now live outside the village and travel there often—these are categorized as outside. There are people that may be non-native but work for a non-profit or agency in a hub village—these are categorized as village.
- The number "-9999" means no data

POSITION	POS-TYPE	ENT-TYPE	SUBJECT	AGE	SEX	ETHNIC	RESIDE
Tribal council member	0	0	0	50s	0	0	0
Former chief	0	0, 5	0	40s	1	0	1
Tribal employee	1	0	0	40s	1	0	0
Environmental coordinator	1	0	0	50s	1	1	0
City mayor	0	0	0	50s	1	0	0
Tribal environmental coordinator	1	0	0	60	0	0	0
Chief	0	0	0	40	1	0	0
Tribal environmental coordinator	1	0	0	30s	0	0	0
Tribal employee	1	0	0	-9999	0	0	0
Tribal employee	1	0	0	40s	1	1	0
Tribal chief	0	0	0	60s	1	0	0
City mayor	0	0	0	40	1	0	0
Tribal administrator	1	0	0	60s	0	0	0
Tribal environmental coordinator	1	0	0	-9999	1	0	0
Former tribal administrator	1	0	0	70	1	0	0
Tribal council member	0	0	0	50s	1	0	0
Tribal council member	0	0	0	60s	1	0	0
Tribal council member	0	0	0	30s	0	0	0
Tribal environmental coordinator	0	0	0	20s	1	0	0
Tribal citizen	2	0	0	60s	1	0	0
Tribal citizen	2	0	0	60s	1	0	0
Tribal employee	1	0	0	50s	1	1	0
Tribal environmental coordinator	1	0	0	50s	0	0	0
Tribal administrator	1	0	0	-9999	0	0	0
Former tribal employee	1	0	0	50s	0	0	0
Tribal citizen	2	0	0	71	1	0	0
Tribal administrator	1	0	0	-9999	0	0	0
Tribal citizen	2	0	0	70	0	0	0
Tribal citizen	2	0	0	59	1	0	0
Tribal citizen	2	0	0	60	1	0	0
Tribal citizen, transportation planner, former Subcabinet member	2,8	0, 5	0	50s	1	0	0
Tribal environmental coordinator	1	0	0	50s	1	0	0
Tribal environmental coordinator	1	0	0	30s	0	0	1
Tribal citizen	2	0	0	66	1	0	0

POSITION	POS-TYPE	ENT-TYPE	SUBJECT	AGE	SEX	ETHNIC	RESIDE
Tribal employee	1	0	0	-9999	0	0	0
Former chief	0	0	0	45	1	0	0
Tribal citizen	2	0	0	60s	1	0	1
Environmental coordinator	1	0	0	-9999	0	0	0
Tribal citizen	2	0	0	60s	1	0	0
Chief	0	0	0	70	1	0	0
Tribal environmental coordinator	1	0	0	50s	1	0	0
Former chief	0	0	0	61	1	0	1
City administrator	2	0	0	40s	0	0	0
Second Chief	0	0	0	40s	0	0	0
Tribal administrator	1	0	0	60s	1	0	0
Tribal citizen	2	0	0	63	1	0	0
Tribal citizen	2	0	0	70	0	0	0
Tribal environmental coordinator	1	0	0	60s	0	0	0
Tribal administrator	1	0	0	50s	1	0	0
City employee	2	0	0	40s	1	0	0
Tribal environmental coordinator	1	0	0	45	1	0	0
Tribal environmental coordinator	1	0	0	56	1	0	0
Council member	0	0	0	-9999	0	0	0
Tribal citizen	2	0	0	60s	0	0	0
Tribal citizen	2	0	0	40s	1	0	1
Former tribal Administrator and chief	0	0	0	40	0	0	1
Tribal employee	1	0	0	20s	0	0	1
Tribal administrator	1	0	0	60	0	0	1
Natural resources tribal coordinator	1	0	0	61	1	1	0
Second Chief	0	0	0	43	1	0	1
Former chief	0	0, 5	0	75	1	0	0
Natural resources tribal coordinator	1	0	0	50s	1	1	0
Tribal administrator	1	0	0	-9999	1	0	0
Tribal employee	1	0	0	50	1	0	0
Tribal president	0	0	0	50	1	0	0
Chief	0	0	0	60s	1	0	0
Chief	0	0	0	40s	1	0	0
Tribal citizen	2	0	0	60s	1	0	0
Tribal citizen	2	0	0	60s	1	0	0

POSITION	POS-TYPE	ENT-TYPE	SUBJECT	AGE	SEX	ETHNIC	RESIDE
Tribal environmental coordinator	1	0	0	27	1	0	0
Tribal employee	1	0	0	40	0	0	0
Tribal environmental coordinator	1	0	0	30s	1	1	0
Tribal environmental coordinator	1	0	0	-9999	1	0	0
Tribal administrator	1	0	0	50s	0	0	0
Tribal citizen	2	0	0	80	1	0	0
Tribal administrator	1	0	0	50	0	0	0
Agency division director	3	5	1	40s	1	0	0
Agency manager	4	3	2	40s	1	1	1
Planner	9	6	3	60s	0	1	1
Agency advisor	4	5	4	30s	0	0	1
Tribal law professor	9	7	6	60	0	1	2
Agency advisor	4	1	5	30s	0	0	2
Agency grant administrator	4	1	2	-9999	0	1	1
Agency researcher, manager	4	1	4	40	0	1	1
Agency division director	3	3	1	66	1	1	1
Agency advisor	4	3	5	51	1	1	2
Agency advisor	4	3	5	37	0	0	2
Engineer	4	1	7	50s	0	1	1
Lawyer	9	6	6	60s	1	1	1
Legislative staffer	7	2	5	-9999	1	1	1
State legislator	6	2	5	66	1	1	1
Planner	4	1	2	50s	0	1	1
Agency manager	4	3	7	32	1	1	1
Agency tribal liaison	4	3	1	50s	0	1	1
Agency director	3	5	4	50s	0	1	1
Legislative staffer	7	4	5	50s	1	0	1
Agency advisor	4	1	5	49	1	0	1
Former subcabinet member	8	6	1	50s	1	1	2
Agency division director	3	3	6	30s	0	1	1
State legislator	6	2	5	54	1	1	2
State legislator	6	2	5	64	0	1	1
Planner	9	6	1	60s	1	1	1
Agency scientist	4	3	8	-9999	1	1	1
Agency manager	4	3	6	60s	1	1	2
Agency director, former subcabinet member	3,8	1	1	60s	1	1	2
Agency researcher, anthropologist	4	3	1	30s	0	1	1

POSITION	POS-TYPE	ENT-TYPE	SUBJECT	AGE	SEX	ETHNIC	RESIDE
Legislator (former)	6	2	5	66	1	1	0
Former subcabinet member, geology professor	8	7	1	60s	1	1	1
Agency manager	4	3	1	40s	1	1	1
Agency division director, former subcabinet member, oceanographer	3,8	3	1	40s	0	1	1
Tribal law professor	9	7	6	40s	1	1	1
Agency manager	4	3	6	50s	0	0	1
Biologist	4	3	1	50s	1	1	1
State legislator	6	2	5	50	1	1	2
State legislator (former) and mayor (former)	6	2	5	64	1	0	0
Agency manager, biologist	4	3	1	60s	1	1	1
Agency division director	3	5	6	50s	1	0	0
Adaptation researcher	9	7	1	40s	1	1	1
Agency tribal liaison	4	3	4	40	0	0	1
Legislative staffer	7	2	5	40s	1	1	2
Lawyer, manager	4	3	2	30s	0	1	2
Vice president	3	5	6	30s	1	0	2
Professor, lawyer	9	7	2	40s	0	1	1
Agency tribal liaison	4	3	3	50s	1	1	2
Agency director	3	3	2	50s	1	1	1
Agency manager	4	1	3	-9999	1	1	1
Native non-profit founder, former congressional staffer, state commissioner	3	5	5	80	1	0	1
Legislative staffer (former)	7	2	2	20s	1	0	1
Legislative staffer	7	4	5	30s	1	1	2
Geologist	4	2	7	30s	0	1	1
Agency division director	3	3	8	60s	1	1	1
Agency division director	3	5	1	40s	1	0	1
Legislator	6	2	5	36	1	1	2
Agency division director	3	3	4	50s	1	0	1
Agency manager	4	5	1	40s	0	0	1
Legislative staffer	7	2	5	-9999	1	1	2
Agency division director, planner	3	3	2	40s	0	1	1
Agency program manager	4	3	8	30s	0	1	2
Planner	4	3	1	50s	1	1	1
Planner	4	3	7	50	1	1	1
Agency manager	4	5	6	30s	0	1	0

POSITION	POS-TYPE	ENT-TYPE	SUBJECT	AGE	SEX	ETHNIC	RESIDE
Agency advisor	4	3	2	40s	0	1	1
Engineer	4	1	7	60s	1	1	1
Board Chair, biologist	3	1	4	60s	1	1	1
Lawyer	9	6	4	60s	1	1	1
Tribal law professor	9	7	6	40s	0	1	1
State legislator	6	2	5	40s	0	1	2
Lawyer	9	6	1	50s	1	1	2
Agency advisor (former)	4	3	6	33	0	0	1
Agency tribal liaison	4	3	3	60s	0	1	1
Lawyer	9	6	2	60s	1	1	1
Agency advisor, ecologist	4	3	8	50s	0	1	2
Agency division director	3	5	1	30	1	0	0

Appendix D: Questionnaires

Semi-Structured Interview Questions for ANV Leaders

1. **Some people are talking about temperatures getting warmer and climate change. I want to hear your take on this. Have there been any major changes in your community's hunting and fishing, and in flooding or erosion in recent years that made your life more difficult?**

[This question aims to assess personal impacts, which may relate to personal adaptation strategies, and determine whether participant views climate change as a problem or risk.]
(Prompt: Here are some examples other people have mentioned: big floods that destroy buildings and infrastructure, less game or fish in their areas, animals coming at different times, difficulty accessing hunting areas, and thinner ice and more dangerous hunting.)

2. **How have you and other people in your community been dealing with these changes?**

[This question aims to identify personal adaptation processes and strategies.]
(Prompt: Here are some examples other people have mentioned: moving to a new home or weatherizing/elevating an existing home, being ready to evacuate in the event of a flood, hunting at different times or in different places, and eating different foods or relying on others for food.)

(2a: Follow-up to 2) I have heard people say that their traditional knowledge helped them adapt to changes in the past. I'm wondering if this kind of knowledge would be helpful in dealing with the current changes in the climate and environment, and in what ways might it be used.

[This question draws from literature noting the utility of community knowledge in adaption; although some literature suggests that social and environmental change has made this knowledge less useful.]
(Prompt: For example, are there strategies that you can use now that you heard about from elders who used them before? Or is the knowledge harder to use because the environment is so different?)

3. **Are you aware of any community plan to deal with changes in the environment, hunting and fishing impacts, or disasters, such as a climate change adaptation plan or a hazard mitigation plan?**

[This question aims to identify community adaptation strategies, or the existence of a community plan. I have information provided by the state on community and hazard mitigation plans, but it is likely to be incomplete and would only include FEMA-approved hazard mitigation plans. This question is also an opportunity for me to see if interviewees are aware of the existing plans that I have on file.]
(Prompt: Have there been any community meetings about changes or disasters? Is there any discussion or written plan about what to do?)

4. **Thinking about all the things that you and your community have done to maintain your way of life, what would you say have been the most effective actions and the ones that are most likely to work in the long term?**

[This question aims to get the interviewee's perspective on which adaptation processes and strategies contribute to sustainability and resilience.]

(Prompt: Is there anything you can think of that has really helped you continue your hunting and fishing and avoid flooding and erosion? This could be something like buying a bigger snowmachine to travel further out or maybe your community got biomass or some alternative energy that's a lot cheaper.)

5. **Can you think of any action to deal with climate change that you or someone you know tried, but it turned out to not work or have negative impacts?**

[This aims to identify maladaptations.]

{Prompt: For example, maybe you know of someone who tried to weatherize or elevate their house but it still got messed up by a flood? Or maybe someone bought a larger snowmachine to be able to travel further out, but it turned out to be too expensive?]

6. **It seems like you and your village have been managing change in various ways. Now I want to go through the different ways and ask about the kinds of obstacles you might be facing with each of these strategies. I'm especially interested in the legal obstacles, like whether some law or agency has made it hard for you to do what you need to do, or maybe there's no agency to help you.**

[At this point I will go through each of the processes or strategies the interviewee mentioned to assess legal and other barriers.]

7. **Aside from the obstacles you mentioned, I'm wondering if there's anything else that makes it hard to deal with impacts from flooding and erosion. For example, has it been hard to get help from the agencies who are in charge of this, or is some law getting in the way?**

[This question aims to identify barriers to adaptation.]

(Prompt: Here are some examples other people have mentioned: lack of funding, lack of heavy equipment/materials, remoteness, lack of good leadership or politicians not caring, lack of capacity, lack of local control, community not getting along, the way the government manages disasters, or wanting to stay in the present location right by the water.)

8. **Now I have the same question, except this time I'm thinking about hunting and fishing. Are there any other obstacles you can think of as far as trying to maintain your traditional hunting and fishing?**

[This question aims to identify barriers to adaptation.]

(Prompt: Some other people have talked about how hunting laws get in the way, maybe the seasons are too short or there are too many rules to deal with. Or people don't have control over the land or resources since ANCSA.)

9. **Does the community have any plans to relocate?**

[Based on my research, there are only a few communities with informal plans to relocate, and many communities are divided on whether to relocate and where. This questions seeks more insight on plans to relocate as a potential adaptation strategy, it also probes whether the community is working together on a plan.]

(Prompt: This doesn't have to be a formal plan, it could just be conversations or a general idea on where the community might want to relocate.)

10. **What would you say are the pros and cons or risks of relocating the village?**

[This question aims to identify obstacles to relocation, including unknown risks, and assess the potential for the community to work together to relocate.]

(Prompt: Before ANCSA, it seems like lots of villages just picked up and moved when they got flooded out. At this point in time, would it be hard to get funding or deal with all the laws involved? Are you concerned that a new location could upset hunting access or change the community dynamics?)

11. **I'm trying to understand how helpful it is for an Alaska Native Village to have its own plan to deal with climate change. Would it be useful if your community had a plan that would lay out different scenarios and come up with potential solutions to implement down the road?**

[This question aims to identify interviewee's perception of planning (particularly scenario planning) as an adaptation strategy that could be sustainable.]

(Prompt: I'm wondering how important it is to have a plan, especially one made by the community itself. Does it help in the event that you would have a serious problem or disaster, or is it just paperwork?)

(11.a. Follow up question if yes to 11): How far into the future should we be planning?

12. **I'm wondering what the role of the tribal council should be in helping the community deal with climate change, and what is the role of other entities and levels of government, like Native Corporations, the regional non-profits, the city, the borough (if any), the state, and the federal government. What should the community do on its own, and what should other entities be doing?**

[This question aims to identify whether the participant sees the need for the community to take the lead or whether other levels of government should be doing this. This helps give a sense of the participant's value of community self-sufficiency.]

(Prompt: Should the community take the lead on dealing with climate change? Should the state or the federal government be making plans or passing laws? Who should be paying for relocation and climate change assistance?)

13. **I'm wondering if there are times that help from outside entities can backfire. Can you think of any times the government might have tried to help deal with flooding or another community problem, and it didn't work out?**

[This question aims to identify maladaptations]
(Prompt: For example, I have heard some people talk about how the Army Corps put rip-rap or some kind of reinforcement on the shoreline, but it didn't last.)

14. **Do you have suggestions for other communities dealing with flooding, erosion, or impacts to hunting and fishing? Is there anything you want to share with them?**

[This question solicits additional adaptation strategies.]
(Prompt: Maybe you have a success story you want to share or something that makes your community strong?)

15. **What about the government—is there anything you want to tell the borough [if any], state, or feds, or Congress or the legislature about what they should be doing or how they should change the law?**

[This question solicits recommendations regarding laws and institutions]
(Prompt: Maybe you have a wish-list of things that the government should do or should not be doing so you can continue your way of life?)

16. **Is there anything else you want to tell me that you think I should know?**

Semi-Structured Questions for Policy-Makers and Influencers Outside ANVs

1. ***[For all those outside ANVs]* Many people in Alaska are talking about challenges related to higher temperatures, unpredictable weather, flooding and erosion, more disasters, and changes to species that people rely on for subsistence. Do see this as a problem that the government should be involved in or making laws to address?**

[This question assesses whether participant believes that climate change is occurring, whether it is a problem that can be addressed, and the government's role in addressing it.]
(Prompt: Is climate change a problem for Alaska? Is it something that requires a government solution?)

(1.a. Follow up to 1 if yes) Do you see a need for changes in state or federal laws or agencies to deal with climate change?

[This question and the next address whether gaps are significant enough to require a change in the legal and institutional framework.]
(Prompt: Specifically, I'm thinking about whether we need changes in laws that regulate subsistence and laws that try to prevent flooding and erosion or provide assistance when damage occurs.)

(1.b. Follow up to 1.a if yes) Would it make sense to have a national or state climate change law and a climate change agency?

(Prompt: When Palin was governor there was a Subcabinet to deal with climate change mitigation and adaptation—should something like this be brought back?)

(1.c. Follow up to 1.b if yes) What kinds of problems would a new law or agency address?

(Prompt: For example, would it have jurisdiction over all aspects of climate change or just certain areas like relocation? Would it take away jurisdiction from other agencies, or just coordinate other agencies?)

2. ***[For all those outside ANVs]*** **What challenges do you see to making new laws and agencies to address changes in the environment and climate?**

[This question allows the participant to suggest barriers to adaptation policies/strategies.]

(Prompt: For example, one challenge might be uncertainty about what changes are going to happen in the future. You may not know if the law is going to be effective down the road. Other challenges might relate to politics—maybe there are bigger problems that political leaders are dealing with.)

3. ***[For all those outside ANVs]*** **One challenge to making new laws or even using the ones we have is that they get stuck in time, even while the environment and circumstances are changing. For example, hunting season starts on a certain day by law, but the animals are coming later. Or the law allows someone to build in a certain area and then later this turns out to be a frequently flooded area. Have you encountered any problems in the law related to lack of flexibility?**

   [This question assesses whether the participant perceives the inflexibility of current laws as a barrier, and any strategies for addressing this.]

   (3.a. Follow-up if yes to 3) Can you think of any ways to make the laws we have more flexible?

(Prompt: For example, is there a way to make hunting laws more flexible so that quotas can increase or decrease in response to species population, or the dates that seasons open and end can change in response to the weather?)

4. ***[For those involved in natural resource/wildlife management or research]*** **There is a lot of talk about using "adaptive management" to increase the flexibility and responsiveness by monitoring changes and adjusting policy in response to these changes. I've read that adaptive management can be challenging to implement in practice. Have you encountered any implementation challenges and would you have suggestions for resolving them?**

[This question is geared toward natural resource/wildlife agencies to evaluate whether they think adaptive management is feasible and how to improve it.]

(Prompt: For example, have you or your agency worked with policies that would not take effect unless certain conditions are triggered, like a change in temperature or a change in species population?)

5. **[*For those involved in disaster management or research, or those concerned with flooding, erosion, and relocation*] Do you think the current disaster regime is effective to manage flooding and erosion, and if not, how could it be improved?**

[This question addresses the challenges of using the current disaster regime to address climate change.]
(Prompt: Is there a way to address long-term flooding and erosion ahead of time or fund relocation in advance, instead of waiting until after the disaster to rebuild?)

6. ***[For all those outside ANVs]*** **Are you familiar with any strategies or plans that ANVs are currently undertaking or planning on taking to manage flooding, erosion, disasters, and subsistence impacts?**
   (6.a. Follow-up if yes to 6) Can you think of any strategies that are working particularly well and are likely to be sustainable in the long-term?

[This could identify successful processes and strategies. It also helps assess the level of information the participant has to answer the next couple of questions.]
(Prompt: Have you been to any of the villages that have experienced a lot of flooding? Can you think of any village that has taken initiative on some kind of plan or project that is helping to mitigate negative impacts? This might be a relocation plan or some kind of co-management to deal with subsistence impacts. Or maybe you're aware of a community that has gotten a lot of grant funding to work on these issues.)

7. ***[For all those outside ANVs]*** **Lack of funding and the extreme size and distances in our state can make it challenging to address the problems that many Alaska Native Villages are going through in terms of flooding, erosion, and subsistence impacts. Are there other barriers that you see to addressing these problems?**

[This question assesses the outsider's perspective of ANV challenges.]
(Prompt: Some possible barriers that others have mentioned include challenging relationships between villages and higher levels of government, lack of laws or direction to assist villages, lack of agreement in communities about what to do, lack of community capacity or participation, and lack of political support for ANV assistance.)

8. ***[For all those outside ANVs]*** **I'm interested in how communities might be more self-sufficient or pro-active, and what their responsibilities are in terms of managing flooding, erosion, disasters, and other problems related to changes in the environment versus the responsibility of higher levels of government. How much should be done at the community level before higher levels of government and other entities step in?**

[This aims to identify where the locus of control is for adaptation. If participant thinks communities or ANVs should take more responsibility, is s/he willing to give villages more responsibility and power (next two questions)?]
(Prompt: For example, should the community have to provide a certain level of its own funding or labor before it can get outside help?)

9. ***[For all those outside ANVs]*** **Would community plans for hazard mitigation or climate change adaptation be helpful to prepare for future changes?**
   [This assesses participant's view on the role of planning, and the utility of plans as an adaptation strategy.]
   (9a: Follow-up to 9 if yes) Should these plans be required?
   (9b: Follow-up to 9, regardless of answer) Should they be funded by higher levels of government?
   (9c: Follow-up to 9, regardless of answer) How far ahead should we be planning?

10. ***[For all those outside ANVs]*** **Should ANVs or local governments be provided with more options to control natural resources, lands and waters, and/or subsistence?**
    (10.a: Follow up to 10 if yes) Can this be accomplished under the existing laws, maybe by better collaboration with agencies, or do we need a change in laws?
(Prompt: For example, do you see land-into-trust or more co-management as a way forward?)

11. **I'm wondering how laws and government agencies working with ANVs can avoid contributing to unintended consequences or actions that seem effective in the short-term but turn out not to work in the long-run. Can you think of any assistance that was provided to an ANV that turned out to be ineffective?**
[This aims to identify maladaptations and how to avoid them.]
(Prompt: For example, maybe you can think of an agency initiative to bolster a shoreline that was very expensive and didn't last very long.)
    (11.a: Follow up to 11 if yes) Can you think of any way that this unintended consequence could be avoided if a similar effort is made in the future?

12. ***[For all those outside ANVs]*** **How feasible would it be for villages threatened by severe environmental problems to co-relocate, where the whole village moves together to another spot?**
[Will participant recognize the importance of a village's cultural and physical continuity? Does participant think it is worth government investment?]
(Prompt: Is relocating a whole village too impractical or should funding be made available for this from some level of government or the private sector?)
    (12.a: Follow up to 12 if yes) How would you decide how to allocate funding and assistance to these communities?

[A relocation prioritization scheme appears to be a major gap in the law—does the participant agree and consider this important enough to address?]
Prompt: Which level of government should bear the cost, or is it all up to the community? What about the private sector?

(12b: additional follow-up to 12 if yes) Where do you think the land to relocate should come from—corporations? The state or federal government? Something that the community owns or buys or trades for?

[This helps assess interviewee's opinion on where responsibility for relocation lies]

13. ***[For all those outside ANVs]*** **What would you say is the most important thing a village should be doing to make sure it can maintain its existence in the face of environmental and climate changes?**

[This could bring out planning or other strategies.]
Prompt: Should it be writing a plan or applying for grants? Should it be trying to improve economic development?

14. **[*For all those outside ANVs*] Are there any other policy recommendations you have might have for ANVs dealing with environmental and climate change? This could be something related to law or it could be about the way agencies work with villages, or even something beyond this related to education.**

[This aims to solicit additional recommendations.]
(Prompt: Maybe you could think of some way to facilitate cooperation on adaptation through a task force, or you would like to see more adaptation planning. Or on the flip side, maybe you'd like to see fewer laws and less red tape when it comes to adaptive actions.)

15. **Is there anyone else you think I should be talking to about this?**

Appendix E: Proposed Law Changes to Assist Alaska Native Villages with Climate Change Adaptation and Hazard Mitigation

This document expands on Chapters 1 and 3 to suggest changes in laws and regulations to assist Alaska Native Villages adapt to climate change that affects flooding, erosion, and subsistence. The aim is to provide suggestions that require as few legal changes as possible, by the entity that can most easily make the change (e.g., State can change more easily than Federal; Executive can change more easily than Legislature). These ideas should not be construed as legal advice—all suggestions warrant further study by lawyers with experience in the areas of law discussed. After the number that identifies each row is a sign that categorizes the suggests the feasibility of the change:

(+) relatively easy to change/likely to pass (low-hanging fruit)
(—) not so easy to change or unlikely to occur under current administration as of 2018
(x) difficult to change or unlikely without extensive lobbying by coalition of stakeholders
(?) needs more research to make specific suggestions

The evaluation of feasibility is based on my analysis of the current laws and political situation, which was informed by my literature review and interviews and conversations with research participants. Change is more likely to occur when it is incremental, specifically articulated, limited to a single statute, and has the potential to help people outside of ANVs. Change that is cross-cutting, expensive, and could negatively impact non-ANV stakeholders is unlikely.

Acronyms

ADEC	Alaska Department of Environmental Conservation	FEMA	Federal Emergency Management Agency
ADFG	Alaska Department of Fish and Game	FMA	FEMA's Flood Mitigation Assistance
AK	Alaska	FSB	Federal Subsistence Board
ANCSA	Alaska Native Claims Settlement Act	FWS	U.S. Fish and Wildlife Service
ANILCA	Alaska National Interest Lands Conservation Act	HMP	Hazard Mitigation Plan
ANV	Alaska Native Village (may refer to Tribal Council or Tribal community)	HUD	U.S. Department of Housing and Urban Development
		IAWG	Immediate Action Working Group (panel under Alaska's former Sub-Cabinet on Climate Change)
APA	Administrative Procedure Act		

ASHA	former Alaska State Housing Authority	ICDBG	Indian Community Development Block Grant
BIA	Bureau of Indian Affairs	IHS	Indian Health Service
BOG	Alaska Board of Game	MMPA	Marine Mammal Protection Act
CDBG	Community Development Block Grant	NEPA	National Environmental Policy Act
CDQ	Community Development Quota (fishing rights)	NFIP	National Flood Insurance Program
CWA	Clean Water Act	NMFS	NOAA National Marine Fisheries Service
DCRA	Alaska Division of Community and Regional Affairs	NOAA	National Oceanic and Atmospheric Administration
DGGS	AK Division of Geological and Geophysical Services	NRCS	USDA Natural Resource Conservation Service
DOI	U.S. Department of the Interior	PDM	FEMA's Pre-Disaster Mitigation Program
EO	Executive Order	USDA	U.S. Department of Agriculture
ESA	Endangered Species Act		

Row/ Feasibility	**Need**	**Relevant Law**	**Actor [Name of Beneficiary]**	**Proposed Action**
1 **(—)**	Recognition of climate change as problem for government and communities to address	EO 13653 (2015) (revoked by EO 13783 (2017)	President [All U.S. communities]	Re-implement EO 13653, which required agencies to reform policies that may increase the vulnerability of communities to climate change related risks and to inventory their proposed and completed policy changes aimed at increasing community resilience
2 **(—)** **(+)**	Motivation at all levels to address climate change adaptation, especially when there are many other problems: demonstration to F government and ANVs that S government is doing what it can within its means	AAO 238 (establishing AK Climate Change Sub-Cabinet to advise Governor on preparation and implementation of climate change strategy) HB 173 (2017, not passed), "An Act establishing the	Governor or S Legislature [All ANVs]	(Re)establish entity to assist ANVs with climate change adaptation and relocation. This need not be a stand-alone agency. It should be something that can coordinate resources and knowledge of other state and federal agencies (e.g., Climate Change Sub-Cabinet IAWG). A low budget version of this could simply provide for a climate change "ombudsman" in the Governor's Office or DCRA that can answer questions and provide guidance (especially where projects are subject to multiple sets of

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
		Alaska Climate Change Response Commission"		conflicting regulations) and identify points of contact for climate change issues within each state agency.
3 **(—)**	Control over or access to resources needed for adaptation—Bering Sea	EO 13754 (2016), Northern Bering Sea Resilience Areas, revoked by EO 13795 (2017), Implementing an America-First Offshore Energy Strategy)	President [West coast ANVs]	Re-implement EO 13754. This order, the work of many stakeholders from west coast Alaska, withdrew from oil leasing ocean areas important for subsistence. It created a task force among federal agencies to improve communication, and it provided for the use of community knowledge.
4 **(—)**	Control over or access to resources needed for adaptation—ANC lands	ANCSA §14, 43 U.S.C. § 1613	Congress [All ANVs]	Amend ANCSA to allow ANCs to convey land to ANVs and have it immediately/automatically go into trust (at the election of both the conveying ANC and the receiving ANV). This would give an ANV land jurisdiction and avoid the potential for loss of fee simple land during a potentially long process to obtain trust status.
5 **(+)**		ANCSA 43 U.S.C. § 1613; NEPA 42 U.S.C. § 4332(C); CWA 404, 33 U.S.C. § 1344	Congress [All ANVs]	In consultation with S, allow (an) ANV(s), in agreement with an ANC, to exercise land use jurisdiction over ANC land, consider modifications to expedite NEPA and CWA review. This would give an ANV control over zoning and permitting similar to that of a home rule borough or the Metlakatla Tribe over its reservation on Annette Island.
6 **(—)**		ANILCA § 809, 16 U.S.C. § 3119	Congress [All ANVs]	In consultation with S, expand the Secretary's power to enter into cooperative agreements to allow (a) ANV(s), in agreement with an ANC, to exercise jurisdiction over hunting and fishing on ANC land. This would give an ANV control over subsistence similar to that of the Metlakatla Tribe over its reservation on Annette Island. [A similar result can occur where an ANV successfully petitions Secretary to put land into trust.]

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
7 **(—)**	Cooperation between agencies: mechanisms to ease money transfer between agencies and combine grant funds	Agency enabling statutes for agencies with jurisdiction over resources relevant to adaptation (see chart on Adaptation Agencies)	Congress, S Legislature [All states and communities]	Add language to statutes that outline agency powers to broaden spending power and ability to enter inter-agency agreements. An example could be language in applicable to AK DGGS AS § 41.08.020. (Powers and Duties): "accept and spend funds for the purposes of this section … and enter into agreements with individuals, public or private agencies, communities, private industry, state agencies, and agencies of the federal government." Other examples include authority given to NPS under 54 U.S.C. § 101701 to enter into cost-share agreements and to IHS 25 U.S.C. § 1638e to accept funds from any source to construct health facilities, and to enter inter-agency agreements. (It is not clear if agencies are following these laws.) FWS has authority under 16 U.S.C. § 668dd(b), but it is more limited.
8 **(—)**	Cooperation between agencies and tribes; tribal participation in outside government decision-making process	MMPA 16 U.S.C. 1388; ANILCA 16 U.S.C. § 3119; Tribal Self-Determination Act 25 U.S.C. § 458cc; A.S. 16.05.050(12))	Congress, S Legislature, S & F Agencies	Require agencies to budget for and appropriate funding to support co-management where an entity that is eligible under the statute chooses to participate. Agencies could issue regulations under the relevant laws clarifying eligibility to enter into a cooperative agreement. Funding supports the engagement and training of a consultant or employee to perform the necessary research, monitoring, and reporting for co-management
9 **(—)**		AS 16.05.260 (Advisory Committees) 5 AAC 96.010; A.S. § 16.05.221 (Board of Game)	S Legislature [All ANVs]	Change A.S. § 16.05.260 to give deference to recommendations of state fish and game advisory committees, similar to that provided to federal regional advisory council decisions under ANILCA § 805(c), 16 U.S.C. § 3115.

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
(+)				Change A.S. § 16.05.221 to provide for at least one member of the Boards of Game and Fisheries to be from a rural community.
10 **(—)**		A.S. 46.40	S Legislature [All AK coastal communities]	Revive the Alaska Coastal Management Program, which sunsetted in 2011. This program allowed coastal areas to create land and water use policies that applied to state and federal permitting decisions.
11 **(—)**		Magnuson Stevens Act, § 302(b)(5) (A), 16 U.S.C. § 1852(b)(5) (A)	Congress [Western ANVs]	The Act currently provides for tribal representation only for the Pacific Council (not the North Pacific) for tribes with federally recognized fishing rights from California, Oregon, Washington, or Idaho. Provide similar representation on the North Pacific Fisheries Management Council for ANVs.
12 **(—)**		Magnuson Stevens Act, 16 U.S. C. § 1861a(d)	NOAA [U.S. communities dependent on fisheries]	Implement an industry fee assessment to build a disaster relief fund
13 **(—)**	Consultation	EO 13175	President [All Tribes]	Section 1(a) provides for consultation with tribes on agency actions "that have substantial direct effects on one or more Indian tribes, on the relationship between the Federal Government and Indian tribes, or on the distribution of power and responsibilities between the Federal Government and Indian tribes." Language could be added to include actions that affect resources and lands that ANVs and other Tribes rely on for adaptation. Tribes

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
				could be provided with a process to submit a list of lands on which they rely, with the basis for why these lands are important (i.e., demonstrated subsistence use).
14 **(x)**			Governor [All ANVs]	Issue an Administrative Order similar to EO 13175.
15 **(x)**	Mitigating flooding and erosion hazards: need for jurisdiction to participation in NFIP	42 U.S.C.§ 4022	Congress [All ANVs and some other Tribes]	Currently NFIP does not extend to communities that do not have land use jurisdiction (such that they are unable to regulate building in floodplain). Amend 42 U.S.C.§ 4022 to allow ANVs and other Tribes without land jurisdiction to participate if they exercise their sovereignty over tribal citizens to control building in floodplain.
16 **(—)**	Disaster preparedness and hazard mitigation—funding allocation	42 U.S.C. 5170c(a); 44 C.F.R. § 206.432; 42 U.S.C. § 5306	Congress [All states and communities]	The money available for HMGP (and the Disaster Relief Fund created by Sec. 1234 of the Disaster Recovery Reform Act (2018)) is determined by a percentage of money spent on recent disaster relief. Change disaster law so hazard mitigation funding is not tied to a percentage of recent disaster expenditures. Allocate a set amount of funding (in a manner similar to CBDG, 42 U.S.C. § 5306).
17 **(+)**	Disaster preparedness and hazard mitigation—MMPA	MMPA 16 U.S.C. § 1371(a)	Congress [All coastal communities]	MMPA allows for permits for research and incidental take, but does not allow exceptions for emergency actions or disaster mitigation (such as stabilizing an eroding beach). Add language to MMPA authorizing such an exception.
18 **(?)**	Post-disaster relief—eligibility	Stafford Act 42 U.S.C. § 5122.	Congress, FEMA [All communities]	Consider whether FEMA and the Stafford Act is situated to handle slow-moving disasters like drought, erosion, permafrost, and sea level rise; if so, add the latter three to the definition of disaster.

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
19 **(?)**	Disaster preparedness and hazard mitigation	42 U.S.C. § 5305	Congress [All states and communities]	An alternative to relying on emergency management-based programs under Stafford Act to prepare for disasters and climate change would be to amend CBDG to more clearly authorize hazard mitigation measures like elevation and relocation and allocate more money into CBDG.
20 **(—)**	Post-disaster relief—housing	42 U.S.C. § 5204, § 5174(c)	Congress [Rural Alaskan communities]	Amend definition of "insular" in 42 U.S.C. § 5204 to include rural Alaska so these areas are eligible for more permanent housing under 42 U.S.C. 5174(c)
21 **(—)**	Post-disaster relief—criteria	Stafford Act 42 U.S.C. § 5170; 44 C.F.R. § 206.48	FEMA [All communities]	Congress gives President broad latitude to find a disaster. FEMA should promulgate criteria on when an event rises to the level of a disaster, along the lines of existing criteria for determining the need for public and individual assistance. Such a threshold will be especially important if eligibility is opened up to erosion-related disasters. Sec. 1232 of the Disaster Recovery Reform Act (2018) appears to require FEMA to promulgate criteria within two years.
22 **(—)**	Post-disaster relief—subsistence	44 C.F.R. § 206.117 (Housing), § 206.119(c)(Financial assistance to address other needs)	FEMA [All ANVs and some Tribes]	Add subsections to provide assistance for subsistence-related infrastructure (including cabins where hunters/fishers temporarily reside and gear such as nets)
23 **(x)**		Magnuson Stevens Act/Interjurisdictional Fisheries Act, 16 U.S.C. §§ 1802, 1861a, 1864	Congress [All ANVs and some Tribes]	Add subsistence to the section providing for disaster relief so NOAA can declare and provide relief for subsistence failures

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
24 **(x)**	Relocation—Simplified process for obtaining land and relocating or constructing infrastructure	42 U.S.C. § 5170c(d)(1)(B)	FEMA [All communities]	Clarify how NEPA takes place where entire community intends to relocate simultaneously with government assistance
25 **(?)**	Relocation—local labor and environmentally appropriate housing	42 U.S. C. §§ 5170c, 5174(c)(4)	Congress [Communities in insular areas]	Add exemption from labor acts such as the Davis Bacon Act — 40 U.S.C. §§ 3141 *et seq*., Fair Labor Standards Act of 1938— 29 U.S.C. §§ 201 *et seq*., McNamara-O'Hara Service Contract Act of 1965— 41 U.S.C. §§ 351 *et seq*., Contract Work Hours and Safety Standards Act— 40 U.S.C. §§ 3701 *et seq*., and Walsh-Healey Public Contracts Act — 41 U.S.C. §§ 35 *et seq*., so residents in insular areas can assist with building houses.
26 **(x)**		"Bartlett Bill" (Demonstration Cities and Metropolitan Act § 1004, PL89-754 (1966)	Congress [All ANVs]	Reauthorize the Bartlett Bill (terminated in 1974), which provided for "self-help" program with HUD funding to construct houses in ANVs
27 **(—)**		25 C.F.R. § 256.21; 44 C.F.R. Part 206	BIA, FEMA [All Tribes]	Adjust regulations on BIA's Housing Improvement Program and FEMA's HGMP to provide for a "sweat equity" program in which residents can get training to participate in construction of their own homes and facilities.
28 **(x)**	Relocation—obtaining land	ANCSA § 22, 43 U.S.C. § 1621(f); see also ANILCA § 1302(a) and (h), 16 U.S.C. § 3192(a) and (h)	Congress [All ANVs]	In the interest of climate justice, amend ANCSA to allow Congress to transfer non-Wilderness land to any ANV or village corporation that has demonstrated readiness to move to a specific location and is willing to survey the land and move there within specified time. Law could specify allocation of this land between tribe, municipal entity, and village
29	Relocation—subsistence rights	ANILCA § 801, 16 U.S.C. §§ 3111, 3114; ANILCA §804, 16	Congress, S Legislature	Add language indicating that a resident of an ANV that entirely relocates into an area with more restrictive

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
(—)		U.S.C. § 3114. A.S. §16.05.258(c); 5 AAC 99.015; A.S. §16.05.258(c); 5 AAC 99.015.	[All ANVs]	subsistence rights can maintain the rights held in the previous location so long as the person remains a resident of the ANV at the new site.
30 **(—)**	Relocation—fishing rights	Magnuson-Stevens Act, 16 U.S.C. §1855 (i)(1)(D).	Congress [Western ANVs]	Add language indicating that an ANV that entirely relocates can continue to participate in the CDQ program (this may not be necessary if the ANV retains its name, as eligible villages are listed by name).
31 **(—)**	Disposition of and access to old site	42 U.S.C. § 5170c(b)(2)(B); 44 C.F.R. § 80.19	Congress, FEMA [All communities]	Amend requirement to destroy all structures at old site when a relocation occurs. Rather, prohibit new structures and new residents, and allow standing structures to be used as temporary residences or for subsistence purposes if these structures are not in immediate danger or eroding. Provide for FEMA to clarify requirements for leaving structures in place. Give residents an "easement" to temporarily reside at old site even if it is now owned by state or municipal government.
32 **(—)**	Disposition of and access to old site	ANILCA §1110, 16 U.S.C. § 3170	Congress [All ANVs]	Add language indicating that residents of an ANV that entirely relocates have a right of access to travel to and temporarily reside in the old site, and to travel to the nearest body of navigable water.
33 **(—)**	Need for basic health and safety services to be maintained at existing site while relocation is taking place	44 C.F.R. Part 80 or new executive order; AAO 224	FEMA or President, Governor [All communities]	Law or guidelines to establish threshold as to when to stop funding infrastructure at old site and put money into relocation (see suggested threshold for relocation in Bronen (2011, p. 399)); but maintain some basic health and safety services at old site
34	Flexibility to adjust rules and agency practices in response to	APA 5 U.S.C. Chapter 5, A.S. 44.62	Congress, S Legislature	Adjust APA and Alaska equivalent along lines suggested by Craig and Ruhl (2014) (e.g., "arbitrary and capricious"

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
(—)	changes in climate and to cover situations not adequately addressed in existing law while maintaining fairness and public involvement		[All states and communities]	standard of judicial review for APA should consider how agency is integrating new information and adjusting management in response so as to move toward an overall management goal)
35 **(x)**	Food security—avoiding bycatch	Magnuson-Stevens Act, 16 U.S.C. §§ 1801(c)(3), 1851(a)(9), 1853(b)(10), 1862(f-g), 1865(b); 50 C.F.R. § 679.21(b)(2)(ii); 50 C.F.R. § 679.26.	NOAA/NMFS [All states and communities]	Repeal the regulation requiring bycatch to be returned to the sea, regardless of condition. Require bycatch to be preserved and sold, with profit going into general adaptation fund; or rather than prescribe specific standards, regulatory permits could provide for performance based standards where, once a vessel reaches a certain quota of bycatch, it must stop fishing for the rest of the season
36 **(x)**	Food security-application of rural preference	ANILCA § § 102(3), 103, 16 U.S.C. § § 3102, 3103, Magnuson-Stevens Act Title III, 16 U.S.C. § § 1851 *et seq.*	Congress [All ANVs]	Extend definition of public lands and/or boundary map or Title 8 of ANILCA so that ANILCA's rural preference applies to fisheries beyond the state boundary (those regulated by NOAA); provide for subsistence in Magnuson-Stevens Act
37 **(x)**	Food security—providing for aquaculture	AS 16.40 Art II	ADFG [All Alaskan communities]	Broaden ability for individuals and small companies to conduct aquaculture with various species
38 **(x)**	Subsistence fisheries	Magnuson Stevens Act § 305, 16 U.S.C. §1855 (i)(2	Congress [Western ANVs]	If Northern Pacific is opened to commercial fisheries, provide for a subsistence fisheries administered by the Northern Pacific Council, using language similar to that applicable to the Western Pacific Council
39 **(x)**	Means to pay for subsistence	5 A.A.C. § 92.200; 36 C.F.R. §242.25 (j); 50 C.F.R. § 100.25(j)	Alaska BOG, Secretaries of	Allow subsistence hunters to sell "trophy" portion of animal if they are using animal for subsistence purposes; develop any additional regulations needed to avoid waste

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
			Interior and Commerce [All ANVs]	
40 **(?)**		MMPA 16 U.S.C. § 1371(b), 50 C.F.R. § 216.23; ANILCA 803, 16 U.S.C. § 3113, 36 C.F.R. §242.27, 50 C.F.R. § 100.27; A.S. § 16.05.258; A.S. § § 16.40.020. 16.05.940 (32-33); 5 AAC 92.200, 99.021	Congress, S Legislature, FSB, ADFG [All Alaskan communities]	FSB and ADFG should pursue public comment on adopting provisions for limited sale of subsistence foods (i.e., along the lines of MMPA; could be in villages to Alaska residents only, with regulation of village and state, or when population is high and in danger of crashing)
41 **(x)**	Response to ocean acidification	18 AAC 70.015 (Antidegradation policy)	ADEC [All Alaskan communities]	Add an adaptive management provision to the water quality antidegradation policy so that when ADEC obtains data regarding elevated ocean acidity or harmful algal blooms, it may implement measures to reduce discharges that may aggravate these water quality conditions
42 **(x)**	Subsistence opportunity for Natives	Alaska State Constitution Article VIII, § § 3, 15 and 17	S Legislature or S Supreme Court [Rural Alaskan communities]	Amend Article VIII of the State Constitution to adopt a rural preference similar to ANILCA Title 8, or, if there is an appropriate case/opportunity, AK Supreme Court could overturn McDowell v. State, 785 P.2d 1 (1989) and adopt the dissent by Rabinowitz (finding that a rural preference does not violate Article VIII of the Constitution).
43 **(x)**		ANILCA Title 8	Congress [Alaska Natives]	Change ANILCA to protect Native hunting rights (whether urban or rural), or subsistence rights could be income-based, which may be a fairer distinction than rural vs. urban
44		36 C.F.R. § 242.23; 50 C.F.R. § 100.23	FSB	Reconsider which areas are defined as “rural” and whether the term should be more inclusive

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
(?)			[Alaskan communities near cities]	
45 **(?)**		AS § 16.05.258, 5 AAC 99.015	BOG/BOF [Alaskan communities near cities]	Reconsider which areas are defined as "non-subsistence" and whether there is dependence on subsistence in areas near urban centers
46 **(?)**	Avoid interference with sport hunting	36 C.F.R. § § 242.24, 242.26 and 50 C.F.R. § 100.24, 100.26	FSB [Rural Alaskan communities]	Mechanisms to reduce interference of sport hunting with subsistence, such as allowing subsistence or local resident hunt to start prior to other hunts.
47 **(?)**		5 AAC Parts 1 and 3(2)	BOG/BOF [Rural Alaskan communities]	Mechanisms to reduce interference of sport hunting with subsistence, such as allowing subsistence hunt to start prior to other hunts.
48 **(+)**	Hunting safety	36 C.F.R. §242.25(j)(5), 50 C.F.R. § 100.25(j)(5); 5 AAC 92.220; 50 C.F.R. §18.3	BOG/BOF, NOAA/NMFS [Rural Alaskan communities]	Safe harbor provision allowing "waste" for "unanticipated weather conditions" akin to the salvage exception under ANILCA regulations (36 C.F.R. §242.25(j)(5))
49 **(?)**	Flexibility in terms of who hunts for community	5 AAC 92.072; 50 C.F.R. § 300.65	BOG/BOF, FSB [Rural Alaskan communities]	Explore mechanisms for community hunts. Learn from failure of the State community moose harvest Alaska (5 AAC 92.072), which allowed too much outside participation, and the failed bill to introduce the Native Subsistence Co-Management Demonstration Act of 2014 (which the state opposed since it gave jurisdiction to a non-sovereign, Ahtna). Look to the halibut subsistence management program as a guide for a community harvest

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
				(50 C.F.R. § 300.65). 50 C.F.R. 300.66k allows a tribe to reimburse subsistence expenses.
50 **(—)**		5 AAC 92.011; 36 C.F.R. §242.10(d)(5)(ii)/ 50 C.F.R. § 100.10(d)(5)(ii) (Board authority to allow hunting designation); 36 C.F.R. §242.25(a)/ 50 C.F.R. § 100.25(a) (definition of designated hunter); 36 C.F.R. §242.25 (d,e) / 50 C.F.R. § 100.25 (d,e) (hunting and fishing by designated hunter).	BOG/BOF [Rural Alaskan communities]	Broaden proxy rules to increase flexibility in a manner similar to federal system.
51 **(—)**	Provide for fall subsistence bird hunting	16 U.S.C. § 712; 50 C.F.R. 20.102	FWS [All ANVs]	Amend regulations implementing the Migratory Bird Treaty Act to provide for fall subsistence hunt.
52 **(?)**	Allowing for new species	EO 13751 (2016) Safeguarding the Nation from the Impacts of Invasive Species, EO 13112 (1999) Invasive Species	President, FWS, USDA [All U.S. states and communities]	As environments change and species colonize new areas, reconsider how to define "invasive species," since it may not be practical to eradicate a new species that pushes out an existing species not adapting to changing environment
53 **(?)**	Ecosystem-based management in a changing climate	Laws requiring adherence to current ecological conditions that would need to be changed: EO 11987 Exotic Organisms (1977), National Park Service Organic Act, 54 U.S.C.§ 100101; Wilderness Act, 6 U.S.C. § 1131(a);	Congress, DOI, FWS, NPS, BLM, USFS [All U.S. states and communities]	Authorize and fund DOI and USFS to assess and "triage" federal lands with public input, dividing them into the following categories (1) landscapes and species that merit preservation and intensive management (including assisted migration) to avoid extinction under climate change; (2) landscapes and species that are not economically or ecologically feasible to preserve under

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
		Endangered Species Act, 16 U.S.C. §§ 1531(c)(1), § 1538		climate change, which may merit a new type of management to promote the best available ecological services; and (3) landscapes and species that should continue to be managed under current policies, recognizing that ecosystem will change with climate change. Laws governing USFS (16 U.S.C. § 1604), BLM (43 U.S.C.§§ 1702(c), 1732(a)), and FWS (16 U.S.C. §§ 668dd, 668ee) should allow sufficient flexibility to implement ecosystem management changes, but NPS authority (54 U.S.C.§ 100101) may need to be amended to broaden authority, and agency regulations (e.g., 50 C.F.R. § 17.81(a)) and manuals would need to be revised. Ideally, Congress could amend ESA (16 U.S.C. § 1533) to list threatened and endangered "ecosystems" subject to category 1, and grant FWS discretion not to list species that fall into category 2 (or remove the prohibition in 16 U.S.C. § 1538 against take of these species).
54 **(x)**	Provide for community revenue, grants	42 U.S.C. § 5170c and other laws	Congress, FEMA, HUD [All Tribes]	Reduce cost-share requirements in infrastructure and hazard mitigation grants for tribes, similar to 42 U.S.C. § 5133(h)(2) (which reduced cost-share to 10% for small impoverished communities)
55 **(x)**		FMA (42 U.S.C. § 4104c), PDM (42 U.S.C. § 5133) and HMGP (42 U.S.C. § 5170c; 44 C.F.R. § 206.434)	FEMA [Impoverished communities]	FEMA-administered programs require mitigation measures to be cost-effective or in the interests of NFIP, but the statutes and regulations do not specify how to determine cost-effectiveness. FEMA generally requires a benefit-cost ratio (BCR) of 1.0 to demonstrate cost-effectiveness. FEMA could require a lesser BCR for small impoverished communities (as defined in 42 U.S.C. § 5133) or adjust its

Row/ Feasibility	Need	Relevant Law	Actor [Name of Beneficiary]	Proposed Action
				benefits-costs tool to better reflect intangible benefits of projects to remote communities.
56 **(—)** **(x)**		Appropriations bill	Congress [All U.S. states and communities]	Appropriate more money into established programs that mitigate hazards and help with climate change adaptation, including FEMA's PDM (42 U.S.C. § 5133) and HMGP (42 U.S.C. § 5170c), BIA's HIP (25 C.F.R. § 256.21), NRCS's Watershed Protection and Flood Prevention Program (16 U.S.C. § 460d and 7 C.F.R. Part 622) and the Emergency Watershed Protection Program (at 33 U.S.C. § 701b-1, 7 C.F.R. § § 624.6, 624.10), and HUD's ICDBG Imminent Threat Grants (42 U.S.C. 5301 *et seq*, 24 C.F.R. § 1003.400). Change agency budget allocation from annual to biennial (with potential for more change later).

References

Abate, Randall S., and Elizabeth Ann Kronk. 2013. "Commonality Among Unique Indigenous Communities: An Introduction to Climate Change and Its Impacts on Indigenous Peoples." In *Climate Change and Indigenous Peoples, The Search for Legal Remedies*, edited by Randall S. Abate and Elizabeth Ann Kronk, 3–18. Edward Elgar Publishing Limited.

ADFG. 2018a. "Advisory Committee Information." 2018. http://www.adfg.alaska.gov/index.cfm?adfg=process.advisory.

———. 2018b. "Alaska Hunting Regulations." 2018. http://www.adfg.alaska.gov/index.cfm?adfg=wildliferegulations.hunting.

———. 2018c. "Kuskokwim Salmon Management Working Group." 2018. http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareakuskokwim.kswg.

Adger, W. Neil. 2003. "Social Capital, Collective Action, and Adaptation to Climate Change." *Economic Geography* 79 (4): 387–404.

Adger, W. Neil, Jon Barnett, Katrina Brown, Nadine Marshall, and Karen O'Brien. 2012. "Cultural Dimensions of Climate Change Impacts and Adaptation." *Nature Climate Change* 3 (2): 112–17. https://doi.org/10.1038/nclimate1666.

AECOM. 2016. "City of Saint Paul, Alaska Hazard Mitigation Plan."

Agnew Beck Consulting, PDC Engineers, and USKH, Inc. 2011. "Relocation Report: Newtok to Mertarvik."

Ahtna, Inc. 2015. "2016-2017 Ahtna Tene Nene' C&T Community Subsistence Harvest, Permit Program." http://www.ahtna-inc.com/wp-content/uploads/2015/11/Guide-Sheet-Subsistence-Harvest-Hunt-2016-2017.pdf.

AK Division of Community and Regional Affairs. 2018. "Community Database Online." 2018. https://www.commerce.alaska.gov/dcra/DCRAExternal.

Alaska. 2016. "Alaska Pre-Disaster Mitigation Local Mitigation Planning Project, Request for Proposals, RFP 09160000081." https://aws.state.ak.us/OnlinePublicNotices/Notices/Attachment.aspx?id=104529.

Alaska Board of Game. 2015. "Meeting Summary, Board of Game Central/Southwest Region Meeting, Lake Lucille Inn, Wasilla, Alaska." February 13, 2015. http://www.adfg.alaska.gov/index.cfm?adfg=gameboard.meetinginfo&date=02-13-2015&meeting=wasilla.

Alaska Climate Cabinet. 2018. "State of Alaska Climate Actions by Department."

Alaska Climate Change Sub-Cabinet. 2010. "Alaska's Climate Change Strategy: Addressing Impacts in Alaska." *Final Draft Report by the Adaptation Advisory Group*. http://www.tribesandclimatechange.org/documents/nccc/nccc20110516_328.pdf.

Alaska Department of Community and Economic Development. 2004. "Local Government in Alaska." 2004.

Alaska Department of Fish and Game. 2010. "Climate Change Strategy." https://www.adfg.alaska.gov/static/lands/ecosystems/pdfs/climatechangestrategy.pdf.

———. 2016. "Alaska Hunting Maps by Hunt Type." 2016. http://www.adfg.alaska.gov/index.cfm?adfg=huntingmaps.byhunttype.

Alaska Department of Natural Resources. 2000. "Land Ownership in Alaska." http://dnr.alaska.gov/mlw/factsht/land_fs/land_own.pdf.

———. 2015. “Fact Sheet, Off-Road Travel on the North Slope on State Land.” http://dnr.alaska.gov/mlw/factsht/land_fs/off-road_travel.pdf.
Alaska Department of Revenue. 2014. “Annual Report.” http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?1139r.
Alaska Division of Homeland Security. 2010. “Small Community Emergency Response Plan.” 2010. https://ready.alaska.gov/Plans/SCERP.
Alaska Native Heritage Center. 2017. “Alaska History and Cultural Studies.” 2017. http://www.akhistorycourse.org/alaskas-cultures/alaska-native-heritage-center.
American Planning Association. 2011. “Policy Guide on Planning and Climate Change.”
Anderson, Cheryl L. 2012. “Analysis of Integrating Disaster Risk Reduction and Climate Change Adaptation in the US Pacific Islands and Freely Associated States.” 201105. Hazards, Climate, and Environment Program, Social Science Research Institute, University of Hawai`i at Mānoa.
Anderson, Cheryl Lea. 2005. “Decolonizing Disaster: A Gender Perspective of Disaster Risk Management in the United States-Affiliated Pacific Islands.”
Anderson, Robert T. 2016. “Sovereignty and Subsistence: Native Self-Government and Rights to Hunt, Fish, and Gather after ANCSA.(Special Issue on the Forty-Fifth Anniversary of the Alaska Native Claims Settlement Act).” *Alaska Law Review* 33 (2): 187.
Ansell, C., and A. Gash. 2007. “Collaborative Governance in Theory and Practice.” *Journal of Public Administration Research and Theory* 18 (4): 543–71. https://doi.org/10.1093/jopart/mum032.
Arctic Council. 2017. “Adaptation Actions for a Changing Arctic (AACA)-Bering/Chukchi/Beaufort Region Overview Report.” https://oaarchive.arctic-council.org/handle/11374/1941.
Armitage, Derek, Fikret Berkes, Aaron Dale, Erik Kocho-Schellenberg, and Eva Patton. 2011. “Co-Management and the Co-Production of Knowledge: Learning to Adapt in Canada’s Arctic.” *Global Environmental Change* 21 (3): 995–1004. https://doi.org/10.1016/j.gloenvcha.2011.04.006.
Army Corps. 2006. “An Examination of Erosion Issues in the Communities of Bethel, Dillingham, Kaktovik, Kivalina, Newtok, Shishmaref, and Unalakleet.”
———. 2014. “Climate Change Adaptation Plan.” http://www.usace.army.mil/Media/NewsArchive/StoryArticleView/tabid/232/Article/547550/the-us-army-corps-of-engineers-releases-robust-climate-change-adaptation-strate.aspx.
Arnstein, Sherry R. 1969. “A Ladder of Citizen Participation.” *Journal of the American Institute of Planners*, July, 216–24.
Arroyo, Vicki, and Terri Cruce. 2012. “State and Local Adaptation.” In *The Law of Adaptation to Climate Change : U.S. and International Aspects*, edited by Michael Gerrard and Katrina Fischer Kuh, 569–600. Chicago: American Bar Association, Section of Environment, Energy, and Resources.
Arthur, Robert, Richard Friend, and Melissa Marschke. 2011. “Fostering Collaborative Resilience through Adaptive Comanagement: Reconciling Theory and Practice in the Management of Fisheries in the Mekong Region.” In *Collaborative Resilience : Moving Through Crisis to Opportunity*, edited by Bruce Evan Goldstein, 255–81. MIT Press.

Aruskevich, Kas. 2010. “Telling a Story about Indigenous Evaluation : Insights of Practitioners from Australia, Canada, New Zealand, and the United States.” Dissertation. University of Hawaii, Manoa.

Associated Press. 2014. “Shaktoolik Building Berm to Guard against Erosion Norton Sound Community Takes Coastal Erosion Matters into Its Own Hands,” July 4, 2014. http://juneauempire.com/state/2014-07-04/shaktoolik-building-berm-guard-against-erosion#.VDIBkfldW2F.

Babbitt, Bruce. 1997. “Secretarial Order 3206, American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act.” http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/so3206.pdf.

Bajracharya, Bhishna, Iraphne Childs, and Peter Hastings. 2011. “Climate Change Adaptation through Land Use Planning and Disaster Management: Local Government Perspectives from Queensland.” *Paper Presented at the 17th Pacific Rim Real Estate Society (PRRES) Conference: Climate Change and Property: Its Impact Now and Later*, January. http://epublications.bond.edu.au/sustainable_development/48.

Ballew, Carol, Angela Ross, Rebecca Wells, and Vanessa Hiratsuka. 2004. “Final Report on the Alaska Traditional Diet Survey.” http://anthctoday.org/epicenter/publications/Reports_Pubs/traditional_diet.pdf.

Barry, Janice. 2012. “Indigenous State Planning as Inter-Institutional Capacity Development: The Evolution of ‘Government-to-Government’ Relations in Coastal British Columbia, Canada.” *Planning Theory & Practice* 13 (2): 213–31. https://doi.org/10.1080/14649357.2012.677122.

Bedsworth, Louise W., and Ellen Hanak. 2010. “Adaptation to Climate Change: A Review of Challenges and Tradeoffs in Six Areas.” *Journal of the American Planning Association* 76 (4): 477–95. https://doi.org/10.1080/01944363.2010.502047.

Bennett, T.B. Bull, Patricia Cochran, Robert Gough, Kathy Lynn, Julie Maldonado, Garrit Voggesser, Susan Wotkyns, and Karen Cozzetto. 2014. “Indigenous Peoples, Lands, and Resources.” *Climate Change Impacts in the United States: The Third National Climate Assessment*, 297–317.

Berger, Thomas. 1999. *A Long and Terrible Shadow: White Values, Native Rights in the Americas since 1492*. Second Edition edition. Vancouver; Seattle: University of Washington Press.

Berke, Philip, John Cooper, Meghan Aminto, Shannon Grabich, and Jennifer Horney. 2014. “Adaptive Planning for Disaster Recovery and Resiliency: An Evaluation of 87 Local Recovery Plans in Eight States.” *Journal of the American Planning Association* 80 (4): 310–323. https://doi.org/10.1080/01944363.2014.976585.

Berke, Philip, and Ward Lyles. 2013. “Public Risks and the Challenges to Climate-Change Adaptation: A Proposed Framework for Planning in the Age of Uncertainty.” *Cityscape*, 181–208.

Berke, Philip, and Gavin Smith. 2009. “Hazard Mitigation, Planning, and Disaster Resiliency: Challenges and Strategic Choices for the 21st Century.” In *Building Safer Communities: Risk Governance, Spatial Planning and Responses to Natural Hazards*, edited by Urbano Fra Paleo, 1–20. IOS Press.

Berkes, Fikret. 1998. “Indigenous Knowledge and Resource Management Systems in the Canadian Subarctic.” In *Linking Social and Ecological Systems: Management Practices*

and Social Mechanisms for Building Resilience, edited by Fikret Berkes, Carl Folke, and Johan Colding, 98–128. Cambridge, U.K.; New York: Cambridge University Press.

———. 2002. "Cross-Scale Institutional Linkages: Perspectives from the Bottom Up." In *The Drama of the Commons*, edited by Committee on the Human Dimensions of Global Change, 294–321. Washington, D.C: National Academy Press. http://www.nap.edu/openbook.php?record_id=10287&page=293.

Berkes, Fikret, and Dyanna Jolly. 2001. "Adapting to Climate Change: Social-Ecological Resilience in a Canadian Western Arctic Community." *Conservation Ecology* 5 (2): 18.

Berkes, Fikret, Gary P. Kofinas, and F. Stuart Chapin III. 2009. "Conservation, Community, and Livelihoods: Sustaining, Renewing, and Adapting Cultral Connections to the Land." In *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World*, edited by F. Stuart Chapin III, Carl Folke, and Gary P. Kofinas, 2009 edition, 129–47. New York: Springer.

Bernard, H. Russell. 2006. *Research Methods in Anthropology: Qualitative and Quantitative Approaches*. 4th ed. Lanham, MD: AltaMira Press.

Bernard, H. Russell, and Gery W. Ryan. 2009. *Analyzing Qualitative Data: Systematic Approaches*. 1 edition. Los Angeles Calif.: SAGE Publications, Inc.

BIA. 2017. "Indian Entities Recognized and Eligible To Receive Services From the United States Bureau of Indian Affairs." 82 FR 4915. https://www.federalregister.gov/documents/2017/01/17/2017-00912/indian-entities-recognized-and-eligible-to-receive-services-from-the-united-states-bureau-of-indian.

Bixler, R. Patrick. 2013. "The Political Ecology of Local Environmental Narratives: Power, Knowledge, and Mountain Caribou Conservation." *J. Polit. Ecol* 20: 273–285.

BLM. 1983. "Master Memorandum of Understanding between the Alaska Department of Fish and Game and the U.S. Bureau of Land Management." https://eplanning.blm.gov/epl-front-office/projects/lup/66965/83522/100152/Master_MOU_Alaska_Department_of_Fish_and_Game_and_BLM_Anchorage.pdf.

Boutet' Company, Inc. 2010. "City of Fort Yukon Hazard Mitigation Plan."

Boyd, Emily, Björn Nykvist, Sara Borgström, and Izabela A. Stacewicz. 2015. "Anticipatory Governance for Social-Ecological Resilience." *AMBIO* 44 (S1): 149–61. https://doi.org/10.1007/s13280-014-0604-x.

Boyd, P. W., S. Sundby, and H.-O. Pörtner. 2014. "Cross-Chapter Box on Net Primary Production in the Ocean." In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel of Climate Change*, edited by C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, et al., 133–36. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Bradner, Tim. 2012. "Coastal Management Initiative Fails by a Heavy Margin." *Alaska Journal of Commerce*, August. http://www.alaskajournal.com/Alaska-Journal-of-Commerce/September-Issue-2-2012/Coastal-management-initiative-fails-by-a-heavy-margin/.

Brelsford, TAYLOR. 2009. "We Have to Learn to Work Together:" Current Perspectives on Incorporating Local and Traditional/Indigenous Knowledge into Alaskan Fishery Management. Pages XX–XX in CC Krueger and CE Zimmerman, Editors. Pacific

Salmon: Ecology and Management of Western Alaska's Populations." In *American Fisheries Society, Symposium*. Vol. 70. http://marin.fisheries.org/proofs/ayk/brelsford.pdf.

Brinkman, Todd J., Winslow D. Hansen, F. Stuart Chapin, Gary Kofinas, Shauna BurnSilver, and T. Scott Rupp. 2016. "Arctic Communities Perceive Climate Impacts on Access as a Critical Challenge to Availability of Subsistence Resources." *Climatic Change* 139 (3–4): 413–27. https://doi.org/10.1007/s10584-016-1819-6.

Brinkman, Todd, Karonhiakta'tie B. Maracle, James Kelly, Michelle Vandyke, Andrew Firmin, and Anna Springsteen. 2014. "Impact of Fuel Costs on High-Latitude Subsistence Activities." *Ecology and Society* 19 (4). https://doi.org/10.5751/ES-06861-190418.

Bristol Environmental & Engineering Services Corporation. 2010. "Shishmaref Relocation Plan Update."

Bronen, Robin. 2011. "Climate-Induced Community Relocations: Creating an Adaptive Governance Framework Based in Human Rights Doctrine." *NYU Rev. L. & Soc. Change* 35: 357.

———. 2013. "Climate-Induced Displacement of Alaska Native Communities." *Brookings Institution* 2. www.brookings.edu/research/papers/2013/01/30-arctic-alaska-bronen.

Bronen, Robin, and F. Stuart Chapin. 2013. "Adaptive Governance and Institutional Strategies for Climate-Induced Community Relocations in Alaska." *Proceedings of the National Academy of Sciences of the United States of America* 110 (23): 9320–25. https://doi.org/10.1073/pnas.1210508110.

Brooks, Michael P. 2002. *Planning Theory for Practitioners*. American Planning Association.

Brooks, Thom. 2013. "Climate Change Justice." *PS: Political Science & Politics* 46 (01): 9–12. https://doi.org/10.1017/S1049096512001400.

Brubaker, Michael, James Berner, Jacob Bell, John Warren, and Alicia Rolin. 2010. "Climate Change in Point Hope, Alaska, Strategies for Community Health." Alaska Native Tribal Health Consortium.

Brubaker, Michael, and Raj Chavan. 2011. "Climate Change in Kiana, Alaska, Strategies for Community Health." Alaska Native Tribal Health Consortium.

Brubaker, Mike. 2014. "Climate Change in Nuiqsut, Alaska Strategies for Community Health."

Brunner, Ronald D., and Amanda H. Lynch. 2010. *Adaptive Governance and Climate Change*. American Meteorological Society.

Burkett, Maxine. 2008. "Just Solutions to Climate Change: A Climate Justice Proposal for a Domestic Clean Development Mechanism." *Buffalo Law Review* 56: 169–244.

———. 2013. "Indigenous Environmental Knowledge and Climate Change Adaptation." In *Climate Change and Indigenous Peoples: The Search for Legal Remedies*, edited by Randall S. Abate and Elizabeth Ann Kronk Warner, 96–120. Edward Elgar Pub. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2213506.

BurnSilver, Shauna, James Magdanz, Rhian Stotts, Matthew Berman, and Gary Kofinas. 2016. "Are Mixed Economies Persistent or Transitional? Evidence Using Social Networks from Arctic Alaska: Are Mixed Economies Persistent or Transitional?" *American Anthropologist* 118 (1): 121–29. https://doi.org/10.1111/aman.12447.

Byrne, J. Peter, and Jessica Grannis. 2012. "Coastal Retreat Measures." In *The Law of Adaptation to Climate Change : U.S. and International Aspects*, edited by Michael Gerrard and Katrina Fischer Kuh, 267–306. Chicago: American Bar Association, Section of Environment, Energy, and Resources.

Camacho, Alejandro E. 2011. “Learning Collaboratory: Improving Federal Climate Change Adaptation Planning, A.” *BYU L. Rev.*, 1821–61.
Cameron, Emilie S. 2012. “Securing Indigenous Politics: A Critique of the Vulnerability and Adaptation Approach to the Human Dimensions of Climate Change in the Canadian Arctic.” *Global Environmental Change* 22 (1): 103–114. https://doi.org/10.1016/j.gloenvcha.2011.11.004.
Carp, Jana. 2011. “The Study of Slow.” In *Collaborative Resilience : Moving Through Crisis to Opportunity*, edited by Bruce Evan Goldstein, 99–125. MIT Press.
Case, David S., and David A Voluck. 2012. *Alaska Natives and American Laws*. 3rd ed.. Fairbanks, AK: University of Alaska Press.
Cavallo, A. 2015. “Disaster Cost Index.” Division of Homeland Security and Emergency Management.
Chaffee, Eric. 2008. “Business Organizations and Tribal Self-Determination: A Critical Reexamination of the Alaska Native Claims Settlement Act.” *Alaska Law Review* 25 (1): 107–55.
Chapin, F. Stuart, and Patricia Cochran. 2014. “Community Partnership for Self Reliance and Sustainability, Final Report to Communities from the Alaska Native Science Commission and the University of Alaska Fairbanks.”
Chapin, F Stuart, Corrine N Knapp, Todd J Brinkman, Robin Bronen, and Patricia Cochran. 2016. “Community-Empowered Adaptation for Self-Reliance.” *Current Opinion in Environmental Sustainability* 19 (April): 67–75. https://doi.org/10.1016/j.cosust.2015.12.008.
Chapin III, F. Stuart, Carl Folke, and Gary P. Kofinas. 2009. “A Framework for Understanding Change.” In *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World*, edited by F. Stuart Chapin III, Gary P. Kofinas, and Carl Folke, 2009 edition, 3–28. New York: Springer.
Chapin III, F. Stuart, Gary P. Kofinas, Carl Folke, Stephen R. Carpenter, Per Olsson, Nick Abel, Reinette Biggs, et al. 2009. “Resilience-Based Stewardship: Strategies for Navigating Sustainable Pathways in a Changing World.” In *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World*, edited by F. Stuart Chapin III, Gary P. Kofinas, and Carl Folke, 2009 edition, 319–38. New York: Springer.
Chapin III, F. Stuart, Sarah F. Trainor, Carl Markon, and Mark Serreze. 2014. “Alaska.” *Climate Change Impacts in the United States: The Third National Climate Assessment*, 514–36.
Charnley, S., A.P. Fischer, and E.T. Jones. 2008. “Traditional and Local Ecological Knowledge About Forest Biodiversity in the Pacific Northwest.” PNW-GTR-751. United States Department of Agriculture Forest Service. www.fs.fed.us/pnw/pubs/pnw_gtr751.pdf.
Cho, Ji Young, and Eun-Hee Lee. 2014. “Reducing Confusion about Grounded Theory and Qualitative Content Analysis: Similarities and Differences.(Report).” *The Qualitative Report*.
Churchman, C. West. 1967. “Guest Editorial: Wicked Problems.” *Management Science* 14 (4): B141–42.
Climate Action for Alaska Leadership Team. 2018. “Climate Change Action Plan Recommendations to the Governor.”
Clinton, Bill. 2000. *Executive Order 13175, Consultation and Coordination with Indian Tribal Governments*.

Cochran, Patricia, Orville H. Huntington, Caleb Pungowiyi, Stanley Tom, F. Stuart Chapin, Henry P. Huntington, Nancy G. Maynard, and Sarah F. Trainor. 2013. "Indigenous Frameworks for Observing and Responding to Climate Change in Alaska." *Climatic Change* 120 (3): 557–67. https://doi.org/10.1007/s10584-013-0735-2.

Coleman, James S. 1988. "Social Capital in the Creation of Human Capital." *American Journal of Sociology* 94 (January): S95–120.

Conners, Hannah, Kathleen D. White, and Jeffrey R. Arnold. 2015. "Report Providing Comparison of Adaptation Plans Submitted to the White House in 2014."

Corbin, Juliet, and Anselm Strauss. 2007. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 3rd edition. Los Angeles, Calif: SAGE Publications, Inc.

Corburn, Jason. 2003. "Bringing Local Knowledge into Environmental Decision Making Improving Urban Planning for Communities at Risk." *Journal of Planning Education and Research* 22 (4): 420–433.

Cox, Sally Russell, and Erik O'Brien. 2009. "Alaska Division of Community and Regional Affairs, Memo Re Notice of Competitive Grant Solution." http://climatechange.alaska.gov/docs/iaw_17feb11_ACCIMP_appl.pdf.

Craig, Robin Kundis. 2010. "'Stationarity Is Dead'-Long Live Transformation: Five Principles for Climate Change Adaptation Law." *Harvard Environmental Law Review* 34 (1): 9–75.

Craig, Robin Kundis, and J. B. Ruhl. 2014. "Designing Administrative Law for Adaptive Management." *Vanderbilt Law Review* 67 (January): 1–87.

Crane, Randall, and John Landis. 2010. "Introduction to the Special Issue: Planning for Climate Change: Assessing Progress and Challenges." *Journal of the American Planning Association* 76 (4): 389–401. https://doi.org/10.1080/01944363.2010.512036.

Creswell, John W. 2007. *Qualitative Inquiry and Research Design: Choosing among Five Approaches*. 2nd edition. Thousand Oaks: SAGE Publications, Inc.

Cumming, Graeme S. 2013. "Scale Mismatches and Reflexive Law." *Ecology and Society* 18 (1): 15–16. https://doi.org/10.5751/ES-05407-180115.

Cutter, Susan L., Lindsey Barnes, Melissa Berry, Christopher Burton, Elijah Evans, Eric Tate, and Jennifer Webb. 2008. "A Place-Based Model for Understanding Community Resilience to Natural Disasters." *Global Environmental Change* 18 (4): 598–606. https://doi.org/10.1016/j.gloenvcha.2008.07.013.

Daniels, R. Steven. 2013. "The Rise of Politics and the Decline of Vulnerability as Criteria in Disaster Decisions of the United States, 1953-2009." *Disasters* 37 (4): 669–94. https://doi.org/10.1111/disa.12026.

deGrandpre, K. 2015. "Relative Sea Level Change in Western Alaska as Constructed from Satellite Altimetry and Repeat GPS Measurements." M. Sc. Thesis, University of Alaska Fairbanks.

DeMarban, Alex. 2015. "Interior Secretary Vows to Work on Solutions for Climate-Threatened Village." *Alaska Dispatch,* February 16, 2015. http://www.adn.com/article/20150216/interior-secretary-vows-work-solutions-climate-threatened-village.

Demer, Lisa. 2015. "The Creep of Climate Change." *Alaska Dispatch,* August 29, 2015. http://www.adn.com/article/20150829/creep-climate-change.

Demer, Lisa, and Kyle Hopkins. 2012. “Alaska Voters Reject Coastal Zone Measure.” *Alaska Dispatch*, August 28, 2012. http://www.adn.com/article/20120828/alaska-voters-reject-coastal-zone-measure.

Denali Commission. 2017. “Denali Commission Fiscal Year 2018 Draft Work Plan, 82 Fed. Reg. 44759.” Federal Register. https://www.federalregister.gov/documents/2017/09/26/2017-20562/denali-commission-fiscal-year-2018-draft-work-plan.

Department of the Interior. 2015. “Federal Subsistence Management Program, Permits.” September 4, 2015. https://www.doi.gov/subsistence/statewide/permits.

———. 2016. “Memorandum of Agreement between the United States Department of the Interior and the Ahtna Inter-Tribal Resource Commission for a Demonstration Project for Cooperative Management of Customary and Traditional Subsistence Uses in the Ahtna Region.” https://www.doi.gov/sites/doi.gov/files/uploads/ahtna_doi_moa_with_signature_pages_final.pdf.

Dilling, Lisa, Elise Pizzi, John Berggren, Ashwin Ravikumar, and Krister Andersson. 2017. “Drivers of Adaptation: Responses to Weather- and Climate-Related Hazards in 60 Local Governments in the Intermountain Western U.S.” *Environment and Planning A* 49 (11): 2628–48. https://doi.org/10.1177/0308518X16688686.

Diver, Sibyl W. 2009. “Towards Sustainable Fisheries: Assessing Co-Management Effectiveness for the Columbia River Basin.” https://doi.org/10.1038/npre.2009.3754.1.

DOI, and Ahtna. 2016. “Memorandum of Agreement between U.S. Department of the Interior and Ahtna Inter-Tribal Resource Commission for a Demonstration Project for the Cooperative Management of Customary and Traditional Subsistence Uses in the Ahtna Region.”

Donaghy, Kieran. 2007. “Viewpoint: Climate Change and Planning: Responding to the Challenge.” *The Town Planning Review* 78 (4): i–ix.

Driessen, Peter P. J., and Helena F. M. W. van Rijswick. 2011. “Normative Aspects of Climate Adaptation Policies.” *Climate Law* 2: 559–81.

E & E. 2011. “City of Hydaburg Local Hazard Mitigation Plan.”

Egan, Timothy. 1992. “Eskimos Learn They’ve Been Living Amid Secret Pits of Radioactive Soil.” *The New York Times*, December 6, 1992. http://www.nytimes.com/1992/12/06/us/eskimos-learn-they-ve-been-living-amid-secret-pits-of-radioactive-soil.html.

Engle, Nathan L. 2011. “Adaptive Capacity and Its Assessment.” *Global Environmental Change* 21 (2): 647–56. https://doi.org/10.1016/j.gloenvcha.2011.01.019.

Engler-Stringer, Rachel. 2014. “Food Security.” In *Encyclopedia of Quality of Life and Well-Being Research*, edited by Alex C. Michalos, 2326–27. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-007-0753-5_1073.

EPA. 2014. “Climate Change Adaptation Plan.” EPA 100-K-14-001. U.S. Environmental Protection Agency.

Evans-Campbell, Teresa, Karina L. Walters, Cynthia R. Pearson, and Christopher D. Campbell. 2012. “Indian Boarding School Experience, Substance Use, and Mental Health among Urban Two-Spirit American Indian/Alaska Natives.” *The American Journal of Drug and Alcohol Abuse* 38 (5): 421–27. https://doi.org/10.3109/00952990.2012.701358.

FEMA. 2011. “Local Mitigation Plan Review Guide.” https://www.fema.gov/media-library/assets/documents/23194.

———. 2013. “Integrating Hazard Mitigation Planning into Local Planning.” http://www.starr-team.com/starr/RegionalWorkspaces/RegionX/mitigationplanning/Shared%20Documents/11_Integrating_NHMP_into_Local_Plans/FEMA_Integrating_Hazard_Mitigation_into_Local_Planning_2013.pdf.
———. 2015. “State Mitigation Plan Review Guide, FP 302-094-2.”
———. 2017a. “Tribal Mitigation Plan Review Guide.”
———. 2017b. “Hazard Mitigation Assistance Mitigation Activity Chart.” June 20, 2017. https://www.fema.gov/hazard-mitigation-assistance-mitigation-activity-chart.
———. 2018. “FEMA Disaster Declarations Summary - Open Government Dataset.” 2018. https://www.fema.gov/media-library/assets/documents/28318.
Fernandez-Gimenez, Maria E., Henry P. Huntington, and Kathryn J. Frost. 2006. “Integration or Co-Optation? Traditional Knowledge and Science in the Alaska Beluga Whale Committee.” *Environmental Conservation* 33 (4): 306–15. https://doi.org/10.1017/S0376892906003420.
Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, et al., eds. 2014. *Climate Change 2014: Impacts, Adaptation, and Vulnerability, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
Field, Christopher B. 2014. *Climate Change 2014: Impacts, Adaptation, and Vulnerability: Summary for Policymakers*.
Fischman, Robert L., and Jillian R. Rountree. 2012. “Adaptive Management.” In *The Law of Adaptation to Climate Change : U.S. and International Aspects*, edited by Michael Gerrard and Katrina Fischer Kuh, 19–47. Chicago: American Bar Association, Section of Environment, Energy, and Resources.
Flatt, Victor B. 2012. “Adapting Laws for a Changing World: A Systemic Approach to Climate Change Adaptation.” *Fla. L. Rev.* 64: 269.
———. 2014. “Focus and Fund: Executing Our Way to a Federal Climate Change Adaptation Plan.” *Virginia Environmental Law Journal*, 157–172.
Flo, Frank, and Anne Smith. 1999. *The Community Development Handbook*. Ottawa: Human Resources Development Canada.
Focht, Will, and Zev Trachtenberg. 2005. “A Trust-Based Guide to Stakeholder Participation.” In *Swimming Upstream: Collaborative Approaches to Watershed Management*, edited by Paul A. Sabatier, Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, 85–135. Cambridge, Mass: The MIT Press.
Folke, Carl, F. Stuart Chapin III, and Per Olsson. 2009. “Transformations in Ecosystem Stewardship.” In *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World*, edited by F. Stuart Chapin III, Gary P. Kofinas, and Carl Folke, 2009 edition, 103–25. New York: Springer.
Food and Agriculture Organization of the United Nations. 2002. “The State of Food Insecurity in the World 2001.” http://www.fao.org/docrep/005/y7352e/y7352e00.htm.
Ford, James D., Tristan Pearce, Frank Duerden, Chris Furgal, and Barry Smit. 2010. “Climate Change Policy Responses for Canada’s Inuit Population: The Importance of and Opportunities for Adaptation.” *Global Environmental Change* 20 (1): 177–91. https://doi.org/10.1016/j.gloenvcha.2009.10.008.

Ford, James D., and Barry Smit. 2004. “A Framework for Assessing the Vulnerability of Communities in the Canadian Arctic to Risks Associated with Climate Change.” *Arctic*, 389–400.

Ford, James D., Ellie Stephenson, Ashlee Cunsolo Willox, Victoria Edge, Khosrow Farahbakhsh, Christopher Furgal, Sherilee Harper, et al. 2016. “Community-Based Adaptation Research in the Canadian Arctic: Community-Based Adaptation Research.” *Wiley Interdisciplinary Reviews: Climate Change* 7 (2): 175–91. https://doi.org/10.1002/wcc.376.

Ford, James, Tristan Pearce, Barry Smit, Johanna Wandel, Mishak Allurut, Kik Shappa, Harry Ittusujurat, and Kevin Qrunnut. 2007. “Reducing Vulnerability to Climate Change in the Arctic: The Case of Nunavut, Canada.” *Arctic*, 150–166.

Ford, Jamie Kay, and Erick Giles. 2015. “Climate Change Adaptation in Indian Country: Tribal Regulation of Reservation Lands and Natural Resources.” *Wm. Mitchell L. Rev.* 41: 519.

Forester, John F. 1999. *The Deliberative Practitioner: Encouraging Participatory Planning Processes*. Cambridge, Mass: The MIT Press.

Forsyth, Tim. 2014. “Climate Justice Is Not Just Ice.” *Geoforum* 54 (July): 230–32. https://doi.org/10.1016/j.geoforum.2012.12.008.

Foss, Ann. 2018. “Divergent Responses to Sustainability and Climate Change Planning: The Role of Politics, Cultural Frames and Public Participation.” *Urban Studies* 55 (2): 332–48. https://doi.org/10.1177/0042098016651554.

Frazier, Tim G., Monica H. Walker, Aparna Kumari, and Courtney M. Thompson. 2013. “Opportunities and Constraints to Hazard Mitigation Planning.” *Applied Geography* 40 (June): 52–60. https://doi.org/10.1016/j.apgeog.2013.01.008.

GAO. 2003. “Alaska Native Villages: Most Are Affected by Flooding and Erosion, but Few Qualify for Federal Assistance.” GAO-04-142. Government Accountability Office. http://www.gao.gov/products/GAO-04-142.

———. 2009. “Alaska Native Villages: Limited Progress Has Been Made on Relocating Villages Threatened by Flooding and Erosion.” GAO-09-551. Government Accountability Office.

———. 2015. “An Investment Strategy Could Help the Federal Government Enhance National Resilience for Future Disasters, GAO-15-515.”

Garmestani, Ahjond S., and Melinda Harm Benson. 2013. “A Framework for Resilience-Based Governance of Social-Ecological Systems.” *Ecology and Society* 18 (1). https://doi.org/10.5751/ES-05180-180109.

Gerrard, Michael, Katrina Fischer Kuh, and Energy American Bar Association. Section of Environment. 2012. *The Law of Adaptation to Climate Change : U.S. and International Aspects*. Chicago: American Bar Association, Section of Environment, Energy, and Resources.

Glicksman, Robert L. 2010. “Climate Change Adaptation: A Collective Action Perspective on Federalism Considerations.” *Envtl. L.* 40: 1159–93.

Godschalk, David R., Samuel Brody, and Raymond Burby. 2003. “Public Participation in Natural Hazard Mitigation Policy Formation: Challenges for Comprehensive Planning.” *Journal of Environmental Planning and Management* 46 (5): 733–54. https://doi.org/10.1080/0964056032000138463.

Goldsmith, Scott, and Eric Larson. 2003. “Federal Spending and Revenues in ALaska.” Institute of Social and Economic Research. http://www.iser.uaa.alaska.edu/Publications/federalspendingak.pdf.

Gray, Glenn. 2010. “Kivalina Consensus Building Project, Final Project Report.” Glenn Gray and Associates.

Gremellion, Thomas M. 2011. “Setting the Foundation: Climate Change Adaptation at the Local Level.” *Environmental Law* 41: 1221–52.

Grootaert, Christiaan, and Thierry van Bastelaer, eds. 2002. *Understanding and Measuring Social Capital: A Multi-Disciplinary Tool for Practitioners*. Washington, D.C: World Bank Publications.

Grossman, Elizabeth. 2014. “Natural Food, Unnatural Shortages.” *Alaska Dispatch News*, November 22, 2014. https://www.adn.com/we-alaskans/article/natural-food-unnatural-shortages/2014/11/23/.

Groulx, Mark, John Lewis, Christopher Lemieux, and Jackie Dawson. 2014. “Place-Based Climate Change Adaptation: A Critical Case Study of Climate Change Messaging and Collective Action in Churchill, Manitoba.” *Landscape and Urban Planning* 132: 136.

GT Consulting. 2002. “Hydaburg Community Action Plan.”

Guettabi, M.J., J Little, and J Joly. 2016. “Evaluating Differences in Household Subsistence Harvest Patterns between the Ambler Project and Non-Project Zones.” Natural Resource Report NPS/GAAR/NRR—2016/1280. National Park Service, Fort Collins, Colorado.

Hamin, Elisabeth M., Nicole Gurran, and Ana Mesquita Emlinger. 2014. “Barriers to Municipal Climate Adaptation: Examples From Coastal Massachusetts’ Smaller Cities and Towns.” *Journal of the American Planning Association* 80 (2): 110–22. https://doi.org/10.1080/01944363.2014.949590.

Hanna, Jonathan M. 2007. “Native Communities and Climate Change: Protecting Tribal Resources as Part of National Climate Policy: Report.” http://scholar.law.colorado.edu/cgi/viewcontent.cgi?article=1014&context=books_reports_studies.

Hansen, Winslow D., Todd J. Brinkman, F. Stuart Chapin, and Caroline Brown. 2013. “Meeting Indigenous Subsistence Needs: The Case for Prey Switching in Rural Alaska.” *Human Dimensions of Wildlife* 18 (2): 109–123. https://doi.org/10.1080/10871209.2012.719172.

Hardess, Lisa. 2013. “Co-Creative Planning: Simpcw First Nation and the Centre for Indigenous Environmental Resources.” In *Reclaiming Indigenous Planning*, edited by Ryan Walker, Theodore S Jojola, and David C. Natcher, 141–65. McGill-Queen’s Native and Northern Series ; 70. Montreal: McGill-Queen’s University Press. http://hccproxy.lib.hawaii.edu:2048/login?url=http://site.ebrary.com/lib/honcclib/Doc?id=10740369.

Hausam, Sharon. 2013. “Maybe, Maybe Not: Native American Participation in Regional Planning.” In *Reclaiming Indigenous Planning*, edited by Ryan Walker, Theodore S Jojola, and David C. Natcher, 166–92. McGill-Queen’s Native and Northern Series ; 70. Montreal: McGill-Queen’s University Press. http://hccproxy.lib.hawaii.edu:2048/login?url=http://site.ebrary.com/lib/honcclib/Doc?id=10740369.

Haverkamp, Jamie AR. 2017. “Politics, Values, and Reflexivity: The Case of Adaptation to Climate Change in Hampton Roads, Virginia.” *Environment and Planning A* 49 (11): 2673–92. https://doi.org/10.1177/0308518X17707525.

Haycox, Stephen. 2016. *Battleground Alaska: Fighting Federal Power in America's Last Wilderness*. University Press of Kansas. https://www.amazon.com/Battleground-Alaska-Fighting-Americas-Wilderness/dp/0700622152.
Haycox, Stephen W. 2006. *Alaska, an American Colony*. Seattle: University of Washington Press.
Hayes, Tryck Nyman. 2006. "Relocation Planning Project Master Plan, Kivalina."
HDR Consulting. 2016a. "Shaktoolik Strategic Management Plan."
———. 2016b. "Kivalina Strategic Management Plan." https://www.commerce.alaska.gov/web/Portals/4/pub/1_Kivalina_SMP_September_2016.pdf.
Head, Brian W. 2014. "Evidence, Uncertainty, and Wicked Problems in Climate Change Decision Making in Australia." *Environment and Planning C: Government and Policy* 32 (4): 663–79. https://doi.org/10.1068/c1240.
Healey, P. 1999. "Institutionalist Analysis, Communicative Planning, and Shaping Places." *Journal of Planning Education and Research* 19 (2): 111–21. https://doi.org/10.1177/0739456X9901900201.
Healey, Patsy. 1996. "Consensus-Building across Difficult Divisions: New Approaches to Collaborative Strategy Making." *Planning Practice and Research* 11 (2): 207–16. https://doi.org/10.1080/02697459650036350.
———. 2006. *Collaborative Planning, Second Edition: Shaping Places in Fragmented Societies*. Second Edition edition. Basingstoke, Hampshire ; New York: Palgrave Macmillan.
Healy, Carole. 2001. "Brown Bear Management Report." https://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/mgt_rpts/mbr01_nw.pdf.
Hibbard, M., M. B. Lane, and K. Rasmussen. 2008. "The Split Personality of Planning: Indigenous Peoples and Planning for Land and Resource Management." *Journal of Planning Literature* 23 (2): 136–151. https://doi.org/10.1177/0885412208322922.
Hibbard, Michael, and Robert Adkins. 2013. "Culture and Economy: The Cruel Choice Revisited." In *Reclaiming Indigenous Planning*, edited by Ryan Walker, Theodore S Jojola, and David C. Natcher, 94–112. McGill-Queen's Native and Northern Series ; 70. Montreal: McGill-Queen's University Press. http://hccproxy.lib.hawaii.edu:2048/login?url=http://site.ebrary.com/lib/honcclib/Doc?id=10740369.
Hirokawa, Keith H, and Jonathan Rosenbloom. 2013. "Climate Change Adaptation and Land Use Planning Law." In *Research Handbook on Climate Change Adaptation Law*, 325–54. Cheltenham, UK: Edward Elgar Pub.
Hitchins, Diddy RM. 2011. "An Alaskan Perspective: The Relationship between the US and Canada in the Arctic." *International Journal* 66 (4): 971–977.
Holen, Davin. 2014. "Fishing for Community and Culture: The Value of Fisheries in Rural Alaska" 50 (4): 403–413. https://doi.org/10.1017/S0032247414000205.
Horney, Jennifer, Mai Nguyen, David Salvesen, Caroline Dwyer, John Cooper, and Philip Berke. 2017. "Assessing the Quality of Rural Hazard Mitigation Plans in the Southeastern United States." *Journal of Planning Education and Research* 37 (1): 56–65.
Howitt, Richard, Kim Doohan, Sandie Suchet-Pearson, Gaim Lunkapis, Samantha Muller, Rebecca Lawrence, Sarah Prout, Siri Veland, and Sherrie Cross. 2013. "Capacity Deficits at Cultural Interfaces of Land and Sea Governance." In *Reclaiming Indigenous Planning*,

edited by Ryan Walker, Theodore S Jojola, and David C. Natcher, 141–65. McGill-Queen's Native and Northern Series ; 70. Montreal: McGill-Queen's University Press. http://hccproxy.lib.hawaii.edu:2048/login?url=http://site.ebrary.com/lib/honcclib/Doc?id=10740369.

Huang, Yee, Robert L. Glicksman, Catherine O'Neill, William L. Andreen, Victor Flatt, William Funk, Robin Kundis Craig, Alice Kaswan, and Robert RM Verchick. 2011. "Climate Change and the Puget Sound: Building the Legal Framework for Adaptation." *Climate Law* 2 (3): 299–344.

HUD. 2016. "Notice of National Disaster Resilience Competition Grant Requirements, 81 Fed. Reg. 36557." https://www.federalregister.gov/documents/2016/06/07/2016-13430/notice-of-national-disaster-resilience-competition-grant-requirements.

Huntington, Henry, Shari Fox, Fikret Berkes, and Igor Krupnik. 2005. "The Changing Arctic: Indigenous Perspectives." In *Arctic Climate Impact Assessment - Scientific Report*, 62–98.

Huntington, Henry P. 1998. "Observations on the Utility of the Semi-Directive Interview for Documenting Traditional Ecological Knowledge." *Arctic*, 237–242.

———. 2000. "Using Traditional Ecological Knowledge in Science: Methods and Applications." *Ecological Applications* 10 (5): 1270–1274.

Huntington, Henry P., and Roger G. Barry. 2006. "'It's Not That Simple': A Collaborative Comparison of Sea Ice Environments, Their Uses, Observed Changes, and Adaptations in Barrow, Alaska, USA, and Clyde River, Nunavut, Canada." *Ambio* 35 (4): 203–211.

Huntington, Henry P., Sarah A. Kruse, and Astrid J. Scholz. 2009. "Demographic and Environmental Conditions Are Uncoupled in the Social-Ecological System of the Pribilof Islands." *Polar Research* 28 (1): 119–28. https://doi.org/10.1111/j.1751-8369.2009.00096.x.

Immediate Action Workgroup. 2008. "Recommendations Report to the Governor's Subcabinet on Climate Change."

Indian Law and Order Commission. 2015. "A Roadmap For Making Native America Safer - Report To The President And Congress Of The United States." http://www.aisc.ucla.edu/iloc/report/.

Innes, J.E., J. Gruber, M. Neuman, and R. Thompson. 2011. "Coordinating Growth and Environmental Management through Consensus Building." CPS Report: A Policy Research Program Report. Berkeley: California Policy Seminar, University of California.

Innes, Judith E., and David E. Booher. 2003. "The Impact of Collaborative Planning on Governance Capacity." *Institute of Urban & Regional Development*, April. http://escholarship.org/uc/item/98k72547.

Innovative Solutions. 2011. "Ahtna Planning Conference Report."

Jacobs, Melanie B., and Jeffery J. Brooks. 2011. "Alaska Native Peoples and Conservation Planning: A Recipe for Meaningful Participation." *Native Studies Review* 20 (2): 91–135.

Jewell, Sally. 2016. *Order No. 3342, Identifying Opportunities for Cooperative and Collaborative Partnerships with Federally Recognized Indian Tribes in the Management of Federal Lands and Resources*. https://www.doi.gov/sites/doi.gov/files/uploads/so3342_partnerships.pdf.

Johnson, Terry, and Glenn Gray. 2014. "Shaktoolik, Alaska: Climate Change, Adaptation for an At-Risk Community Adaptation Plan."

Johnston, E. W., D. Hicks, N. Nan, and J. C. Auer. 2011. “Managing the Inclusion Process in Collaborative Governance.” *Journal of Public Administration Research and Theory* 21 (4): 699–721. https://doi.org/10.1093/jopart/muq045.

Jojola, Ted. 2008. “Indigenous Planning--an Emerging Context.(Report).” *Canadian Journal of Urban Research* 17 (1): 37.

Joly, Julie Lurman. 2010. “National Wildlife Refuges and Intensive Management in Alaska: Another Case for Preemption.” *Alaska L. Rev.* 27: 27.

Jones, R. N., A. Patwardhan, S. J. Cohen, S. Dessai, A. Lammel, R. J. Lempert, M. M. Q. Mirza, and H. von Storch. 2014. “Foundations for Decision Making.” In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, et al., 195–228. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Jos, Philip H., and Annette Watson. 2016. “Privileging Knowledge Claims in Collaborative Regulatory Management An Ethnography of Marginalization.” *Administration & Society*, 0095399715623316.

Kaswan, Alice. 2014. “Climate Adaptation and Land Use Governance: The Vertical Axis.” *Columbia Journal of Environmental Law* 39 (March): 390–476.

Kawakami, Alice J., Kanani Aton, Fiona Cram, Morris K. Lai, and Laurie Porima. 2008. “Improving the Practice of Evaluation Through Indigenous Values and Methods: Decolonizing Evaluation Practice—Returning the Gaze From Hawaiÿi and Aotearoa.” In *Fundamental Issues in Evaluation*, 319–48. New York: Guilford Press.

Kerlinger, Fred N. 1986. *Foundations of Behavioral Research*. 3rd ed.. New York: Holt, Rinehart and Winston.

Kettle, Nathan, Jacob Martin, and Michael Sloan. 2017. “Nome Tribal Climate Adaptation Plan.”

Kettle, Nathan P., and Kirstin Dow. 2014. “The Role of Perceived Risk, Uncertainty, and Trust on Coastal Climate Change Adaptation Planning.” *Environment and Behavior*, 0013916514551049.

Kimmel, Mara. 2014. “Fate Control and Human Rights: The Policies and Practices of Local Governance in America’s Arctic.” *Alaska L. Rev.* 31: 179.

King, Mary Ann. 2007. “Co-Management or Contracting? Agreements between Native American Tribes and the U.S. National Park Service Pursuant to the 1994 Tribal Self-Government Act.” *Harvard Environmental Law Review* 31 (2): 475–530.

Klein, Klein, Richard J. T., Guy F. Midgley, and Benjamin L. Preston. 2014. “Adaptation Opportunities, Constraints, and Limits.” In *Climate Change 2014 Impacts, Adaptation, and Vulnerability Working Group II Contribution to the IPCC Fifth Assessment Report, Global and Sectoral Aspects*, 1:899–944. Cambridge University Press. http://dx.doi.org/10.1017/CBO9781107415379.021.

Knapp, Corrine N., F. Stuart Chapin III, Gary P. Kofinas, Nancy Fresco, Courtney Carothers, and Amy Craver. 2014. “Parks, People, and Change: The Importance of Multistakeholder Engagement in Adaptation Planning for Conserved Areas.” *Ecology and Society* 19 (4): 16.

Knodel, Marissa. 2014. “Conceptualizing Climate Justice in Kivalina.” *Seattle University Law Review* 37: 1179–1209.

Kofinas, Gary P. 2009. “Adaptive Co-Management in Social–Ecological Governance.” In *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World*, edited by F. Stuart Chapin III, Carl Folke, and Gary P. Kofinas, 2009 edition, 77–101. New York: Springer.

Kofinas, Gary P., F. Stuart Chapin, Shauna BurnSilver, Jennifer I. Schmidt, Nancy L. Fresco, Knut Kielland, Stephanie Martin, Anna Springsteen, and T. Scott Rupp. 2010. “Resilience of Athabascan Subsistence Systems to Interior Alaska’s Changing Climate.” *Canadian Journal of Forest Research* 40 (7): 1347–1359.

Kofinas, Gary P., and F. Stuart Chapin III. 2009. “Sustaining Livelihoods and Human Well-Being during Social-Ecological Change.” In *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World*, edited by F. Stuart Chapin III, Gary P. Kofinas, and Carl Folke, 2009 edition, 55–75. New York: Springer.

Kronk Warner, Elizabeth Ann, and Randall S. Abate. 2013. “International and Domestic Law Dimensions of Climate Justice for Arctic Indigenous Peoples.” *Ottawa Law Review* 43 (113). http://papers.ssrn.com/sol3/Papers.cfm?abstract_id=2389821.

Kruse, Jack, Dave Klein, Steve Braund, Lisa Moorehead, and Bill Simeone. 1998. “Co-Management of Natural Resources: A Comparison of Two Caribou Management Systems.” *Human Organization* 57 (4): 447–58. https://doi.org/10.17730/humo.57.4.q5825utw35841p11.

La Belle, Jim. 2006. “Boarding School: Historical Trauma Among Alaska’s Native People.” National Resource Center for American Indian, Alaska Native, and Native Hawaiian Elders.

Lane, Marcus B. 2003. “Participation, Decentralization, and Civil Society: Indigenous Rights and Democracy in Environmental Planning.” *Journal of Planning Education and Research* 22 (4): 360–73. https://doi.org/10.1177/0739456X03022004003.

———. 2006. “The Role of Planning in Achieving Indigenous Land Justice and Community Goals.” *Land Use Policy* 23 (4): 385–94. https://doi.org/10.1016/j.landusepol.2005.05.001.

Langlois, Krista. 2014. “Feds and State Officials Square off on Alaska Hunting Regulations.” *High Country News*, April 1, 2014. http://www.hcn.org/blogs/goat/federal-and-state-officials-square-off-on-alaska-hunting-regs.

Lazarus, Richard J. 2009. “Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future.” *Cornell L. Rev.* 94: 1153–1234.

LeMay Engineering. 2015a. “City of Shaktoolik/Shaktoolik Tribal Council, Alaska, Multi-Jurisdictional Hazard Mitigation Plan.”

———. 2015b. “City of Shishmaref, Alaska Local Hazard Mitigation Plan.”

Lemieux, Christopher J., Jessica L. Thompson, Jackie Dawson, and Rudy M. Schuster. 2012. “Natural Resource Manager Perceptions of Agency Performance on Climate Change.” *Journal of Environmental Management* 114: 178–189. https://doi.org/10.1016/j.jenvman.2012.09.014.

Leonard, Damien. 2009. “Raising the Levee: Dutch Land Use Law as a Model for U.S. Adaptation to Climate Change.” *Georgetown International Environmental Law Review* 21: 543.

Lindsay, Bruce R. 2014. “FEMA’s Disaster Relief Fund: Overview and Selected Issues.” Congressional Research Service. https://www.fas.org/sgp/crs/homesec/R43537.pdf.

Loring, Philip A., Craig Gerlach, David E. Atkinson, and Maribeth S. Murray. 2011. "Ways to Help and Ways to Hinder: Governance for Effective Adaptation to an Uncertain Climate." *Arctic*, 73–88.

Loring, Philip A., and S. C. Gerlach. 2009. "Food, Culture, and Human Health in Alaska: An Integrative Health Approach to Food Security." *Environmental Science & Policy*, Special Issue: Food Security and Environmental Change, 12 (4): 466–78. https://doi.org/10.1016/j.envsci.2008.10.006.

Loring, Philip A., and S. Craig Gerlach. 2010. "Outpost Gardening in Interior Alaska: Food System Innovation and the Alaska Native Gardens of the 1930s through the 1970s." *Ethnohistory* 57 (2): 183–200. https://doi.org/10.1215/00141801-2009-060.

Loring, Philip A., S. Craig Gerlach, and Henry J. Penn. 2016. "'Community Work' in a Climate of Adaptation: Responding to Change in Rural Alaska." *Human Ecology* 44 (1): 119–28. https://doi.org/10.1007/s10745-015-9800-y.

Lubell, Mark. 2005. "Do Watershed Partnerships Enhance Beliefs Condusive to Collective Action?" In *Swimming Upstream: Collaborative Approaches to Watershed Management*, edited by Paul A. Sabatier, Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, 201–32. Cambridge, Mass: The MIT Press.

Lubell, Mark, Paul A. Sabatier, Arnold Vedlitz, Will Focht, Zev Trachtenberg, and Marty Matlock. 2005. "Conclusions and Recommendations." In *Swimming Upstream: Collaborative Approaches to Watershed Management*, edited by Paul A. Sabatier, Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, 261–96. Cambridge, Mass: The MIT Press.

Lurman, Julie, and Sanford P. Rabinowitch. 2007. "Preemption of State Wildlife Law in Alaska: Where, When, and Why." *Alaska L. Rev.* 24: 145.

Lyles, Lindsey Ward, Philip Berke, and Gavin Smith. 2014. "Do Planners Matter? Examining Factors Driving Incorporation of Land Use Approaches into Hazard Mitigation Plans." *Journal of Environmental Planning and Management* 57 (5): 792–811. https://doi.org/10.1080/09640568.2013.768973.

Lyles, Ward, Philip Berke, and Gavin Smith. 2014. "A Comparison of Local Hazard Mitigation Plan Quality in Six States, USA." *Landscape and Urban Planning* 122 (February): 89–99. https://doi.org/10.1016/j.landurbplan.2013.11.010.

Lynch, Amanda H., and Ronald D. Brunner. 2007. "Context and Climate Change: An Integrated Assessment for Barrow, Alaska." *Climatic Change* 82 (1–2): 93–111. https://doi.org/10.1007/s10584-006-9165-8.

Mack, Natasha, Cynthia Woodsong, Kathleen MacQueen, Greg Guest, and Emily Namey. 2005. *Qualitative Research Methods, A Data Collector's Field Guide*. Family Health International.

Magdanz, Jim. 2016. "Review of Paper on Subsistence Laws," July 6, 2016.

Maldonado, Julie Koppel. 2014. "Facing the Rising Tide: Co-Occurring Disasters, Displacement, and Adaptation in Coastal Louisiana's Tribal Communities." American University.

Maldonado, Julie Koppel, Christine Shearer, Robin Bronen, Kristina Peterson, and Heather Lazrus. 2013. "The Impact of Climate Change on Tribal Communities in the US: Displacement, Relocation, and Human Rights." *Climatic Change* 120 (3): 601–14. https://doi.org/10.1007/s10584-013-0746-z.

Mannell, Laura, Frank Palermo, and Crispin Smith. 2013. "Community-Based and Comprehensive: Reflections on Planning and Action in First Nations." In *Reclaiming*

Indigenous Planning, edited by Ryan Walker, Theodore S Jojola, and David C. Natcher, 113–40. McGill-Queen's Native and Northern Series ; 70. Montreal: McGill-Queen's University Press. http://hccproxy.lib.hawaii.edu:2048/login?url=http://site.ebrary.com/lib/honcclib/Doc?id=10740369.

Margerum, Richard D. 2008. "A Typology of Collaboration Efforts in Environmental Management." *Environmental Management* 41 (4): 487–500. https://doi.org/10.1007/s00267-008-9067-9.

Marine Mammal Commission. 2008. "Review of Co-Management Efforts in Alaska." https://alaskafisheries.noaa.gov/sites/default/files/mmc_comgmtrev2008.pdf.

Marino, Elizabeth. 2012. "The Long History of Environmental Migration: Assessing Vulnerability Construction and Obstacles to Successful Relocation in Shishmaref, Alaska." *Global Environmental Change* 22 (2): 374–81. https://doi.org/10.1016/j.gloenvcha.2011.09.016.

Martin, Robert J. 2012. "Village of Kivalina Is Falling into the Sea: Should CERCLA Section 9626 (B) Be Available to Move the Village from Harm's Way, The." *Earth Jurisprudence & Envtl. Just. J.* 2: 1.

Matunga, Hirini. 2013. "Theorizing Indigenous Planning." In *Reclaiming Indigenous Planning*, edited by Ryan Walker, Theodore S Jojola, and David C. Natcher, 3–34. McGill-Queen's Native and Northern Series ; 70. Montreal: McGill-Queen's University Press. http://hccproxy.lib.hawaii.edu:2048/login?url=http://site.ebrary.com/lib/honcclib/Doc?id=10740369.

McCarthy, Francis X. 2010. "FEMA's Disaster Declaration Process: A Primer."

McDonald, Jan. 2011. "The Role of Law in Adapting to Climate Change." *Wiley Interdisciplinary Reviews: Climate Change* 2 (2): 283–95. https://doi.org/10.1002/wcc.96.

McDowell Group, Inc. 2014. "The Role of the Oil and Gas Industry in Alaska's Economy." http://www.aoga.org/sites/default/files/news/aoga_final_report_5_28_14_0.pdf.

McGee, Jack B. 2010. "Subsistence Hunting and Fishing in Alaska: Does ANILCA's Rural Subsistence Priority Really Conflict with the Alaska Constitution." *Alaska L. Rev.* 27: 221.

McGregor, Deborah. 2013. "Representing and Mapping Traditional Knowledge in Ontorio Forest Management Planning." In *Reclaiming Indigenous Planning*, edited by Ryan Walker, Theodore S Jojola, and David C. Natcher, 414–35. McGill-Queen's Native and Northern Series ; 70. Montreal: McGill-Queen's University Press. http://hccproxy.lib.hawaii.edu:2048/login?url=http://site.ebrary.com/lib/honcclib/Doc?id=10740369.

McNeeley, Shannon M. 2012. "Examining Barriers and Opportunities for Sustainable Adaptation to Climate Change in Interior Alaska." *Climatic Change* 111 (3–4): 835–57. https://doi.org/10.1007/s10584-011-0158-x.

McNeeley, Shannon Michele. 2009. "Seasons out of Balance: Climate Change Impacts, Vulnerability, and Sustainable Adaptation in Interior Alaska." University of Alaska Fairbanks. http://www.cakex.org/sites/default/files/project/documents/McNeeley_Dissertation_2009.pdf.

Meek, Chanda L., Amy Lauren Lovecraft, Martin D. Robards, and Gary P. Kofinas. 2008. "Building Resilience through Interlocal Relations: Case Studies of Polar Bear and Walrus Management in the Bering Strait." *Marine Policy* 32 (6): 1080–1089. https://doi.org/10.1016/j.marpol.2008.03.003.

Meerow, Sara, and Carrie L. Mitchell. 2017. "Weathering the Storm: The Politics of Urban Climate Change Adaptation Planning." *Environment and Planning A* 49 (11): 2619–27. https://doi.org/10.1177/0308518X17735225.

Miles, Matthew B., and A. Michael Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook, 2nd Edition*. 2nd edition. Thousand Oaks: SAGE Publications, Inc.

Minerbi, Luciano. 2003. "Cultural Assessments and the Planning Process." American Planning Association.

Miraglia, Rita A. 1998. "Traditional Ecological Knowledge Handbook - Subsistence." Alaska Department of Fish and Game. www.subsistence.adfg.state.ak.us/techpap/rp97052b.pdf.

Moller, Henrik, Fikret Berkes, Philip O'Brian Lyver, and Mina Kislalioglu. 2004. "Combining Science and Traditional Ecological Knowledge: Monitoring Populations for Co-Management." *Ecology and Society* 9 (3): 2.

Moser, S. C., and J. A. Ekstrom. 2010. "A Framework to Diagnose Barriers to Climate Change Adaptation." *Proceedings of the National Academy of Sciences* 107 (51): 22026–31. https://doi.org/10.1073/pnas.1007887107.

Moser, Susanne C. 2009. *Good Morning, America! The Explosive U.S. Awakening to the Need for Adaptation*. Charleston, SC: NOAA Coastal Services Center.

———. 2013. "Navigating the Political and Emotional Terrain of Adaptation: Community Engagement When Climate Change Comes Home." In *Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World*, edited by Susanne C. Moser and Max T. Boycoff, 289–305. London: Routledge.

Moser, Susanne C., Joyce Coffee, and Aleka Seville. 2017. "Rising to the Challenge, Together."

Moser, Susanne C., S. Jeffress Williams, and Donald F. Boesch. 2012. "Wicked Challenges at Land's End: Managing Coastal Vulnerability Under Climate Change." *Annual Review of Environment and Resources* 37 (1): 51–78. https://doi.org/10.1146/annurev-environ-021611-135158.

Munaretto, Stefania, and Judith E. M. Klostermann. 2011. "Assessing Adaptive Capacity of Institutions to Climate Change: A Comparative Case Study of the Dutch Wadden Sea and the Venice Lagoon." *Climate Law* 2 (2): 219–50. https://doi.org/10.3233/CL-2011-035.

Munck af Rosenschöld, Johan, Jaap G. Rozema, and Laura Alex Frye-Levine. 2014. "Institutional Inertia and Climate Change: A Review of the New Institutionalist Literature." *Wiley Interdisciplinary Reviews: Climate Change* 5 (5): 639–48. https://doi.org/10.1002/wcc.292.

Murray, Emily, Hal Shepherd, and Jessica Ryan. 2013. "Climate Adaptation and Action Plan for the Norton Bay Watershed, Alaska."

Nakashima, D. J, United Nations University, Traditional Knowledge Initiative, and Unesco. 2012. *Weathering Uncertainity: Traditional Knowledge for Climate Change Assessment and Adaptation*. Paris; Darwin: UNESCO ; UNU-IAS.

Napier, Victoria R., George M. Branch, and Jean M. Harris. 2005. "Evaluating Conditions for Successful Co-Management of Subsistence Fisheries in KwaZulu-Natal, South Africa." *Environmental Conservation* 32 (02): 165. https://doi.org/10.1017/S0376892905002195.

Napoleon, Harold. 2014. “Alaska Natives: Still a People in Peril.” *Alaska Dispatch*, October 18, 2014. http://www.adn.com/article/20141018/alaska-natives-still-people-peril.

National Park Service. 2018. “Alaska; Hunting and Trapping in National Preserves, A Proposed Rule, 83 Fed. Reg. 23621.” https://www.federalregister.gov/documents/2018/05/22/2018-10735/alaska-hunting-and-trapping-in-national-preserves.

Nelson, Donald R., W. Neil Adger, and Katrina Brown. 2007. “Adaptation to Environmental Change: Contributions of a Resilience Framework.” *Annual Review of Environment and Resources* 32 (1): 395–419. https://doi.org/10.1146/annurev.energy.32.051807.090348.

Nelson, R., P. Kokic, S. Crimp, P. Martin, H. Meinke, S.M. Howden, P. de Voil, and U. Nidumolu. 2010. “The Vulnerability of Australian Rural Communities to Climate Variability and Change: Part II—Integrating Impacts with Adaptive Capacity.” *Environmental Science & Policy* 13 (1): 18–27. https://doi.org/10.1016/j.envsci.2009.09.007.

Nilsson, Annika E., Lena Maria Nilsson, Allyson Quinlan, and Birgitta Evengård. 2013. “Food Security in the Arctic: Preliminary Reflections from a Resilience Perspective.” http://www.sei-international.org/mediamanager/documents/Publications/ArcticResilienceInterimReport2013-LowRes.pdf.

Nilsson, Annika, Grete Hovelsrud, Helene Amundsen, Tahnee Prior, and Martin Sommerkorn. 2016. “Building Capacity to Adapt to and Shape Change.” In *Arctic Resilience Report,* edited by M Carson and G Peterson, 164–79. Stockholm: tockholm Environment Institute and Stockholm Resilience Centre.

NOAA. 2013. “Cooperative Agreement between the National Oceanic and Atmospheric Administration and the Alaska Eskimo Whaling Commission.” https://alaskafisheries.noaa.gov/sites/default/files/aewc2013.pdf.

NOAA Fisheries. 2013. “Final Environment Impact Statement for Issuing Annual Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2013 Through 2018.” /resource/document/final-environment-impact-statement-issuing-annual-quotas-alaska-eskimo.

———. 2016. “Alaska Subsistence Halibut Program: Frequently Asked Questions.” May 2, 2016. https://alaskafisheries.noaa.gov/fisheries/sharc-faq.

Noble, Ian, and Saleemul Huq. 2014. “Adaptation Needs and Options.” In *Climate Change 2014 Impacts, Adaptation, and Vulnerability Working Group II Contribution to the IPCC Fifth Assessment Report, Global and Sectoral Aspects*, 1:833–68. Cambridge University Press. http://dx.doi.org/10.1017/CBO9781107415379.019.

Norris, Fran, Susan Stevens, Betty Pfefferbaum, Karen Wyche, and Rose Pfefferbaum. 2008. “Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness.” *American Journal of Community Psychology* 41 (1): 127–150. https://doi.org/10.1007/s10464-007-9156-6.

Nuttall, Mark, Fikret Berkes, Bruce Forbes, Gary Kofinas, Tatiana Vlassova, and George Wenzel. 2005. “Hunting, Herding, Fishing and Gathering: Indigenous Peoples and Renewable Resource Use in the Arctic.” *Arctic Climate Impact Assessment*, 649–690.

Obama, Barak. 2009. *Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance*.

———. 2013. *Executive Order 13653, Preparing the United States for the Impacts of Climate Change*.

———. 2015. *Executive Order 13,689, Enhancing Coordination of National Efforts in the Arctic*. https://obamawhitehouse.archives.gov/the-press-office/2015/01/21/executive-order-enhancing-coordination-national-efforts-arctic.
———. 2016. *Executive Order 13,754, Northern Bering Sea Climate Resilience*.
Olsson, Per, Carl Folke, and Fikret Berkes. 2004. "Adaptive Comanagement for Building Resilience in Social?Ecological Systems." *Environmental Management* 34 (1). https://doi.org/10.1007/s00267-003-0101-7.
Osberghaus, Daniel, Astrid Dannenberg, Tim Mennel, and Bodo Sturm. 2010. "The Role of the Government in Adaptation to Climate Change." *Environment and Planning C: Government and Policy* 28 (5): 834–50. https://doi.org/10.1068/c09179j.
Ostrom, Elinor. 2000. "Collective Action and the Evolution of Social Norms." *Journal of Economic Perspectives* 14 (3): 137–58.
———. 2004. "Collective Action and Property Rights for Sustainable Development." *Understanding Collective Action* 2020. http://www.unigaia-brasil.org/pdfs/Resiliencia/focus11_02.pdf.
Ostrom, Elinor. 2005a. *Understanding Institutional Diversity*. Princeton Paperbacks. Princeton: Princeton University Press.
Ostrom, Elinor. 2005b. *Understanding Institutional Diversity*. Princeton: Princeton University Press.
Ostrom, Elinor, and T. K. Ahn. 2003. *Foundations of Social Capital*. Cheltenham, UK; Northhampton, MA: Edward Elgar Pub.
Ostrom, Elinor, Joanna Burger, Christopher B. Field, Richard B. Norgaard, and David Policansky. 1999. "Revisiting the Commons: Local Lessons, Global Challenges." *Science* 284 (5412): 278–82. https://doi.org/10.1126/science.284.5412.278.
Paavola, Jouni, and W. Neil Adger. 2006. "Fair Adaptation to Climate Change." *Ecological Economics* 56 (4): 594–609. https://doi.org/10.1016/j.ecolecon.2005.03.015.
Palin, Sarah. 2007. *Administrative Order 238*. https://gov.alaska.gov/admin-orders/238.html.
Pathmanandakumar, Vyddiyaratnam. 2017. "The Effectiveness of Co-Management Practices: The Case of Small-Scale Fisheries in Sri Lanka." *Journal of Aquaculture Research & Development* 8 (9): 1–5. https://doi.org/10.4172/2155-9546.1000509.
Patton, Michael Quinn. 2001. *Qualitative Research & Evaluation Methods*. 3rd edition. Thousand Oaks, Calif.: SAGE Publications, Inc.
Pearce, Tristan, James D. Ford, Amanda Caron, and Bill Patrick Kudlak. 2012. "Climate Change Adaptation Planning in Remote, Resource-Dependent Communities: An Arctic Example." *Regional Environmental Change* 12 (4): 825–37. https://doi.org/10.1007/s10113-012-0297-2.
Pearce, Tristan, James Ford, Ashlee Cunsolo Willox, and Barry Smit. 2015. "Inuit Traditional Ecological Knowledge (TEK), Subsistence Hunting and Adaptation to Climate Change in the Canadian Arctic." *Arctic* 68 (2): 233–245. https://doi.org/10.14430/arctic4475.
Peel, Jacqueline, Lee Godden, and Rodney J. Keenan. 2011. "Climate Change Law and Governance from the 'Bottom up': Introduction to the Special Issue." *Climate Law* 2 (4): 459–468.
Peter, Albert, and Doug Urquhart. 1996. "Co-Management of the Porcupine Caribou Herd." *Rangifer* 16 (4): 272–276. https://doi.org/10.7557/2.16.4.1255.

Pinkerton, Evelyn. 1992. “Translating Legal Rights into Management Practice: Overcoming Barriers to the Exercise of Co-Management.” *Human Organization* 51 (4): 330–41. https://doi.org/10.17730/humo.51.4.v0127327j24u378r.

———. 2009. “Coastal Marine Systems: Conserving Fish and Sustaining Community Livelihoods with Co-Management.” In *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World*, edited by F. Stuart Chapin III, Carl Folke, and Gary P. Kofinas, 2009 edition, 241–57. New York: Springer.

Porter, Libby. 2010. *Unlearning the Colonial Cultures of Planning*. Farnham, Surrey ; Burlington, VT: Ashgate PubCo.

Pratt, Kenneth L., Joan C. Stevenson, and Phillip M. Everson. 2013. “Demographic adversities and Indigenous resilience in Western Alaska.” *Études/Inuit/Studies* 37 (1): 35. https://doi.org/10.7202/1025253ar.

Putnam, Robert D., and Kristin A. Goss. 2002. “Introduction.” In *Democracies in Flux the Evolution of Social Capital in Contemporary Society*, edited by Robert D. Putnam, 3–19. Oxford ; New York: Oxford University Press.

Quay, Ray. 2010. “Anticipatory Governance: A Tool for Climate Change Adaptation.” *Journal of the American Planning Association* 76 (4): 496–511. https://doi.org/10.1080/01944363.2010.508428.

Reeves, Andrew. 2011. “Political Disaster: Unilateral Powers, Electoral Incentives, and Presidential Disaster Declarations [1].” *The Journal of Politics* 73 (4): 1142–51. https://doi.org/10.1017/S0022381611000843.

Reid, Catherine, and Lawrence Salmen. 2002. “Qualitative Analysis of Social Capital: The Case of Agricuiturai Extension in Mali.” In *Understanding and Measuring Social Capital: A Multi-Disciplinary Tool for Practitioners*, edited by Christiaan Grootaert and Thierry van Bastelaer, 85–107. Washington, D.C: World Bank Publications.

Reid, Michael G., Colleen Hamilton, Sarah K. Reid, William Trousdale, Cam Hill, Nancy Turner, Chris R. Picard, Cassandra Lamontagne, and H. Damon Matthews. 2014. “Indigenous Climate Change Adaptation Planning Using a Values-Focused Approach: A Case Study with the Gitga’at Nation.” *Journal of Ethnobiology* 34 (3): 401–424. https://doi.org/10.2993/0278-0771-34.3.401.

Reyes-García, Victoria, and Aili Pyhälä. 2016. *Hunter-Gatherers in a Changing World*. Springer.

Richardson, Benjamin J. 2012. “Local Climate Change Law, Introduction.” In *Local Climate Change Law : Environmental Regulation in Cities and Other Localities*, edited by Benjamin J. Richardson, 3–28. IUCN Academy of Environmental Law Series. Cheltenham ; Northampton, MA: Edward Elgar.

Richmond, Laurie. 2013. “Incorporating Indigenous Rights and Environmental Justice into Fishery Management: Comparing Policy Challenges and Potentials from Alaska and Hawai‘i.” *Environmental Management* 52 (5): 1071–84. https://doi.org/10.1007/s00267-013-0021-0.

Ristroph, E. Barrett. 2010. “Alaska Tribes’ Melting Subsistence Rights.” *Ariz. J. Envtl. L. & Pol’y* 1: 47.

———. 2012. “Integrating Community Knowledge into Environmental and Natural Resource Decision-Making: Notes from Alaska and Around the World.” *Washington and Lee Journal of Energy, Climate, and the Environment* 3 (1): 81.

———. 2016. “Strategies for Strengthening Alaska Native Village Roles in Natural Resource Management.” *Willamette Environmental Law Journal* 4.
———. 2017a. “Presenting a Picture of Alaska Native Village Adaptation: A Method of Analysis.” *Sociology and Anthropology* 5 (9): 762–75. https://doi.org/10.13189/sa.2017.050908.
———. 2017b. “When Climate Takes a Village: Legal Pathways toward the Relocation of Alaska Native Villages.” *Climate Law* 7 (4): 259–89. https://doi.org/10.1163/18786561-00704003.
Ritchie, Liesel Ashley. 2012. “Individual Stress, Collective Trauma, and Social Capital in the Wake of the Exxon Valdez Oil Spill.” *Sociological Inquiry* 82 (2): 187–211. https://doi.org/10.1111/j.1475-682X.2012.00416.x.
Ritchie, Liesel Ashley, and Duane A. Gill. 2010. “Fostering Resiliency in Renewable Resource Communities Subsistence Lifescapes and Social Capital.” In *How Ethnically Marginalized Americans Cope with Catastrophic Disasters*, edited by Jason D Rivera and DeMond S Miller, 51–82. The Edwin Mellen Press. http://www.ebooks.com/1047222/how-ethnically-marginalized-americans-cope-with-catastrophic-disasters/rivera-jason-d-ed--miller-demond-s-ed/.
Rittel, Horst, and Melvin Weber. 1973. “Dilemmas in a General Theory of Planning.” *Policy Sciences* 4: 155–69.
Rosales, Jon, and Jessica Chapman. 2015. “Perceptions of Obvious and Disruptive Climate Change: Community-Based Risk Assessment for Two Native Villages in Alaska.” *Climate* 3 (4): 812–32. https://doi.org/10.3390/cli3040812.
Ruhl, J. B. 2011. “General Design Principles for Resilience and Adaptive Capacity in Legal Systems: Applications to Climate Change Adaptation Law.” *North Carolina Law Review* 89: 1373–1401.
Rural Alaska Mitigation Planning. 2007. “The City of McGrath, Alaska Flood & All-Hazards Mitigation Plan.”
Ryan, Gery W., and H. Russell Bernard. 2000. “Data Management and Analysis Methods.” In *Handbook of Qualitative Research*, edited by Norman K. Denzin and Yvonna S. Lincoln, 2nd edition, 769–802. Thousand Oaks, Calif: SAGE Publications, Inc.
Sabatier, Paul A., Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock. 2005. “Collaborative Approaches to Watershed Management.” In *Swimming Upstream: Collaborative Approaches to Watershed Management*, edited by Paul A. Sabatier, Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, 4–21. Cambridge, Mass: The MIT Press.
Sabatier, Paul A., Chris Weible, and Jared Ficker. 2005. “Eras of Water Management in the United States: Implications for Collaborative Watershed Approaches.” In *Swimming Upstream: Collaborative Approaches to Watershed Management*, edited by Paul A. Sabatier, Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, 23–52. Cambridge, Mass: The MIT Press.
Saenz Quitian, Alejandra, and Gloria Amparo Rodríguez. 2016. “Guidelines for Inclusion: Ensuring Indigenous Peoples’ Involvement in Water Planning Processes across South Eastern Australia.” *Journal of Hydrology* 542 (November): 828–35. https://doi.org/10.1016/j.jhydrol.2016.09.050.

Sager, Tore. 2009. “Responsibilities of Theorists: The Case of Communicative Planning Theory.” *Progress in Planning* 72 (1): 1–51. https://doi.org/10.1016/j.progress.2009.03.002.
Sandercock, Leonie. 2004a. “Commentary: Indigenous Planning and the Burden of Colonialism.” *Planning Theory & Practice* 5 (1): 118–124. https://doi.org/10.1080/1464935042000204240.
———. 2004b. “Interface, Planning and Indigenous Communities.” *Planning Theory & Practice* 5 (1): 95–124. https://doi.org/10.1080/1464935042000185080.
Schmidt, Charles W. 2009. “Beyond Mitigation: Planning for Climate Change Adaptation.” *Environmental Health Perspectives* 117 (7): A306–9.
Scott, Jessica. 2014. “Move of Wait for the Flood and Die: Protection of Environmentally Displaced Populations through a New Relocation Law.” *Fla. A&M U. L. Rev.* 9: 369–91.
Serrao-Neumann, Silvia, Ben P. Harman, and Darryl Low Choy. 2013. “The Role of Anticipatory Governance in Local Climate Adaptation: Observations from Australia.” *Planning Practice and Research* 28 (4): 440–63. https://doi.org/10.1080/02697459.2013.795788.
Shishmaref Erosion and Relocation Coalition. 2002. “Shishmaref Relocation Strategic Plan.”
Silverman, David. 2000. “Analyzing Talk and Text.” In *Handbook of Qualitative Research*, edited by Norman K. Denzin and Yvonna S. Lincoln, 2nd edition, 821–35. Thousand Oaks, Calif: SAGE Publications, Inc.
Smit, Barry, and Johanna Wandel. 2006. “Adaptation, Adaptive Capacity and Vulnerability.” *Global Environmental Change* 16 (3): 282–92. https://doi.org/10.1016/j.gloenvcha.2006.03.008.
Smith, Gavin. 2014. “Involving Land Use Planners in Pre-Event Planning for Post-Disaster Recovery.” *Journal of the American Planning Association* 80 (4): 306–307. https://doi.org/10.1080/01944363.2014.990789.
Smith, Linda Tuhiwai. 2012. *Decolonizing Methodologies: Research and Indigenous Peoples*. 2 edition. London: Zed Books.
Smyth, Dermot, Jackie Gould, Margaret Ayre, Ellie Bock, Melanie Dulfer-Hyams, and Tanya Vernes. 2016. “Indigenous-Driven Co-Governance of Sea Country through Collaborative Planning and Indigenous Protected Areas.” *Indigenous Law Bulletin* 8 (26): 15–20.
Snover, A.K., L. Whitely Binder, J. Lopez, E. Willmott, J. Kay, D. Howell, and J. Simmonds. 2007. “Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments.” Oakland, CA: ICLEI – Local Governments for Sustainability.
Spaeder, Joseph J. 2005. “Co-Management in a Landscape of Resistance: The Political Ecology of Wildlife Management in Western Alaska.” *Anthropologica* 47 (2): 165–178.
Spangler, George R. 2011. “Closing the Circle: Restoring the Seasonal Round to the Ceded Territories.” In *Minwaajimo = Telling a Good Story: Preserving Ojibwe Treaty Rights for the Past 25 Years : [Proceedings]*, edited by LaTisha A McRoy and Howard J Bichler. [United States]: Great Lakes Indian Fish & Wildlife Commission.
Spraker, Ted. 2016. “Findings of the Alaska Board of Game 2016-215, Wolf Management Policy.” http://www.adfg.alaska.gov/static/regulations/regprocess/gameboard/pdfs/findings/16215.pdf.

Stake, Robert E. 2000. “Case Studies.” In *Handbook of Qualitative Research*, edited by Norman K. Denzin and Yvonna S. Lincoln, 2nd edition, 435–54. Thousand Oaks, Calif: SAGE Publications, Inc.

Starkey, John Sky. 2016. “Protection of Alaska Native Customary and Traditional Hunting and Fishing Rights through Title VIII OF ANILCA.(Alaska National Interest Lands Conservation Act).” *Alaska Law Review* 33 (2): 315.

Stevenson, Kalb T., Lilian Alessa, Andrew D. Kliskey, Heidi B. Rader, Alberto Pantoja, and Mark Clark. 2014. “Sustainable Agriculture for Alaska and the Circumpolar North: Part I. Development and Status of Northern Agriculture and Food Security.” *Arctic* 67 (3): 271–95. https://doi.org/10.14430/arctic4402.

Stewart, Brooke C., Kenneth E. Kunkel, Laura E. Stevens, Sun Liqiang, and John Walsh. 2013. “Regional Climate Trends and Scenarios for the U.S. National Climate Assessment, Part 7, Climate of Alaska.” NOAA Technical Report NEDIS 142-7. http://www. nesdis.noaa.gov/technical_reports/NOAA_NESDIS_Tech_ Report_142-7-Climate_of_Alaska.pdf.

Stoyanova, Irina L. 2013. “The Saami Facing the Impacts of Global Climate Change.” In *Climate Change and Indigenous Peoples: The Search for Legal Remedies*, edited by Randall S. Abate and Elizabeth Ann Kronk Warner, 287–312. Edward Elgar Pub. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2213506.

Strong, Miranda. 2013. “Alaska National Interest Lands Conservation Act Compliance & Nonsubsistence Areas: How Can Alaska Thaw out Rural & Alaska Native Subsistence Rights.” *Alaska L. Rev.* 30: 71.

Stults, Missy. 2017. “Integrating Climate Change into Hazard Mitigation Planning: Opportunities and Examples in Practice.” *Climate Risk Management* 17: 21–34. https://doi.org/10.1016/j.crm.2017.06.004.

Susskind, Lawrence. 2010. “Policy & Practice: Responding to the Risks Posed by Climate Change: Cities Have No Choice but to Adapt.” *Town Planning Review* 81 (3): 217–35. https://doi.org/10.3828/tpr.2010.5.

Sussman, Edna. 2009. “Case Study: Climate Change Adaptation Planning Guidance for Local Governments in the United States.” *Sustainable Development Law & Policy* 9 (2): 11.

Tanana Chiefs Conference. 2016. “Fort Yukon Community Plan.”

The Arcturus Group. 1998. “Organized Village of Kwethluk Comprehensive Community Long Range Plan 1998-2003.”

The Economist. 2015. “Tales of Atlantis,” September 3, 2015.

Theriault, Sophie. 2012. “Indigenous Peoples and Climate Change Policies: A Comparative Assessment of Indigenous Governance Models in Canada.” In *Local Climate Change Law : Environmental Regulation in Cities and Other Localities*, edited by Benjamin J. Richardson, 243–69. IUCN Academy of Environmental Law Series. Cheltenham ; Northampton, MA: Edward Elgar.

Theriault, Sophie, Ghislain Otis, Gerard Duhaime, and Christopher Furgal. 2005. “Legal Protection of Subsistence: A Prerequisite of Food Security for the Inuit of Alaska, The.” *Alaska L. Rev.* 22: 35.

Thomas, Clive S., Laura Savatgy, and Kristina Klimovich, eds. 2016. *Alaska Politics and Public Policy: The Dynamics of Beliefs, Institutions, Personalities, and Power*. New edition. Fairbanks, AK: University of Alaska Press.

Thompson, Benjamin W. 1999. “De Facto Termination of Alaska Native Sovereignty: An Anomaly in an Era of Self-Determination, The.” *American Indian Law Review* 24: 421–54.
Tongco, Maria Dolores C. 2007. “Purposive Sampling as a Tool for Informant Selection.” http://scholarspace.manoa.hawaii.edu/handle/10125/227.
Trainor, Sarah F., Monika Calef, David Natcher, F. Stuart Chapin, A. David McGuire, Orville Huntington, Paul Duffy, et al. 2009. “Vulnerability and Adaptation to Climate-Related Fire Impacts in Rural and Urban Interior Alaska.” *Polar Research* 28 (1): 100–118. https://doi.org/10.1111/j.1751-8369.2009.00101.x.
Trimble, Micaela, and Fikret Berkes. 2015. “Towards Adaptive Co-Management of Small-Scale Fisheries in Uruguay and Brazil: Lessons from Using Ostrom’s Design Principles.” *Maritime Studies* 14 (1). https://doi.org/10.1186/s40152-015-0032-y.
Trouwborst, Arie. 2013. “Climate Change Adaptation and Biodiversity Law.” In *Research Handbook on Climate Change Adaptation Law*, 298–324. Cheltenham, UK: Edward Elgar Pub.
Trump. 2017a. “Budget of the U. S. Government, Fiscal Year 2018.” Government Printing Office.
———. 2017b. *Executive Order 13783, Promoting Energy Independence and Economic Growth*.
———. 2018. “Budget of the U. S. Government, Fiscal Year 2019.” Government Printing Office. https://www.whitehouse.gov/wp-content/uploads/2018/02/budget-fy2019.pdf.
Turner, Nancy J., and Fikret Berkes. 2006. “Developing Resource Management and Conservation.” *Human Ecology* 34 (4): 475–78. https://doi.org/10.1007/s10745-006-9060-y.
University of Alaska Fairbanks. 2018. “Scenarios Network for Alaska + Arctic Planning | Exploring Our Future in a Changing Arctic.” 2018. https://www.snap.uaf.edu/.
URS. 2010a. “City of Allakaket Hazard Mitigation Plan.”
———. 2010b. “City of Ruby Hazard Mitigation Plan.”
———. 2012. “City of Angoon Hazard Mitigation Plan.”
———. 2013. “City of Teller Hazard Mitigation Plan.”
———. 2014. “City of Eagle and Native Village of Eagle Hazard Mitigation Plan.”
U.S. Forest Service, and U.S. Fish and Wildlife Service. 2007. “Final Rule, Subsistence Management Regulations for Public Lands in Alaska, Subpart C; Nonrural Determinations, 72 Fed. Reg. 25688.”
USFWS. 1982. “Master Memorandum of Understanding between the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service.” http://dnr.alaska.gov/commis/cacfa/documents/FOSDocuments/MasterMOUs/ADFG_USFWS_MMOU.PDF.
———. 2008. “Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Polar Bear (Ursus Maritimus) Throughout Its Range, 73 Fed. Reg. 28211.” https://www.gpo.gov/fdsys/granule/FR-2008-05-15/E8-11105.
———. 2013. “Endangered and Threatened Wildlife and Plants; Special Rule for the Polar Bear Under Section 4(d) of the Endangered Species Act, 78 Fed. Reg. 11766.” https://www.federalregister.gov/documents/2013/02/20/2013-03136/endangered-and-threatened-wildlife-and-plants-special-rule-for-the-polar-bear-under-section-4d-of.

Vaughan, Mehana Blaich, and Margaret R. Caldwell. 2015. “Hana Pa’a: Challenges and Lessons for Early Phases of Co-Management.” *Marine Policy* 62 (December): 51–62. https://doi.org/10.1016/j.marpol.2015.07.005.

Verschuuren, Jonathan. 2013. “Introduction.” In *Research Handbook on Climate Change Adaptation Law*, 1–15. Cheltenham, UK: Edward Elgar Pub.

Walker, Bill. 2017. *Administrative Order 289, Establishing a Climate Change Strategy*. https://gov.alaska.gov/wp-content/uploads/sites/5/Administrative-Order-289-Climate-Change-Strategy.pdf.

Walsh, John, Donald Wuebbles, Katharine Hayhoe, James Kossin, Kenneth Kunkel, Graeme Stephens, Peter Thorne, Russell Vose, Michael Wehner, and Josh Wilis. 2014. “Our Changing Climate.” *Climate Change Impacts in the United States: The Third National Climate Assessment*, 19–76.

Watson, Annette. 2013. “Misunderstanding the ‘Nature’ of Co-Management: A Geography of Regulatory Science and Indigenous Knowledges (IK).” *Environmental Management* 52 (5): 1085–1102. https://doi.org/10.1007/s00267-013-0111-z.

Weber, Edward P. 2011. “Getting to Resilience in a Climate-Protected Community: Early Problem-Solving Choices, Ideas, and Governance Philosophy.” In *Collaborative Resilience : Moving Through Crisis to Opportunity*, edited by Bruce Evan Goldstein, 177–206. MIT Press.

Wenzel, George W. 2009. “Canadian Inuit Subsistence and Ecological Instability—If the Climate Changes, Must the Inuit?” *Polar Research* 28 (1): 89–99. https://doi.org/10.1111/j.1751-8369.2009.00098.x.

Werner, Kevin, and Lina Svedin. 2017. “States, Water, and Climate: Who’s Planning for Change?” *Climate Risk Management* 16: 59–72. https://doi.org/10.1016/j.crm.2017.03.005.

Wernham, Aaron. 2007. “Inupiat Health and Proposed Alaskan Oil Development: Results of the First Integrated Health Impact Assessment/Environmental Impact Statement for Proposed Oil Development on Alaska’s North Slope.” *EcoHealth* 4 (4): 500–513.

Western, John, Robert Stimson, Scott Baum, and Yolanda Van GELLECUM. 2005. “Measuring Community Strength and Social Capital.” *Regional Studies* 39 (8): 1095–1109. https://doi.org/10.1080/00343400500328222.

Wexler, Lisa. 2014. “Looking across Three Generations of Alaska Natives to Explore How Culture Fosters Indigenous Resilience.” *Transcultural Psychiatry* 51 (1): 73–92. https://doi.org/10.1177/1363461513497417.

White House. 2015. “FACT SHEET: President Obama Announces New Investments to Combat Climate Change and Assist Remote Alaskan Communities.” Whitehouse.Gov. September 2, 2015. https://www.whitehouse.gov/the-press-office/2015/09/02/fact-sheet-president-obama-announces-new-investments-combat-climate.

Whyte, Kyle Powys. 2013. “Justice Forward: Tribes, Climate Adaptation and Responsibility.” *Climatic Change* 120 (3): 517–30. https://doi.org/10.1007/s10584-013-0743-2.

Wildcat, Daniel R. 2009. *Red Alert!: Saving the Planet with Indigenous Knowledge*. Golden, Colo: Fulcrum Publishing.

———. 2013. “Introduction: Climate Change and Indigenous Peoples of the USA.” *Climatic Change* 120 (3): 509–15. https://doi.org/10.1007/s10584-013-0849-6.

Willox, Ashlee, Sherilee L. Harper, James D. Ford, Karen Landman, Karen Houle, and Victoria L. Edge. 2012. “‘From This Place and of This Place:’ Climate Change, Sense of Place,

and Health in Nunatsiavut, Canada." *Social Science & Medicine* 75 (3): 538–47. https://doi.org/10.1016/j.socscimed.2012.03.043.
Wilson, Nicole J. 2014. "The Politics of Adaptation: Subsistence Livelihoods and Vulnerability to Climate Change in the Koyukon Athabascan Village of Ruby, Alaska." *Human Ecology* 42 (1): 87–101. https://doi.org/10.1007/s10745-013-9619-3.
Winer, Michael Barry, and Karen Ray. 1994. *Collaboration Handbook: Creating, Sustaining, and Enjoying the Journey*. 1st edition. Saint Paul, Minn: Amherst H. Wilder Foundation.
Wold, Chris. 2009. *Climate Change and the Law*. Newark, NJ: LexisNexis Matthew Bender.
Wood, Mary Christina. 2009. "Advancing the Sovereign Trust of Government to Safeguard the Environment for Present and Future Generations (Part II): Instilling a Fiduciary Obligation in Governance." *Environmental Law* 39 (January): 91–139.
Woodruff, Sierra C., and Missy Stults. 2016. "Numerous Strategies but Limited Implementation Guidance in US Local Adaptation Plans." *Nature Climate Change* 6 (8): 796–802. https://doi.org/10.1038/nclimate3012.
Worl, Rosita Kaaháni. 2016. "Alaska," May. https://doi.org/10.1093/oxfordhb/9780199858897.013.31.
Wuttunee, Wanda. 2004. *Living Rhythms: Lessons in Aboriginal Economic Resilience and Vision*. Montréal ; Ithaca: Mcgill Queens Univ Pr.
Zhang, Yan, and Barbara M. Wildemuth. 2005. "Qualitative Analysis of Content By." *Analysis* 1 (2): 1–12.