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Matthew J. Piccarello

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The Pueblo of Santa Clara (Kha P’o Owinge) Resilience Project: Maintaining Identity While Preparing for an Uncertain Future

By

Matthew J. Piccarello



**A Professional Project Report Submitted in Partial Fulfillment of the Requirements
for the Dual Degree of:**

**Master of Water Resources
Master of Community & Regional Planning**

**The University of New Mexico
Albuquerque, New Mexico**

**Committee
Dr. William Fleming
Dr. Theodore Jojola
Melinda Harm Benson, Esq.**

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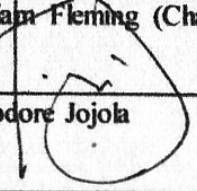
Committee Approval

The Master of Water Resources and Community & Regional Planning Professional Project report of Matthew J. Piccarello, entitled The Pueblo of Santa Clara (Kha P'O Owinge) Resilience Project: Maintaining Identity While Preparing for an Uncertain Future, is approved by the committee:



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Abstract

Since 1998, the people of Santa Clara Pueblo (SCP) have seen 80% of their forested lands burned by wildfires. Wildfire is a natural part of the disturbance regime regulating Southwestern ecosystems, and yet these fires, the Las Conchas wildfire in 2011 in particular, have proven to be a major disaster for SCP. Las Conchas drastically altered the hydrology of the Santa Clara Creek watershed, causing severe flooding that has damaged cultural sites, infrastructure, threatened lives and property, and has rendered much of the watershed inaccessible to tribal members. This project uses resilience thinking to explain why the character of wildfire has changed in the west and as a guiding principle for watershed restoration. The project's primary objective was to determine what issues have reduced SCP's ability to effectively deal with the Las Conchas wildfire – their resilience – and what can be done about it. Several barriers to effective watershed restoration were identified in interviews with tribal officials and community members. These barriers include the discrepancy between the promises of the Tribal Self-Governance Act and the federal government's interpretation of the trust responsibility, and a lack of formal collaboration between SCP and adjacent land management agencies. This project identified recommendations and opportunities to overcome these barriers, including collaborative agreements between SCP and adjacent land management agencies, and SCP representation on the Valles Caldera National Preserve board of trustees.

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Chapter 1. Current challenges

1.1 Introduction

Since 1998, the people of Santa Clara Pueblo (SCP) have seen 80% of their forested land burned by wildfires (Dasheno, 2011). The most recent wildfire, the Las Conchas fire in July, 2011 burned over 45% of the Santa Clara Creek watershed located high in the Jemez Mountains in Northern New Mexico (Dasheno, 2011). Much of the burned area was of high-severity, which in turn lead to a catastrophic flooding event on July 15th, 2011 when as little as ¼ inch of rain sent tons of debris and ash down the canyon destroying infrastructure and filling upstream ponds with sediment in a less than an hour (Figure 1; Dasheno, 2011).



Figure 1 Ponds in upper watershed filled with sediment

Since that initial flooding event, the upper canyon has been restricted to most tribal members due to safety concerns. Where tribal members used to hunt, fish, hike, and perform traditional practices is now off limits. The Santa Clara Creek once clear and cold is now routinely choked with sediment and devoid of vegetation along its banks

(Figure 2). Work is being done to quantify the damage caused by the Las Conchas fire in physical terms; sediment loads, acres burned, water quality impacts. Yet none of these calculations reflects the emotional toll the devastation has had on the SCP community (Dasheno, 2011). For the SCP people, restoration and recovery is a matter of cultural identity. Tribal members living today may never see the canyon as it once was, but there is hope that future generations may yet have the opportunity to hunt, camp, fish, and pray there just as their ancestors have since time immemorial.



Figure 2 Severe flooding has destroyed the riparian areas adjacent to Santa Clara Creek

Wildfire is a natural part of the disturbance regime regulating Southwestern ecosystems, and yet the Las Conchas fire has proven to be a major disaster for SCP. This fact is illustrated in Figure 3, which shows the points of origin for all wildfires on the Santa Fe National Forest (SFNF) from 1960 to 2012 during which time over 5,000 wildfires occurred, with 75% of them being caused by natural processes i.e. lightning (USDA, 2012). If wildfire is such a common occurrence in southwestern forests, then why was the Las Conchas wildfire such a significant disaster for SCP? This project will argue that the reason can be attributed to the diminished *resilience* of SCP's social-

ecological system (linked systems of humans and nature) caused by a number of anthropogenic factors (Walker & Salt, 2012). Resilience is defined as “the capacity of a system to absorb disturbance and reorganize so as to retain essentially the same function, structure, and feedbacks – to have the same identity” (Walker & Salt, 2012). Diminished resilience can largely be attributed to factors outside of SCP’s control such as the federal government’s forest management policies and the administration of disaster and watershed restoration funds. Viewing the circumstances surrounding the Las Conchas fire through a resilience lens provided a useful framework to approach these complex issues where ecology, culture, and governance intersect. Resilience thinking is an emerging paradigm with applications in a wide array of disciplines (Walker & Salt, 2012). The term originates in ecology but is increasingly being applied in the social sciences as well.

Traditional societies like SCP, and the Tewa culture have a lot to teach contemporary planners and resource managers about resilience. Resilience has been a hallmark of Native American communities throughout their history as they have adapted and transformed to meet a number of challenges. It is useful to discuss indigenous cultures and worldviews in terms of their resilience (as defined above) because they have been putting resilience principles into practice long before there was any academic literature on the subject. Climate change has already started to alter what planners and resource managers consider to be reliable reference conditions by which to base management prescriptions on. They should look to indigenous cultures for guidance and insight into how to incorporate flexible and dynamic decision making that embraces change while maintaining essential aspects of system identity.

Two years after the Las Conchas fire the people of SCP are still facing flood events during normal monsoonal thunderstorms. The current degraded watershed conditions have led to a “one step forward, two steps back” restoration process. Repairs to roads and other infrastructure are frequently wiped out or damaged in the next flood event. In addition to the physical challenges to restoration, virtually all SCP tribal departments are continually faced with various bureaucratic hurdles and funding issues related to federal agency collaboration.

This project will explore how these issues have impaired SCP’s ability to respond to and deal with disturbance events such as wildfires using tools and concepts from resilience thinking (Walker & Salt, 2012).

The primary objective of this project is to determine what issues have reduced SCP’s resilience and what can be done about it.

Secondary objectives include (a) exploring intersections of resilience thinking and Pueblo worldview, and (b) identifying what aspects of the SCP community and culture should remain the same in the future despite current and future challenges.

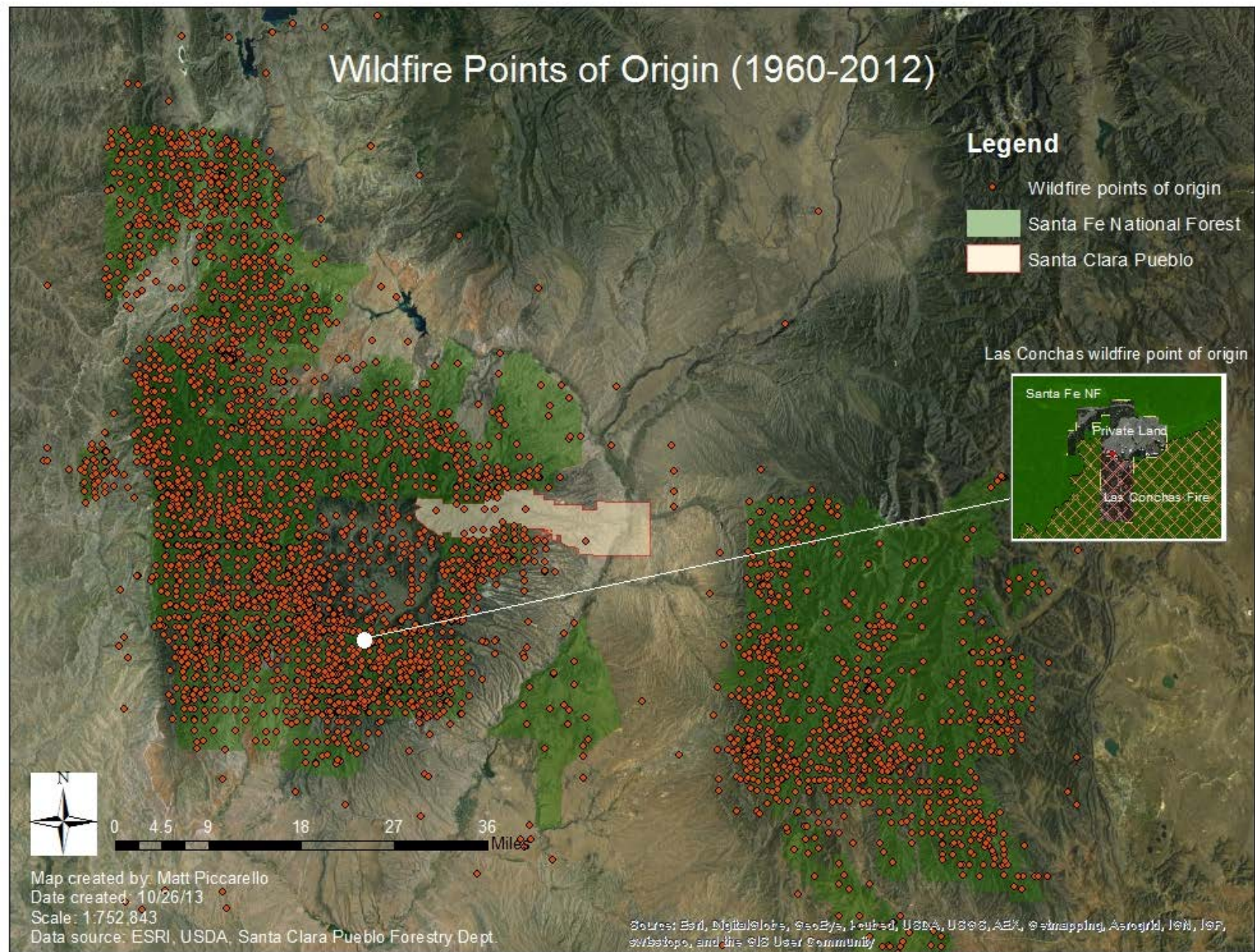


Figure 3 Wildfire points of origin in the Santa Fe National Forest
Professional Project

1.2 Project conception

In the spring of 2012, then governor of SCP Walter Dasheno approached Community & Regional Planning's Indigenous Design + Planning Institute (iD+Pi) director Dr. Ted Jojola about the possibility of facilitating a project with SCP aimed at helping the tribe recover from the Las Conchas wildfire. Dr. Jojola then connected me with Mike Chavarria, SCP's Forest Development and Restoration Manager to discuss potential project ideas. Following a tour of some of the damage caused by Las Conchas, I set out to conceive a project that would fill some existing needs in the restoration efforts. The problems SCP was facing seemed impossibly large and the watershed restoration coordination efforts so complex. While I had several ideas for project themes, such as community-based natural resource management, and traditional ecological knowledge, the project lacked a unifying theme. Resilience thinking emerged as a useful paradigm for contextualizing the issues SCP was dealing with and encompassed several of the themes I had been considering. Resilience thinking seemed especially pertinent for contextualizing issues facing Native American tribes because of its holistic approach and the inclusion of identity as a function of SES resilience (Walker & Salt, 2012). For that reason, resilience thinking aligns well with the iD+Pi mission "to educate by engaging faculty, students, professionals and policy leaders in culturally appropriate design and planning practices" (<http://idpi.unm.edu/>).

In March 2013, I made a formal presentation to the tribal council seeking approval to conduct research related to this project. Governor Bruce J. Tafoya and iD+Pi signed a memorandum of agreement to clarify roles and responsibilities. I agreed to

place an embargo on this report until such time that SCP deems it available for wider dissemination.

1.2 Client

1.3.1 Location

The SCP reservation is located approximately 28 miles northwest of Santa Fe, NM. The town of Espanola is approximately 2 miles north of SCP. The reservation is oriented east to west approximately 22 miles in length (Pueblo of Santa Clara & Wood, 2008). Adjacent lands include the SFNF, San Ildefonso Pueblo, state trust land, Bureau of Land Management lands, the Valles Caldera National Preserve (VCNP), and Los Alamos National Laboratories (Figure 4). SCP lands contain a diversity of ecological zones progressing from the Rio Grande Bosque at a low elevation of 5,550 feet through grasslands and woodlands to mixed conifer forests at Cerro Toledo Peak at an elevation of 10,930 feet (Pueblo of Santa Clara & Wood, 2008).

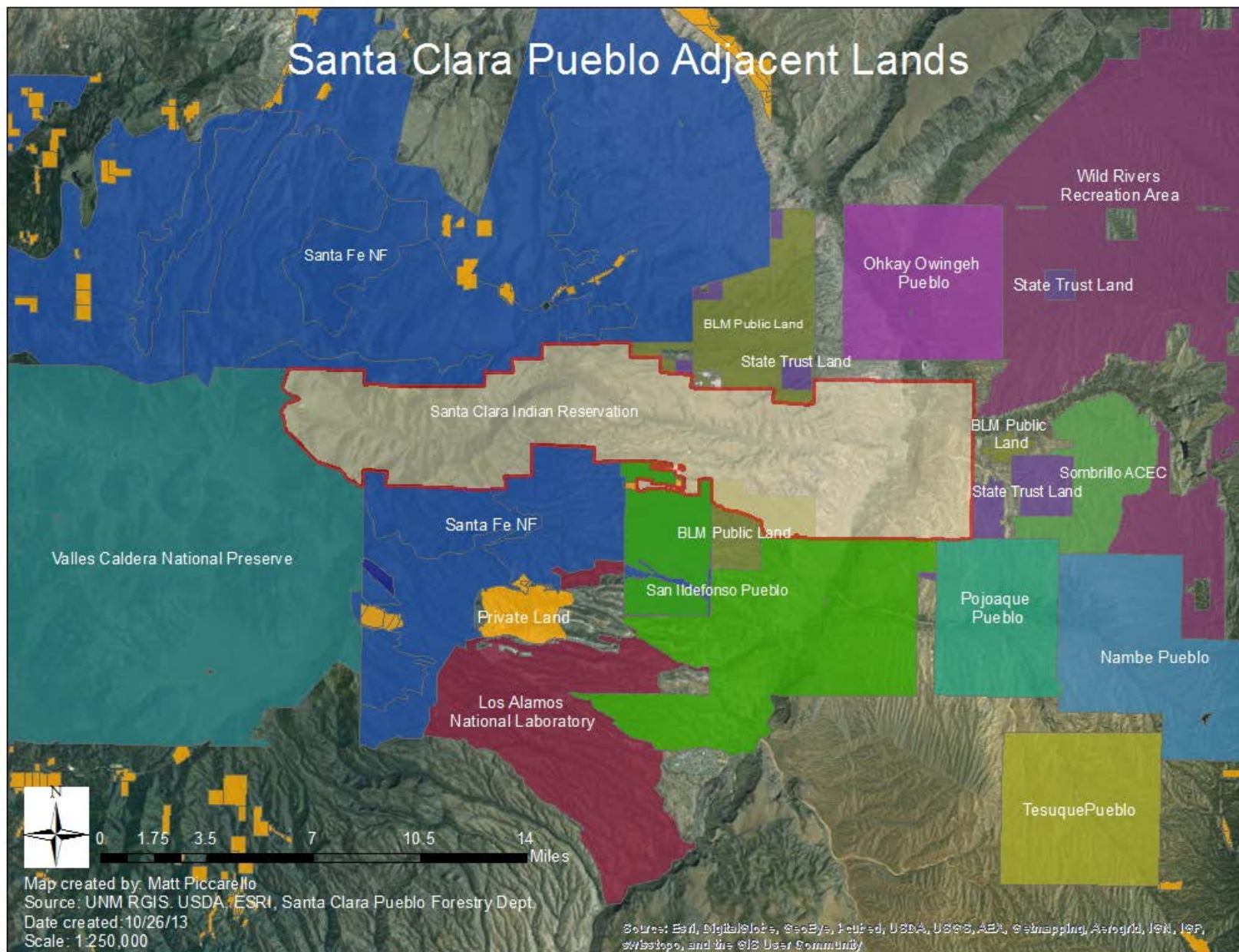


Figure 4 Lands adjacent to SCP

1.3.2 Land tenure and governance

The SCP people are one of six Tewa speaking Pueblo tribes residing in the Northern New Mexico (Pueblo of Santa Clara & Wood, 2008). The current village, known in the Tewa language as Kha P'o Owinge or "village of the wild roses" (Pueblo of Santa Clara & Wood, 2008) has been the home of the SCP people "for some time prior to the coming of the Spanish" probably around the 14th century (Hill, 1982, p. 5). SCP's ancestral home, Puje Owinge (also known as Puye Cliff ruins), which means "village where the rabbits gather" is a national landmark and popular tourist destination located in Santa Clara Canyon (Pueblo of Santa Clara & Wood, 2008).

SCP received two separate land grants from the king of Spain. The first totaled 16,308.01 acres (date unknown) yet 4,309.33 acres were declared by the Pueblo land board to be held by non-Indians (USDI, 1940). After purchasing some of the privately held land located within the grant, SCP ended up with 12,222.67 acres from the original grant (USDI, 1940). The second grant, known as the "Shoestring Grant" totaling 473.18 acres was given on July 19th, 1763 and confirmed by the Court of Private Land Claims in 1894 making the original reservation a size of approximately 12,696 acres (USDI, 1940). By executive order, on July 29th, 1905, 33,044.30 acres of land to the west of the original land grant was declared as trust lands reserved for the people of the Pueblo of Santa Clara (USDI, 1940). After various land exchanges and purchases as recent as 2003, the SCP reservation now totals 53,779 acres (Pueblo of Santa Clara & Wood, 2008).

SCP is one of two self-governance tribes in New Mexico. Self-governance is an extension of the Indian Self-Determination and Educational Assistance Act and gives tribal governments greater autonomy to manage their own affairs and cuts down on the

federal bureaucracy (Indian Self-Determination Act of 1994, 1994). Self-governance tribes are eligible to receive funds directly from the federal government to run programs and services that were once administered through the BIA. SCP currently has funding agreements to manage: forestry, wildland fire operations, law enforcement, realty, social services, education, vital statistics and others (M. Chavarria, personal communication, Sept 22nd, 2013). While self-governance has had its successes, certain limitations apply and will be discussed in a later section.

1.3.3 Demographics

According to the 2007-2011 American Community Survey, there were 1,463 people living in the Santa Clara Village, and 11,174 people living within the reservation boundaries, which include the town of Espanola and small communities of the area including La Mesilla, Guachupangue, Santa Cruz and Riverside (Pueblo of Santa Clara & Wood, 2008; U.S. Census, 2011a). The median household income is \$41,918 and the mean \$54,822 for Santa Clara Village (U.S. Census, 2011b). Major sources of employment can be found with the SCP government as well as private businesses, Los Alamos National Laboratory, the Bureau of Indian Affairs, the Bureau of Land Management, the Department of Housing and Urban Development and other state agencies and local governments (Pueblo of Santa Clara & Wood, 2008).

1.4 Recent fire history

Figure 5 shows the boundaries of recent wildfires that have impacted Santa Clara Pueblo, all of which originated outside of SCP lands. In total, these fires have burned 80% of SCP's forested lands (Dasheno, 2011). While wildfires are considered "natural" disasters, the increase in the frequency of large, high-severity wildfires is largely a man-

made problem that was set in motion a century ago beginning with fire suppression and land use policies that created the tinderbox conditions we see now in the Southwest (Allen, 1998; Westerling et al., 2006). Warmer temperatures expected to accompany climate change exacerbate these problems (Westerling et al., 2006). The two largest wildfires to impact SCP, the Cerro Grande and Las Conchas wildfires, are discussed below.

The Cerro Grande fire, which started on May 5, 2011, began as a controlled burn in the Bandelier National Monument. High winds and temperatures caused the fire to be out of control and ultimately burn 6,681 acres of SCP lands (Dasheno, 2011). In addition, 40 structures at nearby Los Alamos National Labs (LANL) were destroyed (Hill, 2000). The damage at LANL is significant because nuclear and other hazardous waste is stored there. While prescribed burning is a common and useful strategy to reduce fuel loads and the risk of catastrophic wildfire, the burn plan implemented by National Park Service staff was later deemed to have several flaws that contributed to the prescribed area burning out of control (Hill, 2000). The prescribed burn was set in early May, a time when high winds are often experienced in the Jemez Mountains and ultimately drove the fire to spread throughout the region. During the two-week period before the prescribed fire was set, four other prescribed fires burned out of control in the region (Hill, 2000).

The Cerro Grande fire prompted changes in federal interagency fire management and because of the culpability of the National Park Service the response from the federal government to aid restoration efforts at SCP was robust (Dasheno, 2011). However, the

Las Conchas fire and subsequent floods, as well as drought conditions, hampered much of the restoration gains following Cerro Grande, such as tree planting.

The Las Conchas wildfire, which started on June 26, 2011, burned 16,000 acres on the SCP reservation (Dasheno, 2011). In total, the Las Conchas fire burned 156,000 acres, at the time the largest recorded wildfire in New Mexico history. The fire has drastically altered the watershed's hydrology. Steep slopes, loss of vegetation, and hydrophobic soils led to a massive flood event on July 15th, 2011 where flow in SCC reached an estimated 1700 cubic feet per second (cfs) (Dasheno, 2011). The damage from the July 2011 flood was catastrophic. Many culturally important and sacred places were destroyed in the fires and floods, both inside and outside of SCP lands (Dasheno, 2011). Any progress made to restore vegetation and rebuild infrastructure was often wiped out in the next flood. There was a presidential disaster declaration for SCP as recent as July 2013 after heavy rains caused significant flooding damaging many homes in the SCP village.

The Las Conchas fire started when high winds blew over an aspen tree onto a power line. However that does not tell the whole story. The power line was servicing a private inholding within the SFNF (Figure 5). Private inholdings within national forests and other public lands are the legacy of the public lands disposal era when millions of public lands were given to railroad companies to encourage development in the west (Osborn et al., 1995). This history is important when one considers the implications of the fractionalization of public lands, such as threading power lines through heavily forested areas as well as creating jurisdictional challenges. The "checkerboarding" of public lands that occurred in the late 19th and 20th century is still causing conflict in the

West, particularly in landscapes where tribes have lost significant land to various interventions of the federal government in the past two centuries.

Recent research shows that fire and vegetation regimes in the Southwest are changing quickly due to increased temperature, incidence of drought, and changes in the seasonality and amount of snow and rainfall due to climate change (Allen & Breshears, 1998; Williams et al., 2010; Williams et al., 2013; Westerling et al., 2006). The conventions that guide contemporary ecological restoration (i.e. return to some reference condition) may no longer be valid for the climatic conditions projected to occur in the Southwest. Future restoration or management plans should reflect the reality of a changing climate. Viewing these issues from a resilience perspective begins the work of determining what aspects of Southwestern ecosystems, be they socio-cultural or natural, are indispensable.

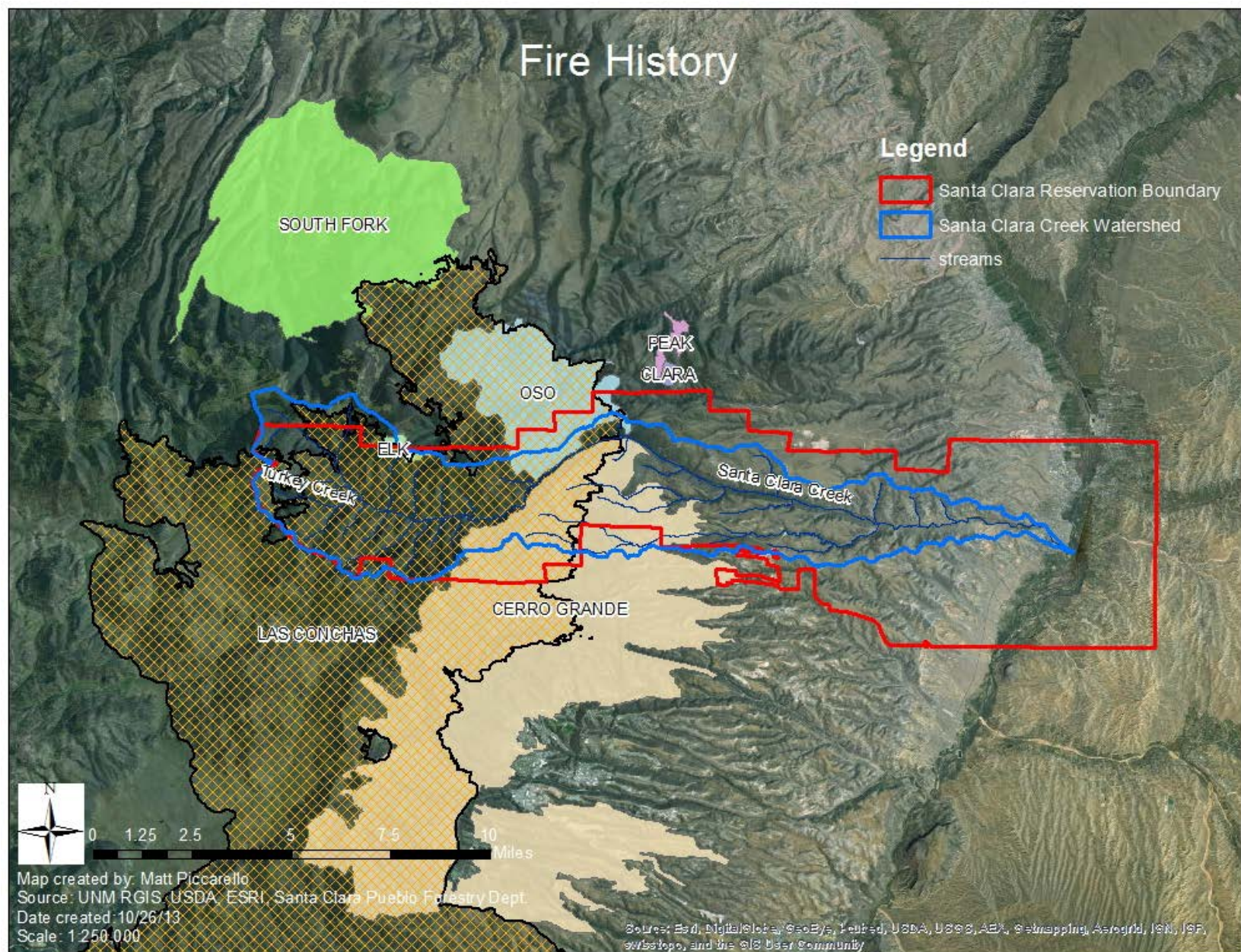


Figure 5 Recent fires to impact SCP

1.3 Report organization

The project report is divided into five remaining sections. Chapter 2 provides an overview of resilience thinking by defining several important key concepts and discusses several intersections of resilience thinking and Pueblo worldviews. Chapter 3 outlines the qualitative methods that were used to assess the general resilience of SCP through interviews and workshops with SCP community members and tribal officials. Chapter 4 discusses the key issues that were identified during participant interviews and workshops. Chapter 5 identifies potential opportunities and recommendations to aid in the watershed restoration efforts and general recovery from the Las Conchas fire. The report concludes with chapter 6, conclusions and a summary of the report and the challenges to SCP's resilience that were identified.

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Chapter 2. Resilience: a conceptual framework for exploring indigenous planning and natural resource management issues

2.1 Introduction to resilience thinking and indigenous planning

Resilience thinking, born out of the field of ecology, has emerged in recent years as an alternative to contemporary planning and natural resource management paradigms. C.S. “Buzz” Holling was the first ecologist to introduce the concept of ecological systems resilience and sought to shift “the emphasis from equilibrium states to the conditions for persistence” when studying natural communities (Holling, 1973). Resilience is not just about what happens after a disturbance, but recognizing that disturbance plays an important role in ecological systems (Chapin et al., 2009). Resilience is a “problem framing approach to your system that seeks to help you decide what’s important for the sustainability of the things you value, that you should be focusing on” (Walker & Salt, 2012, p. 23). A few examples will serve to illustrate this point. First, removing Siberian elms from the Rio Grande Bosque and planting cotton wood poles in their place is focusing on the desired condition of more native cottonwood trees. However, one reason why cottonwood trees have struggled to proliferate in recent years can be attributed to the lack of overbank flooding that creates suitable conditions for cottonwood germination (Smith et al., 2009). Siberian elms are, in part, merely a symptom of what happens when man inhibits an important ecological process through the construction of dams and other flood control measures. The conditions for cottonwood persistence have been changed and a different species has out-competed the native flora.

A second example is in forest management. Forest managers are fighting against time as forests have become so overgrown that further delay in attempting to reduce fuel loads could have catastrophic consequences for plants and wildlife and the communities that depend on

them. The goal of management intervention from a resilience perspective would be to create conditions that will allow wildfire and other natural disturbances to assume their role in regulating forest density and structure rather than to reach some desired condition, such as trees per acre. It is unsustainable for land managers to take the place of natural disturbance regimes with mechanical thinning and even prescribed burning to some extent.

Recently, resilience thinking has expanded to include social-ecological systems (SES), which define the necessary scale for a resilience-based approach to planning and resource management (Figure 6; Berkes et al., 2003; Walker & Salt, 2012, p.1). All humans derive benefit from the environment (ecosystem services) whether they are aware of it or not, such as clean air and water and also cultural identity. A resilience assessment defines these benefits as the “resilience of what” in a SES (Walker & Salt, 2012, p. 41). Scale also helps to contextualize threats to valued system attributes (benefits) and functionality, or the “resilience to what” (Walker & Salt, 2012, p. 48). While some components of a SES may not depend directly on ecological systems, we all benefit indirectly from the various ecosystem services provided by natural environments. Our water and food supplies are dependent on healthy ecosystems. The Resilience Alliance (RA), a group of researchers and practitioners, has lead the way in resilience based SES thinking. The RA provides resources for practitioners who can then apply resilience theories to planning and natural resource management challenges.

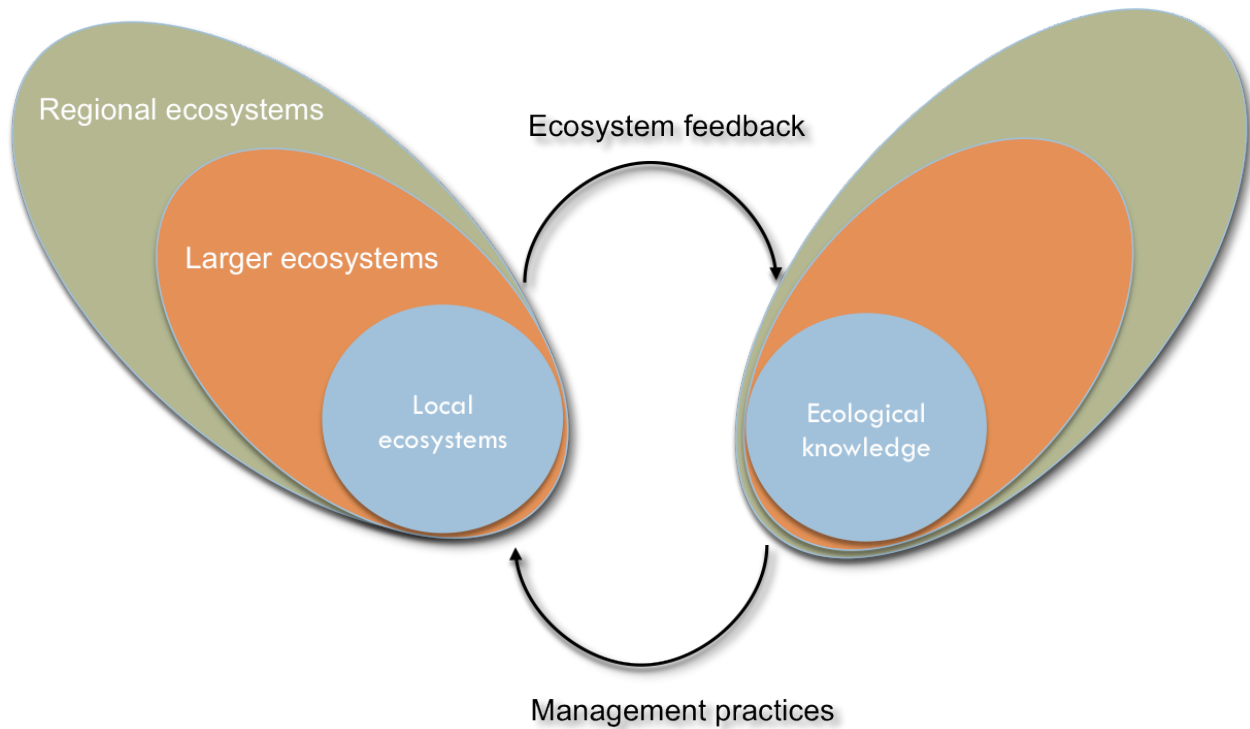


Figure 6 Conceptual model of a social-ecological system (adapted from Berkes et al., 2003)

Indigenous planning is an emerging paradigm that emphasizes the importance of land tenure, stewardship, and indigenous worldviews (Jojola, 2001a). Indigenous planning and worldviews have much in common with resilience thinking. The focus on stewardship, adaptive governance and decision-making, and taking a long-term view of natural and social processes that operate along cyclical timescales are some of the important intersections between the two (Walker & Salt, 2012; Jojola, 2001a). Figure 7 is a conceptual model showing how resilience bridges the gap between ecology, culture, and planning (or natural resource management). Furthermore, the goal of indigenous planning, which “is not just to reinforce cultural identity, but to challenge the community into understanding how the past and present serve to give coherence to the future” could be said for a resilience based approach as well (Jojola, 2004, p. 94; Berkes et al., 2009, p. 130).

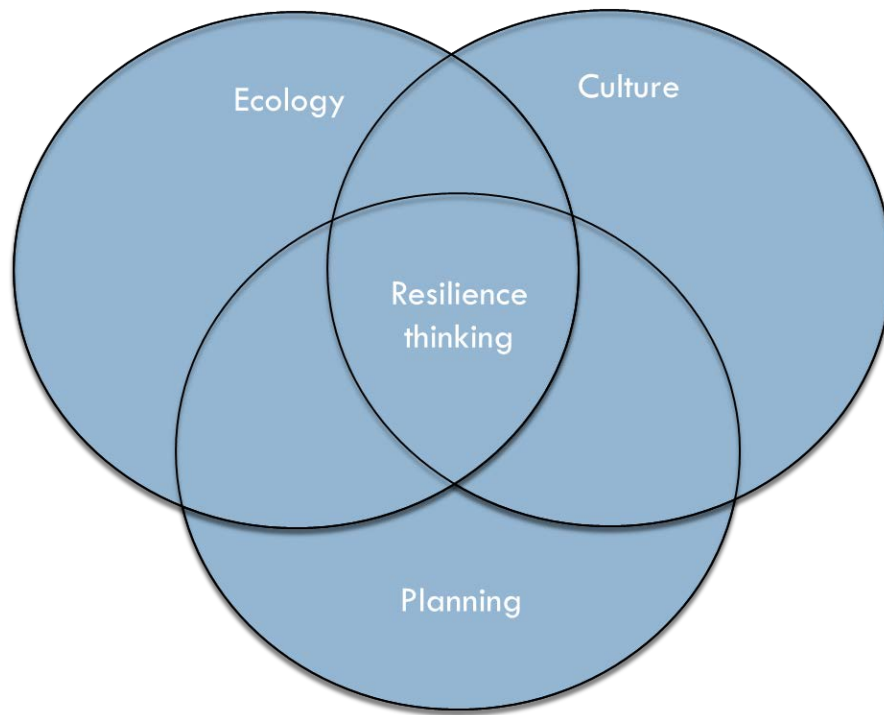


Figure 7 Resilience thinking's place among ecology, culture, and planning

2.2 Key concepts

2.2.1 General vs. specified resilience

When attempting to put resilience concepts into practice - to manage for resilience - there are two possible goals for intervention: general and/or specified resilience. General resilience, which this project is primarily focused on, is the capacity of a system to absorb a variety of disturbances, including novel and unforeseen ones (Walker & Salt, 2012). General resilience is closely related to adaptive capacity, which is “the capacity to deal with a shock when it happens” (Walker & Salt, 2012, p. 100). Specified resilience refers to a particular kind of disturbance, such as wildfire, flood, or loss of native language (Walker & Salt, 2012). Walker and Salt (2012) identified the following key aspects of general resilience:

1. **Diversity:** overly efficient systems are prone to collapse. Diversity decreases the likelihood that a single disturbance will result in an undesirable system state.

2. **Modularity**: the degree to which system components are insulated from shocks occurring in other parts of the system.
3. **Tightness of feedbacks**: the degree to which a shock or disturbance results in some change in the system. Loose feedbacks result in inaction and diminished resilience.
4. **Openness**: the ease with which things like people, ideas, and species can move into and out of a system.
5. **Reserves**: provides a safe operating space by which to respond to disturbance. Examples include knowledge and financial capital.

Specified resilience looks at particular parts of a system and identifies thresholds that if crossed would cause the system to function in a different way, or to change the identity of the system (Walker & Salt, 2012). A poignant example for indigenous communities is the potential loss of native language. A “threshold of potential concern” for the conservation of a native language would be the older age of most fluent speakers (Walker & Salt, 2012). Identifying thresholds can add immediacy to management actions, help to guide priorities, and aid in long-term planning rather than being reactive to crises as they happen. Walker and Salt (2012) and the RA have written extensively on the use of resilience assessments to discover potential thresholds and regime shifts in multiple system types (ecological, societal, economic, urban etc.). This is a growing body of research and one that may be expanded upon in SCP in the future.

2.2.2 System dynamics

“Resilience thinking is systems thinking” (Walker & Salt, 2006 p. 31). We are all a part of a system, or many systems. No one operates in a vacuum, where our actions affect only ourselves and we are not affected by anyone or anything else. This is the nature of systems thinking. A poignant example to illustrate this point is the fact that all of the recent wildfires to

impact SCP have originated outside of SCP lands. Land use decisions made by SCP's neighbors will inevitably impact SCP. Furthermore, systems are dynamic. They do not undergo change in a predictable, linear manner (Walker & Salt, 2006). Systems are self-organizing, meaning that they will respond to disturbance and manipulation in ways that may or may not be expected (Walker & Salt, 2012).

Managing systems as dynamic is a departure from the typical equilibrium based approach that has dominated natural resource management and planning, which tries to make the conditions that provide desired services static and predictable (Chapin et al., 2009). However, history provides numerous examples where such attempts at controlling natural, or even human systems, inevitably proves disastrous (McPhee, 1989). For example, a century of fire suppression in the west, in order to “protect” the value of timber from going up in smoke has instead increased the likelihood that timber stands will be lost to wildfire. Forests are dynamic systems, which are in a continuous cycle of growth and decay caused by a number of different factors including drought, insect and disease outbreaks, and wildfire. Trying to control a single variable (wildfire) merely serves to amplify other disturbance regimes (Chapin et al., 2009). The wildfire example highlights the importance of disturbance in dynamic systems and the negative effects that inevitably occur following attempts to prevent it. Dynamic systems are adaptive. At any one time they exist within one of several alternative “stable” states (Chapin et al., 2009). This view embraces the inevitability of change. Change can be sudden and violent, such as a hurricane altering a coastline in a matter of hours, or slow and subtle, like changes in policy and law (Walker & Salt, 2012).

Another important concept related to system dynamics is that SESs are “self-organizing” (Walker & Salt, 2012). Put simply, this means that actions have consequences. Prevent wildfire

for 100 years and the system will respond with increased pest outbreaks, high-severity wildfire, and the encroachment of woody plant species into grasslands (Allen, 2007). Management regimes should seek to mimic natural processes. It is not always easy to foresee what consequences our actions will have. Scenario planning is one way for planners and resource managers to evaluate potential system responses to interventions or projected future conditions.

2.2.3 The adaptive cycle

As discussed above, SESs are dynamic, continually responding to various disturbance events that shape how the system functions. At any given time, a SES exists somewhere along what is known in the resilience literature as the adaptive cycle (Figure 8; Walker & Salt, 2006). The adaptive cycle has four phases (1) rapid growth, (2) conservation, (3) release, and (4) re-organization (Walker & Salt, 2006).

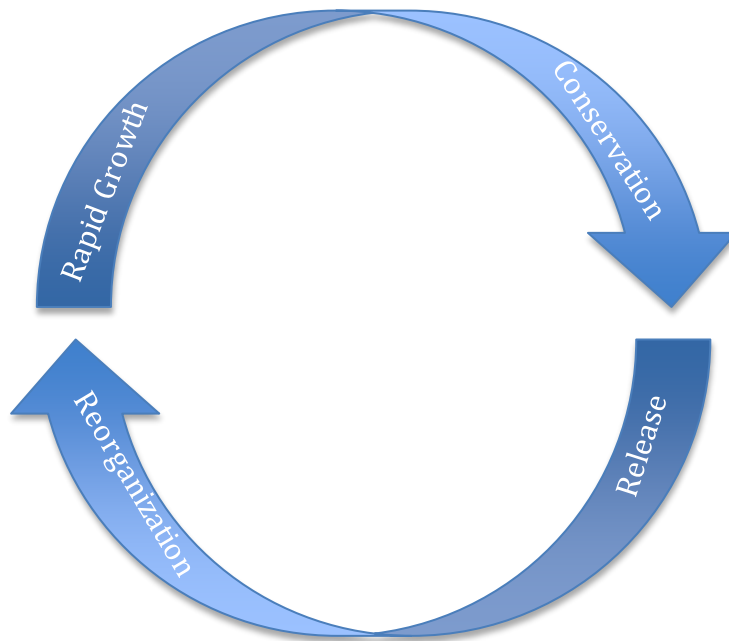


Figure 8 Adaptive Cycle

The rapid growth and conservation phases are referred to as the fore loop where the system dynamics are relatively predictable, capital is accumulated (natural, monetary, etc.) and stability is attempted through various conservation (maintaining the status quo) efforts (Walker & Salt, 2006). The release and reorganization phases are on the back loop, which is characterized by uncertainty and loss of capital (Walker & Salt, 2006). While it is a time of great stress for a system or community, the back loop contains the most potential for initiating creative change in the system (Walker & Salt, 2006). At present, SCP likely finds itself in the back loop. Movement between the fore and back loops is initiated when some threshold has been crossed resulting in a disturbance event. Forest successional processes provide a good example of the adaptive cycle at work (Figure 9).

Phases of the Adaptive Cycle: Forest ecosystem

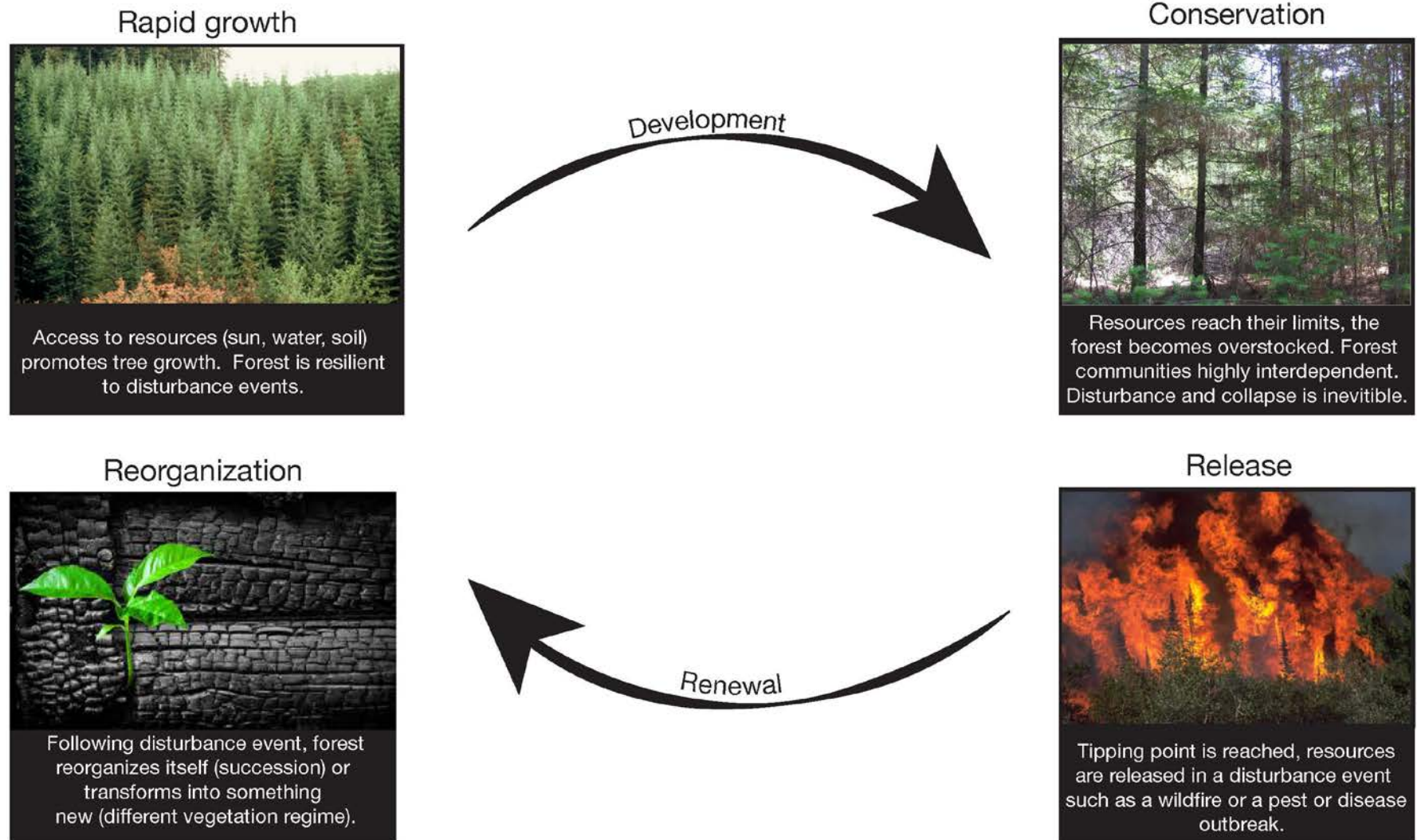


Figure 9 Adaptive cycle as applied to a forest ecosystem

2.2.4 Panarchy

Panarchy is used to describe the phenomenon of cross-scale interactions; that all systems are “composed of a hierarchy of linked adaptive cycles” (Figure 10; Walker & Salt, 2006). One institution may be experiencing a period of growth and relative stability, only to be shocked with a disturbance event originating from some other institution and moved into the release phase. This interaction is depicted by the thin black arrows in Figure 10. “Boom and bust” cycles in the economy provide an example of this in action. If one sector of the economy (the housing sector for example) crashes, that event can trigger a market wide collapse, as was the case with the U.S. economy in 2008.

In order to understand the focal system, in this case SCP, one must acknowledge the influence of both larger and smaller institutions influencing the system. For example, U.S. Forest Service policies, such as fire suppression, had the direct effect of increasing biomass in the forest that lead to high-severity wildfires that swept over SCP lands. Greater damage to SCP forests was mitigated by a thinning project that occurred prior to Las Conchas wildfire (and after Cerro Grande) in the upper Santa Clara Creek watershed. An example of smaller institutions affecting SCP resources would be the actions of individual grazers on range and watershed health. Panarchy is easier understood conceptually than in practice as tracking cross-scale interactions can be difficult because of the high degrees of complexity. However, a conceptual understanding can still be useful to guide management as a basis for collaborative agreements with the relevant scale impacting SCP such as the United States Forest Service (USFS).

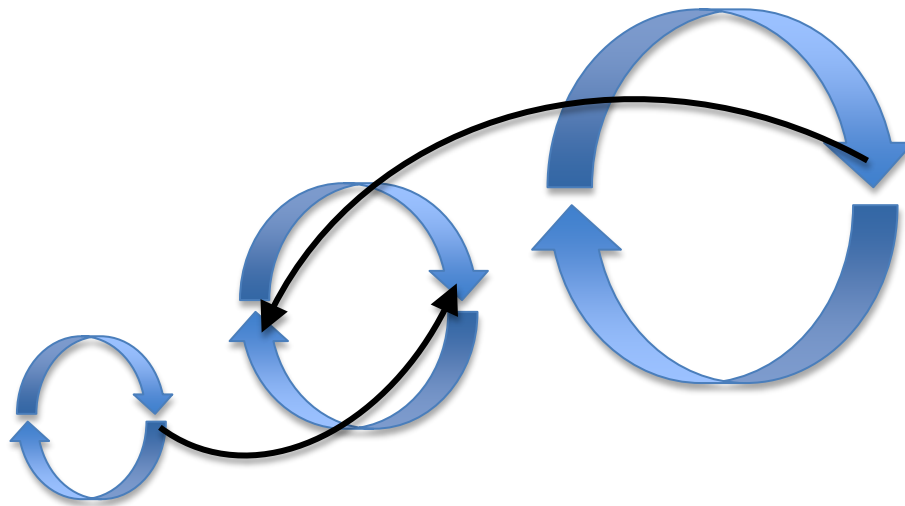


Figure 10 Panarchy

2.2.5 Adaptive management and governance

Adaptive management (AM) and governance (AG) are an integral component of a resilience based approach to planning and natural resource management (Walker & Salt, 2012). AM thinks of management as an experiment where hypotheses are tested in order to learn about the system and determine if current actions are appropriate (Walker & Salt, 2012). Ecological monitoring (water quality, forest structure etc.) provides one example of how to measure the effectiveness of management interventions. Ideally, if experience or quantitative data does not support a management action, managers will learn from that and try some other intervention. However, that is not always the case in practice as will be discussed using examples from SCP's watershed restoration efforts where attempts to act on prior knowledge were denied by the BIA.

AG is the vehicle by which AM is implemented, by incorporating flexible decision making that is responsive to changes to system components (climate, social, economic) and

incorporates the latest knowledge about how the system functions (Walker & Salt, 2012). “Non-adaptive” governance is characterized by rigid, top-down processes with loose feedbacks between experience and policy development. AG also incorporates the ideas of “distributive governance” and “polycentric governance” which consider the scales at which decision are being made (Walker & Salt, 2012, p. 131). Distributive governance passes decision making down to the appropriate scale where it is most effectively dealt with, while polycentric governance creates nested decision making scales whereby each scale has high degrees of independence to set the rules for operation (Walker & Salt, 2012). One strength of polycentric governance is that smaller decision making units have the benefit of local knowledge and receive rapid feedback from their own policy changes (Walker & Salt, 2012). If something doesn’t work, it is more easily fixed at smaller scales and larger scales are insulated from any potential negative effects. Furthermore, larger scales can learn from the experience of smaller ones and where experimentation can be carried out with less risk (Walker & Salt, 2012). Some federal laws, namely the self-determination and self-governance acts could be characterized as attempts to implement AG. However, these laws have limitations that will be discussed in a later chapter. For the remainder of this report, adaptive management and adaptive governance will both be referred to as AM as the concepts are similar and will frequently be discussed in tandem.

2.3 Intersections of resilience thinking and Pueblo world views

This project is informed by the iD+Pi mission, which encourages students and faculty to engage in “culturally appropriate design and planning practices” (<http://idpi.unm.edu/>). A review of the resilience literature and publications on Pueblo culture and worldview bear out that the two have much in common. This section will discuss four topics related to Pueblo culture and world view – with particular emphasis on the Tewa – and how they relate to resilience

thinking. While resilience is not a new concept for “traditional” communities like SCP, its integration into contemporary planning and natural resource management policies is limited to a few examples in the U.S. Innovation in natural resource management policy often begins in Indian country where Native Americans have had great success in “adapting new concepts in order to strengthen older ones” (McQuillan, 2001; Jojola, 2004, p. 88).

2.3.1 Social-ecological systems

Resilience thinking creates an opportunity for preserving cultural connections to landscapes to be considered on an even plane with economic benefits in the hierarchy of resource management goals (Walker & Salt, 2012, p. 41). Furthermore, resilience thinking recognizes that ecological resilience is a function of social resilience, especially for communities and cultures that derive their cultural identity from the land or their economic well-being (Walker & Salt, 2006). This kind of thinking is closely aligned with the Tewa worldview. On this subject, Ortiz writes, “when the Tewa think of their social and cultural system, including their relationship to the natural world, they think of it as a single integrated system” (Ortiz, 1969, p. 97). The Tewa social structure, the ritual calendar, deities etc. are all based on natural elements and influenced by natural cycles (Ortiz, 1969). Western natural resource paradigms are more intent on the monetization of natural resources (Chapin et al., 2009). This can be problematic, as a cost-benefit analysis often discounts cultural connections to land and resources. Resilience thinking bridges that divide and offers a common language to talk about the diverse benefits humans derive from the natural world.

2.3.2 Dual organizations

Tewa society is comprised of two moiety clans, the winter and summer people (Ortiz, 1969). The persistence of this dual organization was explored by Alfonso Ortiz in his seminal

work on Tewa culture and worldview *The Tewa World: Space, time, being & becoming in a Pueblo society*. The answer to Ortiz's central research question, "how can a society be divided and united at the same time, and continue through time?" aligns well with resilience thinking (Ortiz, 1969, p.8). The Tewa dual organization is important for a discussion of resilience because it is the dominant social structure in Tewa society, and understanding it is necessary to discuss all matters of Tewa culture. Ortiz was challenging many of the prominent anthropologists of his day, namely Claude Levi-Strauss, who argued that dual organization societies "really do not exist" because they are static and incapable of adapting (Ortiz, 1969, p. 5). This could not be farther from the truth regarding the dual societies of the Tewa. The Tewa have built in several mediation mechanisms to ensure the functionality of the dual organization. Most importantly, leadership roles among the winter and summer chiefs are temporal. Each chief rules only for half the year so in the course of a year, any asymmetries are resolved (Ortiz, 1969). Furthermore, the Tewa dual organization is only fully understood when the entire lifecycle of a Tewa individual is considered, for as the Tewa saying goes, "all paths rejoin" (Ortiz, 1969, p. 9). The key observation Ortiz makes on this point is that "at the beginning and at the end of life – when it matters most – the Tewa emphasize the solidarity of the whole society rather than the dual organization" (Ortiz, 1969, p. 56). One is not born into a moiety society, they are recruited, and at death, one passes not from their moiety but from the society as a whole (Ortiz, 1969). Overtime, any imbalances in the moieties are sorted out because ultimately they are only temporary.

Ortiz and Holling (1973) addressed a similar limitation of their peers' equilibrium-centered views of social and ecological systems. Holling advocated for a shift in the "emphasis from the equilibrium states to the conditions for persistence" which offer "little insight into the

transient behavior of systems that are not near equilibrium” (Holling, 1973, p. 2). Similarly, Ortiz writes, “I do not emphasize the dual organization itself, but seek instead the *basis of unity* in the society given the dual organization” [emphasis added] (Ortiz, 1969, p. 8). Holling’s definition of resilience, “the measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables” proves very useful for answering Ortiz’s central research question (Holling, 1973, p. 14). With this definition, Holling correlates resilience to instability because resilience is essentially a learned feature (Holling, 1973). It is exactly because the Tewa dual organization is unstable, with frequent imbalances in membership and periodic discrepancies in power that the Tewa have devised the mediation mechanisms necessary for the institution to persist. The fundamental flaw in Levi-Strauss’s analysis becomes clear with this realization. Disturbance in social, as well as ecological systems is essential to persistence.

2.3.3 Identity and transformation

Resilience thinking “embraces change as a basic feature of how the world works and develops, and therefore is especially appropriate at times when changes are a prominent feature of the system” (Chapin et al., 2009). Adapting and transforming in the face of change and disturbance has been a hallmark of Pueblo culture throughout their history and is an important part of various Pueblo’s worldview (Jojola, 2004). Whether it has been responding to multiple colonial powers or regulating the interaction between moiety societies Pueblo “ancestors anticipated the importance of experiential learning to the transformation and survival of the communities” (Jojola, 2004, p. 92). The challenge is in determining how cultures and societies can adapt and change without compromising their identity – “without becoming something else” (Walker & Salt, 2012, p. 3).

Transformation is an important function of resilience and also features prominently in Pueblo world views (Walker & Salt, 2012; Jojola, 2004). A key point for understanding resilience thinking is that “resilience is not about not changing” (Walker & Salt, 2012, p. 23). A willingness to transform – within limits – enhances system resilience. In Pueblo cultures, migration spirals, a common petroglyph in the Southwest, represent a clan’s (moiety) physical and spiritual journey or transformation (Figure 11; Jojola, 2004).



Figure 11 Migration spiral petroglyph

By imagining the two-dimensional spiral as a three-dimensional helix (Figure 12), revolutions within the spiral can be conceptualized not as circular, but as cyclical. With each revolution the Pueblo explore the physical boundaries of their world in each cardinal direction, as well as the spiritual and ideological boundaries (depicted by the upward expansion of the helix) (Figure 12; Jojola, 2004). This model of experiential learning and enlightenment is akin to adaptive management, which uses hypothesis testing to inform management decisions (Walker

& Salt, 2012). In the adaptive management context, each revolution around the spiral represents a change in management based on prior experience.

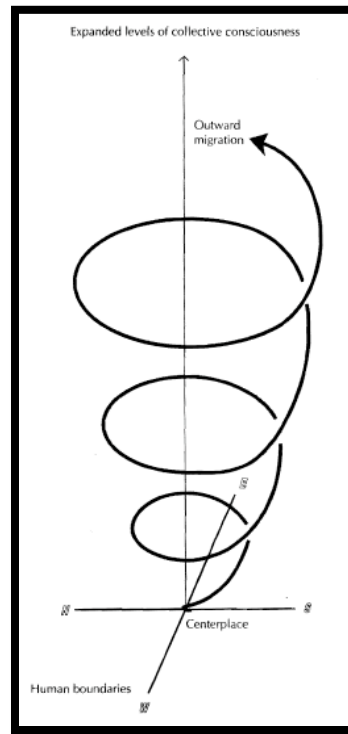


Figure 12 Migration spiral imagined in 3-D (Jojola, 2004)

2.3.4 Nested scales and cyclical time scales

System dynamics are better represented by cyclical time scale models, i.e. the adaptive cycle. The influence of nested scales upon one another is a common theme when studying the evolution of indigenous cultures. Lambert (2012) and Jojola (2001b) both offer interpretations of nested scale interactions within indigenous cultures. Lambert's (2011) model (Figure 13) depicts aspects of resilience of the Maori tribe in New Zealand as they exist at each nested scale. Jojola's (2001b) model (Figure 14) depicts the influence that the three main Indian Pueblo cultures (Hohokam, Mogollon, and Anasazi) had on one another. The curvilinear lines in Figure

14, which depict the “rise and fall of each respective culture and the corresponding events that helped shape its identity,” highlight the adaptive nature of Pueblo culture as it responds to change and disturbance (Jojola, 2001b, p. 6).

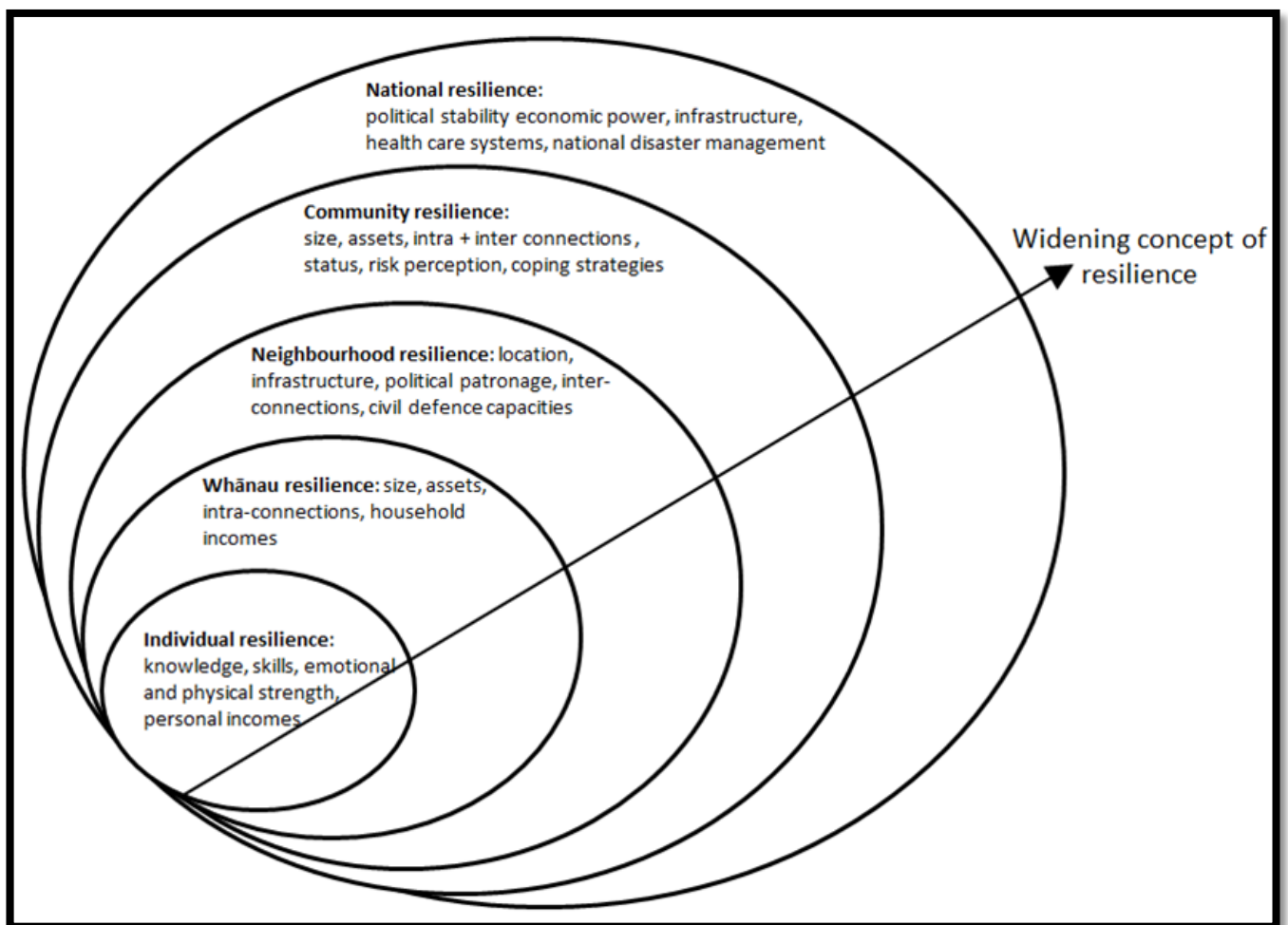


Figure 13 Maori nested resilience (Lambert, 2012)

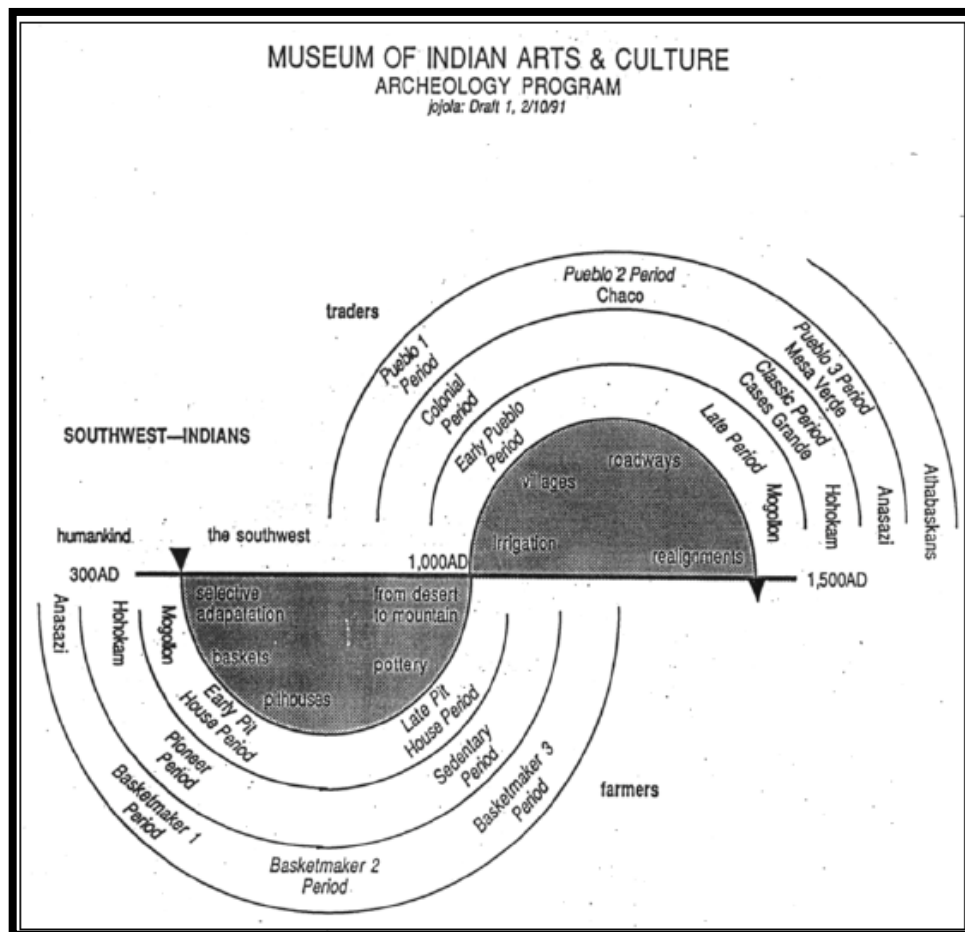


Figure 14 Ancient Pueblo history (Jojoba, 2001a)

Figure 15 presents a new conceptual model that incorporates nested scales (Figure 13), cross-scale interactions imposed on a cyclical timeline (Figure 14), and the adaptive cycle (Figure 8; Figure 9), which is represented here by two half-circles placed side by side. Figure 15 is built around the Las Conchas wildfire as the major disturbance event in the context of the SCP SES and different events that contributed to the catastrophic nature of Las Conchas, as well as certain difficulties SCP has had to respond to the aftermath of Las Conchas. These events will be discussed in greater detail in chapter 4. The timeline begins in 1880 with the entrance of the railroad – and the tens of thousands of grazing animals and logging that accompanied it – because it is credited as being the beginning of a shift in forest and grassland species structure and fire regimes in New Mexico (Allen, 2007). The end of the timeline in the year 3000 is an approximate date for when the Santa Clara Creek watershed will have recovered. The model

depicts two nested scales, (1) SCP lands, and (2) adjacent lands and outside factors. Admittedly, the larger scale is really comprised of several elements (federal agencies, private landowners etc.) but as this is a conceptual model, and because the effect on the land is ultimately the same, they are depicted as a single scale. The image in the bottom left corner of Figure 15 shows how the model can be extended as the SES moves from one disturbance event to the next, changing and adapting along the way.

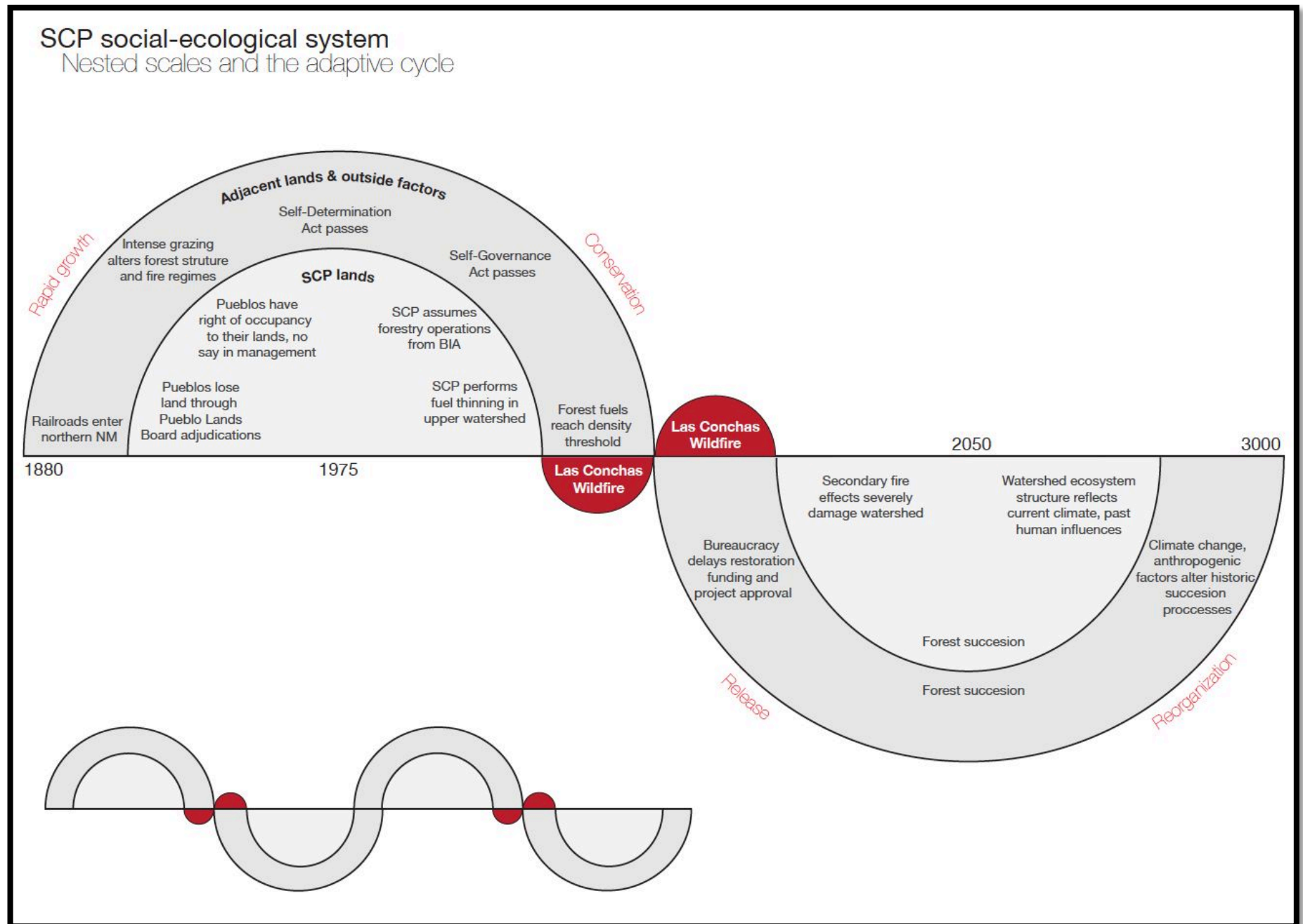


Figure 15 SCP social-ecological system: nested scales and the adaptive cycle

2.4 Summary

Resilience thinking is about preparing for and incorporating disturbance into planning and natural resource management. We are all a part of SESs that are dynamic and at times unpredictable. Achieving desired SES conditions is best achieved with a process based approach rather than one that focuses solely on some equilibrium state, or on the delivery of a single ecosystem service. This project is based on a general resilience approach, which prepares SESs for a variety of disturbances rather than on any one in particular. Two important goals of a general resilience assessment are: (1) to identify system components that hinder the focal system's (the Santa Clara Pueblo community) ability to respond effectively to disturbance and (2) to try and define key aspects of the system's identity. Using a resilience framework to analyze the issues SCP is currently facing not only provides a more insightful analysis on ecological grounds, it is also a more culturally appropriate management paradigm that is grounded in Pueblo worldviews.

Chapter 3. Methods for assessing current issues impacting SCP's general resilience

3.1 Introduction

The methods for answering the primary research question, what has diminished SCP's resilience and what can be done about it, evolved throughout the course of the project and utilized a variety of qualitative methods. In general, the framework for assessing SCP's general resilience was informed by phase I of Walker and Salt's (2012) resilience assessment framework, "describing the system." This first phase of a resilience assessment seeks to gain insight into five elements that govern a SES: (1) scales (bounding the system), (2) people and governance (the players, power, and rules), (3) the resilience *of* what (values and issues), (4) the resilience *to* what (disturbance), and (5) drivers and trends (history and futures) (Walker & Salt, 2012).

I initially hoped to survey a diverse cross-section of SCP community members and tribal officials using an open one-day workshop format. The "resilience workshop" was informed by the Resilience Alliance's (2010) publication "Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners." A notice for the workshop was published in the weekly tribal newsletter for each of the two weeks prior. Unfortunately, no one showed up on the day of the workshop. A description of the workshop is included in this chapter because it informed the interview questions that ultimately served as the primary method for achieving this project's primary objective. A second attempt at community participation was planned for a community event at the Puye cliff dwellings celebrating the anniversary of the acquisition of the P'opii Khanu area of the SCP reservation (the headwaters of Santa Clara

Creek). I had planned to solicit input from SCP community members via a table with the workshop discussion questions written on large sheets of paper that community members could write on as they passed by. The event was cancelled because of heavy rains that caused flooding in the canyon.

It became apparent that getting input from the community at large was going to be a challenge that I did not have the resources or time to overcome. I decided to focus my efforts instead on three specific community groups: youth, tribal officials, and tribal elders. Mike Chavarria helped to arrange a meeting with myself and members of the SCP Youth Conservation Corps. The meeting followed a similar format as that planned for the resilience workshop and is discussed in greater detail later in this chapter. The remaining groups (tribal officials, and tribal elders) were more suited to a one-on-one interview format. Because tribal officials address watershed restoration efforts on a daily basis, their experience and perspectives were the most important for achieving the primary objective. Not every interview question or response resulted in an actionable recommendation or major issue inhibiting resilience. I felt a broad range of questions and methods would best allow me to get a sense of the varied and complex issues effecting SCP's resilience. Methods to apply resilience thinking in real world situations, with complex systems and multiple stakeholder groups, are still being developed by practitioners around the world (Walker & Salt, 2012). A review of the literature did not turn up any examples of resilience assessments having been attempted in Native American communities. The most important part of any resilience assessment is simply getting participants into a "resilience frame of mind" with a general understanding of the key concepts discussed in chapter 2 (Walker & Salt, p. 1). The methods are presented in the order of their inception.

3.2 Resilience assessment workshop

The Resilience Alliance's 2010 publication "Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners" informed the discussion questions and format for the SCP resilience assessment workshop (Resilience Alliance, 2010). While I was unable to attract participants for the workshop, many important lessons were learned and the framework informed the interviews with tribal officials and other community members.

Should SCP desire to gain input from a greater number of community members on resilience based issues, or for any other participatory process, the workshop framework may prove a useful template. The flier advertising the workshop and a brochure explaining the project are included in Appendix I. In addition, at least one facilitator, a note taker, and one additional helper are necessary to conduct the workshop. Because the workshop takes an entire day, breakfast, lunch, and light refreshments should be provided for participants.

The workshop is broken up into five activities; (1) defining "community" and identifying key issues, (2) identifying natural resource uses, needs, and stakeholders, (3) creating a timeline of disturbance events and conditions, (4) governance and decision making, and (5) identifying key aspects of community identity. Participants are asked to work in small groups to answer a few questions related to the activity discussion topic. Responses are to be written on large index cards and placed on a "sticky wall" under the appropriate headings to form a matrix. The matrix is then used to guide a group discussion.

Activity #1 Defining "community" and identifying key issues

The connections and interdependence between communities is one function of resilience. "Community" is often invoked by government agencies, non-governmental organizations, and others to legitimize projects or meet some legislatively mandated

participatory requirement (Kumar, 2005). “Community” is universally thought to be good, but it is rarely defined (Kumar, 2005). While it may be obvious to SCP community members what their community is, as it may be defined by traditional cultural practices, the exercise could prove useful for outside groups and agencies that wish to engage in “community based” projects with SCP to know who it is they are, or should, be working with.

Identifying key issues allows workshop participants to take a broad view and reflect on how the Las Conchas fire and general natural resource management and planning policies and issues are impacting them. Beginning with a broad range of key issues helps to guide the focus of the assessment by providing a starting point and point of reference. The discussion questions for this activity are:

1. What are the elements of the Santa Clara Pueblo Community? In other words, how do you define the Santa Clara Pueblo Community?
2. What are some key issues that affect any or all of those elements?
3. Are any elements (or people/groups) missing from the list?
4. How do you feel these issues are being addressed?
5. Do any of your key issues originate outside of SCP lands?

Activity #2 Identifying natural resource uses, needs, and stakeholders

Next, participants are asked to describe how they and others in the SCP community use natural resources. Resource uses are divided into two categories, direct, and ecosystem services. Direct uses include hunting, fuel wood gather, and fishing etc. Ecosystem services include the cultural importance of the land, clean air, clean water etc. If the use had limited or no availability within SCP lands or the use/resource was also accessed outside of SCP lands, participants are asked to place a sticker on the index card. The purpose of the stickers is to

discover any deficiencies in the ability of SCP lands to deliver natural resources and ecosystem services to the SCP community. Also to see if there are resources that SCP community members need to access that are outside of SCP lands. The discussion questions for this topic are:

1. How do you and others in the SCP community use the land?
2. For uses/resources outside of SCP lands (if any), are they easy or difficult to access?
What barriers exist?
3. Can you identify any people or groups that use/benefit from SCP resources (or ecosystem services) that are outside of the community?
4. If so, how have they benefited from SCP resources?
5. For resources of limited accessibility within SCP lands, what is limiting that access (availability)?

Activity #3 Creating a timeline of disturbance events and conditions

This discussion topic is designed to determine what events have caused change in the past or lead to disturbance events? When did varying phases of the adaptive cycle occur? Can any potential thresholds be identified? Participants are asked to write on the index cards any events and/or conditions that have impacted individual community elements or the SCP community as a whole. The events and/or conditions could be related to natural resources, cultural issues, economic issues etc. Participants should note any associated dates or timeframes (season, year) and place the events in chronological order on the sticky wall.

Next, participants would consider the stakeholders from activity #2 that are already on the board. They would then write down any additional elements of larger communities whose

actions impact the SCP community. The Bureau of Indian Affairs, and the US Forest Service are examples of larger communities. Participants would then write down any events/conditions that have occurred at these larger communities. They would also include any actions these communities have taken that have affected the SCP community. The discussion questions for this activity are:

1. Are there any related disturbances, where one caused another?
2. Are there any recurring disturbances/events?
3. Which events/conditions have had the greatest impact on the SCP community?
4. Have any events/conditions in one community impacted/caused events in the others?
5. How interconnected/interdependent do the different communities appear to be?
6. Can you identify any potential “tipping points” or thresholds on the horizon?

Activity #4 Governance and decision making

The goal of this activity is to determine who is making decisions that impact the SCP community and how are they making them? Participants are to indicate, by placing them under the correct heading on the wall, whether the decision makers were inside or outside of the SCP community. The discussion questions are:

1. Who is making decisions that affect the SCP community?
2. Are there any collaborative efforts between the decision makers?
3. Are there any barriers or challenges to collaboration?
4. Are there any mismatches in decision-making power? Why might that be, and what effect has that had?
5. What can be done to improve collaborative efforts between decision makers, if needed?

Activity #5 Identifying key aspects of community identity

The final workshop activity was designed to determine the resilience of what. What has contributed to SCP's resilience in the past and present and what should stay the same no matter what happens in the future? The discussion questions are:

1. What aspects of the SCP community have contributed to its resilience following past and present challenges?
2. What are the most important aspects of the SCP community (3-7) that should remain the same no matter what the future brings. In other words, how do you define the identity of the SCP community?
3. Is anything missing from the aspects of SCP identity list? Can we combine or refine this list?
4. Are any of the most important aspects of the SCP community under threat?
5. How can the SCP community strengthen or encourage those aspects that have contributed to the community's resilience in the past/present?

3.3 Youth Conservation Corps workshop

The workshop with members of the SCP Youth Conservation Corps (YCC) followed a similar format as the resilience workshop outlined in the previous section. It served two purposes: (1) educate youth about viewing SCP's issues from a resilience perspective, and (2) gain their insight into what makes up the SCP community (describing the system) and what issues they are concerned about. Youth are the tribal leaders of tomorrow, so it was important to gain their unique perspectives. Because the responses to workshop questions cannot be attributed to any one individual, the questions and notes from participant responses are included in Table 3. After this workshop, the project's primary objective shifted slightly from

a more comprehensive resilience assessment based on the Resilience Alliance's (2010) workbook to the objective given at the end of chapter 1; to determine what issues have reduced SCP's resilience and what can be done about it. The responses from participants were still useful however as they helped to determine what aspects of SCP's SES were desirable and threatened by a lack of resilience. For example, participants indicated that before Las Conchas, they and others used the land to gather plant materials. The loss of that opportunity informed a discussion in chapter 4 about the extent of collaboration and joint use agreements between SCP and adjacent land owners.

Table 1 Youth Conservation Corps workshop questions and responses

Youth Conservation Corps Resilience Workshop 8/1/13	
Question	Responses
1. Who or what is the SCP community?	<ul style="list-style-type: none"> • Culture • People • Tribal Council • Land • Youth • Language • Agriculture • Elders • Different tribal departments: environmental, Governor's office etc. • Education • Law Enforcement
2. What are the biggest issues that the community is facing since the fire?	<ul style="list-style-type: none"> • Flooding • Food (Hunting) • Fishing • Medicinal Plants (Herbs) • Deforestation • Firewood • Language • Loss of respect for culture • Access to canyon=culture • Loss of recreational space • Outdoor skills

3. How do you and others use the land?	<ul style="list-style-type: none"> • Irrigation • Teaching • Hunting • Gathering (Wood, plants) • Fishing • Camping • Recreational • Livestock • BBQ • Planting (Agriculture)
4. How has the use of the land changed since the Las Conchas fire?	<ul style="list-style-type: none"> • There are fire restrictions now. Like if you're going to burn weeds. • We can't go fishing anymore • No access to canyon at all • No more hunting • The creek is now full of ash • We have to watch out for falling boulders • There is a lot of debris in the creek
5. What makes SCP Resilient?	<ul style="list-style-type: none"> • Gathering together • Culture • The people • We didn't want to lose our homes, where we came from • It's like the stories they tell us, we have been through worse before the fire • Prayer, faith
6. How do you identify SCP Identity, what should never change?	<ul style="list-style-type: none"> • Language -Tewa • Tradition • Learning from the land • Our ways of life- beliefs, Who we are, where we came from • Culture, identity • Tewa- That's who we are
7. What role can youth play in restoration and resilience?	<ul style="list-style-type: none"> • Taking part in traditional activities • Ditch digging • Learning the language, little by little • Learning how to plant and irrigate (Agriculture) • Dancing for feast • Preserving Puye • Helping in the canyon by planting trees • Restoring the walls at Puye Cliffs (Preservation work at ancestral ruins) • Teaching youth, sharing your knowledge
8. Who is making decisions that	<ul style="list-style-type: none"> • Governor

effect SCP?	<ul style="list-style-type: none"> • Tribal Council • Elders • Tribal Members • The State • Development corps • Our parents • Ourselves
9. Who else benefits from SCP resources?	<ul style="list-style-type: none"> • Other Pueblos <ul style="list-style-type: none"> ○ Wood ○ Medicinal plants ○ Hunting • Down River

3.4 Tribal officials interviews

Moving from an open workshop format to one-on-one interviews created new privacy concerns for project participants. Information that could identify interview sources was left out of all written documents to preserve their anonymity. The interview questions served as the basis for further research into the issues impacting SCP's general resilience. The goal of the interviews was to tease out larger policy issues that might be affecting SCP's ability to respond to disturbance events like the Las Conchas wildfire. The questions and their justifications were based largely on the workshop activities discussed above. Chapter 4 will provide a summary and analysis of the resulting themes and issues using the concept of "requisite simplicity" to determine the most important issues from a resilience perspective (Walker & Salt, 2012, p. 23).

A request for interviews was made to all tribal departments via email by SCP forestry director Mike Chavarria. The email also contained the interview questions. Table 1 contains a list of the ten tribal departments (out of 18) that I was able to obtain an interview with. The forestry department has taken on the largest role in managing the watershed restoration efforts and collaboration with state and federal agencies so officials in that department were able to speak to a broad range of issues. For departments that did not respond to email requests, I

simply showed up at their office while at SCP conducting other interviews. All interviewees were very gracious with their time and allowed for follow up questions over the phone days and weeks later. All tribal officials were asked the same series of questions. However, certain groups were asked additional questions that addressed areas an interviewee had unique knowledge of (Table 2).

Table 2 SCP tribal official interviews and questions

Tribal Department/Official Interviews	
Tribal department/official	Questions
Forestry	<ol style="list-style-type: none"> 1. How did the Las Conchas fire affect your area of tribal management? 2. What have been the greatest challenges you have faced following Las Conchas and/or other disturbance events in regards to: <ol style="list-style-type: none"> a. Collaboration with adjacent land owners b. State and federal agency collaboration c. Inner tribal (SCP) collaboration d. Access to funds e. Legal/jurisdictional issues f. Regulatory compliance g. Other challenges 3. Who are the decision makers in your area? Is anyone being left out? 4. Is the decision making process that governs your area responsive to change? Is it nimble in a crisis? Why or why not? 5. What, if any, demands (resources, services, etc.) are not being met from within the boundaries of the SCP reservation or are also accessed outside of SCP lands? 6. Can you identify any barriers to accessing or utilizing resources or services from outside of SCP lands? 7. Can you identify significant events (natural disasters, policy changes etc.) that have had a major impact on the way you manage your area? 8. What do you consider to be the most important aspects of the SCP community and culture that should remain the same no matter what happens in the future?
Office of Environmental Affairs	
Intergovernmental and Public Relations Office	
Santa Clara Economic Development Corporation	
Office of Cultural Preservation, Land Claims, and Rights Protection	
Santa Clara Pueblo Housing Authority	
Tewa Language Program	
Senior Citizens Services	
Social Services	
Realty Office	

Table 3 Additional questions for specified tribal departments

Additional or Area Specific Tribal Department/Official Interview Questions	
Tribal department/official	Questions
Office of Environmental Affairs	<ol style="list-style-type: none"> 1. What are your thoughts on water rights adjudications and settlements that affect SCP? What are your concerns? 2. What are the biggest threats or challenges to SCP water rights?
Office of Cultural Preservation, Land Claims, and Rights Protection	
Tewa Language Program	<ol style="list-style-type: none"> 1. What are some of the biggest challenges to preserving the Tewa Language? 2. How is Language tied to other aspects of the culture? 3. Can you identify any potential thresholds that if passed would make preserving the Tewa Language more difficult? 4. Generally, who are the majority of Tewa Speakers?

3.5 Tribal elders

Interviews with tribal elders took on a much more informal and conversational tone than those with tribal officials. I was introduced to a leader in the elder community by a tribal official in the senior citizens services department who helped me to find interviewees. Many elders were reluctant to speak with me; however two people did sit down for an interview. I took notes by hand rather than on a computer and focused more on listening than on asking questions. The interviews helped to paint a picture of what the canyon was like before the Las Conchas fire. The stories the elders told helped to illustrate what was lost in the Las Conchas wildfire beyond what is measureable. Furthermore, knowing how the canyon has changed will help to determine which ecosystem services are no longer available to SCP community members and thus must be obtained from outside of SCP lands. I asked four questions:

1. How has SCP been resilient in the past?
2. What are your current concerns for the future regarding Santa Clara Canyon?
3. How has the fire affected the community?
4. What should never change in the community?

3.6 Summary

Resilience assessments are iterative processes and should be done periodically as conditions change (Walker & Salt, 2012). Despite challenges early in the project to survey community members, I tried to live up to the principles of resilience and allowed the objective and methods to adapt as circumstances changed. The methods discussed above were designed to get a diversity of opinions and perspectives regarding issues that are impacting SCP's resilience, but many community members and stakeholders were not included in the project because of time and resource constraints. Future efforts to perform a resilience assessment

should attempt to reach community member groups that were not available for this assessment. If I could restage the resilience assessment workshop, I would have spent more time performing outreach in the community to explain what resilience thinking is and what the workshop would try to accomplish. Perhaps if people had more of an expectation they would have been more interested in participating. Advertising for two weeks prior was just not enough. I think the workshop format is a good one but in hindsight it requires more time, resources and experience than I had at the time to do the workshop justice. Furthermore, while this assessment focused solely on SCP community members, it would be useful to include stakeholders from outside of the SCP community, such as representatives from adjacent federal agencies and other stakeholders in future assessments.

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Chapter 4. Analysis of issues hindering SCP's general resilience

4.1 Introduction

This chapter explores the issues raised by SCP community members resulting from the interviews and workshops described in Chapter 4 and how those issues affect SCP's general resilience. The analysis focuses on the ability of SCP to deal with the secondary fire effects of the Las Conchas wildfire (erosion, flooding, etc.) and other issues that limit SCP's ability to respond to disturbance events. The most prominent factors limiting resilience that resulted from the methods discussed in chapter 3 are related to (1) adaptive management and tribal sovereignty, (2) collaboration with federal agencies, (3) climate change, and (4) water rights, (5) retaining technical expertise within the tribe, (6) building adaptive capacity, (7) diminished recreational activities, and (8) access to (nonfederal) funding. The preservation of Tewa language and culture is also discussed, but in a slightly different context. Participants universally indicated that the Tewa language and culture is something that should never change within the SCP community so the analysis will focus on how the Las Conchas wildfire has impacted tribal members' ability to practice and preserve their language and culture.

In the interviews, participants identified a number of issues the community is currently facing. While transcripts of the interviews with tribal officials and tribal elders cannot be included because of privacy concerns, Table 4 contains a summary of the issues, concerns, and stories about the Santa Clara Canyon. While all of these issues are important, the focus of this analysis was given to the issues that encompass several similar issues raised by community members and because they speak to the SCP's ability to deal with a variety of disturbances. They also represent in many cases broad structural and policy issues with

implications throughout Indian country. While climate change was not explicitly stated as a major concern, it is an inevitable challenge to and watershed restoration efforts.

It should be noted that a lack of federal funding was raised as an issue all tribal departments. The economic recession has created a universal lack of federal funding not unique to tribal governments. In many cases, when one investigates an issue a tribal community is having, such as the lack of adequate health care facilities, the inevitable end point is a lack of funding. However, to conclude that money is the only limiting factor for building resilience in tribal communities would ignore several larger structural policy issues. Opportunities for SCP to seek funds outside of the federal government will be discussed in a later chapter. However, it is acknowledged that Native American communities have been hit particularly hard by budget cuts and sequestration.

Table 4 Interview responses: major issues, concerns, and stories

Resilience Project Participant Interviews	
Tribal department/official	Major issues, concerns, and stories
Forestry	<ul style="list-style-type: none"> • Access to upper watershed through adjacent public lands • Discrepancy between SCP's desired watershed restoration methods and the BIA, BAER, etc. • Complicated permitting process. • Experienced delays to receive funding.
Office of Environmental Affairs	<ul style="list-style-type: none"> • Severely degraded water quality of Santa Clara Creek. • Monitoring difficult because of lack of access to upper watershed, dangerous conditions. • Diminished funding from EPA resulted in sample sites being excluded. • Illegal dump sites along Rio Grande in Espanola. • Rio Grande not a viable alternative to the Santa Clara Creek for recreation and cultural uses. • Difficulty to access background (baseline) sample sites that are on adjacent public and private lands. • Better collaboration with local environmental groups to aid cleanup efforts along Rio Grande, monitoring, etc. • Degraded septic tanks.
Intergovernmental and Public Relations Office	<ul style="list-style-type: none"> • Difficulty in seeking outside funding, the need for a professional fundraiser. • Difficulty to move funds around from various projects (ARRA). • Restrictive nature of federal funding.
Santa Clara Economic Development Corporation	<ul style="list-style-type: none"> • Tourism to Puye cliffs has been impacted. • Lack of high-speed internet on the reservation. • Difficult to retain qualified individuals (higher education experience) to work for the tribe. • Mentoring, job placement. • Succession plan to fill experience gap when people move on or retire.
Office of Cultural Preservation, Land Claims, and Rights Protection	<ul style="list-style-type: none"> • Hiring outside contractors is expensive, lack of qualified individuals to work for the tribe with specific technical knowledge (archeology, civil engineering etc.). • Water rights settlements. Concern that precedent may be set in earlier sub proceedings that will impact SCP.

Santa Clara Pueblo Housing Authority	<ul style="list-style-type: none"> • The need to approve a mortgage ordinance.
Tewa Language Program	<ul style="list-style-type: none"> • Making sure younger generations pass on the language. • Past government policies still impacting language, culture (assimilation and termination policies). • Conflicting western norms and ideals with Tewa cultural norms and ideals. • Immersion is the best technique to teach language, • At what point to stop incorporating new ideas into language? This is an ongoing debate. • Age of fluent Tewa speakers is a threshold. • Fire was traumatic experience. • Greater collaboration with other Tewa speaking tribes may be beneficial.
Senior Citizens Services	<ul style="list-style-type: none"> • Emotional impact on seniors when they saw pictures of the canyon. • Need a database of at-risk individuals to check on during a disaster/emergency. • Alert system during emergencies. • Declining services from Indian Health Services. • Difficulty hiring new staff. • Budget cuts (state, federal) also impact Espanola community who rely on services provided by SCP.
Social Services	<ul style="list-style-type: none"> • Slow process to receive funding from federal agencies (disaster relief funding).
Realty Office	<ul style="list-style-type: none"> • Diminished road conditions a major issue. • Boundaries now unclear after fire, need to re-fence etc. • Appraisals to acquire lands are often overbid. • Lack of infrastructure, septic tanks not sustainable.
Tribal Elders	<ul style="list-style-type: none"> • Past floods were much less severe, could still jump over Santa Clara Creek. • You used to be able to smell wild herbs all the way up to 4th pond. • Wildlife (bears etc.) used to be abundant in canyon. • Need help from other tribes to have corn, evergreens, etc. for rituals and dances as they are now less available in the canyon.

4.2 Adaptive management and tribal sovereignty

“Who else knows better for their own tribal lands than the people who live and work there and see them on a daily basis?”

-Matt Tafoya – Santa Clara Pueblo Forestry Department

Adaptive management and governance (AM) is a key function of a resilience-based approach to the management of SESs (Walker & Salt, 2012). AM gives decision-makers the flexibility to learn from prior experience and adjust management interventions accordingly. Over burdensome bureaucracy erodes the ability of actors in a SES to engage in AM because decision-making mechanisms and management techniques are entrenched in uniform policies, rules, and regulations. Though not using the term directly, many tribal officials complained of a lack of capacity to engage in AM because federal funding is often restrictive in how it can be spent and because the BIA has the final approval over many management actions. Tribal officials had knowledge based on prior experience that they were unable to act on because they did not have the authority or the ability to put that knowledge to use. AM is dependent upon sovereignty, a tribal right granted in the U.S. constitution and clarified by various congressional acts. When tribal sovereignty is undermined, the tribe's ability to respond to disturbance events effectively is diminished and resilience is compromised. This complaint highlights a contradiction in federal policies regarding self-determination/self-governance and the interpretation of the trust responsibility on the part of the federal government.

The Indian Self-Determination and Educational Assistance Act of 1973 (1973) (ISDA) authorized the Department of the Interior (DOI), and the Department of Health and Human Services to enter into contracts with tribes who would then assume those department's role in

delivering certain services. ISDA (1973) reads in part,

“the prolonged Federal domination of Indian service programs has served to retard rather than enhance the progress of Indian people and their communities by depriving Indians of the full opportunity to develop leadership skills crucial to the realization of self-government, and has denied to the Indian people an effective voice in the planning and implementation of programs for the benefit of Indians which are responsive to the true needs of Indian communities.”

In 1994, ISDA (1994) was amended to include Title IV Tribal Self-Governance, which aimed to further reduce federal bureaucracy and oversight. In 1995 SCP became the first tribe in New Mexico and Colorado to sign a self-governance compact with the Department of the Interior Bureau of Indian Affairs. Since then, the tribe has signed agreements/contracts with the BIA to manage forestry, wildland fire operations, law enforcement, realty, social services, education, vital statistics and others. Following an experimentation period known as the Self-Governance Demonstration Project, congress concluded that

“transferring full control & funding to tribal governments, upon tribal request, over decision making for Federal programs, services, functions, & activities (or portions thereof) – is an appropriate & effective means of implementing the Federal policy of government-to-government relations with Indian tribes; & strengthens the Federal policy of Indian self-determination” (Indian Self-Determination Act Amendments of 1994, 1994).

This implies that Self-Governance tribes have the final say in how federal funding is utilized for programs they have taken over. However, they often do not have a voice in how funding

is implemented and the timing of implementation. A recurrent theme throughout the tribal official interviews was that federal funding could not be used in the way tribal officials deemed most appropriate despite having entered into funding agreements with the BIA to assume responsibility to deliver those services. Furthermore, the process to obtain final BIA approval has caused costly delays in beginning the time-sensitive restoration work in Santa Clara Canyon.

Three specific examples from SCP serve to illustrate the difference between tribal self-governance in theory and in practice. First, following the Cerro Grande fire, aerial straw mulching was used to mitigate erosion, flooding, and to aid in reforestation. Despite claims that the straw was “weed free,” invasive plant species such as cheatgrass proliferated where aerial mulching had occurred. Learning from this experience, tribal officials proposed the use of wood mulch from salvaged logs in Santa Clara Canyon as part of the Burned Area Emergency Response (BAER) plan. This request was denied by the BIA despite the fact that technical assistance manuals identify the risk of the spread of invasive plant species following aerial straw mulching (Napper, 2006). SCP was unable to lobby successfully for this viable alternative during which time, the first snow had occurred and runoff events limited the effectiveness of aerial mulching.

Second, SCP requested options for structural protection from flooding that were listed in the BAER treatment catalog to protect Santa Clara Village in the lower watershed, yet those requests were denied by the BIA in favor of cheaper, less effective sand bags and k-rails (concrete barriers) (Napper, 2006). Sand bags eventually degrade and along with k-rails, are potential floatable debris in the event of large flood events on the order that SCP has experienced. They are not permanent solutions. While BAER treatments are not intended

necessarily to be permanent solutions, the options SCP was proposing are in the BAER catalog.

The final example is the delay SCP experienced in beginning BAER treatments because of the Northern Pueblo's Agency (NPA), the local branch of the BIA. SCP was required to meet all permitting requirements specified by the USFS in the BAER plan and because the NPA has to sign off on all such plans, SCP could not circumvent their approval. Unfortunately, NPA lost an important permit and time was lost while SCP officials tracked it down. The approval of the NPA merely added another layer of red tape.

Why does a Self-Governance tribe need the approval of the BIA for something it has a funding agreement to do for itself? The answer can be explained by the contradiction between the promise of the Self-Governance Act and the federal government's interpretation (and legal definition) of the trust responsibility. In *Cherokee Nation v. Georgia* Chief Justice John Marshall stated what continues to define the trust responsibility for federal agencies almost 200 years later, writing in the decision, "they (tribes) occupy a territory to which we assert a title independent of their will,...meanwhile they are in a state of pupillage. Their relation to the United States resembles that of a ward to his guardian" (*Cherokee Nation v. Georgia*, 1831).

Prior to 1910 Indian tribes were granted no more than a right of occupancy to trust lands held in common, with any resources (timber, minerals, etc.) belonging solely to the United States (McQuillan, 2010). While progress has been made, this paternalistic view of tribes as wards in need of federal "protection" continues to play out in natural resource management. The SCP experience bears this out. This viewpoint is reflected in guiding documents for BIA interactions with self-governance tribes managing wildland fire operations

(USDI, 2001). The BIA retains the final approval over management plans that guide wildland fire operations in order to “fulfill its trust responsibility in resource protection” (USDI, 2001). “Full control and funding...over decision making” apparently does not extend to wildland fire management (Indian Self-Determination Act Amendments of 1994, 1994).

4.3 Collaboration with State and Federal Agencies

In times of crisis, collaborative relationships can help to build the resilience of a SES (Kaufman, 2012). When a crisis or disturbance event such as the Las Conchas fire occurs, its impact is felt across multiple spatial scales i.e. land tenures. “Collaborative resilience” is an emerging planning and natural resource management paradigm that seeks to build the resilience of SESs by leveraging resources and mutual interests in order to be better prepared for disturbance events (Kaufman, 2012). Furthermore, collaborative relationships can enhance the openness of the SCP system, which is one function of general resilience identified by Walker and Salt (2012). Openness is the ability of people, ideas, plant and animal species etc. to move in and out of the focal system i.e. the SCP reservation (Walker & Salt, 2012). Collaboration among landowners and managers is necessary because as former Forest Service chief Jack Ward Thomas once said, “ecological systems don’t come in squares” (Nie, 2008, p. 21). Chief Thomas is referring to the problem of intermixed land ownership in the west, particularly the “checkerboard” pattern of land tenure left over from the land disposal era of public land management (Osborn, 1995; Nie, 2008). In the context of ecosystem, watershed, and wildlife management etc., private ownership and political boundaries are arbitrary. In this way land health is a shared responsibility.

In addition, the Las Conchas fire and subsequent floods resulted in severe damage to the Santa Clara Creek watershed, rendering much of it inaccessible to most tribal members for

several years and limiting the eco-system services the watershed can provide for at least a generation (Dasheno, 2011). Several interviewees indicated that they could no longer hunt, fish, gather plant materials, and recreate in the watershed. It is likely that SCP will need to utilize resources outside of their reservation boundaries as the watershed recovers, which will likely require building on existing agreements and forming new ones to clarify rights of access and use of adjacent public lands. For example, several species of conifers that are used in ceremonial dances are now in limited supply. Conifers grow at higher elevations in Santa Clara Canyon in an area that experienced high severity burns during the Las Conchas fire. Similarly, medicinal plant species that were once found within the riparian zone of Santa Clara Creek are limited because flooding has scoured the banks of Santa Clara Creek where vegetation once thrived. Tribal elders relayed that at one time you could smell the wild herbs all the way up to the fourth pond, an area now devastated by wildfire. While many neighboring tribes have graciously contributed many of these materials, SCP should be able to access such materials on their ancestral lands with as few bureaucratic barriers as possible. The Tribal Forest Protection Act authorizes tribal governments to engage in restoration and management activities on adjacent public lands. To date no agreements between SCP and adjacent federal agencies have been formalized.

Because access to the upper Santa Clara Canyon is limited due to roads being washed out and other hazardous conditions, SCP officials and workers must go through adjacent lands in order to access the upper watershed. This requires contacting officials from the SFNF and VCP every time SCP needs to traverse their lands. Additional access points to SCP lands are often blocked by locked gates requiring even more time to gain access while waiting for a key. Furthermore, in order to obtain baseline data for water quality monitoring, SCP officials

must obtain samples from outside of SCP lands. Surface waters within the reservation are too degraded to provide an accurate baseline. These actions require the permission of adjacent public and private landowners that is currently obtained informally.

Another concern is the protection and restoration of sacred sites on adjacent federal lands. However, many tribes have been hesitant to identify the locations of sacred and cultural sites for fear that the nature of the sites and their locations may be disclosed, and because it may go against cultural norms to discuss such issues with outsiders (Plaut, 2009 FOIA and tribes). The fear of sacred sites becoming public knowledge is partially due to the 2001 US Supreme Court decision, in *Department of Interior v. Klamath Water Users Protective Association*. In *Klamath* (2001), the court held that confidential information transmitted between tribes and the federal government is not exempt from the Freedom of Information Act (FOIA) (Plaut, 2009). However, the 2008 farm bill exempts the USFS specifically from FOIA requests to release the location or nature of Native American cultural uses of land and resources and the location of sacred or culturally significant sites on national forest system lands (Food, Conservation, and Energy Act of 2008, 2008). So it seems as if the 2008 law provides SCP some legal protection to collaborate with the USFS without fear of disclosing the location of sacred sites.

For all of the aforementioned reasons, SCP has a significant interest in how adjacent public lands are managed. From SCP's perspective, ancestral and spiritual connection to the land extends beyond the reservation boundaries and as such, they have an interest in how that land is managed (Ortiz, 1969; Pueblo of Santa Clara & Wood, 2008). Unfortunately, SCP officials have expressed the concern that adjacent federal agencies do not fully comprehend SCP's concerns. The Clinton administration issued several executive orders (EO) and

memorandums requiring greater collaboration between federal agencies and tribal governments. The relevant EOs include (1) EO 13007 “Indian Sacred Sites” (2) EO 12875 “Enhancing the intergovernmental partnership,” and (3) EO 13175 “Consultation and coordination with Indian tribal governments.” Following the Clinton EOs, the Indigenous Peoples Subcommittee of the National Environmental Justice Advisory Council (NEJAC) to the Environmental Protection Agency (EPA) issued a consultation guide to aid government agencies and tribes in enhancing collaborative relationships (NEJAC, 2000). In the guide, NEJAC distinguishes between the public participation process, “an information gathering exercise” and consultation (collaboration) “a government-to-government process that requires greater involvement and decision-making by all parties” (NEJAC, 2000). Tribes are more likely to engage in collaborative relationships when their sovereign status is recognized and respected (Adelzadeh et al., 2003). Consultation between SCP and federal agencies lacks consistency and formality. As a sovereign nation, SCP deserves nothing short of a government-to-government interaction as opposed to being another interested member of the public.

4.4 Climate change

Indigenous communities are disproportionately affected by climate change (NWF, 2001). Greater reliance on natural resources for economic well-being, a lack of infrastructure, and having one’s cultural identity tied closely to the land are all contributing factors (NWF, 2011). Much of the emphasis regarding climate change has been on what the potential effects will be: how high sea-levels will rise, will we see more extreme weather events etc.? Perhaps the more important question to ask is how well equipped are society and the environment to absorb climate-change induced disturbances? This is an important distinction. The abiotic

factors that drive ecosystem function and structure are changing rapidly. The intent of this section is not to declare restoration impossible because of climate change. Rather it is to paint a clearer picture of the full spectrum of challenges so that SCP can use the best available information to inform management interventions and priorities and to advocate for a process-based approach to restoration as opposed to one aimed at returning to some desired reference condition. The watershed will recover eventually; what the character of the watershed's biologic communities will look like compared to historical references remains to be seen.

Historical records show that mean yearly temperatures in the Southwest are increasing and are projected to continue doing so (Cayan et al., 2010). This has several implications for SCP. First, higher temperatures will increase drought stress on trees, which has led to a dramatic shift in forest structure and composition, particularly at ecotones (Williams, et al., 2013). The regeneration of conifer species which characterize the forest type in the highest severity burn category in Santa Clara Canyon generally occurs in pulses of wet/cool periods (Williams et al., 2013). A warmer climate coupled with a lack of parent tree sources will make it very difficult to restore the canyon to pre-Las Conchas conditions (Williams et al., 2013). More drought tolerant species, such as junipers and oaks may proliferate in place of conifers.

Second, increased temperatures have led to earlier springs and longer summers (Westerling et al., 2006). As a consequence, snowmelt occurs earlier lengthening the fire season and further increasing drought stress (Westerling et al., 2006). Warmer temperatures are also changing the composition of winter precipitation, with an increasing amount precipitation falling as rain rather than snow (Westerling et al., 2006). A decrease in winter snowpack will decrease soil moisture and result in lower stream flows later in the summer

(Cayan et al., 2010). Water resources in the Southwest are largely snowpack driven, so even if precipitation amounts do not change in the future, the change in character of precipitation and greater evaporative losses due to increased temperatures will make the Southwest more arid and will cause surface water flows to decline.

Wildfire is a wildcard when considering how ecosystems will change with a warming climate. Drought and land use induced landscape changes can take decades, a relatively short time period to be sure, but wildfire can alter hundreds of thousands of acres in a matter of weeks (Allen & Breshears, 1998). It is important to remember that the southwest has experienced large wildfires before (pre-euro settlement) including stand replacing fires in certain ecosystems (Keane et al., 2008). What has changed dramatically is the resiliency of southwestern ecosystems to recover from wildfire. Even ecosystems that are historically characterized by high severity fires are now impaired in their ability to recover from typical wildfire events due to the introduction of opportunistic and invasive species.

4.5 Water rights

In addition to groundwater, SCP relies on two surface water bodies for agriculture and other uses: Santa Clara Creek and the Rio Grande. The small community of Guachupangue is the only other user of Santa Clara Creek water besides SCP. Currently, there is no agreement to quantify the rights of Guachupangue or SCP users on Santa Clara Creek. SCP's rights to Rio Grande water are currently being adjudicated through settlement in State of *New Mexico ex rel. State Engineer v. John Abbott, et al* (1968). The adjudication will have three sub-proceedings to adjudicate Pueblo claims as follows: (1) Nambe, San Ildefonso, and Pojoaque, (2) Ohkay Owingeh, and (3) Santa Clara. There is a concern that precedent will be

set in the earlier sub-proceedings (the first is settled and the second is in process) that will impact SCP's own claims.

Another possible impact is the adjudication method used to quantify SCP's water right. Indian water rights have historically been quantified under the standard of "Practicably Irrigable Acreage," which means that a tribe has a right to as much water as it would take to irrigate all such land on their reservation, regardless of whether they have ever irrigated that amount of land (Osborn, 2011). This is in sharp contrast to non-Indian water users whose water rights are quantified based on the principle of beneficial use, which states that one only has a right to as much water as they historically used since they acquired the right. Under the prior appropriation system and the principle of beneficial use, you must "use it or lose it" (Osborn, 2011). However, in the recently settled *Aamodt* adjudication, the standard of "Historical Irrigable Acreage" was used to quantify Pueblo claims, which substantially limits the amount of water a tribe can claim (Osborn, 2011). In *Aamodt*, the Pueblos did retain their senior rights (Osborn, 2011).

The potential impact for SCP is that several factors have contributed to SCP's changing water needs. First, the Las Conchas fire has severely degraded the Santa Clara Creek, making it unusable for irrigation and other uses for an undetermined amount of time while the watershed recovers. Severe erosion in the upper watershed will result in high sediment loads in the creek for years to come, as well as altered chemical and biological characteristics. So that is one historical source of water that SCP will not be able to rely on for a long time. Second, tribal officials identified aging and degraded septic tanks as a threat to SCP's groundwater. As that situation worsens, SCP will need to find other sources of drinking water. These are issues that SCP should consider throughout the adjudication

process. Tribes are not limited to their use of Rio Grande water for agricultural purposes, but if SCP's other sources of water are compromised, they may end up relying more heavily on the Rio Grande to meet their various water needs (Osborn, 2011).

In many ways, the prior appropriation system of water rights adjudication is poorly suited to a resilience-based approach to planning and resource management. Adjudications that are based on past uses, quantities, and climatic conditions may become outdated. A water rights system that is based on efficiency and limiting variability (for senior users at least) ultimately decreases resilience, for as Holling (1973) states, efforts to provide a “non-fluctuating supply of water from a watershed might paradoxically increase the change for extinction.” An earlier chapter discussed the correlation observed by Holling (1973) between instability and resilience. This concept holds true for water rights. Users with senior water rights may be lulled into a false sense of security and fail to properly guard against future challenges associated with climate change. Furthermore, the economic and ecologic well-being of water users in a watershed would be hard to decouple. A single farmer with senior water rights cannot feed everyone in the region. Shocks (water rights being cut-off) at one scale of the system may cause disturbance in other parts of the system (senior users) i.e. panarchy.

4.6 Preservation of Tewa language and culture

When asked what aspects of the SCP community should stay the same no matter what happens in the future – the resilience of what – the answer from project participants (interviews and workshops) was overwhelmingly the Tewa language and culture. The responses to that question are given in Table 4 at the end of this section. Interviewees identified three issues that are inhibiting the practice and preservation of Tewa language and

culture: (1) lack of access to the canyon and degraded natural environment, (2) desire to adopt mainstream western (American) cultural norms, and (3) the number and age of fluent speakers.

Lack of access to the upper watershed and degraded natural environment has greatly impacted SCP people's ability to practice their culture and teach their language to younger generations. Many people, tribal elders in particular, have said that they do not want to see the canyon today because they want to keep their memory of it before the fire intact. Language and culture are rooted in the physical place which SCP has inhabited since time immemorial. Hunting, fishing, camping, and gathering medicinal and culturally important plants are not only a part of the Tewa culture, they are also a link to past generations. Plant species that are important for rituals and ceremonial dances are now harder to gather from SCP lands, such as conifers, which are a symbol of everlasting life in the Tewa culture (Ortiz, 1969). The preferred and most effective method for teaching the Tewa language is through immersion and by participating in traditional cultural practices. Unfortunately, the Las Conchas fire has made it impossible to pursue activities that require access to the upper canyon. Besides a lack of access, agricultural activity has diminished because the water quality in Santa Clara Creek is not suitable for irrigation because of degraded quality and damage to acequia infrastructure. Acequias are irrigation ditches that date back to the Spanish colonial era and are a major aspect of New Mexican and Pueblo culture. Water is also an important component in many rituals and rites of passage (Ortiz, 1969).

Disturbance is not always violent like natural disasters. It can also happen slowly over many years or decades. Cultural disturbance often happens this way. When assessing the resilience of the Tewa language, it is important to look for these "slow variables," such as

shifting cultural norms, technology, and demographics so that thresholds can be identified and interventions planned (Walker & Salt, 2006). Having a resilient cultural identity requires asking the difficult question “change is inevitable, but how much is too much?” This is an ongoing debate among SCP people and cultural and secular leaders. Language, culture, religion, and worldview are all inextricably linked. When one of those areas faces change it has a cascading effect on the others. Framing the debate as a matter of resilience – as adaptation and transformation rather than assimilation – may help to resolve disputes among parties that advocate for or are opposed to cultural adaptation. Some degree of change is necessary, even inevitable, but that does not discredit the concerns of some tribal members that at some point cultural identity may be compromised; finding that point is an important discussion for tribal leaders and members to have.

Table 5 Most important aspects of SCP community and culture

What do you consider to be the most important aspects of the SCP community and culture that should remain the same no matter what happens in the future?
<ul style="list-style-type: none"> • SCP people have always been here and always will. • Multi-generational activities. • Need the older kids to talk to younger kids to keep the connection to home. • Even the culture has changed over time. • The resilience of our people. Our religious significance, prayers, ceremonies should continue to be the foundation of our community/individual. • Language, has tremendous impact on the culture. • Strong effort to keep language. What cultural and religious leaders say is followed. They provide the directives. • Core of who we are and will remain so. • Art, world famous for pottery. Spiritual relationship with pottery. Symbols on pottery have cultural meaning. • Our traditional ways. • Adaption within SCP was in order to protect practices and traditions. Adaptation is why cultures and tribes (Pueblo) has been in existence for so long. Without those traditions and cultures SCP would just be another community wouldn't have that important mechanism that gives the Pueblo its identity. Other cultures may have experienced a significant break in traditions and then lost them. Pueblos have maintained continuity of culture and traditions. • Story of the revolt carried on and gave people strength throughout Pueblo history. Heard about it all the time in school. • Traditions, religious ceremonies, culture, language. • Native speakers proportionately seniors. Grandparents teaching children, generation in the middle missing from this. • As a Tribal Council we have a responsibility to protect and preserve all aspects of the community and the traditional culture of Santa Clara; from our natural areas that are the focal point of this disaster to its effect on our tribal community members who have a close relationship with these natural resources as part of our traditional culture. Our community has had to adjust to these changes, however, we continue with our traditions and culture based upon our traditional beliefs. • Individual viewpoint: deeper adherence to old teachings.

4.7 Retaining technical expertise within the tribe

The lack of qualified individuals, native individuals especially, with higher education and/or specific technical experience who work for SCP was raised in two similar ways by tribal officials. First, the response to the Las Conchas fire required varying kinds of technical expertise including civil engineering, hydrology, and archaeology. Because SCP does not currently employ people in these fields, or does but to a limited extent, they must rely on outside contractors which can be expensive. Second, SCP people who have gone on to earn higher education find it difficult to work for tribal governments because the pay is less than one can find outside of the reservation. Walker and Salt (2012) identify reserves of knowledge as a function of general resilience and adaptive capacity

4.8 Building adaptive capacity

Adaptive capacity, which is closely related to general resilience, speaks to the ability of a system to respond to shocks and disturbance (Walker & Salt, 2012, p. 100). Building adaptive capacity increases the “safe operating space” within which a system functions so transitions to undesirable system states can be avoided (Walker & Salt, 2012, p. 100). Specific issues raised by tribal officials related to adaptive capacity include not having a database of at risk individuals to contact in the event of a disaster, and an alert system. It should be noted that all interviewees expressed the opinion that the tribal response to the Las Conchas fire, including coordination between tribal departments, has generally been outstanding.

4.9 Diminished recreational opportunities on SCP lands

Opportunities to hunt, camp, fish, picnic etc. have been severely diminished on SCP lands. SCP community members must now pursue these activities on adjacent public lands. This can create barriers such as the cost of permits, lack of access, and a generally poorer experience compared to previous conditions in Santa Clara Canyon. Many of these activities, while considered recreational by others, are a part of the traditional cultural practices of SCP, such as hunting and collecting plant materials. Removing barriers to pursuing these activities on adjacent public lands can help preserve cultural identity and enhance “openness” within the SCP SES thus increasing resilience (Walker & Salt, 2012).

4.10 Access to outside funding

Budget cuts, sequestration, and bureaucratic red tape can make federal funding unreliable. Barriers to pursuing such initiatives with greater vigor such as the lack of a full time grant writer to seek outside (non-federal) funding should be evaluated. Furthermore, Walker and Salt (2012) identify reserves of financial capital as a function of general

4.11 Conclusions

Collaboration with federal agencies stands out as the biggest issue that is hindering SCP’s ability to effectively respond to the Las Conchas fire. It seems as though the knowledge SCP gleaned from previous wildfires, the Cerro Grande fire in particular, are not being utilized to the proper extent. This is largely due to contradictions in federal policy regarding self-governance and the federal trust responsibility and weak mandates for tribal consultation and collaboration among federal land management agencies. This is an issue that directly affects SCP and other tribal government’s authority as sovereign nations.

Viewing the issues SCP faces from a resilience perspective is useful for SCP as well as for those whose actions are impacting SCP. Addressing many of these issues not only solves problems today, but also prevents future ones. For example, enhancing SCP's ability to manage its own affairs when it comes to natural resource management decisions will streamline the response to future disturbances. While this is certainly a challenging time for SCP, it is also a time of growth and renewal. Chapter 5 will discuss opportunities for addressing the issues discussed in this chapter, thereby building a more resilient SCP community.

Chapter 5. Recommendations and opportunities for reorganization

5.1 Introduction

While this is a time of great uncertainty for the people of SCP, it also holds a lot of potential for positive change. It is during the reorganization phase of the adaptive cycle – which SCP arguably finds itself in now – when changes to policies that hinder resilience are most likely to occur (Walker & Salt. 2012). Decision makers have the benefit of hindsight to consider the events leading up to the Las Conchas wildfire and the experience of trying to recover from it to evaluate what has and has not been effective management.

This chapter provides several opportunities for SCP to enhance resilience, primarily through adaptive management, innovation, and utilization of traditional ecological knowledge. These opportunities were chosen because they directly address the issues identified in SCP community interviews. They are:

- Agreements with adjacent land management agencies
- SCP representation on the VCNP board of trustees
- Federal legislative opportunities
- Traditional ecological knowledge working group
- Water resources
- “Soft” engineering watershed restoration methods
- Technological tools for language education
- Social media

These opportunities are summarized in Figure 16 in relation to the relative scale at which they are implemented. Figure 16 is an adaptation of Lambert’s model (Figure 13) of Maori resilience. Figure 16 can be seen as a roadmap for how to manage for resilience across the various scales impacting SCP.

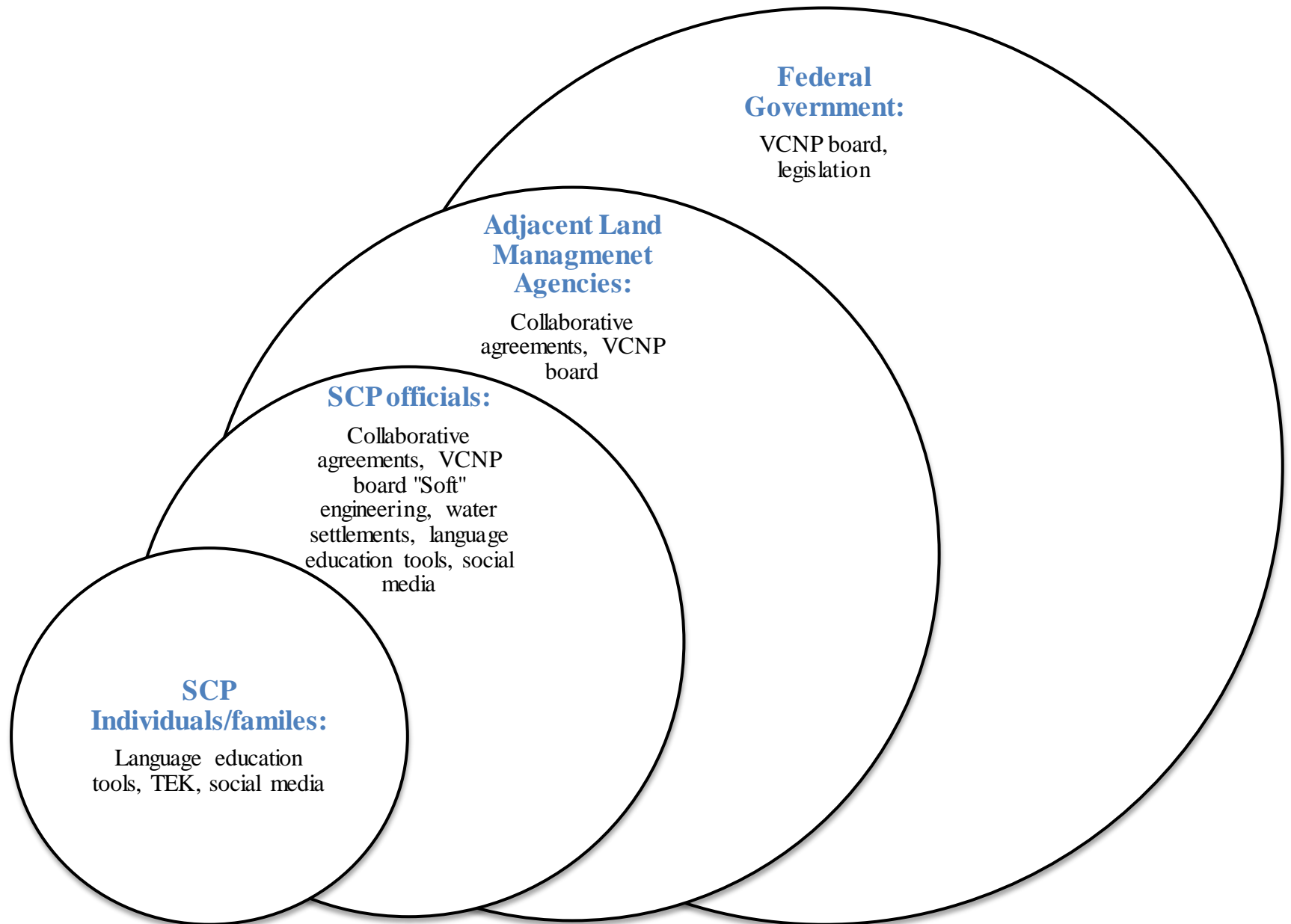


Figure 16 Opportunities for reorganization at nested scales, adapted from Lambert (2012)

5.2 Agreements with adjacent land management agencies

Collaborative agreements, such as memorandum of understandings and/or agreements (MOU, MOA) are useful tools for tribal-agency collaboration as they clarify mutual interests, methods for collaboration, and rights of access. These kinds of agreements can be useful in an adaptive management approach as they add flexibility to more rigid statutory and regulatory frameworks. For example, the Self-Governance Act authorizes the BIA to allow tribal governments to have a greater role in decision-making, however it does not mandate to what extent local BIA offices must consider tribal opinions. A written agreement between SCP and the Northern Pueblos Agency could help to clarify how the BIA plans to weigh the tribes input, adding transparency to the approval process for resource management plans and laying the ground work for greater collaboration.

The language of any potential agreement should be considered carefully to provide for the greatest degree of enforceability and accountability for the parties involved. Where agency policies and guidelines lack clarity or specific strategies for implementations, agreements can clarify those positions. For example, the VCNP “authorizes the use of the Preserve by Native Americans for religious and cultural purposes” provided that the Pueblo governor makes a request to the Preserve Manager (National Park Service, 2009). What about providing access solely for the use of VCNP roads to access parts of the SCP reservation? Do Pueblos have a standing right of access once a single request has been made? The experience of SCP officials has exposed several instances where a lack of clarity has led to confusion and an onerous process to access the VCNP. The VCNP has the authority to grant access to SCP but the process by which that access is granted could be clarified with a formal agreement.

The Las Conchas fire has severely limited the recreational opportunities for SCP community members due to unsafe conditions and the current degraded state of the watershed as well as the availability of culturally important plant species. SCP community members will inevitably need to pursue these activities outside of SCP lands. Barriers now exist, such as obtaining the necessary permits from public land managers, to pursue activities that were once pursued for no charge (or without permits) on SCP lands. The current SFNF plan has the directive to “periodically update permits and the process which accommodates Native American access to collect greens, herbs, or other materials for tribal ceremonies” (USDA, 1987). The Las Conchs fire has changed the need for tribal access to the SFNF. SCP in many cases has no other option but to obtain certain materials from the SFNF. This reality can form the basis for new agreements to remove unnecessary barriers, whether it is to collect plant materials or for “recreational” activities such as hunting and fishing. There is precedent within the National Forest system for Native Americans to gather “miscellaneous forest products for personal use” without a permit (Lesko & Thakali, 2001, p. 297).

Several tribes have created MOUs with adjacent federal and state land managers, including the Jemez Pueblo and the SFNF in 2011 (USDA, 2010). While SCP is likely to have different concerns than Jemez Pueblo, the existing MOU may be useful as a template for SCP to enter into its own MOU with the SFNF. The Jemez MOU also sets an important precedent for collaboration and paves the way for future agreements.

Highlights of the Jemez-SFNF MOU include (1) the SFNF will integrate cultural resource considerations and traditional ecological knowledge into land and resource management decisions to promote sustainable ecosystems (2) both parties will attend quarterly meetings (3) the SFNF will, to the extent authorized by law, the confidentiality of

records, maps, photos, and other information about activities and locations significant to Jemez Pueblo (4) the SFNF will work with Pueblo leadership to manage public access to areas where cultural and/or religious activities are taking place (USDA, 2010).

5.3 SCP representation on the VCNP board of trustees

The Valles Caldera is a super volcano that makes up the Jemez Mountains in Northern New Mexico. The SCP reservation is located on the northeastern slope of the caldera. Because of its close proximity, SCP has a great interest in how the VCNP, which was established by congressional act in 2000, is managed (Pueblo of Santa Clara & Wood, 2008). The VCNP was designed to be an “experiment in public land management” that uses adaptive management and incorporates elements of public and private administration (Valles Caldera Trust, 2012). Whether the experiment is a success or not will be based on performance in three areas, (1) public access, (2) comprehensive management, and (3) financial self-sufficiency (Valles Caldera Trust, 2012). The trust's authority is set to expire in 2020 unless extended by congress. At that time management responsibility for the VCNP will default to the SFNF. The trust is currently making progress towards reaching its goals, however Senators Udall, and Heinrich of NM are co-sponsors of a bill to transfer control of the VCNP over to the National Park Service before the experiment is given the full time allotted to reach its goals. In addition, an opportunity to broaden the experiment to be the first public-private-tribal administration structure is potentially lost if the trust is dissolved.

There have been numerous executive orders, agency guidelines, and laws passed requiring federal agency consultation with tribal governments. However, decision-making power always remains in the hands of the federal government. The VCNP experiment provides an opportunity to move beyond MOUs, MOAs, and tribal consultation and give

tribal governments actual decision-making power in the management of lands and resources that impact them yet are outside of their reservation. This can be accomplished by amending the VCNP legislation to mandate that the board of trustees include at least one member that is appointed by a council of Pueblo Governors or some other means. If the “experiment” is continued in this way, it could act as a case study for other public-tribal partnerships to manage public lands. Currently, there are nine people on the VCNP board of trustees. Seven are presidentially appointed and two are the supervisors of the SFNF and Bandelier National Monument. Presidentially appointed board members serve three-year terms. Each member is chosen because of their expertise in a particular management such as financial, natural resources, cultural resources etc. One criticism of this management structure is that the turnover of board members inhibits consistent policy (Valles Caldera Trust, 2012). Including Pueblo representation will add continuity to the mission and goals of the VCNP.

5.4 Traditional ecological knowledge working group

“We got to know the plants, we got to know the trees, we got to know the various animals; this was our education. We were able to see, touch and feel those things in life that you won’t hear, and feel, and see in a classroom.”

-Former SCP governor Walter Dasheno

The initial proposal for this project included the creation of a traditional ecological knowledge (TEK) working group. This proved to be too ambitious given time and resource constraints and is thus included here as a recommendation. The TEK working group will be tasked with designing a survey or other instrument to document the TEK of SCP community members that may help to guide watershed restoration efforts and help to preserve the Tewa language and culture, which is closely tied to the land. The working group should be created from a variety of tribal departments to provide a more diverse set of ideas (Fogerty, 2001).

While it is recommended that only tribal officials are included in the creation of a study design, other tribal members, such as youth, may be involved in the collection of TEK by functioning as interviewers. *The Historical Ecology Handbook: A restorationist's guide to reference ecosystems* (2001) provides useful case studies and methods for conducting oral histories and ethno biologic surveys. "Historical ecology" can be defined as "the interface between ecology and historical geography that undertakes studies of lost or degenerated historic ecosystems, and as a discipline that 'traces the ongoing dialectical relations between human acts and acts of nature, made manifest in the landscape'" (Egan & Howell, 2001, p. 2; Crumley, 1994)

Fogerty (2001) identifies several important steps for conducting oral history interviews that will help guide the TEK working group's process (1) writing a project statement containing goals and objectives (2) determining ethical standards for conducting interviews/surveys and for the dissemination of sensitive material (3) identifying interviewers (4) identifying narrators (interviewees) (4) writing survey/interview questions (5) designing a process for analyzing and storing interview/survey data (Fogerty, 2001).

TEK is increasingly being recognized by public land managers as a valuable tool to guide restoration projects and management policy (Lesko & Thakali, 2001). Furthermore, Walker and Salt (2012) identify *reserves* of social memory and local knowledge as an important aspect of general resilience. As indigenous peoples have in many cases inhabited their present locations long before the founding of the United States, they are often in a unique position to offer insight into what ecosystems were like prior to intensive land use activities. This perspective is important enough for calls to not only incorporate TEK into land management but to compensate tribes for such knowledge (Lesko & Thakali, 2001).

Several examples of tribal-agency collaboration can help to guide possible changes to forest policy in the SFNF adjacent to SCP and are discussed below.

In 2004, the Tesuque Pueblo Environment department conducted a TEK documentation project to guide restoration of the Bosque (riparian forest) ecosystem (Mion et al., 2004). Tesuque Environment Department officials surveyed tribal members on how they used the Rio Tesuque in the past and what tribal members concerns are for the river in the future as it faces disturbances due to drought and the spread of invasive species (Mion et al., 2004). Over the course of two months, a survey and study design was developed and responses from approximately 8% of the Tesuque Pueblo population were analyzed (Mion et al., 2004).

The Pueblo of Tesuque Traditional Knowledge Project can serve as a case study in how tribal members can be consulted for their unique knowledge of how the environment has changed and what values the community places on ecosystem services that are not easily quantified. Furthermore, a TEK survey will tap into a knowledge base that has guided resource management in SC since time immemorial. Adaptive management is about learning from the past and using that information to change current and future actions. The top-down approach to resource management that tribal communities have experienced with the BIA and other federal agencies largely ignored the valuable knowledge indigenous communities possess (Lesko & Thakali, 2001). However, as federal policies have shifted towards self-determination, TEK is being incorporated more frequently and readily into land management in Indian country and near it as well (Lesko & Thakali, 2001). A TEK survey would be helpful not only to inform management on SCP lands, but also as a resource for adjacent land management agencies to work with SCP to incorporate TEK on the management of adjacent

federal lands as well.

Native American uses of forest resources often consist of gathering plant species necessary for rituals or other traditional uses such as weaving. The knowledge of where certain native species grow or have grown in the past could be used to guide restoration treatments (Lesko & Thakali, 2001). In the Mendocino National Forest for example, forest managers have studied the possibility of reintroducing a native grass used by local Native Americans in basket weaving (Lesko & Thakali, 2001).

In the Kaibab National Forest (Kaibab), the Hopi tribe and forest managers have engaged in innovative means to foster collaboration that can serve as a model for other tribal agency collaborative efforts. Both entities have taken meaningful steps towards institutionalizing collaboration and building trust. The Hopi created the Cultural Resource Advisory Task Force to advise the Hopi Cultural Preservation Office in consultation with the Kaibab who in turn employs a tribal liaison, the first National Forest to do so (Lesko & Thakali, 2001). Furthermore, the Kaibab no longer practices “commodity driven” forest management as a result of the incorporation of traditional Hopi beliefs (Lesko & Thakali, 2001).

5.5 Federal legislative opportunities

5.5.1 Indian Country Educational Empowerment Zone Act

The “Indian Country Educational Empowerment Zone Act” (2006) is a proposed amendment to the “Higher Education Act of 1965,” which authorizes the Secretary of the Interior to carry out a program to repay the student loans of qualified individuals who obtain employment with a tribal government. The act is designed to “dramatically increase the number of individuals with higher education degrees working within and for Indian Country”

(Indian Country Educational Empowerment Zone Act, 2006). The act would begin to address the issues raised by SCP officials related to retaining qualified individuals to work for the tribe. By providing the incentive of loan forgiveness, tribal governments would be more competitive with outside entities to hire technical staff and Native peoples who are knowledgeable of indigenous cultures and worldviews. While the program would be competitive, enrolled members of a federally recognized tribe are to be given priority. Further priority is given to individuals seeking employment within their own tribe.

House representative Stephanie Sandlin (D-SD) introduced the bill in 2006. Unfortunately, the bill never made it out of the Higher Education and Workforce Development committee. Like most Indian tribes, SCP employs a lobbying firm to advocate on its behalf for relevant issues in Washington. Since 2011 that lobbying firm has been Hobbs Straus, which has several other New Mexico Pueblos as clients (Sunlight Foundation, 2013). In order to get the bill reintroduced, SCP may wish to implore Hobbs Strauss, along with the other tribes the firm counts as clients, to lobby NM's elected federal officials to co-sponsor the bill and reintroduce it to congress.

5.5.2 Indian Development Finance Corporation Act

The "Indian Development Finance Corporation Act" (2009) (IDFCA) is another attempt by congress to address some of the issues raised by SCP officials. Current SCP Intergovernmental and Public Relations Office official, Joe Baca, was a part of the effort to get the original legislation passed (J. Baca, personal communication, September 19th, 2013). IDFCA was first introduced to congress in 1987 and although it passed both houses of congress, President Reagan vetoed the bill. Senator Daniel Inouye (D-HI) introduced an

identical version of the original bill to congress in 2009 where it currently is sitting in the Senate Indian Affairs committee.

IDFCA would establish a government corporation, with tribal governments as shareholders that would act as a development bank for Indian country. Tribes that have more economic development opportunities, gaming tribes for example, would help to increase the value of the holdings in the bank, earning money for all shareholders. The bank would also provide loans to tribes to fund economic development and infrastructure projects at a lower interest rate and with a longer repayment period than commercial banks typically do (Indian Development Finance Corporation Act, 2009). The development bank model would empower inter-tribal investments and reduce the need for federal monies, or at least to supplement it, to fund infrastructure projects. However, an initial federal investment of \$100 million is needed as “capital stock.” It seems unlikely that the current bill will make it out of committee. Lobbying efforts are necessary to get the bill re-introduced. The primary author of IDFCA, Allen Parker, is currently advocating for similar legislation to create Tribal Trade Development Corps (A. Parker, personal communication, October 23rd, 2013). This new bill is largely based on the IDFCA legislation but focuses more intently on tribal trade relations.

5.6 Climate change and water resources

While certain projections can be made with reasonable certainty, such as the Southwest becoming more arid, how natural systems will respond to those projections is difficult to say. The best approach is a general one, i.e., general resilience. The more flexibility that can be built into the SCP system (diverse economy, adaptive management etc.) the better prepared the community will be for climate change. Areas where flexibility is hampered, such as with the ability of SCP to make its own determinations regarding effective

treatments following a disaster (straw vs. wood aerial mulching) speak to larger policy issues that impact SCP's resilience. As this project is focused on building general resilience, all of the opportunities for reorganization given in this chapter will make SCP a more climate change resilient community.

Addressing SCP's water resource issues is best accomplished by identifying specific thresholds, such as the age and condition of septic tank systems that threaten SCP's groundwater. As for the adjudication of SCP's water rights, settlements offer more flexibility than litigation. Because the Abbott adjudication (of which SCP is a party) is currently being pursued by settlement, SCP may be able to form creative agreements with other users for dealing with drought and the restoration of watersheds that impact all users, including the Santa Clara Creek watershed. One SCP official also noted the possibility that through settlement, SCP may be able to secure additional funding for cleaning up various dumping sites on SCP lands along the banks of the Rio Grande and other brownfield sites.

For land managers, the convention guiding restoration and management is to look for a reference condition. Climate change is refuting that convention as the climatic conditions that created those references become increasingly outdated. However, by focusing on preventative restoration, rather than rehabilitation, managers can build ecosystem resiliency for a changing climate. An example of an area where this way of thinking needs to be better incorporated is the discrepancy between funding for restoration activities and rehabilitation. Rehabilitation is considered to be emergency work to stop erosion and other immediate threats and is relatively easy to fund while restoration is part of ongoing land management and is difficult to fund (Wolf, 2003, p. 12). Many treatments have proven effective for maintaining historical ecosystem conditions (Keane et al., 2008). Wildfire has a role to play

in management. Continued research is necessary to determine how that role can be maintained given a warming climate and changing ecosystems.

5.7 “Soft” engineering watershed restoration methods

“Soft” engineering watershed restoration methods utilize available onsite materials and rely largely on hydrologic processes to guide restoration, letting the “water do the work” (Zeedyk & Clothier, 2009). These methods, championed by Bill Zeedyk, New Mexico’s “riparian restoration guru” have proven to be more effective than many of the methods favored by land management agencies and prescribed in the Burned Area Emergency Response Catalog (BAERCAT) (Kristoflic, 2008; Zeedyk et al., 2009; Napper, 2006). Soft engineering treatments include one-rock dams (Figure 17), zuni bowls (Figure 18), and several other methods.



Figure 17 One rock dam (photo: <http://www.openfrequency.net>)



Figure 18 "Zuni bowl" (photo: <http://permaculturenews.org>)



Figure 19 Rock gabions (photo: www.nitinwirenetting.com)



Figure 20 SCP tribal members fill sandbags in anticipation of a flood event in July, 2013 (photo: ABQ Journal)



Figure 21 K-rails being delivered to SCP for flood control (photo: BAER)

One-rock dams provide a good example to explain the principles of soft engineering. Rather than trying to completely stop the flow of water in an incised channel, a one-rock dam attenuates the flow and therefore is more resilient to flood events than a larger structure that absorbs more force. As sediments are deposited over top of the one-rock dam (Figure 17), vegetation is given an opportunity to take root and gradually, soil is built up behind the dam and erosion ceases. The structure is permanent and does not need to be removed since is made from rock as opposed to steel or other foreign materials. Over time, additional layers of rock may be added over top of the existing structure to gradually raise the bed of the channel. Traditional methods, such as silt fences and rock gabion structures (Figure 19) are prone to failure because they are susceptible to rusting and breakage (the steel wire holding the rocks). Furthermore, because they are rectangular in shape, they may concentrate the flow of water around the edges and where water spills over the top, further contributing to erosion.

These are not new methods for SCP. Following the Cerro Grande fire in 2001, thousands of one-rock dams were built to prevent erosion and attenuate flooding using funding from the Collaborative Forest Restoration Program (Zeedyk et al., 2009; M. Chavarria, personal communication, October 20th, 2013). If soft engineering methods were included in the BAERCAT catalog than an additional source of funding would become available. This is not meant to suggest that soft engineering methods should replace the entire BAERCAT. Some short-term measures, like sand bags (Figure 20) and k-rails (Figure 21) are necessary to protect life and property and when time is short. However, it should be acknowledged that following the first flood event, emergency stabilization perhaps no longer accurately reflects the conditions, and that restoration as well as emergency stabilization work should begin sooner than allowed under current policy.

5.8 Technological tools for language education

Walker and Salt (2012) named innovation as one attribute of a resilient world. Many tribes have used innovations in technology to preserve their indigenous languages. The Indigenous Language Institute (ILI) in Santa Fe has worked to create a few such innovations designed to help indigenous peoples learn and preserve their native language (www.ilinative.org). Two useful tools created by ILI and their partners are the “Tewa Talk” smartphone application and a downloadable keyboard, which allows users to type in their native language, including the Tanoan languages (Tiwa, Tewa, Towa, and Kiowa) (Bell et al., 2012). Incorporating technology into indigenous language education is a way to connect youth, who tend to be well versed in technology but less so with native languages, with older fluent speakers who have the opposite problem. This further encourages the intergenerational communication that is necessary for passing along indigenous languages and cultural practices. Technology should not replace more traditional methods of indigenous language education, such as emersion and through rituals, but it can be a helpful addition.

“Tewa Talk,” began in 2012, when ILI partnered with a team of students and faculty from the Worcester Polytechnic Institute in Massachusetts, to develop a language app specifically for Tewa people (Figure 22; Bell et al., 2012). Over a four-month period, the team developed the application and recorded words and phrases in Tewa in partnership with the Pueblo of Pojaque at the ILI recording studio. The application functions as a reference with over 500 recordings of Tewa words and phrases and gives users the ability to make their own recordings and upload them to the accompanying website. Users can select which Tewa dialect pertains to them when searching for a word or phrase. The application also contains

games where users can compete to see who has the best grasp of the Tewa language. As of now, the application is only available on the android platform.



Figure 22 Tewa Talk smartphone application

The actions needed now are a dedicated server to host the website and database of recordings and for Tewa speakers to grow the amount of voice recordings (Bell, et al., 2012. This is an area of potential collaboration between the various Tewa speaking tribes, something several SCP officials indicated would be a positive development and something that could strengthen SCP's resilience. I was unsuccessful in attempts to download the application so SCP officials may need to contact ILI to inquire about how the app may be downloaded by SCP community members. The Tanoan language family keyboard map is available for download at the ILI website at the following URL http://www.languagegeek.com/sw/keyboards/sw_keyboards.html.

5.9 Social media

One issue raised by SCP officials was the need for an effective way to reach at risk community members during an emergency. Social media websites, such as Facebook and Twitter are useful ways of conveying information to large groups of people quickly. One shortcoming to these sites is that it relies on users to check either their Facebook or Twitter accounts to be notified when someone, a SCP tribal official for example, is sharing information. A relatively new social media site, www.nextdoor.com potentially addresses this problem. Nextdoor is a private social networking site based in the physical geography of one's neighborhood. Neighborhood boundaries are drawn by the founding member (the first person to sign-up) but are able to be adjusted if necessary. Members have the option of sharing their exact address or just the street they live on. Nextdoor will verify the addresses of everyone before they are allowed to join a neighborhood. An image of a sample Nextdoor neighborhood map is given in Figure 23.

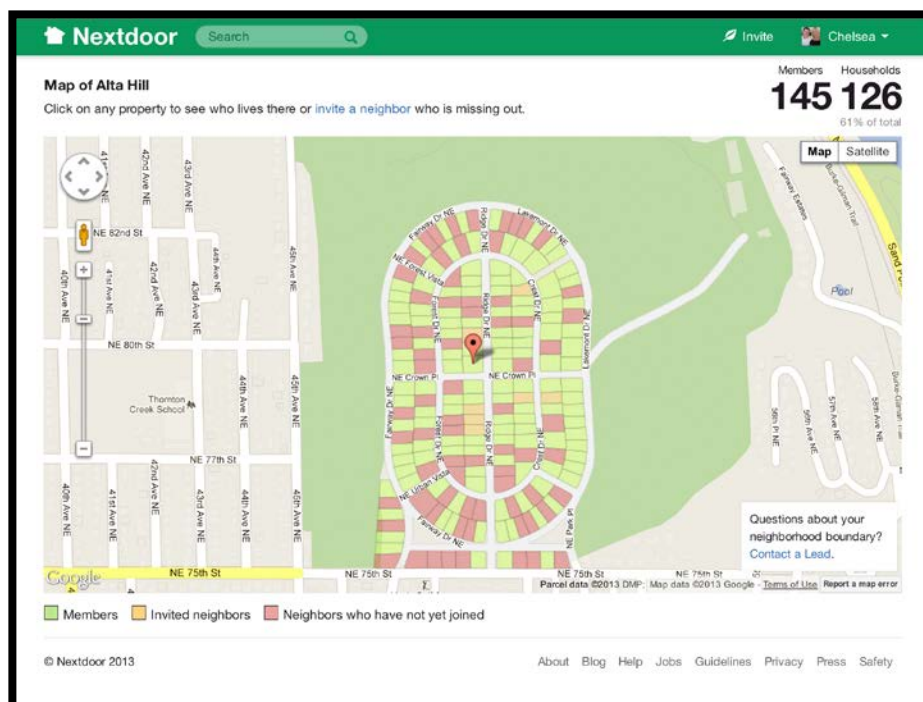


Figure 23 Sample Nextdoor neighborhood map

Nextdoor has several applications that are relevant to disaster and emergency response plans. First, it provides a free, easy to use platform for mapping out where everyone in the community lives or at least their general area; Nextdoor users have the option of only displaying their street, rather than their full address. SCP officials can cross-check the neighborhood map with a database of at-risk individuals to determine who may need help in an emergency. Second, a key feature allows neighbors to send urgent text message alerts to their neighborhood in an emergency, so that even if someone doesn't have a smartphone or is not near a computer they can receive important information immediately.

Another common application for Nextdoor includes crime-prevention by acting as a virtual neighborhood watch. Users can post about suspicious vehicles or share news about a recent break-in. Many SCP community members stated crime and safety as an issue due to the close proximity to the city of Espanola, which has high incidences of crime and drug-use. Applications for the site have not been fully explored in rural areas or in Indian reservations. Challenges related to the checkerboard nature of many reservations may cause challenges to neighborhood boundary creation. Furthermore, the use of neighborhoods as a foundational structure does not necessarily reflect the geography of many rural Indian communities. However, it is proving to be a useful tool in other communities and given its applications for disaster response may be something SCP officials want to look into as another useful tool (Tate, 2012). Indigenous communities may also appreciate the privacy features, which only allow verified neighborhood members to join and monitor the site. It should be noted that a Nextdoor is a user driven site, meaning that the neighborhood site can be created and maintained by anyone in the neighborhood and is not necessarily the responsibility of a tribal official to manage.

5.10 Conclusions

The recommendations given above are not focused on trying to prevent disturbance. Rather, as part of a general resilience approach they attempt to make it easier to respond to a variety of disturbances whether they can be foreseen or not. The most common challenge identified by interview participants was the federal bureaucracy. The BIA losing important permits, delays in funding appropriation, and the disregard of tribal concerns and preferences make that more than an abstract complaint. As such, the most important adaptation SCP can pursue is to strengthen their autonomy as a sovereign nation. Collaborative agreements (MOUs, MOAs) provide an opportunity to work within existing agency mandates for collaboration and consultation with Indian tribes. As SCP can attest, just because a federal agency is authorized – encouraged even – to pursue greater collaboration with tribal governments, that doesn't necessarily materialize in practice. Examples of other tribal governments signing agreements with federal agencies to clarify roles, responsibilities, and expectations for collaboration can provide a template for SCP and sets an important precedent that such agreements can be successful and mutually beneficial (Lesko & Thakali, 2011).

Chapter 6. Summary and conclusions: removing barriers to resilience

6.1 Summary

This project addressed issues SCP is having related to responding effectively to the Las Conchas wildfire and floods. Since the Las Conchas wildfire, SPC tribal officials and their counterparts in state and federal agencies have been focused on immediate needs and disaster response activities, and rightly so. However, it is important to address the larger structural and policy issues that contributed to the Las Conchas wildfire being such a major disaster in the first place and asking why certain watershed restoration activities have been harder to implement than others. The impact of the Las Conchas wildfire is ongoing and dynamic, touching many areas of the SCP community. This project presented resilience thinking, an emerging planning and natural resource management paradigm as a useful lens by which to view current and future challenges to the SCP people. The primary objective was to determine what issues have reduced SCP's resilience and what can be done about them.

Chapter 1 provided an overview of the issues facing SCP that stem from the Las Conchas wildfire and subsequent flooding. A brief introduction to the primary client for this project, SCP, was given in terms of some basic demographic data and location. The chapter gave a brief history of the two most recent wildfires to impact SCP, Cerro Grande in 2001 and Las Conchas in 2011. Both fires originated outside of SCP lands. Upon closer examination of the circumstances that lead to Las Conchas wildfire it became clear that classifying the fire as an accident was somewhat disingenuous. The fire occurred when a tree fell on a powerline that was supplying electricity to a private inholding surrounded by the SFNF. The

circumstances surrounding the Las Conchas fire highlight the complexity of jurisdictional challenges in and around public lands.

Chapter 2 provided an overview of resilience thinking, defining important key concepts: general vs. specified resilience, adaptive management and governance, system dynamics, the adaptive cycle, and panarchy. Chapter 2 also discussed examples of the intersections between resilience thinking and Pueblo worldviews in terms of social-ecological systems, dual organizations, identity and transformation, and nested scales and cyclical time scales. One of the primary goals of chapter 2 was to show that indigenous cultures, the Tewa in particular, are inherently resilient. Furthermore, highlighting the similarities between Tewa and Pueblo culture provides a roadmap of sorts for contemporary planners and resource managers who are interested in how to implement resilience thinking principles into SES governance.

Chapter 3 discussed the methods that were used to answer the primary objective. This was an iterative process that evolved as circumstances changed. A resilience workshop based on the Resilience Alliance's (2010) assessment guidebook was planned and attempted but no one from the community showed up on the day of the event. A second attempt to use the assessment framework was planned for a community celebration event but the event was canceled due to flooding. To achieve the primary objective, three community groups (youth, tribal officials, and tribal elders) were sought for interviews/workshops. Youth, specifically, members of the SCP youth conservation corps, participated in a workshop format similar to the one planned for the resilience workshop. At that point, the focus and objective shifted from a resilience assessment based on the Resilience Alliance's (2010) guide to determining what was hindering SCP's resilience and what could be done about it. Ten out of 18 tribal

departments agreed to sit for interviews. Interview questions focused on challenges the officials were dealing with that inhibited their ability to effectively deal with the Las Conchas wildfire and floods. Tribal elders were interviewed in a more informal setting. Interview questions focused on what the watershed was like in the past and what had been lost in more qualitative terms.

Chapter 4 analyzed the issues project participants raised in chapter 3. The issues were discussed in the context of larger policy issues, mostly federal policies. Challenges related to the federal bureaucracy were the most common response to questions about challenges following Las Conchas. The importance of adaptive management to a resilience-based approach was discussed and barriers to its implementation identified. The contradiction between the promise of the Self-Governance Act and the federal government's interpretation – and the legal definition – of the trust responsibility emerged as a major issue that inhibited resilience, tribal sovereignty, and adaptive management. Other issues that were discussed included: collaboration with adjacent land management agencies, climate change, water rights, preservation of Tewa language and culture, retaining technical expertise within the tribe, adaptive capacity, diminished recreational activities, and access to non-federal funding.

Chapter 5 presented several recommendations and opportunities for changing SCP's SES to build resilience for the future and address current watershed restoration challenges. Collaborative agreements, such as MOUs and MOAs were discussed as a possible means for clarifying roles and responsibilities between SCP and the BIA. The Valles Caldera National Preserve, which is an "experiment in public lands management" was discussed as an opportunity to test a new model for a public-private-tribal management. One recommendation called for the formation of a traditional ecological knowledge working

group. The group would be tasked with creating a survey or other instrument to document reserves of traditional ecological knowledge that may be threatened because of a lack of access into the canyon and the damage to the watershed. The information could be used to guide restoration efforts based off of the community's knowledge of where certain plant species once grew for example. The TEK working group and survey would also provide an opportunity for more of the community to be involved in the watershed restoration efforts. Other recommendations and opportunities included: federal legislation to create an Indian development finance corporation and a federal loan repayment program for individuals who work for a tribe, "soft" engineering watershed restoration techniques, technological tools for language education, and social media to enhance communication during disasters.

6.2 Future work

In addition to the recommendations and opportunities discussed in chapter 5, future work might include holding the resilience workshop that was initially planned for this project and was discussed in chapter 3. The workshop format would allow for a diverse cross-section of community members to participate and allow for discussion that would not be possible in a one-on-one interview format. Furthermore, the formulation of the traditional ecological knowledge working group and implementation of a survey would provide an opportunity for greater numbers of the SCP community to participate in watershed restoration efforts. While this project focused only on interviewing SCP community members and tribal officials, future resilience assessments should be expanded to include stakeholders and decision makers from outside of SCP, such as representatives from the SFNF and the Valles Caldera National Preserve. This project was focused on assessing SCP's general resilience, but future assessments may focus on the specified resilience of particular areas of concern, such as water

resources or climate change. Specified resilience assessment focus more intently on looking for thresholds and on scenario planning. For future assessments, having a truly community-driven process, where people from the SCP community or tribal officials conduct interviews and or workshops would probably be more effective. Certain sensitive information such as the locations of sacred sites and cultural values may be more easily incorporated if someone from the community were managing the process. This sort of internal process may produce a more robust assessment than one that addresses such sensitive topics in a more general sense.

6.4 Conclusions

By all accounts, the response of SCP tribal officials and the community in the aftermath of Las Conchas has been outstanding. Everyone interviewed for this project understands that there is a long road ahead and what is at stake. Throughout the course of the project, it became clear that SCP tribal officials have a firm grasp of the issues facing the community and what needs to be done to address those issues. However, this project identified several barriers and issues that the tribe is facing that if overcome would build the tribe's resilience so that future disturbances do not have as great an impact as Las Conchas has. First, SCP's ability to engage in adaptive management is compromised because of discrepancies between the promise of self-governance and the federal trust responsibility. If SCP had greater autonomy to implement what tribal officials believe to be the best strategy for watershed restoration their response would be quicker and more robust than current efforts that rely on BIA approval. Second, collaboration with adjacent federal agencies is currently informal, which challenges SCP officials who need to traverse public lands to gain access into the upper watershed. Furthermore, SCP community members who can no longer rely on SCP lands to deliver certain ecosystem services will inevitably have to access those resources on

public lands, which creates new barriers such as user fees and permits. Third, climate change threatens to change the character of forests in the Southwest, which have experienced an observed shift at ecotones to more drought tolerant species from grasslands (Allen et al., 1998; Williams et al., 2013). The Santa Clara Creek watershed is particularly susceptible to these changes because the landscape has essentially been reset by the Las Conchas fire. SCP officials may have difficulty returning the watershed to a pre-Las Conchas reference condition. Fourth, water rights adjudications present a potential challenge based on the methods used to quantify SCP's rights. The degradation of Santa Clara Creek and aging septic tanks threaten SCP's water supply, which may result in SCP relying more heavily on the Rio Grande. As such, SCP's water resource needs are likely to change in the future and quantification based on historic use may not accurately reflect future needs. Fifth, the preservation of the Tewa language and culture emerged as an issue that SCP officials and community members are concerned about. Sixth, a lack of access to the upper watershed has severely diminished the ability of SCP community members to conduct traditional cultural practices there. Lastly, additional barriers and issues identified by SCP officials and community members include: retaining technical expertise within the tribe, adaptive capacity, diminished recreational activities, and access to non-federal funding.

Recommendations and opportunities for overcoming the aforementioned barriers and issues were also identified. First, using collaborative agreements, such as MOUs and MOAs to clarify roles, responsibilities, and expectations among SCP and adjacent land management agencies can formalize rights of access of SCP officials and community members to adjacent public lands. Second, The VCNP presents a unique opportunity to experiment with a new model for a public-private-tribal management by adding Pueblo representation to the board of

trustees. Such a move would give SCP and other Pueblos an opportunity to have more of a voice in how their ancestral lands are managed and may help guide future efforts to include tribal governments in public lands management. Third, the formation of a traditional ecological knowledge working group was proposed. The working group would be tasked with designing and implementing a survey of SCP community members to document their TEK that may help to inform watershed restoration efforts and give community members an opportunity to participate in the restoration efforts. Fourth, two proposed federal laws were identified that attempt to give tribes greater financial autonomy and encourage qualified individuals to work for tribal government through a student loan repayment program. Fifth, “soft” engineering watershed restoration methods were discussed as an alternative to those proposed in the BAERCAT. Sixth, the importance of flexible decision making that utilizes an adaptive management approach was discussed as a method for climate change adaptation. Lastly, technological innovations in language education and social media platforms were offered as recommendations.

As I suspected at the start of this project, SCP already has the knowledge and expertise to implement resilience based planning and natural resource management. As chapter 2 expressed, resilience thinking and adaptive management is inherent in the Tewa culture. The past provides a prescription for the future of the SCP people and the Santa Clara Creek watershed characterized by flexible decision making and using ecological processes to inform management actions.

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Appendix I: SCP & iD+Pi MOU

MEMORANDUM OF AGREEMENT

Between

PUEBLO OF SANTA CLARA and the INDIGENOUS DESIGN + PLANNING INSTITUTE

For

PUEBLO OF SANTA CLARA (KHA P'O OWINGE) RESILIENCE PROJECT:
MAINTAINING IDENTITY WHILE PREPARING FOR AN UNCERTAIN FUTURE

THIS AGREEMENT is entered into this 24th day of May, 2013, by and between the Indigenous Design + Planning Institute (hereinafter "iD+Pi"), represented by Matthew J. Piccarello, and the Pueblo of Santa Clara (hereinafter the "Pueblo"), represented by the Governor, pursuant to authorization of the Pueblo of Santa Clara Tribal Council.

WITNESSETH, THAT:

WHEREAS, Matthew J. Piccarello is working on a professional project (hereinafter the "Project"), which will fulfill the graduation requirements for the Master of Community & Regional Planning and Master of Water Resources.

WHEREAS, iD+Pi is committed to providing planning and community development services to Native American communities by facilitating collaborative projects between tribes and University of New Mexico, School of Architecture + Planning students. Indigenous design and planning is a value-based process that integrates the past, present and future in community development. It is informed by indigenous world-views that value cultural identity, land-tenure and stewardship. It is a process that is invested in consensus building and meaningful collective participation.

WHEREAS, iD+Pi and the Pueblo desire to enter into an agreement (hereinafter the "Agreement") to conduct a resilience assessment of the Pueblo of Santa Clara social-ecological system (hereinafter the "Assessment") as defined in the proposal submitted to the Pueblo Tribal Council on May 10, 2013.

WHEREAS, the Pueblo will receive one hard copy and one digital copy of the Project for use by the Pueblo. One hard copy will be provided to the UNM Community and Regional Planning Program. Additional copies will be placed on embargo by the University of New Mexico for two years after which time the Pueblo may extend the embargo every two years after that.

WHEREAS, the research conducted by Matthew J. Piccarello will be certified through the University of New Mexico Institutional Review Board.

WHEREAS, Matthew J. Piccarello agrees to make a final presentation of the Project to the Pueblo Tribal Council and Pueblo community members if the Pueblo so desires.

WHEREAS, iD+Pi agrees to assume all costs associated with the Project, which are food, refreshments and presentation materials used during the workshops and working group meetings, and transportation for iD+Pi staff and students to and from the Pueblo.

NOW, THEREFORE, iD+Pi and the Pueblo agree as follows:

ARTICLE I – RECRUITING WORKSHOP PARTICIPANTS

The Pueblo shall aid iD+Pi in the recruitment of Pueblo community members to participate in the Assessment workshops by offering their endorsement of this Agreement and by helping to inform Pueblo community members that their participation is requested and paramount to the success of the Assessment.

ARTICLE II – TRADITIONAL ECOLOGICAL KNOWLEDGE WORKING GROUP

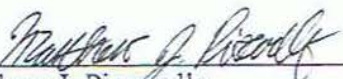
The Pueblo shall, with consultation from iD+Pi, form a Traditional Ecological Knowledge working group comprised of tribal officials. The working group will create a study design over the course of several meetings to be held at Pueblo tribal offices. Working group meetings will be facilitated by iD+Pi.

ARTICLE IV – CONFIDENTIALITY

To the extent permitted by the laws governing each party, the parties agree to maintain the confidentiality of exchanged information when requested to do so by the providing party.


IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the Pueblo Governor.

INDIGENOUS DESIGN +
PLANNING INSTITUTE

BY: 
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Indigenous Design + Planning
Institute

DATE: 5-20-13

PUEBLO OF SANTA CLARA





BY: 
J. Bruce Tafoya
Governor



DATE: 05-30-13

Appendix II: Resilience workshop flier and project brochure

The Pueblo of Santa Clara (Kha P'O Owinge) Resilience Project Workshop

What	This workshop will focus on gaining <i>your</i> perspective and ideas about the Las Conchas fire and how the Pueblo of Santa Clara community can build <i>resilience</i> for the future. Refreshments and lunch will be provided free of charge.
When	Saturday July 13, 2013 9am - 5pm
Where	Santa Clara Pueblo Housing Authority conference room
Why	The Las Conchas fire was devastating, yet the Pueblo of Santa Clara community will endure. What events and conditions have impacted how <i>you</i> use the land? What could be improved? The workshop is a part of UNM graduate student Matt Piccarello's professional project.
Contact	Amanda Montoya UNM iD+Pi program specialist amonto11@unm.edu, 505-277-4493.





Co-hosted by the Indigenous Design + Planning Institute and the Pueblo of Santa Clara Forestry Dept.

Why was the Las Conchas fire such a big disaster?

This project will begin to answer that question as well as looking at ways the Santa Clara Pueblo community can recover and be better prepared to face future challenges.



For more information contact:

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The Pueblo of Santa Clara (Kha P'o Owinge) Resilience Project

Maintaining identity while preparing for an uncertain future



This project will assess the resilience of the Santa Clara Pueblo community. There are three parts to this **resilience assessment**:

1. Describing how the community functions. How do you define community?
2. Determining the **reserves** of Traditional Ecological Knowledge?
3. Recommendations for enhancing resilience.

While tribal leaders and officials focus on making the canyon safe **you** can help plan for the long-term and guide management priorities.

What aspects of the Santa Clara Pueblo community's **identity** should be protected no matter what challenges the future brings?

Resilience thinking applies an ecological perspective to the relationships between human communities and how they interact with each other and the environment.

Consider that all of the recent wildfires to impact the Santa Clara Pueblo community have originated outside Santa Clara lands.

How does this fact affect the resilience of the Santa Clara community to disturbance events?



How you can participate...

UNM graduate student Matt Piccarello will be reaching out to various community groups (youth, elders, tribal officials etc.) and facilitating discussions on various topics related to the resilience of the community.

A working group is being formed to create a survey tool to document **your traditional ecological knowledge**. This information will be collected by community members and used only within the community.

Change is inevitable. What we change is not...

