AGRI-‘CULTURE’ AND BIODIVERSITY: RETHINKING PAYMENTS FOR ECOSYSTEM SERVICES IN LIGHT OF RELATIONAL VALUES

by

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Abstract

Agricultural land management has major implications for biodiversity and ecosystem services, including the many cultural and social values that agricultural landscapes provide. A key challenge is balancing trade-offs between these diverse and sometimes conflicting goals. One popular but controversial tool to address this challenge is Payments for Ecosystem Services (PES) programs, which offer agricultural producers monetary compensation for stewardship actions. In this dissertation I consider the role of environmental values in policy-making and program development, both for PES or alternative policy options to address the ecological impacts of agriculture.

The first study examines the consequences of applying a metric (as a simple scientific tool) towards the challenge of food system sustainability in Vancouver, Canada. Via a case study examining four different policy options (including a PES program), I conclude that the Ecological Footprint, when applied as a sustainability metric, led the city towards a ‘metric trap’ that excluded policy options and prioritized particular values. The second study examines an incentive program in Costa Rica that pays farmers to protect forested land. I show that while program management focused on the instrumental values of nature and used an economic framing for the program, most participants focused on values about their relationships to the land (relational values) and saw the program as a type of help or support. The final two studies examine an incentive program for riparian buffers on agricultural land in the Puget Sound region of Washington State (USA). In the third study, I use interviews with land managers to show how key program rules conflict with farmer and rural land manager values. The fourth study draws on expert interviews and document analysis to show the ways that supposedly value-free scientific guidelines, in reality, express a suite of values regarding culture, landscape and place.

This dissertation as a whole shows the ways that environmental policies and programs articulate values about what matters, and why, via supposedly value-free rules, regulations, metrics and guidelines. I conclude by offering suggestions for how agri-environmental incentive programs could be made more effective and popular by incorporating values-thinking.
Lay Summary

Feeding the world without destroying Earth’s ecological life support systems is one of humanity’s greatest challenges. Agricultural land management impacts biodiversity, air and water quality, and also cultural values of agricultural landscapes. Various incentive programs offer agricultural producers monetary compensation for stewardship actions such as maintaining forest fragments or creating riparian buffers. I examine the roles of environmental values in agricultural environmental incentive programs and show how conservation program participants, policy makers and stakeholders can have conflicting values. Failing to acknowledge these values and value conflicts can lead to a) policy paralysis, b) conflicts around program design, c) disconnects between programs and participants, and d) resistance of agricultural producers to participate in conservation programs. Programs and polices, for agriculture and biodiversity or for other sectors, can benefit from explicitly learning about and incorporating the values of those involved.
Preface

Chapters 2, 3, 4 and 5 of this dissertation are intended to be published as distinct manuscripts in academic journals. As standalone contributions they therefore have some repetition in the research context. Because these chapters are intended to be published as co-authored journal articles, they use a plural voice.

A version of Chapter 2 has been published in the journal *Sustainability Science* [Chapman, M., LaValle, A., Furey, G., & Chan, K. M. A. (2017). Sustainability beyond city limits: can “greener” beef lighten a city's Ecological Footprint? Sustainability Science, 9, 1146. http://doi.org/10.1007/s11625-017-0423-7]. The research questions and analysis were developed collaboratively between LaValle, Furey and myself. Kai Chan provided overall guidance and input for developing the paper and situating it in relevant literatures. As lead author, I was responsible for writing the majority of the paper and for coordinating contributions from all other authors and implementing revisions. The project itself was initially developed within a graduate course taught by Kai Chan. The figures were developed by LaValle (Fig 1) and Furey (Fig 2) based on input from all co-authors.

Chapters 3, 4 and 5 are all based on my own original empirical research. I conducted all of the interviews, coded all of the transcripts and documents, and conducted all of the analysis. Kai Chan provided guidance and support on all aspects of the research process for all chapters, including research plans, interview protocols, analysis, interpretation, writing and presentation. Terre Satterfield provided detailed guidance and input on the interview protocols, fieldwork, research ethics, data analysis, interpretation of results and presentation of qualitative data for Chapters 3, 4 and 5.

Logistical support and background information for Chapter 3 were provided by the FuturAgua research team collaborators, especially Alejandra Echeverri, who also helped to correct my Spanish-language documents and offer guidance for finer level translation issues. I conducted all interviews and analysis in Spanish, in which I am a fluent (but not native) speaker. Co-authors are Kai Chan and Terre Satterfield, who contributed substantially to the interpretation of the
results, as well as Hannah Wittman, who provided input on the conceptual framework. All three co-authors provided substantial feedback and revisions to the manuscript. I designed and produced all of the figures. Chapter 3 was approved by UBC’s Behavioural Research Ethics Board (certificate number H16-01171).

Initial contact with non-academic research partners for Chapters 4 and 5 was conducted by Noah Enelow. Kelly Biedenweg provided feedback on a stakeholder report based on the data presented in Chapter 4. Monte Marti facilitated fieldwork and interview contacts and provided background information. Co-authors for Chapter 4 are Kai Chan and Terre Satterfield, who provided input on and revisions to the manuscript and assisted in the interpretation of results. I designed and produced all of the figures. Additional input on the manuscript was provided by Hannah Wittman.

Chapter 5 was conducted with support from the UBC Public Scholar’s Initiative. The research design was developed with support from Kai Chan, who along with Terre Satterfield, helped me to interpret the results. Co-authors for Chapter 5 are Kai Chan and Terre Satterfield, who provided guidance and input on writing and developing the manuscript. Additional input on the manuscript was provided by Hannah Wittman. Chapters 4 and 5 were approved by UBC’s Behavioural Research Ethics Board (certificate number H13-02135).
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<tr>
<td>‘CoV’</td>
<td>The City of Vancouver</td>
</tr>
<tr>
<td>‘the City’</td>
<td>The City of Vancouver</td>
</tr>
<tr>
<td>BC</td>
<td>British Columbia</td>
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<tr>
<td>CREP</td>
<td>Conservation Reserve Enhancement Program</td>
</tr>
<tr>
<td>EF</td>
<td>Ecological Footprint</td>
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<tr>
<td>EFA</td>
<td>Ecological Footprint Analysis</td>
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<tr>
<td>ES</td>
<td>Ecosystem Services</td>
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<td>ESA</td>
<td>Endangered Species Act</td>
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<tr>
<td>FEMAT</td>
<td>Forest Ecosystem Management Assessment Team</td>
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<tr>
<td>FONAFIFO</td>
<td>Fondo de Financiamento Forestal de Costa Rica (National Forestry Financing Fund)</td>
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<td>FSA</td>
<td>Farm Service Agency</td>
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<tr>
<td>GCAP</td>
<td>Greenest City Action Plan</td>
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<tr>
<td>GHG</td>
<td>Greenhouse Gas(es)</td>
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<td>NGO</td>
<td>Non Government Organization</td>
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<td>NMFS</td>
<td>National Marine Fisheries Service</td>
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<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>NRCS</td>
<td>Natural Resources Conservation Service</td>
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<td>Abbreviation</td>
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<tr>
<td>NWIFC</td>
<td>Northwest Indian Fisheries Commission</td>
</tr>
<tr>
<td>PES</td>
<td>Payment for Ecosystem Services</td>
</tr>
<tr>
<td>PSA</td>
<td>Pagos por Servicios Ambientales (Payments for Ecosystem Services—Costa Rica’s nationalized program)</td>
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<tr>
<td>PSI</td>
<td>Puget Sound Institute</td>
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<td>PSP</td>
<td>Puget Sound Partnership</td>
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<tr>
<td>SCD</td>
<td>Snohomish Conservation District</td>
</tr>
<tr>
<td>TRAR</td>
<td>Treaty Rights at Risk</td>
</tr>
<tr>
<td>UBC</td>
<td>University of British Columbia</td>
</tr>
<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
</tr>
<tr>
<td>Vancouver</td>
<td>The City of Vancouver</td>
</tr>
<tr>
<td>WDFW</td>
<td>Washington State Department of Fish and Wildlife</td>
</tr>
<tr>
<td>WSCC</td>
<td>Washington State Conservation Commission</td>
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Dedication

I dedicate this dissertation to Ann Kennedy for sharing with me her passion, wisdom and kindness.
Chapter 1: Introduction

Increasingly, global land use is dominated by agricultural production systems for food, fuel and fiber (Foley et al., 2005). Crop and pasture lands cover around 38% of earth’s ice-free land (Foley et al., 2011). Agricultural production systems are a key driver of ecological impacts that may approach planetary boundaries, including climate change, global freshwater use, biogeochemical flows of nitrogen and phosphorus, land system change, biodiversity loss, and chemical pollution (Rockström et al., 2009). Humanity depends on agricultural lands not only for the production of food, but also for carbon sequestration, air quality regulation, water quality and flow regulation, mediation of infectious diseases, and as habitat for biodiversity (Foley et al., 2005; G. P. Robertson & Swinton, 2005). Agricultural lands are also important as cultural landscapes, for recreation and tourism, and for human livelihoods (Fish, Seymour, & Watkins, 2003; Plieninger, Dijks, Oteros-Rozas, & Bieling, 2013; G. P. Robertson & Swinton, 2005; Vandermeer & Perfecto, 2007; Wittman, 2011). Agricultural production itself is also dependent upon a suite of ecosystem services, including pollination, pest regulation, water provision and climate regulation (Swinton, Lupi, Robertson, & Hamilton, 2007). Population growth and changing diets are also driving increased demand for food production (Godfray et al., 2010).

While proposals to address the agriculture-environment-food nexus vary greatly, most all agree that substantial changes in both agricultural production systems and related policies are needed (Altieri & Toledo, 2011; E. M. Bennett, Carpenter, Gordon, & Ramankutty, 2014; Clapp, 2016; P. R. Ehrlich & Harte, 2015; G. P. Robertson & Swinton, 2005).

Within the suite of agri-environmental programs and policies that seek to shape food and agricultural production systems, one proposal that has received a great deal of attention, both positive and negative, is payments for ecosystem services (PES) programs (Adhikari & Agrawal, 2013; Gómez-Baggethun & Ruiz-Pérez, 2011; Jack, Kousky, & Sims, 2008; Kemkes, Farley, & Koliba, 2010; Muradian, Corbera, Pascual, Kosoy, & May, 2010; Pascual et al., 2014) (Engel, Pagiola, & Wunder, 2008; Naeem et al., 2015; Pattanayak, Wunder, & Ferraro, 2010; Wunder, 2013). PES programs are voluntary transactions between a buyer and seller where payment is conditional upon provision of a well-defined ecosystem service or a practice expected to produce
that service (Wunder, 2006). In an agricultural context, PES programs often provide monetary incentives to agricultural producers for specific land management changes or practices that are expected to result in benefits for society at large or for a specific group or entity. For example, a producer might receive payments to maintain or reforest upland areas in order to improve water quality and flow for downstream benefits to drinking water, recreation or fisheries.

In one sense, PES put into practice Coase’s thinking on social cost (Muradian et al., 2010). In 1960 Coase proposed an alternative to the traditional Pigovian welfare economics; rather than tax, regulate or assign liability to a factory that pollutes (or another party that inadvertently creates harm), private parties could instead negotiate a mutually agreed upon solution (Coase, 2013). Coase proposed to change the way we look at pollution and other types of social costs of business; rather than see these as a one-way harm imposed upon other people or society, we could also see the restriction or taxation of the harmful activities as inflicting harm on the business or party that caused them (Coase, 2013). Thus in the private version of PES, rather than push for government regulations, downstream water uses instead pay upstream landowners for changes in management practices. Importantly, Coase suggested that how we assign these rights and responsibilities is a social choice (Coase, 2013). Do businesses have a right to pollute, or alternatively, do people have the right to a clean environment (Polasky, Doremus, & Rettig, 1997)(Boyd, 2012)?

In theory, PES are a market alternative to government regulation or taxation (Muradian et al., 2010; Wunder, 2013). Given a clear delineation of property rights, low transaction costs, and the right distribution of costs and benefits, parties might negotiate a mutually beneficial agreement without government intervention (Coase, 2013). In practice, PES usually do involve some level of government intervention, to the extent that in many famous programs (e.g., Costa Rica’s nationalized program) the government acts as the primary ‘buyer’ of ES (Engel et al., 2008; Muradian et al., 2010; Wunder, Engel, & Pagiola, 2008). However, it is this association of PES as a market-based solution that has inspired much of its praise and criticism. In theory, PES might be integral to the future of conservation (The Economist, 2005a), forging new paths to greatly expand the funding available for conservation (Kareiva, Marvier, & Lalasz, 2012), and leading to innovative and efficient solutions in the right contexts (Kinzig et al., 2011; Wunder,
2013). Alternatively, PES programs might undermine motivations for conservation (Luck et al., 2012), lead to the commodification of nature (Gómez-Baggethun & Ruiz-Pérez, 2011; Kosoy & Corbera, 2010), and increase existing global inequalities (Wittman, Powell, & Corbera, 2015).

Yet in practice, PES programs operate quite differently than in theory (Engel et al., 2008; Muradian et al., 2010; van Noordwijk et al., 2012; Wegner, 2015). Transaction costs are usually high, government intervention necessary, ecosystem services difficult to clearly associate with specific activities and harder yet to parcel to the extent needed for commodification, and the motivations of both service providers and beneficiaries more complex than mere economic rationality would suggest (Chan, Anderson, Chapman, Jespersen, & Olmsted, 2017a; Engel et al., 2008; Kinzig et al., 2011; Muradian et al., 2010; Porras, Barton, & Miranda, 2013; van Noordwijk et al., 2012; Vatn, 2010; Wegner, 2015). Yet key questions remain around the ways that social, ecological, historical, political and institutional factors interact to shape PES outcomes (Van Hecken, Bastiaensen, & Windey, 2015).

In this dissertation I explore PES programs ‘in the wild.’ I seek to understand how they work from the perspective of those people and groups involved in PES in agricultural contexts. I examine the experiences of several key groups that interact with PES programs—from policy makers to land manager participants, from program managers to those that might pay into or benefit from ES provision. How do these different groups make sense of and engage with this new instrument?

On a basic level, PES programs require three things: buy-in from beneficiaries, participation from service providers and agreement on the conditions of ES provision and payment. In practice, each of these components presents challenges. How do PES programs gain traction and support from ‘beneficiaries,’ including urbanites who consume the products from agricultural landscapes? What do these beneficiaries expect in return from a PES program? And how does that shape the demands they make on service provision? A second set of questions surrounds how participants (suppliers of ES in this terminology) perceive PES programs. What attracts them to, or repels them from, participation? Do they see PES as a new market or as another government program (given that most PES are mediated or run by governments)? As PES are
rarely spontaneous agreements between beneficiaries and service providers, what roles to policy makers, program managers and facilitating (intermediary) organizations play in developing, implementing and negotiating the conditions for PES programs?

Values, of various sorts, are central to PES programs. There is the value of the ecosystem service enhanced or protected by the program, the value of this service in terms of how much beneficiaries are willing to pay, and the value of the payment to the service provider. But, as I hope to show, values are involved in many other (sometimes surprising) aspects of PES programs. In particular, I use the lens of environmental values to consider: buy-in from beneficiaries, participation of service providers, and agreement on the terms and conditions. I focus specifically on agricultural contexts for PES programs and consider how a values lens offers ways to ‘rethink’ PES. I also consider the role of values in broader questions around policy-making and program development, both for PES or alternative policy options to address the ecological impacts of agriculture. In this I focus on the role of policy metrics and program requirements; both are sometimes assumed to be value-neutral, but how do they actually carry baggage in the form of inherent values? And what effects do these metrics and requirements have for the choice of programs and uptake of those programs?

In this dissertation, I develop an approach to understanding and identifying environmental values and apply it to understand the values of PES program participants and policy makers in two programs in very different contexts. In one program I focus on PES as an institution that might articulate market-based values and logics; in the other I consider the way a PES program’s rules can conflict with the ways that participants view their relationship to nature and land. I also examine two specific policy processes to understand to what extent different values are incorporated into these processes. In one, I analyze the role and interaction of riparian science and environmental values in a debate over a particularly contentious condition for a PES program. In the other debate, I examine the role of ecological metrics in shaping city sustainability policy to address the impacts of food consumption and consider the potential of PES as a policy solution. In addition to literatures on PES and on environmental values (reviewed below), I draw on prescriptive and descriptive literatures on the use of science in environmental decision making (such as R. S. Gregory, Failing, Harstone, Long, & McDaniels,
2012; Newton, 2011; Pahl-Wostl, 2009) and on the idea of PES as an institution that articulates values (Vatn, 2010), described below. I also seek to attend to some of the lessons of political ecology, such as the importance of power and politics, the interaction between the biophysical and social worlds, and the political nature of framing environmental problems (Forsyth, 2003; Robbins, 2012). I consider PES as an institution, embedded in social-ecological processes and contexts, in line with several recent proposals (Muradian et al., 2010; Vatn, 2010) (Van Hecken et al., 2015; Wegner, 2015).

1.1 Considering the dual challenge of agricultural production and biodiversity preservation

Concerns with feeding the world date back at least to Thomas Malthus’s realization in 1798 that population was growing exponentially while agricultural production only linearly (Malthus, 1959). It was only a matter of time, Malthus presumed, before population growth would overshoot agricultural production. Since then, large-scale land conversion from forests to pastures and fields; inputs of mined phosphorus, synthetic nitrogen, and irrigation; specialized breeding and GMOs; along with mechanization of production and harvest, preservation and transport advances have allowed food production to keep up with population growth (P. R. Ehrlich & Ehrlich, 2016; Foley et al., 2011). Yet these advances have come with substantial costs to biodiversity and ecosystem services (P. R. Ehrlich & Harte, 2015; Green, 2005; Rockström et al., 2009).

Prominent authors have called for solutions to address the dual challenge of ‘feeding the world’ without undermining it ecologically (Foley et al., 2011; Godfray et al., 2010). Substantial debate arose over whether land sparing—intensive agriculture that might ‘spare’ natural habitats—or land sharing—wildlife friendly farming that might ‘share’ land via habitat or ecosystem service provision—might best address this challenge (J. Fischer et al., 2011; Green, 2005; Phalan, Onial, Balmford, & Green, 2011; Tscharntke, Clough, Wanger, & Jackson, 2012). More recently, this framing has been critiqued for failing to address the actual causes of deforestation or hunger, leading for calls to ‘move forward’ (Coates, 2013; J. Fischer et al., 2014; Perfecto & Vandermeer, 2010; I. Tomlinson, 2011). Much work now revolves around the concept of
sustainable intensification, which assumes a need to increase production and improve yields, while also attending to environmental impacts and allowing for diverse approaches based on context (T. Garnett et al., 2013; Tilman, Balzar, Hill, & Befort, 2011).

Others have also critiqued the sustainable intensification framing as failing to account for the political and power dimensions of production and consumption (Clapp, 2016) (Vandermeer & Perfecto, 2007) (Altieri & Toledo, 2011). These authors have argued for inclusion of concepts of justice (Loos et al., 2014), rights and sovereignty (Chappell et al., 2013; Wittman, 2011), global policies and trade (Clapp, 2014), as well as a focus on history and place (Barthel, Crumley, & Svedin, 2013). The sustainable intensification literature has largely treated biodiversity conservation as potentially compatible with but ultimately outside or alongside agricultural production (e.g., in forest fragments or wildlife friendly farming). However, for many communities, biodiversity also exists within the diversity of crop varietals used in agricultural production systems and is embedded in social and cultural systems that support this agrobiodiversity (Barthel et al., 2013; Shepherd, 2010; Wittman et al., 2016). Those endorsing food sovereignty seek to situate values (e.g., of justice, stewardship, or citizenship) more directly in debates about agricultural production that can otherwise seem purely technical (Chappell et al., 2013; J. Fischer et al., 2014). Sustainable intensification also implies particular values, though these are not always articulated explicitly. For an implicit example, the imperative to increase food production 70 to 100% by 2050 was used to focus policy towards increasing production while downplaying issues of access and demand (I. Tomlinson, 2011).

1.2 Payments for Ecosystem Services

These different arguments about the challenges facing agriculture shape the types of policy prescriptions suggested, e.g., technological advances and diffusion methods for higher yields tend to accompany those who argue for increasing food production (Connor & Mínguez, 2012). Land reform (Blesh & Wittman, 2015) and alternative food networks (Carlisle, 2015) are often suggested as solutions from those who argue for food sovereignty. Payments for ecosystem services (PES) are favored by many different parties for various reasons, and they are often
suggested as one practical tool by those who argue for sustainable intensification (Foley et al., 2011).

PES, and the application of market instruments and logic to environmental problems generally, have been controversial. One set of critiques concern the implicit and/or explicit monetary valuation of nature within PES. Monetary valuation of nature can be problematic (in part) because it requires expressing multiple and often incommensurate values into a single unit and because certain types of values (e.g., spiritual) can be degraded via expression in monetary units (for excellent reviews see Fischhoff, 1991; Gómez-Baggethun & Ruiz-Pérez, 2011; Spash, 2008). However, many of the objections about placing a dollar value on nature are less problematic when the decision context is both real and specified (R. S. Gregory et al., 2012). Whereas assigning abstract and hypothetical values to ecosystems or their benefits is problematic, choosing between specific alternatives that include price information is generally accepted (R. S. Gregory et al., 2012). This may be the case for PES, too. In theory PES can be effective instruments for conservation when the benefits of an ecosystem service are greater than the costs to service providers of providing it (Wunder, 2013), thus the amount of the payment implies a minimum value of the ES. However in reality neither the value of the benefits nor the full costs are often calculated (Ferraro, 2011). As the payment is rarely chosen via explicit monetary valuation of the ES provided, in practice PES programs are more similar to other policy choices where the decision context is both real and specified (e.g. should a group of service providers be paid a specified amount for a defined activity expected to provision one or more desired ES?) (Wunder, 2013).

A related set of critiques surrounds the idea that PES might lead to commodification of nature (Gómez-Baggethun & Ruiz-Pérez, 2011; Kosoy & Corbera, 2010). While in theory monetary valuation need not lead to commodification, in the context of increasing use of market-based instruments worldwide, once something has been monetarily valued, commodification is likely to follow (Gómez-Baggethun & Ruiz-Pérez, 2011). Several problems with commodification have been described. There is an ethical argument, similar to that for monetary valuation, that some things should not be bought and sold (Spash, 2008). Commodification might also function as a complexity blinder (à la Norgaard’s critique of ES) in that it obscures and externalizes both
the labor of humans and of “ecosystem workers” (M. J. Peterson, Hall, Feldpausch-Parker, & Peterson, 2010) and requires the creation of discrete units for exchange which is in opposition to the interconnected nature of ecosystems (Gómez-Baggethun & Ruiz-Pérez, 2011; Norgaard, 2010; Sullivan, 2012). A further problem is the potential to exacerbate existing inequalities via transforming open-access public goods into private goods, especially if these goods are banked or traded (Gómez-Baggethun & Ruiz-Pérez, 2011; Sullivan, 2012). This last critique (of equity) is particularly interesting in the case of PES, which is sometimes suggested as a way to alleviate poverty (Pagiola, Arcenas, & Platais, 2005). PES might serve to transfer resources to rural smallholders if structured, as some propose, as compensation for ecosystem services (McAfee & Shapiro, 2010). Alternatively, those most in need of payments can be excluded as those with larger land for enrollment can more efficiently participate (Porras et al., 2013; Wittman & Caron, 2009).

PES might also change the relationship between people and nature (Kosoy & Corbera, 2010) to the extent that commodification involves “a modification of relationships, formerly unaffected by commerce, into commercial relationships,” (Gómez-Baggethun & Ruiz-Pérez, 2011, p. 620). So in the case of PES, a farmer might have maintained a forest fragment out of a sense of responsibility or stewardship, but when paid for that forest fragment, they may then see their own relationship to the forest differently (e.g., changing the relationship from one of land steward to one of ‘fee for service provisioning’) (Fisher, 2012).

One specific concern within commodification critiques is the potential of PES to lead to motivational crowding out, e.g., where financial incentives erode altruistic or other non-instrumental motivations (Bowles, 2008). This is particularly concerning as such processes may be difficult to reverse (Gneezy & Rustichini, 2000). While the commodification literature discusses the issue of crowding out, this concept has largely been developed in the psychology literature (Fehr & Falk, 2002) and as such can be considered as a third set of critiques. The idea behind PES originates from a neoliberal economic understanding of motivations for addressing environmental problems—that humans are economically rational beings (Levine, Chan, & Satterfield, 2015). A key concern in this regard is that by treating humans as economically rather than morally motivated, they might respond in more selfish and less morally motivated ways...
(than programs that assumed moral or other motivations) (Bowles, 2008). Many authors have pointed to the potential of PES to lead to motivational crowding out (Gómez-Baggethun & Ruiz-Pérez, 2011; Kosoy & Corbera, 2010; Luck et al., 2012; Muradian et al., 2013; Vatn, 2010), however empirical results are mixed. In some cases PES ‘crowded in’ non-economic motivations and most studies have been experiment or lab-based, rather than examining existing programs (Rode, Gómez-Baggethun, & Krause, 2015; Olmsted, 2017). Thus more empirical work is needed to investigate fundamentally and specifically the potential for and mechanisms behind the capacity of PES to lead to motivational crowding out (or in).

Much work on the potential of PES to lead to commodification and the implications of this, has focused on carbon sequestration, where international markets, explicit prices and more standardized accounting have been developed (such as REDD+ or carbon offsetting programs) (Bottazzi, Cattaneo, Rocha, & Rist, 2013; Wittman & Caron, 2009). However no international markets exist for payments for other types of services (e.g., hydrological, scenic beauty, or biodiversity protection) and payments and conditions are negotiated on a program by program basis (Wunder, 2013), though some propose standardizing PES for non-carbon services in much the way of carbon standards (Naeem et al., 2015). Thus it is important to explore how these concerns play out for non-carbon PES programs.

Above and beyond concerns with PES as a monetary instrument, are debates about the social and ecological impacts of programs on the ground, including their efficacy in achieving social and ecological outcomes (Pagiola, 2008; Wunder, 2007). Should programs aim solely to benefit ‘nature’ or should they also incorporate poverty reduction or development goals (Adhikari & Agrawal, 2013; Pagiola et al., 2005; Porras et al., 2013)? Often programs face a trade-off between greater equity and greater efficiency (Kinzig et al., 2011; Pascual, Muradian, Rodriguez, & Duraiappah, 2010). Economic efficiency of PES could be achieved by paying more (or only) for high value conservation areas and not paying those who would conserve regardless of the payment (Kinzig et al., 2011). However such an approach might be seen as unjust and could then be more likely to undermine values of stewardship (Chan, Balvanera, Benessaiah, Chapman, Díaz, Gómez-Baggethun, Gould, Hannahs, Jax, Klain, Luck, Martín-López, Muraca, Norton, Ott, Pascual, Satterfield, Tadaki, Taggart, & Turner, 2016b; Pascual et al., 2014). Therefore a
consideration of program design is also key to understanding the on-ground impacts of PES programs.

1.3 Environmental values and the culture of agriculture

Environmental values are important for many contexts, from participatory decision making (Fish, 2011; see R. S. Gregory et al., 2012) to policies and programs that are developed without structured processes. All decision-making involves both scientific/technical and value/ethical dimensions (as described in the case of GMOs by Jasanoff, 2005). As such, a variety of approaches seek to account for values in order to inform decision-making and policy. A common approach is to use ecosystem services assessments of the contribution of different environmental goods and services to valued ends (e.g., benefits of forest cover for water quality and flow regulation) (Brauman, Daily, Duarte, & Mooney, 2007), which in some cases are converted into monetary valuations (e.g. Barbier et al., 2008). There is a spectrum of approaches to values, both in methods and in the types of values considered: social psychological approaches that treat values as individual priorities, ES assessments that treat them as contributions to a goal, economic approaches that treat values as individual preferences, and scholars whose work treats values as relations (Tadaki, Sinner, & Chan, 2017).

In this dissertation, I focus on the role of values as relations. In chapter 3 I elaborate on my approach to studying values and in the conclusions of this dissertation I reflect upon the implications of this approach. Briefly, I define values as: what matters, to whom and why (in line with the 'thick ethics' approach suggested by O'Neill, Holland, & Light, 2008). This definition incorporates both rights and principles and as such is broader than many approaches (e.g., political scientists and political ecologists generally see rights as an expression of politics and not values) (Dietz, Fitzgerald, & Shwom, 2005). I also consider environmental values broadly, not only as values of care or concern towards the environment, but the full suite of relationships that people might have towards nature (including values of mastery or extraction) (Kellert, 2005; Trainor, 2006). I take this broad approach to better incorporate the ways that many people use ideas of values in everyday life (Dietz et al., 2005; O'Neill et al., 2008).
A key insight from diverse literatures is that the choice of method or approach to values then also constrains the types of values considered (Satterfield, Gregory, Klain, Roberts, & Chan, 2013; Spash, 2008; Vatn, 2009) (Bowles, 1998). Much of the literature based on this idea arose from critiques of the application of economics tools to conservation programs (Sagoff, 1998; Vatn, 2005). In particular, critics worry about the possibility of commodification of nature resulting from the application of economic science to conservation problems (Kosoy & Corbera, 2010; Spash, 2008). The use of economic valuation methods in particular led to the concept of ‘value articulating institutions' to describe monetary valuation methods as institutions that not only assess values but also articulate particular types of values by their design (Vatn, 2005). As a product of that same economic logic, tools such as PES can also articulate particular values (Vatn, 2010). More broadly, a variety of different scientific tools and methods might also (unintentionally) articulate values in certain contexts. This may be especially likely for applied tools such as conservation planning, indicators and metrics, and science-based guidelines.

Institutions of all sorts thus articulate values and/or constrain the types of values considered (Vatn, 2010). This can lead to two kinds of problems for programs and policy: 1) key values of participants or affected groups may be excluded and 2) the values of participants or affected groups may conflict with those articulated by programs or policies. As to the first, the failure to engage with the values of participants and affected communities can cause conservation efforts to stumble or even backfire. For example, requirements that decisions be made solely on the basis of science can lead to dysfunctional decision-making processes as participants deploy technical arguments to stand in for their ‘fugitive’ values (Satterfield & Levin, 2007). Local communities may resent conservation programs that ignore their values (West, 2006). And programs that prioritize economic benefits may crowd out existing motivations for conservation (Rode et al., 2015).

More broadly, the second problem is that conservation programs and their intended participants may have different values. For example, conservationist values often promote ‘letting nature do its thing’ (see Marris, 2011) whereas agrarian values quite frequently promote ‘getting your hands in the dirt’ (e.g. Carlisle, 2013). These two perspectives can lead to very different land management philosophies. Another example of value clashes is between food sovereignty or
agroecology movements and those values embodied by industrialized food production (Carlisle, 2013; Chappell et al., 2013). The role of value differences in conservation programs has also been explored by political ecology and environmental history literature, including the attendant differences in values about nature (Cronon, 1996; Gareau, 2007; Shepherd, 2010; West, 2006). A third example is pertinent to the agricultural context: rural communities and urban in-migrants may clash over the use of the landscape for production or “consumption” purposes (McCarthy, 2007; P. Walker & Fortmann, 2003).

These examples point to the importance of shared values (Irvine et al., 2016; Kenter, 2016) in many rural and agrarian communities, in a sense making up the ‘culture’ or cultures (as pertaining to different cultures within a community or between communities) of agriculture. A key premise of this dissertation is that agriculture is not only an activity or job, but also a way of life and an expression of values (Burton & Paragahawewa, 2011; Busck, 2002; Carlisle, 2013; Smith, 2003; Wittman, 2010).

1.4 Chapter overviews

In this dissertation I address PES programs in agricultural contexts considering how PES could be re-imagined via: a) a richer understanding of the many values dimensions of such programs, and b) considering the role of institutions in articulating values. Each chapter in this dissertation seeks to ‘rethink’ PES programs from a different angle—examining the values and perspectives of consumers, beneficiaries, rural land managers that supply ES, program staff and policy makers. I first consider the role of potential beneficiaries to an emerging PES program and the potential applicability of PES to a new context. I ask specifically how PES might (or might not) get taken up in city-level sustainability policy. The following two chapters then turn to focus on the experiences of participants in two PES programs, considering in turn the ways that each PES program articulates values. I ask how one program embodies and translates market logic and values. In the second, I focus on values around land management and ask if the values articulated by the program align or conflict with those of participants. Finally, I turn to focus on the negotiation and agreement of conditions for ES supply and payment in PES programs. I examine
the roles of environmental values and riparian science in an intractable debate about PES conditions.

In my dissertation, I situate my research questions in specific places, policies and programs and work with on the ground partners who might benefit from my work. In the following chapter descriptions I discuss specific problem contexts and research partners as well as the research goals of each sub-project. I begin and end with a chapter focused on policy with the two middle chapters focused on the experiences of participants in PES programs.

1.4.1 Chapter 2

Chapter 2 examines several policy options—including PES—for linking agricultural producers and urban consumers. Much of the food produced on agricultural lands is destined for cities (Folke, Jansson, Larsson, & Costanza, 1997). Yet most city sustainability efforts focus on addressing ecological impacts within city limits (Seitzinger et al., 2012). When cities do consider the off-site impacts of their consumption, they may employ metrics or indicators to assess their impacts and evaluate policies. More broadly, programs and policies of all sorts increasingly employ metrics or indicators to assess progress towards their goals (Carlisle, 2015; Shore & Wright, 2015). For PES in particular, a large group of authors recently called for more standardization of PES programs and proposed baselines, monitoring and metrics as three of four essential principles and guidelines from a natural science perspective (Naeem et al., 2015).

Yet developing ‘good’ indicators and metrics is a challenge (Failing & Gregory, 2003; Hauser & Katz, 1998; Newton, 2011; Satterfield et al., 2013). The idea of an indicator or metric is to assess ‘what matters’ in achieving a particular goal, but oftentimes factors are selected for their ease of measurement rather than their importance (Hauser & Katz, 1998; Satterfield et al., 2013). In this way, the use of indicators and metrics can also shape the way we conceive of goals—essentially specifying ‘what counts’ as achieving those goals. In this way, metrics and indicators also articulate values, a topic I take up in the concluding chapter of this dissertation. Furthermore, poorly designed indicators or those are ill-fit to their context can lead to perverse effects when used as policy goals, to the extent that the actual goal is undermined (Hauser & Katz, 1998;
Newton, 2011). This can happen if actors adjust their behavior to meet the indicator itself, rather than the goal it seeks to measure (a phenomenon called Goodhart’s law) (Newton, 2011). In this chapter I examine a case where a metric (the Ecological Footprint) was used as a policy goal to illuminate more fully the consequences that accompany application of particular kinds of metrics to measure achievement towards sustainability goals.

To do this, I use a case study of the City of Vancouver’s “Greenest City Action Plan.” I focus specifically on the “Lighter Footprint” which sought to reduce the city’s Ecological Footprint by 33%. The Ecological Footprint was co-created by two scientists—Wackernagel and Rees—to assess human impacts on the earth (Rees & Wackernagel, 1996). I examine the ways that the choice of this specific metric shaped the way policy goals for addressing the city’s off-site impacts were conceived. To do this I examine four different policy options. One of the policy options I explored, was the possibility for a nascent PES program to work with the City of Vancouver. This would allow the PES program to increase the number of agricultural land managers it supported in restoration and conservation projects by bringing on board more beneficiaries (i.e., urban consumers) and thus more funding. For each policy option, I assess the role of the Ecological Footprint as a metric in shaping the kinds of policy options considered, including the applicability of PES as a means for advancing city sustainability.

1.4.2 Chapter 3

Chapter 3 focuses on a well-established and popular PES program in Costa Rica. The Pagos por Servicios Ambientales (PSA) was one of the first explicitly PES programs in the world and has garnered substantial attention in research and policy circles (Pagiola, 2008). While excellent work has been conducted examining the ecological and social impacts of the program (for a synthetic review see Porras et al., 2013), less is known about why participants enroll in this oversubscribed program despite relatively little tangible reward. Monetary incentives likely play a role regardless, yet some evidence indicates that other factors are at play (Kosoy, Martínez-Tuna, Muradian, & Martínez-Alíer, 2007). In parallel, many conservationists have recently become concerned that PES programs might ‘crowd out’ intrinsic or altruistic motivations for conservation of nature (as discussed above) (Kosoy & Corbera, 2010; Muradian et al., 2013;
Vatn, 2010), although if and how this occurs is less clear. In my study, I explore a potential mechanism of crowding out—the language and logics employed by the program—and examine to what extent these are adopted by participants, thereby affecting the value-logics that underpin their behavior. If we assume, as I do, that language and logics may accompany certain types of values, then examining the extent to which participants and program managers employ languages of market values versus ‘thick’ relational values (e.g., care, responsibility, stewardship) could reveal a possible mechanism by which crowding out occurs (or why it doesn’t). The service provider/beneficiary relationships within PES programs can take different forms, including a commodity economy or a gift economy, with attendant implications as to the relationship between individual providers, programs and nature (e.g., instrumental or reciprocal) (Kosoy & Corbera, 2010; Vatn, 2010). I therefore ask: how does a PES program embody and translate market logics along the chain of leadership to participants?

In my study, I develop a conceptual framework that connects the language and logic used to describe the program, with the values expressed regarding nature, to better understand the potential mechanisms by which PES might lead to motivational crowding out and/or commodification of nature. I then examine where participants and program managers fall along the spectrum of language/metaphors about the program and nature.

1.4.3 Chapter 4

In contrast to the Costa Rican PSA (oversubscribed despite little tangible reward), some PES programs are undersubscribed despite ample rewards. Chapters 4 and 5 address just such a program in the Puget Sound region of Washington State, USA, in collaboration with the Snohomish Conservation District (SCD). The SCD administers a variety of programs to support conservation practices on private land, including the Conservation Reserve Enhancement Program (CREP). CREP is a federally funded and state administered program that includes funding for the creation and maintenance of riparian buffers along salmon-bearing streams in agricultural lands, as well as offering an annual “rental” payment to landowners. While it less directly adopts the language of PES than the PSA in Costa Rica (i.e., the program does not call itself a PES but does use the language of “rental payment” and “monetary bonus”), CREP
nonetheless has many of the key features of a PES program—conditionality, voluntary enrollment and a payment for meeting these conditions (Wunder, 2015).

A key challenge for many PES programs is enrolling participants. Much literature on farmer decision making and uptake of agri-environmental programs (including PES), follows from a demographic tradition of identifying attributes of individuals and how these may affect participation (Ahnström et al., 2008; Buckley, Hynes, & Mechan, 2012; Farmer, Knapp, Meretsky, Chancellor, & Fischer, 2011; Greiner & Gregg, 2011). However, recent work has called for more incorporation of cultural factors (Burton & Paragahawewa, 2011), a greater emphasis on PES programs as institutions (Vatn, 2010) and a shift in focus to program ‘fit’ with participants’ needs, values and perspectives (Burton, Kuczera, & Schwarz, 2008; Fish et al., 2003; Sorice & Donlan, 2015). In parallel, political ecological studies of conservation efforts in rural and resource dependent communities have identified the challenge of value conflicts between conservation efforts and these communities (Marsden, Banks, & Bristow, 2002; McCarthy, 2007; Satterfield, 2007; P. Walker & Fortmann, 2003; West, 2006). Beginning from these ideas, I ask how the values articulated by a PES program align or conflict with those of potential participants? In so doing, I detail PES as an institution that articulates values and can also ignite value and cultural clashes between conservation programs and rural communities.

To answer this question, I develop a series of questions and themes to elicit a wide variety of environmental values relevant to land management for environmental and agricultural purposes, based on literatures from cultural ecosystem services (Gould, Klain, & Ardoin, 2015; Klain, Satterfield, & Chan, 2014), sense of place (Feld & Basso, 1999) and agrarian values (Carlisle, 2013; Smith, 2003). Upon this basis I examine participation in programs for riparian buffer creation on rural lands in Snohomish County and consider the role of value conflicts between particular program rules and (potential) participants.

### 1.4.4 Chapter 5

One of the CREP rules that conflicted with participant values became the focus of a region-wide debate involving conservation districts, government agencies and treaty-holding Tribes. Chapter
examines this conflict in depth, focusing on the larger policy context. The conflict surrounded a proposal to change the minimum width of riparian buffers funded by CREP from 35 to 100 feet (10 to 30 meters). This proposal came as a response to a call to action from the Treaty Tribes of Western Washington for greater federal oversight and coordination to improve salmon habitat.

The uptake and use of science in conservation policy is a subject of great concern. On the one hand, many potentially useful scientific findings are not incorporated into policies that they might inform (Knight et al., 2008; Naeem et al., 2015; Nguyen, Young, & Cooke, 2017). On the other, relying exclusively or primarily on science to make policy decisions can exclude or obscure other important dimensions of the decision related to values, rights and responsibilities (R. S. Gregory, Failing, Ohlson, & McDaniels, 2006; Satterfield & Levin, 2007; Turner, Gregory, Brooks, Failing, & Satterfield, 2008). Moreover, science itself can become politicized (Pielke, 2006) or powerful actors may misuse the institution of science for their own ends (Oreskes & Conway, 2012). PES programs specifically must grapple with these challenges, as determining the conditions for payment is an exercise in both science (what practices will result in which ecological functions and how do these relate to desired ecosystem services?) and values (how much should be paid for that service? Who should pay? Who should be paid?) (Naeem et al., 2015).

In the context of this controversy about minimum widths of riparian buffers to support salmon habitat, I examine a series of interlinked questions: 1) What are the values and objectives of conservation districts and treaty tribes as pertains to riparian buffers, salmon and farms? 2) How do these shape the way that these groups interpret science, promote particular land use futures, and argue for appropriate thresholds and conditions for payment? 3) Given answers to 1 and 2, how was riparian science used, contested and reproduced in this intractable policy debate? To answer these questions I used expert interviews and document analysis. I use a ‘forensic’ study approach to trace the ways that ‘facts’ and figures were used and reproduced in the scientific and policy processes.
1.5 Summary

In the conclusion to the dissertation (Chapter 6) I reflect on the ways we might ‘rethink’ PES programs, based on the empirical and theoretical insights generated by the above studies. To this end, I consider the ways that various sorts of institutions, including PES as well as metrics like the EF, function to articulate values. I further discuss the ways that scientific metrics and guidelines function to shape policy options, goals and debates. And I place these in the context of the broader debates about how and in what ways agricultural production and food consumption systems ‘ought’ to change in the coming decades. I finally consider the implications of my dissertation for the design of conservation policies and programs of all sorts. It is my hope that this dissertation will help conservation policy makers to design more effective policies and programs by engaging the conservation community in a discussion of how values matter for environmental problems.
Chapter 2: Sustainability beyond city limits: Can “greener” beef lighten a city’s Ecological Footprint?¹

2.1 Introduction

By 2050, it is projected that two thirds of the world’s population will live in cities (United Nations, Department of Economic and Social Affairs, Population Division, 2012). This increasing urbanization is placing a growing strain on surrounding regions and the global market (Grimm et al., 2008; Kennedy, Cuddihy, & Engel-Yan, 2008). However, economies of scale and density allow cities with sustainability policies to reduce per-capita impacts more quickly than rural and suburban communities (Artuso, 2011). To address climate change, locally driven action at the municipal level has been championed as a solution to international inaction (Kates & Wilbanks, 2003; Lee, 2014). Indeed, Wackernagel et al. claim that “[t]he global effort for sustainability will be won, or lost, in the world’s cities” (2006, p112).

To date, most efforts at city sustainability are focused inwardly, missing many if not most of the important impacts of cities and their residents (Grimm et al., 2008; Seitzinger et al., 2012; Seto et al., 2012). However, city’s impacts on biodiversity and ecosystem services also occur in rural (often agricultural) and sparsely populated areas (Folke et al., 1997; Rees, 2012; Wackernagel et al., 2002). Food consumption is one such key impact, as cities must import the vast majority of their food from outside city limits. Agriculture and pasture lands account for about 40% of the world’s land and impacts include water quality degradation, salinization, soil erosion, fertility loss, and loss of habitat (Foley et al., 2005). Yet common foci of city sustainability initiatives are generally inward-looking, e.g., urban green spaces for biodiversity, urban ecosystem services and the wellbeing of urban residents (Berghöfer, Mader, Patrickson, Calcaterra, & Smit, 2011; Schewenius, McPhearson, & Elmqvist, 2014); public participation and livability/quality of life (Taylor, 2012); and climate change adaptation and mitigation (Betsill, 2001; Kates & Wilbanks, 2003; Taylor, 2012). What’s missing is consideration of the off-site impacts of city residents’

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consumption, leading researchers to call for more focus on the broader impacts of cities (Jansson, 2013; Seitzinger et al., 2012; Seto & Ramankutty, 2016).

When cities do address environmental impacts beyond their limits, they may apply sustainability metrics or frameworks to evaluate those impacts. Two of the most prominent approaches for sustainability are the Ecological Footprint (EF) and Ecosystem Services (ES). Each represents a fundamentally different approach. EF is a metric and as such it aggregates many different factors into a single numeric system quantifying impacts and resources in terms of productive land via a globally standardized formula. Ecological Footprint Analysis, “is an accounting tool that enables us to estimate the resource consumption and waste assimilation requirements of a defined human population or economy in terms of a corresponding productive land area,” (Rees & Wackernagel, 1996, p. 9). Some studies have used EF to better understand sustainability, for example, comparing the relationship between EF and GDP across nations, (Szigeti, Toth, & Szabo, 2017) or connecting EF and subjective well-being (Verhofstadt, Van Ootegem, Defloor, & Bleys, 2016).

EF’s creators often recommend it for use as a sustainability indicator, suitable for municipal applications (Kitzes, Moran, Galli, Wada, & Wackernagel, 2009; Rees & Wackernagel, 1996; Wackernagel et al., 2006; Wackernagel & Silverstein, 2000; Wackernagel & Yount, 1998). National and international governments, cities, states and provinces have employed it as an evaluative indicator (Global Footprint Network, 2015; Wiedmann & Barrett, 2010). Researchers have also employed the EF concept and methodology to conduct analysis of cities and universities and to draw policy recommendations from these (Lo-Iacono-Ferreira, Torregrosa-López, & Capuz-Rizo, 2016; Lu & Chen, 2017). ES on the other hand, is a framework; it uses not one, but many different measures of impacts, and the measures selected and evaluated can be adapted to local circumstances. Ecosystem Services (ES) can be described “as the provision of direct and indirect benefits to people from ecosystems” (Chan, Satterfield, & Goldstein, 2012b). The ES concept has been employed for sustainability planning and decision making at national, international, municipal and regional levels (Guerry et al., 2015) and now forms the basis of a new international body (IPBES) to assess and address ES and biodiversity on a global scale.
In this paper we reflect on how cities use these concepts, including the kind of data used (e.g. sources and availability) and later policy implications.

This paper’s objective is to ask: what barriers and side effects accompany a city’s application of specific metrics to measure achievement towards sustainability goals? We address this question by way of a case study based on collaboration with the City of Vancouver regarding its efforts to achieve a “Lighter Footprint” towards becoming the ‘Greenest City in the World.’ This goal represents the one target area outlined in Vancouver’s “Greenest City Action Plan” (GCAP) that focused on impacts beyond city limits. Using the case study of beef consumption identified by the City as a potential area of concern, we examine the consequences of the City’s choice of the Ecological Footprint for guiding policy. Literature examining metrics and indicators cautions against pitfalls related to their selection and application (Failing & Gregory, 2003; Hauser & Katz, 1998; Satterfield et al., 2013; Shore & Wright, 2015). One such pitfall of particular concern for our work is that metrics can lead to perverse results as actors adapt to meet the metric (e.g., teaching to the test), a phenomenon known as ‘Goodhart’s Law’ (Hauser & Katz, 1998; Newton, 2011). We investigate the possibility that the use of the EF in this case led to unexpected outcomes that detract from the original goal the metric is intended to measure.

### 2.2 Approach and methods

Our research team was tasked with analyzing opportunities for sustainability via a graduate course (taught by Kai Chan) that featured projects in close collaboration with key actors. In our case these were a) a City of Vancouver staff member tasked with the City’s Greenest City Action Plan Lighter Footprint goal, and b) a British Columbia (BC) cattle rancher seeking to expand a successful Payment for Ecosystem Services program. Both collaborators wanted to know how to move forward to achieve greater sustainability within and beyond their jurisdictions. We saw mutual benefit to finding ways for the city and cattle ranchers to work together. Our research involved regular contact via in person meetings, phone and email with our research partners at the City of Vancouver and at the BC cattle industry, including a meeting involving both research partners. We conducted expert interviews with: our cattle industry research partner, a local expert on grassland conservation, a BC professor researching cattle and natural resource
economics, and the original analyst of the City’s ecological footprint. We also analyzed City
documents, regional, provincial and federal legislation, and white and grey literature on
agricultural land management and city sustainability programs. Academic literatures focused on
beef production and its environmental impacts, ecological footprint methodology and
applications, the ecosystem services framework and Payment for Ecosystem Services programs.
Throughout the research we also reflected on the process of conducting problem-focused trans-
disciplinary research and the application of iterative questioning, illustrated in Figure 1. Our
approach can be described using the concept of triple-loop learning, (Pahl-Wostl, 2009) adapted
for resource governance regimes. Single-loop learning focuses on how to achieve established
goals, whereas double-loop learning calls into question if the right goals have been selected
(Pahl-Wostl, 2009). Finally, in triple-loop learning, the context and frame of reference are called
into question, including new actors and roles (Pahl-Wostl, 2009). Often organizations or
researchers work on single-loop learning problems. While important and useful for many
applications, these can fail when big changes, such as those required by sustainability, are
needed.
As research or learning progresses, barriers inspire reflection. When actions fail to lead to expected outcomes, then moving to the second loop and a new framing of the problem can create new research questions and opportunities. Further surprises push the team to consider a new context in the form on triple loop learning. Adapted from original by Pahl-Wostl (2009 p 360).

2.3 Case description and results

CoV staff asked our team to analyze policy options to reduce the EF of the city’s beef consumption. While the CoV’s plans involved measures to ‘green’ the city in a wide variety of areas, the EF of beef was of particular interest to our team and the city for two reasons:

First, of the ten goals in the City of Vancouver’s Greenest City 2020 Action Plan (GCAP) only the EF goal has its main focus on impacts outside of city limits (City of Vancouver, 2011). The other nine goals focus on sustainability aspects within the City’s limits, such as creating new parks, promoting farmers markets and carbon neutral green buildings. Vancouver’s GCAP Lighter Footprint goal looks to reduce the impact of the City’s consumption to a “one planet
ecological footprint” (City of Vancouver, 2011). To reach this ambitious goal, the City had set the specific target to “reduce Vancouver’s per capita ecological footprint by 33% over 2006 levels” (City of Vancouver, 2011).

Second, within the EF beef was the single greatest contributor. A custom Ecological Footprint Analysis (EFA) was created for the City of Vancouver by UBC PhD candidate Jennie Moore under the supervision of Dr. William Rees, who originally developed the EFA methodology (Rees & Wackernagel, 1996). There are a variety of different approaches to EFA, including new modifications and additions such as using system dynamic models (Lu & Chen, 2017). Moore’s analysis based the EFA on an urban metabolism analysis (Moore, Kissinger, & Rees, 2013). Urban metabolism uses a materials flow approach to quantify the flows of materials and energy through the city to help identify potential interventions (Moore et al., 2013). This analysis determined that 40% of Vancouver’s ecological footprint came from food consumption and 13% of the total footprint came from beef and veal (City of Vancouver, 2011). A wedge analysis of opportunities to reduce the City’s EF found the greatest potential decrease in EF could come from changing food consumption. Specifically reducing consumption of high impact foods (e.g., meat and dairy) by 10%, could reduce the total footprint by 3.4% (Pitre-Hayes, 2011). Other categories such as consumables, buildings and transport had potential total EF reductions of up to 2%.

The GCAP involves both media and communication focused on engaging with the public as well as more detailed reports and analysis focused on setting specific policy goals and strategies and evaluating options. The city reached out to a variety of groups, including local universities, for help with these specific components of the GCAP, including in our case the EF of beef.

2.3.1 Policy option 1: Shifting consumption to local beef

Deciding that a campaign to reduce beef consumption would be politically risky, unlikely to be successful and difficult to implement and measure, in 2012 the City moved to explore if shifting consumption towards local beef would help meet its goals. Vancouver defined “local” as produced in BC. The City assumed that BC beef would have a lower footprint for two reasons: a)
the idea that food miles—the distance the beef would travel from farm to fork—would be an important contributor to beef’s footprint and b) a common view of the BC cattle industry as being more pasture raised and generally ‘greener’. This approach was appealing as it synergized with another GCAP goal, that of local food.

In line with the City’s interest, our first research question was:

1. Would a shift in consumption towards local (BC) produced beef reduce Vancouver’s ecological footprint?

To test our first question regarding food miles we interviewed the creator of the CoV EFA to obtain data on the specific components of beef production that were relevant to our research question. The numbers shown in Figure 2 demonstrated that the contribution of transportation emissions, or “food miles” to beef’s EF is very small, less than 1% (Moore et al., 2013). Given the tiny contribution of food miles to the total EF for beef the difference in food miles between local and non-local beef would not substantially change Vancouver’s EF. Importantly for the GCAP’s specific goals, even a large difference between food miles for BC beef and beef from elsewhere would not make a considerable dent in Vancouver’s overall goal of a 33% reduction in EF. An “eat local beef” strategy would not make Vancouver significantly “greener”, according to its own GCAP metrics.

This finding—that food miles have little direct impact—has been found in other analysis. Particularly for beef, due to the high GHG emissions of production, lifecycle GHG emissions from transportation account for only 6% of total emissions and final delivery only 1% (other transportation emissions come from supply chain impacts, such as transporting feed grain) (Weber & Matthews, 2008). Food miles are more relevant for fruits and vegetables, where total transportation accounts for 18% of impacts (Weber & Matthews, 2008). The mode of transportation (e.g., air versus transoceanic freight) and the production of food itself are more critical factors in the GHG emissions of food than are food miles per se (Edwards-Jones et al., 2008). Even local food proponents worry that focusing only on the distance food travels misses
the main points of the local food movement, which center around a place-based vision of sustainability (DeLind, 2011; Winter, 2003).

While the question of whether a locally based food economy would make Vancouver itself ‘greener’ is complex, the answer to our specific question is clear—a shift in consumption towards local beef will not significantly help CoV to reduce its Ecological Footprint. The EF cannot account for system based or indirect benefits. A local food economy could have myriad benefits not captured by calculations of EF or GHG emissions (Klassen, 2016). Indeed, the CoV has identified this focus as important via another GCAP goal focused specifically on ‘local food’ that supports a place-based vision of local food.

![Components of the Ecological Footprint of Vancouver’s Beef Consumption](image)

*Figure 2.2 Components of the Ecological Footprint of Vancouver’s beef consumption.*

Quantities calculated by Moore subdivided for beef production and based on 2006 data and an urban metabolism framework to calculate EF (Moore 2013). Rangeland and cropland represent the “food land” and do not represent actual hectares used but rather the concept of Global Hectare (GHa) weighted and adjusted annually based on globally available land using EFA methods. Cropland is the proportion of the feed for the cattle (e.g., corn and barley) that was grown on land considered ‘cropland’ by EFA. Rangeland is the proportion of the cows feed consumed from being on pasture considered rangeland as determined by the EFA. Embodied energy and food miles (operational energy) are expressed as the GHa’s needed to sequester the carbon used for each category. Embodied energy accounts for the inputs to produce the feed such as fertilizers. Food miles (the primary component of operating energy) represent the energy required for transportation.
Examining if BC beef had a lower EF led us to discover three key challenges facing the City’s plan to shift consumption toward local beef:

a) Defining “BC beef” as a category proved problematic. Currently, 90-95% of calves in BC are sent outside the province for finishing, i.e. fattening and slaughter, mostly to Alberta (BC Cattlemen’s Association, 2012). In other words, grazing is generally done in BC and feedlots and slaughter generally in Alberta (BC Association of Abattoirs and BC Association of Cattle Feeders 2012). Thus the vast majority of “BC Beef” is also “Alberta Beef.” The impression of BC beef as “greener” comes from a misunderstanding of the production cycle of beef that in this case involves both provinces.

b) On the consumer side, this problem was complicated by the lack of tracking and labeling. At the time, the only way for Vancouver consumers to buy BC beef would be through direct purchase from a ranch in BC. A lack of federally certified abattoirs in BC means that almost all beef must travel to Alberta for processing. Thus BC beef cannot be separated from beef produced in the neighboring province of Alberta, and moreover, most BC beef is not processed locally and may not have lower food miles. A new initiative “BC Beef for BC Markets” has since developed a tracking system to address this problem (bcmeats.ca), however it was not in place at the time of research.

c) Even if 100% BC beef could be tracked and labeled, and it could be 100% produced in BC, calculating an accurate BC specific EF for beef would require extensive additional data, including grazing land type as well as percentage, type and source of feed used. Given the heterogeneity of the production practices, land types and porosity of the defining borders, especially between BC and Alberta, this could prove challenging and may not be the best use of City of Vancouver resources.

The changes that would be needed for Vancouver to lower its EF via local beef would require action beyond the City’s jurisdiction. Development of new market and tracking systems as well as data and analysis beyond the City’s capacity to measure are needed. Not only does Vancouver lack data on the sources of beef that City residents are consuming, it even lacks data on how
much beef residents consume. The City’s EFA used national dietary statistics as no Vancouver specific baseline of beef consumption is available (Moore et al., 2013). Given these challenges, the research team concluded local beef was not a feasible option for CoV resources or a viable option for CoV for reaching the EF reduction goals (e.g. 33% by 2020).

2.3.2 Policy option 2: Shifting consumption to grass-fed beef

Part of Vancouver’s interest in BC beef was the idea that BC beef was more often grass-fed. In 2013 Canada approved the food certification label for 100% grass and forage fed beef so consumers can choose animals that are raised without grain feed throughout their lives (Baumer, 2013). This new certification is in response to previous consumer confusion and producer inconsistencies around the terms such as grass-fed, grass-finished and pasture raised. Since the problem of availability and tracking was now an option, we next addressed this question.

2. Would a shift in consumption towards grass-fed beef lower Vancouver’s EF?

Understanding the impacts of beef, or food production generally, requires not only a tallying of different impacts, but also a consideration of the local context in which these impacts occur (Thibert & Badami, 2011). Compared to other sources of protein, beef production systems rate higher and are much more heterogeneous in terms of land use (ranging from 7 to 420 m2 y /kg) and carbon footprint (ranging from 9 to 129 kg CO2-eq/kg) (Nijdam, Rood, & Westhoek, 2012). As such, the best option for reducing beef production impacts often depends on the local context. For example, in the Brazilian Amazon the increased on-farm land needs of 100% grass-fed beef may fuel deforestation (Havlik et al., 2014). However, in the U.S. and U.K., certain types of grazing can support natural carbon sequestration within grasslands. In some cases grass-fed beef can perform better than more intensive feeding systems, reducing net-carbon emissions between 10-94% (National Trust, 2012). In BC, cattle are often grazed on soils that traditionally hosted native grasslands co-adapted with ruminants, thus light grazing mimics natural systems, encourages deep roots, increases soil biomass and leads to higher carbon sequestration rates than croplands (Bailey, McCartney, & Schellenberg, 2010). Furthermore, the distinction between grass and grain finished beef may only account for a minority of the total impacts of beef.
production. The cow-calf phase of production—shared across grass and grain finished beef—has been found to account for 63% of resource use and emissions impacts (Pelletier, Pirog, & Rasmussen, 2010) and 80% of GHG emissions (Beauchemin, Janzen, Little, McAllister, & McGinn, 2010).

While EF would seem to be the ideal tool to compare land use and GHGs of beef production systems, we found it falls short. For land use, it measures the amount of land, but not the quality of its management. It seeks to minimize land use without the potential for synergies such as promoting biodiversity and ecosystem services. All metrics must simplify, but in the case of grass-fed versus grain-fed beef, these simplifications obscure the most important trade-offs. Between Concentrated Animal Feeding Operations (CAFOs) and fully grass-fed cows lies a spectrum of production practices and the best management practice for any given agrarian landscape may lie somewhere in the middle (Beauchemin et al., 2010; Pelletier et al., 2010). Meeting the dual needs of food security and conservation of biodiversity and ecosystem services will require thinking about where and under what conditions intensification makes sense, not promoting intensification always or never (Foley et al., 2011).

One such key trade-off in beef production is a result of methane emissions. While production and sequestration of carbon is central to EFA, methane is not accounted for as it cannot be sequestered by the environment on a meaningful scale (Rees, 1996). In beef production, methane is the most important source of GHGs with a global estimate of 2.0 GtCO2e·y−1 resulting from cattle’s enteric fermentation (Havlik et al., 2014). A study of beef GHGs in Western Canada found that enteric methane accounted for 63% of GHG production (Beauchemin et al., 2010). Several other studies show that methane is the most important contributor to beef’s GHG emissions (Nijdam et al., 2012; Pelletier et al., 2010; Vergé, Dyer, Desjardins, & Worth, 2008). Grass-fed beef can potentially have higher total GHG emissions due to longer lifespans and resultant enteric fermentation and methane emissions. Increasing the feedlot component of a cattle’s lifecycle can decrease net GHG emissions due to a shorter lifespan of the cow and thus a reduction in methane production (Beauchemin et al., 2010).
While EFA can and has been modified to account for methane when applied to beef (Beauchemin et al., 2010; Pelletier et al., 2010; H. J. Schwartz, Feldkamp, & Bungenstab, 2011; Vergé et al., 2008), the standard EFA does not account for methane. While in theory the city could employ a revised EF for beef that included methane, in practice they chose not to. Incorporating methane (e.g., via CO$_2$ equivalents) would offer a more complete picture of beef’s production impacts but would a) complicate the use of EF as a policy target to measure overall progress and b) require a new EF assessment. It also would raise the question of including methane or other CO$_2$ equivalents important from other sectors found in the city. Furthermore the design of the EF precludes counting GHGs sequestered by soil in pasturelands. Under EFA land can only be classified for one use. Land that is classified as ‘pastureland’ therefore cannot also be counted for carbon sequestration, which only is counted on land classified as ‘forest’ by the EFA.

We could therefore not conclusively say either that a) grass-finished beef has a lower EF, or that b) promoting grass-fed beef without attention to local ecological conditions and production would be a likely solution to improving beef sustainability. Forging pathways to more sustainable beef production requires examining the whole context—options for feed, market dynamics, local ecological conditions and even global processes such as deforestation (Havlik et al., 2014; H. J. Schwartz et al., 2011).

### 2.3.3 Policy option 3: Payments for Ecosystem Services to address impacts of beef production

Having determined that consumer-focused policy options would not reduce the City’s EF in measurable and important ways, we re-framed the problem to consider policies addressing producers. Because beef production is so heterogeneous, examining the problem from an ecosystem services framework could allow consideration of specific ecosystems and a broader array of land types. Compared to the EF, ES has two key benefits: 1) ES examines the whole ecosystem in which beef is produced, which allows for the specific impacts in that ecosystem to be studied; 2) ES allows for consideration of a broader array of impacts, in this context, avoiding the issue of missing the bigger goal. Though ES as a framework can be difficult to define and use
in policy, a successful Payments for Ecosystem Services program in the province could facilitate implementation and serve as a model. Since Vancouver had publically committed to the EF metric, policies that impacted it might be more feasible and appealing.

Our next research question addressed this policy option:

3. Could Vancouver’s contribution to a PES program address relevant ecological impacts of beef production? Would any reductions in impacts also be captured by the EF metric? That is, could a PES contribute to the larger goal, and to the specific metric?

A shift in focus towards ES would allow Vancouver to influence production practices directly, rather than via efforts to change consumption. More generally a PES program could achieve ES gains relevant to Vancouver’s broader goal of reducing the impacts of its residents’ consumption. Our industry partner’s successful program offered an example. The voters within the Regional District of East Kootenay in the Upper Columbia River Valley agreed to a $20/parcel property tax to fund the Columbia Valley Local Conservation Fund. Since the fund’s inception in 2008 the program has funded 50 projects focusing on a) fish and wildlife habitat conservation, b) watershed conservation and, c) open space conservation (Petersen, 2015). Among other projects, the fund pays landowners, farmers, and ranchers to maintain and enhance the natural assets that they manage, especially addressing the local watershed through projects such as riparian buffers and fences to keep cattle out of water sources. The fund’s success has inspired a neighboring area to create its own program, also funded by property taxes.

Creating a similar program could help the CoV meet its broader goal to reduce the City’s ecological impact. If the CoV were to pass a $20 per property tax for a similar program the revenue generated would be around $3,900,000 per year (Calculation based on 2014 data on all property classifications) (Metro Vancouver 2014). This specific funding mechanism is just one of many possible program configurations, but this example shows the financial power that Vancouver has to influence ranching practices through a potential PES in the province. Additionally, as the primary population center of the province, Vancouver could potentially influence provincial policy.
Would, however, a PES help Vancouver reduce its EF, such that the program could align with the existing metric/goal? We examined three key possible ES that could be supported by a PES program: 1) water regulation and purification, 2) biodiversity and 3) carbon sequestration.

### 2.3.3.1 Water regulation and purification

First, the program could support a suite of hydrological Ecosystem Services such as fresh water provision, flood regulation, and water purification. Key practices are creating and protecting riparian buffers and building fences to keep cattle out of waterways and to protect riparian buffers. Riparian buffers support a host of ES including: flood regulation, nutrient cycling, biodiversity, filtration of pollutants, soil stabilization (Brauman et al., 2007; Mayer, Reynolds, McCutchen, & Canfield, 2007; Sweeney et al., 2004). Extensive literature and existing programs for riparian buffers could inform the PES program as to design guidelines and Best Practices (Buffler, Johnson, Nicholson, & Mesner, 2007; Committee on Riparian Zone Functioning and Strategies for Management, Water Science and Technology Board, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies, National Research Council, 2002). As well, the East Kootenays program has already successfully supported riparian buffers and fences with the goal of improved water quality and could be used as a model program.

However, none of these improvements would be measured by the EF because water quality and flow regulation are not accounted for in EFA.

### 2.3.3.2 Biodiversity

Second, the program could support a variety of practices designed to protect or enhance biodiversity. While not technically an ES, biodiversity is considered to underlie ES (Balvanera et al., 2006). Practices to support include: grazing management such as slow rotational grazing and appropriate rest periods for pastures to help increase heterogeneity and with it biodiversity in ranchlands (Fuhlendorf & Engle, 2001). BC grasslands have evolved with ruminant grazing pressure, so biodiversity can be supported on grazing lands given grazing management to this end (Austin, Buffett, Nicolson, Scudder, & Stevens, 2008). Other measures include planting native vegetation, creating or protecting riparian buffers, controlling invasive species, installing
large woody debris, creating riparian wetlands and protecting plantings from livestock and wildlife (Pearson & Blair, 2013). Regional NGOs such as the Grasslands Conservation Council of British Columbia and the Stewardship Center for BC have developed Best Practices for managing grasslands and supporting biodiversity.

However, EFA does not account for protection of native ecosystems and biodiversity, so none of these efforts would impact the EF.

2.3.3.3 Carbon sequestration and GHG mitigation

Third, a PES on ranchlands could support practices to reduce or sequester GHG emissions, thus contributing to the ES of carbon sequestration and climate regulation. Two types of practices could be included: 1) rangeland management practices which promote the uptake of carbon in soils and grasses and 2) manure management practices to reduce methane emissions from beef production (Lal & Bruce, 1999; Paustian, Antle, Sheehan, & Paul, 2006). Carbon PES programs have paid ranchers for grazing management practices such as maintaining forage-animal balance, using a prescribed grazing schedule and developing contingency plans for draughts, application of biochar, and particular types of prescribed burns (Chan, Balvanera, Benessaiah, Chapman, Díaz, Gómez-Baggethun, Gould, Hannahs, Jax, Klain, Luck, Martín-López, Muraca, Norton, Ott, Pascual, Satterfield, Tadaki, Taggart, & Turner, 2016; Chicago Climate Exchange, 2009). Methane emissions can be reduced by manure storage and management practices or captured for use as fuel in anaerobic digesters, thereby reducing the need for fossil fuel sources (Paustian et al., 2006). These practices as well as improving livestock feed to reduce enteric fermentation are included in Australia’s carbon farming initiative (Chan et al., 2016).

However, in EFA, only forest land is considered an area that sequesters carbon and methane is not accounted for. Practices to increase the carbon sequestration of grasslands or to reduce methane emissions would thus not be accounted for by EFA.

Accordingly, the EF would capture none of the three prominent ES benefits from a PES addressing cattle ranching. As such, a PES program was less attractive to the City, which was committed to reducing its EF as one major goal in its Greenest City Action Plan.
2.3.3.4 Envisioning a triple-loop PES

Beyond the specific challenges of integrating PES with EF, we also applied triple loop learning to critically consider PES and the specific challenges it could cause. PES programs face a host of challenges, ranging from ecological effectiveness and cost efficiency to motivational crowding out and consistent funding (Bowles, 2008; Kosoy & Corbera, 2010; Luck et al., 2012; Pagiola, 2008; Pattanayak et al., 2010; Rode et al., 2015).

While some authors have proposed conditions for PES (Wunder, 2013), we suggest a triple loop learning approach, inspired by PES while remaining open to innovation. Indeed, most PES programs fail to meet the strict definition of such (Fletcher & Breitling, 2012; Vatn, 2010). Program features such as cost-sharing and reverse auctions assure that payees have non-monetary motivations to undertake the projects and allow program managers to select the most effective (in terms of cost and ecology) projects based on multiple-criteria (Stoneham, Chaudhri, Ha, & Strappazzon, 2003). Peer monitoring (employed in an organic certification program in Brazil) could reduce costs of monitoring (Rover, 2011). Treating inspections a opportunities for learning and sharing knowledge can improve compliance and encourage innovation (Carlisle, 2015).

Rather than a market transaction, we envision a reformed PES as a partnership between urban and rural areas with the payment facilitating progress on goals both care about. The GCAP goal of local food and definition of such as produced in BC demonstrate an interest on the part of the CoV to contribute to food systems in the province. Payments could be targeted towards locally salient issues such as water quality, fish habitat and even cultural ES in the form of supporting small-scale ranches and farms. These can be accomplished via projects for riparian buffers and fencing, which also offer benefits to ranchers in terms of reduced streambed erosion and management of cattle. Cash-strapped ranchers often cannot afford to undertake such projects despite their own internal motivations. Yet support from city dwellers in the form of a re-imagined PES could help ranchers to make such changes.
Some may argue that PES amounts to buying offsets for Vancouver’s food consumption rather than tackling the problem directly. Yet while for many other types of environmental impacts the city can do much to address and reduce these impacts via its policies, for food the main impacts occur on landscapes remote from Vancouver. Therefore this is one tool that offers focus on reducing impacts by Vancouver that are outside of CoV.

2.3.4 Policy option 4: Proxy metric with individual and community leadership

In response to the problems the City discovered in implementing the EF goal, the City adapted its policy to use a proxy indicator. The indicator defined is “the number of people empowered by City led or City-supported projects, training or personal lifestyle changes to take action” (City of Vancouver, 2013).

While this proxy indicator captures some of the intent of the EF goal, in terms of changing consumption patterns and lifestyles, it misses two of the key qualities the EF is designed for: a quantitative measure and outward focus. Examples cited in the report include an immigrant bike training program and schoolyard gardens. While empowerment may indeed lead to lifestyle changes of the type that could reduce the EF, measuring the number of people who participate in City programs does not reflect actual EF reduction. Furthermore, while these could affect Vancouver’s consumption patterns and may be an effective way of addressing the behavioral dimensions of the EF, these examples shift the focus away from the original intent of the EF goal to be global in thinking and scope.

The EF seems designed to inspire global thinking and policies with measurable impacts to that metric. Yet in this case Vancouver found that the limits of its capacity and jurisdiction made such outwardly focused concrete action unrealistic. By directing the City’s focus on policy options over which they had little direct control, the EF had the opposite effect of that intended. In fact the Greenest City Action Plan 2012-2013 Implementation Update remarks, under the Lighter Footprint Goal, that “while the City can support lighter footprint choices through the development of green infrastructure, achieving an overall reduction in Vancouver’s ecological footprint remains largely outside of the City’s control” (City of Vancouver, 2013).
2.4 Discussion

2.4.1 Triple-loop learning in sustainability research

The concept of triple-loop learning describes how we reached barriers in our research process that led us to reconsider first our goals and finally our more fundamental assumptions. Our analysis of the first two policy options was single-loop learning. Through this process we arrive at the first part of the ‘metric trap’—the policies prescribed by the metric were either not actionable (local beef) or would obscure trade-offs and potentially not meet the bigger goal the metric was designed to measure (grass-fed beef).

Through collaboration with research partners at the University of British Columbia, City staff and the BC beef industry we were able to determine that neither local beef nor grass-fed beef would be a reliable policy solution for Vancouver to lower its EF. Our work was facilitated by the City’s continuing relationships with researchers who conducted the original ecological footprint. This productive trans-disciplinary research relationship set the stage for us to reframe our research in a process of double-loop learning. We considered a Payment for Ecosystem Services project and found it would meet the bigger goal but miss the metric of EF.

The unsatisfying conclusions from single- and double-loop learning led us to reflect on the role of actors and partners, in a process of triple-loop learning. We had reframed our research questions without fundamentally changing our basic assumption—that the City of Vancouver could be a key player in driving more sustainable beef production and consumption in BC. This final loop led us to consider what appropriate roles and responsibilities might be for a city to address off-site consumption impacts associated with beef.

The City chose to adapt by focusing its efforts on fostering individual and community leadership and collaboration within the City. Yet this still leaves the opportunity and issues around beef consumption unaddressed. Does an individual city such as Vancouver have the necessary influence to transform beef production and consumption, or is that the role of (a) another level of government; (b) non-governmental organizations, or (c) a collaborative process across different bodies? Without data to support this opinion, we felt that option (c) offered promise. Cities can
play a key role in such transformations, but require a suite of partnerships to make meaningful change. We realized that continuing our efforts would require a broader actor coalition. Realistically, there are obstacles to the City changing its policies, and raising taxes to support a PES that does not even address its stated metric may not be politically feasible in the short term.

Yet the idea of expanding and reimagining a PES program via support from Vancouver consumers remained promising and our team is applying our triple loop thinking to re-envision PES. While PES faces many pitfalls in implementation, the inherent flexibility of the ES concept compared to a strict single-metric EF allows for thoughtful program managers to sidestep the worst traps and adapt the program when new challenges are discovered. To this end we are engaging with a coalition of local governments, NGOs, university partners, local businesses and BC producers to consider if and how a reformed PES might contribute to the larger goal of addressing the off-site impacts of beef consumption. Collaborating on a province wide PES program could continue this focus on the relationships and institutional aspects of local food; areas that cities and regional actors have potential to influence. This may parallel the City’s own turn towards a focus on empowerment and community to create change in reducing its off-site impacts. Rather than singularly pursuing a quantitative metric, this approach focuses on building institutions and fostering grass-roots community action for sustainability.

2.4.2 The Ecological Footprint as a metric trap

Our analysis showed the ways the EF metric 1) focused attention on non-actionable policy areas, 2) was non-responsive to promising policy options and 3) limited the types of policy options considered. The outcome of our analysis, while unique to Vancouver, follows a pattern that we would also expect to occur in other cities using a metric like the EF and which we call the ‘metric trap.’ A city eager to address the impacts of its consumption chose a popular and resonant metric to measure that impact. The metric led to an initial policy focus, but remaining within the mindset of addressing the metric led the City to conclude that the policies available were outside of its jurisdiction. However, available and actionable policy options that could address the broader goal were not considered because they did not address the specific metric.
The City focused on a kind of beef it could buy with a lower EF, rather than considering how it might use its influence to change how beef is produced in BC.

The ‘metric trap’ can be explained by three phenomena already defined in the literature: 1) mismatch between metrics and decisions or control (Failing & Gregory, 2003; Hauser & Katz, 1998), 2) Goodhart’s law (Newton, 2011), and 3) path dependence (R. R. Brown, Farrelly, & Loorbach, 2013). First, Vancouver’s choice of the EF metric preceded a full understanding of what specific policies might influence that metric. As the City pursued options for lowering the EF they found that these did not align with the actual decisions and policy options available to them.

Second, Goodhart’s law says that in cases where policy is tightly coupled to an indicator or metric, this can result in actors changing behavior to meet the targets of the indicator while missing the bigger goal the indicator is designed to measure (Newton, 2011). EF does not account for intensification, technology or land degradation and is even in some cases negatively correlated with land degradation (Fiala, 2008). Thus without a broader view of the big picture goal, a focus on solely the EF metric could miss that bigger goal.

Third, path dependence occurs when past decisions, investments and routines prevent adoption of better options that arise (R. R. Brown et al., 2013). In this case it functions because the City had made a public and political commitment with programing and publicity, to the Ecological Footprint. Path dependence can be exacerbated by a single-loop learning mindset where actors expect actions to have predictable outcomes (Pahl-Wostl, 2007). The promise of a producer-led conservation initiative via a PES program failed to fit with the specific metric despite addressing the broader goal.

Several other authors have found that especially for city or regional scales, EF is not well suited to inform policy and decision making (Kitzes et al., 2009; Lenzen & Murray, 2001; Van Den Bergh & Grazi, 2010). EF is a measure of “snapshot” impact, not a predictor of future impact (Kitzes et al., 2009) and it fails to describe the consequences of crossing ecological thresholds (Wiedmann & Barrett, 2010). These characteristics may make it difficult for cities to consider a
broad array of different scenarios and their consequences. In EFA land is classified as only one land type, each assumed to have its own capacity for production and service to supporting human needs, for example as crop (productive), pasture (marginal), or forest (for carbon sequestration). This limits options to develop solutions based on multiple land uses.

Metrics like EF may be useful for rapid pre-assessment of policy options, but more detailed analyses are likely necessary for final policy discussions (Giampietro & Saltelli, 2014; Stoeglehner & Narodoslawsky, 2008). EF helped Vancouver to think about its impacts outside of city limits and to create a policy focus—in this case on beef production and consumption. However, as we have described, after this point the EF contributed to the metric trap, leaving the City with few actionable options to lower its EF. While the City pursued other policies to address its GCAP goals, the focus remained on actions within city limits.

EFA can often lead to a focus on food consumption as a key impact. Here would be an excellent opportunity for cities to play leading or collaborating role in shifting food systems. While EFA shows the importance of the impacts of food consumption and production, our case study focused on beef shows the specific issues that arise in attempting to guide food policy with EF: 1) many of the key impacts of agricultural production are excluded from EFA and 2) those impacts that are included in EFA are outside of cities’ jurisdictions.

This paper contributes to concerns in the literature on ‘green’, ‘eco’ or sustainable cities around the development of indicators for sustainability, particularly the inclusion of impacts external to cities’ geographic boundaries (Mori & Christodoulou, 2012). We further contribute to literature debating the use of the EF for policy applications (Blomqvist, Brook, Ellis, Kareiva, Nordhaus, & Shellenberger, 2013a; 2013b; Fiala, 2008; Galli et al., 2016; Kitzes et al., 2009; Rees & Wackernagel, 2013; Wiedmann & Barrett, 2010). These contributions are both empirical, via our case study of the CoV, and theoretical, via application of literature from decision and management sciences to analyze the implications of using the EF as a sustainability metric (R. R. Brown et al., 2013; Failing & Gregory, 2003; Hauser & Katz, 1998; Newton, 2011). Our contribution to these literatures is twofold: a) to point to the limitations of the EF in accounting
for key external impacts of cities; and b) highlight the challenges that arise when metrics do not align with actual policy levers.

2.4.3 Recommendations for escaping the metric trap

Cities can avoid getting locked into metric traps by assessing the problem and the range of possible solutions before deciding on a metric of progress and success. Metrics like the EF may be useful for initial analysis, but can limit both creative thinking and policy options. One option to lessen the problems of the metric trap could be if an iterative approach is adopted from the onset. For example, first use EF to identify priority areas for action, then use ES to develop policy.

Cities and sustainability scholars should consider a wide range of stakeholders to include in the formulation of sustainability initiatives to ensure that crucial viewpoints can be included early on to make efficient use of time and energy. Partnerships with regional businesses and NGOs can help to envision and implement the broader scale changes needed to more fully address its offsite impacts. Partnerships in the form of networks can help cities learn from each other (Childers, Pickett, Grove, Ogden, & Whitmer, 2014) as can sister city relationships (McLarty, Davis, Gellers, Nasrollahi, & Altenbernd, 2014). Vancouver’s planning document for the GCAP suggests seeking out friendly competition and partnership with other cities (Pitre-Hayes, 2011).

Partnerships with researchers, especially ‘hybrid’ researchers with academic and practical experience have been shown to help cities with sustainability transitions (R. R. Brown et al., 2013). As our case shows, researchers can serve as intermediaries between different partners, e.g., our work facilitated communication between the City and the cattle ranching industry. Drawing on theory and empirical work often inaccessible to cities (due to expertise and pay walls that stand in the way of access to academic papers), researchers can help cities to avoid making common mistakes and suggest novel ways of conceiving the problem. Intermediary organizations can be important to help cities with sustainability transitions, e.g., by showing comfort with complexity and ambiguity as well as via an ability to frame conflicts and tensions.
as opportunities for innovation (Hamann & April, 2013). Both are roles that researchers could play.

2.5 Conclusion

We have demonstrated that metrics of success for city sustainability limit options for achieving the larger goals those metrics are designed to measure via a process we call ‘the metric trap.’ We identified three barriers or side effects of the use of specific metrics to measure city scale sustainability.

First, the metric is primarily responsive to policy options that are beyond the jurisdiction of the city or that are infeasible. The Ecological Footprint could measure dietary shifts (i.e., reduced beef consumption) but this option was not viable for the CoV; it was neither politically feasible nor measurable.

Second, the metric is not responsive to policy options that would contribute to the larger goal because the metric only captures a subset of the key impacts of the larger goal. Beef production systems influence a host of social and ecological factors: water quality and quantity, soil quality, biodiversity, land use, cultural and social influences on nearby and distant communities as well as GHGs such as carbon and methane. Yet EF typically only measures carbon and land use. EF thus excludes most of the impacts and obscures the trade-offs of different beef production systems. Thus for policy options such as: ‘local beef’, grass-fed beef or PES - neither relevant ecological impacts, nor potential sustainability benefits of options and any supporting policies would be captured.

Third, the metric focuses policy makers attention on one way of framing and understanding the problem thus limiting the types of policy options explored. The city focused attention on beef consumption in the city rather than exploring how a major metropolitan area might use its influence towards sustainable regional food systems. A key strength of the EF is its ability to focus the attention of individuals and governments on the impacts they have globally. Yet in this case it had the opposite effect, re-focusing the CoV’s attention inward.
We recommend that cities focus on the broader sustainability goals they wish to achieve and assure that metrics serve the goal and not vice versa. Continual reflection on metrics and how well they align with policy options and broader goals can help cities to avoid the metric trap.
Chapter 3: A payment by any other name: Starkly different perceptions of Costa Rica’s PES from participants to managers

3.1 Introduction

In 2005, *The Economist*’s cover page signaled its lead article entitled, ‘Rescuing environmentalism,’ which claimed that environmental groups in Europe and the US had too often rejected ‘pragmatic solutions’ and risked losing the ‘battle of ideas’ (*The Economist*, 2005b). The solution, according to *The Economist*, was to embrace market-based conservation, including emissions trading, economic valuation of ecosystem services and Payments for Ecosystem Services (PES) as prime examples. This call to action has largely been heeded: market-based conservation instruments have become widespread, and market thinking in the design of solutions is increasingly pervasive. Presentation of the report series, *The Economics of Ecosystems and Biodiversity* (TEEB), coincided with an elevation of economic valuation and the integration of ecosystem services into corporate decision-making, such as via the World Resources Institute’s Corporate Ecosystem Services Review tool (www.wbcsd.org). Similarly, the Convention on Biological Diversity’s Strategic Plan for 2011-2020 includes targets and recommendations for incorporating biodiversity values into national accounting systems, implementing incentives, trade, tax, subsidy and pricing measures as well as payments for the services provided by ecosystems. And major international NGOs such as WWF have made market-based conservation and business partnerships a key priority (wwf.panda.org).

Market instruments have a number of potential advantages when addressing resource management problems. Broadly, they can be durable and effective institutions for allocating and managing scarce resources (Kinzig et al., 2011). Benefits of market-based conservation mechanisms can include economic efficiency (i.e., more conservation ‘bang for the buck’), new funding opportunities and sources and the potential to improve livelihoods of service providers (or at least diversify them) (*Wunder*, 2006). When suppliers of ecosystem services are from

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poorer regions than beneficiaries there is the potential to also alleviate poverty and redistribute wealth (Kinzig et al., 2011). By using price-signals and economic incentives, market-based conservation can be an effective way to modify the behavior of individuals, firms and organizations (Jack et al., 2008). It might thus inspire conservation behavior even in those with no such motivations—involving more people or companies in conservation efforts, in deed if not intent (Daily & Ellison, 2002; Helm, 2015). PES resulting in improved agricultural land management can, for example, be inspired by corporate interests (Perrot-Maitre, 2006). Market and incentive based mechanisms can also promote innovation, including in economic systems, and enable cost-efficient solutions to evolve.

But what are the long-term implications of motivating conservation by economic reasoning? Might paying for conservation change previously held rationales for conservation? Many authors have become concerned about the potential of financial incentives to undermine long-term conservation objectives, via a phenomenon known in this literature as “motivational crowding-out” (Gómez-Baggethun & Ruiz-Pérez, 2011; Kosoy & Corbera, 2010; Muradian et al., 2013; Vatn, 2010). Motivational crowding out is the idea that financial incentives could ‘crowd-out’ intrinsic motivations. For example, morally-motivated blood donors might be less inclined to donate if there were a financial incentive, potentially even reducing the total supply (Titmuss, 1971). The empirical evidence for both crowding out and its corollary (crowding in, whereby financial incentives increase intrinsic motivation) has recently been summarized by Rode et al. (2015); in short: motivational crowding out is a possible but not an inevitable consequence of PES programs.

Of the mechanisms identified that might cultivate motivational crowding out, many hinge upon the symbolic role of the payment. For example, paying someone to complete a task signals that the task is boring (were the task intrinsically enjoyable or interesting, a payment would not seem to be necessary) (Fehr & Falk, 2002). Another signaling mechanism is that when a program or policy pays people for what is otherwise considered the morally right thing to do, it changes the frame of reference towards economic reasoning and implies that rational self-interest is an appropriate response (Bowles, 2008). Similarly, Igoe has argued that when consumers buy offsets they essentially are purchasing ‘moral redemption’ allowing them to avoid confronting the
moral responsibility they have towards global environmental degradation (2013). Alternatively, payments can signal that biodiversity conservation is valued by outside elites, thus crowding in motivations for conservation (Van Hecken & Bastiaensen, 2010). In Ireland, a small tax on plastic bag use had a huge effect by turning plastic bag use into an antisocial behavior, that is crowding in motivations based on a shift in social norms (Bowles, 2008).

Two factors are then essential to understand the potential of PES to erode intrinsic motivations for conservation. First, we need to understand the signaling role of the payment. Second, we need to understand the values underlying conservation motivations and how these might be impacted by participation in PES. For both of these ends, a crucial issue (that has largely been overlooked in this debate) is the language used to a) describe payments and b) describe nature. PES employs a very particular set of market-based languages and attendant logics. For example, the language of payment may assume that individuals are primarily monetarily motivated, and the language of ecosystem services implies that nature’s value is in its utility to humans (Luck et al., 2012). Logics, “make sense of . . . any particular context . . . [and] they ascribe value to different actors, actions and governance structures” (Corson, MacDonald, & Neimark, 2013, p. 6). Thus ‘wild nature’ becomes ‘marketable services such as clean water’ and so too the perceptual shift follows. Thus the languages and logics used by a program signal what is valuable (economically valuable goods and services versus trees, birds and clean water), what is appropriate behavior (self-interest versus moral responsibility) and the sorts of relationships that occur between people and nature (e.g., natures as service provider versus people as stewards of nature).

If values change in response to participation in environmental institutions (such as PES), we would expect that change to be signaled by adoption of particular types of languages and logics taken up by participating groups (Agrawal, 2005). Institutions normalize languages, and ‘ways’ of seeing the things valued (e.g., as a service), which can in turn normalize the idea or logic that nature is a service. How those services are also valued (e.g., primarily economically) might add to the general pattern. Different value ‘realms’ are often associated with particular languages, logics and valued entities (Martinez-Alier, 2008; Trainor, 2006). One value language that has received a great deal of attention (positive and negative) is that of ecosystem services, which
some see as framing the value of nature in terms that could lead to an erosion of non-utilitarian values (Fisher & Brown, 2015), leading even the Intergovernmental Panel on Biodiversity and Ecosystem Services itself to move away from the term (Pascual et al., 2017).

Insofar as the logics of payments convey information about values or commodification of nature, we might also expect to see these reflected in the languages and logics with which participants discuss the value of nature. Concerns about PES as an application and ES as an analytical concept include the extent to which they might shift the ways the people value and perceive nature (Luck et al., 2012). Work on environmental values has identified a suite of ways that people value nature (sometimes termed ‘value languages’) (Avcı, Adaman, & Özkaynak, 2010; Trainor, 2006). By applying a single monetary value, these various dimensions of value are flattened or narrowed into one single dimension (Spash, 2008). This simplification of the plurality of values for nature is part and parcel of the process of commodification (Kosoy & Corbera, 2010). Critics have pointed to the possibility of commodification or commodity fetishism resulting from PES programs (Gómez-Baggethun & Ruiz-Pérez, 2011; Kosoy & Corbera, 2010). Commodification is “a modification of relationships, formerly unaffected by commerce, into commercial relationships,” (Gómez-Baggethun & Ruiz-Pérez, 2011) (p.620). Certainly much of the critical literature on PES and ES focus on the ways these concepts shape dialogues and discourse around conservation and biodiversity (e.g., by excluding moral and political arguments in favor of technical or bureaucratic ones) (Brosius, 1999; McAfee, 1999). And even within PES literature, the importance of terminology for program acceptance by local communities has been shown (Wunder & Vargas, 2005). So, we might expect to see evidence of commodification in the languages and logics used to describe such relationships with nature (e.g., focusing on provision of services with monetary benefits versus on responsibility and care for a specific piece of land).

However, while a PES program may employ certain languages and logics around payments and the values of nature, these do not necessarily filter down to program participants. Yet the different experiences of participants, intermediary organizations, and program management have not been directly assessed in the degree to which they adopt market-based language and logics. A parallel situation is that people who live within biosphere reserves often do not know they do so
(Levine, Muthukrishna, Chan, & Satterfield, 2017; Sundberg, 1998). Similarly participants do not always perceive PES as market-based. They may use or prefer different languages, such as help, support, recognition or compensation, which imply a different logic about the program and participant (Clot, Grolleau, & Méral, 2017; Kosoy et al., 2007). A farmer may see a payment for services as a recognition and reward for his/her status as an ideal farmer in the tradition of their particular agricultural practice.

In this paper we use a conceptual framework that considers two ‘archetypical forms’ of PES programs, each of which incorporates certain language and logics regarding the program and the values of nature. One end of the spectrum is what McAfee and Shapiro term the “conservation efficiency” paradigm of PES; the other end is the “compensation for ecosystem services” paradigm (2010). The idea of compensation for ecosystem services arose as a response and alternative conceptualization of PES, articulated by sustainable rural development advocates (McAfee & Shapiro, 2010; Rosa, Kandel, & Dimas, 2004). Together these alternative visions offer a value spectrum which characterizes programs along an axis of more-to-less market-based. We then examine how different groups fall along the spectrum and how they define the different points along this spectrum.

To achieve these ends, we examine in detail the questions of whether the use of market-based languages and logics of PES permeate through the language of different groups involved in a long-establish PES program in Costa Rica. Specifically, we interviewed PES program managers, staff at intermediary organizations and participants in Costa Rica’s national PES program. Intermediary organizations in Costa Rica include NGOs, agricultural cooperatives and associations, as well as the cantonal agricultural centers (Bosselmann & Lund, 2013). Questions posed to interviewees included: a) how participants understand PES payments (e.g., what such payments mean and their purpose) and b) the languages of value with which they discuss ‘nature.’ This in turn helped us understand whether people who view the payment through more market centric logics also view the forest in that way. That is, does the use of ecosystem services language accompany the use of market language and logics? Ultimately, our goal is to bring a fine-grained and empirical view of if and/or how a PES program embodies and translates market logics along the chain of leadership through to participants.
3.2 Methods

3.2.1 Study area

Few PES programs in the world are as well-known as the Pagos por Servicios Ambientals (PSA) run by FONAFIFO (The National Fund for Forestry Finance) in Costa Rica. FONAFIFO is an explicitly designated PES program, with specified ecosystem services, suppliers and beneficiaries. Other programs that pay farmers for conservation, such as the Conservation Reserve Enhancement Program in the US, function as PES but do not use the language of PES or of ES. Also unlike some other PES programs, the PSA is over-subscribed in that more landowners would like to participate than there is funding available (Porras et al., 2013).

The PSA was established in 1996 as part of Forestry Law 7575 which also banned further forest conversion (Porras et al., 2013). The PSA specifically focuses on four ecosystem services: GHG mitigation, water protection, biodiversity protection, and scenic beauty (www.fonafifo.go.cr). The program operates several different modalities for land-owner participation, the most common of which are forest conservation (which pays to maintain existing forests) and reforestation (which subsidizes plantations of native or more often exotic trees). Together these two encompassed 95% of the area enrolled in the PSA in 2015 (data retrieved September 30, 2017 from www.fonafifo.go.cr). Forest conservation pays 64 USD/ha per year in renewable contracts of 5 years. Reforestation pays landowners 816 USD/ha over a ten-year period. The higher amount for reforestation is intended to partially cover the costs of buying and maintaining plantation trees. Between 1997 and 2012 the program signed 15,375 contracts with landowners, enrolling nearly 1 million hectares for forest conservation, reforestation and natural regeneration as well as 4.4 million trees in agroforestry projects in a country of 51,100 square kilometers (Porras et al., 2013) and 4.86 million people (23% rural) (data retrieved September 30, 2017 from https://data.worldbank.org/country/costa-rica).

Our study focused on the Nicoya Peninsula in the northwest of Costa Rica in the province of Guanacaste. The native forest is dry-tropical rainforest and there are a number of national parks in the northern part of the province. Guanacaste has historically been dominated by agriculture
and has a tradition of extensive cattle ranching (Zúñiga, 2009). Major economic activities generally follow the geography of the area. Tourism dominates much of the peninsula’s coasts. Large farms occupy the lowlands and cultivate crops for export: sugar cane, melon/rice (normally cultivated together during the dry/wet season). Highlands are occupied by small holders who engage in extensive cattle ranching along with some subsistence agriculture and gardening (e.g., corn, beans, vegetables, chickens). There were two primary types of immigrants to the peninsula: wealthy landowners whose haciendas evolved into the current large corporate farms in the lowlands, and smallholders from the highlands around San José who were able to buy larger holdings in the mountains of Guanacaste by selling a few hectares of land in the San José highlands.

Figure 3.1 Map of study area

Interviews were conducted in and around Hojancha, Nicoya, Nandayure (not labeled), Santa Cruz, Bagaces and Cañas. Image created by author from Google Maps.
Fieldwork was facilitated by established relationships with local organizations as part of the umbrella project *FuturAgua*, which focuses on local adaptation and water management under changing climate conditions. Irregularity in rainfall patterns as well as a recent multi-year drought have brought concerns about water management to the forefront of many people’s minds in the region.

We conducted 43 semi-structured interviews in the Nicoya Peninsula of Costa Rica. Interviews were conducted with 12 local and national experts, including FONAFIFO staff, local administering or intermediary organizations of the PSA program, agricultural organizations, and water focused organizations. Expert interviews focused on themes around agriculture, water and—when relevant—the PSA program.

Farmer interviews included 26 PSA participating farmers, 2 former and 3 non-PSA farmers. The three non-PSA framers were included to broaden the perspectives included and check for potentially important ideas that might have otherwise been missed. Farmer interviews involved a) questions around the farm and land management and b) questions about the PSA including motivations, costs and benefits as well as the experience of enrolling. Open-ended questions and discussions about the PSA, farms and farming, as well as water and birds facilitated elicitation of values related to nature and forests. Additional questions focused on water due to its local salience and relationship to forest protection. We also asked questions about participants’ opinions of different birds and ideas about respect and care of birds. Birds of various types are common sights and sounds and provided a useful way to elicit values around nature.

To assess how participants see PSA payments, a closed question was asked, “How do you see the money you receive: as a payment, a gift, a help, a recognition or something else?” After answering many participants explained their reasoning. In the analysis, the category of gift was dropped as no interviewees chose it. A new category was added, ‘incentive’ or *incentivo*, as many interviewees suggested this word. Groupings of alternative words volunteered by respondents were based on analysis of interviewees’ explanations for their choice as well as context provided by other interview sections. For example, many interviewees used the word *ayuda*, but discussed the payments as a form of government assistance, such that we defined this
category as help/support. Thus the few replies of assistance were grouped with the help or ayuda category. A few respondents said it was a type of compensation and these were grouped with recognition or reconocimiento. This is because reconocimiento was often coupled with the concept of financial compensation for the activity (e.g., forest protection). In two cases, the respondent gave two answers, which were each weighted by one half. This study conceptualizes each of the payment categories studies as follows:

- **Payment**: Funds in return for service as in a transaction; action not performed without funds.
- **Incentive**: Funds to encourage action; action unlikely without funds.
- **Recognition**: Funds to acknowledge existing stewardship.
- **Help**: Funds to enable ongoing farming and land stewardship.

Languages related to participant values about nature were coded throughout the interview transcripts of all respondents. Where interviewees discussed or mentioned payment, prices, or monetary values in relation to nature, such as making money from ecosystem services or native forests, we coded such passages as “market values.” Production of ‘ecological goods’ such as producing oxygen was coded as both ecosystem service and market language given that it is a particularly market-based framing of ecosystem services. The ecosystem services code encompasses language around benefits of ecosystems for people and specific ecosystem services or categories. Relational values were coded for sections where respondents discussed their relationships to the land, farms, place, lifestyle, plants or animals, as well as relationships between people mediated by these.

All interviews were conducted by M. Chapman during May to July of 2016 in the Nicoya Peninsula. In addition to interviews, she attended meetings of local project partners and visited a variety of different farms and parks in the area. Participants were identified via partnerships with local organizations. We used non-proportional quota sampling to include a variety of different farm sizes, women and men, different socio-economic groups as well as participants in both forest conservation and reforestation. All interviews were transcribed by a local research assistant and coded using NVivo by M. Chapman.
3.2.2 Participants

Self-reported farm size of respondents (including experts that also owned farms) ranged from 1 to 15,500 hectares with a median size of 130 hectares (see figure 3.2).

![Figure 3.2 Farm size and area enrolled in PSA of interview participants.](image)

Three farms over 1000 ha are not shown. These are 15,500 ha (221 ha PSA), 10,000 ha (no PSA) and 2,600 ha (1000 ha PSA) in size.

Among PSA-enrolled farmer interview participants, the area enrolled ranged from 2.5 to 1000 hectares with a median of 72.5 hectares. The percentage of area enrolled in the PSA ranged from 1 to 100% with a median of 56%, with seven participants having the whole farm enrolled. Other characteristics of participants are summarized in figure 3.2. A large majority were enrolled in forest conservation, with smaller numbers enrolled only or additionally in reforestation; this general pattern parallels national enrollment in the program. Many respondents were over the age of 50, which likely reflects the fact that contracts are usually held by the oldest generation in the family, even where adult children manage day-to-day operations. A number of participants (6) were over 75 years old, indicative of the region’s designation as a “Blue Zone” characterized by long and healthy lifespans. Female experts and PSA participants were specifically sought out such that despite the small numbers they may be slightly over-represented in the sample (15% of all PSA contracts were with women in 2015 (based on data from fonafifo.go.cr) versus 26% of
our farmer sample). Many participants, especially older family farmers, had only a few years of formal education.

<table>
<thead>
<tr>
<th>Employment</th>
<th>Age</th>
<th>Farming is Primary Job</th>
<th>Size of farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm employee</td>
<td>18 - 29</td>
<td>3</td>
<td>No</td>
</tr>
<tr>
<td>Farm owner</td>
<td>30 - 49</td>
<td>11</td>
<td>Yes</td>
</tr>
<tr>
<td>Government, agriculture</td>
<td>50 - 64</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Government, environment</td>
<td>65 +</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Government, water</td>
<td>Gender</td>
<td>100 to 299 ha</td>
<td>14</td>
</tr>
<tr>
<td>NGO</td>
<td>Female</td>
<td>30 to 49 ha</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>300 to 499 ha</td>
<td>6</td>
</tr>
<tr>
<td>PSA Modality</td>
<td>Education</td>
<td>100 to 299 ha</td>
<td>14</td>
</tr>
<tr>
<td>Forest conservation</td>
<td>Elementary or none</td>
<td>Less than 30</td>
<td>5</td>
</tr>
<tr>
<td>Forest conservation</td>
<td>Some or complete secondary</td>
<td>More than 1000 ha</td>
<td>3</td>
</tr>
<tr>
<td>NA</td>
<td>Some or complete university</td>
<td>NA</td>
<td>6</td>
</tr>
<tr>
<td>Reforestation</td>
<td>NA</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1 Characteristics of interview sample.

Each cell contains the number of each type of individual interviewed according to different characteristics. ‘Modality’ (also described under Methods) refers to the type of contract in the PSA program. Forest conservation contracts pay landowners to protect existing forested areas on their land. Reforestation contracts subsidize the costs of plantations of native or non-native trees. Some landowners were enrolled in both types of programs.

3.3 Results

In order to organize the different value languages presented and coded across interviews (see methods section above) and the perceptions of payments articulated by participants, we used two analytic frameworks. The first (perceptions of payments) was derived from concurrent cases in
Costa Rica as well as the particular meanings of different words as derived from the data in this study. The second seeks to capture a spectrum of value languages.

### 3.3.1 A payment by any other name—Payment language and logics used

We investigated four different perceptions of the ‘payment’ in PES, organized to offer a spectrum from more to less market-based logic, with *payment* at one end and *help* at the other (see figure 3.3). The language/logic that denotes a ‘payments’ framing for ecosystem services implies a fully market-based relationship, as it is the same language and logic used for the actual purchase of products or services. In terms of motivational crowding out, we might expect that using the language of payment signals that the land manager is economically motivated and that a corresponding instrumental rationality is the appropriate ‘logic’ to apply to this situation. The PES literature also frequently employs the language and logics of incentives. While still primarily market-based, incentives imply that non-monetary motivations also exist as the incentive serves as a form of encouragement. The language of incentives, moving along the continuum, instead denotes a lesser degree of ‘marketism’ in that land managers have some non-economic motivations for the conservation, but require an additional ‘push’ in the form of a monetary payout. Thus, we could expect the language of incentives to partially but not completely imply an economically rational logic to participation.
The above analytical framework explains the conception of languages/logics used in PES programs. The arrows on the top represent the two ‘archetypical forms’ of PES in this spectrum. The middle row represents the different payment languages along a spectrum of more (left) to less (right) market-based. The bottom row maps the languages of the value about nature onto this same spectrum. The questions in red boxes represent the hypothesized steps towards motivational crowding out examined in this study: first, that participants would perceive the program as offering a payment and second if motivational crowding out had occurred, we might expect participants to employ market-based language regarding the value of nature.

The next two perceptions explored are derived from empirical results from PES programs in Costa Rica. Work from the Ciudad Quesada region in Costa Rica found that many respondents saw payment as a recognition or reconocimiento (Chan et al., 2017a). This language and logic implies that the participant is being recognized/rewarded for a conservation action (or inaction).
taken or implemented regardless of the monetary payout. This can be in the sense of social status (i.e., ‘recognition as an environmentally responsible land steward’) or in the sense of financial reward (i.e., FONAFIFO recognizes landowners for the provision of ecosystem services via a payment mechanism). The language of recognition moves away from an instrumental logic and towards a reciprocal logic. The landowner has protected the forest and FONAFIFO reciprocates by recognizing the landowner’s efforts and compensating them for these.

Finally, help/support (ayuda) was chosen based on a finding from Kosoy et al (2007), that participants in Costa Rica saw PES payments as an apoyo; initial fieldwork showed that residents in the Nicoya Peninsula more often used the nearly synonymous word ayuda. The language and logic of ‘help’ or ‘support’ moves away from that of a market-based system. As with recognition, it implies that the participant would have carried out the conservation action regardless. However, unlike recognition, the payment is not seen as a reward or compensation,Ayuda has more of a connotation of a government assistance program or support. It shifts the focus from the land manager’s actions to their needs. Ayuda implies that both FONAFIFO and the landowner are interested in protecting the forest, and as these interests are aligned we would not expect motivational crowding out.

We found that participants and program staff described the payments in the FONAFIFO program in substantially different ways. Most family farmers saw the payment as an ayuda, a help or assistance, whereas for FONAFIFO staff the program clearly offered a payment as a market transaction. These differences are depicted by the representative quotes in figure 3.4. In addition to the representative quotes, the figure describes the different percentages of each group’s views of the payment. Intermediaries had the most diverse views of the payments, perhaps reflecting their position of working both with the government rules and regulations as well as with small-holder farmers. More telling than these quantitative results are the different ways that each group describes the program and payment. These are described by payment language in the following sections.
The percent of each type of response is shown by group. The responses are organized along a spectrum of more to less market focused, with payment and help at opposite ends. Family farmers are individuals, often small-holders, who own and manage land (only current or former PSA participants are included such that \( n = 23 \)). ‘Corp’ or corporate farmers are staff members at large agro-industrial operations. Intermediaries are heads of CAC’s, regente forestal, or NGO staff that facilitate participation in the PSA for family farmers. FONAFIFO staff members are direct staff of the national organization, at the head or regional offices. Language is arranged based on the degree of market-logic within. Representative quotes from the different groups characterize responses by group and response type. The most dramatic differences are shown by the payment responses where the family farmers tended to see payment as a form of care, moving to the corporate farmer who compares the program to renting, to the FONAFIFO staff who describes the payment in purely market terms using the analogy of a taxi ride. Quotes, from left to right: Interview 28, 36, 02, 35, 42, 13
3.3.1.1 Payment (pago)

Within the response of ‘payment,’ the way that payment was described varied by group along the axis of increasing market logic. For the quoted family farmer, the payment was money given to protect and care for the forest, whereas the corporate farmer compared the payment to paying rent, and the FONAFIFO staff person compared it to a taxi ride. The taxi analogy fully displayed market logic; not only does one pay for the forest or the taxi ride, but for a specific period of time, after which the contract is void and the taxi heads off wherever it wants. Applying this logic to forest conservation could mean that after the contract ends, the landowner ‘heads off where it wants,’ which for the longevity of conservation is concerning, e.g., if the forest were cut down after the contract. This same market logic was applied by the program leadership to describe how pricing was determined. While many groups have criticized the program for paying too low a price (see for example, the quote in figure 3.6 by an intermediary), for the program leadership, the demand for participation proved that the price was right.

Only a few family farmers saw the money as a payment (3 used language of payment and help and 2 primarily used payment language). In the clearest example of a farmer seeing the PSA as a payment, they conflate the intermediary (Fundecongo in this case) with the PSA program:

Fundecongo gives me this to take care of the farm, so now I don’t take care of it with my money but with Fundecongo’s money. According to [FONAFIFO] it is a payment for the services that the forest offers: producing oxygen. [Interview 33]

In this case, the respondent’s own view is focused on the costs of taking care of the forest, which no longer must be paid out of pocket. However the respondent also understands that the program is paying for the production of oxygen (using here the language of ecosystem services).

3.3.1.2 Incentive (incentivo)

In some ways, the word incentive seems inappropriate for the context of the PSA, where forest protection payments accompany the law that prevents land conversion. Under this modality (the most common) there is no substantial change in land management. However, some respondents pointed out that the payment or the possibility of such may reduce illegal land conversion.
In several cases, the concept of an incentive was used in conjunction with the idea that amount of money offered by the program was small. For example, the family farmer below considered the program as offering an incentive, in that it was a monetary benefit, but a small one:

\[\ldots\text{In reality it is an incentive, it’s not much money. But with the passing of the years, the thing is the farm is turning into a very beautiful forest but there’s no profitability because now it is forest and you can’t think about extracting wood. [Interview 08]}\]

This farmer appreciated the beauty of the forest, but found the inability to profit from the forest (as prescribed by law) difficult. For the intermediary quoted in figure 3.4, the ‘incentive’ was not to discourage land conversion but rather to encourage better care of that land.

### 3.3.1.3 Recognition (reconocimiento)

The FONAFIFO website uses the language of recognition, but specifies that this recognition is specifically financial, thus placing the emphasis on market logic. The PSA is described as a ‘financial recognition on the part of the state’ for the ecosystem services provided by forests and forest plantations (www.fonafifo.go.cr).

Among respondents, recognition was used in the sense that the landowner was already willingly protecting the forest and the program would recognize that effort in the form of financial compensation. In the case of the intermediary in figure 3.4, this is also associated with the production of ecosystem services. A few family farmers saw the money as a recognition (reconocimiento) in the sense that the government formally recognizes in the form of a payment that they are conserving their forest. For example:

\[\text{You go to the office ask for the service. You say I’d like the forested areas of my farm to be recognized with payments for ecosystem services. [Interview 05]}\]

Another family farmer saw the money as both a recognition and a help (and not a payment):

\[\text{It’s not a payment because it’s a lot that you have to invest but yes, it is a great help or a recognition that allows one to keep an eye on the forest so that no one goes in. I see it as a recognition to the owners of properties to maintain them and to guard them. And also it is a help for the owners, so that every now and then they can obtain a little benefit, buy a little something nice. [Interview 35]}\]
In this case the money has multiple purposes: to recognize the work that the owners must put in to guarding and maintaining the land and also to help them financially to ‘buy a little something nice.’

3.3.1.4 Help/Support (ayuda)

In many cases, the payment was characterized as help to protect the forest from various threats—a substantial expense. The most important threat is that of forest fires, both natural and human in origin, that spread quickly during the dry season. FONAFIFO requires that recipients maintain firebreaks around the contracted land. These must be cut back twice a year, which farmers must either pay for or do themselves. Additional threats mentioned include illegal logging, marijuana planting, poaching, and even orchid theft. When farmers then spoke of the money helping them to protect the forest this referred to actual costs, not just opportunity costs. For example, this farmer focused exclusively on care and protection of the land: “Everything is for taking care of the land, for protecting the land, this is what the money is for.” [Interview 18]

Further examining the responses of family farmers that used ayuda showed two distinct but overlapping meanings: money to help the farmers care for and protect the forest and money to support the family’s income. For example, the ayuda quote in figure 3.4 goes on to explain that the payment is also to help small-holder farmers, especially given the terrible drought they recently suffered. Another explained that the payment helped them economically but also described themselves as the type of person that conserves land:

If we were a different type of person we would say no and make this a pasture for cattle, but we decided to conserve the land. So I imagine it is a help because it doesn’t pay for many things but it does help us a bit. [Interview 19]

For many other participants, the name ‘Pagos por Servicios Ambientales’ never came up as they discussed the program. These participants saw themselves as enrolled with the intermediary organization that coordinated their inscription in the PSA (see for example the way Fundecongo is described as the PSA in the final quote under ‘Payment’ above). Many never dealt directly with FONAFIFO and only some knew FONAFIFO by name (some believed they were enrolled with the intermediary organization and expressed confusion when asked about FONAFIFO or
the PSA). Instead, these farmers had a personal relationship with a representative of an intermediary organization. All were familiar with the person and organization that had helped them to enroll. As these groups provided a variety of extension and other services, they may have then seen the PSA program as another *ayuda* delivered by this group.

### 3.3.2 A generational shift in payment language?

We found some indications of differences in response patterns of payment language by age group and education level. These are shown in figure 3.5. While older and less educated respondents tended to use *ayuda* or help, the responses are more evenly distributed across categories for those under 50 years of age and with at least some university education. These are epitomized by experiences in two interviews where in both cases the respondent’s adult son interrupted the respondent (who was answering ‘*ayuda*’) to say that the money was a payment. After all, the sons explained (in both cases), the name of the program said it was a payment. In a third interview, an adult daughter explained that she saw the money as a payment but that her mother would see it as a help.

![Figure 3.5 Payment Language by Age and Education](image)

The number of respondents describing the payment using different language is broken down by age and education level.
3.3.3 Value about nature languages across groups

We examined the different value languages that participants, intermediaries and program managers employ. We focus on three categories of value languages: relational (including such value languages as responsibility and care), ecosystem services based languages (including those of services and benefits from nature), and market-based languages (including a focus on transaction and monetary benefits). These are illustrated in the conceptual framework (figure 3.3). If motivational crowding out is occurring we might expect participants to use more market-based language and less relational values language. ES language can be seen as an intermediate step, in that it focuses on the instrumental value of nature, but does not necessarily monetize that value.

Relational values focus on the relationships that people have with nature or with each other via nature (Chan et al., 2016). They may be especially central for people with close relationships to the land or sea, such as farmers. Relational values are further categorized in table 3.2. The use of ecosystem services language focuses on the benefits to humans as derived from ‘nature.’ This could include descriptions or lists of specific ES (e.g., pollination, carbon sequestration) or more general language focusing on the services and benefits to humans provided by nature. Market-based language might be based too on ES language, but takes the further step of referencing monetary benefits or values.

We found differences in the ways that program managers and participants discussed the values of nature and forests. These are summarized in figure 3.6. Family farmers expressed a rich array of values regarding their relationships to land, animals and trees. These ‘relational values’ are categorized with examples in table 3.2. Family farmers primarily discussed the value of their land and forests in these relational terms and much less often employed languages relating to market values, monetary reward or ecosystem services. FONAFIFO staff however, spoke of the values of land and trees primarily using the languages of markets and ecosystem services. The frequencies of the languages used are summarized in figure 3.6 along with example quotes illustrating each value language. Corporate farmers and intermediaries fell in between family
farmers and FONAFIFO staff, in terms of the ways they spoke about nature. These groups employed a mixture of relational, ecosystem service and market-based language.

**Figure 3.6 Values of nature language by group**

The frequency of each type of response is shown by group. The x-axis shows number of text selections coded at that value divided by number of participants in each group. n=FONAFIFO (3), Intermediary (6), Corporate Farmer (4), Family Farmer (26). Family farmers are individuals, often small-holders, who own and manage land. ‘Corp’ or corporate farmers are staff members at large agro-industrial operations. Intermediaries are heads of CACs, regentes forestales, or NGO staff that facilitate participation in the PSA for family farmers. FONAFIFO staff members are direct staff of the national organization, at the head or regional offices. See text for definitions of market, ecosystem services, and relational languages of value. Exemplary quotes from different groups also with their value language designation are included in the left hand side of the figure. Quotes, from top to bottom: Interview 13, 21, 06, 16, 22
3.3.3.1 Market value of nature

In many cases, market and ES language were used in conjunction, as show in figure 3.6. The FONAFIFO quote focuses on the specific ES that the program is supporting via a price paid for by society. The intermediary quote, however, is much richer in detail (e.g., tourists do not come to see ‘dirty and ugly cities’) and frames the very same payments for ES as a question of justice between urban beneficiaries and rural forest owners/services providers. Whereas for FONAFIFO staff the price is fair and paid for by the tax, for the intermediary the price paid for the ES provided by forests is in no way commensurate with their real value.

3.3.3.2 Ecosystem Service value of nature

Although FONAFIFO staff and intermediaries often referred to specific ecosystem services (and sometimes the idea that society should pay for those services), the language used by each group also differed (figure 3.6). The corporate farmer lists ES in a very straightforward and comprehensive way, whereas the intermediary focuses on the injustice of the payment compared to the ES produced. The corporate farmer’s ES list and that of the intermediary go beyond the four specific ES paid for by FONAFIFO and mentioned in the FONAFIFO staff quote in figure 3.6. The FONAFIFO staff person commented on the society that pays for the benefits using ES based language. For example, one staff person explained that they monitor the contracts each year and if there are changes they change the contract: ‘every year, every tree, every time they carry out the contract’ [Interview 12]. This mindset focuses on the forest not as a living, interconnected web of life, but as a collection of individual trees providing specific services for people. Contrast this with the way one family farmer describes the ecosystem:

*I believe what my mother, who is 85 years old and very wise, says. There is nothing extra here. All of this is for some reason so all should be conserved. We should not allow species to disappear. In a puzzle if you remove one piece then it is no longer a puzzle, it is no longer how it should be and it won’t give the same image . . . An animal that you remove from the food chain affects all of the rest that remain. And at the end the most affected will be us.* [Interview 38]

The framing of ES by family farmers often shared the focus on justice so eloquently described by the intermediary in figure 3.6. The quote in this figure exemplifies this thinking, explaining how
by protecting their forest, farmers in Costa Rica were ‘alleviating the bad’ done by big industrial countries. A number of farmers believed that the money from FONAFIFO came from these big industrial countries. FONAFIFO staff however, explained that despite a series of promises, pilot projects and proposals, major funding from outside the country had yet to materialize. The program is primarily funded via national taxes and contributions. Some farmers felt that their forest was for public but not private benefit. This was generally discussed in the context of payments or land taxes. Costa Ricans are allowed to exonerate their forested land from property taxes. However, in reality many do not take advantage of this benefit because either they are not aware of it or because they cannot afford to pay for the necessary costs of enrollment. The idea behind the exoneration is that the forest is benefiting the public and not the individual, a comment that several farmers echoed. Whereas in the past farmers produced beef or milk for local markets, they now produce oxygen for the world.

The FONAFIO website describes the beneficiaries and uses of each ES it funds (www.fonafifo.go.cr). Water protection is for urban, rural and hydroelectric use; biodiversity for scientific and pharmacological use; scenic beauty for tourism and science. Biodiversity is also ascribed importance for conservation, protection of ecosystems and of life forms. Yet left out of these benefits are many of the relationships that Costa Ricans have with nature and the landscape—their enjoyment of scenic beauty, the joy some respondents expressed of watching cedar trees grow on their land, and the common activity of family visits to swimming holes for Sunday picnics. Among the many uses of biodiversity listed, there is no mention of local appreciation of forest species, like the joy of hearing the toledo’s call or watching the small birds’ mating dance. Yet these were all benefits of the forest that interviewees discussed. Nor are the documented benefits of forest fragments for agricultural pollination or pest management mentioned (Karp et al., 2013; Mendenhall, Karp, Meyer, Hadly, & Daily, 2014).

3.3.3.3 Relational value of nature

Respondents, especially family farmers, discussed a rich variety of relational values. These included stewardship and connection to the land; family and historical ties to place; the value of the farming and countryside lifestyle; as well as concern for and connection to plants and
animals. Many talked about planting fruit trees for animals and birds, for example one explained how the bananas in his garden are for the birds because birds themselves cannot plant trees. When his neighbors ask for some, he says they can take a ‘child’ from the banana plant and grow their own. Others talked of attachment to trees. One described the story of a friend who had to cut down a large tree to pay the hospital bills for his daughter: “a daughter in the hospital and the tree fallen, two sadesses.” He later described his own reasons for keeping a small grove of mature cedar trees:

*One time a friend of mine came, and I had an old Toyota truck, and he said, ‘you are crazy or you have a lot of money, with all these cedar trees that you have. I would have cut them down and bought a new Toyota.’ But look, in 6 years I won’t have either the truck or the trees. The truck won’t be worth what I bought it for because it will deteriorate and the trees will no longer exist. I was not crazy nor did I have a lot of money. . . But there are people that think this way. How much do they think it has cost that poor tree to grow for 80 years? That you then come and put a chainsaw to it, is very sad. [Interview 22]*

Relationships to farm animals were also important. Explaining why his cattle preferred to drink water in the corral, one farmer said: “in the corral they have water, they have honey, they have salt and they have love” [Interview 22]. See additional examples of relational values in table 3.2.

<table>
<thead>
<tr>
<th>Relational Value</th>
<th>Type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stewardship of the Land</td>
<td>People and Nature</td>
<td>The culture of the Tico, the Guanacasteco, sometimes we don’t have the vision to think about the years ahead. We think of the moment. For example, this part of the hill in front of the melon farm. I am going to be 50 years old. When I was 16 or 17, this was bald, this was clean, clean of tees and it pained me to see this arid and I never thought that I would live to see this . . . become a forest. . . In one occasion I was cutting the saplings in the pasture with a tractor and there was a blackberry tree, and it was a little bush and I raised up the plow and I left it and now it is a tree. And I say, look it was my decision to leave it or remove it. . . many times we see a little tree and we do not value it and we say, lets cut it because it is small and when will it ever be big? But the years pass and we see. Possibly there are many farmers that think the same way, but hopefully there would be more people thinking like this. [Interview 08]</td>
</tr>
<tr>
<td>Respect of Nature</td>
<td>People and Nature</td>
<td>Respect is knowing that this world is for everyone, for the animals just as much as for human beings. [Interview 10]</td>
</tr>
</tbody>
</table>

66
<table>
<thead>
<tr>
<th>Relational Value</th>
<th>Type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care for wild animals</td>
<td>People and Nature</td>
<td>Here I planted bananas and quite a few. I eat them and my family, but we eat maybe one of every 10 that grow. And sometimes the neighbors come and they say ‘the birds are eating the bananas. I want some, please give me some bananas.’ And I say ‘Yes, get a knife and take a child plant and plant it in your garden and in 2 years you will have bananas for yourself, because these bananas are for the birds and the birds can’t plant. We are destroying the birds so I plant bananas here for them. And they come here to eat them and I sit down to watch them. [Interview 20]</td>
</tr>
<tr>
<td>Care for farm animals</td>
<td>People and Nature</td>
<td>The cattle almost always like to drink water from the corral because in the corral they have water, they have honey, they have salt and they have love. [Interview 22]</td>
</tr>
<tr>
<td>Rural Culture</td>
<td>People and People via Nature</td>
<td>The medicines, food, survival, flowers, gardens, all these things and more have molded the Costa Rican idiosyncrasy. For example, if you go to a village, from the moment you enter you will see beautiful houses, gardens, the park, which is typical of the compassion way of thinking. Our houses are like that, our lots. You see bananas and plantains, flowers and oranges. Every farm is like a particular design of the culture of that family. [Interview 21]</td>
</tr>
<tr>
<td>Rural Lifestyle</td>
<td>Eudaimonia</td>
<td>People say how much they are jealous of me and I agree. To live like this is very beautiful and very tranquil. One is healthy and very relaxed. We work hard physically but the compensation is incredible, enough to make one want to leave the city to be able to come here and enjoy the sun. The truth is that living in this peace has no price. [Interview 38]</td>
</tr>
<tr>
<td>Identity</td>
<td>Virtue</td>
<td>I am not a destroyer. When I had cattle I had to cut down forest to make pasture. But afterwards I stopped and now I have forest again. As long as I live I will continue. When I die, I don’t know what will happen to it. But I know what kind of person I am. [Interview 33]</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Virtue</td>
<td>I feel good because I plant many trees. On Sundays and days off of work, I collect seeds and place them to germinate and afterwards I plant them. I always say that the planet belongs to everyone and we must take care of it... but I also pollute and sometimes cut down a tree so I need to have a balance. When I throw things out, I recycle, you understand? So if we all act in this way we will be very different. [Interview 27]</td>
</tr>
</tbody>
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Table 3.2 Example relational values elicited in interviews.

Examples of several different types of relational values elicited in the interviews. “People and Nature” refers to values regarding appropriate or desired relationships between people and nature, including living a good life in harmony with nature. “People and People via Nature” refers to valued relationships between people that require or are facilitated by nature. “Eudaimonia” is a concept loosely translated as ‘living a good life.’ “Virtues” refer to characteristics of a person.
3.3.4 Intersections of payment and value of nature languages

ES language intersected with payment and relational values languages in five different ways. First, these two co-occurred in the way described in theoretical PES literature—ES producers as being paid by beneficiaries. This can be seen in the two quotes where ES and market language co-occur in figure 3.6. ES and market-based language were the most frequent value languages to co-occur in the same statement by respondents (9 times versus 6 for the next most common) and in several cases were also associated with ideas of payment language. Certainly, discussing a payment program for ecosystem services made such a coincidence likely, yet the direct way they are discussed together indicates these concepts may be highly associated in some participants’ minds. The two quotes titled ‘market and ecosystem services’ in figure 3.6 highlight this. The first explains how society pays for the production of ES; in another part of the interview the respondent explained how farmers are paid for this service to society.

Second, both ES and payment languages were used in conjunction to make an argument about distributional justice between rural and urban groups and between Costa Rica and more industrialized countries. This can be seen in the quote from the intermediary in figure 3.6. A number of family farmers also pointed out that the payments only covered a short time period or a small fraction of their land or the benefits from their land to the world, for example one family farmer explains:

*We need more institutions like Fundecono that help us to give them more land. We have produced oxygen for more than 100 years, we have always produced oxygen but only now with this project are they paying us for that oxygen. But they are paying one part of the large quantity of land that we have. We have 440 hectares and they are paying for the oxygen from only 86. [Interview 34]*

The family farmer quoted in figure 3.6 also explained that given the ‘relief to the planet’ that their land was providing, the payment should have been double what it was. This farmer argued that Costa Rica was relieving the ‘bad’ done by big industrial countries and should be paid a more appropriate amount for that. Another respondent argued that the payment should be higher because of the value of the sacrifice that the farmers were making.
Third, ES language was used in conjunction with the recognition language. Both the language used by FONAFIFO on their website and the quote from the intermediary in figure 3.4 link the language of recognition to that of ecosystem services. The idea here is that people who have done the right thing should be recognized (financially) for that.

* I see it [the PSA program] as just. Before [the PSA] there were many people that for reasons of conscience had a forest. They protected it because they wanted to [do so] but they didn’t receive any recognition. [Interview 23]

Fourth, in some cases relational values were closely coupled to the idea of the program as a help. For example, the following quote explains how a farmer feels sad cutting down trees for pasture, expressing a relational value. At the same time, they describe the PSA as a ‘help’ from the government (or from donations from abroad) which reduces the needs of farmers to cut down the forest for pasture:

* I cut down many trees and it hurts me to go cutting down these young tress to create pasture. This help from the government or donations from abroad allows us to try to maintain the forest. [Interview 28]

On the other hand, some participants expressed values of care along with ideas of the program as a payment. For example, the second farmer quote in figure 3.4 says that the program is a payment to care for the forest. Thus, while some respondents coupled ideas of payment and market language or help and relational values, others combined these in different ways.

Finally, one FONAFIFO staff member made an argument for the PSA crowding in motivations, similar to the example of motivational crowding-in mentioned in the introduction, where outside elites signal the value of biodiversity. The below quotes speaks about people in the region and says that the PSA has changed the mentality of the people from one of seeing the forest as useless to one where it can potentially generate a bit of (needed) income.

* The problem is that most people . . . if they are not paid then they look for an alternative to make use of the land, like converting it back to pasture. You need a balance between the economic and the environmental. People need money and the forest does not generate money. So this ecosystem service [program] has served to change this mentality that the forest is useless and doesn’t produce. And it gives them a little bit of economic relief so that the pressure on the forest is reduced. [Interview 09]
3.4 Discussion

Whereas much of the literature on PES seems to assume that the language used in official program communication will be the language used by various stakeholders about the program, we found stark differences in the way that program officials and participants described the program and the values surrounding it. Family farmers most often described the program as a help to protect the forest and support their household economy. They also tended to use more relational language to describe the importance of the forest and nature, and used less ES and market-based language. Conversely, FONAFIFO staff used more market-based language to describe the PSA (as a payment) and more frequently used ES and market-based language to describe forests and nature.

For PES programs specifically and market-based conservation generally, a key factor in assessing the real impacts of such approaches is understanding the ways that they function on the ground. Much of the critique of PES assumes that such programs actually do operate as rational markets and that this logic pervades their operation. Yet in reality, PES seldom resemble actual markets (Vatn, 2010). We studied one such program—FONAFIFO’s PSA in Costa Rica—which explicitly calls itself a PES and employs the language of ES. We found that despite the prevalence of market language and logic in official documentation and interviews with organization leadership, most participants in our study region saw the program as a form of assistance to help them protect the forest and as support for rural communities. This confirms Olmsted’s findings of strong relational and pro-environmental values across both PES and non-PES farmers in the Nicoya region (2017). As well, they parallel Kosoy et al. (2007) whose PES participants in Central America perceived their payments as an ‘apoyo’ (a support, a word nearly synonymous to ayuda). Understanding the ways that participants view programs can help to design and manage PES programs such that they avert counterproductive outcomes, including motivational crowding out (Rode et al., 2015) and commodification of nature (Kosoy & Corbera, 2010; Spash, 2008).

Our finding that FONAFIFO staff see the PSA as a payment and employ market-based logic shows how this group has adopted the market logic and language of PES as described in the
theoretical, and especially critical, literatures on PES. Beneficiaries of the ES are clearly defined on FONAFIFO’s website. So too are suppliers, and the specific ES they supply; in some cases ES beneficiaries (buyers) may pay more or less per acre protected in order to target specific services, e.g., hydrological services or carbon sequestration. Yet the divergence we found between this view and that of the intermediaries points to the importance of the intermediaries in conveying the program to participants. Rather than repeating the official program language and logic, intermediaries conducted the work of ‘translating’ the program into language and logic appropriate for the farmers they worked with. This translation not only in the payment language but also in the uses of value languages of ES, including market values and relational values, also points to the role intermediaries may have in translating not just the program, but also potentially the logic of valuing nature. This may explain why Olmsted did not find evidence of motivational crowding out due to PES participation in the Nicoya region (2017).

Despite the frequent assertions that ecosystem services are a purely utilitarian concept, several farmers linked ecosystem services with concerns about justice, appropriate recognition, and other deontological and relational values. Moreover, the languages and logics of payments and of values do not map onto each other in neat and tidy ways (as might be expected or feared). Rather, these languages are varied and are differentially taken up and employed by actors, each of whom is actively making sense of and arguing for particular outcomes. Thus, intermediaries and family farmers often employed the language of ES to make arguments about distributional justice—between urban and rural Costa Ricans and between Costa Rica and large industrial countries. In one sense these statements could be seen as indicative of motivational crowding out, in that respondents are demanding payment for previously freely given ecosystem services. However, in the context of the substantial economic differences between rural Costa Ricans in our study site and both urban Costa Ricans and richer industrialized countries, we could interpret these statements instead as using new logics and language to make important arguments about justice.

Common value languages of farmers support the idea that the point of the PSA is not additionality, but rather appropriate compensation for the burden of forest protection that farmers were expected and required to carry due to the deforestation ban, which was introduced
simultaneously. The PSA was implemented simultaneously with a ban on land conversion and (A. E. Daniels, Bagstad, Esposito, Moulaert, & Rodriguez, 2010; Porras et al., 2013). Costa Rica experienced a major turn-around in 1990 as deforestation shifted to reforestation (Kleinn, Corrales, & Morales, 2002). While in theory the simultaneous creation of the PSA with the land conversion ban means that the PSA should have zero impact on forest cover, in reality the picture is more complicated. The ban and the PSA might be seen as a package deal: by offering the potential for financial recognition of forest conservation, it makes the land conversion ban more palatable. Perhaps this policy mix plays a role in the way farmers view the PSA. As they are not allowed to cut down their forest, the program is not paying for a change in management or even a significant opportunity cost. It pays farmers to continue doing what they would anyway, with some additional protection requirements. This situation might explain why few farmers saw the program as a payment. The language of payment and incentive assume farmers would not protect the forest without the PSA, whereas recognition and help imply they would do so regardless of the program.

While our results indicate that to date smallholders on the whole do not see their yearly check as a payment, we also found some indications that this could change over time, shown by the different use of language by age and education level. This potential generational shift is an important area for further investigation. What might happen if the market logic of the PSA filtered down more directly to participants? And if there is a generational shift in how land managers see the payments, how might that shift the individual or social understanding of forest conservation in Costa Rica over the next 20 to 30 years as the next generation takes over land use decisions? While their parents were happy to receive government assistance or help to care for their forest, might this new generation look down at their payment for $64/hectare and feel they have gotten a bad deal? Or might the package of the PSA and the land conversion ban ‘crowd in’ motivations for conservation by shifting perceptions of the forest from useless to productive, as one intermediary surmised? What are the broader impacts of the PSA (beyond only those that participate as suppliers) on the ways Costa Ricans imagine appropriate relationships between people and nature? Certainly we can imagine many different scenarios for Costa Rica’s future pathways. The ability of FONAFIFO to adapt to changing conditions may be most critical,
particularly if the main threats to forest cover continue to shift from agriculture to urban and coastal development (A. E. Daniels et al., 2010).

Understanding of this potential shift along generational and educational lines will require further research to determine if the preliminary findings found in this study are widespread, as well as to identify potential causes. While the PSA could possibly be influencing the ways that Costa Ricans view nature and the responsibilities around it (and the ability of younger generations to easily visit the website and read contracts could point to this), there are many other possible explanations. The widespread social and economic changes over the past generation could play a role as ecotourism has grown and agricultural production declined, changing the way the landscape is used. A further explanation could be education in economics obtained at higher levels of education. Economics education has shown to affect views of private behavior and public policy, e.g., increasing support for free trade and fostering greedy behavior (Hainmueller & Hiscox, 2006; Wang, Malhotra, & Murnighan, 2011).

While our study answers some questions, it leads to many more. How widespread are the values and logics we identified among FONAFIFO staff, other regions in Costa Rica, and in other PES programs elsewhere? Costa Rica’s specialization in eco-tourism and green reputation make it unique and the views of participants and program managers elsewhere may be quite different. A further important research direction is to understand the ways that values, language and logics interact and intertwine in PES programs. How does the use of ES and market language influence the views of nature within an individual or group? Another set of questions centers around how respondents may describe nature or programs differently when asked as experts versus as participants in such programs. Intermediaries and FONAFIFO staff were interviewed and approached as ‘experts’ and this may have shaped the types of language and logics they employed. Farmers on the other hand, described their personal experiences, which may have lead them to focus more on relational values and less on market or ES values.

The work of the intermediaries likely played an important role in the frequency with which farmers, especially family farmers, saw the program as a help or support. That farmers were more likely to use the language of ‘ayuda’ than intermediaries points to several potential
explanations. It is possible that intermediaries used different language when speaking with the interviewer versus when they speak to farmers with which they worked (though we did not get the chance to observe this). Alternatively, the farmers themselves may have interpreted the program in this way based on past experience with government or NGO assistance. Since small-holder farmers participated in the program via NGOs or cantonal agricultural centers (CACs), which also deliver other forms of extension and assistance, they may have categorized the PSA more with the organization that they worked with than the actual source of the funding. This explanation is supported by our finding that many farmers referred to enrollment with the NGO or CAC rather than with FONAFIFO and in a few cases did not even know they were enrolled with FONAFIFO. The contrasting view of the program among corporate farmers again points to the potential translation role of intermediaries. Corporate farmers worked more directly with FONAFIFO. They either contracted a forest engineer themselves to conduct the required assessments or in some cases employed their own forest engineer. This more direct interaction, un-buffered by intermediaries, may explain their more frequent use of market-based languages and logics.

The most important research direction pointed to by our results is around the role of intermediaries. Intermediaries play a number of roles in PES programs. Huber-Stearns et al categorized four key functions in a systematic literature review: information exchange; program design; networking, representation and mediation; and administration and project coordination (2013). While information exchange includes presenting appropriate information and terminology, the idea that intermediaries might tone-down the market-based language of PES does not seem to have been directly explored. How intentional is their ‘work of translation’ and what factors impact their choices around how to describe the program? How does the other work conducted by the intermediary organization shape their relationships with participants? And how does the history of programs and policies in the area shape the way that participants in turn view the intermediaries and the program itself? Contextual factors such as the intermediary’s mission, values, network and purpose impact their inclusiveness in organizing PSA contracts with small-holders (Bosselmann & Lund, 2013). These factors might also influence the ways they chose to frame the program when speaking with potential participants.
Policies are not passively absorbed by all actors, but rather modified and translated, such as the case of Mexico’s PES, where market-based logic was contested by local actors (McAfee & Shapiro, 2010). Our results point to the importance of language and program framing in the debate around market-based conservation. Most importantly, they show that different groups interpret the program in different ways. Even when program leadership and official communications have adopted a strongly market-based language and logic of PES, this does not mean that the on-ground participants experience the program in this way. By integrating an understanding of the different experiences of participants and managers, market-based conservation may be able to more effectively capture some of the benefits while avoiding the most problematic side effects.
Chapter 4: Value conflicts as barriers to farmer participation in incentive programs

4.1 Introduction

As ecosystem services and biodiversity decline throughout the world, conservationists are increasingly turning to incentive programs as tools to improve the management of aquatic and terrestrial systems. One specific set of programs focuses on transitioning agricultural lands towards practices and land uses more conducive to maintaining or enhancing biodiversity and ecosystem services. Agriculture accounts for almost 38% of the world’s ice-free land and has important ecological impacts on global carbon, nitrogen and phosphorus cycles, biodiversity and freshwater use (Foley et al., 2011). Addressing the sustainability of the agricultural sector is therefore crucial. Agricultural lands also constitute an important opportunity for conservation due to relatively low opportunity costs (compared to urban or suburban areas) and the many potential synergies between agricultural production and conservation (Mendenhall et al., 2014).

A variety of educational, outreach, extension and incentive programs and policies seek to encourage land managers to adopt stewardship practices such as wildlife friendly farming, no-till and organic, as well as set-asides of forest fragments or riparian buffers. Some programs compensate farmers for the direct costs of changing practices or building new infrastructure or natural areas. Other programs go farther, paying farmers for forgone income from agricultural production incurred via the conservation practice (considered opportunity costs in PES literature). The latter programs, generally characterized as payments for ecosystem services (PES), may be necessary in contexts where the opportunity costs are significant and farmers have low or even negative profit margins (Jack et al., 2008; Wunder, 2013). Similarly, PES might be more attractive to farmers than command-and-control environmental regulations because of their voluntary nature and the incentives involved (Jack et al., 2008). Many countries already

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subsidize agricultural production—to protect the cultural heritage inherent in some agrarian landscapes, to support local farming economies, or to bolster food security.

A key question for all incentive programs (including PES) is how to increase enrollment of land managers. One approach is to set incentive amounts that exceed the full costs to farmers of implementing the conservation practice (direct costs), maintaining the practice (maintenance costs) and any resulting losses in income or potential income (opportunity costs). Such an approach is costly and so not generally popular with policymakers. However, farmers may still choose to participate even without being compensated for the full cost (Stoneham et al., 2003) and they may resist participation even when payments appear to equal or exceed full costs (Buckley et al., 2012). Therefore, while PES has generally been considered a purely financial instrument in the ecosystem services literature, economic motivations alone do not explain participation.

A second thread of research has examined if farmer motivations can be explained by their environmental values and attitudes (Buckley et al., 2012; Farmer et al., 2011; such as Greiner & Gregg, 2011). This work has found that attitudes and values influence farmer participation in agri-environment programs and pro-environmental behavior generally, but reviews have found that the results are highly context dependent and the relationships between values, attitudes and behavior are often not straightforward (Ahnström et al., 2008; Busck, 2002; Dietz et al., 2005)

A key barrier to farmer participation in incentive programs may be the mis-alignment of participants’ values and values perceived to be imposed upon them by programs. Via rules, scope, criteria, priorities and other means, programs articulate particular values, which may align or conflict with values of intended participants. Conflicts or mis-alignment of participant and program values can have several undesirable consequences. First, imposition of urban or conservation values from outsiders (via immigration, policies or programs) can cause rural communities to feel their own values are threatened (McCarthy, 2007; Nesbitt & Weiner, 2001; P. Walker & Fortmann, 2003). Second, when programs fail to understand and engage with participant values, they may lead to perverse outcomes for human wellbeing or conservation (West, 2006). Third, if incentive programs inadvertently promote monetary benefits over locally
salient stewardship values, motivational crowding out could occur (whereby stewardship values are eroded and replaced by instrumental motivations) (Rode et al., 2015). As a corollary, when programs support actions and language that align with participant values, they may be more successful: Burton explains how farmers prefer conservation actions that visibly demonstrate success or productivity—e.g., fences are preferred to overgrown buffers (Burton, 2004). Wynne-Jones showed that farmer buy-in was improved in a PES project when it adapted to farmers’ language and culture, e.g., framing ES as a product that farmers produce and could be proud of (Wynne-Jones, 2012). Programs can increase participation when design and delivery better fit with farmers’ views and values (Sorice et al., 2013).

In this paper I examine Conservation Reserve Enhancement Program (CREP), which compensates farmers for direct, opportunity and maintenance costs of installing native vegetation along salmon-bearing streams. While some programs that offer much less in the way of compensation are oversubscribed (e.g., Costa Rica’s nationalized PES), the CREP program is undersubscribed, despite generous compensation. I therefore examine the possibility that poor alignment of rural values (e.g., related to place, community and landscape) and program values (i.e., those embedded in program rules and language) impedes uptake of this PES program. I examine the possibility that values implicit in the CREP program (via rules, design or delivery) may impede increased participation. I therefore ask: do farmers’ values conflict with those of a PES program in the US Northwest? If so, what are the points of conflict, and how might they be mitigated? To answer these questions, I conducted interviews with rural land managers and farmers in Snohomish County in Washington State, USA. I elicited farmer and rural land manager values as well as motivations and barriers, and experiences in programs incentivizing the creation of riparian buffers on agricultural land. I seek to better understand the values, motivations and barriers of landowners to participate in the CREP program or other riparian buffer programs, and how value conflicts or misalignment could impede participation in such programs.
4.1.1 PES Programs as Value-Articulating Institutions

Programs and polices embody values, intentionally or not. In this sense, they can be considered as institutions that ‘articulate’ values via rules that specify who should participate and in what ways, as well as what types of data are considered valid and how that data should be used (Vatn, 2005). The idea of value-articulating institutions arose from critiques of environmental valuation within Cost-Benefit Analysis (Jacobs, 1997). Specifically, such methods constrain the articulation of public good or ‘citizen’ preferences in favor of consumer preferences (Jacobs, 1997; Sagoff, 1998). Alternative approaches such as citizen juries facilitate the articulation of different types of values (e.g., around the public good) (Tadaki, Allen, & Sinner, 2015).

While the term value-articulating institutions was initially applied to environmental valuation methods, it equally applies to the institutions, interventions and programs born of the same economic logic that inspired such valuation methods (Tadaki et al., 2015; Vatn, 2010). One such program is payments for ecosystem services. While often conceptualized as a market mechanism, as Vatn argues, PES is in practice, equally an institution, requiring state or community engagement (Vatn, 2010). Similarly, environmental regulations and institutions can foster changes in the way that participants view the environment or take up new identities and relationships to nature (Agrawal, 2005). Institutions articulate values in several ways: by setting criteria for evaluation or arbitration between different outcomes; prioritizing values or sets of values (e.g., explicitly via mission statements or goals, or implicitly via rules, language choice, and scope of work); and defining jurisdiction and decision-making processes (e.g., who participates and how?) (Tadaki et al., 2015; Trainor, 2006; Vatn, 2005).

4.1.2 A value lens to understand Rural Land Manager and Agrarian Values

O’Neill, Holland and Light use what they call ‘thick ethics’ to offer three insights to better understand the ways that people use and think about values in the real world (2008): 1) structural pluralism, 2) combining descriptive and evaluative statements, and 3) being rooted in history and place. Structural pluralism is an approach to values that allows for not only multiple types of values but multiple (or plural) value structures. There are three main structural or ethical
approaches to values: “consequentialism (What state of affairs ought I to bring about?),
deontology (What acts am I obliged to perform or not perform?), and a virtues ethic (What kind of person should I be?),” (O’Neill et al., 2008, p. 82). Structural pluralism sees all three approaches as valid and avoids creating a priori hierarchies of values (which is more reflective of how most people make decisions in their lives). Combining descriptive and evaluative statements involves connecting ‘what matters’ with ‘why,’ which is often how values are discussed in everyday conversations (e.g., “It’s important to arrive on time to show you respect other people” or “Protecting salmon is essential for Western Washington tribes due to the cultural, economic, and religious role salmon play for these groups”). This is important as values are often expressed in ‘bundles’ rather than neat categories (e.g., salmon are important for recreational fishing, food, culture and tradition)(Klain et al., 2014).

In many agricultural communities, values are not just personal characteristics (virtues), but also expressed on landscapes (and so rooted in history and place). For example, a key concern of many farmers and rural land managers centers around the relationship between community and individual (Donahue, 2003; McCarthy, 2007). For many rural resource-dependent communities, the structure of the landscape (e.g., via farm management practices) is essential for a way of life (Satterfield, 2007) and also as a reflection of key values of place (Drenthen, 2009). In this paper, I conceptualize values as ‘what matters, to whom and why.’ An explicit focus on ‘to whom’ acknowledges the political nature of many environmental management conflicts, drawing from work in political ecology which focuses on the politics and positions of different groups (Robbins, 2012).

In analyzing farmer and rural land manager values I consider the practices, relationships and ecological understandings that intersect with those values. This allows us to account for different groups’ understandings of the material world (e.g., professional farmers, hobby farmers, eNGOs, conservation groups). Our definition of ‘environmental values’ includes but is not limited to bio or eco-centric values or values around care of the environment (following Trainor, 2006). In this sense all people have environmental values—some may be about care or respect, others about mastery or extraction (Kellert, 2005). In particular I am interested in understanding different ideas about appropriate relationships—between people and the natural world directly;
or between different people mediated by landscapes, particular species, or other aspects of the natural world. In this I consider the concept of relational values, following work by Brown (T. C. Brown, 1984) and more recently articulated by Chan et al. (2016). Relational values are “preferences, principles, and virtues associated with relationships, both interpersonal and as articulated by policies and social norms” (Chan et al., 2016). As with thick ethics, relational values as a concept is based on structural pluralism (in that it includes preferences, principles and virtues). Relational values are often deeply rooted in history and place, such that thick ethics is a helpful way to think about these kinds of values. Combining these two approaches—thick ethics and relational values—can shed light on a key knowledge gap around the mechanisms by which values and pro-environmental behavior interact (Burton, 2014; Dietz et al., 2005). One reason mechanisms have been difficult to determine is that values and attitudes have generally been seen as (relatively static) attributes of the person (Dietz et al., 2005), which might be appropriate for Brown’s (1984) category of held values. Approaching values as relational (e.g., between people and landscapes) (Chan et al., 2016) and dynamic might help to identify mechanisms by which values interact with behavior.

4.2 Methods

4.2.1 Study Area

The federally funded Conservation Reserve Enhancement Program (CREP) pays for restoration, maintenance and opportunity costs for agricultural landowners to install riparian buffers along salmon bearing streams of their property. County level conservation districts recruit participants to the CREP program and administer and manage the projects, along with a variety of other voluntary and cost-share programs. Yet conservation districts have had difficulty achieving their recruitment goals, leading to questions about how to increase participation rates in order to accomplish regional salmon-recovery and water quality goals.

The CREP program in Snohomish County is one of a suite of funding programs supporting conservation on private agricultural lands that can be considered a PES program. Payment for ecosystem services (PES) programs are market-based conservation programs involving a
transaction between an ecosystem service “supplier” and “beneficiary” (Wunder, 2005). In this case, government represents the human and natural “beneficiaries” (people who care about salmon, water quality in the Puget Sound and tributaries and riparian habitat) and farmers act as the “suppliers” of a suite of ES (including water filtration, stream bed stabilization, riparian habitat, stream temperature stabilization) through the management of riparian buffers. These ES help to create good habitat for salmon and thus support salmon populations. Salmon are a key provider of provisioning and cultural ES in Puget Sound. Valued for tribal, commercial and recreational fishing, these species also play critical roles in the cultural traditions of tribes in the region.

Riparian buffers—vegetation strips along streams and waterways—are key for both salmon recovery efforts and watershed restoration in the Puget Sound region. However, no regulation in the Puget Sound region requires the creation of new riparian buffers on agricultural lands. Some regulations (which vary by county) protect existing riparian areas. Therefore, increasing the miles of stream with riparian buffers requires cooperation of private landowners, who are sometimes reluctant to ‘give up’ what they currently view or utilize as productive land. A variety of programs exist in the Puget Sound to support and incentivize the creation of new riparian buffers on private land, including the federally funded Conservation Reserve Enhancement Program (CREP). The CREP program is similar to the federally administered Conservation Reserve Program, however CREP is a partnership between the federal Farm Service Agency and state governments to address “a high priority conservation concern” (Farm Service Agency, 2017). The CREP program is specifically designed to address endangered and threatened salmon species (Farm Service Agency, 2017). In the Puget Sound, Chinook, Hood Canal summer chum, steelhead trout and bull trout are all threatened (Washington State Recreation and Conservation Office, 2017).

Most programs offer some form of cost sharing for the expense of installing riparian buffers. The CREP program pays the expense of installation as well as a yearly payment up to 15 years based on the width and length of eligible land put into riparian buffers. At the time of research, buffers had to be at least 35 feet wide to receive funding from CREP (on each side of salmon bearing streams). Current policy debates surround proposals to increase minimum buffer widths required
for CREP participation. In addition to the minimum width requirement, CREP requires that buffers be ‘no-touch’ in that no agricultural activities can occur in the buffer zone.

4.2.2 Data collection and analysis

The interview protocol and research design were developed in consultation with the research team and regional research partners: the Puget Sound Institute and Snohomish Conservation District (SCD). Interviews were conducted with 22 property owners or managers⁴ who had worked with or considered working with SCD on riparian buffers and other conservation projects on their property. Interview participants were recruited with the help of SCD via their existing relationships and contacts with efforts to reach a diverse group of respondents, particularly including age, gender and farm size. Our sample consisted of 3 full time farmers (in that they obtained more than half of their income from farming), 8 part time farmers (farms which operated as a business but were supported by off-farm income), 9 hobby farmers (who produce only for friends or family, or have horses for personal use, or operate nurseries), and 2 land managers of church properties with agricultural designations. The sample included both CREP enrollees (7 current and 3 potential) as well as landowners who had implemented or were planning to implement a riparian buffer via a cost-share or voluntary program. The sampling of CREP enrollees was limited by the number of potential participants in SCD's network (there were only 29 CREP enrollees in Snohomish County at the time of research; of these 17 were full time farmers). The prevalence of hobby farmers in our sample is largely reflective of Snohomish county, where the average net cash income from a farm is $4,244. Of the 1,438 farms in Snohomish County, 589 have sales of less than $1000 annually. A further 536 had sales of $1000 to $10,000 annually (US Dept of Agriculture, 2014). Thus while the interviewed group is not a representative sample of those enrolled in CREP, it does largely reflect the context of rural landowners in Snohomish County.

⁴ Two couples were interviewed, one together and one separately such that there were 22 total individuals, 21 total interviews and 20 discrete properties included in the study.
Interviews focused on three key areas: a) values related to farms and farming, including sense of place and aesthetics as well as land management paradigms; b) experiences with riparian buffer programs, including motivations, benefits and costs to participation; and c) participant's suggestions for improvement of riparian buffer programs (see interview protocol in Appendix A). The following are examples of the questions used to elicit value information: a) Comparison: 'Can you describe a farm/ranch in this region that you admire and why?'; b) Sensory information: 'Can you describe what it's like to be there? [sounds, smells]'; c) Narrative elicitation: 'Can you tell me a story that describes why or how you value that place?'

Land manager interviews were conducted between November 2013 and December 2014. Interviews lasted between 1/2 and 2 hours and were conducted by the researcher in participants' homes, workplaces or cafes, with the exception of 2 interviews conducted by phone. Participants came from communities in or around Arlington, Everett, Stanwood, Lake Stevens, Monroe, or Snohomish. They had lived in Puget Sound between 3 and 72 years. Most had animals on their land, usually horses or cows.

Analysis of interviews proceeded as follows: Interviews were transcribed by the research team and assistants. The lead researcher for this qualitative study (M. Chapman) coded the transcripts with NVivo for Mac qualitative data management software. Codes were derived via a four-step process: 1) Emic coding (where code categories are inspired by the respondents’ own words) of fieldnotes from all interviews as well as line-by-line coding of 10 interviews selected to represent key groups of the sample and to achieve a breadth of perspectives. Field notes, which included summaries of key points from the interviews, were used to analyze major points of the remaining interviews. 2) The initial coding sample provided direction for a literature review focused on: empirical results from PES and agri-environment schemes, theoretical and empirical literature on agrarian values, agrobiodiversity and food sovereignty, as well as political ecology of rural/urban conflicts and conservation programs in rural communities. 3) Based on this focused literature review a final list of codes was created and used to code all interviews. 4) Finally, within each code, specific themes and categories were derived based on participant’s own words and concerns (taking an emic perspective). Identification of points of conflict in the CREP program with participant values was derived based on the participants’ own perspectives (some
participants had read the CREP rules in great depth). Additional sources of data provided context and background and included webpages of interview participants' businesses, videos and newsletters produced by the SCD, and publically available demographic data.

4.3 Results: Value Conflicts between Farmers and Riparian Buffer Programs

Five inter-related value themes emerged from the analysis of participant interviews that pointed to misalignment between participant and program values leading to reduced program participation. These value themes are defined in Table 1 and discussed in detail in the following sections. Prior to an in-depth description of these value conflicts, however, two other key results must be explained: the motivations for participating in riparian buffer programs as well as the rules of the CREP program.

<table>
<thead>
<tr>
<th>Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetics</td>
<td>Sensory descriptions, preferences, or feelings generated by the senses (sight, sound, smell, taste or touch).</td>
</tr>
<tr>
<td>Agency</td>
<td>Descriptions, preferences or feelings about who has or should have influence, power, or control</td>
</tr>
<tr>
<td>(Active) Land management</td>
<td>Descriptions, preferences or feelings related to how land is or should be managed (e.g., goals of profit, sustainability or stewardship)</td>
</tr>
<tr>
<td>Knowledge base</td>
<td>What kinds of knowledge are or should be considered; who's knowledge 'counts' especially regarding science or local knowledge</td>
</tr>
<tr>
<td>Relational Values</td>
<td>Descriptions, preferences or feelings about relationships between people and other people (including future generations) with regard to the land(scape) or between people and the land(scape).</td>
</tr>
</tbody>
</table>

Table 4.1 Key value themes and definitions

The first four themes are values that conflicted with program rules. The second two are over-arching themes that help to explain the value conflicts (described below). These themes were identified from an emic process (see Methods) from the 22 interviews with farmers in Snohomish County. The results section details the data (quotes) that represent these themes.

Respondents who elected to install a riparian buffer (CREP, independently, or via another program), cited motivations that often combined several factors. For many respondents, especially those actively farming their land, the ability to improve productive capacity or...
function of their land as a whole was a key motivation. Often, SCD could provide technical, labor or material contributions that allowed for the simultaneous creation of buffers alongside changes desired by the landowner (e.g., stabilization of stream beds, measures to improve drainage, compost installation, etc.). Thus while they might lose some economically productive crop or grazing land in order to create the buffer, this was in cases outweighed by overall improvements to productivity or function. Many land managers were also motivated by a sense of stewardship or “doing the right thing” and for some the ability to improve water quality or support salmon and other wildlife was also a motivator. Financial, technical and labor assistance were also important for most land managers: for some apparently as motivations in their own right and for others as enabling factors to do what they would have liked to do anyway.

Some respondents, while initially interested in a CREP buffer, ultimately ended up working with the SCD to install a buffer via other grant programs or without financial assistance. CREP has a substantial financial advantage over any of the other grant programs that SCD can offer to landowners for creating riparian buffers: CREP pays not only for the full costs of riparian buffer installation, but also for maintenance costs associated with the vegetation and infrastructure (fences are installed in cases where the vegetation could be damaged by wildlife such as deer or by livestock), as well as a yearly rental payment to cover the landowner’s opportunity costs (or forgone potential to use the land converted into a buffer for economically productive purposes) and an incentive payment equal to the annual rental payment. Other grant programs managed by SCD cover partial costs of buffer installation, but not maintenance or opportunity costs.

Respondents that opted to forgo these substantial financial benefits, often mentioned one or more of the rules of the CREP program as the reason why (more detail is provided below). While there are many guidelines and rules in CREP (far too many to list in this paper), I focus here on those rules pertinent to the key points of conflict. One interviewee had read through the entirety of their proposed CREP contract and presented this 2-3 cm thick collection of papers to the researcher. In neighboring Skagit County, Breslow mentions discussing CREP rules for an hour with two administrators and only covering the “tip of the iceberg” (Breslow, 2001). The sheer volume and complexity of rules under CREP meant that participants had to either trust the SCD
staff person to explain the program to them, or attempt to muddle through numerous pages of legal contracts.

In particular, respondents objected to three types of rules: 1) the no-touch requirement (which restricts land-owner activities in the enrolled riparian buffer area); 2) minimum buffer widths (35 feet on each side of the stream or river at the time of research); 3) the types of buffers required (CREP primarily pays for riparian forests which consist of a variety of native trees and shrubs that will ultimately grow to provide shading of the river and deposit large woody debris). Some respondents were also concerned about restrictions on future property use under the CREP program. For example, if the land were sold the new owner would need to take over the CREP contract. CREP also involves a number of detailed guidelines, such as for avoiding ‘take’ of endangered species during installation and maintenance activities, managing pests, and agency roles for cultural resources. Assessing what can and cannot be carried out often is the purview of “qualified agency personnel” or “trained personnel” (Farm Service Agency, 2017) essentially excluding the landowner from making many decisions about what happens on their land. In the following, four values that conflicted with the CREP rules are explained:

4.3.1 Aesthetics: Agrarian preferences for the look and function of farms can conflict with program preference for ‘wild’ riparian buffers

Many rural land managers, particularly those that were full or part time farmers, preferred an aesthetic that was neat, orderly and well cared for, expressing that a tidy farm is a way to demonstrate both care and competence. Riparian forest buffers on the other hand, can appear ‘messy’ or ‘wild.’ Other types of buffers (such as hedgerows or grass strips) are ‘tidier’ than a forest buffer in that they tend to be short, of one height, and just one type of plant. ‘Tidy’ farms require work—work that cannot be undertaken if the landowner is excluded from ‘touching’ the land via a no-touch rule.

One farmer described his dislike of the way many other farms looked and his pride at the aesthetic of his own farm:
I've been to a lot of different farms and there's just a lot of debris and blackberries growing up around there and everything. And you don't see any of that on our farm. [Interview 04]

He went on to explain that a beautiful farm is an organized farm. This organization is then specifically tied to the work of farming: hard, meticulous work.

_Interviewer:_ What is it about that in contrast to other farms that makes it so beautiful?

_Respondent:_ Organized. [laughs] . . . this farm, the outbuildings are made from the original homestead home and they're still upright and they are still nice looking and they are painted and everything looks organized. [My partner’s] dad, he's very meticulous. He goes and he mows a couple times a month and he's down there planting flowers and trees. [Interview 04]

Some of these aesthetic concerns were practical. For example, when working with machinery the curving lines of a river (that a buffer would normally follow) are difficult to maneuver. While this is normally a challenge, one farmer was able to achieve both aesthetic and ecological goals in one CREP funded buffer; the vegetation was planted at varying widths along the river allowing for both a meandering river and a square field.

_A farmer likes a nice square piece of ground, and when there’s a lot of corners and turns and angles it’s hard to get your equipment in there._ [Interview 05]

Visibility of farm animals was also important. The ability to look out the kitchen window and see that all the animals were safe and unhurt would be blocked in some cases by riparian vegetation. Some grant programs provide for small hedgerows along watercourses that allow for visibility, access to the watercourse for dredging, and avoided shading adjacent fields; CREP however requires plants that will grow to a full riparian forest, including shrubs and trees. Many mentioned that having healthy animals was important. Others simply valued being able to see the creek or river on their property. Given the time commitments of farming, many people do not have the time to participate in outdoor recreation but enjoy the time they spend outside on their farm.

While more respondents expressed a preference for neat and tidy farms, a few preferred a natural look. These landowners often mentioned the wildlife they could observe as highly valued, for example:
listening to the eagles calling is amazing and you just feel privileged to be here, you experience all of those things [Interview 01]

And in some cases they sought a mix of ‘wild’ and ‘organized’ areas on their property, as in the following hobby farmer:

I always keep a few sort of crazy areas where the animals and mother nature can just get on with it but . . . if I could have a work crew come in here every other week I'd be the happiest woman in the world [Interview 13]

4.3.2 Agency: No-touch program rule restricts rural land manager agency over their land and landscapes

Agency over their land was important for many respondents. Particularly those land managers actively engaged in farming often felt threatened by the encroachment of suburban recreational values at the expense of production values. This could take the form of non-farm neighbors complaining about regular farm activities, increasing regulatory pressure and restrictions as well as the loss of the farming community and resources associated with that (e.g., abattoirs, equipment rental). Restrictive rules such as no-touch can, in this context, feel like an imposition of outsider ideas onto rural landscapes.

In the context of regional discussions around salmon conservation and the fears of many farmers of increasing regulations (including regarding riparian habitat) as well as increasing urban immigration to rural areas in the Puget Sound, some rural land managers associate environmental regulation with the imposition of urban values. Environmental regulations restrict land manager agency and regulations are seen as imposed from outside of rural areas; while most of the land area of Washington State is rural, the majority urban population (84%) dominates state politics and economics (Jewell, 1998; Washington State Department of Health, 2017). For example, one farmer questioned the motivations behind salmon conservation efforts, suggesting that perhaps urbanites wanted the landscape for recreational purposes:

I don't think it has anything to do with the fish. . . I think . . . Seattle wants this to be their park [Interview 03]
Agency thus takes the form of the power of the farming community over the management of the landscape. But it also expresses itself more specifically in terms of how landowners and managers see the proper way to manage their land. Many participants expressed the importance of independently caring for and managing their land and their frustrations with the CREP rule requiring ‘no-touch’ buffers, which some saw as limiting even their ability to move around a few (large) rocks in the river. For example, one hobby farmer explained the extent of the effort he put into his property:

*This is a home... This is where somebody lives and somebody has taken ownership of the land and responsibility for it. And they maintain that land... you look around, and you won't see any Scotch Thistles, that's not because I use chemicals on them, that's because I went around with a shovel and a cultivating fork and I dug every single one of them up that I could find, every spring. That's why they are not here.* [Interview 12]

### 4.3.3 Active land management: No-touch restriction conflicts with ethic of active care

Related to the idea of agency was the importance of active land management to many respondents. Agency relates to regional scale conflicts focused on the relationship between land managers and urbanites or environmentalists that are seen to be exerting some control over rural lands. Active management is centered on the farm scale and focused on the relationship between land manager and land. This idea of actively managing one’s land caused some respondents to choose a non-CREP buffer, despite the much lower financial incentives. Three different rules/restrictions in the CREP program motivated these choices.

First, for some, minimum buffer widths were too restrictive, especially for smaller properties. One hobby farmer explained that the shape of the creek and his property would leave him with very little usable land left given the 30 foot minimum for CREP enrollment.

*I bought the property because I want to use the property and so you can throw as much money as you want in front of me but that's not why I'm here* [Interview 17]

For this landowner, the additional financial incentives from the CREP program could not compare with the potential loss of usable property. Second, the restrictions imposed by CREP regarding how landowners could manage the land enrolled in the buffer caused some rural land
managers to reject the program, especially the ‘no-touch’ rule. One hobby farmer explained that
the restrictions would not be worth the financial and labor assistance provided by CREP. This
respondent understood the goal of creating shade for the creek and had a targeted plan to do so
via trees in key places that in conjunction with a hillside would maintain shade over the creek at
all times. He explained: *I'd rather spend the time and work and do it myself and not have them
restricting what I can do* [Interview 12]. Another hobby farmer also expressed concern about the
no-touch rule, explaining: *I don't want to feel like I'm a criminal for picking a few nuts up off the
ground* [Interview 14].

Third, a few landowners were concerned about a number of specific and potentially unrelated
restrictions in the CREP program, such as those restricting their options for selling the land
during the tenure of the contract. While also an economic conflict, this concern also had other
value dimensions; respondents expressed concern that the future landowners would be restricted
in the ways they might want to use their land and did not want to impose this upon them. One
respondent described these as ‘poison pills’ deterring potential enrollees from what was
otherwise a good program. Another ex-urbanite explained that his view of government
regulations (in the voluntary CREP program specifically and regulations for agricultural land
general) had become more negative after just a few years as a rural landowner, via his own
experiences and conversations with neighbors. This landowner as well as the above two hobby
farmers all chose to implement a non-CREP riparian buffer. For them, the great cost and effort of
that alternative was worth the additional flexibility.

Some landowners were happy to ‘let nature do its thing,’ but these were mostly ex-urban
migrants to rural areas. For example, one ex-urban hobby farmer even supported the idea of no-
touch: *But most of it I don’t touch it. I don’t wanna touch it* [Interview 09]. However, more
landowners expressed a view of stewardship that focused on taking an active role in land
management, as explained by the hobby farmer below regarding blackberries.

*I want to leave it better than when I found it. But what is better? That's the responsibility
that I have is to figure out what is better. Just to walk away from it, let the blackberries
take over everything and just let it go back to nature, I don't feel that's an improvement.*
We are part of the environment here also, I am part of Nature, I live here. This is where my home is. [Interview 12]

While the Puget Sound has a native blackberry, far more common are Himalayan and evergreen blackberry bushes which are considered a Class 3 noxious weed in Washington state and are particularly prevalent along streams. CREP funding will pay for removal of blackberry bushes in the riparian area if needed, however, they are extremely difficult to fully remove and control. On this point then (the removal of blackberries), most rural land managers were in agreement with the CREP program. However, the above land manager extrapolated this idea of no-touch to potentially include letting the blackberries ‘take over everything’ to make the point of why active management was needed. How then can the program pay for blackberry removal if the buffers are ‘no-touch’? The reason is that the ‘no-touch’ rule applies to the land manager, but not to the staff implementing the buffer. The land manager might also participate in creating the buffer, but this would need to be approved by the program staff. Thus while ‘no-touch’ does not literally mean that the land manager cannot touch any part of the buffer, land managers sometimes perceived it to mean no activities whatsoever in the buffer zone.

4.3.4 Knowledge: local and experiential knowledge rebuked by urbanites and regulators

Many respondents valued knowledge derived from direct experience and felt that program rules and urbanites’ perspectives snubbed such knowledge. Two sub-themes illustrate this point. One, many rural land managers expressed frustration that regulators or urbanites did not understand the nature of farming or rural communities. They felt that these groups lacked the direct experience of working that land that would allow them to appreciate how farming worked and what it entailed; one part-time farmer said ‘you gotta live it’ [Interview 03] and according to a hobby farmer: ‘somebody needs to love that piece of land’ [Interview 12]. And yet regulators made decisions that impacted farmers and rural land managers, following their ‘books’ without looking around or, as one hobby farmer put it, referring to the spotted-owl process:

[the federal government made] . . . a lot of one-size-fits-all type rules to try to solve the problem and ignored a lot of very local specific kinds of things that could have been done that maybe would have achieved the goals without inflicting so much economic pain on the communities [Interview 14]
As well, some urban migrants to the rural countryside complained officially or unofficially about farm activities. One respondent put this frustration succinctly, speaking of these urban migrants:

They want to be able to see the cattle out in the field but they don't want manure
[Interview 03]

Two, many land managers described in detail their parcel-specific knowledge, and how it appeared not to be valued by regulators. Through years of working and often living on their land, they had gained detailed knowledge of seasonal patterns, responses to management, drainage and flooding patterns, and species presence. Much of that information is potentially relevant to ecological restoration and riparian buffer creation. For those who had developed this detailed knowledge, it was important that restoration work integrate this knowledge. One hobby farmer described this as follows:

These folks have studied this a lot, they have put a lot of years of study into this they know a lot but maybe because I live here I know more specific information. And I think the specific information is really important. It needs to be embraced a little bit stronger.
[Interview 12]

The above two themes sometimes led to frustration with biologists. In some cases, land managers felt that their specific knowledge of farming, of the land and especially of their own land, was negated by what they saw as the ‘generalizable’ knowledge of biologists and scientists. This applied primarily to those scientists seen as making rules for CREP or creating environmental regulations for agricultural land; many respondents had positive relationships with the SCD staff they worked with. One farmer described this as such:

There were a bunch of people called fish biologists that . . . acquired the ability of being smarter than everybody else when the fish were listed. And what would happen is you know, we'd sit out there as farmers and say 'why do we need to do this?' And 'Because I said so, I'm a fish biologist.' You know it's like a little kid that's got a dad or a mom that doesn't teach them anything except 'I said so, so that's why you do it, and I'm bigger than you,' that kind of a deal. [Interview 08]

The above farmer’s frustration can be better understood in the context of the challenges and changes that rural communities are facing, in terms of increased regulatory burdens and changing social and cultural makeup of rural residents.
4.4 Understanding value conflicts through the lens of relational values

Many respondents expressed strong values regarding their relationships with their land, as described above under agency and active management. Beyond these four relational values, interviewees discussed a variety of additional relational values pertaining to connections to past and future communities, family and spirituality as mediated by land and landscape. These are detailed in the table below with example quotes.

<table>
<thead>
<tr>
<th>Relational Value</th>
<th>Example Quote</th>
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<tbody>
<tr>
<td>Continuity of farming</td>
<td>It doesn’t have to have a specific role . . . just that it becomes healthy and vibrant and stays a farm. [Interview 07]</td>
</tr>
<tr>
<td>Farm for family and kids</td>
<td>We wanted to have a farm life with the kids, that was our hopes and dreams. So everything is built around that kind of living in nature type of experience. We did the suburban life a lot and we got tired of that. So that’s always been our driving goal to get into more of a farming life for the kids. Something that slows down. You know we actually voluntary dropped in income, I mean that’s almost unheard of. [Interview 09]</td>
</tr>
<tr>
<td>Keeping the farm in the family</td>
<td>We would like to be able to build a business for the next generations so that it stays in the family. And it’s interesting, the more my husband and I get involved in this, the more excited I can see my dad and grandmother... happy about the farm, and they are more relaxed and excited. I think they had given up and now they are excited to see it being passed down. And so it definitely has a family connection. [Interview 07]</td>
</tr>
<tr>
<td>History of the land</td>
<td>If we take care of it and are patient with each other and understand how it works and fit into it instead of deciding how you want it to work and then changing it you know, I think that's my [philosophy], about this piece of property, and about what I'm going to do with it. It's been here for a long time. I can tell you the history of it, I've researched when it was actually first homesteaded. I mean I've met the daughters who were born and raised in this house. [Interview 12]</td>
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<tr>
<td>Land for community</td>
<td>What we're doing with the creek restoration [is] getting out there and actually planting a tree. Physically it’s good for you because you get in the soil, that's good for you. And it’s also good for you for the psychological part of it, just being out there and being outside. So we want to preserve that so we preserve the gardens, the creek, a little bit of the farm and then [invite kids from a] school. So [it’s] a place to go and be. [Interview 16]</td>
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Table 4.2 Relational values of rural lands

This table lists the key relational values (beyond aesthetics, agency, active land management and knowledge base) described by land manager respondents. One example quote from the interview data is provided for each relational value.

One way to understand these relational values is as expression of a rural or farming identity. Many farmers spoke of farming as a lifestyle and an identity—and one that was based on actively working the land. For example, in the following quote, a part-time farmer describes how even though her family lived from the income from another business, the farm was what they loved. She discusses how much work farming is and how she loves that work.

*All of our income came from the [off-farm family] company. . . but we had the farm because it was so private and we loved what we did and we were on the river. You feel like you’ve died and gone to heaven, because you have this big piece of property and you get up every morning [and work on it]. It’s a lot of work; it really takes a big toll on a family, but it’s worth it. I have no regrets. I remember my brother used to come and I’d be out scraping the feeders, and he looked at me and he goes: ‘if you weren’t scraping the feeders what would you be doing?’ and I’m thinking, scraping the feeder. I can’t imagine anything else that I’d rather be doing. [Interview 05]*

This idea, of the satisfaction of farming work is repeated by the below farmer who explains why he loves farming as following:

*It’s the satisfaction of feeding cattle, doing things, the cycle of life, [being] part of it. This has been my life. I [worked another job] but I came home to this every night. It’s just my heritage, my roots. [Interview 03]*

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<td>Leaving a legacy</td>
<td>I'll do everything I can, that when I'm dead and gone somebody's going to walk up to this piece of property and they're going to say, wow who lived here, you know? What a nice place... I wouldn't mind having my ashes scattered right here in the creek, I mean, I think that would be appropriate. So we [pause] the space adventure thing, somebody else can do that, my life and my demise all the things that I have are right here. [Interview 12]</td>
</tr>
<tr>
<td>Spiritual connection</td>
<td>All of my treasures in life are here. This is where my sanctuary is, this is my peace. I am a Christian. Right here is when I am really hurting, this is where I will come talk to God. This is my window to God, right here. [Interview 12]</td>
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This farmer also worked an off-farm job, but always found a way to have at least a small farm because of the importance of this activity to him. For him, it was hard to imagine a life without farming.

4.5 Discussion

The challenge of increasing riparian buffer acreage on agricultural land has traditionally been conceptualized as a question of understanding either intrinsic values of farmers or their instrumental values in terms of developing attractive incentives. In this study, I have shown how a host of values play into farmer and rural land manager decisions to enroll in riparian buffer programs. Value alignment is key. Prescribing a minimum buffer width for participation in the CREP program limits the options available to land managers and SCD staff to design riparian habitat that fits with the needs and values of farmers and other rural land managers. The presence of this or other rules thus limits the perceived agency of land managers. Wider buffers also spark concerns about the broader impacts of farmland loss. The values around tidy landscapes and active management of the land, that many farmers and land managers hold, directly conflict with the idea of ‘no-touch.’

Many of these value conflicts can be better understood through the lens of relational values (Chan et al., 2016). Two relationships are of special importance here: one is the relationship between the land manager and their land. As described below, this relationship can be seen as derivative of a farming identity, and from it follow values such as active land management, using an experiential knowledge base, and tidy aesthetic preferences. The other relationship is between the land manager and the rural community. As described below, the importance of this relationship (and the perceived threat to it from conservation efforts) drives the value conflict around agency. Beyond value conflicts, many relational values can be seen in the farmers’ and land managers’ motivations for installing riparian buffers found in this study: the ability to improve the land, for example via stream bed stabilization or improving drainage during wet months; a sense of stewardship or care for wildlife, the land, and water; the technical, labor and financial assistance provided by SCD staff and the relationships with these staff.
4.5.1 On Being a Good Farmer: Relational values as derivative of identity

Farmers and other rural land managers have identities as producers, stewards of the land or farmers. Based on the land manager’s conception of what it means to be a good farmer or land manager, they might then have certain relational values—values around appropriate relationships between the farmer or land manager and their land. The participants in this study expressed a wide variety of relational values, including some compatible with riparian buffer projects and programs and others that highlighted value conflicts either between the project itself or certain rules of the program.

A useful way to understand how these value conflicts work together to facilitate or constrain land manager participation in conservation programs is via Burton’s theory of role performance. He has elaborated how the identity of a ‘good farmer’ is performed via activities that demonstrate the farmers ‘commitment to agriculture as a way of life, to the soil and to the crop.’ (Burton, 2004, p. 209). The tidy agricultural landscape is thus an outward demonstration of the farmer’s commitment and skill (Burton, 2012). This value—for neat and tidy landscapes—has been found among farmers throughout the world (Burton, 2004; Dessein & Nevens, 2007; Egoz, Bowring, & Perkins, 2001; Fish et al., 2003; Morris, 2004; Nassauer, 1995; Schneider, Ledermann, Fry, & Rist, 2010; Schoon & Grotenhuis, 2000; Setten, 2004). Via active management informed by keen observation, the farmer can create a neat and tidy agricultural landscape.

From this perspective we might ask: what does a farmer need to do? Here I have identified two key tasks, which symbolize particular types of relationships between the farmer and the land. First, farmers must observe and understand a particular piece of land, and its unique features (knowledge base); based on this, they need to actively manage the land (agency, active management). These both involve a particular type of relationship between the farmer and the land, a relationship that is valued for its own sake by many agrarians. This relationship is not with the land in general necessarily, but with a specific piece of land (Carlisle, 2013; Smith, 2003), in contrast to some strands of conservation such as ecosystem services or conservation planning, where models optimize production of a suite of ES or biodiversity objectives across a landscape (Chan, Shaw, Cameron, Underwood, & Daily, 2006).
The farmer’s role is to utilize a patch of land using a management order designed for a specific purpose (food production), which generally associates with a tidy appearance. Many participants in our study discussed green grass and a lack of mud as key visual indicators of successful farm management. These require observations of water-runoff during the rainy season and planning to manage this water via work conducted in the summer months. This idea of active management can conflict with conservationist ideals around wild or natural landscapes (Cronon, 1996; Marris, 2011). This is a recurring theme relevant for agrarian/conservation value conflicts: that of differing ideas about the relationships between people and nature, with conservation actors often promoting a clear separation between ‘natural’ areas and human productive activities (Cronon, 1996).

Beyond its role as signifying farming care and competence, the tidy agricultural landscape can also been seen as creating a what Drenthen calls a ‘legible landscape’ (Drenthen, 2009). The symbolic value of the tidy landscape can even be seen as derived from its ‘legibility’ in that it only demonstrates farming competence when other farmers can ‘read’ the landscape and see that the farm is thus well managed; for example, our respondents discussed well-cared for historic farm implements and color-coded gates on fences as demonstrations of competence and care. Similarly, Nassauer discusses ‘landscape language’ and the ways it can demonstrate ‘cues of care,’ i.e., a tidy landscape demonstrates that a human has cared for it via the work they have put into maintaining it (1995). Unmanaged ecological function however may not be legible to many people.

We can see many of these ideas about what it means to be a good farmer by considering the history of American agrarianism, in the Jeffersonian ideal of the yeoman farmer as foundational to the moral fabric of the nation (Smith, 2003) or via the food sovereignty movement’s rallying cry to keep ‘our hands in the dirt’ (Carlisle, 2013). The idea of ‘no-touch’ buffers seems to keep farmers’ hands out of the dirt. The aesthetic qualities of a ‘no-touch’ buffer may also conflict with farmers’ and rural land managers’ preferences. Leaving vegetation to grow of its own accord may result in messy and uneven buffers; beautiful to restoration ecologists, but potentially challenging to the tidy aesthetic preferred by many farmers.
To require a land manager to avoid particular kinds of management activities in a designated part of their land conflicts with the agency of the land manager to actively manage and care for their land. Yet, the actual restrictions imposed by the ‘no-touch’ rule may be less strict than many land-managers imagined (Breslow, 2001). Staff at the SCD explained that the rule is primarily aimed at keeping agricultural activities such as grazing out of the riparian zone. Respondents often questioned if they could engage in seemingly benign activities in the riparian buffer (mushroom picking, moving around a few rocks), indicating that even after discussing the program with SCD staff, they still were concerned about such small infractions to the no-touch rule. One reason for this heightened concern may be that by signing up for a government program, landowners feel more exposed to potential regulatory action by environmental agencies. This may or may not be the case, but regardless, the perception could limit participation in the program.

Yet ecological restoration can also be active management, observation and experimentation. For example, building fences and getting hands in the dirt via invasive species removal or new plantings also align with an agrarian conception of care for the land. Land managers parcel specific knowledge could also be used to design restoration. For example, one respondent understood that a key goal of the buffer would be to create shade over the river. He could explain exactly where vegetation would be needed in order to shade the creek and where it could be left out because of the shade from a steep slope above the creek. Another option is Nassauer’s suggestion that we create ‘messy ecosystems’ in ‘orderly frames.’ This idea was implemented by one respondent where a variable width buffer ‘evened out’ the river; while the buffer itself was messy, the straight edge by the field demonstrated that it was intentional and part of the landowner’s care of the land.

In terms of what knowledge counts, value conflicts occur in that ‘no-touch’ involves some qualifications. Indeed, some individuals are allowed to ‘touch’ and modify the buffer—individuals from agencies funding and implementing the projects. In this sense, these individuals are considered qualified to make decisions that are implemented on a farmers’ land. The farmer or land manager themselves, however, is excluded from making these choices. This situation—of local peoples’ knowledge being overridden by that of outside ‘experts’ has parallels in
literature examining value (and other) conflicts around establishment of protected areas or conservation projects in the Global South (Gareau, 2007; Pfeffer, Schelhas, & Day, 2001; West, 2006). Similarly, the way that several farmers in this study discuss their frustration with government regulations and ‘fish biologists’ reflects a similar frustration on the part of ‘local communities’ in opposition to externally imposed conservation (P. Walker & Fortmann, 2003; West, 2006) (Satterfield, 2007; Sayre, 2006).

4.5.2 Large scale transformations in rural landscapes set the stage for frustration with conservation initiatives

At one level, one could consider the current resentment over regulations governing riparian buffers to derive ultimately from the perception of many farmers that their very identity/way of life is at risk due to a constellation of pressures. Both amenity migration (wherein elites buy vacation properties in the countryside, often in the Global South) and suburbanization are changing the face of the countryside in places around the world from a production focused landscape (e.g., agriculture, forestry) to one that is primarily ‘consumed’ (e.g., for recreation, tourism, and vacation homes) (Donahue, 2003; McCarthy, 2007). This trend is both ecologically and socially problematic, involving habitat fragmentation, conversion of arable land, social inequality in rural areas, and loss of revenues and amenities from cities (McCarthy, 2007). For rural areas, there are often conflicts or at least different ideas of how the place and landscape should look, function (and smell) between agricultural residents and recent suburban ‘immigrants’ (Donahue, 2003; McCarthy, 2007).

Within the Puget Sound region as well as many other agricultural areas near urban centers, pressure to sub-divide and develop agricultural lands is high. A suite of economic and social factors is pushing farmers out of business: market globalization and resultant decreases in farm economic viability, recruitment of new farmers, regulatory burdens, and the aforementioned development pressure from urbanization (Canty, Martinsons, & Kumar, 2012). In the context of these other pressures, efforts to push for greater conservation on agricultural lands can seem threatening, especially practices like riparian buffers that remove land from agricultural production for the purposes of conservation. This may explain Breslow’s finding that farmers in
neighboring Skagit County have argued to resist new environmental regulation on the basis of their cultural heritage, which farmers see as threatened (Breslow, 2014). While some farms may be converted to more conservation oriented purposes, others will be converted into subdivisions. Above and beyond the food security problem of paving over prime agricultural land, the opportunity to find synergies with food production and conservation is lost. More fundamentally, this demographic and landscape change threatens the values that agrarians hold dear—(relational) values of connection that depend on vibrant agricultural communities and landscapes.

Several literatures suggest that the values and conflicts identified here are found in other regions of the world. In the a watershed supplying New York City, one of the most important factors in predicting participation was resentment towards New York City’s conservation policy and control of land (Armstrong, Ling, Stedman, & Kleinman, 2011). Research on agri-environment schemes are increasingly paying attention to cultural and values questions, described as a cultural turn in agricultural research (Blackstock, Ingram, Burton, Brown, & Slee, 2010; Burton & Paragahawewa, 2011). These rules and corresponding value conflicts may be widespread in other conflicts between conservation and local communities also. For example, of seven conservation objectives identified by Karp et al., only one (cultural services) focuses on the relationship between people and nature (Karp et al., 2015). Many ecological managers are highly invested in and dedicated to the idea of preserving ‘natural’ ecosystems (Marris, 2011). Yet for agrarians, the relationship between farmer and land is a central value (Carlisle, 2013).

4.6 Conclusion

This paper found that specific rules and institutional structures of an agri-environment incentive program conflicted with agrarian values, apparently impeding farmer participation despite generous compensation. Understanding the source of this conflict—in terms of relational values derived from farmer identities, as discussed above—suggests several ways to mitigate such problems. Conservation programs need not conflict with agrarian values. Activities such as removing invasive species, building fences, stabilizing river banks, or installing compost management systems all have ecological as well as farm management benefits; all also fit within the agrarian preference for actively managing tidy landscapes. Creative solutions can also
include creating riparian buffers with varying widths such that field edges are square while rivers continue to meander. Such a design would help with large woody debris recruitment for salmon habitat by including wider stretches within the buffer but also allow for farmers to create a neat and tidy field that allows for their ease of management. In other cases, riparian buffer design could incorporate land managers’ parcel specific knowledge. Including this level of detailed observation from land managers into plans can help both to meet land manager and conservation objectives, but also validates the knowledge and skills of the land manager. Farmers are experts in knowing which actions will produce which results on their land. When programs ignore this expertise they can feel slighted.

Thus, understanding the values held by potential participants in conservation programs of all sorts can help to better design such programs. This can serve two purposes. First, by developing programs that align with potential participants’ values, participation can be increased and financial ‘incentives’ can enable projects for already motivated participants via cost-shares, without exceeding the full cost of such actions. Second, and perhaps more important, by reflecting values such as stewardship and care for the land, conservation programs could reinforce such values, therefore not only yielding improved habitat or ecosystem services, but also sustaining the values needed to maintain such programs in the first place.
Chapter 5: The contested values of fish and farms: On the limitations of ‘best available science’ to resolve an intractable riparian buffer debate

5.1 Introduction

Scientists are often frustrated by the limited or flawed uptake of their findings in policy (Knight et al., 2008) (Nguyen et al., 2017). This is especially true within conservation biology, which has often sounded alarm bells given science-based calls for major policy changes (P. R. Ehrlich & Harte, 2015; P. R. Ehrlich & Wilson, 1991). There are many reasons for the science-policy gap (also known as the knowledge-action gap, research-implementation gap, or knowing-doing gap), including the influence of powerful actors (Oreskes, 2004), resistance to expected policy responses (aka ‘solution aversion’ or rejection of policy solutions associated with partisan political positions) (T. H. Campbell & Kay, 2014), and different understandings of uncertainty between scientists and policy makers (Bradshaw & Borchers, 2000). While these barriers mostly refer to the use of natural science findings in policy, another set of critiques focuses on the limited uptake of social science in policy making (Charnley et al., 2017; Shove, 2010).

However, as the literature on decision-making processes has argued, a fundamental reason for the science-policy gap is that scientific information is not all that matters when making choices about policy and that values can and should be adequately addressed as well (Dietz, 2013; Failing, Gregory, & Harstone, 2007). Science can alert society to problems, provide key information about consequences of different actions on desired outcomes, and rank stressors or activities in terms of impacts on desired attributes (R. S. Gregory et al., 2006). Yet questions science cannot answer include: Who to involve in the policy or decision (who are the decision constituents)? What objective or attributes are desired to meeting value and factual parameters? How to address trade-offs between different desired objectives or outcomes? (R. S. Gregory et

5 Authors: Mollie Chapman, Terre Satterfield and Kai M. A. Chan
Perhaps the science to policy gap is then a result of us ‘asking more from science than it can deliver’ (R. S. Gregory et al., 2006, p. 718). These ‘more than’ questions revolve primarily around the values of different stakeholder groups in policy and decision contexts.

While the integration of values and science information into environmental policy and decision-making is no easy task, methods and approaches to account for and integrate stakeholder values have been well developed in the context of participatory decision making (Failing et al., 2007; R. S. Gregory et al., 2012; R. S. Gregory & Wellman, 2001), assessment processes (Farrell, VanDeveer, & Jäger, 2001), public participation, and deliberative democracy (Beierle, 2002; Dietz, 2013; Ryfe, 2002). There are a suite of research methods that allow for incorporation of value information into environmental policy and planning (N. J. Bennett et al., 2016; Satterfield et al., 2013). Also well developed are approaches to account for the complexity of ecosystems and their interactions with social systems. For example, ecosystem-based management is an integrative and adaptive approach that incorporates stakeholder participation (Pomeroy & Douve, 2008; Rosenberg & McLeod, 2005). Processes such as triple-loop learning seek to guide managers to a greater understanding of social-ecological systems via an iterative process of questioning and reflection (Pahl-Wostl, 2009). And frameworks such as the institutional analysis and development framework can guide consideration of political and institutional and be combined with a social-ecological systems framework to interface with ecological factors (Ostrom & Cox, 2010).

Yet in practice there has been less uptake of approaches to both a) account for stakeholder values, b) incorporate an understanding of complexity and social-ecological interaction, and c) incorporate social science insights more broadly into environmental policy (N. J. Bennett et al., 2016; Chan et al., 2012a; Charnley et al., 2017; Shove, 2010). For example, Forsyth has criticized environmental science for failing to account for complex system properties such as non-linearity and chaotic dynamics (2003). Yet the field of ecology has long engaged with such challenges (see S. A. Levin, 1992) so it would seem that there is a gap in application of environmental science.
Why does there seem to be such a gap between available approaches and uptake in policy? Several factors may play a role. Scientific knowledge can be considered as co-produced by both science and politics (Forsyth, 2003). The emergence of certain ‘truths’ can be a product of their alignment with the positions of powerful actors (I. Tomlinson, 2011). Alternatively, when scientific findings contradict the interests of powerful actors, these actors may actively “merchant doubt” (Oreskes & Conway, 2012). Thus science can become politicized, especially when engaging with controversial environmental issues (Pielke, 2006). In conjunction or apart from this politicization, certain groups or types of concerns can become ‘invisible’ or ‘fugitive’ in policy debates and decision making processes (Satterfield & Levin, 2007; Turner et al., 2008; Witter & Satterfield, 2014). Institutional factors and the challenges of implementation also play a role (Nuno, Bunnefeld, & Milner-Gulland, 2014). Rather than measuring ‘what matters,’ progress towards conservation goals is often assessed via easy to measure goals and indicators (Failing & Gregory, 2003). Government agencies in particular often require efficient means to justify their decisions and may gravitate towards codified or certified prescriptions (Lave, Doyle, & Robertson, 2010). Another factor may be national cultures of decision making. Different countries have taken different approaches to integrating science and values in policy choices, e.g., Germany considers ethical arguments as important input, Britain relies on expert judgment, and the US largely eschews discussion of values in favor of science-based decision making (Jasanoff, 2005).

A case in point of science-driven policy is that underpinning the Endangered Species Act, one of the strictest pieces of environmental legislation in the US. It specifically calls for the use of ‘best available science’ in policy decisions. Scholars have thus examined impediments to and best practices for government agency use of ‘best available science’ in policy decisions (Doremus, 2004; Lowell & Kelly, 2016; Murphy & Weiland, 2016; Ryder, Tomlinson, Gawne, & Likens, 2010; Sullivan, Acheson, & Angermeier, 2006). The ESA’s call for use of best available science has generally been interpreted to only include natural science (Charnley et al., 2017). Yet the political implications of many decisions made in the case of the ESA have major political, economic and social consequences (Doremus, 2004). Requiring the use of best available science
assumes a “linear relationship” between science and policy, i.e., science alone will guide agencies towards good decisions and policy (Pielke, 2006).

Yet examination of a specific ESA-driven policy—the use of riparian buffer widths to create habitat for ESA-listed salmon—indicates what can only be called a tangle of values, rights, responsibilities and power over the form and future of the landscape. We understand this to be the case by studying the environmental values of the different groups involved, elicited via interviews and documents, and connected these to a conflict in the Puget Sound region of Washington State. We ask how a values debate and a science debate became conflated, or, as one informant explained, how ‘riparian buffers’ became “fighting words.” Specifically we discuss the ways that scientific debate on buffer widths became conflated with a debate over the more fundamental trade-offs at stake between different groups. We first elaborate key value and paradigm differences in the debate, specifically focusing on two groups: (1) The Treaty Rights at Risk movement from the Treaty Tribes of Western Washington (which have called for stricter regulation to support salmon habitat) and (2) the Conservation Districts that implement voluntary habitat restoration via riparian buffers on agricultural lands in the Puget Sound region. We then analyze the conflation of science and values as it unfolded in the policy debate and the ways that policy makers ‘asked more of science that it could deliver.’

5.2 Methods

The use of science and values in Puget Sound riparian restoration debates can take unexpected forms. Previous work on the conflict between farmers and tribes includes Breslow’s ethnographic study in neighboring Skagit County. Conducted as a political ecology study, the case highlights the surprising role reversal of the two groups, with Tribes arguing for restoration on the basis of Western science and law, while farmers point to the importance of their local knowledge, cultural heritage and place attachment (Breslow, 2014). This paper continues that exploration of the unexpected ways that science and values are used in Puget Sound riparian restoration, with a specific focus on the controversy over increasing minimum riparian buffer widths within the Conservation Reserve Enhancement Program (CREP).
All material for this study was derived from a set of expert interviews and case study materials described below. Access to both interviewees and materials was facilitated by our team’s close work with the Snohomish Conservation District (SCD) and the Puget Sound Institute (PSI). SCD operates in Snohomish County, just north of Seattle’s King County; the county has struggled with this controversy as has the rest of the Puget Sound. PSI is the research-focused partner of the Puget Sound Partnership (PSP) a regional group focused on improving environmental quality and human wellbeing in the Puget Sound region.

5.2.1 **Expert interviews**

Interviews were conducted with experts on riparian buffers and policy in the Puget Sound region. A total of 12 expert interviews were conducted with individuals representing the following groups: Conservation District staff (3), state and federal agency staff (4), tribal employees (3), local/regional government staff (2). Interview participants were recruited with the help of our research partners at the SCD and PSP. The interview protocol was developed based on key questions derived from analysis of previous work with rural land managers as well as consultation with research partners at PSP and SCD. Interviews focused on: a) farm characteristics, land management and environmental values; b) current proposals regarding riparian buffer program rules. Interviews were conducted by the first author in November 2016, lasted between ½ hour and 2 hours and took place by phone or at participants’ offices or homes.

5.2.2 **Document Analysis**

Organizations, documents, events and websites known by the research team or referenced by the interviewees were later searched on the world-wide web and relevant documents and websites collected and organized in Excel. In a few cases documents were provided by interviewees, some private but most publically available. All documents were reviewed for relevance, author (individual and/or agency/organization), audience, date and context. Types of documents collected and reviewed include: reports, white papers, meeting minutes and agendas, documents shared as part of meetings (technical documents, letters), videos, images, newspaper reports, blog posts, PowerPoint slides, technical guides, summaries of legal proceedings and websites. Of
the over 50 documents collected and reviewed, 19 documents were selected for detailed analysis and coding (listed in table 5.1). Selection focused on a) those documents most pertinent to the debate over the proposed rule change regarding buffer width for the CREP program, b) documents that offered descriptive value language, and c) achieving a diversity of perspectives. These include the following: 1) reports and publications from Treaty Rights At Risk program regarding treaty rights, salmon habitat restoration and impacts from agriculture; 2) meeting packet from the Dec 5, 2013 Washington State Conservation Commission meeting with letters from federal agencies and tribal groups regarding proposed buffer width changes to the CREP program; and 3) letters from Conservation Districts across the state submitted to the technical advisory committee to the Natural Resources Conservation Service (NRCS) meeting of Jan 28, 2014 – as above, the entity that defines regulations for the CREP program in Washington State.

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<td>Various</td>
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<td>TRAR</td>
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Table 5.1 Documents analyzed in this study

5.2.3 ‘Forensic’ Study of Riparian Science

To understand how riparian science is translated into policy, we applied a ‘forensic’ approach to document analysis. This involved the tracing of figures (e.g., graphs or tables reproduced but sometimes differently interpreted) across documents, and ‘facts’ as they were also reproduced in different reports and policy documents. This analysis was further informed by the expert interviews, which served to point to relevant reports and papers and fill in the gaps regarding processes and decisions.

5.3 Value conflicts contest the future, not the science

5.3.1 Treaty Rights at Risk

At the center of the controversy over buffer widths are tribal treaty rights, particularly the right to co-manage the salmon resource. In 1854-55 treaties were signed between the US government and the tribes of Western Washington. These treaties granted tribes the right to fish, for example, the Treaty of Point Elliot says:

\[ The \ right \ of \ taking \ fish \ at \ usual \ and \ accustomed \ grounds \ and \ stations \ is \ further \ secured \ to \ said \ Indians \ in \ common \ with \ all \ citizens \ of \ the \ Territory \ [Doc13] \]

However securing this right took decades of efforts known as the Fish Wars. In 1974, tribes’ right to fish salmon was firmly established with the Boldt decision which interpreted the treaty language to mean that tribes were entitled to half of the harvestable salmon [Doc13]. The Boldt decision established tribes as co-managers of the salmon resource [Doc13]. However, without sufficient numbers of salmon in the rivers to fish, this treaty-guaranteed right is essentially meaningless. In 1980, a further ruling confirmed the responsibility of state and federal agencies to protect salmon, in light of tribal treaty rights. Yet four of the eight anadromous salmonid species native to the Puget Sound are listed as threatened under the Endangered Species Act: Chinook, Hood Canal summer chum, steelhead trout and bull trout [Doc14].

This situation prompted the creation of the Treaty Rights at Risk (TRAR) effort with a 2011 white paper as the most influential output. The TRAR white paper criticizes federal agencies for
tightly restricting Tribal fishing while much less regulatory pressure is placed on habitat concerns. Amongst a suite of policy recommendations regarding salmon habitat, Treaty Tribes have asked for wider buffer widths in government grant-funded restoration projects (including CREP). The following section elaborates on why salmon and treaty rights are of great importance to the Treaty Tribes of Western Washington.

Without sufficient numbers of salmon returns, tribal fishing would be dramatically reduced or even eliminated. The mere existence of the salmon is insufficient to support the many cultural, religious and economic uses of salmon. As a member of the Port Gamble S’Klallam Tribe describes, treaty-protected resources are essential to both culture and identity:

> It's a cultural resource to us as much as a natural resource. We are doing the same things as our ancestors did to sustain ourselves and it's a part of our identity and a part of what we like to do. Not only do we have to do it but we love to do it. [Doc17, #3]

These resources, including salmon, but also elk and deer, oysters and clams, are essential to support many dimensions of the treaty tribes’ way of life, as an Upper Skagit Tribal member explains:

> It's not just fishing, it's all of it. It's the hunting, it's the gathering, it's the commercial side of it; it's the subsistence side of it; it's the religious component of it; it's the traditional side of it. It's like 'who are these people?' Probably a good part of the treaty represents who the Indian people are. [Doc17, #6]

The centrality of salmon and other treaty resources explains the pain that their loss would inflict. A member of the Jamestown S’Kallam Tribe explains what the loss would feel like to him:

> If my rights were taken away it's hard to think about. It would hurt so much in so many ways, not just financially. It's what I do for fun, for food, in so many aspects; its my identity. I would be lost without treaty rights. I have relied on treaty rights, it's what I've known, it's how I've been raised. [Doc17, #5]

The importance of treaty rights has led a number of tribal members to conclude that action on a national level is necessary. The treaties are between tribes and the US Government. Under the Obama administration, these activities contributed to the creation of a Federal Puget Sound Task Force focused on environmental restoration (Goldfuss, 2016). A member of the Quinault Indian Nation explains the need for such action:
I couldn't imagine how we could exist without the treaties. We have to bring this forward to the state of Washington, to DC, to the agencies, to our delegations to point out where they are. Our treaties are at risk. They are meaningless if you don't have the natural resources that we had when we grew up. [Doc17, #1]

The tribes did in fact bring this issue forward to the state of Washington, to the federal government in Washington DC and to state and government agencies. The TRAR white paper of 2011 called on the US federal government to take leadership and coordinate the various state and federal agencies to work together towards salmon recovery. The TRAR white paper criticized federal agencies such as National Oceanic and Atmospheric Administration (NOAA) and the US Environmental Protection Agency (EPA) for failing to use their authority to protect ESA-listed salmon.

The document was taken seriously. Substantial legal precedent backed up the claim that this was in fact a treaty rights issue. Will Stelle, the head of NOAA speaking at a salmon recovery conference in May 2013 substantiated his agency’s commitment to addressing the demands:

This missive is not just an idle passing observation. It is the expression of a long term strategic perspective of the tribal leadership in an intergenerational way... advising all of us that what they see is no good and they will not and cannot accept it. . . So, we in the executive branch take these treaty rights observations and recommendations deeply seriously. We take them at face value and we believe them to be credible. We are working very hard with the limited tools we have to turn the knobs on the machines that we run in order to change some of that trajectory. [Doc17]

One of the ‘knobs’ that NOAA turned involved a set of specific policy proposals from the TRAR white paper, asking the federal government to “align funding programs” and condition federal grants to “achieve consistency” with water quality and salmon habitat regulations and plans. NOAA recommended the use of a table that described various types of streams and recommended minimum widths for riparian buffers. This table became known as the “NOAA Riparian Buffer Matrix” [Interview 05].

As no legislation exists to require the establishment of riparian buffers of any sort on agricultural land in Washington State, the ‘NOAA Riparian Buffer Matrix’ applied only to federally funded programs, for example programs exist in the Puget Sound region to support and incentivize the creation of riparian buffers on private agricultural land. These can also involve state and local
funds, tribal collaborations as well as collaborations with NGOs. One program, however, the federally funded Conservation Reserve Enhancement Program (CREP) not only covers the costs of establishing a buffer but also offers compensation in the form of annual rental payments. The CREP program pays for the expense of installation as well as a yearly payment based on the width and length of eligible land put into riparian buffers. This is a significantly greater investment as compared to most other programs, which offer less expensive forms of cost sharing for the expense of installing riparian buffers.

Prior to the Treaty Rights at Risk paper, CREP required minimum riparian buffers of 35 feet on each side of salmon-bearing streams. Implementing the NOAA Riparian Buffer Matrix would have increased this minimum from 35 to 100 feet. In this paper, we focus on the specific controversy around this change—from 35 to 100 foot minimum buffer requirements for the CREP program in Washington State. However, we also review other buffer guidelines to the extent that they are pertinent to the debate over CREP buffer widths.

NOAA asked the Natural Resources Conservation Service (NRCS), as well as other government agencies, to implement the new guidelines specified in the NOAA Riparian Buffer Matrix. The NRCS is responsible for determining the recommendations for implementation of the CREP program within Washington State. While other federal agencies adopted the ‘NOAA Riparian Buffer Matrix,’ NRCS delayed doing so until 2015, when it ‘reviewed the science’ and chose to increase their minimum width from 35 to 50 feet, but not the 100 feet specified in the NOAA Riparian Buffer Matrix.

The NRCS technical committee that ‘reviewed the science’ received letters from NOAA, the Northwest Indian Fisheries Commission (NWIFC) as well as conservation districts from across the state. Conservation districts played a key role in the debate. They are government funded, with a conservation mission, but nonetheless work directly and primarily with private landowners. Conservation district staff are thus at the front lines of the riparian buffer battle; they literally knock on doors and chat in kitchens over coffee, working to sign up farmers and rural landowners for CREP as well as a suit of other conservation programs and projects in rural, urban and peri-urban areas.
5.3.2 Using riparian science: The contested value of a 35-foot riparian buffer

A key point of divergence between the TRAR effort and the conservation districts is the value and significance of a 35-foot buffer. For conservation districts the first foot of buffer is the most valuable and additional width has diminishing returns. A 35-foot buffer is seen by most conservation district staff to provide a substantial protection in terms of shading and temperature as well as filtration of nutrients and pesticides. Most critically, the option to put in a narrow buffer allows conservation districts to get their ‘foot in the door.’ As the foot soldiers of conservation on agricultural land, conservation district staff are the ones who risk doors slamming in their faces and their success depends largely on their ability to build relationships with land-owners. Their arguments about the use of riparian science focused on ground-level consequences as they saw them, for example:

I don’t think it’s worth even speaking to the ecological benefit because I don’t think anyone is arguing about the science behind needing bigger buffers. There’s obviously an ecological benefit to having bigger buffers. But that’s not what we’re talking about right now. We’re not talking about bigger buffers versus smaller buffers. We’re talking about a buffer versus no buffer. [Interview 03]

The TRAR movement, however, has questioned the value of the 35-foot buffer. They have argued that these narrow buffers, while offering some level of water quality benefits, fail to provide functional salmon habitat. The primary function that requires 100 feet is the provision of Large Woody Debris (LWD). Wider buffers also seem to improve the temperature of the stream and offer greater filtration of nutrients and pesticides. They also provide better near-stream habitat, which apparently improves the overall ecosystem function. While different tribes and individuals vary substantially in their views, for some tribal members, the construction of 35 foot buffers is a waste of limited restoration money, which they feel should be spent to create fully functional habitat. Furthermore, the construction of 35 foot buffers gives the impression (to farmers, to the public) that salmon habitat is being addressed, when, as the TRAR white paper asserts, only water quality is improved. A substantial concern of the TRAR movement is the establishment of the Treaty Tribes of Western Washington as co-managers of the salmon resource. This right derives from the treaties and has been held up in court. Yet state and federal government agencies have not granted the tribes this right in practice. One tribal scientist
summarized these concerns succinctly, explaining that the current regulatory and incentive policies would give us ‘museum fish,’ in other words, the current approach may prevent the salmon from extinction, but it will fail to provide the returns needed to support the cultural, food and economic uses of salmon upon which tribes rely.

Both groups referred to the need to base decisions in ‘science,’ as the following conservation district letter shows:

*We encourage that political agendas at least be grounded with some science.* [Doc06]

The Northwest Indian Fisheries Commission (NWIFC) was created following the 1974 Boldt Decision to support the Treaty Tribes in their role as co-managers of salmon resources. The NWIFC also participated in the debate, writing to the Washington State Conservation Commission (WSCC), the coordinating state agency for conservation districts. NWIFC wrote to the WCCC asking for assistance in working with some conservation districts that they felt were ‘ideologically opposed’ to the ‘expertise’ of federal agencies:

*The NWIFC would also like to request your support in communicating the importance of treaty right protection to conservation districts. We recognize the central role of the WSCC in coordinating with conservation districts. The NWIFC, therefore, believes that the WSCC is well suited to address some of the misunderstandings emerging from conservation districts. For instance, it has been repeatedly noted that a few select conservation districts are ideologically opposed to working with federal fish agency expertise, and are unwilling to implement their recommendations!* [Doc08]

Understanding the different ways these groups use riparian science is improved when we also understand a number of other key value and perspective differences, outlined in the table below and discussed in the following sections.
Table 5.2 Points of divergence (values and perspectives) between Conservation Districts and the Treaty Rights at Risk movement regarding riparian science restoration

Synthesized from analysis of interview and documents, the above table describes the ‘points of divergence’ between the two groups in terms of values, paradigms and perspectives.

### 5.3.3 Purpose of riparian restoration and goal for salmon recovery: Is saving the salmon preventing extinction or restoring economic, cultural and traditional uses?

Riparian buffers can serve a variety of purposes, but the key question is: what goals do we seek?

As one tribal interviewee explained, the goal needs to be ‘harvestable’ salmon, not just avoiding extinction:
Yes, a long buffer is beneficial, but if it’s a long buffer of less than what we are going to be needing for recovery, then it doesn’t really matter how long it is. We do need to have that adequate width of the buffer to be able to start dealing with recovery. And if we continue to stay at the 50-foot buffer, then what we’re basically saying is that we’re just going to have museum fish. We’re going to just be able to go out and look at them but we’re not going to be able to catch. And that’s a violation of the treaties here in Washington. Because it’s the harvestable treaty right. And we’ve had numerous federal court cases that have told the state of Washington that is not the mark that they need to meet. They need to meet to the level of harvestable salmon, and not just the sustaining the population so that we can all just look at them and not be able to catch them. [Interview 11]

Conservation Districts on the other hand, focused on the role of buffers in reducing impacts or preventing harm. They saw their role as helping farmers to be ‘good neighbors’ and avoid ‘impacting the community’ [Interview 01]. For the conservation district respondents, buffers have diminishing returns.

*the outer edges of that 100-foot buffer doesn’t have the same ecological impact and positive benefits that they would for that first 50 feet [Interview 05]*

One key area of divergence that the TRAR document and tribal interviewees highlighted relates to the idea of museum versus harvestable fish—that is, riparian restoration for water quality or for habitat. As the TRAR white paper points out, most efforts in the Puget Sound have addressed water quality but not salmon habitat, the latter of which requires wider buffers. Conservation Districts often focused on water quality as the primary purpose for riparian restoration, for example:

*mandating extreme buffers as a condition to voluntary conservation programs makes no sense to improve water quality in our state. [Doc 05]*

5.3.4 Temporal and spatial scale and metrics of success: Incremental progress on parcel scales or landscape wide transformation towards pre-colonial baselines?

*Tribes are very long term in their thinking. And they don’t have a lot to lose because they’ve already lost most of it. You know? And it’s one of their primary issues. Because it’s so central to who they are as a people. And it spreads into everything else that’s important to them. You know, their health, their wellbeing, their culture. So, they’re willing to be out on the frontline, and they’re willing to really make people*
uncomfortable...if they think that it might help them get to that point where their concerns are recognized and they actually get some real protections in place. Their ultimate goal with Treaty Rights at Risk was to get increased federal requirements through ESA for regulatory protections of habitat. [Interview08]

Central to the debate on buffer widths are the interrelated issues of scale and metrics. The TRAR effort has framed the issue as a region-wide need to restore salmon runs. Reference is made to centuries long changes, as in the following:

Agricultural lands are still impaired and reflect the practices that began in the late 1800s with the removal of trees and clearing of lowland forests. Diking soon followed, with lower estuaries diked to protect the new farmland and to increase its productivity. Impacts included the loss of stream channels, wetlands, stream buffers, increased sediment, and pollution in the form of runoff from agricultural activities. [Doc14]

This perspective includes not only changes in ecosystems and their management, but also the longstanding struggle for recognition of tribal treaty rights.

We are at a legal and biological crossroads in our efforts to recover the salmon and preserve our tribal cultures, subsistence, spirituality, and economies. Not since the darkest days of the fishing rights struggle before Judge Boldt’s decision in U.S. v. Washington have we feared so deeply for the future of our treaty rights. [Doc12]

But I want to mention this in case you haven’t heard this yet that I think is important to realize. You know, the Tribes have been doing this for a very long time. And they’ve been working for quite a while to try and increase protection for salmon and natural resources. [Interview08]

Yet such a perspective is challenged by Conservation Districts, as in the following:

Unfortunately, many of the 21st century resource concerns cannot simply be resolved to a 19th century conceived condition. [Doc06]

More often however, the temporal scale focus of the conservation districts is implicit in the general acceptance of current land use patterns and the focus on year-to-year impacts of regulation changes on project implementation.

But Tribal resource managers continue the effort with a focus that extends history forward and backward:
one of the things that my Tribal elders told me a long, a long time ago is that we’re going to be here. We’re not moving. And so, it’s basically, when I got into natural resources management, um, they said “You’re going to be doing this a long time. And you’re going to be saying the same things over and over again. But that’s what we have to do.” And so I’ll continue to do it and we’ve seen some successes out there, so I’m not totally giving up. I’m more positive towards the little steps that we make forward than maybe other people do. But, it’s going to take a lot of us to educate a lot of other people that this is the right way to go. [Interview11]

A further issue is that different groups consider different spatial scales to be most relevant. The TRAR effort and the NWIFC both measure of success on watershed and regional scales. They furthermore support a holistic approach:

The NWIFC believes that shellfish and salmon protection are not separate, water quality standards are not separate, and that riparian health, salmon productivity, and shellfish production are all interconnected. [Doc08] letter from NWIFC to WSCC

Yet conservation districts tend to focus on a smaller scale than the TRAR effort, and when they do talk of integrated management, focus on the importance of a flexible approach that accounts for site-specific parameters.

Solutions must be site-specific and in the context of the watershed itself. [Doc01]

. . . appreciate that each watershed is different, water resources are highly dynamic and fluid (no pun intended) within the drainage, and there are so many interrelated parameters that it is ludicrous to think a one-size-fits-all should be applied equally, everywhere. [Doc06]

The conservation districts report the successes of their efforts in terms of miles of stream, numbers of projects and trees in the ground. When asked about the consequences of increasing minimum buffer widths for the CREP program one conservation district interviewee explained “So we get much fewer trees in.” [Interview03].

5.3.5 Policy paradigms: Rights versus resources

Perhaps the most fundamental point of divergence is around the paradigms each group uses to consider policy. Whereas the conservation districts approach the problem as one of resource management, for the TRAR group, the paradigmatic issue is rights and responsibilities. This manifests in a key point of contention around trust and data sharing. Because of privacy rules,
conservation districts are not able to share detailed information about the projects they implement with treaty tribes. Yet a fundamental issue for the TRAR group is the establishment of the treaty tribes as meaningful co-managers of the salmon resource. While levels of trust and communication between local tribes and conservation districts vary by watershed, the lack of data sharing is an important impediment to collaboration.

The issues around rights and responsibilities are particularly important in light of recent restrictions of tribal fishing due to increased understanding of the importance of salmon as a food source for orcas (also an ESA listed species in the Puget Sound). A fundamental concern for TRAR is that tribes have done their part to reduce harvest but no parallel effort is taking place for salmon habitat. The TRAR document points to several mechanisms that the federal government could use to better regulate habitat destruction as well as restoration, yet state and federal government agencies maintain that a confluence of political and regulatory issues keep their hands tied.

5.4 Stumbling blocks on the path from science to policy

5.4.1 Riparian science and policy processes based on the forestry context shape the approach to riparian buffers in the agricultural context

Throughout the debate on riparian buffers on agricultural land, a report from 1993 is referenced when then-President Clinton convened three interagency working groups to address the controversy around old-growth forest protection and forestry in the Pacific Northwest and Northern California. One of these groups, the ‘Forest Ecosystem Management Assessment Team’ (FEMAT) produced a 1000-page document assessing the social, economic and ecological impacts of several management options (Bureau of Land Management, 1993). The FEMAT report’s analysis and approach were important references for synthesis applied to agricultural contexts. In particular, one figure produced by FEMAT (pp V-27) illustrates the approach of most riparian buffer guidelines as derivative of forestry contexts. In forestry, the question is, “how close to streams should timber harvesters be allowed to cut” [Interview 05]? In this context, it makes sense to present data on buffer functions in terms of cumulative effectiveness,
which is how the FEMAT curve is drawn. In other words, as trees are cut closer and closer to a stream, when is there a noticeable drop in the functioning of the riparian ecosystem?

In an agricultural setting, in contrast, the baseline is often zero trees along the stream [Interview 05]. The USDA’s Conservation Buffer Design Guidelines present the effectiveness of buffers for agricultural lands in terms of ‘trapping efficiency’ of pollutants and sediments (Bentrup, 2008). Designing a buffer for agricultural lands, where the baseline is no vegetation, shifts the question. Instead of asking how much will be lost by cutting closer to the stream, the question is how much will be gained by each foot of vegetation planted? Beyond these different baselines, is the difference in purpose of the buffer. The FEMAT report was specifically written to address habitat concerns for endangered species in forested lands. The buffer width calculator in the USDA’s Conservation Buffer Design Guidelines however, focuses on the effectiveness of different widths for pollutant removal.

The different foci—on habitat or water quality (via pollutant removal), were a key issue in the TRAR white paper. There, Treaty Tribes argued that federal enforcement of environmental standards was inconsistent, that water quality regulations were more effectively enforced than those to protect or enhance riparian habitat [Doc12]. As part of this argument, the TRAR document requests stricter enforcement and higher standards for riparian habitat (i.e., wider buffers).

These differences between agriculture and forestry also became important for policy processes. Expert respondents in our study from different groups held up two processes from the forestry context—the Timber, Fish, and Wildlife Agreement and its later revision under the Forests and Fish law—as an example to follow and they are referred to in a variety of policy documents as an exemplary process to follow for agriculture (such as Britney, 2014). In 1987, the Timber, Fish, and Wildlife Agreement was reached, specifying a process to manage forests in Washington State for timber production and wildlife protection, including agreements about riparian buffers. According to several interview respondents, the agreement left tribes, the forestry industry and government environmental agencies satisfied and allowed for adaptation of riparian buffer rules based on new insights and active monitoring. Once salmon were listed under the ESA, a multi-
stakeholder group (housed in the Washington State Department of Natural Resources) convened with government agencies, treaty-holding tribes and the forestry industry to develop updated rules to the Timber, Fish, and Wildlife Agreement including a plan for riparian forests that would address salmon habitat and water quality impacts. These updated rules are known as the Forests and Fish Law.

Due to the success of the Timber, Fish, and Wildlife Agreement and later Forest and Fish Law, a similar forum was convened for agriculture from 1999 to 2003 “including participation from state and federal agencies, tribal governments and diverse agricultural interests” [Doc10]. This forum, the Agriculture, Fish and Water process sought to address a suite of issues around water quality, irrigation and salmon habitat (Spellecacy, 2009). One of the efforts of Agriculture, Fish and Water forum was to develop guidelines for riparian buffers on agricultural lands that “provide adequate salmon habitat and are implementable” [Doc10]. Yet an agreement on buffer widths could not be reached [Interview05]. Particularly contentious was Agriculture Director Jim Jesernig’s prediction of ‘litigation Armageddon’ in 2001, not long after the blockbuster hit movie Armageddon, with Jesernig erroneously claiming that regulators wanted a mile-wide buffer in some places (Associated Press, 2017).

While the convening of the Agriculture, Fish and Water forum and its ‘failure’ to develop riparian buffer guidelines for agriculture are not the focus of this paper, it nonetheless generated a ‘buffer matrix’ that played an important role in the controversy over increasing CREP buffer widths from 35 to 100 feet. As part of the Agriculture, Fish and Water process, in March of 2002, NOAA put forward the ‘Federal Option 3’ riparian buffer recommendations (3/4 Site potential tree height, later simplified to 100 ft; see Table 5.3). The NOAA team that put together Option 3 felt they had accommodated the interests of agriculture as much as possible without compromising their own integrity as scientists (by permitting narrower buffers than they might have otherwise recommended if they were not accommodating agriculture) (in the words on one interviewee: they “squeezed the rock as hard as possible” to come up with something that would “pass the red face test” for embarrassment). Ultimately the Agriculture, Fish and Water process did not lead to agreement on buffer width standards and the Option 3 buffer table was shelved. As one respondent explained:
AFW [Agriculture, Fish and Water] was forced, the parties were forced to the table, forced into negotiation that the parties didn’t want. So there was no chance of success. A miracle would have had to occur. And a miracle did not occur. [Interview05]

The Agriculture, Fish and Water group had sought to apply the science and process that had been successful in forestry to the agricultural context without considering the ways that it was fundamentally different (which are reviewed in the discussion).

5.4.2 Policy and science are conflated: Recommendations based on agency needs reproduced as scientific conclusions

One paper in particular seems to have played a key role in framing how riparian buffer regulation would be addressed in government agency guidelines. This paper—Castelle 1994—reviewed the literature on riparian buffers, and developed recommendations based not only on the science but also on the needs of government agencies (Castelle, Johnson, & Conolly, 1994). This paper was frequently cited in the buffer width debates and as the ‘scientific basis’ for assessments in the Puget Sound. Castelle specifically wrote about the applicability of this review for regulatory agencies trying to determine appropriate buffer widths. The paper recommends fixed width buffers of 50 to 100 feet.

The Castelle paper played a key role in the science behind buffer widths. The 1994 review paper has only two major sections: Introduction and Discussion. This review is neither systematic nor a meta-analysis. The paper is specifically targeted towards addressing the needs of these agencies. The authors explain the benefits of fixed-width buffers as follows: “more easily enforced, do not require regulatory personnel with specialized knowledge of ecological principles, allow for greater regulatory predictability, and require smaller expenditures of both time and money to administer” (Castelle et al., 1994, p. 881). In short, fixed-width buffers are easier and cheaper. Variable-width buffers in contrast consider site-specific criteria. They conclude that buffers under 5 to 10 meters “provide little protection of aquatic resources.” This is an interesting conclusion given that they describe, e.g., studies that grass strips of under 5 m can remove 90% of nitrogen and phosphorus run-off or grass strips of 9.1 m can remove 85% of sediments (Castelle et al., 1994). The authors recommended buffers of 50 feet to maintain natural physical and chemical features and 100-foot buffers to address the ‘biological components’ (in other
words, habitat for species like salmon) (Castelle et al., 1994). Castelle et al.’s approach of fixed-width buffers is clearly the one taken in the development of the various ‘riparian buffer matrices’ as described in the next section. This even though the recommendation for fixed-width buffers was based on agency needs and not science, it became reproduced as a scientific conclusion.

5.4.3 Inertia of one approach limits development of alternatives: The life and times of the ‘Riparian Buffer Matrix’

Throughout this process, a central feature was debate over various guidelines specifying buffer widths. Most often these took the form of a table, often described as a “buffer matrix” in discussions. As shown in table 5.3, numerous riparian buffer matrices and guidelines have been developed over almost 30 years. Table 5.3 lists only those reports, papers and guidelines most pertinent to the debate described in this paper. Most of these guidelines have two characteristics: (1) they were developed for a forestry context, or based primarily on science from forestry (as described in section 5.4.1) and (2) they take the form of a table with stream types and recommended buffer widths (described below). A key exception is the 2008 Conservation Buffers: Design Guidelines for Buffers, Corridors and Greenways produced by the US Department of Agriculture. These guidelines were developed specifically for an agricultural context and in them, buffer width is just one of many possible factors. However, most of the other guidelines, and in particular those that sparked controversy, took the form of a ‘matrix’ (actually a table) that defined what counts as an adequate riparian buffer. There are many ways to approach riparian restoration on agricultural lands, but as shown below, much effort and debate in the Puget Sound focused on defining the cells of different ‘buffer matrices,’ rather than engaging a conversation about a broader suite of policy options.

When the TRAR White Paper was published in 2011, one of the demands upon federal agencies was to condition funding of riparian restoration grants upon “buffers comparable to those that NMFS has called for in its RPA for FEMA’s National Flood Insurance Program” [Doc12] which in turn refers to the Washington Department of Fish and Wildlife (WDFW) Riparian Guidelines from 1997 (Knutson & Naef, 1997). In 1997, WDFW the produced a report called ‘Management Recommendations for Washington’s Priority Habitats: Riparian.’ The report is part of a series of
‘Priority Habitats and Species’, that the department produces. Amongst the report’s 181 pages was Table 3, which listed 5 stream types and recommended riparian widths. For fish-bearing streams, the WDFW recommended a ‘Riparian Habitat Area’ (RHA) of 150 to 200 feet (46-61 m) (Knutson & Naef, 1997). These were general guidelines intended to support a variety of planning, management and restoration activities; they were not designed for or based on the creating of new riparian buffers within agricultural lands.

<table>
<thead>
<tr>
<th>Year created</th>
<th>Document name</th>
<th>Organization or author that produced the guidelines</th>
<th>Purpose or applicability of the guidelines</th>
<th>Minimum recommended buffer for salmon bearing streams (feet)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>Forest Practices Rules: Title 222 WAC</td>
<td>Forest Practices Board (established from Timber, Fish and Wildlife agreement and Forests and Fish law)</td>
<td>Forestry, negotiated agreements on riparian buffers</td>
<td>50 – 200</td>
<td>Permitted activities are defined for each of three riparian management zones (core, inner and outer) and vary by type of site</td>
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<tr>
<td>1990</td>
<td>Source distances for coarse woody debris entering small streams in western Oregon and Washington</td>
<td>M.H. McDade, F.J. Swanson, W.A. McKee, J.F. Franklin, J. Van Sickle</td>
<td>Minimizing loss of existing riparian function in forests</td>
<td>100</td>
<td>100 ft buffers are to provide 85% of coarse woody debris</td>
</tr>
<tr>
<td>1993</td>
<td>Minimum widths of Riparian Reserves (Table V-5)</td>
<td>FEMAT</td>
<td>Forestry, addressing ESA listing of the Northern Spotted Owl</td>
<td>300</td>
<td>300 feet or the equivalent of two site potential tree heights</td>
</tr>
<tr>
<td>1994</td>
<td>Wetland and stream buffer size requirements—A review</td>
<td>A.J. Castelle, A.W. Johnson, and C. Conolly</td>
<td>Agency applicability; existing forested areas and new restoration</td>
<td>50 – 100</td>
<td>Recommend fixed width buffers due to regulatory ease</td>
</tr>
<tr>
<td>1997</td>
<td>Management Recommendations for Washington’s Priority Habitats: Riparian</td>
<td>WDFW</td>
<td>“all areas throughout Washington to the greatest extent possible” (p 88)</td>
<td>150 – 200</td>
<td>150 ft for streams &lt; 5 ft wide</td>
</tr>
<tr>
<td>Year created</td>
<td>Document name</td>
<td>Organization or author that produced the guidelines</td>
<td>Purpose or applicability of the guidelines</td>
<td>Minimum recommended buffer for salmon bearing streams (feet)</td>
<td>Notes</td>
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<td>------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
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<td>-------------------------------------------------------------</td>
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</tr>
<tr>
<td>2002</td>
<td>Federal Option 3 for the Agriculture Fish and Water Process</td>
<td>NOAA</td>
<td>Proposed guidelines</td>
<td>3/4 Site potential tree height</td>
<td>Later simplified to 100 ft</td>
</tr>
<tr>
<td>2007</td>
<td>Conservation Practice Standard: Riparian Forest Buffer</td>
<td>NRCS</td>
<td>Guidelines for CREP funded buffers</td>
<td>35</td>
<td>Washington State CREP began in 1999</td>
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<tr>
<td>2008</td>
<td>Conservation Buffers: Design Guidelines for Buffers, Corridors and Greenways</td>
<td>USDA</td>
<td>Synthesis of scientific knowledge applicable for buffers on agricultural lands</td>
<td>&lt;15 – 180</td>
<td>Buffer width design tool for surface runoff calculates widths based on desired ‘trapping efficiency’ and site characteristics</td>
</tr>
<tr>
<td>2012</td>
<td>Interim Riparian Buffer Recommendations for Streams in Puget Sound Agricultural Landscapes (November 2012)</td>
<td>NOAA</td>
<td>Response to TRAR White Paper</td>
<td>3/4 Site potential tree height</td>
<td>Later simplified to 100 ft</td>
</tr>
<tr>
<td>2013</td>
<td>Interim Riparian Buffer Recommendations for Streams in Puget Sound Agricultural Landscapes (October 2013)</td>
<td>Washington State Department of Ecology</td>
<td>Simplification of 2012 NOAA guidelines</td>
<td>100</td>
<td>supporting site assessment recommended to increase buffer width</td>
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<tr>
<td>2015</td>
<td>WA Biology Technote 14 Revision</td>
<td>NRCS</td>
<td>Guidelines for CREP funded riparian buffers in Western Washington</td>
<td>50</td>
<td>50 ft is a minimum, not an average, but needs only apply to 70% of the length of the project (increased from previous standard of 35 ft minimum)</td>
</tr>
</tbody>
</table>

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Table 5.3 Buffer matrices and guidelines

The WDFW “matrix” was not the table that NOAA put forth, when a year and a half later (Jan 30, 2013), Will Stelle of NOAA wrote to NRCS and the regional EPA office to recommend the conditioning of these agencies’ funding upon compliance with a riparian buffer matrix. Instead of the WDFW matrix suggested by the TRAR document, he attached a document originally called the ‘federal Option 3 for the Agriculture, Fish and Water Process’ of 2002 (Agriculture, Fish and Water —discussed further below) [Doc10]. The document became rebranded, officially as the “Interim Riparian Buffer Recommendation” but more informally referred to as the ‘NOAA Riparian Buffer Matrix’ [Interview 05]. This NOAA Riparian Buffer Matrix also listed 5 stream types with attendant riparian buffer width recommendations (thus again taking the form of a ‘matrix’), this time as “site potential tree heights.” A “site potential tree” is “a tree that has attained the average maximum height possible give site conditions where it occurs,” (Bureau of Land Management, 1993 p IX-32) and is generally approximated at 150 to 200 feet in Western Washington. After a “review of the current scientific information” [Doc10] that was behind these ‘site potential’ recommendations, NOAA decided to attach a 10-year old table produced for but never agreed upon within a multi-stakeholder process (the Agriculture, Fish and Water process). The original Agriculture, Fish and Water table was presented by NOAA Fisheries in 2002 to the Agriculture, Fish and Water Executive Committee and, according to Stelle, the agency’s “view
of the buffer table is unchanged. We supported its use in 2002, and we still support its use in 2012” [Doc10]. According to my contact at NOAA, the tribes identified the 2002 buffer matrix as “good enough for them,” despite the fact that the buffer widths therein were significantly narrower than the 1997 WDFW guidelines called for in the 2011 TRAR document.

However, the use of ‘site potential tree heights’ complicated implementation of the matrix; it required significant knowledge and expertise to implement [Interview05]. Therefore the “buffer matrix” took yet another form; later that year (Oct 28, 2013), the NOAA Riparian Buffer Matrix was simplified by the Department of Ecology, focusing on an easier to implement set of width measurements. By using straightforward widths (as opposed to site potential tree heights or buffer width calculators based on site characteristics) as requirements for riparian buffers, agencies could easily determine if they had met the criteria and (perhaps equally important) easily justify choices about what buffers to implement. Thus the WDFW’s broad set of general guidelines recommending buffers in the range of 150 to 200 feet for protection of priority habitats, passed through several different government agencies and emerged as a simple (yet controversial) set of guidelines specific to government funded grant programs for agricultural lands.

By this point, numerous state and federal government agencies had been involved: NMFS, WDFW, NOAA, and the Washington Department of Ecology. Yet a buffer matrix that was “implementable” as NOAA had hoped their proposal (of the re-branded Option 3 from the Agriculture, Fish and Water process) would be, remained elusive. At this point, the WDFW “stepped forward” to “take on this buffer issue” [Interview 05]. WDFW addressed the buffer issue by revising its 1997 Priority Habitats and Species guidelines, essentially putting forth a new proposal for the controversy over riparian buffers. At the January 26, 2016 meeting of the State Technical Advisory Committee, Mike Kuttle of the WDFW presented the department’s ideas for a new ‘Priority Habitats and Species’ document on riparian guidelines, revising its 1997 report. The most significant decision of the WDFW for this document was to avoid putting forth yet another ‘buffer matrix.’ In the PowerPoint slides used for this presentation, Kuttle is clear that the Priority Habitats and Species guidelines under development are not meant to be doctrinaire,
“[the Priority Habitats and Species guidelines] do not represent a policy decision about how much is enough, reasonable, or practicable.” However it is supposed to “Convey to land managers best scientific thinking about how riparian area management impacts riparian functions” but it “Doesn’t contain: Numeric description of what constitutes an “adequate” riparian width.” [Doc18]

Given the controversy that had developed around various versions of the “buffer matrix” it is perhaps not surprising that WDFW decided a new approach was necessary. However, some were disappointed in the failure to draw hard lines regarding buffer widths [Interview05]. Almost 20 years after the WDFW put forth their 1997 guidelines on riparian buffers in the form of a “buffer matrix” the agency itself chose to take a new tact. Whether this shift was out of concern for political backlash or from an effort to separate the science from the politics, is not stated. Nonetheless, the WDFW had decided that drawing a line in the sand (or in this case, in the field or pasture) was more than science could deliver; a scientific report could not answer the policy decision of what counts as an “adequate” riparian buffer width.

5.4.4 Technical language obscures real trade-offs: Specific vegetative prescriptions and alignment with salmon recovery objectives

Throughout the official letters and meeting minutes regarding the controversy over riparian buffer widths, obtuse technical language is used that serves to obscure the actual issues of value. While the EPA worked to implement the NOAA Buffer Matrix, the NRCS (which sets the standards for CREP) resisted increasing their standards from their 35-foot minimum. In September 2013, Northwest Indian Fisheries Commission (NWIFC) wrote to WSCC (the statewide association of conservation districts) requesting that they take “decisive action” at their December meeting, in other words, that they implement the NOAA Buffer Matrix (the rebranded Option 3 from the Agriculture, Fish and Water process which would require 100-foot buffers) [Doc08]. WSCC dedicated 3 hours to this topic on December 5, 2013 but previously wrote to NWIFC explaining that ‘decisive action’ would take more time.

Specific language in cases referred to the particular rule in question that an agency was considering changing. For example, many documents refer to “WA Biology Technical Note 14” which is the NRCS guidance for minimum buffer widths required for participation in the CREP
program. Thus a meeting packet of the State Technical Advisory Committee which advises the NRCS (which administers CREP) refers to “Letters to hold Biology Tech Note 14,” in other words, to delay implementation of the proposed increase in minimum buffer widths (from 35 to 100 feet) for participation in CREP. The State Technical Advisory Committee received letters from Conservation Districts across the state opposing the increase in buffer widths, which one conservation district framed as “specific vegetative prescriptions” rather than guidelines for riparian buffer projects [Doc01]. In this way the conservation districts framed the issue as overly prescriptive. At the January 28th, 2014 State Technical Advisory Committee meeting, the group did indeed choose to “hold [back on] Biology Tech Note 14,” explaining:

> Partially due to the widespread disagreement among state and federal partners on which science should be used to determine the width and extent of buffers, and due to the presumed low voluntary participation rate by ag landowners should a wide buffer be “required”, NRCS was asked to delay implementation of the newly revised WA Biology Technical Note 14 and to refrain from implementing NOAA buffer recommendations or others that are not contained in the NRCS field technical guide. [Doc19]

Two main arguments are given in the above quote. First is presumed disagreement on “which science” should be used, with the implication that the choice of scientific information to include will result in different assessments of appropriate buffer widths. The second argument is that implementing the NOAA buffer matrix will result in lower participation rates by agricultural landowners. This second argument was substantiated by the letters from conservation districts. When the NRCS did change its guidelines, it chose to make an “incremental change,” shifting the minimum from 35 to 50 feet. This was on Nov 23, 2015, almost three years after Will Stelle’s original letter. The NRCS first asserts the utility of 35 to 50 foot buffers and follows with an argument based largely on the need to successfully work with their “agricultural clients” and continue the “conservation conversation” with this group:

> Riparian buffers provide a wide variety of ecological functions from filtering pollutants and water temperature moderation to contributing structured habitat elements for aquatic and terrestrial species. Many of these functions can be provided by a 35-50 foot-wide riparian buffer when composed of vegetative communities appropriate to the site. . . It is essential that NRCS continue to offer conservation plan alternatives to our agricultural clients that allow continued production and economic viability, while treating water quality and inadequate habitat resource concerns. The changes to the
Throughout this debate, language referencing technical documents is used instead of language that clearly states the issues at hand. For example, in only a handful of documents analyzed is the width of riparian buffers mentioned directly (the above is one of the few exceptions). Key questions include: who is responsible for setting buffers (NOAA, CREP, NRCS, the conservation districts)? Should riparian buffers serve only to protect water quality or also to provide salmon habitat? Do buffer sizes correspond with research, and how does one isolate the necessary action? Yet these questions are obscured via vague technical or oblique ‘report-referencing’ language that evades a straightforward discussion of the issues. For example, the State Technical Advisory Committee references ‘WA Biology Tech Note 14’ (the technical note which would require wider buffers) instead of directly discussing buffer widths. Conservation districts requested that they ‘hold’ this ‘note’—in other words, that they delay implementing requirements for wider buffers. One of the conservation districts refers to ‘specific vegetative prescriptions’ to refer to buffer width requirements. In the TRAR white paper, the words ‘buffer widths’ are never mentioned; instead, the document refers to ‘alignment with salmon recovery objectives’ and other obtuse language. While these questions about riparian buffers are certainly relevant for many different people and groups in the Puget Sound, the use of technical language serves as a barrier to participation.

5.5 Discussion

5.5.1 Broadening the scale of time and space: The long view of salmon conservation and tribal sovereignty

Like many stories, ours is but a small-scale snapshot within many layers of larger and longer ones, and the controversy stems partly from different scales of the perspectives of farmers vs. tribes. Farmers balk at the changes to a landscape that some have managed for generations, but prior to agrarian colonization and reshaping of the land (via dredging, clearing forests and establishing fields and pastures) the Tribes enjoyed a landscape of estuaries, evergreen forests
and clam gardens (Turner, 2014). Yet only a few generations ago trees were cut down, fields drained, ditches dug to create a landscape more resembling Europe and more amenable to that agrarian tradition. Not only does landscape change have a long history, but so do the politics of treaty rights. In an overview paper on treaty rights, the NWIFC quotes Chief Red Cloud of the Oglala Lakota:

“They made us many promises, more than I can remember, but they never kept but one; they promised to take our land, and they took it.” [Doc13]

The efforts to reclaim those promises, all but the one fulfilled, frame the Tribes’ long views of today’s controversy over salmon conservation. In the 1960s tribal members in Washington joined forces in civil disobedience to reclaim promised rights to fishing. The Boldt decision of 1974 confirmed the rights of tribes to fish off reservation property and additionally the connection between treaty rights and available fish for harvest [Doc13]. Yet despite big wins in the courts, including a recent ruling requiring the Washington State Department of Transportation to create fish passage through more than 800 culverts, actual action on the part of state and federal agencies has often failed to comply with such rulings or challenged them in the form of appeals (as in the case of culverts) (“State Again Tries to Deny Tribal Treaty Rights - Northwest Treaty Tribes,” 2015).

Differences in ideas about place, aesthetics, nature and science across farmers and farm advocates, Treaty Tribes and advocates of restoration help explain differences in expectations regarding farmland preservation versus salmon restoration (Breslow, 2011). From the perspective of a farmer in the Puget Sound, looking at his or her patch of land, and the river flowing through it, the proposition of 100-foot buffers suggested by NOAA appears unreasonable. The farmer looks back in time and sees generations of farmers and the continual changes that have been demanded of them to protect water quality and to save the fish. From the perspective of the tribes, this whole landscape has been stolen and transformed. First the state denied fishing rights outside of reservations and now they are failing to step in and do what is needed to assure the salmon’s survival. When the salmon become listed under the ESA, instead of regulating development and agriculture, NOAA limited tribal fishing. From the perspective of a tribal member, this is a long and arduous battle first for access to salmon, and now to protect
the resource base itself. Asking for only 100-foot buffers in a landscape of farmland seems like a huge compromise already.

This case points to key issues in the literature on restoration, in particular, a) disputes over baselines (Marris, 2011)(Suding, 2011) (what landscape do restoration projects seek to recreate: pre-colonialism, pre-urban sprawl or something else?) and b) the choice of scale in considering restoration activities (Lake, Bond, & Reich, 2007) (how do small-scale parcel level projects interact with and impact regional scale dynamics? And who should determine the form and future of the landscape?). As this case study shows, ‘good’ ecological restoration is not only a technical question, but also an “historical, social, cultural, political, aesthetic and moral” question (Higgs, 1997, p. 338). Restoration creates new relationships with place and landscape, and is an expression of what kinds of landscapes are valued and why (Drenthen, 2009; Lowenthal, 2013). Increasingly, we will be faced with novel ecosystems, where return to an historical baseline, however conceived, may be unlikely (Hobbs, Higgs, & Harris, 2009). Greater clarity on the goals of restoration projects is essential. Smaller scale river restoration projects in the US are conducted for a number of different goals, the most common being water quality improvements, managing riparian zones, improving habitat in stream, fish passage and bank stabilization (Bernhardt et al., 2005). Yet each may involve trade-offs. As our case shows, a focus on the science of restoration can hinder a discussion on the goals and desired endpoints of such restoration.

5.5.2 Square pegs and round holes: The challenge of squeezing a riparian buffer for agriculture into a matrix designed for forestry

Throughout this process, a key controversy has been to find a ‘buffer matrix’ that reflects the ‘best available science’ and is applicable to granting and policy processes to support salmon recovery. Many of the challenges faced in developing buffer-width standards for agriculture stem from an attempt to apply the research, reports, and processes from forestry into an agricultural setting. Most of the research on riparian forest buffers, especially for habitat functions, comes from forestry contexts (Stoffyn-Egli & Duinker, 2013). There are several problems with this approach, stemming from key differences in these two settings.
First, as discussed above, the baseline in forestry is generally existing forest versus in agriculture where it is (often) no riparian vegetation at all. This has several consequences for applying riparian science developed in the forestry context to agricultural settings. Ecologically, the forest case involves existing riparian areas that are likely already used by salmon. Trees may be over 100 years old. Contrast this with riparian restoration on agricultural lands where trees and shrubs must be planted, maintained, protected from wildlife (e.g., deer), and fenced from livestock. They also much compete with high growth species like blackberry bushes and may be disconnected from other natural areas. The time lag from planting to growth to the ultimate end goal of tree mortality and LWD in streams is decades at minimum. The cost of maintaining the buffer and planting it are high. There is uncertainty as to its success and establishment, especially when isolated. Little is actually known about riparian restoration on agricultural landscapes, especially considering impacts such as shading and LWD. Most agriculture-focused research on buffers has addressed their use to filter nutrients, pesticides and sediment. As one riparian scientist explains:

“*At present most research on riparian buffer zones has been carried out on sites where restoration was not needed. Thus, we know much more about the general water quality functions of riparian buffers than we know about how to restore buffers or how quickly and effectively they regain their functions*” (Correll, 2005, p. 437)

The basis of riparian science in forestry also explains some differences in perspectives. Research and recommendations on riparian buffers in forestry asked how much of the forest could be cut before it would have a noticeable impact on the aquatic ecosystem. From this perspective, riparian function starts to decline when buffers are less than 100 feet. From an agricultural perspective, where the status quo is no buffers, benefits of buffers seem to have diminish returns as they get wider. This ‘glass half empty/half full’ situation does then seem to reflect the different perspectives. Considering a fully functional landscape of riparian forests, the glass is indeed half empty. Yet adding buffers to agricultural landscapes is in a sense ‘making the glass half full.’

Second, socio-economically the differences are also important. Forestry consists of a small number of large landowners. This means that a 100-foot buffer has a marginal impact on the
operations of foresters. Contrast this with the large number of small farms in the Puget Sound. Removing a buffer of 100 feet from a property could mean the difference between continuing to farm vs. selling out (perhaps to urbanites seeking a rural lifestyle). Third, there are large institutional differences between the two groups. The small number of landowners and their predominant use of public lands meant that the riparian buffer rules developed were applied to all operations in the state. It also meant that the groups could sit down together and talk it out. Farmers on the other hand are too numerous to all sit down together with other stakeholders. They also have highly diverse needs, value and operations. Fourth, from a regulatory point of view, forestry could be regulated, but despite Jesernig’s concern of ‘litigation Armageddon’ there was little political will or regulatory apparatus to require farmers to install riparian buffers.

So while fixed-width buffers of 100 or more feet (e.g., as recommended in the FEMAT report) made a great deal of sense in the forestry context, they do not in the agricultural context. Cheap and easy buffers made sense for large landholders where buffers mean drawing a line on a map and not cutting past it. In an agricultural context, where buffers are on small highly valuable parcels, and require substantial efforts to plant and maintain, this calculus no longer works. The fixation on width seems particularly problematic in light of the fragmentation of riparian buffers on small parcels. Extracting the science and policy recommendations on riparian buffers from the forestry context without adaption to an agricultural setting failed to account for the social, political and ecological differences between these two settings. Asking science to provide policy recommendations for a specific context is already demanding more of science that it is designed to provide (R. S. Gregory et al., 2006). Applying recommendations developed for one context to a completely different one fails to account for the ways those recommendations were tailored to fit the original context.

This process sheds light on why concepts of complexity have seen so little uptake in environmental management, despite over 20 years of their development in the field of ecology. Simple rules, such as requiring fixed-width buffers, are easier and cheaper to administer. The use of fixed-width buffers applied using a simple matrix, parallels current approaches to stream restoration by private consultants—broadly applicable, simplified methods that are easy to codify and justify (Lave et al., 2010). While most academic scientists of stream restoration oppose such
simple approaches, arguing that they obscure the complexity of natural systems, government agencies in the US have embraced them, in part because they allow agencies to justify their decisions about which consultants are hired and what methods are followed by appealing to a seeming standard (Lave et al., 2010). And thus policymakers may choose simple guidelines fit for other contexts even over complex guidelines fit for purpose.

5.5.3 Fugitive values arise from and reside in technical terms: A debate about resources and rights is couched as a scientific and technical debate

The use of such technical language and the focus on the scientific basis of buffer widths, ultimately served to inhibit a discussion of the real issues at hand. When environmental conflict is forced into science focused discussions, values become ‘fugitive,’ still dominating the discussion, but coded in technical terms that limit participation and discussion of the key points of contention (Satterfield & Levin, 2007). The key issue for the TRAR group is rights, both in terms of assuring adequate salmon survival, but also to co-manage the salmon resource, including access to data and involvement in decisions about programs and policies for salmon recovery. Yet when conservation districts replied to the demands of TRAR and the proposed changes, they remained focused on a resource management paradigm, clarifying the likely consequences of the proposed policy changes in terms of projects completed and stream miles restored. Potential low-hanging fruit, such as finding ways to improve data sharing or collaboration on strategies, was overshadowed by the more contentious issue of defining buffer widths.

While on paper all the actors in this debate could agree on basic goals of ‘salmon recovery’ and meeting ‘water quality standards,’ when it came to implementation, opinions diverged substantially. First are divergences regarding what salmon recovery means—is it meeting ESA requirements, which might result in ‘museum fish’? Or does it mean restoring salmon to the level necessary for tribal members to practice their treaty rights in the form of fishing sufficient numbers of salmon across traditional grounds for economic, cultural, and subsistence purposes? In Kuttle’s presentation on behalf of the WDFW, he directly addresses the question of values and goals in regard to what constitutes wide enough for riparian buffers:
“enough” is a relative concept that reflects our values: enough for healthy fisheries? Enough to remove species from endangered status? Enough to maintain water quality only? [Doc18]

The second and more complicated divergence concerns what actions to take towards salmon recovery, however conceived. Restoration of riparian buffers on agricultural lands in Puget Sound is one of many potential actions, leaving plenty of room for blame and finger pointing towards other potential avenues. The third and most challenging divergence, however, concerns how to implement these actions. The TRAR group has demanded protection of their treaty-reserved resources via (among other actions) specific requests to condition funding of voluntary riparian restoration upon certain specifications. Yet Conservation Districts oppose such ‘specific vegetative practices,’ arguing that in the context of a voluntary program, they will ultimately lead to less restoration.

5.6 Conclusion

This case study of riparian buffers for salmon revealed how a piece of ‘science’ (the riparian buffer matrix) can hide fugitive values, obscuring conflicts about the scale of the problem, exacerbated by a preference for simple policy solutions cloaked in technical language. Ultimately, the demands placed on the riparian buffer matrix—to answer a policy question using natural scientific synthesis—were far too great and led to a conflation of science and values. It was created to determine appropriate thresholds for specific policy applications—questions that require far more judgments beyond science. In particular, this case highlights three of the ‘pitfalls of an overemphasis on science’ identified by Gregory et al (R. S. Gregory et al., 2006), as discussed in the three discussion sections. First, it resulted in unclear objectives (see ‘Broadening the scale…’). Rather than a discussion of rights and responsibilities that is at the heart of the conflict, it focused attention on effectiveness curves and stream classifications. Second, it led to inadequate alternatives (see ‘Square pegs and round holes’). The buffer width debate focused on specific rules for voluntary programs impacting a tiny area of potential salmon habitat. Rather than a broad search for policies that might meet a variety of needs (such as working buffers that could increase habitat while providing some income to farmers), the matrix locked attention into its rows and columns. Third, once different groups zeroed in on the buffer
matrix, a discussion of the real trade-offs involved in salmon conservation and farmland preservation was avoided.

Based on this case study, we suggest a number of remedies to the conflation of science and values. Each might help to remove a stumbling block to the implementation of ‘best available science.’ These include: 1) expand the fields of science included to incorporate social as well as natural sciences, including qualitative social science (Charnley et al., 2017). This would have allowed policy makers to consider the social and political context in which the riparian buffer matrix would be used and adapt recommendations on that basis. 2) Adapt and if needed re-think scientific recommendations taken from one context before applying them in a new social, political, legal, or ecological context. By considering more explicitly the ways that agriculture differed from forestry, agencies might have been able to develop more feasible recommendations. 3) Consider the historical origins of different groups’ positions and of ecological changes across the landscape. The frustration and demands of the TRAR effort were based on a long history of failed promises and unfair treatment. These concerns might have been more effectively addressed via changes in decision-making process than in buffer widths. 4) Address limitations imposed by existing legislation, power structures and agency jurisdiction (Chapman, LaValle, Furey, & Chan, 2017). A fundamental challenge involved the jurisdiction over regulating habitat creation (i.e., what agency should regulate habitat and under what law?). 5) Consider the key differences between restoration and protection of habitat. The ecological benefit and the social and economic costs of habitat restoration are often much greater than of protection. 6) Elicit a wide variety of alternatives from diverse sources to move beyond institutional inertia. The focus on defining a buffer matrix limited explorations of alternative pathways that might have been more fruitful, such as the reach scale approach described below.

Restoration done well can have social as well as ecological benefits, building social capital, providing new job and training opportunities, revitalizing cultural practices dependent and even fostering a sense of community (Kittinger et al., 2013). One approach that some groups are attempting in the Puget Sound region is to focus on the ‘reach scale,’ targeting restoration to a particular ‘reach’ or stretch of stream with good ecological and social potential for salmon recovery. Such an approach has many benefits: potential to achieve (nearly) continuous buffers;
ability to target reaches with greatest ecological potential (e.g., bottlenecks, extension of existing habitat); ease to assess trade-offs and if narrow buffers are ‘worth it’; the possibility to reinforce social norms around stewardship via whole neighborhoods participating; and potential for participants to observe changes in their backyard/community as cumulative restoration projects add up to more substantive changes. Some practitioners in the Puget Sound refer to the current ad hoc voluntary approach as “random acts of restoration.” Moving towards a reach scale approach might allow that restoration to be both targeted and effective.
Chapter 6: Conclusion

I began this dissertation by considering PES as a tool to address a suite of interlinked challenges in the food-agriculture-environment nexus. I postulated that while in theory PES is a market instrument applying Coasean logic to environmental problems, ‘in the wild’ PES programs operate quite differently. As I have discussed at several points in this dissertation, PES programs in practice diverge substantially from their purely market form, a point well accepted by both proponents and opponents of PES (Muradian et al., 2010; Vatn, 2010; Wunder, 2015). In exploring this divergence between theory and practice, I have identified a number of conclusions, both for the design and implementation of PES programs, as well as for conservation-focused institutions more broadly. In so doing, I have employed a lens of environmental values to better understand the ways that PES and other institutions function. I have also considered some challenges, based on environmental values thinking, regarding the intersection of food, agriculture and the environment.

Specifically, I have identified two challenges: 1) the need to engage with values as constitutive of human-nature relationships and 2) the need to understand the ways that tools, programs and policies can articulate values (purposely or not). In the following I elaborate on the need for 1) a new approach to understand participant and stakeholder values in the context of conservation programs, and 2) a broader application of the concept of ‘value articulating institutions’ to encompass a host of tools, metrics and programs. I employ this thinking to develop recommendations for ‘rethinking’ PES, with a focus on agricultural contexts.

I have shown several ways that stakeholders involved in agriculture and biodiversity conservation express their values in these contexts and the ways that these may conflict or fail to align. In particular, I have shown how particular tools and metrics for assessing conservation related goals can conflict with key values of agrarians in particular cultural and geographic contexts. My focus here is synthetic conclusions that can be drawn from this dissertation as a whole. I first consider the implications of my results for debates around the role of agriculture in biodiversity conservation. I consider various applications of the concept of ‘value articulating institutions,’ or the ways that institutions (including metrics, policies and programs), often
inadvertently, convey ideas about what values or types of values should be considered. I then discuss PES as one tool to address the challenges of conservation in agricultural contexts. I suggest two ways to ‘rethink’ PES in light of my results. I then follow this re-thinking to offer some suggestions for research on environmental values. I conclude with directions for future research and policy implications. In this concluding chapter I also take the opportunity to engage more deeply with some of the pertinent theories and literature, than in chapters 2 to 5 (as these chapters were written to be stand-alone papers for more applied audiences).

6.1 Agri-‘culture’ and biodiversity

There are multiple ways to balance the goals of agricultural production of food, fuel and fiber with those of conservation of biodiversity and ES (Foley et al., 2005). This balance may take many different forms. For small-holders in the Peruvian Andes, the practices and seed varietals that sustain a history of agro-biodiversity are paramount (Shepherd, 2010). In Brazil, food sovereignty movements articulate not only agricultural practices, but associated social relations (e.g., regarding class and gender) (Chappell, 2012). Post-colonial American agrarian traditions are based on family farmers as central to the moral fabric of the nation (Smith, 2003). Balinese water temples are simultaneously religious and political institutions and effective means of regulating and distributing water resources for crop irrigation (Lansing et al., 2012). In much of Europe, ‘cultural landscapes’ are valued for the production of traditional foods as well as their aesthetic and recreational values (Plieninger et al., 2013). Each of these places has a unique landscape, inscribed not only with cropping patterns, but also with cultural practices.

Upon these cultural landscapes of agricultural production, programs for biodiversity and ES inscribe a new set of values and priorities (Schaich, Bieling, & Plieninger, 2010). Yet this overlay of conservation values upon agrarian landscapes can lead to points of friction as I have shown in the west coast of North America and Costa Rica. I highlighted several cases in which values and perspectives of agrarians and rural land managers differed from those of biodiversity conservation (as articulated explicitly or implicitly via organizations, programs or polices). Differences included ideas about a) how conservation goals should be conceptualized and b) how those goals should be implemented via specific conservation practices. In chapter 2, I showed
how the Ecological Footprint’s (EF) conceptualization of conservation goals for agriculture was incompatible with alternative conceptualizations based on multifunctional landscapes. The EF conceptualizes agricultural production as a drain on a finite global productive capacity. In this sense it essentially adopts a ‘land sparing’ philosophy, wherein there are two ways to reduce the EF of food and agriculture. Producers can increase yield to ‘spare’ wild land (or more realistically, to reduce the expansion of agricultural land). Alternatively, consumers can eat less or differently (primarily by reducing consumption of animal products). Missing from such a conceptualization are many possibilities to protect biodiversity and increase ES within agricultural lands (Plieninger et al., 2017; Vandermeer & Perfecto, 2007). Also absent are the values of agricultural landscapes for scenic beauty, recreation and heritage (Schaich et al., 2010), and the importance of particular production systems as expressions of values and ways of life (Satterfield, 2007; Sayre, 2006; Smith, 2003).

In contrast to this view inherent in EF, PES programs focus specifically on multifunctional landscapes and land management choices for desired biodiversity and ES ends (Reyers, O’Farrell, Nel, & Wilson, 2012; van Noordwijk et al., 2012). The ecosystem services framework itself is well suited to a land sharing philosophy and the idea of multifunctional agricultural landscapes (Foley et al., 2005). By pointing to a suite of ecological functions across a landscape and the diverse benefits provided by these in areas from water flow regulation to food production to aesthetic values, these squarely frame landscapes as sources of multiple benefits and values. From this perspective using the ES framework to set goals might be more compatible with agrarian and rural values than using a metric like the EF.

However, as I have shown, certain aspects of the underpinning logics of PES may also engender conflicts or misalignment of values between programs and participants. PES can adopt ideas from conservation movements, such as that of wild nature (Marris, 2011), which we see expressed in the CREP rule for ‘no-touch’ riparian buffers (chapter 4). By externally defining the conditions upon which payments are contingent, PES can constrain the agency of agricultural producers or land managers, transferring that agency to program designers and policy makers. The program rules themselves then define how conservation goals for agricultural landscapes are conceptualized, what these goals should be, and what practices are appropriate to achieve these
goals. It is in this way that PES can then be seen as a value-articulating institution, as discussed in the following section. Alternatively, PES can be designed by producers themselves, as in the case of the ESI in BC or proposals by the groups PRISMA in El Salvador (Rosa, Kandel, & Dimas, 2003) or UNAFOR in Costa Rica.

In chapter 3 I highlighted another misalignment of values. PES can articulate values in the ways that they conceptualize a) human motivation(s) and b) the relationship(s) between people and nature. In the case of the PSA in Costa Rica, the program managers articulated a conception of nature as providing monetarily quantifiable benefits. Yet these same service providers often saw the program as providing a help or support for their ongoing stewardship of the land, a stewardship that would have occurred even in the absence of such a payment; they often spoke of nature in terms of their relationships with the land, its history, and the plants and animals (both wild and cultivated) that used that land. Some of these land managers employed the language of PES to articulate views about distributional justice. They argued that, as rural land stewards, their lands have provided valuable ecosystem services for many years (far before the PES program began). The carbon that their forests sequester alleviates the emissions of urban residents or more industrialized countries. This argument reframes PES as a compensation for ongoing stewardship rather than an incentive to change practices. This idea of ‘compensation for ecosystem services’ is highlighted by McAfee and Shapiro as a response of rural campesino groups (such as PRISMA or UNAFOR, discussed further below) to PES programs (2010). Such groups have taken the idea and language of PES and transformed it to articulate their own values and position (e.g., distributional justice as above or employing PES to support the rights, values and livelihoods of rural communities). In this way, PES can serve as an instrument to “turn farmers from polluters of soils and water into ecosystem managers” (Friedmann & McNair, 2008, p. 430).

6.2 Articulating value

This dissertation has highlighted several ways that value metrics, programs and guidelines served to both articulate particular types of values, and constrain others. Vatn has discussed the ways that institutions – as value articulating entities – have emerged in response to market logics, and
so shed light more broadly on how institutional context can shape preference formation and behavior (Vatn, 2005). Other scholars have also explored the role of institutions in shaping the ways that people construct meaning and so value as a function of specific institutional cultures and the logics they employ (W. W. Powell & DiMaggio, 2012). Institutions have been defined in many different ways; a number of definitions focus on institutions as defining the ‘rules of the game’ including both formal rules and informal constraints (Ensminger, 1996; North, 1990). Other definitions focus on the role of institutions in shaping social norms and paradigms, e.g., as “socially constructed templates for action” (Barley & Tolbert, 1997, p. 94) or “typifications of both natural and social phenomena” (Berger & Luckmann, 1966; Vatn, 2005, p. 206). I follow Vatn’s (2005) synthetic approach to institutions, considering their roles in shaping the way we ‘make sense of’ the world, creating or articulating values, and in coordinating behavior. While this dissertation has focused on more practical questions, its findings invoke these kindred literatures with regard to how institutions work and affect their constituents. This is too vast a literature to cover here, but as I discuss my findings a few key points surface from these other schools of thought. In particular, I point to three synthetic conclusions about the mechanisms by which institutions articulate values.

6.2.1 Institutions articulate values about appropriate human motivations via the use of languages and logics

One mechanism by which institutions articulate values is the logic and languages used in programs such as PES. Institutions can serve not only to constrain behavior (e.g., by setting the ‘rules of the game’), but also to structure the logic or rationality that individuals use to understand the situation in question (Vatn, 2005). This is an important consideration for PES program design—where the program may be based on an idea of individually rational or strategic behavior, a key principle of market-based mechanisms. In this way institutions can facilitate or constrain the ‘activation’ of self-interested or market logics. Consequently, they then might facilitate logics of reciprocity (and in this way ‘crowd in’ other-oriented motivations) (Vatn, 2005). Not only can PES programs articulate values, but also other land managing institutions. For example, institutional design can facilitate cooperation and reciprocal behavior in collective action problems including communal resource use (Ostrom, 2000). And even
regulatory instruments can erode motivations, perhaps by shifting responsibility to the regulatory institution and in this way replacing informal local management systems (Cárdenas, Stranlund, & Willis, 2000).

For these reasons, motivational crowding out is key to understanding the imprint of the institutions examined here. In chapter 3 I have used the languages of ‘market values’ and ‘relational values,’ as values that institutions might articulate. Yet market values can be seen as a parallel concept to institutional values that assume self-interested individuals as the basis for motivation and relational values as parallel to those that are assuming a logic of reciprocity—ideas also used by scholars of institutions, psychology and game theory (which have variously examined motivations) (Fehr & Falk, 2002; Ostrom, 2000; Rode et al., 2015). That is, I have used market and relational values to draw connections between the literatures on motivational crowding out, commodification in PES programs, and on environmental values. Lab studies of motivational crowding out have focused on short-term behavior and the activation of self-interested or strategic behavior versus intrinsically motivated behavior or logics of reciprocity and trust (Fehr & Falk, 2002; Rode et al., 2015; Vatn, 2005). One concern associated with motivational crowding out in PES programs or other incentive-based programs is that the shift in motivation might also contribute to an erosion of values and norms (Bowles, 2008; Gneezy & Rustichini, 2000; Luck et al., 2012). Commodification of nature is concerning precisely because the potential shift in values and relationships is toward a market logic. The logic of the market assumes that human actors are rational and self-interested, sometimes referred to as *Homo economicus* (Levine et al., 2015).

In addition to market logic, alternative logics of reciprocity and trust seem to be central to the question of motivational crowding out (Fehr & Falk, 2002; Vatn, 2005) because they align with the idea of relational values. The logics of trust and reciprocity place value on the relationships between people or between people and nature. An example of reciprocity between people and nature is the relationship between Northern indigenous hunters and caribou—where the caribou gives itself to the hunter, but only if the hunter has properly fulfilled his or her obligation to the caribou (Nasasdy, 2008). Another way of seeing the value articulation of institutions is by the role they ask us to take—thus Sagoff’s distinction between consumer and citizen preferences.
In our consumer role we are expected to employ self-interest and market logics (that is, to satisfy individual preferences); in our citizen role we engage moral arguments about what ‘we’ want as a society (aka thinking through and satisfying what is collectively preferred for society) (Sagoff, 1998).

In chapter 3, I examined the role of a PES program in articulating market language and logics. I showed how market languages and logics are clearly expressed by PSA program leaders and used in the way the program describes itself. Many participants in the program, however, articulated a variety of relational values and expressed a program language and logic more akin to the idea of compensation for ecosystem services. So in this case, the market logic was not adopted by the participants, likely due to the role of intermediary organizations in ‘translating’ the program for participants. In this sense, we can also consider the role of participants themselves in developing their own conception of the program and articulating new logics, such as those around distributional justice. Thus while PES programs might articulate values based on market logics, they are not passively absorbed by those involved in the program. A parallel situation is the case of protest votes in contingent valuation studies, where respondents refuse to accept the use of the ‘as if’ market posed and applied to contexts (nature) where they see it as inappropriate (Vatn, 2005). However, while protest votes are discarded by the researchers in contingent valuation studies, in PES programs, participants may keep both the money and their own favored interpretations of the values and purpose of the stewardship actions.

6.2.2 Institutions articulate values about appropriate human-nature relationships via rules and metrics

Above and beyond the articulation of market or relational values, institutions can also articulate other types of values. In chapter 4, I showed how the CREP program articulated a particular conception of conservation on agricultural lands via specific rules: the ‘no-touch’ requirement and minimum buffer widths. I explained how these rules conflicted with key values of participants and potential participants—values of tidy aesthetics, land manager agency and active land management. In this case, an institution (CREP) articulated values and logics about appropriate relationships between people and nature. The incompatibility of the program and
participants’ conceptions about the relationship between people and nature then became a point of conflict.

Articulation of human-nature relationships is important because there are many different ways to conceive of this relationship (Sundberg, 2014). The idea of a riparian buffer only makes sense in contrast to something that must be buffered against. A riparian buffer seeks to divide human activities from natural processes. Mountains can be gloomy and dangerous or, alternatively glorious places of self-renewal (M. H. Nicolson, 1997). ‘Nature’ can be a pristine wilderness (void of human touch) or a culturally inscribed landscape (Basso, 1996; Denevan, 1992; Sayre, 2006; Solnit, 1994). The conception of nature as devoid of human presence has led to the expulsion of indigenous peoples from their traditional lands throughout the world—all in the name of nature protection (Agrawal & Redford, 2009; Dowie, 2010).

In chapter 2, I showed how the EF shaped the ways that the City of Vancouver’s GCAP conceived of its goals and how this limited policy options. However, although this was not discussed in that chapter, the EF also serves to articulate ideas about appropriate human-nature relationships. Metrics, including the EF, are not just technical or scientific tools, but also derivative of certain values. The EF in particular, seeks to measure the impact of an individual, city or nation in terms of their ‘share’ of the total biologically regenerative potential of the earth. First, this framing focuses on humans as a drain on a finite global capacity of nature. The EF creates a visual image of an oversized footprint taking up some percentage of a limited global pie of biologically regenerative potential (as measured in “Global Hectares”). Thus the implied relationship between people and nature in the EF is people, primarily, as a negative impact on nature. Nature, by implication, would be better off without people. Contrast this with a host of alternative conceptions whereby people and nature have mutual dependence (Díaz, Demissew, Joly, Lonsdale, & Larigauderie, 2015b; Nasasdy, 2008; Poe, LeCompte, McLain, & Hurley, 2014; Sundberg, 2014; Turner, 1988; West, 2006). Second, the EF is not place-specific. Land is categorized according to its biologically regenerative potential, but within each category, a hectare in Africa, Asia or Europe is the same. This is necessary in order to create the single numeric output that the EF generates (expressed in terms of ‘Global Hectares’). The EF thus aligns with certain framings of the agriculture and environment challenge, namely the land
sparing framing and debate, which also largely assumes that a hectare ‘shared’ in one part of the world means less land ‘spared’ elsewhere. This contrasts with many agrarian movements which focus on specific relationships to the land and their long-term stewardship for both ecological and human benefit (Carlisle, 2013; Smith, 2003). Third, the EF framing focuses on distributive justice of the earth’s renewable resources. This form of value-articulation of the EF may be its greatest strength, in parallel with movements for ‘climate justice’ that seek to highlight the ecological components of global inequality (J. T. Roberts & Parks, 2009).

6.2.3 Institutions articulate values by structuring problem definitions and simplifying contexts

Ecological restoration itself, despite its attempt to return to a ‘natural’ state involves the creation of new places and human designed ecosystems (Drenthen, 2009; Marris, 2011). The debate about the ‘riparian buffer matrix’ can in this light be seen as a process of defining the conditions of this new category of ‘nature.’ Robertson’s discussion of the social construction of the native wetland flower *Aster simplex* tells a similar story. While botanists continue to debate the divisions of a variety of related species and sub-species of the flower, the emergence of wetland banking necessitated the definition of clear designations, using the flower as an indicator of ‘what counts’ as a wetland (M. M. Robertson, 2016). Similarly, Sayre has asserted that the designation of ‘endangered species’ is “a legal construct disguised as a natural biological fact” (Sayre, 2006 p xxiv). Each of these—the EF, BC Beef, *Aster simplex*, the riparian buffer matrix, or endangered species designations involve the creation of clear designations, reducing in cases many different factors into a single threshold or metric. Even the more straightforward concept of ‘BC Beef’ proved to be difficult to align with the reality of an industry that inevitably crosses provincial boundaries. The creation of ‘BC Beef’ as a specific designation that consumers could purchase required development of a new institution to monitor and track the product through value chains where it might become mixed up with beef produced elsewhere (chapter 2).

The creation of an indicator such as EF is a way to simplify complexity, manage uncertainty, and convey authority. As with monetary valuation, the metrics and indicators such as the EF reduce a suite of values and trade-offs into a single number (Sarfaty, 2011). Sarfaty explained how the
reliance on quantitative indicators in the Global Reporting Initiative (GRI) for corporate sustainability resulted in greater importance placed on easy to quantify variables such as GHG emissions, while the more difficult to quantify concerns around human rights were primarily assessed via ‘box ticking’ or superficial compliance measures such as counting the number of hours of employee training regarding human rights (Sarfaty, 2011). In this way the GRI indicator system also served to articulate values and set priorities in much the same way the EF did in chapter 2. When guided by numerical indicators, policies focus on that which can be measured (Sarfaty, 2011). And formalized standards may be less effective at monitoring compliance than the more informal systems they replace (Carlisle, 2015).

Furthermore, an institution need not be designed to elicit or measure values in order to articulate them. Both the EF and the riparian buffer matrix are scientific tools or guidelines, intended to measure or assess achievement of conservation related goals, not necessarily to define such goals. But this is not to say that intention and use have aligned. The studies herein demonstrate that the tools do often in fact serve to set the parameters for ‘what counts’ in achieving these goals. In so doing, they excluded policy options that could have contributed to the goals each was designed to measure. The EF, for example, excluded policy options that would address sustainable land management. The riparian buffer matrix excluded restoration projects that fell outside of its parameters. By seeking the answer to a complex social-ecological problem within a ‘matrix’ of buffer widths, a broader discussion of potential policy options was avoided. Each went beyond its role of assessing objectives, to defining objectives and processes.

To the extent that the metric (EF) and the matrix (riparian buffer) served to define objectives, they also, by this mechanism, articulated values. By determining ‘what counts’ they de facto determined ‘what matters.’ In the case of the EF, what counted was the amount and type of food consumed by residents, but not a host of other potential objectives one might have for community food choices: health of local residents, community employment and stability, knowledge of local foods and traditional farming methods, maintaining biodiversity (or agrodiversity) (N. Gregory & Gregory, 2010). Theories of prescriptive decision making, such as that offered in Structured Decision Making, propose using participatory processes to define a set of objectives for a given decision-context (R. S. Gregory et al., 2012). Scientific tools and
metrics are then used (along with modeling and/or other inputs) to assess the degree to which each policy option would meet the objectives. But when such options and guidance are not heeded (how a community or region might set its own objectives and measures or modify metrics to match local contexts), the metric or guidelines offered can become the goal as each of my case studies demonstrate. In the case of the EF, the specific goal was explicitly defined in terms of the metric (‘lighter footprint’). In the case of the riparian buffer matrix, implementation or not of the matrix became symbolic of larger issues around rights or responsibilities (perhaps a particularly likely outcome when legacies of controversial land use and appropriation are long and deep). For the Treaty Tribes, successful implementation of the matrix meant a clear expression of their own role as co-managers of the salmon resource. For the Conservation Districts, such implementation represented a negation of their own expertise working with landowners.

6.2.4 Individuals and organizations can and do contest, reimagine and translate the values articulated by institutions

My case studies have shown not only the ways that institutions articulate values (as described in 1.2.2-3) but also how individuals and communities challenge or reimagine those value articulations. Rather than remain stuck in the ‘metric trap’ City of Vancouver staff chose to redefine the EF metric in their own terms (chapter 2). They employed a ‘proxy metric’ that captured the spirit of the EF in their own conceptualization—as a chance to consider the many ways that city residents impact the environment both within and beyond city limits. Their proxy metric measured the engagement of city residents in a suite of city programs designed to promote sustainable lifestyles and innovations for city sustainability.

In Costa Rica, intermediary organizations and PES program participants interpreted the program on their own terms, despite the officially articulated purposes and values. They reimagined the program as a stewardship and rural livelihood support for smallholders, rather than a payment for services rendered. Beyond this, individuals and intermediary organizations articulated values of distributional justice, conceiving of the program as a mechanism of redistribution of ecological ‘goods’ and ‘bads.’ Campesino groups such as UNAFOR in Costa Rica and PRISMA in El
Salvador have elaborated this vision of redistribution, by which vision PES programs can be seen as compensation for ecosystem services.

The conservation districts that work in the Puget Sound also serve an important role as translators of value. They serve as a ‘buffer’ (so to speak) between rural land managers and conservation efforts (tribal, federal, state or NGO). Standing between these two worlds, they learn to speak to both groups. Their status as a government funded but non-regulatory organization allows them access to many kitchen tables that would be closed to any other government employee (chapter 4). A similar ‘boundary organization’ role was played by the Ecological Services Initiative in BC, by collaborating with a suite of actors, from the City of Vancouver, to a local conservation fund to the BC Cattlemen (Chapter 2 and Leimona et al., 2015). Despite the roles of institutions in articulating values, as described above, this dissertation demonstrates that individuals and organizations can and do contest, reimagine and translate these values.

6.3 Rethinking payments for ecosystem services

This dissertation considered two key critiques of PES—1) the simplified representation of ecological processes and 2) the potential to shift values and norms. In many ways, these can both be seen as the problem of simplification. The potential shifts in values and norms from PES can be seen as a simplification of human motivations. Whereas people might have a suite of motivations and values for stewarding nature, when these are focused into a single economic motivation the values are in a sense flattened or narrowed.

6.3.1 ES as social and ecological complexity blinder

As many authors have pointed out, the ES framework offers a simplified representation of both ecological and human relationships and interactions (Fish, 2011; Norgaard, 2010; M. J. Peterson et al., 2010). In the Puget Sound, the CREP program pays for riparian restoration around designated salmon-bearing streams. By seeking a matrix of appropriate riparian buffer widths based only on stream type, many important complexities were obscured. For example, ecologically, the effectiveness of a buffer will depend not only on the width, but also on the
neighboring stretches of stream (their aquatic health, if they have buffers and what type), the adjacent land uses, topography, and the way restoration is conducted (what kinds of plants, their successful establishment, managing invasive species, measures to address stream-bank erosion), among many other factors (Correll, 2005). Socially, the likelihood of implementing a buffer will depend (among other factors) on the conditions attached to that implementation, the values and needs of the landowner, and the relationship between the implementing organization (in this case the Conservation Districts) and the landowner (chapter 4). As it does not target areas with high ecological and social potential for success, some practitioners in the Puget Sound have referred to the current restoration approach as “random acts of conservation.”

Yet while PES programs can result in ‘random acts of conservation’ to the extent that specific parcels for conservation may not be prioritized, conditions for payments must be clearly defined. This simplification of ecological and social factors into a simple set of rules or guidelines—a.k.a. conditionality—is part and parcel of PES programs (Pattanayak et al., 2010). Yet, the need for clearly defined boundaries as to what counts as meeting the conditions and what does not can conflict with the complex and messy nature of ecosystems (Norgaard, 2010). The riparian buffer matrix required setting a clear threshold that would apply across the region.

On the other hand, PES programs can set up more complex conditions both socially and ecologically (van Noordwijk et al., 2012). They may target specific priority ES or geographic areas with high ES or biodiversity value (Wünscher, Engel, & Wunder, 2008). Or they may seek to target particular suppliers as part of a poverty reduction goal (Pagiola et al., 2005). Yet often there is a trade-off between targeting for ecological versus social goals (Pagiola et al., 2005; van Noordwijk et al., 2012). Targeting ‘high value’ areas for PES may boost conservation’s ‘bang for the buck,’ but it can also exacerbate inequity (Pascual et al., 2010). In Costa Rica’s PSA, FONAFIFO uses a complex matrix of different ES values as well as social priorities to determine which of the many applicants will get funded via the program. For participants such complex targeting can be frustrating. Preparing an application for the program is already time consuming and can be expensive (Porras et al., 2013). Such targeting can increase the transaction costs of PES programs, which often inhibits participation by smallholders who have similar transaction costs but a much smaller payment (Pagiola et al., 2005).
A further problem is that, as a product of the particular economic science that inspired PES, these programs imply that humans are economically rational actors and motivated primarily by financial incentives (Bowles, 2008; Levine et al., 2015). Such a conceptualization negates the other motivations that a land manager might have for stewarding the land and creating habitat for species that inhabit it (Carlisle, 2013; Smith, 2003; Wirzba, 2003). Yet my research shows that the logic of economic rationality is not necessarily absorbed by PES participants. Rather, both participants and intermediaries discuss PES in novel ways, using languages and logics different than those implied by the logic of the market.

This points to two implications for research on motivational crowding out in PES. One is the potential for program participants to reject or reframe the logic suggested by a PES program. A second is the need for a richer conception of motivations. Much research on motivational crowding out has focused on either ‘altruistic’ / ‘moral’ motivations or on logics of reciprocity and trust between people (e.g., in ‘games’ that test motivational crowding out in laboratory settings) (Bowles, 2008; Fehr & Falk, 2002). In this sense, motivational crowding out is testing the use of intrinsic versus instrumental motivations. Yet in the case of PES the motivations we are concerned about also include the relationship of the land manager to their land, which is not fully captured by either the idea of instrumental or intrinsic values (Chan et al., 2016).

In light of these findings, following my involvement in efforts to ‘rethink’ PES programs (Chan et al. 2017), I elaborate on two ways in particular.

### 6.3.2 Align programs with participants’ values

Chapter 4 points to the importance of understanding and aligning PES programs with the land management values of target participants. As these values are likely to vary or take different expressions depending on the context and the participant, efforts to first understand what is important to potential participants would be a useful undertaking. Some values, such as the preference for a tidy landscape, have been found broadly and recommendations for their uptake into agri-environment programs elaborated (Burton, 2012; Nassauer, 1995). Other values, such as agency over the form and function of the landscape, are likely to be deeply embedded in local
contexts and histories. In particular, the use of rules (like no touch) that exclude land managers from active use of and agency over their land, can turn some participants away (Chan et al. 2017; Chapter 4). However, even in a context where enrollment is not a problem (as in the Costa Rica PSA), considering the values of participants is important. If programs assume individual economic motivations as primary, they could lead to motivational crowding out. Alternatively, such framings have caused programs to fail or falter. For example, in Bolivia a PES program using the language of pago (payment) was seen by local communities to represent privatization and land appropriation, leading to substantial resistance (Wunder & Vargas, 2005). The language used to describe payments however can take many forms: payments, markets, rewards and compensation have all been used (Wunder & Vargas, 2005). These different languages might imply alternative ‘logics’ such as reciprocity, trust, and normative motivations (Vatn, 2005).

Even Wunder himself, who proposed the most commonly cited definition of PES, has suggested that the language of service users and service providers is more appropriate than that of buyers and sellers (Wunder, 2015).

In particular, the language of compensation seems to have potential in some contexts. ‘Compensation for Ecosystem Services’ is the way that several groups in Latin America have sought to reimagine PES (Rosa et al., 2004). In Costa Rica, the group UNAFOR is working to create a ‘campesino PSA’ that would compensate smallholders for many of the biodiversity supporting practices that they already engage in (Olmsted, 2017). This would contradict one of the key principals of PES—that of additionality—by paying for ES that providers would supply regardless (Pattanayak et al., 2010). However, others have argued that a focus on such small-scale additionality could detract from the larger land-scape scale changes we might hope for from PES (Chan et al., 2017a; Olmsted, 2017). If PES programs are to lead to large scale change, then they should reinforce and not undermine values of stewardship and responsibility (Chan et al., 2017a). One of the mechanisms of motivational crowding out is via reciprocity (Fehr & Falk, 2002). When those already engaged in stewardship are ‘punished’ via ineligibility for payments, they may be tempted to reciprocate by no longer engaging in that stewardship. Compensation for ecosystem services, however, could support land managers to ‘do more’ in their stewardship. Beyond PES, the choice of language and the framing of policies and programs of all sorts can
have important implications for their impacts, including impacts on motivation (Cárdenas et al., 2000).

Another possibility is to offer non-monetary compensation to participants (Asquith, Vargas, & Wunder, 2008). For example, a successful health intervention in India offered 1 kg of lentils and a set of small metal plates to mothers for bringing their children to a camp for immunization (Banerjee, Duflo, Glennerster, & Kothari, 2010). Lentils were chosen over cash for their immediate nutritional value and the metal plates (thalis) for their utility and also as a symbol of achievement (Banerjee et al., 2010). These rewards may also have been well chosen from a motivational crowding out point of view. To imply that a mother would only immunize her child for a monetary reward is contrary to most ideas about the appropriate relationship between a parent and child. Yet bringing the child to the camp had a high opportunity cost (almost one day’s work), which she might not be able to spare. The amount of lentils was chosen to approximate the opportunity cost to the mother (Banerjee et al., 2010). The lentils and thalis contribute to the well-being of the family and child, and thus are appropriate types of rewards or compensations for the costs of travel for immunization. A similar logic of compensation could work for PES in agricultural contexts. Many of the agricultural producers in my studies operated with low or even negative profit margins. The costs in time, labor and materials for conservation projects can be unfeasible in this context. Some form of compensation to land managers is thus likely needed for much conservation on agricultural lands. But this need not be monetary. In-kind contributions of materials, labor or technical assistance were also valued by interviewees working with the Snohomish Conservation District. In particular, conservation projects were more attractive when they could improve farm functioning by stabilizing streambeds or resolving drainage problems (chapter 4). Such types of rewards are more appropriate to the type of relationship than strictly monetary compensation (Chan et al., 2017a). A PES program so structured, could adopt the language of ‘co-investment in stewardship’ to emphasize the joint contributions of service providers and beneficiaries (van Noordwijk et al., 2012).
6.3.3 Recognize PES as a social choice

A further way we could ‘rethink’ PES in light of relational values is to recognize that PES is fundamentally a social choice of how much we are willing to pay (and who should pay?) and who we think should pay and benefit. In chapter 2 I considered who could or should contribute to PES. Might urban consumers, regardless of the benefits they receive, pay into or support PES programs, given the impacts of their consumption? Arguably, consumers also benefit from the negative impacts of their consumption in the form of lower prices (Chan, Olmsted, Bennett, Klain, & Williams, 2017b). Yet including urban food consumers also raises challenges: if they are paying into a program they may also wish to determine the conditions of the program (Pattanayak et al., 2010). Yet urban consumers can have ideas about appropriate means of production that clash with the views or needs of agricultural producers. For example, consider the clash in the case of tethering dairy cows in the European Union under organic certification. Organic consumers see the practice as inhumane, yet dairy farmers have found that without tethering, the cows receive little human contact and become difficult to handle (Hovi & Bouihol, 2001; Leach et al., 2012). Here the consumer conception of appropriate human-animal relations conflicts with that of rural producers. In chapter 4 I discussed the frustration of rural landowners who felt urbanites wanted to impose their own idea of what the rural landscape should look like—as ‘their’ (the urbanites’) park, or as a scenic meadow of cows with no manure. The creation of widespread riparian forest buffers that allowed rivers and streams to meander would create a landscape more amenable to salmon yet less so for agricultural production, as highlighted by the conflict discussed in chapter 5. PES raises the question of who should make what kinds of changes, how much should they be compensated for that, and who should pay.

PES acknowledge that our actions are interconnected via ecosystems and that the benefits and costs from the use and reliance on ecosystems are unevenly distributed (Vatn, 2010). PES is then one type of institution to resolve this uneven distribution. However, while often considered a market solution, in reality PES almost always rely on substantial state intervention (Vatn, 2010). This is clearly the case in both Costa Rica’s PSA and CREP. Payment amounts and conditions are not negotiated directly between beneficiaries and suppliers, but decided by state institutions. For example, the PSA was established as part of the same forestry law that prohibited further
land conversion and clearing. The incentives for plantation forestry, even for non-native species such as Teak, were a result of negotiation with the forestry industry (Porras et al., 2013). The PSA was primarily negotiated with forestry and conservation interests, which are reflected in its rules and structure (Rosa et al., 2004). However, over time, pressure from organizations such as UNAFOR has allowed for adaptations to the program to better fit the needs of smallholder agricultural producers and indigenous groups (Rosa et al., 2004). For example, the agroforestry modality—introduced in 2003—pays a per-tree rate, making it more suitable for those with small parcels; recent changes have also facilitated enrollment of smallholders in general (Porras et al., 2013). UNAFOR seeks further changes to the PSA program and envisions a ‘campesino PSA’ that supports traditional practices and helps smallholders implement practices with simultaneous conservation and production benefits (e.g., watering tanks so cattle need not drink from the river). In Puget Sound too, forestry guidelines were used as a model for a PES on agricultural lands (chapter 5). Yet I as showed, the needs of forestry and agriculture are different, necessitating adaptation.

What can we learn from comparing a PES program that is lightly funded but oversubscribed (in Costa Rica) versus a program that is generously funded but undersubscribed (in Puget Sound)? I have identified a few potential reasons regarding environmental values for this seemingly contradictory result. In Costa Rica, despite potential value misalignment between the program and participants, intermediaries served to ‘translate’ the program to potential participants. In the Puget Sound, despite intermediaries’ efforts to ‘translate’ the program values to align with those of participants, strict rules turned many potential participants away. Beyond the role of values in attracting or repelling participants, several other factors play important roles. Chief among these is the de facto opportunity cost in Costa Rica, whereby many participants have forested land that they cannot legally convert to other uses (due to the deforestation ban). The different opportunity costs of farmers in Costa Rica versus Puget Sound however, are in part a result of the differing political power of small farmers in Costa Rica versus agricultural interests in Puget Sound to shape environmental regulations (e.g., Costa Rica’s land conversion ban, or Puget Sounds’ lack of binding riparian restoration).
Rather than expect PES to then emerge from allocation of property rights, programs could be negotiated as a societal choice (Chan et al., 2017a). In some ways, this thinking is well aligned with Coase’s original conception of the ‘problem of social cost’:

*The question is commonly thought of as one in which A inflicts harm on B and what has to be decided is: how should we restrain A? But this is wrong. We are dealing with a problem of a reciprocal nature. To avoid the harm to B would inflict harm on A. The real question that has to be decided is: should A be allowed to harm B or should B be allowed to harm A?* (Coase, 2013, p. 837)

Coase himself framed the problem as a social choice—who ‘should’ be allowed to harm whom? By setting conditions and payments, PES programs must determine an allocation of rights and responsibilities between different parties (Vatn, 2010). Such questions cannot be answered by natural science or market forces alone. Acknowledging this would open space for discussions of how rights and responsibilities should be allocated.

### 6.4 Towards ‘thick,’ place-based, and relational values

PES programs force us to consider such questions as, what kind of landscape do we want? Who should participate in determining the shape of the landscape? How should they participate? In the Puget Sound conservation, agricultural production and development all compete for land use. The resulting landscape is not only important for the food or fish produced, but also for the values it expresses. Drenthen’s discussion of ‘palimpsest landscapes’ (or layers of history inscribed on the landscape) is particularly relevant here (2009):

“If we conceive of ecological restoration as the uncovering of ancient layers and the cultivation of the lessons learned from reading the older text, then the palimpsest landscape could be a landscape ideal worth striving for: a multi-layered legible landscape that reflects human history and ‘grounds’ our sense of place in an understanding of the earlier and deeper layers. The big challenge is, of course, how one can uncover deeper layers (for instance clearing older river channels) without destroying more recent depositions on top” (Drenthen, 2009, p. 296)

This is indeed the challenge in the Puget Sound. The cultural practices and foods of the treaty tribes are one way of remembering the older layer of landscape that produced them (Donatuto, Satterfield, & Gregory, 2011; Garibaldi & Turner, 2004; Turner, Berkes, Stephenson, & Dick,
Restoration of riparian forests is one way that this older landscape layer can be partly ‘uncovered.’ But such restoration can conflict with agrarian visions of the landscape, which can involve a tidy landscape with unobstructed views of the river (chapter 4). Finding ways to create a ‘multi-layered legible landscape’ that accounts for the palimpsest nature of the landscape is then the challenge (Drenthen, 2009; Sayre, 2006).

Landscapes then can be read (Drenthen’s ‘legible’ landscape) but, as Nassauer explains, they can also speak (via ‘landscape language’ and ‘cues of care’) (Drenthen, 2009; Nassauer, 1995). The language of landscape takes the shape of their forms and functions, a language in which those closely engaged with the landscape are fluent. The Apache have woven the language of landscape deeply into their culture, as Basso highlights in *Wisdom Sits in Places*, via a conversation consisting entirely of place names. Each place name is associated with a specific traditional story that conveys important information about what is important and why (Basso, 1996). Key to these conceptions of landscape is the active presence of humans upon them, reading the landscape, speaking with the landscape or writing ‘cues of care’ upon the landscape (Nassauer, 1995). These landscape languages may not be legible to outsiders, as was the case for European colonists arriving in what appeared to them as a ‘wild’ North America, a landscape that was actually actively managed by many First Nations groups (Denevan, 1992). When conservation programs seek to ‘return’ to wilderness, they then erase the history and language of the landscapes upon which that wilderness is created (Cronon, 1996).

Accounting for the ways that landscapes serve as expressions of value can be facilitated by place-based approaches to both policy making and value elicitation (Klassen, 2016; Norton & Hannon, 1997; O’Neill et al., 2008). In chapter 3 I discussed how using ‘thick ethics’ along with relational values can help us to ‘get at’ the values of landscapes. A key component of ‘thick ethics’ is rooting values in history and place. And a relational values approach focuses on the value of specific relationships, such as those with particular places (Norton & Hannon, 1997). We might then imagine ‘thick’ relational values, as those that focus on the specific place-based relationships that people value. They can also be ‘thick’ by expressing both descriptive and evaluative statements (O’Neill et al., 2008). Such weaving of description and judgment is needed for discussion of many environmental problems (R. S. Gregory & Wellman, 2001).
both ethical arguments as well as technical and natural scientific understanding to explain the relative trade-offs and benefits of issues such as GMOs, riparian buffers, or grass-fed beef. Denying the value dimensions of such issues can lead those values to become ‘fugitive’ or ‘invisible’ (Satterfield & Levin, 2007; Turner et al., 2008).

The relational values approach can contribute to two interrelated issues in values research. First, by placing values into specific contexts, meanings, and places, it allows people to express their values in more policy and decision relevant terms (Chan et al. 2016). This resolves the problem of researchers or policy makers needing to ‘translate’ broad value concepts or specific valuation measurements into policy relevant insights (Tadaki et al., 2017). There is a need for more social indicators, including assessments of values, in sustainability policy and research (Hicks et al., 2016). However, most people struggle to articulate their values for all but a few issues they care deeply about (Fischhoff, 1991). Especially for issues such as emerging technologies or environmental risks, value elicitation requires creating a space for the respondent to consider and reflect upon their values in the context of the new issue (Satterfield, 2001). Values in contexts important to a person are much easier to elicit, especially when there is value conflict, either in the form of concrete trade-offs or threats to values (Lichtenstein, Gregory, & Irwin, 2007; S. H. Schwartz, 1996). A further challenge of integrating stakeholder values into environmental decision-making is that many of the concepts of values used by researchers and policy makers are poor measures of what people actually care about in the particular decision context at hand (Tadaki et al., 2017). Broad value categories, such as postmaterialism (Inglehart, 1995) or universalism (S. H. Schwartz, 1996) provide interesting insights for researchers, but applying such coarse scale and fundamental categorization as information to a specific policy context requires substantial interpretation (Tadaki et al., 2017).

A second challenge for values research has been understanding the relationship between attitudes, values and behavior (Ajzen & Fishbein, 2014; Levine et al., 2015; Shove, 2010). In psychology, attitude studies tend to focus on more specific issues (e.g., attitudes towards race relations, the environmental movement, or smoking) (Ajzen & Fishbein, 2014) whereas values have focused on broader priorities (e.g., self-direction or conformity) (S. H. Schwartz et al., 2012). Researchers consider how values correlate with specific attitudes (as in Dreesens,
Martijn, Tenbült, Kok, & de Vries, 2005) or how attitudes are related to behavior (Ahnström et al., 2008). Efforts to explain the gap between attitudes and behavior include incorporating social norms and perceived control (as in Theory of Planned Behavior), and considering the role of spontaneous versus deliberative processing (Ajzen & Fishbein, 2014). Yet others have argued that this linear model of values, attitudes and behavior is a poor reflection of actual decision-making (Levine et al., 2015; Shove, 2010). One reason for this is that many decisions are spontaneously made and justified post-hoc (Haidt, 2001). A relational values approach however, could create more spaces for deliberation, either via individual value elicitation or via group deliberations, that air alternative views and enable integration of technical and moral arguments (S. E. Daniels & Walker, 1996; Dietz, 2013; Ryfe, 2002; Sagoff, 1998; M. A. Wilson & Howarth, 2002).

Using a relational values approach might also allow for a broader and more inclusive conversation and deliberation about ‘what matters and why.’ Politically, environmentalism has become tangled up with a particular political philosophy and set of solutions, leading many people to question the problem due to aversion toward the solution (T. H. Campbell & Kay, 2014; Kahan, 2010). And in research and activist circles, much debate has surrounded issues of appropriate motivations for conservation, with a focus on a binary division of instrumental versus intrinsic (Guha, 1989; Kareiva et al., 2012; Kareiva, Watts, McDonald, & Boucher, 2007; Soulé, 2013; Soulé & Lease, 1995; Tallis & Lubchenco, 2014). Yet this division itself excludes a host of alternative values and motivations for conservation and by extension excludes many different groups of people who hold those values (Chan et al., 2016). For example, in Schwartz’s value wheel, environmental concerns are directly considered only as a sub-category of universalism, grouped with concern and tolerance (S. H. Schwartz et al., 2012). Yet values of universalism such as concern and tolerance are more important for liberals than conservatives (Haidt, 2013). A relational values approach opens up space for environmental concerns to derive from many different types of values, including those of stewardship or protection of family and tradition (Chan et al., 2016). Worldwide there are many different articulations of the values and motivations for environmental protection (Guha, 1989; Guha & Martinez-Alier, 2013; Martinez-Alier, 2014). An approach to environmental values should make space for all of them.
6.5 Future research directions, strengths, and limitations

Above I have hinted at several directions for future research. One is further elaboration and development of a relational values approach. Recent work has shown the usefulness of the relational values approach to assess values (Klain, Olmsted, Chan, & Satterfield, 2017). In chapters 3 and 4 I highlighted a number of place- and context-specific relational values important for the land managers I interviewed. My use of in-depth interviews allowed me to elicit such values in context and express them in the words of my interviewees themselves. This allowed me to discuss the implications of these values for particular times and places and policy contexts. A logical next question is how widespread are these relational values? And how important are they for farmers with larger land holdings and more industrialized processes? How culturally and context specific are the relational values identified? Additional studies using both qualitative and survey methods will be needed to answer these questions.

Another area critical for additional research is better elaborating the relationship between values and behavior (Ajzen & Fishbein, 2014; Bardi & Schwartz, 2016; Stern, Kalof, Dietz, & Guagnano, 1995). I have argued that an approach to values focused on thick ethics and relational values could better inform policy making. But expressing values and acting upon them are two separate questions (Levine et al., 2015). Examining values from a systems perspective, considering how they are related to behavior (including civic participation) will be needed to inform effective conservation policies (Shove, 2010; Stern et al., 1995). I have shown have value conflicts could deter program participation but might value alignment encourage engagement? And furthermore, if we consider a broad suite of institutions as articulating values, how does this shape the ways that different people engage with those institutions (e.g., if they align better or poorly with their own values)?

Specific to the case of PES for agricultural contexts are a suite of further issues regarding ongoing demographic and production changes in agriculture in many parts of the world (Clapp, 2014; Gosnell & Abrams, 2011; McCarthy, 2007; Wittman et al., 2015). In both Costa Rica and the Puget Sound context, the farming community has observed dramatic changes in the last generation (e.g., who farms, how products are sold). My research has primarily focused on the
values and perspectives of land managers with relatively small parcels. Yet much agricultural production occurs on large industrialized farms. How can or should PES programs be designed to address industrial agriculture? And if we consider PES as a social choice, what are the ethical dimensions of using PES (versus e.g., regulation) to address the impacts from industrial agriculture?

I have suggested that a key factor in aligning programs and policies with the values of target participants is the role of intermediaries. Intermediary organizations and individuals can serve as ‘boundary objects’ between different groups (Guston, 2001; Pham, Campbell, Garnett, Aslin, & Hoang, 2010). Do intermediary organizations actively and intentionally ‘translate’ program values and goals to better fit with participants? If so, how do they do this? How could PES programs better employ intermediary organizations towards this end? ES could be a useful bridging concept between social and natural sciences (Abson et al., 2014; Fish, 2011). PES might play a ‘bridging’ role, facilitated by intermediaries (Leimona et al., 2015). Could PES then also serve as a boundary object to bridge different groups and perspectives?

6.6 Policy implications

This dissertation points to the need to account for environmental values in policies and programs for conservation. I have touched on some of the key value conflicts that may occur between programs or policies and participants. Differing ideas about the relationship between people and nature or land and well as different ideas about human motivations are two such conflicts. I have also shown how issues around agriculture, food and the environment can be important for many different groups of people and that these groups have different ideas about the ways forward. In particular the clash between rural and urban populations is likely to only grow—often the most productive agricultural land is that around urban areas (so much so that the EF counts a city’s land base as the highest productive category).

This chapter as a whole synthesized several proposals for making incentive programs that effectively achieve positive environmental outcomes without sparking conflicts between groups. The first step is articulated in section 6.3.3, to recognize that all incentive programs are social
choices, and thus to negotiate their terms clearly with stakeholders. Second, as articulated in section 6.3.2, is to align program rules with participant values, for example, by enabling agency and active land management in riparian buffers in Puget Sound. Third, given that policymaker perspectives may differ greatly from participants’, employ intermediaries with sufficient flexibility to bridge value languages and logics between the two groups, as I documented in Costa Rica in chapter 3 and discussed for the cases of BC and Puget Sound in section 6.2.4.

If conservation programs seek to work with and not clash with rural resource managers, they will need to pay more attention to the values and value differences between these groups and their proposed policies and programs. One option is of course, that PES and other conservation programs be designed by or with grassroots groups and in this way might better reflect the needs and values of their communities. I have proposed ways to approach research on environmental values that might then inform more effective programs and policies for conservation, and they are each grounded in specific empirical cases. Ultimately, however, much thinking and broadening of the ‘solutions’ landscape needs to occur and this dissertation, I hope, offers some clear first steps.
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Appendices

Appendix A  Interview protocol chapter 4

The Values of Place: Cultural Ecosystem Services in Puget Sound Place Based Study

Interview Script for Farmers and Ranchers

[items in brackets are possible prompts or things to look for]

Introduction

1. Introduce yourself and the project. My name is Mollie Chapman and I am a PhD student at the University of British Columbia in Vancouver, BC. I am studying different programs for conservation on agricultural lands.

A few other researchers and I have been asked by the Puget Sound Institute to help them better understand the ways that people in this region think about or value the land, water and ocean. The institute is part of the Puget Sound Partnership, a regional group involving various levels of government to improve the ecological health of the Puget Sound. I am working with the Snohomish Conservation District, which identified the issue of riparian buffers and the CREP program as important to this area.

2. Consent form and confidentiality agreement.

3. Overview of interview: farms and farming, riparian buffer programs experience and opinions on how to improve.

4. A reminder that this is an exploration and there are no right or wrong answers.

5. Thank the participant in advance.

6. Start the digital recording device.
1. Values

What makes a good farm in Snohomish County? Aesthetics and Land Use

I’d first like to talk to you generally about your views of farms and farming in this area.

A. To start, can you tell me a bit about your farm?

   Can you describe what it’s like to be there? [sounds, smells]

   What are your goals for managing your farm? e.g., goals of profit, productivity, or stewardship? Education, tradition or innovation? [ask them to speak about each and what it means to meet those goals specifically]

   Where do you get help or assistance when managing the resources on your farm? Are you part of any professional organizations related to your farm?

B. Can you describe a farm/ranch in this region that you admire and why, even if its your own though it doesn’t have to be?

   First, can you paint me a picture of what it’s like to be there including as much description as possible? [sounds, smells]

   Can you tell me a bit about how this farm is managed? e.g., goals of profit, productivity, or stewardship? How do they deal with mud?

   What else comes to mind when you think about this farm? Any other thoughts or even feelings that come to mind?

   Are there many farms like this? How unusual or usual is it?

C. Can you now describe a farm or ranch in this region that you dislike and why?

   Can you explain to me what it’s like to be there? [sounds, smells]

   How is this farm managed differently from the one you described above (admired)?

   What else comes to mind when you think about this farm? Any other thoughts or even feelings that come to mind?

   How do you feel when you think about this farm? Are there many farms like this? How unusual or usual is it?

D. What, if any, problems or challenges do you see facing farmers in your community?
**What makes a good farmer? Goals, Autonomy**

Can you tell me about why you are a farmer/rancher? [or if needed: how you became a farmer/rancher? Or What do you like about farming?]

Can you tell me about an experience or event that helps me understand or sums up in your mind why you farm and your relationship to your farm?

Is your way of viewing your role as a farmer typical of this community, or different/unique? [Describe ...]

**What makes a good community? Sense of Place, Scale and Land Use**

A. When you think of your community more broadly, the place that you feel connected to, what comes to mind – who is that community, how would you characterize ‘them’ or the ‘place’? [if needed: do you identify most with your neighborhood, town/city, county, Puget Sound or Washington state?]

B. What places, people, characteristics or attributes do you most value about your community and the surrounding landscape?

   a. What do you specifically appreciate about physical features around your community, the qualities of its land, its natural resources, or the landscape?

   b. If and when you say to someone: “the countryside is beautiful” – what images or places are you imagining? What comes to mind?

C. What do you see as the role of farms and farming in your community? Are they important to your community?

D. What, if any, changes do you see taking place in your community and the surrounding landscape?

E. Do you have concerns about the natural resources or environment in your community and landscape?

**2. Program Motivations and Barriers**

I understand you have worked with the conservation district on a few projects. Can you tell me the story of how you ended up participating in these projects or programs?

1. Information and ideas usually flow two ways. I’m curious as to what you might have learned as well as what knowledge you have shared with others.
2. Do you think the other groups involved now see farming differently? [if other than SCD involved]

3. Who did you work with and how did you decide the details of your participation? [e.g., what land will be used, what changes made, etc.]

4. Have you made new connections to people or organizations through your participation?

5. Are your neighbors aware of the changes you have made? Do they see these positively or negatively?

6. Would you consider expanding your participation? Why or why not?

What do you consider to be the pluses and minuses to participation?

1. What do you consider to be the advantages to participation?

2. Are there other reasons besides benefits to yourself or your farm that motivated your participation? Such as a sense of stewardship or concern?

3. What do you consider the costs to participation, in time, money, or other ways?

4. What sorts of compensation did you receive? Both monetary but also in terms of flexibility in other rules, technical assistance, labor or materials, or anything else?

3. Program Redesign

Considering the pluses and minuses for farmers that you told me about, what changes to the CREP program would you suggest to make it more attractive to farmers in this region?

Since you are essentially giving up the ability to use your land, what forms of compensation broadly conceived could you imagine?

*These could include technical assistance, compensation, greater flexibility in how the program is implemented, ability to use the buffers for other purposes, or flexibility in determining the width based on importance of that land to the farm, or relaxing other rules or regulations, recognition for your efforts*

If monetary compensation is an issue, what level of compensation would you consider acceptable? [go for a number if possible? $100/acre? $1000/acre?]

What if a program to create more riparian buffers on farms was designed and implemented by local farmers or ranchers? What would be the key differences in:
a. The rules?

b. The compensation?

c. The technical help?

d. The management?

Increased Riparian Buffer Width Requirements

I understand that the federal government is now requiring buffers of 100 feet or more on salmon bearing streams for participants in the Conservation Reserve Enhancement Program (CREP). Have you heard about this?

As I understand, 30 foot buffers are good at filtering pesticides and sediment. But 100 foot buffers with trees as well as grass are needed to stabilize stream beds, provide habitat for birds and riparian animals, and shade stream beds. Shading is especially important for many fish as it cools the water.

Just hypothetically, I’d like to imagine that all farms in this region were required to install 100 foot buffers. In this imaginary future and thinking about the changes we discussed just now, can you think of conditions that would make it acceptable for you to have a 100 foot buffer requirement?
Participant Information

Name: ________________________ Date: _____________________ Sex: M / F Age: __________________

Of which town or communities are you a part? ______________________________

How many years have you lived here? _______ In Puget Sound? _______

What is your primary occupation(s)?: ______________________________

If you own or operate a farm/farmstead, please answer all that are applicable:

Do you have an off-farm job? Y / N What? __________ Where? __________ How long have you been on/farming your land? _______ years

How much longer will you be farming? _______ years

What % of your family’s income comes from farming? __________%

Do you have livestock? Y / N What kind / how many head? __________________

In the table below, indicate how much land you own or operate and its use:

<table>
<thead>
<tr>
<th>Land Owned</th>
<th>Acres</th>
<th>Land Operated</th>
<th>Acres</th>
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</thead>
<tbody>
<tr>
<td>Total</td>
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<tr>
<td>Crop</td>
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</tr>
<tr>
<td>Pasture</td>
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<td>Pasture</td>
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</tr>
<tr>
<td>Other (list below):</td>
<td></td>
<td>Other (list below):</td>
<td></td>
</tr>
</tbody>
</table>

Concluding the Interview

Thanks for your participation. We are happy to let you know when we present our research back to your community. You will be entered into a raffle to win a $75 gift certificate to Cabela’s.