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Building & Measuring Psychological Capacity for Biodiversity Conservation

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Building & Measuring Psychological Capacity for Biodiversity Conservation

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Abstract

Capacity building has become the centerpiece of recent attempts to strengthen regional biodiversity conservation. Many conservation organizations aim to increase this capacity by training local conservation professionals. While many practitioners will agree that these trainings presumably have a psychological effect on their participants that may benefit long-term local action toward conservation goals, there also seems to be a resignation that these effects are difficult if not impossible to measure and target, especially within diverse cultures. The common result is a perfunctory evaluation of observable behaviors or basic knowledge, which may be easy to count but undoubtedly fails to represent the nuance of complex psychological variables associated with long-term capacity to conserve biodiversity. My dissertation is fundamentally aimed at investigating capacity for biodiversity conservation at this psychological level. Specifically, I explored the current understanding of capacity for biodiversity conservation and how this understanding can be supplemented by psychological theory to strengthen the development, evaluation, and prediction of this capacity over time. I did this within the context of case studies that focus on three separate populations of conservation professionals who participated in capacity building trainings in Africa and North America between 1994 and 2014. I administered surveys to these conservation professionals to create and validate an instrument that measures the construct I call psychological capacity for biodiversity conservation (PCBC). PCBC includes psychological dimensions such as meaningful ownership, effective autonomy, being needed, group effectiveness, and understanding. I administered the PCBC survey instrument to training alumni and conducted interviews with their trainers to the evaluate

the effectiveness of the capacity building methods at increasing PCBC directly after and two to ten years after a training. I found that meaningful ownership, effective autonomy, and being needed predicted 34% of the variance in long-term capacity behavior in conservation professionals after training. I recommend specific training methods that I found to significantly increase these dimensions of PCBC. Together, these results offer a novel approach to capacity development and evaluation and a psychometric instrument that can be used to predict long-term capacity for biodiversity conservation in a diverse population of conservation professionals.

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Chapter 1: Introduction

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Conservation of biodiversity continues to be one of the many global environmental concerns that require sustained local and regional response. Challenges associated with the maintenance of global biodiversity conservation are increasingly recognized as complex issues that necessitate increased knowledge about how international conservation organizations can effectively engage local practitioners to address biodiversity problems regionally (Mengers, 2000; Mahanty & Russell, 2002; Troja, 2000; Liberato et al., 2011; Beckley et al., 2008; Constantino et al., 2012; Boissière et al., 2014; Ekowati et al., in press; Felker et al., in prep). Various terms have been used in the conservation literature to describe this type of local engagement (Brechin et al., 2002; Raik, Decker and Siemer, 2003; Moore, Severn, Millar, 2006; Liberato et al., 2011). Two terms that have been used with increasing popularity include capacity building for conservation and collaborative or community-based conservation (Brechin et al., 2002; Mengers, 2000).

Capacity building is defined as the process by which individuals, communities and institutions develop abilities to perform functions, solve problems, and set and achieve conservation objectives (United Nations Committee of Experts on Public Administration 2006). Collaborative or community-based conservation efforts refer to multiparty conservation projects, programs, or decision-making processes using a participatory approach (Conley & Moote 2003). As I explain later, the subjects and process of these collaborative approaches to conservation tend to vary. Capacity building for biodiversity conservation departs from other community-based or collaborative

conservation frameworks in its approach to human development. While various collaborative conservation efforts might find it necessary to teach local community members to perform functions, solve problems, and set and achieve objectives in the process of ensuring conservation, a human development-centered goal is not explicit in many instances (Wilshusen et al., 2003). Instead, the goal of many collaborative conservation efforts is focused on the protection of non-human species, ecosystems, or resources, which tends to frame the building of any human capacity along the way as little more than a means to an end.

When human development is viewed as equally critical rather than a means to an end goal of conservation, the development of institutional, community and individual capacity is of equal priority to the conservation of non-human species, ecosystems and resources (Raik, Decker and Siemer 2003). This distinction is important because my dissertation focuses on the latter type of locally engaged conservation effort—capacity building for biodiversity conservation, where human development and biodiversity conservation are deemed equally important goals that are imperatively pursued in tandem.

With this dual goal in mind, one aim of capacity development for biodiversity conservation is to develop the capacity of individuals, communities and institutions to perform functions, solve problems and set and achieve objectives to learn about and improve conservation efforts on their own as new conservation challenges occur in the future (Salafskey et al., 2002, p. 1477). In this charge, Salasfsky et al. (2002) suggest, "A key challenge is not only building the capacity of specific individuals and organizations in the network or portfolio, but also building the capacity of teachers who can in turn

train all the members of the network or portfolio" (p. 1478). Inherent in Salasfsky's suggestion is a requirement for the capacity of a region to increase or at least remain stable after it has been built. To develop and evaluate this type of sustained capacity strategically, in-depth research is needed to further explore and make operational our definition of capacity for biodiversity conservation.

It is important to clarify the definitions of the terms biodiversity, individual, community, and institution that I will use throughout this dissertation. In most projects, biodiversity is defined as the species and ecosystems in a specific area, the scale of which can range from a small pond to an entire continent (Salafsky et al., 2002). Raik, Decker and Siemer (2003) explain that in the field of capacity building for conservation, individuals refer to individual people or citizens of the community of interest. Community refers to an informal group of individuals bounded geographically such as within a town or neighborhood. Institutions refer to organizations or a set of organizations, such as a state or federal wildlife management agency or local government. These definitions are used in the following analysis of capacity development for biodiversity conservation.

The categorization of first and second order capacity development is a first step toward an operational definition of capacity development for biodiversity conservation. First order capacity development includes "building the capacity of specific individuals and organizations in the network or portfolio" (Salafsky et al. 2002, p. 1478). Integrating Raik, Decker & Siemer's (2003) definitions above with the United Nation's 2006 definition of capacity development, first order capacity is defined as the ability of specific

institutions, communities, and individuals to perform functions, solve problems and set and achieve objectives necessary for biodiversity conservation.

Just as the species and ecosystems that constitute biodiversity in a specific area are certain to change over time, so do the specific institutions, communities and individuals that constitute capacity to conserve biodiversity. Herein lies the importance of what Salafsky (2002) calls second order capacity development. The development of second order capacity includes "building the capacity of teachers who can in turn train all the members of the network or portfolio" (Salafsky, 2002, p. 1478). Combining the UN's definition of capacity with the well-documented assertion that continual global change may require future environmental training that is different from that which is offered today (Gotts 2007), I extend the definition of second order capacity to include not only the training of teachers but also the development of infrastructure that allows future institutions, communities and individuals to perform functions, solve problems and set and achieve objectives necessary for biodiversity conservation in the midst of changing environmental, social, political, and economic conditions.

Institutional infrastructure is defined as the financial and governmental systems required for that institution to support institutional capacity for biodiversity conservation. Community infrastructure is defined as the communication and educational systems that support the relationships and allow for the maintenance of the common purpose, values and history within the community for biodiversity conservation (Landre and Knuth, 1993; Beckley et al., 2008; Raik, Decker and Siemer, 2003; Moore, Severn, Millar, 2006; Liberato et al., 2011). Unfortunately, while community and institutional infrastructure are relatively common terms within the conservation lexicon, the concept of infrastructure at

the individual level may be less familiar. To further explore these definitions, I expand upon the specific dimensions of first and second order institutional, community, and individual capacity below.

As I describe in detail in the literature review portion of this dissertation, first and second order capacity at the institutional level has been explored thoroughly in the conservation literature (Mengers, 2000; Troja, 2000; Lewis, 1998; Ta'I, 2000; Goodman et al. 1998; Madden & McQuinn, 2014). An example of an institution with first order capacity might be a local government that has the personnel, funding, materials, partnerships and programming required to conserve the species and ecosystems in a specific area at a specific time. At the institutional level, second order capacity would be indicated by the presence of financial and governmental systems that allow the institution to obtain and utilize future personnel, funding, materials, partnerships, and programming, which is needed to perform functions, solve problems and set and achieve future objectives toward biodiversity conservation. The development of institutional capacity to support conservation has been heavily addressed in the conservation literature and is primarily informed by political and economic literature (Brosius & Russell, 2003; Wilmesn et al., 2008; Wilmsen & Krishnaswamy, 2008; Mahanty & Russell, 2002). The purpose here is not to expand on institutional examples but to emphasize that first order institutional capacity focuses on the present conservation issues while second order capacity is defined by the infrastructure that supports future biodiversity conservation.

The literature on first and second order community capacity is also reviewed in this dissertation. An example of a community with first order capacity might be a network of conservation biologists that has established the relationships, sense of

common purpose, values and history amongst themselves that is needed to conserve the species and ecosystems in a specific area at a specific time. Second order community capacity would be indicated by the presence of educational and communication systems that support the relationships and maintain the common purpose, values and history that allow the community to perform functions, solve problems and set and achieve future objectives toward biodiversity conservation. The development of community capacity to support conservation has been heavily addressed in the conservation literature and is largely informed by sociology and anthropology literature (Agrawal & Gibson, 1999; Belsky, 2003; Wates, 2000). Again, the purpose here is not to expand on examples of community capacity but to emphasize that first order community capacity focuses on the present conservation issues while second order capacity is defined by the infrastructure that supports future biodiversity conservation.

Equally important as institutional and community capacity are the dimensions and infrastructure that help individuals support biodiversity conservation. The work that exists in the conservation literature on this topic suggests that individual-level first order capacity is indicated by an individual's leadership and analytical skills and is complimented with appropriate technical knowledge that allows a specific individual to perform functions, solve problems and set and achieve objectives that support biodiversity conservation (Goodman et al., 1998; Poole, 1997; Raik, Decker and Siemer, 2003; Wondelleck and Yaffee, 2000). According to this definition, an individual has first order capacity to conserve biodiversity when that individual has the skills and knowledge to support sustained, meaningful action toward goals of biodiversity conservation. Pairing this with Salafsky et al.'s (2002) definition, it would follow that second order individual

capacity would be indicated by the presence of infrastructure that allows a person to use their skills and knowledge to perform functions, solve problems and set and achieve future objectives to support future biodiversity conservation.

What would second order infrastructure look like in the context of individual capacity development for conservation? As I explore in the literature review chapter of this dissertation, little research has been conducted on the second order infrastructure necessary to stabilize and increase individual capacity for biodiversity conservation over time. Answering this question and enhancing the individual ability to support capacity development from within the region where it is needed has become increasingly important in biodiversity hotspots around the world where human development and biodiversity conservation are of equal importance. Discussion at the African Capacity Building Foundation (ACBF) summit in Kigali, Rwanda, suggests that psychological variables such as attitudes, beliefs and values related to oneself, environment and others contribute to human development and biodiversity conservation. At the ACBF summit, the issue of Africans attaching value and dignity to themselves was emphasized as a vital element to the continent's development (Kagire, 2011).

This individual focus continued in Addis Ababa, Ethiopia, when national leaders across Sub-Saharan Africa launched a movement “to operationalize the action plan that will anchor…a regional movement to promote a development approach that is based on individual transformation and responsibility” (Chinje, 2011). Africa Unbound, Inc., told participants at the symposium, “We will find innovative solutions to all of our problems on the continent when we start looking inward to discover our inherent talents and put them to productive use." In a statement to the symposium, Chairperson of the African

Union Commission Dr. Jean Ping pointed out, "the focus on individual responsibility and empowerment is pertinent at this time when it is critical for Africa to harness its full human potential for the development of the continent" (Ibid.). These examples highlight the real world importance of developing capacity at the individual level. The importance of individual capacity for biodiversity conservation juxtaposed with the dearth of research available on this topic further serves to emphasize the need for deeper investigation of the type of capacity an individual must have to conserve biodiversity now and in the future.

While the need for an operational definition of this individual level capacity continues to mount, empirical studies on this topic remain scarce. Before moving forward with empirical studies of individual capacity for biodiversity conservation, the theoretical framework for this topic needs further development. My dissertation is fundamentally aimed at meeting this research need. Specifically, I explored our current understanding of capacity for biodiversity conservation and how this understanding can be supplemented by psychological theory to strengthen our development, evaluation, and prediction of this capacity over time. I did this within the context of case studies that focus on three separate populations of conservation professionals who participated in capacity building trainings in Africa and North America between 1994 and 2014. I administered surveys to these conservation professionals to create and validate an instrument that measures the construct I call psychological capacity for biodiversity conservation (PCBC). Then, I administered the validated PCBC survey instrument to training alumni and conducted interviews with their trainers to the evaluate the effectiveness of the capacity building methods at increasing PCBC directly after and two to ten years after a training. The result

is a novel approach to capacity development and evaluation and a psychometric instrument that can be used to predict long-term capacity for biodiversity conservation in a diverse population of conservation professionals. I have organized my dissertation into five chapters, which are briefly described below:

- Chapter 1: This brief Introduction outlines the structure and justification for the following chapters.
- Chapter 2: Literature Review defines capacity building for biodiversity conservation, what is currently known on the topic, and why more research is needed to explore a concept I call psychological capacity for biodiversity conservation (PCBC).
- Chapter 3: This chapter explores the development of a scale to measure PCBC and the initial effects of capacity building training methods on PCBC.
- Chapter 4: This chapter investigates which PCBC dimensions are predictive of behaviors associated with long-term capacity and which training methods are associated with those dimensions and long-term capacity behaviors over time.
- Chapter 5: A brief conclusion describes how results from my research contribute to our understanding of capacity for biodiversity conservation; I also make recommendations for how to use results to inform how organizations can effectively build and evaluate capacity for biodiversity conservation.

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Chapter 2: Literature Review
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Introduction

Conservation organizations across the world are increasingly recognizing that international biodiversity conservation can be achieved most effectively by facilitating local conservation solutions to regional biodiversity issues (Mengers, 2000; Mahanty & Russell, 2002; Troja, 2000; Liberato et al., 2011; Beckley et al., 2008; Constantino et al., 2012; Boissière et al., 2014; Ekowati et al., in review; Felker et al., in prep). With the acceptance of this reality comes a revitalized mission: to build the capacity of self-sustaining regions to conserve their own biodiversity. This mission requires a comprehensive exploration of capacity and empirically based recommendations to design effective programs. Capacity Building for Biodiversity Conservation (CBBC) is typically categorized into three dimensions—institutional, community, and individual capacity (Raik, Decker and Siemer, 2003; Moore, Severn, Millar, 2006; Liberato et al., 2011). While institutional and community capacity for biodiversity conservation are well studied and defined across contexts (Landre and Knuth, 1993; Beckley et al., 2008; Raik, Decker and Siemer, 2003; Moore, Severn, Millar, 2006; Liberato et al., 2011; Mengers, 2000; Troja, 2000; Lewis, 1998; Ta'I, 2000; Goodman et al. 1998; Madden & McQuinn, 2014), the individual aspects of capacity in this context have received less attention (Ekowati et al., in review; Felker et al., in prep).

Past studies that have focused on the underpinnings of individual capacity seem to have something in common—they all allude to an elusive catalyst that is required to move individual potential and competence into action to conserve biodiversity. The

majority of the studies on this topic either assume that this catalyst inherently exists (Poole, 1997; Raik, Decker, Siemer, 2003; Beckley et al., 2008; Moore, Severn, Millar, 2006; Liberato et al, 2011; Goodman et al., 1998) or if the need for it is identified, it is only after its absence has led to the failure of a program (Ta'I, 2000; Mengers, 2000). Studies of the catalyst that moves individuals into action have typically been approached qualitatively and results are context-based and often unsuitable for generalization to the larger study of capacity building (Constantino et al., 2012, Boissière et al., 2014, Ekowati et al, in review; Felker et al, in prep). What is clearly missing in the conservation literature on capacity building is a definition of this individual action catalyst that can be generalized across contexts along with empirically based recommendations for how to design programs to develop it. After exploring what is currently known about all three dimensions of capacity in this context, I review psychological literature to inform the definition of a concept I call Psychological Capacity for Biodiversity Conservation (PCBC). PCBC is composed of the psychological variables associated with empowerment, self-determination, meaningful action, and group efficacy. This concept offers a unique, psychology-based definition of the under-studied concept of individual capacity for biodiversity conservation that can support a novel approach to effectively building human capacity to sustain action toward the goal of biodiversity conservation over time.

To begin exploring any human aspect of conservation it is important to begin by clarifying the associated technical language, which can easily be misinterpreted through our colloquial understanding of human experience. There are at least three similar terms that are often referenced in discussion of the human ability to conserve biodiversity:

competence, readiness, and capacity. Capacity is distinguished from competence in that capacity reflects potential for addressing issues, whereas competence focuses more specifically on how skillfully a person applies capacity while addressing issues (Goodman, 1998). In this way, "capacity is most similar to readiness in that both are potential states that may lead to action" (Goodman et al., 1998, p. 250). I argue that the psychological aspects of capacity have been underexplored in the context of biodiversity conservation. The purpose of diving into the psychological underpinnings that link potential and competence to action in this context is that it offers a more comprehensive definition of capacity for biodiversity conservation, which can then be made operational to catalyze its development across the globe.

The term capacity development began captivating international development audiences in the 1990s (Smillie, 2001) while the concept of collaborative conservation has been discussed more commonly in the conservation and natural resource management literature to define a similar purpose (Brechin et al., 2002). While there are multiple ways to combine the two concepts in theory and practice, I propose that it is important to recognize that there is a real difference between capacity building and collaborative conservation in the context of conserving biodiversity. Where collaborative conservation focuses on stakeholders and interactions among them (e.g., local people, communities, and institutions) as a means to a biodiversity conservation outcome, capacity building is aimed at the development of local individuals, communities, and institutions to effectively continue biodiversity conservation in the future when outside help may be limited or no longer available. Many conservation programs can and often do aim to practice collaborative conservation and capacity building at the same time or at least in

equal measure. In these instances, it is particularly important for management to recognize that these separate goals have traditionally led to very different ends (Wilshusen et al., 2003).

Collaborative conservation is a practice that does not automatically lead to the development of capacity for conservation when it is defined as, "a partnership in which governmental agencies and local communities negotiate and share, as appropriate, the responsibility for management of a specific area or set of resources" (Schusler et al., 2003, p. 311). These researchers reported eight processes that helped support this type of approach to develop common purpose and collaborative relationships in natural resource management. Knowledge, supportive policy, appropriate processes and structures, and capacity were also needed to sustain learning and enable long-term, joint action but that these essential aspects of locally-sustained conservation were not supported by the collaborative conservation processes investigated (Ibid.). Indeed, many collaborative approaches have been critiqued as impotent in their ability to empower local community members (Wilmsen et al., 2008), a goal which is often identified as the key to capacity building for conservation and is discussed in depth below. Without being paired with capacity building and empowerment goals, collaborative conservation has mainly been studied in controversial, community-based initiatives, where environmental decision making requires local support and the goal is rarely more than short-term consensus making (Troja, 2000).

Moving past the facilitation of short-term decision making processes, capacity building offers the type of local innovation that supports long-term conservation success and results from the pressure caused by arising problems and the level of existing

capacities to address these problems. While it may sound promising, Mengers (2000) study that focused on institutional capacity for conservation warned:

> 'Capacity building' may become a mantra, a cure to all ailments. The problem with capacity building as a concept is that it is nothing more than a strategy somewhere in between an existing situation and a better one, between the formulation of an objective and achieving it. It cannot be a goal in itself although several authors dealing with capacity building give the impression it is. 'Capacity building' should be a strategy that is linked to a goal…the achievement of such a goal cannot be realized by human resource development or training alone…clarity should be provided about what dimensions are important and immediate and which are not. The intrinsic time dimension of 'capacity building' also suggests that it has to be seen as a long term and continuous process. (p. 378)

Defining Capacity Building for Biodiversity Conservation

For these reasons, it is important to clearly define the purpose of any capacity building effort. Capacity building for biodiversity conservation (CBBC) is the process by which institutions, communities, and individuals build upon their existing abilities to perform functions, solve problems and set and achieve biodiversity conservation objectives now and in the future (adapted from United Nations Committee of Experts on Public Administration 2006). In this definition, I reference a temporal aspect as well as the specific goal of biodiversity conservation. The following analysis extrapolates on how previous conservation researchers have explored the dimensions that are central to the process of CBBC.

As previously mentioned capacity building for biodiversity conservation (CBBC) includes institutional, community, and individual capacity. Institutions refer to organizations or a set of organizations, such as a state or federal wildlife management agency or local government. Community refers to an informal group of individuals bounded geographically such as within a physical location. Individuals refer to individual people or citizens of the community of interest (Raik, Decker and Siemer, 2003). Each

dimension of CBBC is comprised of different variables, all of which I discuss below in relation to the goal of biodiversity conservation.

The institutional dimension of capacity for biodiversity conservation includes aspects such as locally hired and trained personnel, direct funding, local development of educational materials, and utilization of an identity-focused mediation process to foster compromise in the face of conflict. A system of recruiting and training personnel is essential to the development of any institution. When World Bank's Karnataka Urban Infrastructure Development Project (KUIDP) in India aimed to increase institutional capacity by helping local institutions manage their assets and services, their first step was to set up "a suitable and well-planned staff recruitment and development strategy and a deliberate effort aimed at training and the transfer of knowledge" (Mengers, 2000, p. 388). An interesting point here is that World Bank does not specify whether the KUIDP staff were hired from the surrounding community or transferred in from other areas. While this omission may have been typical of past conservation organizations' hiring practices (Wilshusen et al., 2003), it simply will not do if the aim of the initiative is to develop a type of capacity for biodiversity conservation that builds upon *existing abilities* of the region. Since building upon existing abilities is central to definition of CBBC that I propose, hiring and training *local personnel* is essential to the development of institutional capacity for biodiversity conservation.

Similarly important as the source of personnel to CBBC is the source of funding. As priorities change in the modern landscape of international conservation, so do relationships between Northern development non-governmental organizations (NNGOs) based in industrialized countries and local Southern non-governmental organizations

(SNGOs), which are based in many aid-recipient countries. While funding has traditionally flowed from NNGOs to aid conservation programs in developing countries (Wilshusen et al., 2003), the direct flow of funding through SNGOs is becoming more essential in current capacity building efforts (Lewis, 1998). Still some researchers contend that funding in general is a main component of institutional capacity in conservation and natural resource management without mentioning the nature of the route of that financial support (Raik, Decker and Siemer, 2003). What may seem to be a small oversight in detail here is actually the root of much scrutiny regarding the most effective type of relationship between NNGOs and SNGOs in the future of international conservation. Political economists argue that NGOs based specifically in Europe and the United States need to relinquish their role as leaders of conservation work in developing countries and instead strengthen their ability to act as facilitators of resources to local organizations in developing countries (Mahanty & Russell, 2002). While the direct flow of funds through SNGOs may result in an identity crisis for partnering Northern NGOs, it better ensures "the viability of longer-term development work" (Lewis, 1998, p. 501) in areas where capacity is being built. This is crucial in a definition of CBBC that values setting and achieving objectives now and *in the future.* Therefore, the emphasis on the direction of funding is highlighted here as support for a more specific definition, one wherein *direct funding through regionally based organizations* is necessary for the development of institutional capacity for biodiversity conservation.

Along with funding, the source and development of materials such as training and educational curriculum is important to institutional capacity development. This point is supported by research in industrialized (Raik, Decker, Siemer, 2003) and developing

countries (Ta'I, 2000), which aimed to strengthen the institutional capacity of municipalities in various regions of the world by developing materials that would enhance local municipal knowledge of fiscal management, operational development, and community-based organization (Ta'I, 2000). These materials may come in the form of training manuals, PowerPoint slides, documentation and reports, policy guidelines, textbooks, and new tools. More recently, conservation organizations seem to understand the importance of materials for institutional capacity and have made strides in the effort to make educational materials more available and up-to-date. The American Museum of Natural History's Network of Conservation Educators and Practitioners (NCEP) offers open access teaching modules to conservation educators on their website. In an effort to offer high quality, up-to-date educational resources, NCEP may have joined many institutional capacity researchers in underestimating the importance of the source of the educational resources. As with funding and personnel, building upon existing regional strengths by having local educators create the educational materials is essential to the definition of capacity building for biodiversity conservation discussed here. To their credit, NCEP does attempt to integrate local knowledge into the materials they offer by asking local educators in developing countries to adapt NCEP's online teaching modules to content that is pertinent to biodiversity in their region (Landrigan, personal communication, April 19, 2012). However, it is unclear whether having local educators adapt materials that were created by outside experts builds the same type of capacity that would be built if the materials were created and developed solely by the local educators. *Educational materials created by local experts* may be essential to the development of institutional capacity for biodiversity conservation.

Conflict between decision-makers is often present while working toward the mission of conservation and local institutions can play a role in mediating that conflict. For instance, in summer of 1996 the Parliament of Berlin, Germany, developed the Waste Management Programme of Berlin to address the initial waste problems in the region and maintain updated waste management programs in the future. Troja (2000) describes the development of the Waste Management Programme of Berlin as an essential piece of Berlin's capacity to efficiently manage their waste issues. Important to the development of this program was the process of mediation, "in which an impartial third party-the mediator- helps the conflict parties to come to an agreement" (p. 268). Raik, Decker, and Siemer (2003) suggest that this type of formal mediation programming is essential to development of institutional capacity.

Recent research on this topic suggests that there is a specific type of mediation that is essential to an institution's capacity for conservation. The Human Wildlife Conflict Collaboration (HWCC) is an organization that aims specifically to increase this aspect of institutional capacity for conservation with a type of mediation called conservation conflict transformation (CCT). CCT starts by acknowledging the deeply rooted, identity-driven issues that lay beneath conservation conflicts between the stakeholders and offers suggestions for how to set conditions to address these root causes in mutually beneficial dialogue aimed at long-term compromise (Madden & McQuinn, 2014). I interpret the mediation aspect of institutional capacity discussed in earlier research (Raik, Decker, Siemer, 2003; Troja, 2000) in a more specific way here as support for the importance of *programming an identity-focused mediation process to foster compromise* when there is conflict in the development of institutional capacity for

biodiversity conservation. As emphasized above, these institutional processes that are essential to move potential and competence into conservation action must be the responsibility of local community members. Therefore, to fully understand CBBC, it is important to also define the requisite dimensions of community and individual capacity for biodiversity conservation.

The community dimension of capacity for biodiversity conservation requires there to be a shared history, set of shared values, human and social capital, and well-timed and diverse relationships among community members. Researchers have suggested for some time that shared history and values are two aspects that are essential to community capacity for resource management (Goodman et al. 1998, Raik, Decker, Siemer, 2003). Shared history is characterized by, "awareness of important social, political, and economic changes that have occurred both recently and more distally; awareness of the types of organizations, community groups, and community sectors that are present; and awareness of community standing relative to other communities" (Goodman et al. 1998, p. 261). Shared values means "clearly defined norms, standards, and attributes; consensus building about values" (Goodman et al. 1998, p. 262).

In the context of biodiversity conservation, the terms *social and human capital* have become popular in more recent discussion of community capacity (Moore, Severn, Millar 2006; Liberato et al., 2011). Trust, reciprocity, shared attitudes and behavior, commitment, sense of place, and networks are described as essential to building this type of capital (Moore, Severn, Millar, 2006). A review of eighteen peer-reviewed articles on the topic added that learning opportunities, skills development, resource mobilization, and a development pathway were essential to the type of social and human capital that

supports community capacity (Liberato et al., 2011). The timing and type of relationships fostered between a group of individuals is also important to community capacity. Citizen satisfaction with the planning process is largely based on how early environmental agencies begin developing relationships with citizen committees (Landre and Knuth, 1993). Specifically, researchers have found that the least satisfactory agency/committee relationships were those that were forged late in the decision-making process, when it was difficult to develop relationships between agency representatives and citizens (Ibid). More recent research has delved into the types of relationships necessary for community capacity and found that four types of social relations are important: market, bureaucratic, communal, associative (Beckley et al., 2008).

This literature suggests that the underpinnings essential for a community to move from their potential and competence into action toward biodiversity conservation include a shared history, set of shared values, human and social capital, and a well-timed and diverse set of relationships. Inherent in this definition is the assumption that individual community members are willing to put forth a sustained effort to establish these important dimensions of community capacity with other individuals in their region. As such, it seems one of the most important aspects of exploring CBBC would be to investigate the complex dimensions of the human will to create community and institutional capacity to conserve biodiversity.

Individual Capacity for Biodiversity Conservation

I found that most of the conservation literature has focused on how to define and build the potential and competence of an individual to conserve biodiversity, without much attention paid to the nuances of human willingness to catalyze potential and

competence into action toward conservation goals (Raik, Decker, Siemer, 2003; Beckley et al., 2008; Moore, Severn, Millar, 2006, Liberato et al, 2011; Goodman et al., 1998). For instance, leadership skills are often described as important to individual capacity (Liberato et al, 2011; Goodman et al., 1998). Goodman et al. (1998) defines leadership as an individual ability to:

> Provide direction and structure for participants; encourage participation from a diverse network of community participants; implement procedures for ensuring participation from all during group meetings and events; facilitate the sharing of information and resources by participants and organizations shaping and cultivating the development of new leaders; utilize a responsive and accessible style; focus on both task and process details; be receptive to prudent innovation and risk taking; connect to other leaders. (p. 261)

Inherent in the definition of leadership is the assumption that the individual with this capacity is motivated to conduct this list of extensive actions. This aspect of individual capacity is interpreted here in a similar way as support for the proposal *that fostering individual leadership skill* is important in the development of individual capacity for biodiversity conservation.

Analytical skill and practical reason supplement leadership skill in an individual who has the capacity for biodiversity conservation. Offering insight from the field of social work, Poole (1997) proposed that individual social work students must have analytical skill and practical reason in their approaches to community development. After reviewing several successful capacity development projects in the United States, Poole (1997) offers a social ecology framework to help students develop analytical skill, which Poole defines as "the ability to understand the full theoretical scope of the problem, the multiple levels of intervention and targets needed to change the situation, and the tested strategies to assist with this change" (p. 7). Again, it is assumed that the individual with

capacity is motivated to move this potential and competence into action. Poole (1997) also suggested universities need to develop the student's capacity for practical reason. Poole defines practical reason as "the ability to recognize, acknowledge, pick out and respond to the singular salient features of a complex and unique situation…the thinking process involved in deciding what to say or how to do that which best suits the particular situation at hand (1997, p. 7). This practical reason is important to balance the theoretical approach of the social ecology framework because "of the complexity and distinctiveness of each social situation, (which) can never be reduced to a general formula" (Poole, 1997, p. 7). I extend an interpretation of Poole (1997) to include the proposal that *fostering analytical skill and practical reason* is important in the development of individual capacity for biodiversity conservation.

In much of the research I reviewed on institutional and community capacity above, there is a clear need for programs and processes led by local practitioners who would be continually motivated to the development of those programs and process. For instance, Ta'I (2000) noted that, "Through no fault of their own the executing agency could not devote enough time to implement the programme due to overload of work. This reduced the degree of ownership to the programme" (p. 411). Ta'I (2000) specified that individual factors associated with ownership might have been helpful to explore before project staff contracts ended and they left the project; this is important because it was not clear exactly how to and who would perform the most important task of ensuring the utilization of materials and, thereby, the sustainability of institutional capacity after the program ended (2000).

I found mention of the need to look into the motivational aspects of individual capacity for biodiversity conservation in past as well as more recent studies (Mengers, 2000; Constantino et al., 2012; Boissière et al., 2014, Ekowati et al, in review; Felker et al, in prep). Mengers (2000) suggested that further capacity building programs should "be related to properly articulated goals" (2000, p. 385). The need for a deeper investigation of individual capacity is alluded to in the explanation that, "such specific goals would have triggered sufficient motivation and pressure to sustain capacity building efforts over several years" (p. 385). Further in this discussion, Mengers (2000) suggested:

> There was a risk of fading enthusiasm in a situation where no further follow-up support would be given, where senior officers or administrative staff might be transferred or where failures might be encountered with some of the components in the programme. Such drawbacks can only be overcome when the outputs (new skills, changed attitudes, improved procedures etc.) of capacity building programmes have taken root in an organization and have found a sufficient number of supporters. It is a mistake to think that the commitment of one person in the to of the organization is sufficient. (p. 387)

In my review of this literature, it is clear that past studies that have focused on the underpinnings of individual capacity all suggest the necessity of a catalyst to move individual potential and competence into action to conserve biodiversity. For instance, the term empowerment is used to identify a dimension that might act as a catalyst for action toward wildlife management and biodiversity conservation (Raik, Decker, Siemer, 2003; Constantino et al., 2012, Boissière et al., 2014, Ekowati et al, in review; Felker et al, in prep). In their study of individual capacity for wildlife management, Raik, Decker and Siemer (2003) suggested that increased knowledge and skill contributes to a feeling of *empowerment,* which they define as *the exertion of ownership and influence over important events in one's life*. Raik, Decker and Siemer (2003) identified empowerment as a psychological mechanism that allows individuals to continually apply their

leadership skills, analytical skills and technical knowledge toward the mission of conservation. If empowered individuals are more likely to continually apply their knowledge and skills to conserve biodiversity, a deeper understanding of the concept of empowerment would strengthen CBBC efforts.

Recent research on empowerment and local engagement in conservation has involved qualitative exploration of empowerment in conservation and while some acknowledged the importance of technical definitions of empowerment (Wilmsen et al., 2008; Costantino et al., 2012) none actually used those definitions to measure empowerment in their case studies. Instead, these case studies used qualitative interviews, participatory mapping, focus groups, and personal observation of community leaders and villagers to aggregate a list of factors that were important (Constantino et al., 2012, Boissière et al., 2014, Ekowati et al, in press; Felker et al, in prep) and conditions that enabled local participation (Constantino et al., 2012, Boissière et al, 2014). Factors found to be important to empowerment in these studies included personal interest, belief in benefit to the community, knowledge, freedom of choice, self-esteem, pride, recognition, and competition. Results suggest that while the methods used to identify factors important to empowerment were suitable for their purposes, any definition of empowerment based on these results may not be representative of the range of potential empowerment factors and must be considered solely in the context of the particular case studies. An operational definition that can be applied more generally across contexts would be useful to further explore the concept of empowerment and other motivational aspects of individual capacity for biodiversity conservation and move our understanding of this topic forward.

It is clear from these recent findings that what is missing in the conservation literature is a definition of this individual action catalyst that can be generalized across contexts and empirically based recommendations for how to design programs to develop it. This action catalyst seems to be rooted in an aspect of individual capacity that lies deeper in the human psyche than leadership skill, analytical thought, or practical reason. In the world of social sciences, psychology is known as the science that studies the basic rules of the human psyche that influence human behavior. As such, most psychological researchers aim to conduct experiments that will lead to findings and conclusions about human behavior that can be applied to the general human population. Therefore, to fully understand empowerment or human motivation in a way that can be generalized across contexts, it seems smart to begin by exploring the research psychologists have conducted on the topic.

A Psychological Lens on Individual Capacity for Biodiversity Conservation

I begin the following exploration of psychological capacity for biodiversity conservation (PCBC) where the current literature on the topic ends—with empowerment. Much like the action catalyst discussed above, even though psychological empowerment had much relevance to topics like community development, the concept had been viewed for many years as an enigma: "easy to define in its absence—alienation, powerless, helplessness—but difficult to define positively because it takes on a different form in different people and contexts, and differs across levels of analysis" (Rappaport, 1984, p. 2). With the relationship between helplessness, lack of control, and alienation long established in the psychological literature, Zimmerman (1990) attempted to explore the empowerment enigma through the development of the Theory of Learned Hopefulness.

"Learned hopefulness suggests that empowering experiences-ones that provide opportunities to learn skills and develop a sense of control" (Zimmerman, 1990, p. 71)-can help individuals limit the debilitating effects of alienation, powerlessness, and helplessness. The theory of learned hopefulness emphasizes the importance of personal control and competence and hypothesizes that these variables are supported by opportunities for voluntary participation in community activities (Zimmerman 1990). Results from this study supported a direct effect of participation in voluntary organizations on psychological empowerment (Zimmerman, 1990, p. 77). These findings gave support to Zimmerman's theory of learned hopefulness and suggested that future research to fully develop the theory was warranted. As a result of continued research on the topic, Zimmerman (1995) discovered that a sense of control was not the only psychological attribute of empowerment. In fact, Zimmerman (1995) defined nine psychological variables that comprise empowerment. These variables include as *knowledge, understanding of causal agents, critical awareness, decision-making, perceived control, self-efficacy, perceived competence, perception of difficulty, and motivation to control*. Confirmatory factor analyses were conducted on a scale that was created to test Zimmerman's theory to evaluate the internal structure of the theory and the reliability of its respective scale's scores (Akey, Marquis, & Ross, 2000). The results provided evidence of convergent and discriminant validity for the scores, thereby validating the instrument and confirming the integrity of the theory. Since then, the empowerment scale has been tested many times and has been found to be useful to measure empowerment across many contexts in diverse populations (Fadda et al., 2016; Cyril, Smith, & Renzaho, 2015; Haswell, et al., 2010)

In this context, *knowledge* is defined as the understanding an individual has about the resources needed to achieve goals (McCarthy & Zald, 1977). *Understanding of causal agents* is an individual's ability to understand the cause and effect relationships pertinent to achieving goals within a context (Sue & Zane, 1980). *Critical awareness* includes an individual's ability to perceive the underlying mechanisms at work within a context (Freire, 1973; Kieffer, 1984). *Decision-making* is defined as an individual's ability to navigate barriers and solve problems within a context (Zimmerman, 1992). *Perceived control* refers to an individual's "sense of control in personal and community decisions" (Paulhus, 1983, p. 1254). There are multiple theoretical approaches to understanding the concept of *self-efficacy*, a concept Zimmerman proposed is vital to psychological empowerment. Bandura (1977) approaches self-efficacy from the perspective of social cognitive theory, defining self-efficacy as an individual's belief in his or her own ability to succeed in specific situations. By this definition, self-efficacy plays an important role in how an individual approaches goals, tasks, and challenges. For instance, individuals who believe they can perform well (individuals with high self-efficacy) are more likely to view difficult tasks as something to be mastered rather than avoided (Bandura, 1977). Social learning theory describes self-efficacy as a socially valuable skill that is developed exclusively or primarily in a social group (Ormrod, 1999). As such, social learning theory would define self-efficacy as an individual's understanding of what skills they can offer in a group setting (Ormrod, 1999).

While self-concept theory (McAdam, 1986) and attribution theory (Heider, 1958) both offer alternative definitions for concepts similar to self-efficacy, definitions linked to social cognitive theory (Bandura, 1977) and social learning theory are closest to the

definition of self-efficacy used in Zimmerman's theory of psychological empowerment. Zimmerman defines self-efficacy as a person's "perceived effectiveness of different actions to influence community decisions" (1992, p. 713). In this, Zimmerman distinguishes between how much control a person perceives herself to have and how effective that individual perceives her control to be in relation to different decisions.

An individual feels *perceived competence* if they think they are capable at applying their specific skill set (Kaplan, 1990). *Perception of difficulty* is a psychological construct that accounts for an individual's view of how much effort will be required to overcome barriers to achieve goals. *Motivation to control* refers to a motivation to perform those actions that are perceived to be effective and within one's control (Zimmerman & Rappaport, 1988). While these empowerment variables are consistent with some aspects of individual capacity as it is discussed in the conservation literature, they do not encompass other important dimensions of PCBC.

For instance, meaning and self-determination are also discussed as important to an individual's will to conserve biodiversity. Thomas and Velthouse (1990) define *meaning* as the value of a work goal or purpose, judged in relation to an individual's own ideals or standards. They define *self-determination* as an individual's sense of having choice in initiating and regulating actions (Ibid). While Thomas and Velthouse (1990) do consider these two important elements as a part of psychological empowerment, they lack the depth of consideration Zimmerman (1995) gives to the other five intrapersonal variables associated with psychological empowerment and found to be important to PCBC. A deeper understanding of constructs like self-determination, meaningful action, and group efficacy in this study can supplement the concept of psychological empowerment and

help us examine a type of PCBC that is more likely to last over time in the context of collectivistic cultures, such as those found in many developing countries.

Wehmeyer's Functional Self-Determination (fSDT) gives us a more robust definition of self-determination and is unique among similar SDT theories in its relationship with psychological empowerment (Wehmeyer, 2005; Wehmeyer, Little, Sergeant, 2011). While other SDT theories do not consider psychological empowerment (DeCaro & Stokes, 2008), fSDT suggests that psychological empowerment along with self-realization, self-regulation, and autonomy are essential elements of an individual's capacity to continue action over time. Due to this empirically tested relationship between fSDT and psychological empowerment, indicators of fSDT variables are included in the proposed survey instrument.

As discussed above, the importance of meaning should not be underestimated in psychological empowerment, where meaning is defined as the value of a work goal or purpose, judged in relation to an individual's own ideals or standards (Thomas and Velthouse 1990). Kaplan's (1990) conception of meaningful action is similar to Thomas and Velthouse (1990)'s construct of meaning in that it references the value of the work in comparison to individual ideals. Kaplan's (1990) definition of meaningful action takes the construct a step further by distinguishing how the value of the work is being considered in relation the individual's own ideals.

Kaplan (1990) distinguishes how meaningful action can be valuable to the individual by proposing the importance of psychological variables such as perceived niche, perceived competence, and being needed. By this definition, an individual feels they have a *perceived niche* if they sense that their specific set of skills could potentially

contribute to a larger context. An individual feels *perceived competence* if they think they are capable at applying their specific skill set. An individual experiences a feeling of *being needed* if they think other individuals deem the individual's applied skill set essential to the larger context. If an action increases the individual's sense of perceived niche, perceived competence, and being needed in relation to the individual's own ideals, Kaplan (1990) would define that action as meaningful.

Many of the theories and models reviewed above were developed for use within the individualistic cultures of the United States of America or Europe. Individualistic cultures are oriented around the self independent from, instead of identifying with, a group mentality (Rothwell, 2010). In collectivistic culture, the success of the larger group of people within which one individual is a member is perceived to be more important than the success of the individual member (Nisbett, 2003; Nisbett & Masuda, 2003; Chua, Boland, & Nisbett, 2005). Many international conservation organizations are interested in building regional capacity for biodiversity conservation in developing countries within Africa, South America, or Asia. Collectivistic culture is pervasive within these regions of the world (Platteau, 2000). It would follow then that a study of PCBC in collectivistic developing countries should also consider the individual's perception of *group efficacy*, or how the individual perceives the effectiveness of their group at conserving biodiversity (Staats & Harland, 1995).

Inherent in the construct of group efficacy is a focus on an individual's perception of the capability of the group of individuals to which they belong. The perceived effectiveness of this group is paramount to an individual's will to work toward conservation goals for many reasons. One of those reasons is that regardless of culture, it

seems illogical for one individual to expect themselves to be effective, competent, self-determined, and have a meaningful relationship with each action required to move forward toward the complex mission of biodiversity conservation. This claim is supported by the importance of the variable of perceived niche in PCBC, discussed above as an individual's sense that their specific set of skills could potentially contribute to a larger context (Kaplan, 1990).

Accordingly, it follows that an individual would be more willing to fill their perceived niche in the larger context of biodiversity conservation if that individual also felt confident in their group's ability to play compatible and necessary roles to move the group as a whole forward toward that mission. None of the other PCBC variables account for an individual's perception of the group from this critical perspective. This supports the proposal that group efficacy is an essential component of the nuanced construct of PCBC.

In this review, I have examined theory from the conservation literature to help us better understand what is known about Capacity Building for Biodiversity Conservation (CBBC). I identified a need for further investigation of the individual dimension of CBBC and reviewed relevant psychological literature to explore how to guide further research on that dimension. As a result, I propose the construct of psychological capacity for biodiversity conservation and conclude that when used together, psychological empowerment theory (Thomas and Velthouse, 1990; Zimmerman, 1992), the Reasonable Person Model (Kaplan & Kaplan, 2009), Functional Self-Determination theory (Wehmeyer, Little, & Sergeant, 2011), and the concept of group efficacy (Staats &

Harland, 1995) can help guide further investigation of capacity building strategies to support regionally based biodiversity conservation.

These findings support a set of hypotheses that can frame future research on psychological capacity for biodiversity conservation (PCBC). First, I hypothesize that PCBC is composed of the psychological variables associated with empowerment, self-determination, meaningful action, and group efficacy. I further hypothesize that capacity building efforts that increase these dimensions of PCBC will find that the capacity they build will last years after the intervention and will have a positive association with other indicators of long-term capacity in those trainees. Further research is needed to test these hypotheses. Evaluation criteria can be based on the definition of PCBC I have discussed here and a psychometric instrument can be designed and validated to quantitatively measure how PCBC is affected by different capacity building strategies. This type of research will then be able to offer empirically based recommendations as to how to design programs to develop and evaluate an individual's psychological capacity to conserve biodiversity.

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CHAPTER 3: Willing & able: Measuring the effectiveness of training methods to build psychological capacity for biodiversity conservation

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ABSTRACT

For at least two decades conservation organizations have worked to increase the capacity of local conservation professionals to conserve biodiversity, and many aim to accomplish this goal by conducting regional trainings or sponsoring local education programs. One recurring challenge is measuring success— having a quantitative instrument to evaluate the effectiveness of training programs at building capacity has essentially remained elusive. While there is a plethora of conservation research on how to define and measure institutional and community capacity for biodiversity conservation (CBC), the literature still lacks a comprehensive discussion of the individual dimension of this construct. While many researchers agree that local individuals must be willing and able to work toward the mission of biodiversity conservation, current research only identifies variables that would strengthen their ability (not their willingness) to do so. The motivation of such an able individual to take action toward biodiversity conservation is mentioned often but lacks rigorous assessment or thorough investigation. The field of psychology offers insights to understand individual motivation and human willingness. Unlike more traditional ways of considering capacity building, this study focuses on the psychological aspects of the individual dimension of CBC. After a brief review of the conservation literature on CBC, I apply theoretical insights from the fields of community and positive psychology to propose and validate a psychometric survey instrument to evaluate psychological capacity for biodiversity conservation (PCBC). I use this survey to evaluate the initial effect of capacity building trainings on PCBC in East African and North American conservation professionals. This research produced three key findings: 1) Meaningful ownership, efficacy, and being needed are three dimensions of PCBC found to be universal across East African and North American study populations; 2) These populations varied in how they were motivated by the universal PCBC dimensions; and 3) Specific training methods were found to significantly increase each dimension of PCBC. These three findings combined support an innovative and more generalized approach to defining, building, and measuring capacity for biodiversity conservation across the world.

Key Words: Capacity building, biodiversity conservation, conservation psychology, individual capacity, evaluation, validity, training methods, survey instrument, psychometric, empowerment

Introduction

The promise of global biodiversity conservation is largely dependent on the capacity of local professionals to conserve biodiversity within their region of the world.

Although many international organizations recognize this association and aim to build conservation professional capacity, implementation faces several challenges (Chandra & Idrisova, 2011). Three such challenges involve defining what it means for a local professional to have the capacity to promote biodiversity conservation, developing an instrument to evaluate that capacity, and identifying training methods that significantly increase all aspects of that capacity. There has been a great deal of research about the attributes, evaluation instruments, and strategies associated with building capacity at the institutional and community levels. Less research has been focused on defining, evaluating, and identifying training methods to increase a local conservation professional's capacity to build upon their own skills to conserve biodiversity.

One question to help guide this type of research is: what are the dimensions of a conservation professional's capacity for biodiversity conservation and which training methods significantly increase those dimensions directly after training? Researchers who have attempted to answer this question define capacity as a potential state that must be achieved before action toward a goal can be taken (Goodman et al., 1998; Raik, Decker, Siemer, 2003). To define the term more specifically, it is important to first clearly identify the specific goal that the prerequisite capacity is meant to support. Clarifying the intended goal allows us to identify the important dimensions that constitute the capacity to reach that goal, which it turn helps us identify the tools and methods that would support capacity development (Mengers, 2000).

In this study, I focused on the concept of capacity toward the goal of biodiversity conservation. Biodiversity conservation is defined here as the reduction of threats and the support for opportunities for species and ecosystems to flourish alongside human

communities (Salafsky et al., 2002). I define the capacity for biodiversity conservation (CBC) as the willingness and ability to perform functions, solve problems, and set and achieve objectives toward the goal of biodiversity conservation now and in the future (United Nations Committee of Experts on Public Administration, 2006). The conservation literature on the topic of CBC attempts to further clarify this intended objective by dividing the concept into three interrelated tiers: capacity at the institutional, community, and individual level.

In a more thorough review of the capacity building literature (Cranston, in prep), I integrated current conservation literature to develop a more comprehensive definition of institutional and community capacity for biodiversity conservation (CBC). The result is a definition of institutional CBC that includes locally hired and trained personnel, direct funding, local development of educational materials, and utilization of an identity-focused mediation process to foster compromise in the face of conflict. Community CBC requires there to be a shared history, set of shared values, human and social capital, and well-timed and diverse relationships among community members. The details of how these definitions are supported by past research on institutional (Mengers, 2000; Lewis, 1998; Ta'I, 2000; Troja, 2000; Mahanty & Russell, 2002; Raik, Decker and Siemer, 2003; Madden & McQuinn, 2014) and community capacity (Goodman et al., 1998; Landre and Knuth, 1993; Moore, Severn, Millar 2006; Liberato et al., 2011; Beckley et al., 2008) can be found in Cranston (in prep).

Within the aforementioned definitions of institutional and community CBC are verbs that imply that individuals must act in certain ways to build institutional and community CBC. Institutional and community capacity require that the institution or

community desiring the built capacity *hire and train* local personnel, *receive* direct funding, *develop* education materials, *utilize* a mediation process, and *establish* diverse relationships. All of these actions require an individual or group of individuals to behave in certain ways to move forward toward a stated objective. It is the individual who must be *willing and able* to undertake these various behaviors to achieve goals associated with biodiversity conservation. As such, one of the most important aspects of exploring CBC should be an investigation of the complex dimensions of the human will to create community and institutional capacity to conserve biodiversity.

I found that most of the conservation literature has focused on how to define and build the ability of an individual to conserve biodiversity, without comprehensive investigation of the nuances of human willingness to catalyze ability into action toward conservation goals (Raik, Decker, Siemer, 2003; Beckley et al., 2008; Moore, Severn, Millar, 2006, Liberato et al, 2011; Goodman et al., 1998). In this research, willingness is most often called empowerment. The majority of the studies on empowerment in the conservation literature either assume that it inherently exists (Poole, 1997; Raik, Decker, Siemer, 2003; Beckley et al., 2008; Moore, Severn, Millar, 2006; Liberato et al, 2011; Goodman et al., 1998) or if the need for it is identified, it is only after its absence has led to the failure of a program (Ta'I, 2000; Mengers, 2000). More recently, when the need for a deeper investigation of empowerment has been identified and pursued in the conservation literature, it has been approached qualitatively in studies that explicitly state that their results are context-based and unsuitable for generalization to the larger study of capacity building (Constantino et al., 2012, Boissière et al., 2014, Ekowati et al, in press; Felker, in prep). The details of these studies as well as how they support the proposal that

an empirical study of willingness that can be generalized to CBC projects across the world can be found in Cranston (in prep).

In this paper I define this *willingness* of an able individual to take action toward biodiversity conservation goals as psychological capacity for biodiversity conservation or PCBC. As I discuss below, this type of willingness goes well beyond the psychological definition of empowerment. To develop the concept of PCBC I reviewed relevant literature and put forth a hypothesis regarding the psychological dimensions of this concept. PCBC is predicated on four psychological constructs that contribute to our understanding of this concept: psychological empowerment, self-determination, meaningful action, and group efficacy. I developed a Likert scale psychometric instrument to measure this PCBC construct. I tested the validity of this instrument within a population of conservation educators and researchers in East Africa and North America. Validity results from this research are presented to identify five distinct dimensions of PCBC and the results of a study I conducted to test the initial effect of different capacity building training methods on each of those dimensions. This study offers a deeper investigation of the individual dimensions of capacity for biodiversity conservation and the training methods, which may increase those dimensions in conservation professionals directly after training.

Literature Review

Psychological Empowerment

Empowerment is a term that is referenced but rarely explored deeply in association with capacity building in the conservation literature (Raik, Decker, Siemer, 2003). According to Rappaport (1984), even though psychological empowerment has

much relevance to community development, the concept had been viewed for many years as an enigma: "easy to define in its absence—alienation, powerless, helplessness—but difficult to define positively because it takes on a different form in different people and contexts, and differs across levels of analysis" (p. 2). Zimmerman (1990) attempted to explore the enigma of empowerment further using the relationship between helplessness, lack of control, and alienation long established in the psychological literature.

Zimmerman (1990) emphasized the importance of personal control and competence in empowerment and hypothesized that these variables increase when there are opportunities for voluntary participation in community activities. Results from his large study of American students and community members showed a direct effect of participation in voluntary organizations on psychological empowerment (Zimmerman, 1990, p. 77). As a result of continued research on the topic, Zimmerman (1995) showed that a sense of control was not the only psychological attribute of empowerment; other psychological variables comprised empowerment such as: critical awareness, decision-making, perceived control, self-efficacy, perception of difficulty, and motivation to control (Ibid).

The psychological definition of critical awareness describes an individual's ability to perceive the underlying mechanisms at work within a context (Freire, 1973; Kieffer, 1984). Decision-making is defined as an individual's ability to navigate barriers and solve problems within a context (Zimmerman, 1992). Perceived control refers to an individual's "sense of control in personal and community decisions" (Paulhus, 1983). There are multiple theoretical approaches to understanding the concept of self-efficacy (Bandura, 1977; Ormrod, 1999; McAdam, 1986; Heider, 1958; Zimmerman, 1992). In

this study, I employ the definition of self-efficacy as a person's "perceived effectiveness of different actions to influence community decisions" (1992, p. 713). Zimmerman distinguishes between how much control a person perceives herself to have and how effective that individual perceives her control to be in relation to different decisions. Perception of difficulty is a psychological construct that accounts for an individual's view of how much effort will be required to overcome barriers to achieve goals. Motivation to control refers to a motivation to perform those actions that are perceived to be effective and within one's control (Zimmerman & Rappaport, 1988). While these empowerment variables are consistent with some aspects of individual capacity as it is discussed in the conservation literature, they do not encompass other important dimensions of PCBC.

Self-Determination

Meaning and self-determination are also important to an individual's will to conserve biodiversity. Thomas and Velthouse (1990) define meaning as the value of a work goal or purpose, judged in relation to an individual's own ideals or standards. They define self-determination as an individual's sense of having choice in initiating and regulating actions (Ibid). While Thomas and Velthouse (1990) do consider these two important elements as a part of psychological empowerment, they lack the depth of consideration Zimmerman (1995) gives to the other five intrapersonal variables associated with psychological empowerment and found to be important to PCBC.

A deeper understanding of constructs like self-determination, meaningful action, and group efficacy in this study can supplement the concept of psychological empowerment and help us examine a type of PCBC that is more likely to last over time in the context of both individualistic and collectivistic cultures. Functional Self-

Determination (fSDT) (Wehmeyer, 2005) offers a robust definition of self-determination and is unique among similar SDT theories in its relationship with psychological empowerment as defined by Zimmerman (1995). While other SDT theories do not consider psychological empowerment (DeCaro & Stokes, 2008), fSDT suggests that psychological empowerment (Zimmerman, 1995) along with self-realization, self-regulation, and autonomy are essential elements of an individual's capacity to continue action over time.

According to fSDT (Wehmeyer & Schwartz, 1997), self-realization is defined as acting in ways that are aligned with personal values. Self-regulation means making decisions about which skills to use in a situation and then formulating, enacting, and evaluating a plan of action with revisions if necessary. Autonomy is defined as acting according to personal "preferences, interests and/or abilities, and independently, free from undue external influence or interference" (Wehmeyer & Schwartz, 1997, p.246).

Meaningful Action

As discussed above, the Thomas and Velthouse (1990) theory suggested the importance of meaning in psychological empowerment. In that research, Thomas and Velthouse define meaning as the value of a work goal or purpose, judged in relation to an individual's own ideals or standards. The Kaplan (1990) conception of meaningful action is similar to Thomas and Velthouse (1990)'s construct of meaning in that it references the value of the work in comparison to individual ideals. The Kaplan (1990) definition of meaningful action takes the construct a step further by distinguishing how the value of the work is being considered in relation to the individual's own ideals. Kaplan (1990) distinguishes how meaningful action can be valuable to the individual by proposing the

importance of psychological variables such as perceived niche, perceived competence, and feeling needed. By this definition, an individual feels they have a perceived niche if they sense that their specific set of skills could potentially contribute to a larger context. An individual feels perceived competence if they think they are capable at applying their specific skill set.

An individual experiences feeling needed if they think other individuals deem the individual's applied skill set essential to the larger context (Kaplan, 1990). In the context of capacity building, perhaps a more appropriate term for 'feeling needed' by biodiversity conservation is 'being needed'. The difference between the two terms lies in the process by which the individual gathers information to support the thought that their skill set is essential to the cause. Being needed would indicate that the individual has experienced a situation or process associated with biodiversity conservation wherein the individual has received direct feedback that without their skill set, conservation would not be achieved or would not work as well. This type of feedback about an individual's skill set in the context of what is needed requires a two-way exchange of information between the individual and the situation at hand. Feeling needed does not necessitate an exchange of information and instead relies on the individual's own belief (which may or may not be based in direct feedback from relevant experience) that their skill set is needed. Research on clarity-based decision making suggests that the ('being needed') psychological variable that is informed by experience and direct feedback is more likely to motivate action than the ('feeling needed') psychological variable that relies on an individual's less-informed belief of how others feel about the usefulness of their skill set (Kaplan, 1991). If an action increases the individual's sense of perceived niche, perceived

competence, and feeling needed in relation to the individual's own ideals, Kaplan (1990) would define that action as meaningful.

Group Efficacy

Many of the theories and models reviewed above were developed for use within the individualistic cultures of the United States of America or Europe. Individualistic cultures are oriented around the self-- independent from, instead of identifying with, a group mentality (Rothwell, 2010). In collectivistic culture, the success of the larger group of people within which one individual is a member is perceived to be more important than the success of the individual member (Nisbett, 2003; Nisbett & Masuda, 2003; Chua, Boland, & Nisbett, 2005). Many international conservation organizations are interested in building regional capacity for biodiversity conservation in developing countries within Africa, South America, or Asia. Collectivistic culture is pervasive within these regions of the world (Platteau, 2000). It would follow then that a study of PCBC in collectivistic countries should also consider the individual's perception of group efficacy, or how the individual perceives the effectiveness of their group at performing a task (Staats & Harland, 1995).

Inherent in the construct of group efficacy is a focus on an individual's perception of the capability of their chosen group of individuals. The perceived effectiveness of this group is paramount to an individual's will to work toward conservation goals for many reasons. For example, it might seem illogical for one individual to expect themselves to be effective, competent, self-determined, and have a meaningful relationship with every action required in the complex mission of biodiversity conservation. This claim is supported by the importance of the variable of perceived niche in PCBC, discussed above

as an individual's sense that their specific set of skills could potentially contribute to a larger context (Kaplan, 1990).

Accordingly, it follows that an individual would be more willing to fill their perceived niche in the larger context of biodiversity conservation if that individual also felt confident in their group's ability to play compatible and necessary roles to move the group as a whole forward toward that mission. None of the other PCBC variables account for an individual's perception of the group from this critical perspective. I therefore propose that group efficacy is an essential component of the nuanced construct of PCBC.

Methodology

My goals were to create an instrument to measure PCBC and to identify effective capacity building training methods. As a first step, I tested the construct validity of my PCBC scale (Cronbach & Meehl, 1955). A necessary pre-condition for validity of any construct is reliability as determined by statistical tests of internal consistency (Hinkin, 1995; Nunnally, 1978). After establishing the internal consistency of the PCBC scale, I used the instrument to determine the effectiveness of the capacity building training methods employed in different case studies in East Africa and North America. The East African conservation professionals (see Participants section below) in my study attended one of three trainings that focused on different topics oriented to conservation biology: Geographical Information Systems (GIS), social science research methods, and program development. The North American conservation professionals attended one of two trainings on human wildlife conflict transformation. Table 3 below lists the specific methods that were employed in these trainings and Appendix A describes the content and structure of each training in detail.

Data Collection

Method: Pre/Post Survey

Training staff asked the conservation professionals in the training to take a paper or electronic-version of the PCBC instrument created to measure the variables in Table 1, participate in the 1-5 day training, and then take the paper or electronic-version of the survey again before leaving the training. Depending on which training the conservation professional attended, this process was conducted inside the training facility at the National University of Rwanda (Rwanda), National University of Burundi (Burundi), University of Dar es Salaam (Tanzania), Oakland Zoo in California (USA), or Whiterock Conservancy in Iowa (USA).

Survey Instrument

I developed a PCBC instrument that was inspired by survey items that have previously been found valid in peer-reviewed, psychometric studies. Survey instruments have been developed from both Zimmerman (1995) and Thomas and Velthouse (1990)'s theories of psychological empowerment and have been empirically tested for internal consistency as well as external validity (Akey, Marquis and Ross, 2000; Spreitzer, 1995a & 1995b).

Table 1
Authors of Definitions and Validated Scales Adapted to Measure PCBC variables

Psychological Variable	Author of Definition	Author of Scale
1. Knowledge	Zimmerman et al. (1992)	Akey, Marquis, and Ross (2000)
2. Understanding Causal Agents	Zimmerman et al. (1992)	Akey, Marquis, and Ross (2000)
3. Critical Awareness	Zimmerman et al. (1992)	Akey, Marquis, and Ross (2000)
4. Decision-making	Zimmerman et al. (1992)	Akey, Marquis, and Ross

		(2000)
5. Perceived Control	Zimmerman et al. (1992)	Akey, Marquis, and Ross (2000)
6. Self-efficacy	Zimmerman et al. (1992)	Spreitzer (1995a)
7. Motivation to Control	Zimmerman et al. (1992)	Akey, Marquis, and Ross (2000)
8. Perception of Difficulty	Zimmerman et al. (1992)	
9. Perceived Niche	Kaplan (1990)	
10. Feeling needed	Thomas & Velthouse (1990); Kaplan (1990)	
11. Self-Realization	Spreitzer (1995a)	Spreitzer (1995a)
12. Self-Regulation	Wehmeyer, Little, Sergeant, (2011)	
13. Autonomy	Wehmeyer, Little, Sergeant, (2011)	
14. Group Efficacy	Staats & Harland (1995)	

Note. Blanks spaces in the Author of Scale column indicate variables for which I developed survey items based on the definitions of these variables authored by the researchers

Table 1 references the past studies that have developed a definition for each variable of PCBC in a context outside of capacity building for biodiversity conservation and within populations consisting primarily of citizens of the United States of America. To measure PCBC effectively in this study, I developed all survey items to reflect the definition of that variable in the context of capacity for biodiversity conservation. Each survey asked conservation professionals to rate statements on a 5 point Likert scale where 1 (Not At All) meant I do not agree with this statement at all and 5 (Very Much) meant I strongly agree with the statement. The survey items I developed for knowledge, understanding causal agents, critical awareness, decision-making, perceived control, self-efficacy, motivation to control, and self-realization were inspired by survey items that have been used in the past to measure for psychological variables (Akey, Marquis, and Ross, 2000; Spreitzer, 1995a). The survey items I developed for perception of difficulty, perceived niche, feeling needed, group efficacy, self-regulation, and autonomy were

inspired by the definitions of these variables authored by the researchers in Author of Definition column in Table 1 (Zimmerman et al., 1992; Kaplan, 1990; Thomas & Velthouse, 1990; Spreitzer, 1995a; Wehmeyer, Little, Sergeant, 2011; Staats & Harland, 1995).

The Participants

I measured changes in PCBC across five different training groups. These five training groups included two study populations (East African & North American). Within these two populations, I investigated PCBC using two methods: a) pre-post survey using an instrument I created to measure variables described in Table 1 above, and b) interviews with trainers about which training methods they employed in each training.

East African Population

PCBC Instrument Validation

I tested the PCBC instrument in a population of East African conservation researchers and educators who were participating in a training in Butare, Rwanda, that was meant to increase their capacity to understand and apply Geographical Information Systems (GIS) in their conservation work. I included similar populations in this study who were participating in trainings to enhance their skills in Social Science Research Methods (SSRM) and Project Development (PD) skills in Bujumbura, Burundi, and Dar es Salaam, Tanzania, respectively. The majority of these conservation professionals were of African descent and lived in Tanzania, Burundi, Rwanda, Democratic Republic of Congo, or Kenya at the time of the training. All participants taught or conducted research for the Regional Network of Conservation Educators in the Albertine Rift (RNCEAR) at the time of the training, a member-driven organization that focuses on biodiversity

conservation in the Albertine Rift eco-region of East Africa. Information on the gender of the conservation professionals was not collected. Participation in these trainings was voluntary and travel expenses for each of the conservation professionals to the training were covered by RNCEAR.

Training Method Effectiveness

I tested the initial effect of different training methods on the PCBC construct in the aforementioned population of East African conservation professionals who were attending a capacity building training. To determine which methods were used in each training, I conducted semi-structured interviews with three trainers separately. The interviews were conducted between 1-2 years after the training and were supplemented by a copy of the trainers' lesson plans that they created in preparation for the training. All interviews were conducted via Skype. The GIS trainer was of African descent, was born and raised in Rwanda, and lived in the United States of America at the time of the training. The SSRM and PD trainers were born, raised, and living in the United States of America at the time of the training.

North American Population

Instrument Validation

I also tested the PCBC instrument in a population of nineteen North American conservation researchers and professionals who were participating in trainings meant to increase their capacity to understand and transform human wildlife conflict in their conservation work in California and Iowa, USA, respectively. The majority of these conservation professionals lived in the United States of America or Canada at the time of the training. They all worked for local, national, or international organizations that

focused on biodiversity conservation. Information on the gender of the conservation professionals was not collected.

Training Method Effectiveness

I tested the initial effect of different training methods on the PCBC construct in a population of North American conservation professionals. To determine which methods were used in these trainings, I conducted a semi-structured interview with the one trainer who conducted both trainings. The trainer was born, raised, and living in the United States of America at the time of the training. The interviews were conducted between 1-2 years after the training and were supplemented by a copy of the trainers' lesson plans that they created in preparation for the training. All interviews were conducted via Skype.

A detailed description of the trainings can be found in Appendix A. All conservation professionals had earned or were pursuing Bachelors, Masters, or PhD degrees in wildlife conservation, ecology, zoology or related topics. Conservation professionals were included in these studies if they attended one of the trainings and completed the pre and post-training PCBC survey. As explained in the first paragraph of the Method: Pre/Post Survey section above, training staff asked the conservation professionals in the training to take a paper or electronic-version of the PCBC instrument created to measure the variables in Table 1, participate in the 1-5 day training, and then take the paper or electronic-version of the survey again before leaving the training. Each survey took approximately 13 minutes to complete. The response rate was 85% for the paper surveys and 80% for the electronic surveys.

Analysis

The conservation professionals' data were analyzed in two stages. First, the survey results from the populations described above were analyzed using exploratory factor analysis (EFA) in order to identify discrete categories within the larger data set. I chose to conduct EFA due to my inclusion of pre-qualified survey items in the PCBC measurement and the limited number of conservation professionals able to participate in this study (Hinkin, 1995). The EFA is recommended for studies of under 200 participants (Germain, 2006) and helps to determine how to categorize the groups of variables. In this first stage of analysis, categories were identified using principal component analysis with varimax rotation and listwise deletion of missing data. The criteria used for inclusion of items in a factor category were loadings greater than .45 in a category, or no dual loadings of greater than .45 in two or more categories. Factors were required to have eigenvalues of greater than 1.0. The output of the factor analysis program was used to identify highly coherent and stable categories. In order to enhance internal validity, categories were required to have a Cronbach's coefficient of internal consistency, alpha (Cronbach, 1951; Nunnally, 1978), of at least .6. Scales were then constructed using a respondent's average rating of the items that formed the category. Together, EFA and Cronbach's coefficient alpha tests provided a complete and unified system to assess the reliability of the pre-qualified survey items adapted in the PCBC measurement into the new context of biodiversity conservation (Dillon, 1984).

Data from the interviews clarified which methods trainers used in their trainings. Once this information was established, the effect of those training methods was tested on the PCBC categories that were shown to be valid and reliable in the survey portion of this

analysis. Interviews were semi structured. Then, I determined the effect of each training on each PCBC dimension with a sign test of the mean pre and post-training PCBC scores. The sign test is a statistical method to test for consistent differences between two pairs of observations, such as the conservation professionals' pre and post-training scores on the PCBC instrument (Baguley, 2012). Given pairs of mean scores for each training, the sign test determines if one score (such as the mean pre-training PCBC score) was generally greater than or less than the other score (mean post-training PCBC score). I calculated the z-score of this result to test the significance of the difference found between the trainings' mean pre-training score and the mean post-training score on each dimension of PCBC. The z-score helps to identify how many standard deviations above or below the mean the difference between pre and post test scores is for each PCBC dimension. Positive z-scores mean the value is more than the average while negative z-scores mean the value is less than the average. To establish the probability of obtaining the determined z-score by chance, I calculated the p-value of each z-score. If the z-score was bigger than 2, then the probability of that score occurring by chance was less than 5% ($p < .05$). If the z-score was bigger than 3, the probability of that score occurring by chance was less than 1% ($p < .01$). If the z-score was bigger than 4, the probability of that score occurring by chance was less than .1% ($p < .001$). The less the probability of the z-score occurring by chance, the higher the probability that the training methods directly caused the PCBC effect in conservation professionals.

Results

Identifying the dimensions of PCBC

I created 44 items related to a conservation professionals' capacity to apply new skill to the mission of conservation by adapting the definitions and scales outlined in Table 1. The exploratory factor analysis (EFA) of these 44 items resulted in three categories of capacity with Cronbach's alpha of internal consistency above .7, which suggests coherent and stable categories (Table 2). Studies with the East African conservation professionals identified two more categories of capacity with Cronbach's alpha of internal consistency ranging from .644 to .65. This suggests that these categories, although less coherent and stable than the three described above, are worth noting for further investigation, especially since they were highly rated by East African conservation professionals. Ten survey items did not meet the selection criteria for categories and were eliminated from further analysis. I created category names by interpreting the meaning of the first two items in each respective category. I interpreted the combined meaning of all the items in each category to create the category definition. The results are presented in Table 2 and are reviewed below, category by category.

Table 2. *Categorical Results from the Exploratory Factor Analysis (EFA) of Psychological Capacity for Biodiversity Conservation* (PCBC)

Categories of capacity and survey items included	E. African 2013-2014 *N=71*	N. American 2013 *N=19*
Mean	4.18	4.36
Alpha	.817	.84
Meaningful ownership		
I have control over how this skill is used in my conservation work	●	●
I feel motivated to use this skill in my conservation work	●	●
When I apply it in my conservation work, I feel in control of the use of the skill	●	●
Applying this skill helps add personal meaning to my conservation work	●	
Using this skill helps me to shape my conservation work into a meaningful part of my life	●	
I feel that my ability to use this knowledge to solve problems is a needed skill in my work place	●	○

I know what I need to apply this skill to my conservation work	●	○
Without the ability to apply this skill, conservation work would have less meaning for me	●	
I have confidence in my ability to effectively use this skill in conservation work	●	○
Regardless of what other people do, I have control over how this issue is addressed in my work	○	●
I can fill a specific niche in the effort to address this issue in the context of conservation	○	●
Mean	3.78	4.24
Alpha	.745	.713
Efficacy		
I am effective at overcoming most difficulties with using this skill in the context of conservation	●	●
My decision-making skill with this topic is good enough to apply it to my conservation work	●	
I am able to apply this skill in the ways that I feel are appropriate in the context of conservation	●	
I know how to access information about this topic	●	
I can fill a specific role in the effort to apply this skill in conservation	●	○
Using this skill in the context of conservation is not very difficult for me at this time	●	○
I feel that my efforts to apply this skill to conservation are needed	○	●
I know I can effectively apply this skill to my conservation work	○	●
Mean	3.28	4.61
Alpha	.744	.54
Being Needed		
People tell me that my skills in this area would make a real difference in solving their problems	●	○
I get direct feedback from my community that my skills in this area are needed	●	
I have control over what happens when addressing this issue in my conservation work	●	○
I want to apply this skill to conservation issues	○	●
This is a practice I am excited to apply in my conservation work	○	●
Without my efforts to address this issue, the problem will probably continue or get worse	○	●
Mean	4.19	
Alpha	.65	
Group Effectiveness		
As a group, my collaborators and I are able to effectively apply this skill to conservation	●	
I am aware of the politically sensitive aspects of applying this skill in conservation	●	
To effectively use this skill, I need to also consider the ethical context of the situation	●	
I am able to solve problems with my current understanding of this topic	●	
I am excited to apply this skill in my conservation work	●	
Mean	4.18	
Alpha	.644	
Understanding		
Applying this skill helps me work toward conservation goals	●	
I want to use this skill in my work	●	
My current knowledge of this topic is high enough to achieve my goals in conservation	●	
When necessary, I am able to revise a flawed application of this skill	●	

Note. Closed circles (●) in Table 2 indicate items that loaded in the factor analysis; Open circles (○) indicate items included on the survey instrument but not meeting inclusion criteria. Blanks indicate items not included on the survey instrument.

Meaningful ownership

- Meaningful ownership was the highest rated category (E. African mean = 4.18; N. American mean = 4.36) and consisted of eleven items relating to the feeling of

being in control and motivated to apply skills toward conservation goals (nine items loaded in the East African population; five items loaded in the N. American population) (Table 2).

- East African conservation professionals felt meaningful ownership when control and motivation to apply the skills was associated with a feeling that their work was personally and professionally meaningful.
- North American conservation professionals felt meaningful ownership when their control and motivation was associated with a belief that there was a place for their work in the global mission of conservation.
- Notably, the North American and East African populations differ remarkably on what type of meaning makes ownership motivating to them. This is a part of a key finding that I will discuss later in the conclusion section.

Efficacy

- Efficacy was the second highest rated category (E. African mean = 3.78; N. American mean = 4.24) and consisted of eight items relating to the feeling of being personally effective at applying new skills to conservation goals (six items loaded in the East African population; three items loaded in the North American population) (Table 2).
- East African conservation professionals felt effective when they could apply their new skills autonomously and make decisions while filling a specific role in the mission toward conservation.
- North American conservation professionals felt effective when they also felt needed in the global mission of conservation.

- It is clear here that there are remarkable differences between the North American and East African populations in respect to why each population felt most effective. This is a part of a key finding that I will discuss later in the conclusion section.

Being Needed

- Being needed was the third highest rated category for the East African population (Table 2; mean = 3.28) and consisted of three items relating to the feeling of their work being needed by their community members.
- While items in this category did not meet inclusion criteria for the North American population (alpha =.54), the differences between the North American and East African populations are remarkable here in respect to what type of need each population found most motivating. This is a part of a key finding that I will discuss later in the conclusion section.

Group Effectiveness

- Group effectiveness (Table 2; mean = 4.19) was one of the categories identified in the East African population with a lower but still remarkable Cronbach's alpha of internal consistency (065).
- This category consisting of five items related to the feeling that the group is effective as a whole and critically aware of the political and ethical aspects of applying new skills in the context of conservation.
- Items in this category were not tested in the North American population.

Understanding

- The final category, understanding (Table 2; mean = 4.2, alpha = .64), was found to be less coherent than the first four categories but still remarkable in the East African population.
- Understanding consisted of four items related to knowledge, understanding, and being able to identify and revise a mistake in the application of a new skill.
- Items in this category were not tested in the North American population.

These results show a notable difference between the North American and East African populations regarding their orientation to the meaningful ownership, efficacy, and being needed dimensions of PCBC. The different orientations to these dimensions seem to suggest that North American conservation professionals are most motivated by applying their skills to a global conservation mission while East African conservation professionals are most motivated by work that increases their ability to make autonomous decisions in a conservation mission that is aligned with a personal, professional, or community goal.

Training Method Effect

Each training had a statistically significant effect on almost all the identified PCBC dimensions, with different trainings having stronger impact on different dimensions (Table 3). I identified which training methods had the most significant impact of each PCBC dimension by first calculating which training most significantly increased which PCBC dimension. Once a specific training was found to significantly increase a specific PCBC dimension, I compared the methods used in that training to those used in the other trainings, highlighting the training methods that were unique to the training that

had the most significant impact on the PCBC dimension of interest. This analysis suggests that methods unique to the most impactful training were critical to its impact. A set of 1-3 training methods resulted from this analysis that I recommend capacity builders use to increase each PCBC dimension. The results are reviewed below, category by category. In the following analysis, p-values less than or equal to .05 were accepted.

Meaningful ownership

All trainings in this study succeeded at significantly increasing the meaningful ownership dimension of PCBC (Table 3). Of these, the program development training (PD) had the greatest positive effect on meaningful ownership (z-score = 6.61) in the East African population. One out of the four training methods employed by the PD trainer was not used by any other trainers in this study: asking conservation professionals to bring in their projects or proposals to which they could directly apply the new skill during class. This would suggest that the conservation professionals felt the most ownership over their new skills when they applied those skills directly to their own work in the training.

The human wildlife conflict collaboration (HWCT) was the only type of training with North American conservation professionals. Therefore, the HWCT training methods were the only methods to be tested on the North American population and it is not possible to statistically compare them to any of the other training methods or populations in this study. Descriptively, however, it may be helpful to identify the HWCT training methods that were most similar to the method that had the most significant impact on meaningful ownership in East African and then discuss how they might have affected the North American definition of meaningful ownership. Asking conservation professionals to write a case analysis of an issue related to the new skill in their work and the

experiential method wherein participants played specific roles in a global conflict issue (role play) are both HWCT training methods that ask the conservation professional to apply their new skill directly to their own work in class, a characteristic that was central to significantly increasing meaningful ownership in East African. The role-play is more likely the critical method that increased meaningful ownership in North American because it literally asked conservation professionals to use the new skill to play a role in the global mission of conservation, a characteristic that is distinct to the definition of meaningful ownership found in the North American study.

These findings support the definition of meaningful ownership as a feeling of control and motivation. They also support the finding that this control and motivation is associated with the feeling that the work is personally and professionally meaningful in the East African population and with a feeling of having a role to play in the global mission of conservation in the North American population.

Efficacy

As with meaningful ownership, all trainings in this study succeeded at significantly increasing the efficacy of their participants (Table 3). Of these trainings, the social science research methods training (SSRM) had the greatest positive effect on efficacy (z-score = 10.49). From these results, a main finding was that the conservation professionals in the training were making autonomous decisions regarding how to apply social science research methods to conservation based on their own personal knowledge of the region's ethical and political context, a role in the mission of East African conservation that could not be as easily filled by an outside expert. Of the ten distinct

methods employed by the SSRM trainer, three were employed in the SSRM training that were not used in any of the other trainings within the study of the East African

Table 3. *Significance of training effect on each PCBC dimension*

Training Focus and Methods Employed	Significance of Effect	Meaningful ownership	Efficacy	Being Needed	Group Effectiveness	Understanding
Geographical Information Systems (GIS) A) Sent pre-training email to ask what they expect from training, send CV, etc. B) Expert PowerPoint presentation C) Expert Demonstration D) Large class Q&A, discussion F) Small group practical work with provided data H) Individual hands-on exercise	*Z-score*	2.94	10.02	.62	4.16	6.92
Social Science Research Methods Training B) Expert PowerPoint presentation D) Large class Q&A, discussion F) Small group practical work with provided data I) Class discussion of ethical/political context of applying skill in conservation J) Think, pair, share re: application to own work L) Participant-led large class discussion of participant case study M) Reflexive curriculum design…noted what participants wanted to know more about half way through the training and changed remaining curriculum accordingly N) Asked participants with experience in topic to share contact information with class P) Participants asked for the training topic T) Materials/templates provided during training	*Z-score*	4.97	10.49	3.46	9.45	4.46
Project Development Training F) Small group practical work with provided data O) Asked participants to bring in their projects or proposals to which they could directly apply skill P) Participants asked for the training topic T) Materials/templates provided during training	*Z-score*	6.61	5.28	3.68	4.22	4.46
Human Wildlife Conflict Transformation D) Large class Q&A, discussion F) Small group practical work with provided data J) Think, pair, share re: application to own work L) Participant-led large class discussion of participant case study U) Reading material given at least 2 weeks in advance W) Case analysis- 1-2 page about the specific outline of related issue in their work Y) Neutral case analysis AB) Neutral case role play AE) Participant case role play AF) Equalizing icebreaker AG) Empowerment icebreaker AH) Collective wisdom exercise AJ) Flip Chart to record class discussion feedback	*Z-score*	5.89	8.81	1.83		

population: a class discussion focused on the ethical and political context of applying their new skills in conservation, reflexive curriculum design, and asking conservation professionals with experience in the training topic to share contact information with the class so that fellow classmates could follow-up with them if they had post-training questions. Since they were unique to the training that most significantly increased efficacy, it seems logical to at least one of these three methods played a critical role in increasing East African's sense of efficacy. The class discussion focused on the ethical and political awareness and social science research methods ethical standards. This conversation was mostly participant-led and focused on how the conservation professionals navigated the intricacies of the political and ethical boundaries of conducting conservation research in East African communities.

Another method unique to SSRM was its reflexive curriculum design. This was created by the trainer asking the participants approximately half way through the training to anonymously tell the trainer what they want to know more about on the training topic; changes were made to the curriculum for the remaining time of the training accordingly. To do this during the three-day SSRM training, I literally asked the conservation professionals in class to write down one thing they liked and one thing they wished to change about the training on a piece of paper without their name on it at lunch on the second day of the training. That evening, I worked with my co-instructor to redesign our last day of training to cover more information regarding a topic that the majority of the conservation professionals had asked to know more about—a topic that we had been briefly discussed during the first day of the training. This method may have increased East African's efficacy as it related to autonomous decision-making and their role in the

global mission of conservation because it offered them a direct opportunity to autonomously ask for more information on exactly what it was that still confused or eluded them on the topic. By doing this, they were able to effectively fine-tune their ability to apply the topic and increase their feeling of efficacy around that application.

Asking conservation professionals with experience in the training topic to share contact information with the class was the third method that I employed in this training that was not employed in other trainings. This method will be discussed thoroughly in the section below that describes why the SSRM training most likely had the most significant positive effect on feelings of group effectiveness.

There was one HWCT training method that was similar in process to a method used in the SSRM training that had the greatest impact in East African, and that was participant-led, large class discussion of their own case study. It is similar because both asked the conservation professionals who were taking the training to lead a class discussion regarding how the they used their new skill to strengthen their personal contribution to a complex conservation issue. Leading this type of class discussion may have offered the North American conservation professionals an opportunity to contemplate how their effectiveness was connected to the need for their application of this skill in the global mission of conservation, a characteristic that was central to the North American definition of efficacy.

These findings support the definition of efficacy in the context of PCBC as a feeling of being personally effective at applying new skills to conservation goals. Efficacy is associated with autonomy, decision-making, and a sense of filling a specific role in the mission toward conservation in populations similar to East African and with a

feeling of being needed in the global mission of conservation in North American. These findings suggest that two specific training methods will be most successful at increasing this dimension of PCBC in groups similar to East African. One method is fostering a class discussion regarding the topic in a way that encourages participants to share insights from their own experience of making autonomous decisions about the application based on their own unique understanding of the context. The second method is designing reflexive curriculum as it is explained in the SSRM training described above.

Being Needed

Only two of the four trainings that were studied succeeded at significantly increasing the being needed dimension of PCBC (Table 3). The program development training (PD) had the greatest positive effect on being needed (z-score = 3.86), followed by the social science research methods training (z-score = 3.46). Since being needed seemed to be the hardest PCBC dimension to significantly increase, it is helpful to look at the training methods commonly employed between the two trainings that did significantly increase it. There were two methods explicitly mentioned by both the PD and SSRM trainers that were not indicated in the other two trainings: explicitly asking the conservation professionals to choose the topic of the training and providing materials/templates to conservation professionals during the training. This would suggest that being needed is best fostered at a training that is developed based on the conservation professionals overtly choosing the training topic or which offers materials and templates to the conservation professionals during the training. The definition for this PCBC dimension states that being needed is specifically associated with getting direct feedback

from their community that the conservation professionals' skills in the area would make a real difference in solving the community's problems.

These are interesting findings in that they contradict a common assumption of most trainers. We assume that if the conservation professionals are voluntarily present at the training, they are at least implicitly choosing to be taught the topic. Furthermore, the PD, SSRM, and GIS trainings were all offered based on the results of a 2012 and 2014 survey to RNCEAR members asking for preferred training topics. What was it about the way the conservation professionals were asked to choose the topic for the SSRM and PD trainings that made them feel that the skill they were learning was needed by their community in a way that was not evoked in the GIS participants? Follow-up interviews with RNCEAR trainers revealed an interesting finding about the type of choice that seems to increase PCBC's being needed dimension.

RNCEAR staff explained that some training topics were chosen more explicitly than others. For instance, GIS and SSRM were pre-written on the RNCEAR member survey as potential training topics from which members could choose. GIS was pre-written on the survey as a topic choice because RNCEAR trainers had this expertise to offer and staff believed that many RNCEAR members needed this skill. SSRM was offered as a pre-written choice on the survey because RNCEAR staff identified it as a need based on the sub-par use of these methods in recent RNCEAR member-created proposals. PD was a topic that was overtly written in the "other" box on the survey by the survey respondents themselves. Of the three training topics taught, it seems that PD was the most explicitly chosen training topic because members were required to think about what aspect of their capacity needed to be built and then write it on the survey in the form

of a training topic that they wanted RNCEAR to offer. The materials that were handed out in both the PD and SSRM trainings had very little in common and it is not clear how this aspect of the trainings could have increased the conservation professionals feeling that their application of the training topic was needed in the community.

Group Effectiveness

All trainings in this study that tested for group effectiveness succeeded at significantly increasing this dimension of PCBC. Of these, the SSRM training had the greatest positive effect on group effectiveness (Table 3; z-score = 9.45, $p < .001$). As mentioned in the discussion of efficacy above, two of the three training methods employed in the SSRM training that were not used in any of the other trainings in the East African population were a class discussion focused on the ethical and political context of applying their new skills in conservation and asking conservation professionals with experience in the training topic to share contact information with the class. While the process by which conservation professionals engaged in this class discussion was described in the section above as playing a central role in its support of efficacy, it is the topic of the discussion itself that is the clearest indicator of why it was the only method to significantly increase the group effectiveness dimension of PCBC.

The very essence of this aspect of capacity is feeling that your group is effective as a whole and critically aware of the political and ethical context within which the skill is being applied. As described in the efficacy section above, the in-class discussion was led by the training participants themselves who enthusiastically shared how they understood and navigated the ethical and political milieu of applying social science research methods in specific regions of East Africa. While the information shared was

based on individual experiences, it became clear that together these insights led to a group feeling that as a whole they were critically aware of how to apply this skill effectively in the complex and diverse context of East African communities.

Identifying and sharing the contact information of classmates who were willing and able to offer expertise that the group could use to help apply the new skill was a method that I employed as a reaction to a reality that became clear to me during small group discussions throughout the course. Two of the over forty conservation professionals in the course had extensive experience with one of the research methods I was teaching to the class. Announcing this observation to the class and asking those two conservation professionals to share their contact information with their fellow conservation professionals was an attempt to increase the conservation professionals' feeling that by using their classmates as a resource, the conservation professionals would be stronger at applying their new skills. It was meant to reinforce the feeling that seemed to come naturally out of the ethical and political awareness discussion on the last day: that their effectiveness as a whole was less connected to the information I offered and more dependent on the invaluable information their group members had to share.

These findings would suggest that the conservation professionals' feeling that their group was effective as a whole and critically aware of the context within which the skill is to be applied was critical to increasing their sense of group effectiveness. This finding supports the definition of group effectiveness proposed in this study and suggests that the training methods that will be most successful at increasing this dimension of PCBC are those that create the opportunity for conservation professionals to, a) feel effective and critically aware of the applied context of the skill as a whole, and b) identify

those within their group who have helpful expertise to share regarding the topic. Inviting groups of co-workers to attend the training together who already have experience working as a team in a complex context and then intentionally identifying classmates that may offer expertise that the group could use may provide opportunity for these types of methods to be effective at increasing group effectiveness.

Understanding

Three of the four trainings in this study succeeded at significantly increasing the applied knowledge dimension of PCBC. Of these, the Geographical Information Systems training (GIS) had the greatest positive effect on applied knowledge (Table 3; z-score = 6.92, $p < .001$). The GIS trainer employed three specific methods that were not used in any of the other trainings. He asked the conservation professionals to send their resume and clarify their learning objectives before the training, providing an in-class expert demonstration of how to apply the skill, and assigning an individual hands-on exercise after the demonstration. These three methods combined offer an example of instructional scaffolding, an educational method that is aimed at enabling a student to internalize information and become a self-regulated, independent learner through a gradual shedding of outside assistance (Wood, Bruner, & Ross, 1976). In order for instructional scaffolding to succeed, a trainer must begin by understanding the learner's current level of development. These findings suggest that training methods will be most successful at increasing this dimension of PCBC if they are intentionally combined to create development-level appropriate instructional scaffolding.

Discussion

This research produced three key findings: 1) Meaningful ownership, efficacy, and being needed are three dimensions of psychological capacity for biodiversity conservation (PCBC) that were found to be universal across the North American and East African conservation professionals in my study; 2) The North American and East African populations in my study varied in how they were motivated by these universal PCBC dimensions; and 3) Specific training methods were found to significantly increased each dimension of PCBC. Below, I first expound upon on the first two key findings and then discuss the details of the third key finding as it fits into the practical application of this research later in the conclusion.

The results on meaningful ownership show that both North Americans and East Africans need to feel that their ownership over a conservation project is meaningful for them to feel motivated to work on that project. This is evidence that meaningful ownership is a universal dimension of PCBC. My second key finding is supported by results such as North Americans feeling most motivated by ownership of their conservation work if that ownership is meaningful to a global conservation initiative, while the East African population is most motivated by ownership that is meaningful to them personally or professionally. Acknowledging this difference helps us to better understand the difficulty North Americans may have if they try to motivate East Africans to apply their skills to conserve biodiversity for reasons that would motivate North Americans to do so, and vice versa. To avoid such difficulty, my findings suggest that resources will be most effectively used to increase meaningful ownership in East African professionals by emphasizing the importance of applying conservation skills to the

personal and professional goals of the individuals being trained. I recommend that organizations emphasize the importance of the application of skill to a global conservation mission to increase the meaningful ownership in North American professionals.

Efficacy was found to be comprised of aspects of self-efficacy combined with being needed in a global conservation mission for the North American population and self-efficacy combined with autonomy, decision-making, and perceived niche in the East African population in this study. Perhaps because it is so well researched in the psychological literature (Bandura, 1977; Ormrod, 1999; McAdam, 1986; Heider, 1958; Zimmerman, 1992), self-efficacy is often identified as important in conservation projects. In most of the conservation literature, self-efficacy is defined by studies conducted on predominantly North American and European populations participants. Similarity in population studied may explain why Zimmerman's 1992 definition of self-efficacy as a person's "perceived effectiveness of different actions to influence community decisions" (p. 713) is most reminiscent of this study's North American definition of efficacy in that both highlight the need for the individual's effectiveness to be meaningful in a larger context (in the community in Zimmerman's context, or the global mission in the context of PCBC).

The East African population's efficacy was also associated with meaningfulness in a larger context (perceived niche), but this insight alone does not describe the majority of the nuance associated with efficacy as defined in the East African population studied. My findings suggest that respecting these important differences will help avoid wasting resources with attempting to foster the type of efficacy that is associated with North

American capacity for conservation within East African populations, or vice versa. Instead, I recommend increasing efficacy by employing training methods that create the opportunity for East African professionals to make or discuss making autonomous decisions regarding conservation. I recommend that methods for training North American professionals emphasize how their effectiveness is needed in a global conservation mission.

Population differences were not specifically considered for the being needed, group effectiveness, or understanding dimensions of PCBC because survey items for these dimensions did not meet inclusion criteria for the North American population studied. Therefore, all nuances discussed from here on relate solely to the East African population studied. The PCBC's being needed dimension is similar to Kaplan's (1990) definition of the feeling of being needed, which he combined with perceived competence and perceived niche in his conceptualization of meaningful action. In the context of PCBC however, being needed is separate from the professional perceiving their own competency at applying the new skill or that there is a niche for their application of that skill in a global mission. Instead, as a dimension of PCBC 'being needed' is characterized by the feeling that the application of the new skill would make a real difference in solving peoples' problems within the professional's own community and that the professional has control over how to apply those skills in that context.

While a professional feeling that their community needs their skills is most certainly meaningful to the professional and in this dimension that feeling is associated with control, this type of meaningful control is distinctly different from the type that is defined by PCBC's meaningful ownership dimension. The PCBC's being needed dimension

describes control that is deemed important by the professional's community while meaningful ownership describes control that is deemed to be either personally or professionally important by the professional. The value of this nuance becomes clear when selecting training methods to increase each of these dimensions. As mentioned above, this study suggests that asking professionals to apply the new skill to a personally or professionally meaningful project during training will most likely increase PCBC's meaningful ownership dimension. Conversely, if you are working to increase the PCBC's being needed dimension, it is recommended that you begin by ensuring that the skill you are teaching is one that the professionals feel is distinctly needed by their community.

While slightly less coherent and stable, group effectiveness and understanding were dimensions of PCBC that were rated highly by East African conservation professionals in this study. Group effectiveness pairs the concept of group efficacy (Staats & Harland, 1995) with critical awareness in the context of PCBC (Freire, 1973; Kieffer, 1984). While these two variables were considered separately in the literature reviewed above, my findings show that they are inherently linked in the context of PCBC. This dimension of PCBC is defined by a professional feeling that their group is effective as a whole and that as a part of that group, the professional is critically aware of the political and ethical aspects of applying new skills in the context of conservation. Perhaps this specific type of awareness can only be built when a group of people effectively discuss and plan to solve complex issues together in the context of conservation. Study findings suggest that opening space for training participants to critically discuss how to combine their unique perspectives to create a group solution to a problem in the complex context of conservation and share classmate contact information to further facilitate post-training

collaboration will help increase group effectiveness in the East African population studied. While awareness and understanding have been linked in previous studies, this study finds that the group effectiveness dimension is separate from the understanding dimension of PCBC as it is defined below.

Like group effectiveness, understanding in the context of PCBC is defined by variables that were considered separately in previous studies. In the psychological literature, knowledge (McCarthy & Zald, 1977) and understanding of causal agents (Sue & Zane, 1980) have been combined as important components of Zimmerman's psychological empowerment (1992). My findings suggest these variables are combined with fSDT's self-regulation (Wehmeyer, 2005) to define the type of understanding important in the context of PCBC. This study's findings suggest that self-regulation is an important piece of understanding because this dimension of PCBC significantly increased the most with training methods that were designed and sequenced to enable the participant to internalize information and become a self-regulated, independent learner through a gradual shedding of outside assistance.

The first two key findings from my research [that 1) meaningful ownership, efficacy, and being needed are three dimensions of psychological capacity for biodiversity conservation (PCBC) that were found to be universal across the North American and East African conservation professionals in my study; and that 2) the North American and East African populations in my study varied in how they were motivated by these universal PCBC dimensions] support an exciting proposition that different populations have variable orientations to dominant PCBC dimensions. For instance, while my research suggests that both populations feel motivated by ownership, the reason each population

finds ownership of specific tasks meaningful dictates the degree to which they are motivated. This result contributes to the literature on capacity development for conservation and informs a deeper understanding of the concept of capacity in the context of conservation.

At the individual level, this idea mirrors classic psychological studies that have shown that there are universal truths about what guides human behavior. Kluckhohn (1951) suggested that it is most helpful to view human behavior in general as guided by a set of dominant values shared across cultures that shape the way people see the world. Human behavior varies according to how people are oriented around those dominant values. Kluckhohn & Stodtbeck (1961) made strides toward a comprehensive understanding of this phenomenon when they created the values orientation theory. This theory posits that a set of five universal categories of values exists in every human population and that these categories include time, activity, relations, person-nature, and human nature. Extensive research on these dominant value categories confirms their existence across the world and suggests that human behavior varies according to the particular cultural orientation of an individual (Rokeach, 1979; Hofstede, 1980; Schwartz, 1992). The studies on values orientation contribute a deeper understanding of individual similarities and differences found across cultures, which in turn informs how institutions approach cross-cultural discussions and negotiations.

Similarly, the results about individual PCBC from this study inform a more comprehensive understanding of how to build institutional capacity for biodiversity conservation. The findings from this study about the importance of autonomous efficacy and community need in an East African population support the proposition that

institutional capacity for biodiversity conservation in East Africa can be developed most effectively when it originates from the region where capacity is being built. In a review of the literature on the dimensions of capacity for biodiversity conservation (Cranston, in prep), I highlight that while most literature suggests personnel, funding, educational materials, and conflict mediation resources are important to institutional capacity for conservation, some researchers remain silent on the importance of these aspects originating from the region where the capacity is being built (Mengers, 2000; Raik, Decker and Siemer, 2003; Ta'I, 2000; Troja, 2000). My findings on East African PCBC fill this gap in understanding and suggest that researchers should be more precise in their recommendations for East African capacity building strategy. Specifically, my research supports strategy recommendations that ensure all aspects of institutional capacity are explicitly asked for by the community and autonomously decided upon by local conservation professionals in East African communities.

This recommendation as well as the suggestion that ownership is most motivating when it is personally or professionally meaningful corroborates early research on the importance of self-interest in motivating human behavior. Empirical evidence from these earlier studies showed that personal interest is necessary to motivate action toward a goal (Snyder & Omoto, 1992; Perloff, 1987; Green & Cowden, 1992), and more specifically, that the concept of altruism (the drive to behave in selfless ways for the well-being of others) has not been shown to be correlated with long-term conservation behavior (De Young, 1996).

While it seems most apparent in the East African population in my study, self-interest may indeed play a less explicit role in the North Americans' motivation to do work that

supports global conservation. For instance, if the majority of the North American population in my study were employed by organizations with global conservation missions, then their work toward a global mission would also be considered a part of their job description. If this is the case, the North Americans in my study may have been motivated by ownership of this work because it is professionally meaningful to them, making their motivation for ownership more similar to the East African orientation in my study. Furthermore, unlike Africa, North America is one of a few continents whose people have traditionally led the charge on global conservation initiatives (Wilshusen et al., 2003). This may support the belief that global conservation continues to be partially guided by the decisions of North American conservation professionals. If the North Americans in my study held this belief, it is easier to see how self-interest may motivate their action toward global conservation. If they believe they are in the driver's seat of global conservation, they may also believe that they are able to guide this mission in ways that ensure their continent's (and thereby, their own) wellbeing. Further research into the employment details and beliefs of these individuals is necessary to confirm these specific connections to self-interest in the North American population.

I recommend that the most effective capacity development planning processes are those in which capacity builders consider stakeholders' interest, needs, and decisions. This recommendation begs the question—what are the most effective processes and tools to plan a multi-cultural capacity building project? On this topic, an application of my research may help capacity builders prepare for diverse planning sessions. As a planning tool, capacity builders can use the PCBC instrument in a way that is similar to how community leaders employ the values orientation theory (Kluckhohn & Stodtbeck, 1961)

to increase the success of cross-cultural negotiations. For instance, Russo (1992) and Russo & Hills (1984) have used value orientation theory to work with Native American tribes in North America over decades to develop measurements that help determine preferred value orientation within tribal groups as well as the orientation of groups of people outside of their tribe with whom they negotiate land, trade, taxes, and transport. The foreknowledge that negotiating parties get of their own and each others' value orientation has resulted in many "successful and harmonious relationships" between trading partners over the years (Hills, 2002, p. 7). Similarly, if capacity development stakeholders were to take the PCBC measurement and share their results with each other ahead of any strategy meeting, all parties would begin the meeting with a deeper understanding of what is meaningful, effective, and needed according to themselves and their fellow stakeholders, increasing the chances of developing a more effective and efficient strategy.

After all stakeholders agree upon capacity building strategies, the PCBC instrument could also be used as an evaluative tool to test the effectiveness of different methods. If training is a component of capacity building plans, my third key finding regarding which specific training methods significantly increased each dimension of PCBC can inform curriculum development. I list the details of this key finding below, organized by PCBD dimension, study population and training method that had greatest impact.

Meaningful Ownership (MO)

East African conservation professionals' MO saw the greatest increase after a training when they were asked to apply their new skill to a personally or professionally meaningful project during training. North American conservation professionals MO saw

the greatest increase after a training that asked them to use the new skill to practice playing a specific role in the global conservation.

Efficacy

East African conservation professionals' efficacy saw the greatest increase after a training where they were: 1) Encouraged to practice or discuss making autonomous decisions regarding the application of the skill based on their own unique understanding of the context, and 2) Offered a direct opportunity to autonomously ask for more in-training information on a topic. North American conservation professionals efficacy saw the greatest increase after a training where they were asked to lead a class discussion of how their application of the new skill would help meet a need in global conservation.

Being Needed (BN)

East African conservation professionals' s BN saw the greatest increase after a training that focused on subject matter that had been explicitly requested by their community. North American conservation professionals' s BN saw the greatest increase after training where they were coached to see a need for their work in a global conservation mission.

Group Effectiveness (GE)

East African conservation professionals' s GE saw the greatest increase after a training that 1) Invited groups of coworkers or community members to attend the training and solve complex problems together, and 2) Identified and shared contact information of fellow conservation professionals who are willing and able to offer expertise that the group could use to apply the new skill. More research is necessary to determine the most

effective training methods to increase group effectiveness in North American conservation professionals.

Understanding

East African conservation professionals' s understanding saw the greatest increase after a training where the curriculum and methods were designed and sequenced to provide instructional scaffolding. More research is necessary to determine the most effective training methods to increase understanding in North American conservation professionals.

Using the PCBC Instrument as an evaluation tool will tell capacity builders which of these training methods or other methods are most effective at increasing which aspects of PCBC in their capacity building work. I have outlined a template for a basic evaluation design in the methods section above. Conducting a simple sign test on pre and post-implementation PCBC data would help capacity builders understand which methods most increase and which are not as effective at increasing PCBC in their stakeholders. These results can further inform future capacity development strategy planning.

Limitations of this research include the fact that only two populations of conservation professionals were included in the study, and only the East African population was tested for the group effectiveness and understanding dimensions of PCBC. Further research is necessary to determine how these dimensions apply to a North American population and to create a PCBC definition and instrument that can be applied to populations of conservation professionals in regions outside of North America and East Africa. Future cross-cultural studies can help to further inform a deeper understanding of the universal and variant dimensions of PCBC. Additionally, the PCBC instrument and delivery

methods will need to be adapted further before this instrument can measure PCBC in local community members who have less education than the conservation professionals in the current study. These two future research avenues may lead to a more generalized PCBC instrument that can be employed across populations and cultures.

I designed part of this study to specifically measure the significance of change between pre-and post-training PCBC scores, which resulted in a deeper analysis of exactly which training methods most significantly increased PCBC directly after training. While this design was well suited for the purpose of this study, future research is necessary to analyze what happens to PCBC long after a training has ended and which aspects of PCBC are correlated with long-term indicators of individual, community, and institutional capacity for biodiversity conservation. If this future research can provide evidence that universal PCBC dimensions can significantly explain the variance in more context-based indicators of capacity, PCBC could potentially be employed as a generalized predictor of individual capacity for conservation across diverse contexts.

In future studies, it is important to acknowledge that PCBC only measures the individual dimension of capacity for biodiversity conservation. While I have discussed in this conclusion how the results of this study may help to inform definitions and measurements of institutional capacity, further research is needed to empirically investigate how institutional, community, and psychological dimensions of capacity interact in the context of biodiversity conservation. The three key findings described above combined with the understanding of this study's limitations create a strong foundation for an innovative and generalized approach to researching, building, and measuring capacity for biodiversity conservation across the world.

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Appendices

Appendix A

Description of Capacity Building Trainings

GEOGRAPHIC INFORMATION SYSTEM (GIS) TRAINING

The Geographical Information Systems (GIS) training brought together academic staff and professionals involved in courses or projects related to conservation and environmental issues and professionals representing research institutions, data centers, governmental and nongovernmental organizations that focus on biodiversity conservation, and professionals in the field. The training focused on GIS, Advanced GIS with an emphasis on spatial analysis, and introduction to ENVI and ERDAS Imagine. Remote sensing as related to vegetation analysis, correction and handling ASTER, IKONOS, AVIRIS, Quickbird, Landsat data, multispectral data analysis, orthorectification, georeferencing, landcover classification, and vegetation mapping were covered. The training included fieldwork on sampling methods and data capture methods.

Conservation professionals in the training session were introduced to the Albertine Rift Conservation Organization's (ARCOS) portal blog and discussion forum platform so that, as conservation professionals do further research, they will be able to ask questions or answer to other requests using this platform. The trainer, Apollinaire William, has a Master's degree in GIS and Remote Sensing (RS) from Redlands University in California. The trainer has experience teaching GIS and RS, experience running previous GIS trainings, and he manages a GIS lab at Antioch University New England. He is from Rwanda and is familiar with the local context.

SOCIAL SCIENCE RESEARCH METHODS (SSRM) TRAINING

This social research methods workshop began with formal presentations by the trainers to familiarize RNCEAR members with the language of social science and to offer an overview of the purpose, basic approach, and sampling methods involved in designing and conducting research with interviews, focus groups, surveys, quasi-experimental approaches, and four different participatory methods. This session also offered information about ethical issues that arise when conducting human research.

This introductory session was followed by a design charrette wherein three RNCEAR members described the human-focused research questions relevant to their conservation projects and receive direct guidance from social scientists and their fellow conservation professionals regarding how to design social science research methods to help answer those questions. During the design charrette proceedings, social scientists will work with

conservation professionals in small sub-groups to design 2-3 research methods that help answer the research question. A representative from the sub-groups then shared the resulting research method design with the larger group. A larger group discussion period followed each share out, which allowed the trainers to clarify remaining questions about each method. The final session covered ethical issues associated with conducting research on human subjects. A combination of formal presentation, individual reflection, small group discussion, and larger group discussion were used to discuss topics such as voluntary participation, informed consent, and the "do no harm" concept.

I was one of the trainers in this training. I co-facilitated this training with a social science professor from National University of Rwanda, Dr. Simeon Wiehler.

HUMAN WILDLIFE CONFLICT COLLABORATION (HWCC) TRAINING

The course draws upon the best practices for addressing complex conservation conflicts and cultivating sustainable conservation solutions. Conservation professionals will leave the training with an individual (or group) "Next Steps" Conservation Conflict Intervention Plan to address both the immediate conflict intervention and longer-term strategic vision and goals for their work. Conservation professionals develop a community of practice around conservation conflict resolution, using a common language to investigate conflict dilemmas, a shared set of tools and approaches to analyze and address conflict, and a community of resource professionals who can continue to provide mutual support in addressing conflict in their efforts to conserve wildlife and wild places.

At the conclusion of the course, conservation professionals will be able to:

- Apply the principles, theory, skills and practices of conservation conflict resolution
- Understand identity-based conflict and the effect of values and beliefs on conservation programming
- Recognize individual reactions to conflict and develop strategies for effective responses
- Analyze the complex, diverse and deep-rooted conflicts encountered in conservation work
- Develop, implement, and evaluate site or context-specific Conservation Conflict Intervention plans for understanding and addressing a conflict situation of their choosing
- Design and lead multi-stakeholder processes for addressing conflict and co-creating sustainable conservation solutions
- Implement strategies to engage multiple sectors and resources to address conservation challenges
- Co-create an ongoing peer-to-peer consultation network and community of practice with their cohort and course instructors

PROGRAM DEVELOPMENT (PD) TRAINING

Pre-Training Preparation includes asking participants to: 1) Please write one paragraph describing yourself as a professional or researcher – what are your skills and areas of

expertise or interests, what special trainings do you have, what publications or achievements, current projects or activities. This exercise is designed to help you develop your ideas about who you are as a professional and scholar/researcher, what your body of work is or will be/what you want it to be. It can also be used for your website and to help you conceive of the professional directions you want to go, and it can also be used to develop projects. Please bring this one page bio with you to the training. 2) If you have a project concept, an idea you want to develop into a project, please bring this with you to the workshop.

In the training, each conservation professional introduces himself or herself briefly and if they have a current project they are managing or involved with they may briefly describe the project. Particular questions about project development and management – paper will be passed; each conservation professional may write their suggestion. The class then discusses the one-page descriptions (bio) conservation professionals wrote prior to the workshop. In small groups conservation professionals read and give feedback. Then, conservation professionals deconstruct a research or project design – conservation professionals will be given an article discussion a conservation project and will work in small groups to deconstruct the article, and discuss:

- research question(s) in the article – are they well-articulated or stated?
- research approach/design used by the authors – is it robust? Does it avoid bias and allow the authors to gather the information they need to answer their questions?
- validity of the study – is the study design strong enough to justify the results; can the results be applied elsewhere?
- are there any alternative approaches to conducting the study?

Each group will present their work to the group. Then, using four scenarios from the book *Measuring Success*; in small groups conservation professionals design a project cycle approach: Clarifying the purpose or mission, designing a conceptual model, diagramming the set of relationships between factors that are important for project outcomes to be achieved; developing a management plan with clear goals, objectives and activities; developing a monitoring plan; implementing the management and monitoring plan; analyzing data and communicate results; and using the results to adapt and learn. The class is concluded with a log frame discussion.

CHAPTER 4: Building durable capacity: Training methods to increase the psychological dimensions that predict long-term capacity for biodiversity conservation

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ABSTRACT

Tropical countries are among the most biodiversity rich regions globally, yet suffer from significant threats to biodiversity conservation. The participation, capacity and motivation of individuals from these regions who can undertake long term conservation has been shown to be a key factor in effective conservation efforts. Intrinsic motivation has been empirically shown to predict long-term, durable action toward conservation goals in many contexts. The psychological construct found to be associated with this type of motivation is called psychological capacity for biodiversity conservation (PCBC) and its dimensions have been found to include meaningful ownership, effective autonomy, being needed, group effectiveness, and understanding in African conservation professionals (Cranston, in prep B). The purpose of this study was to investigate the relationship between these PCBC dimensions, training methods, and the long-term success of African capacity building training alumni. I began this analysis by recruiting 202 African alumni from capacity building trainings conducted between 1994 and 2014 to take a survey that measured their levels of meaningful ownership, effective autonomy, being needed, group effectiveness, and understanding 1-20 years after the training. I interviewed trainers regarding the training methods employed to teach these alumni and asked alumni to list their post-training accomplishments. I found that meaningful ownership, effective autonomy, and being needed are the PCBC dimensions that are most predictive of long-term capacity behavior in training alumni. Group effectiveness and understanding were found to be significant contributors to long-term capacity behavior, but were less predictive of that behavior than meaningful ownership, effective autonomy, and being needed. I used triangulated data to identify four training methods that were specifically associated with an increase in meaningful ownership, effective autonomy, and being needed. Results from this study provide specific recommendations regarding the design and evaluation of programs aimed at building long-term capacity in African conservation professionals.

Key Words: Long-term capacity building, biodiversity conservation, conservation psychology, individual capacity, evaluation, training methods, capacity building strategies

Introduction

The concept of capacity building for biodiversity conservation continues to evolve as we navigate the ever changing landscape of environmental issues that shape our

understanding and practice of it. The urgency of environmental problems tempts us to primarily focus on building the immediate capacity of local practitioners to address pressing biodiversity issues in their region. While this focus on immediate, short-term action is important, many have begun to question if the techniques we use to build short-term capacity for biodiversity conservation will also ensure the stability of that capacity once it has been built. As the global resources necessary for repeated international intervention dwindle, it has become clear that fostering long-term, self-sufficient action toward conservation goals should be a fundamental target of any capacity building strategy (Mengers, 2000; Mahanty & Russell, 2002; Troja, 2000; Liberato et al., 2011; Beckley et al., 2008; Constantino et al., 2012; Boissière et al., 2014; Ekowati et al., in review; Felker, in prep). Building sustainable capacity is an integrally important component of effective conservation and the concept of Capacity Building for Biodiversity Conservation (CBBC) identifies a process by which institutions, communities, and individuals build upon their existing abilities to perform functions, solve problems and *set and achieve biodiversity conservation objectives now and in the future* (Cranston, in prep A). While the need to build long-term, self-sufficient capacity may seem like common sense to many capacity builders, few have conducted empirical studies to determine which techniques are most effective at meeting this specific need.

Literature Review

Many organizations aim to build the capacity of local practitioners to conserve biodiversity by conducting trainings and sponsoring education programs on conservation topics in the region where they want to build capacity. At this individual level, theory from the field of conservation psychology has proven helpful in the past to identify

techniques that promote environmental behavior while minimizing or eliminating the need for repeated intervention (De Young, 1993). Many conservation psychology researchers agree that education-only strategies are unable to predict even short-term environmental behavior (Kollmuss & Agyeman, 2002). In addition to this, De Young (1993) found that extrinsic motivation (material or economic incentives, social support) and coercive motivation (material or economic disincentives, social pressure, legal mandates) are equally as ineffective as information-only strategies at predicting long-term environmental behavior. Instead, De Young (1985, 1986, 1993, 1996, 2000) has found that intrinsic motivation is key to fostering the type of long-term behavior necessary for environmental conservation. A behavior is intrinsically motivated if engaging in it brings personal, internal contentment to the actor. While many behaviors can bring personal and internal contentment to humans, De Young (2000) identified only a few variables that intrinsically motivated people to engage in environmental behavior.

One of the variables De Young (2000) identified—competence—is particularly relevant to the context of capacity building for conservation. Competence is defined as a person's "enjoyment at being able to solve problems and complete tasks" (De Young, 2000, p. 517). Many capacity builders may regard this conclusion as 'common sense', something that they see in action each time they increase a trainee's competence in a specific skill set or field of knowledge during a capacity building training. Yet here is where psychological science can help supplement our common sense understanding of effective training methods. While De Young (2000) states that striving for competence has been shown to be intrinsically motivating toward general environmental behavior, he also purports that its power can be largely mitigated by context. Indeed, many contextual

issues that affect human motivation go well beyond knowing or not knowing how to do something. The promotion of long-term behavior toward any environmental goal requires an "understanding of the great diversity of motives people find acceptable and empowering" about a behavior in a specific context (De Young, 2000, p. 523). In this study I employ a psychological lens to explore the diverse motives that empower training alumni to continue to apply their skills toward the mission of conservation long after their capacity building training has ended.

In a previous study (Cranston, in prep B), I explored variables that intrinsically motivated African and North American trainees to begin applying newly learned skills to conserve local biodiversity directly after a capacity building training. I found that meaningful ownership, efficacy, being needed, group effectiveness, and understanding were the five significant dimensions of the psychological capacity for biodiversity conservation (PCBC) built in the population of African conservation researchers and educators directly after a capacity building training (Table 1). African trainees felt most effective when they were able to make autonomous decisions toward the goal of conservation (Cranston, in prep B). In the same study, North American trainees felt effective regardless of the autonomy they felt while making decisions. I applied my knowledge of this important difference in the following study of African training participants by re-titling the term 'efficacy'. A result of this study suggested that the concept of efficacy is more aptly referred to as 'effective autonomy' (Table 1). This adjusted title highlights the concept that autonomy has been found to be essential to efficacy in populations similar to the population that is the focus of this study.

Table 1. *Definitions of the dimensions of psychological capacity for biodiversity conservation (PCBC)*

PCBC Dimension	Definition
Meaningful Ownership (MO)	The control and motivation the training participant feels while applying the skill to conservation is personally or professionally meaningful to them.
Autonomous Efficacy (AO)	The alumnus effective while acting autonomously and making decisions to apply their skill in a way that they feel help to fill a specific role in conservation.
Being Needed (BN)	The conservation professional feels that their community needs them to apply the skill to conservation.
Group Effectiveness (GE)	The conservation professional feels that their group is effective as a whole and critically aware of the social and political context of applying their skill to conservation.
Understanding (U)	The conservation professional understands information about the topic and feels comfortable correcting mistakes when discussing or applying that information

I conducted this study to determine which aspects of PCBC most strongly predict behaviors associated with long-term capacity for biodiversity conservation and which training methods are best at increasing those aspects of long-term capacity. De Young (2000) suggested that a single set of motives is unlikely to encourage both short- and long-term behavior. I hypothesized that the same variables that constituted PCBC directly after a training (Table 1) would be equally as central to long-term PCBC. I further hypothesized that there is a positive relationship between specific training methods and those dimensions of PCBC.

Methodology

An in-depth analysis needs to be conducted to determine the relationship between training methods, alumni PCBC, and alumni behavior associated with long-term capacity post-training. Feagin, Orum, and Sjoberg (1991) suggested case study methodology for this type of in-depth investigation.

Participants

To explore individual-level, psychological dimensions of capacity for biodiversity conservation that endure years after that capacity is built, it was important to recruit capacity building organizations that focus on building capacity at the individual level. I chose to work with capacity building organizations that conducted trainings up until one year prior to my data collection to explore long-term capacity. The Regional Network for Conservation Educators in the Albertine Rift (RNCEAR) and the Tropical Biology Association (TBA) met these criteria.

The Albertine Rift eco-region of East Africa is home to endemic bird, mammal, fish and plant species that need ongoing conservation attention, as this region is also located in one of the most densely populated areas of Africa (Plumptre et al., 2007). Since its initiation in 2008, the Regional Network for Conservation Educators in the Albertine Rift (RNCEAR) has aimed to conserve biodiversity in the Albertine Rift by building upon the strengths in the region, particularly within academic and research institutions, to address conservation challenges. RNCEAR bases its capacity building efforts in the regional academic institutions that train future conservation leaders. One of the ways RNCEAR seeks to build regional capacity for biodiversity conservation is by hosting multiple training sessions a year for its members. The topics of these training sessions and the training strategies used vary according to RNCEAR member requests. Based on a 2012 survey, training topics most preferred by RNCEAR members were Geographical Information Systems, Social Science Research Methods, and Program Management.

The Tropical Biology Association (TBA) is a non-governmental organization that specifically states its mission is to build capacity for biodiversity conservation at the individual level within developing countries. TBA is based in the UK and Kenya and works in partnership with environmental institutions throughout Africa. Established in 1993, TBA aims to offer "a high standard of ecology and conservation training to African and European biologists alike, thereby strengthening the international scientific and conservation community" (Tropical Biology Association, 2007). I chose to include TBA trainers and staff in my study because they devote a sizeable amount of resources to developing capacity for biodiversity conservation at an individual level.

In total, I interviewed three TBA trainers and two RNCEAR trainers who conducted trainings for their respective organizations between 1994-2014. The TBA trainers included one European and two African conservation professionals who hold bachelors degrees or higher in a biological, ecological, or physical science with a specialty in conservation. The RNCEAR trainers included one American and one African, both of whom hold masters degrees or higher in a biological, ecological, or physical science with a specialty in conservation. These trainers helped me identify and recruit over 600 individuals from East and South Africa who participated in their trainings from 1994-2014. Of the 600 individuals recruited, 202 participated in the survey portion of this study.

I refer to the individuals from East and South Africa who participated in trainings as either alumni or trainees, depending on whether I am referring to these individuals in the past tense (when they were trainees or training participants) or present tense (now that they have graduated from the training and are alumni). This is important to keep in mind

so as not to confuse ‘trainees’ and ‘alumni’ as different groups of individuals in the following study. They are the same group of people.

I recruited trainers to be interview participants from TBA using a snowball method wherein I asked the director of TBA to suggest a list of trainers who would be familiar with the training methods used to teach TBA trainings between 1994-2014. I then asked each of the trainers recommended to identify other trainers who would be familiar with the training methods used to teach TBA trainings between 1994-2014. I stopped recruiting new interview participants from TBA when the trainers I interviewed did not recommend any new trainers. As a RNCEAR trainer myself, I used my own knowledge of the other RNCEAR trainers who taught between 2013-2014 to recruit two interview participants from RNCEAR. I only included data from RNCEAR trainers who taught between 2013-2014 because these are the only years from which trainers and alumni were available to participate in this study. I also used my personal experience to outline the strategies I employed during the RNCEAR training that I conducted in 2013.

Data Collection

Interviews with trainers of capacity building

During interviews with each trainer, I followed a semi-structured interview guide. Questions included:

1. Which training methods and strategies did you implement in the trainings you conducted between 1994-2014?
2. What types of accomplishments could your alumni achieve after the training that would indicate that they had maintained capacity in the field of biodiversity conservation after your training?

To compile a comprehensive list of accomplishments upon which trainers agreed, I asked the first two trainers I interviewed (TBA) to work together to create a list of accomplishments that would indicate that alumni from their trainings had maintained long-term capacity for biodiversity conservation after the training. I asked the last three trainers I interviewed (one from TBA, two from RNCEAR) to review the list that was created by the TBA trainers and then asked the RNCEAR trainers to add or revise any of these accomplishments to reflect those accomplishments they believed would indicate that their alumni had maintained long-term capacity for biodiversity conservation after the training. This interview procedure was conducted with the interviewee's verbal permission and interviewees were allowed to revise or add to any written text on the document up to one day after the interview.

Survey of alumni of capacity building trainings

I asked the TBA and RNCEAR alumni who participated in this study to take a twenty-seven item survey (Table 2) which asked alumni to rate statements on a 5 point Likert scale where 1 (Not At All) meant "I do not agree with this statement at all" and 5 (Very Much) meant, "I strongly agree with this statement".

Table 2. *Survey administered to alumni to measure psychological capacity for biodiversity conservation (PCBC) directly after capacity building trainings*

PCBC Dimension	Items
1. Meaningful ownership	- I have control over how this skill is used in my conservation work - I feel motivated to use this skill in my conservation work - When I apply it in my conservation work, I feel in control of the use of the skill - Applying this skill helps add personal meaning to my conservation work - Using this skill helps me to shape my conservation work into a meaningful part of my life - I feel that my ability to use this knowledge to solve

	problems is a needed skill in my work place - I know what I need to apply this skill to my conservation work - Without the ability to apply this skill, conservation work would have less meaning for me - I have confidence in my ability to effectively use this skill in conservation work
2. Effective autonomy	- I am effective at overcoming most difficulties with using this skill in the context of conservation - My decision-making skill with this topic is good enough to apply it to my conservation work - I am able to apply this skill in the ways that I feel are appropriate in the context of conservation - I know how to access information about this topic - I can fill a specific role in the effort to apply this skill in conservation - Using this skill in the context of conservation is not very difficult for me at this time
3. Being needed	- People tell me that my skills in this area would make a real difference in solving their problems - I get direct feedback from my community that my skills in this area are needed - I have control over what happens when addressing this issue in my conservation work
4. Group effectiveness	- As a group, my collaborators and I are able to effectively apply this skill to conservation - I am aware of the politically sensitive aspects of applying this skill in conservation - To effectively use this skill, I need to also consider the ethical context of the situation - I am able to solve problems with my current understanding of this topic - I am excited to apply this skill in my conservation work
5. Understanding	- Applying this skill helps me work toward conservation goals - I want to use this skill in my work - My current knowledge of this topic is high enough to achieve my goals in conservation - When necessary, I am able to revise a flawed application of this skill

The survey instrument I developed also included a question regarding accomplishments the alumni had achieved since the training. There were ten specific types of accomplishments listed based on the information provided from discussion with the , which indicated ten behaviors associated with long-term capacity for biodiversity conservation. Those behaviors are explained in the interview results section below.

Analysis

Interview Analysis

I used the method described by Charmaz's 2006 *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis* to code the notes from each trainer interview. Following this technique, I identified two different types of training strategies, multiple training methods, and ten alumni accomplishments. I sorted each new training method or alumni accomplishment into one of the respective category types. If the training method or accomplishment did not fit into any pre-existing category, a new category was formed. This technique helped me identify which trainers were using similar methods and strategies as well as which methods were unique to each training. It also helped me gather a comprehensive list of potential accomplishments that trainers believed could indicate success in the field of biodiversity conservation. I interpreted my interview results by identifying the behavior that the alumni would have had to perform to achieve each respective accomplishment.

Alumni Survey Analysis

I converted the alumni survey responses into count data by summing the number of long-term capacity behaviors they indicated in their accomplishments since the training (out of the ten in Table 3 below). I accounted for alumni long-term capacity behavior that did not fit into any of the ten behaviors listed in Table 3 by asking alumni to add accomplishments they achieved outside of the options listed. All accomplishments that alumni added were summed together with the pre-written accomplishments identified by the trainers. After summing the number of long-term capacity behaviors for each participant, I conducted a Poisson regression analysis that helped me determine how predictive different combinations of the PCBC dimensions were of the long-term capacity behavior alumni adopted post-training.

I combined the five dimensions (meaningful ownership, efficacy, being needed, group effectiveness, and understanding) together in different combinations that I called 'super-dimensions' (Table 4). The purpose of creating these super-dimensions was to test which combination of PCBC dimensions was the most predictive of the long-term capacity behaviors as identified by trainers and alumni (Table 3). I created a scale for each super-dimension by combining survey questions that measure one of the five dimensions of PCBC (Table 2). For instance, I combined the meaningful ownership and effective autonomy dimensions to constitute one super-dimension and then created a scale to measure that super-dimension by combining the meaningful ownership and effective autonomy items (Table 2). I conducted Poisson regressions on each super-dimension scale to determine which predicts the largest increase in number of long-term capacity behaviors adopted. I used this specific type of analysis because my dependent

variable (number of long-term capacity behaviors) included count data (Gullickson, 2005). In a Poisson analysis, three values are important to consider regarding the amount of dependent variable variance (the number of long-term capacity behaviors adopted) each dimension can explain: the dimension's p-value, exponentiated beta (Exp(B)), and percent of contribution. The p-value indicates how statistically significant each dimension's contribution is to the total variance in the number of long-term capacity behaviors adopted. The Exp (B) value provides an odds ratio, or how much the odds increase multiplicatively with a one-unit change in the independent variable (Gullickson, 2005), which in this case is a one-unit change in each PCBC dimension. Both the p-value and the Exp (B) are calculated by the Poisson regression analysis test conducted in the Statistical Package for the Social Sciences (SPSS).

The percent of contribution is calculated in two steps. In the first step, I established if the independent variable (the PCBC dimension combination) had a positive, negative, or no predictive influence on the dependent variable (# of accomplishments) by determining if the exponentiated beta (Exp (B)) value is greater than, less than, or equal to one. If the Exp (B) is greater than or less than one, the second step identifies the amount of that effect. If the dimension's Exp (B) equals one, then an individual's high score on that dimension is predicted to have no influence on the number of accomplishments achieved by that individual. If the dimension's Exp (B) is greater than one, an individual's high score on that dimension is predicted to have a positive effect on the number of accomplishments they achieve. If the dimension's Exp (B) is less than one, an individual's high score on that dimension will have a negative effect on the number of accomplishments they achieve. When the direction of the effect is established,

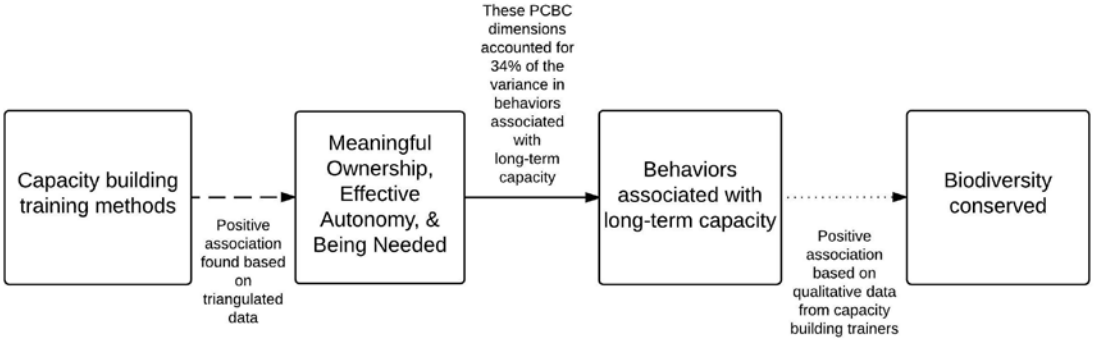
the calculation (Exp (B) value – 1) x 100 yields the percentage of positive or negative effect the dimension has on the number of accomplishments achieved.

Results

Key Findings: Relationship between training methods, PCBC, and long-term capacity

The first key finding from this study is that meaningful ownership, effective autonomy, and being needed predicted 34% of the variance in the long-term capacity behavior alumni adopted after their training (Figure 1). The second key finding is that group effectiveness and understanding also predicted a significant (yet lesser) percentage of variance in long-term capacity behavior adopted as well. The final key finding is that there was a positive association between the training methods described in Table 6 below and increases in meaningful ownership, effective autonomy, and being needed. Based on the qualitative data collected in the interview portion of this study, trainers believe there to be a potential positive relationship between behavior associated with long-term capacity and biodiversity conserved. As there was no objective evidence provided to me at the time of our interview, I consider the relationship between capacity and biodiversity conserved to be a trainer assumption and suggest that more research is necessary to explore the strength of the relationship between those two variables. Figure 1 outlines these findings generally, with a solid arrow indicating that I found a strong relationship between the variables in my study, a dashed arrow meaning the relationship I found was based on triangulated data, and the dotted arrow meaning that the relationship found was based on qualitative data. I describe the details of how my data support these findings below.

Figure 1.



The relationship between capacity building training methods, PCBC dimensions, long-term capacity behaviors.

Behavior associated with Long-term Capacity

Results from this study show that there are specific aspects of psychological capacity for conservation biology (PCBC) that contribute to long term capacity among individuals. Specifically, survey results from alumni responses showed that meaningful ownership, effective autonomy, and being needed are the PCBC dimensions that are most predictive of long-term capacity. The ten behaviors trainers and alumni associated with long-term capacity are listed in Table 3.

Table 3. *Behaviors associated with long-term capacity for biodiversity conservation as indicated by training alumni accomplishment*

Long-term capacity behavior
Adopting responsibility at work to earn or be promoted into leadership position in the field (e.g. program director, manager, senior position, etc.)
Adopting responsibility at work to earn or be promoted being to a senior academic position (lecturer, head of department or group, etc.)
Writing a conservation-related publication as main author
Coordinating with a team to write a conservation-related publication as co-author

Raising grants for conservation action in their country
Training other conservation practitioners, scientists, or students in their country
Implementing campaigns to raise awareness about conservation issues in their country
Founding or co-founding an organization, network, or alumni group for conservation-related activities
Reducing threats to habitats or species through their work
Actions required to achieve other relevant accomplishments that were not mentioned in the listed options

Note. These behaviors are indicative of accomplishments that require a high level of commitment, ambition, and ability to achieve in the field of conservation. While it is impossible to completely control for confounding variables in a case study, I attempted to control for commitment, ambition, and ability by recruiting alumni who were all of a relatively similar education level and were working in a similar field. Having these similarities made it more probable that the alumni were similarly able and interested in achieving the type of high-level accomplishments that are indicative of the behaviors.

PCBC dimensions that predict long-term capacity behavior

I found that almost all of the super-dimension scales predicted between 16.7% to 34.7% of the variance in this behavior (Table 4). The only two scales that were found to be measuring combinations that were not predictive of long-term capacity behavior were the group effectiveness dimension and a scale that measured group effectiveness and alumni understanding of the material taught in the training. Of the scales that predicted a significant percentage of variance in long-term behavior adopted, the one that predicted the most variance (34%) was that which measured meaningful ownership, effective autonomy, and being needed (Table 4). The statistically significant scale that predicted the least variance (16.7%) was that which tested alumni understanding of the material taught followed by a scale that only tested how needed the conservation professionals

felt their learned skills were (17.8%). The exponentiated beta value and percent of variance predicted of all the significant dimension combinations are shown in Table 4.

Table 4. *Poisson regression analysis results*

Super-dimension scale	Exp (B)	% Variance Predicted
(Intercept)		
MO/EA	1.347	34.7%
MO/EA/BN	1.341	34.1%
MO/EA/Understanding	1.335	33.5%
MO/BN/Understanding	1.317	31.7%
MO/BN	1.313	31.3%
MO/Understanding	1.311	31.1%
MO/EA/BN/GE	1.307	30.7%
Initial Hypothesis (MO/EA/BN/GE/Understanding)	1.305	30.5%
MO/EA/GE	1.298	29.8%
Meaningful ownership alone	1.298	29.8%
MO/EA/GE/Understand	1.295	29.5%
EA/BN/Understanding	1.287	28.7%
MO/BN/GE/Understanding	1.286	28.6%
EA/BN	1.284	28.4%
MO/BN/GE	1.284	28.4%
EA/BN/GE	1.273	27.3%
EA/Understanding	1.269	26.9%
Effective autonomy alone	1.268	26.8%
MO/GE	1.263	26.3%
EA/BN//GE/Understanding	1.259	25.9%
EA/GE/Understanding	1.22	22.0%
BN/Understanding	1.235	23.5%
BN/GE/Understanding	1.218	21.8%
EA/GE	1.212	21.2%
BN/GE	1.195	19.5%
Being Needed alone	1.178	17.8%
Understanding alone	1.167	16.7%
GE/Understanding		
Group effectiveness alone		

Note. EA= Effective autonomy, MO= Meaningful ownership, GE = Group effectiveness, BN= Being needed, Initial PCBC = the scale that includes meaningful ownership, effective autonomy, being needed, group effectiveness, and understanding items. Super-dimension scales with a p-value less than or equal to .05 were considered significant and their Exp(B) and percent of variance predicted are listed in this table. Super dimension scales with p-values greater than .05 were considered insignificant and are not listed in this table.

They further suggest that understanding of material taught during the training was the least predictive contributor and that understanding coupled with group effectiveness was a statistically insignificant contributor to long-term capacity behavior in this study corroborates the conclusions of many previous conservation psychology studies regarding the role of understanding and awareness in promoting conservation action. Past studies (Kollmuss & Agyeman, 2002) have clearly demonstrated that understanding and awareness of conservation topics is necessary but insufficient to predict conservation behavior.

Due to this, it seems unsurprising that my survey findings suggest that knowledge and awareness are insufficient for predicting behavior in the context of capacity building for biodiversity conservation. Previous studies (Kollmuss & Agyeman, 2002) broke new ground by uncovering which specific psychological variables can predict behavior in different conservation contexts. This study continues that approach by identifying specific psychological variables that can be expected to predict long-term conservation behavior in the context of capacity building for biodiversity conservation. These results suggests that a modified survey instrument could be created to measure these most predictive dimensions by using the items for Meaningful Ownership, Effective Autonomy, and Being Needed dimensions in Table 2.

In my previous psychometric study of PCBC (Cranston, in prep B), meaningful ownership, effective autonomy, and being needed were found to be the most internally valid dimensions of the five accounted for directly after RNCEAR trainings. The findings add to the external validity of these being the strongest dimensions of this PCBC instrument. The hypothesis that a practitioner's combined score on all five dimensions of

PCBC would be the strongest psychological indicator of the number of accomplishments they achieved after a capacity building training was not validated. Instead, findings from this study suggest that of all the dimensions tested, a practitioner's combined score on the most predictive dimensions of PCBC (meaningful ownership, effective autonomy, and being needed) is the strongest psychological indicator of the number of long-term capacity behaviors adopted after a capacity building training.

While being needed was an integral part of the most predictive scale, this dimension by itself was found to be one of the least predictive of long-term capacity behavior (Exp(B) = 1.178, 17.8% increase). This interesting finding adds nuance to our knowledge of how being needed works to support an individual's long-term capacity behavior, and therefore helps us better understand how to build this capacity. To have long-term capacity to move toward conservation goals, my findings suggest that it is not enough for an individual to feel that their community or co-workers need the application of their skills. Instead, the individual needs to also feel that he or she has control over the application of their skill and that they are motivated to take that control because it is personally or professionally meaningful to them (meaningful ownership). The need to feel effective at making autonomous decisions about how they apply their skill toward the mission of conservation (effective autonomy) was found to be equally important to predicting long-term capacity behavior.

In total, my findings suggest that behavior associated with long-term capacity for biodiversity conservation is best predicted by strategies that support local practitioners in their meaningful direction and autonomous decision-making regarding conservation issues that are found to be important by the local community. Perhaps equally as

important, results suggest that two capacity building approaches are least likely to predict the long-term capacity to conserve biodiversity: education-only campaigns and strategies that employ local practitioners in conservation actions controlled by outsiders that can appear meaningless to the local practitioner.

Effective training strategy and methods

During the interview portion of this study, I learned quickly that there is a difference between a capacity building strategy and a training method used to build capacity. According to my interpretation of trainer feedback, a capacity building strategy is a larger category that encompasses different types of training methods and interventions that practitioners implement to build capacity in the field. In this study, I identified two types of capacity building strategies: a consistent training strategy and an inconsistent training strategy. While the intentionality around this was unclear, I concluded that TBA uses a consistent training strategy while RNCEAR employs an inconsistent training strategy. TBA's training strategy is consistent in that all TBA alumni from 2013-2014 (indeed, since 1994) have been trained using the same twelve training methods listed in Table 5 below. In contrast, RNCEAR's training strategy is inconsistent because while a few RNCEAR training methods overlapped with one other training, only one out of RNCEAR's thirteen training methods (small group practical work with provided data) was applied across all three RNCEAR trainings from 2013-2014.

Intentional or not, the importance of this main strategy difference is best understood in light of the fact that the average TBA alumni scored slightly higher than the average RNCEAR alumni on the most predictive PCBC dimensions even though

TBA and RNCEAR employed many of the very same training methods. These results suggest that applying a consistent capacity building strategy rather than an inconsistent strategy may be associated with slightly higher alumni scores on the most predictive PCBC dimensions. This lesson regarding strategy seems to highlight the importance of choosing effective training methods so that one can implement those methods as a part of a consistent strategy. Outside of establishing the importance of a consistent strategy, these results still leave the question of which specific training methods are the most effective to implement.

I compared which training methods were employed by both organizations, which training methods were unique to each, the alumni average score on the most predictive PCBC dimensions, and the average number of long-term capacity behaviors adopted by those who were trained using those methods. I compared scores from the TBA and RNCEAR alumni for 2013-2014 because these are the only two years for which I collected data from both organizations. This comparison between TBA and RNCEAR is key to establishing a better understanding of the relationship between the type of training methods employed, scores on the most predictive PCBC dimensions, and the number of long-term capacity behaviors adopted by each set of alumni. Table 5 outlines the training methods that TBA and RNCEAR trainers employed along with the TBA and RNCEAR 2013-2014 average alumni scores on the most predictive PCBC dimensions and average number of long-term capacity behaviors adopted by each set of alumni.

TBA and RNCEAR both instructed trainees using PowerPoint presentations, expert demonstration, large class discussion, small group practical work with provided data, and individual hands-on exercises, asking trainees to bring in their projects or

proposals to which they could directly apply their new skill, small group work with trainees' own data, and asking all trainees and teachers to share their contact information within the course. Training methods unique to TBA (Table 5, alumni scoring 90% and 87% points possible on the most predictive PCBC dimensions in 2013 and 2014 respectively) included guided field walks, small expert-led workshop seminar, class discussion of the social dimensions of ecology content, and general ecology and conservation content.

Methods unique to the RNCEAR trainings (Table 5, alumni scoring 82% and 81% points possible on the most predictive PCBC dimensions in 2013 and 2014 respectively) included asking trainees before the training what they expect from the course, requesting trainees to send their resumes to the trainer before class, class discussion of ethical/political context of applying skill in conservation, in-class materials and templates provided, trainee-led large class discussion of trainee case study, trainees asked for the training topic, and reflexive curriculum design wherein the trainer noted what trainees wanted to know more about half way through the training and changed remaining curriculum accordingly.

If I had found that TBA alumni showed significantly stronger scores on the most predictive PCBC dimensions than RNCEAR's alumni in this study while using significantly different training methods, I might have suggested that trainers who want to increase the most predictive PCBC dimensions primarily implement the training methods that are unique to TBA. To the contrary, I found that all 2013-2014 RNCEAR and TBA alumni scored more than above average on the scale that measured the most predictive PCBC dimensions, that all alumni claimed to have adopted approximately 3 long-term

capacity behaviors since their training, and that both organizations taught those alumni with eight similar training methods. These results suggest that more research is necessary to gain a deeper understanding about which methods are most likely to create the highest predictive PCBC dimension scores and increased long-term capacity behaviors over time.

However, I can triangulate the survey and interview results from this study with findings from a previous study of the training methods that significantly increased the most predictive PCBC dimensions directly after a capacity building training (Cranston, in prep B) to recommend training methods that seem to be associated with increased long-term capacity for biodiversity conservation (Table 6). In a previous study (Cranston, in prep B), I found that a significant initial increase in meaningful ownership was associated with training methods that assigned personally or professionally meaningful application of a skill during class. TBA and RNCEAR both do this by asking trainees to bring in their projects or proposals to which they could directly apply their new skill and assigning small group work with trainees' own data. A significant initial increase in effective autonomy was associated with training methods that helped trainees feel effective while applying their new skills autonomously and making decisions to fill a specific role in the mission toward conservation (Cranston, in prep B). Three methods employed by both TBA and RNCEAR may have helped to meet this multi-faceted goal. TBA trainers specifically stated that one of the purposes of the expert demonstrations was to help trainees see that there is a specific place for application of their new skills in the field of conservation. Perhaps effective autonomy is built when this type of method is coupled with methods that ask trainees to autonomously make decisions regarding how to apply their new skills in the context of conservation (for TBA and RNCEAR, these were small

Table 5. *Training methods and alumni scores on meaningful ownership and effective autonomy*

Organization and Training Methods Employed	Year & # of alumni	MO 45 pts Possible	EA 30 pts possible	MO & EA together 75 pts possible	Long term capacity behaviors by 2015
TBA (2013-2014) B) Expert lecture C) Expert Demonstration D) Large class discussion F) Small group practical work with provided data H) Individual hands-on exercise O) Asked trainees to bring in their projects or proposals to which they could directly apply skill AN) Small group work with own data AQ) All students/teachers asked to share contact information AK) Guided field walks AL) Small expert-led workshop seminar AO) Social dimensions of ecology content AP) General ecology/conservation content	*2013 (N=7)* *Mean Score* *% points possible scored* *2014 (N=18)* *Mean Score* *% points possible scored*	40 88% 40 88%	27.3 91% 25.4 85%	67.3 90% 65.4 87%	3.1 3
RNCEAR (2013 Training #1) A) Sent pre-training email to ask what they expect from training, send CV, etc. B) Expert lecture C) Expert Demonstration D) Large class Q&A, discussion F) Small group practical work with provided data H) Individual hands-on exercise (2013 Training #2) B) Expert lecture D) Large class Q&A, discussion F) Small group practical work with provided data I) Class discussion of ethical/political context of applying skill in conservation AN) Small group work with own data L) Trainee-led large class discussion of trainee case study M) Reflexive curriculum design…noted what trainees wanted to know more about half way through the training and changed remaining curriculum accordingly AQ) All students/teachers asked to share contact information P) Trainees asked for the training topic T) Materials/templates provided during training (2014 Training) F) Small group practical work with provided data O) Asked trainees to bring in their projects or proposals to which they could directly apply skill P) Trainees asked for the training topic T) Materials/templates provided during training	*2013 (N=15)* *Mean Score* *% points possible scored* *2014 (N=10)* *Mean Score* *% points possible scored*	36.9 82% 36.5 81%	24.4 81% 24.2 81%	61.3 82% 60.7 81%	2.6 2.9

Note. EA= Effective autonomy, MO= Meaningful ownership. The letters in this table are there to help identify which training methods were consistently employed across trainings.

group practical work with provided data and individual hands-on exercises). Furthermore, there was a significant initial increase in being needed after a training that focused on subject matter that had been explicitly requested by their community (Cranston, in prep B), suggesting that trainings that are conducted at the explicit request of the community are most likely to build this important aspect of PCBC.

Table 6. *Training methods associated with a significant increase in the dimensions of PCBC that are most predictive of long-term capacity behavior*

PCBC Dimension	Goal	Training method recommendation
Meaningful ownership	Assign personally or professionally meaningful application of skill during training	Ask trainees to bring in their projects or proposals to which they can directly apply their new skill Assign small group work with trainees' own data.
Effective autonomy	Assign application of the new skill in a way that helps trainees become more effective at autonomously and making decisions to fill a specific role in the mission toward conservation	Expert demonstrations paired with… • Small group practical work with provided data • Individual hands-on exercises
Being Needed	Conduct training on subject matter that has been explicitly requested by the trainees	Before planning curriculum for trainings, directly ask potential trainees what subject matter they most need to bet trained in to further build their capacity to conserve biodiversity.

Discussion

My study findings corroborate previous research (discussed below) and contribute a next step to understanding the psychological determinants of long-term action toward environmental conservation. Specifically, the key finding that meaningful ownership, effective autonomy, and being needed are predictive of long-term capacity behavior suggests that these are the psychological dimensions that are important to the development of a truly dedicated conservation professional. This type of dedication is the type that many researchers have suggested is needed to lead future environmental conservation initiatives (Logsdon, 1995; Ta'I, 2000; Mengers, 2000; Constantino et al., 2012, Boissière et al., 2014, Ekowati et al, in press; Felker et al, in prep). For instance, a respected voice in the local agriculture movement posited that that environmental movements can only endure over time when the individuals responsible for it are skilled and dedicated (Logsdon, 1995). Research in natural resource management has echoed a similar theme, identifying a need for *dedicated* and skilled individuals after the absence of such individuals has led to the failure of a conservation program (Ta'I, 2000; Mengers, 2000). As explained earlier, research on this type of *dedicated* individuals has been approached qualitatively in studies that are unsuitable for generalization to the larger study of capacity building (Constantino et al., 2012, Boissière et al., 2014, Ekowati et al, in press; Felker et al, in prep). The results of my study add to the investigation of this skilled and dedicated character by showing that the measurement of PCBC can be used in empirical studies to predict dedicated, long-term behavior in conservation professionals. These findings bring us closer to a generalized definition of the psychological dimensions that must be considered in future investigation, design, and evaluation of programs that

aim to develop the capacity of dedicated professionals to work toward the mission of biodiversity conservation.

Results presented here supplement theoretical insight from psychology regarding motivation for long-term behavior toward conservation. The conservation psychology maxim that education-only strategies are unable to predict environmental behavior (Kollmuss & Agyeman, 2002) is supported by my findings. My results corroborate the theory that intrinsic motivation is key to fostering the type of long-term behavior necessary for environmental conservation (De Young, 1985, 1986, 1993, 1996, 2000). I have answered the call to better understand the diversity of motives associated with an environmental behavior in a specific context (De Young, 2000) by exploring the variables that affect a person's intrinsic motivation in the context of capacity building for biodiversity conservation. Striving for competence alone is not intrinsically motivating enough to predict behaviors associated with long-term capacity for biodiversity conservation in training alumni. This finding also corroborates research on clarity-based decision making that suggests that becoming competent in a skill after one gets direct feedback that the skill is needed (as is accounted for in the Being Needed dimension of PCBC) increases the likelihood that the individual will build upon and apply that competence over time (Kaplan, 1990). Results from this study contribute to a deeper understanding of how long-term capacity for biodiversity conservation can be built. When alumni feel that they are becoming competent in a skill set that is personally or professionally meaningful to them and needed by their community in a way that allows them to effectively make autonomous decisions regarding their role in the mission of conservation, the probability for long-term capacity is increased.

This finding also supplements recent research on the psychological determinants of human wellbeing, which will be of interest to organizations that design programs with the dual aim of conserving biodiversity and fostering human well being over time. For instance, my results suggest that meaningful ownership, effective autonomy, and being needed are most predictive of long-term capacity behavior when they are developed jointly. Together, these psychological aspects of capacity are found in an individual that has control over the application of their skill in a way that is effective and meets the needs of a larger entity—in this case, the individual's community. Skilled engagement in a purpose that is perceived as bigger than oneself is also essential to the human experience of well-being (Seligman, 2011). This type of engagement is reached when an individual calls upon personal strengths, talents, and skills to perform an action that requires concerted effort on the individual's part and is not considered easy. Serving an entity bigger than the individual might come in the form of service to a religion, a humanitarian goal, family, or community and helps to make this type of well-being sustainable over time. Given the similarities between the psychological determinants of human wellbeing and capacity for biodiversity conservation, conservation organizations should be able to effectively use the results of my study to develop and evaluate programs that work toward both goals.

The limitations of this study suggest that practitioners use caution when applying findings outside the parameters of this study. For instance, even though I did attempt to account for trainees' perspectives on their long-term capacity behaviors, the definition of these behaviors was still largely based on trainer opinion. A deeper analysis of alumni and other stakeholder opinion is needed to more fully investigate how PCBC correlates

with a diverse range of potential indicators of the long-term capacity of conservation professionals. Furthermore, this study only focuses on how PCBC predicts individual-level capacity. While an individual-level focus suited the purpose of this study, further research is necessary to better understand how PCBC is related to indicators of community or institutional-level capacity. To do this, PCBC will need to be nested in a framework that accounts for the social, political, economic, and structural variables that affect whether or not a willing individual is allowed to apply their skill toward the mission of local conservation over time. This study was conducted in a population of African conservation professionals. Further research is necessary to determine how these dimensions apply to conservation professionals outside of Africa. Future cross-cultural studies can help to further inform a deeper understanding of the universal and variant dimensions of PCBC as they relate to long-term capacity behavior. Additionally, the PCBC instrument and delivery methods will need to be adapted further before this instrument can measure PCBC in local community members who have less education than the conservation professionals in my study. These future research avenues will lead to a more generalized PCBC instrument that can be employed to predict long-term capacity behavior across populations and cultures. I recommend that future studies evaluate the effectiveness of new strategies in diverse contexts with a survey instrument composed of items adapted from the meaningful ownership and effective autonomy items presented in Table 2.

Despite the limitations of this study, the findings and conclusions can help to inform the practice of capacity building. The training methods described in Table 6 can most immediately be applied by trainers and education-based capacity building efforts.

However, by adapting the goals of the training methods described in Table 6 to other contexts capacity builders may also be able to translate the recommendations to inform the design of other types of capacity building intervention. For instance, organizations may aim to foster meaningful ownership through community meetings by employing facilitation strategies that help citizens embrace personally or professionally meaningful control over conservation action. Facilitating meetings that help citizens feel effective at making autonomous decisions regarding their role in local conservation efforts may help to increase effective autonomy. Considering the importance of being needed, the effectiveness of meetings can be increased by ensuring that the meeting addresses goals that have first been identified as necessary by the community participants. My findings support the inference that these types of facilitation methods will most likely help community meeting facilitators build the long-term capacity for conservation among participating citizens. Unlike other studies that have collected similar findings (Khatun, et al., 2015; DeCaro & Stokes, 2008), this study has defined these aspects as one cohesive whole (PCBC) and the instrument used here to measure it may be used in other studies to predict long-term capacity. Together, the methods and aspects of PCBC that were found to be important in this study provide a framework from which researchers and practitioners can better understand and predict the development of long-term capacity for biodiversity conservation across the world.

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Chapter 5: Conclusion

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Just like our understanding of institutional and community capacity has been enhanced by economic, political, sociological or anthropological theory, I have contributed to our understanding of individual capacity by applying psychological theory. The importance of the psychological dimension of capacity for biodiversity conservation is becoming increasingly clear in the conservation literature and practitioner reality (Constantino et al., 2012, Boissière et al., 2014, Ekowati et al, in review; Felker, in prep). By articulating the dimensions of psychological capacity for biodiversity conservation (PCBC) in comparison to institutional and community dimensions of capacity, this dissertation has begun to unpack intrinsic motivation in the context of capacity building for biodiversity conservation. The resulting analysis helps to better define how practitioners can approach this important aspect of capacity building for biodiversity conservation.

I have explored several aspects of capacity building for biodiversity conservation and the significance of psychology in this domain throughout the chapters of my dissertation. First, the literature review in Chapter 2 of this dissertation provides a background for the dimensions that comprise psychological capacity for biodiversity conservation (PCBC), a concept I developed during my dissertation research. My hypothesis was that PCBC was comprised of fourteen psychological variables, which represent dimensions of empowerment, self-determination, meaningful action, and group efficacy. The testing of this hypothesis contributes to the academic discussion of capacity building for biodiversity conservation by offering a theoretical framework from which to

further test validity of this aspect of individual capacity. I tested the PCBC framework validity in Chapter 3 of this dissertation, which resulted in a measurement for PCBC I then used to test which training methods significantly increased each dimension of PCBC. Future research will be able to further test the validity of the PCBC measurement across multiple contexts, thereby improving the survey's usefulness. Conservation practitioners will also be able to utilize this tool to evaluate the effectiveness of a variety of capacity building efforts in the real world.

Chapter 4 employed definitions and measurements refined in Chapters 2 and 3 to determine the relationship between the post-training PCBC dimensions and behaviors of training alumni and the training methods employed to build the capacity of those alumni. The interviews in this study elucidated which strategies were used to build PCBC. The survey helped to determine alumni PCBC scores and which long-term capacity behaviors they had adopted after the training. This analysis has contributed a deeper understanding of how alumni of capacity trainings for biodiversity conservation are associated with long-term capacity behaviors years after the training. Chapter 4's interview and survey results on behaviors associated with long-term capacity for biodiversity conservation provide a set of indicators to determine if capacity building training alumni are making significant progress toward their mission. Alone, this contributes to my field by offering capacity building scholars and practitioners a behavior-based definition of individual capacity that in the past has been considered highly valuable yet difficult to measure. Together with the other results from Chapter 4, I was able to analyze the relationship between long-term capacity behaviors, PCBC dimensions, and training methods. This

contributes a large step towards defining the types of capacity building strategies that could predict long-term practitioner behavior toward effective biodiversity conservation.

Results form Chapter 4 most clearly apply to capacity building trainings and education-based interventions. However, by adapting the goals of the effective training methods I outline in Chapter 4 to other contexts, capacity builders may also be able to translate the recommendations to inform the design of other types of capacity building intervention. While the effectiveness of these types of methods in different intervention contexts is purely speculative at this point, my conclusions can help to shape hypotheses to guide further research. I recommend that future studies evaluate the effectiveness of new strategies in diverse contexts with a survey instrument composed of items adapted from the meaningful ownership and effective autonomy items I created in Chapter 3.

The information I have generated in my study contributes to the literature on capacity development for biodiversity conservation and informs how future researchers apply psychological literature to the study of conservation initiatives that affect non-Western populations. I have contributed to the capacity development literature by offering a comprehensive definition and tool to measure an important and understudied aspect of individual capacity for biodiversity conservation. This definition and tool also informs a more specific definition of community and institutional capacity. With the deeper understanding of individual capacity offered by my studies, I suggest that community and institutional capacity be redefined to include aspects that are created by local conservation professionals who have meaningful ownership of autonomous decisions they make regarding how to conserve biodiversity in a way that is needed by their community. Researchers who intend to apply psychological literature in the study of

conservation topics can also learn from the lessons inherent in my studies. While some psychological dimensions were found to be universal across populations, I also found that North American and African populations varied greatly in their orientation to those dimensions. The important differences found across populations in my studies strongly suggest that future conservation psychologists adapt psychological definitions and test the validity of psychological tools directly in the non-Western population before applying those definitions and tools to that population.

The information described in these chapters also has implications for the practice of capacity development for biodiversity conservation. First and foremost, my results strongly suggest that increasing knowledge and skills is not enough to effectively increase the capacity of local professionals to conserve biodiversity. This finding implies that practitioners need to consider how their training methods and other capacity building strategies are affecting PCBC in individuals. These studies also suggest training methods and provide a generalized, quantitative tool by which practitioners can design and evaluate their programs to increase PCBC. Finally, my studies confirm that it is prudent for practitioners to implement methods and tools that increase PCBC because my findings have empirically shown that PCBC predicts 34% of long-term capacity behavior in conservation professionals.

Limitations of this research include the fact that only two populations of conservation professionals were included in the study, and only the East African population was tested for all five dimensions of PCBC. Further research is necessary to determine how all PCBC dimensions apply to a North American population and to create a PCBC definition and instrument that can be applied to populations of conservation

professionals in regions outside of North America and Africa. Future cross-cultural studies can help to further inform a deeper understanding of the universal and variant dimensions of PCBC. Additionally, the PCBC instrument and delivery methods will need to be adapted further before this instrument can measure PCBC in local community members who have less education than the conservation professionals in the current study. These two future research avenues may lead to a more generalized PCBC instrument that can be employed across populations and cultures. Furthermore, even though I did attempt to account for trainees' perspectives on their long-term capacity behaviors, the definition of these behaviors was still largely based on trainer opinion. A deeper analysis of alumni and other stakeholder opinion is needed to more fully investigate how PCBC correlates with a diverse range of potential indicators of the long-term capacity of conservation professionals. Finally, this study only focuses on how PCBC predicts individual-level capacity. While an individual-level focus suited the purpose of this study, further research is necessary to better understand how PCBC is related to indicators of community or institutional-level capacity. To do this, PCBC will need to be nested in a framework that accounts for the social, political, economic, and structural variables that affect whether or not a willing individual is allowed to apply their skill toward the mission of local conservation over time.

Inherent in the definition of capacity building for biodiversity conservation is a requirement for practitioners to implement strategies that will strengthen the capacity of a region using methods that will foster the continued growth or at least maintain the stability of that capacity over time. The research I've presented in this dissertation has helped our field better understand how to strategically develop and evaluate this type of

sustained capacity. In doing so, I have begun to create a framework to define the second order infrastructure of individual capacity development for conservation. Using this infrastructure, we move closer to the tandem goals of human development and biodiversity conservation.

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