

Landscape-Scale Prioritization Process for Private Land Conservation in Alberta

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Abstract There are 12 conservation land trust organizations (CLTOs) in the province of Alberta, Canada that actively steward land. Together they have protected over 1.09 million hectares of land. Using in-depth interview data with published documents on CLTOs, this paper examines how CLTOs make decisions as to which projects to pursue and the kinds of justifications they offer for the projects they have completed. We identify 13 aspects that such a decision-making process should contain. The CLTOs studied have, to some degree, incorporated 7 of them. The remaining 6 aspects could easily be contributing substantially to some of the main the challenges identified in both the literature and our own research regarding private land conservation. Consequently, we recommend developing a robust landscape-scale approach to private land conservation, communicating that approach to all CLTOs, and increasing cooperation among CLTOs and between them and government.

Keywords Private land conservation · Land trusts · Alberta · Landscape ecology · Conservation

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Introduction

Conservation land trust organizations (CLTOs) are non-government or sometimes government organizations that set aside private land for various environmental and social reasons. There exist a range of tools available for CLTOs to protect private land, including fee simple purchase (the organization buys the land and stewards it); easements (certain rights to the land are acquired in order to protect specific features or services but the land remains privately owned); and land donation programs for landowners, where the donor often receives a tax benefit through programs like Canada's Ecological Gift Program. Conservation efforts by CLTOs have grown tremendously over the past decade and a half in North America. Over this period in Canada, the number of organizations has more than doubled: as of 2012 there were over 150 conservation land trust organizations in Canada ([The Institute for Governance n.d.](#)).

The province of Alberta has also experienced growth in the number of land trust organizations and the amount of land conserved by such organizations. In Alberta, over 1.09 million hectares of private land have now been protected through CLTOs' actions, an area slightly smaller than Jamaica.¹ Because of CLTOs' activities, the majority of newly acquired protected areas in the province result not from government initiatives to establish public protected areas (e.g., provincial or national parks) but from private citizens taking action through the vehicle of conservation land trust organizations. Clearly, these organizations play an important role in protecting various ecological values and services.

¹ While we are confident that conservation land trust organizations are a significant factor in protecting land in the province, the actual number of hectares protected is hard to verify as many organizations operate joint ventures and do not have detailed records of this, thus the number may represent some land counted more than once in our calculations.

Table 1 CTLOs in Alberta (http://www.landtrusts-alberta.ca/who_partners.php)

| Size | Name | Location/Focus |
|--|--|---|
| Large CLTOs | Ducks Unlimited Canada | National and province-wide. Focused on waterfowl protection |
| | Nature Conservancy of Canada | National and province-wide. Focused on areas of natural diversity |
| Mid-Size CLTOs | Alberta Conservation Association | Province-wide. Focused on fish, wildlife and their habitats |
| | Alberta Fish and Game Association | Province-wide. Focused on fish and game species and ethical non-commercial hunting |
| | Southern Alberta Land Trust Society | Eastern Slopes of Alberta. Rancher-driven focus on preserving scenic and productive landscapes |
| Small CLTOs | Crooked Creek Conservancy Society of Athabasca | Northern-central Alberta. Geographical focus in the town of Athabasca |
| | Edmonton & Area Land Trust | Central Alberta. Focused on natural areas in and around Edmonton |
| | Foothills Land Trust | Southern Alberta, Foothills Municipal District. Focused on biodiversity/wildlife habitat with natural, scenic and aesthetic value |
| | Western Sky Land Trust | Southern Alberta. Focused on natural and wild landscapes with natural, agricultural, scenic, recreational and heritage values |
| | Wild Elk Federation | Province-wide. Focused on elk and other animal habitat |
| CLTOs not directly involved in land projects | Land Stewardship Centre | Province-wide |
| | Miistakis Institute for the Rockies | Focused on the Rocky Mountains Region in Alberta |

CLTOs are diverse in their type, aims, functioning, size, and relationship to government. Many CLTOs are involved directly in land protection projects, while some have an advisory, research, coordinating, and/or clearinghouse functions. For example, the Land Stewardship Centre publishes *The Green Acreages Guide Primer: Stewardship for Small Acreages* (Grewal 2012) that helps landowners manage their properties in a sustainable manner, but doesn't hold properties itself. For the purposes of this paper, only organizations that held properties or interests in properties are discussed. Furthermore, this paper does not discuss government agencies that exercise their conservation powers (e.g., a municipality that uses easements for conservation purposes). Such restrictions result in a list of twelve conservation land trust organizations in the province of Alberta (see Table 1). These range from very small, volunteer based organizations, such as Crooked Creek Conservation Society that has one 1.6-hectare property, up to large national level ones, such as Ducks Unlimited and Nature Conservancy of Canada, which have protected the vast majority of privately conserved land in the province (around 1.01 million hectares). Mid-sized CLTOs include the Alberta Fish and Game Association, an organization with only two staff members who work on land conservation and a limited budget for acquiring private land. It currently stewards approximately 13,700 hectares of private land (Brad Fenson, Habitat Development Coordinator for Alberta Fish and Game Association²).

CLTOs can be quite successful in reaching various conservation goals (Kiesecker *et al.* 2007; Morrisette 2001). In spite of these successes, there has been a call for them to switch from individualistic and opportunistic parcel-level protection efforts to a more systematic landscape-scale process (e.g., Cushman *et al.* 2009; Ficetola *et al.* 2009; Nassauer 2006). Parcel-level or individualistic protection results when the focus of conservation remains largely or even solely on the individual parcel under consideration and does not consider the wider landscape within which the parcel falls. Such a process does have a number of benefits, including public and political support and relative ease of scientific justification (e.g., protection of individual parcels of land with nesting sites for endangered birds). There are drawbacks, however. Common indicators used to justify parcel-level protection, such as species threat level, are only one measure of ecological soundness and do not consider other elements that are important for preserving biodiversity and ecosystem functions that are only apparent at a landscape-scale.

This paper examines how land trust organizations in Alberta make decisions about which conservation projects to undertake. Results illustrate that most CLTOs in the province continue to rely on a parcel-level approach in spite of the call for a landscape-scale approach. From this, we derive recommendations to improve the prioritization process used to determine which projects to pursue. We recommend 1) that more research be focussed particularly on decision making processes in order to understand how land trust organizations can improve, 2) that an explicit and detailed landscape-scale prioritization process that includes social, economic, and historical elements be made available for CLTOs to use, and 3) that initiatives designed to share information between organizations and avoid duplication of effort be encouraged. Because the land trust community in Alberta is still

² For consistency's sake, all titles listed reflect the position the individual had at the time of the interview.

growing, our findings would be relevant for other regions where the movement is in a similar stage of maturity.

Methods

The primary and secondary data related to Alberta land trust organizations arises from research undertaken from 2008 to 2010. In-depth semi-structured interviews were conducted with thirteen people: ten individuals who are associated with specific CLTOs in Alberta were interviewed as well as three whom worked closely with land trust organizations in the province (e.g., an environmental consultant). The interviews were tape-recorded and transcribed verbatim. Though the interviews were conversational in style, most of the respondents were asked questions about property procurement, public consultation, affiliation and work with other organizations, governance structures and the social purpose of land trusts. All available documentation about the twelve land trust organizations in Alberta was also collected. For this paper, only data regarding the prioritization process is addressed.

Using a grounded theory approach (Glaser & Strauss 1967) the transcripts and organizational materials were coded for similarities and differences. As well, one of the authors attended both an Alberta land trust conference and a workshop, where she took notes and spoke informally to many individuals who work in various capacities with land trusts. Finally a literature review was undertaken resulting in an extensive collection of scholarly papers, grey literature, and websites focused on land trust organizations from across Canada and the United States.

Conservation Land Trust Organization Literature in Canada and Alberta

There are several documents that outline the requirements and guidelines for CLTOs in Alberta. The Canadian Land Trust Alliance (2005) published the Canadian Land Trust Standards and Practices, which lists some of the factors that must be addressed by land trusts before deciding on a project. For example, all land trusts should identify focus areas and have “a defined process for selecting land and conservation agreement projects, including written selection criteria that are consistent with [their] mission” (14, emphasis removed). They must also conduct a physical site inspection and produce a baseline documentation report in order “to identify the important conservation values on the property and to reveal and liabilities or potential threats to those values” (14). Thus all CLTOs in the province are required to develop a process for choosing projects and they must actually survey potential projects; however, both a parcel-level and a landscape-scale approach would satisfy these requirements.

At a provincial level, The Land Trust Leadership Project: Recommendations Report (Alberta Environment 2006) identified a number of strengths and challenges facing CLTOs in the province. Since “the project focused on short term, ‘easy wins’, [but] ... also captured longer term ideas that could be addressed later” (2), one might expect to see a landscape approach detailed as a future idea. Indeed, some of the challenges the report highlights could be relevant to a landscape-scale approach, but there is nothing in the report that advocates specifically for a landscape-scale approach. Even when the report speaks of the larger landscape, it is to point out that private land conservation is inherently patchy in its coverage and thus does not provide land trust organizations with a landscape-scale model.

Nonetheless, this report does provide numerous positive recommendations. For instance, CLTOs are struggling under a lack of funding. The Land Trust Leadership Project recognizes this and advocates the creation of “significant, long-term endowment funding to support the work of land trusts” (5). The report also acknowledges the need for better coordination of and access to GIS information to assist CLTOs. These are crucial aspects that would serve the private conservation movement well; however, they are incomplete. Without an express and detailed prescription for a landscape-scale approach, CLTOs could be meeting all the requirements and even future recommendations, yet still be making sub-optimal decisions at a landscape level.

Finally, at a more local level, individual CLTOs often publish business plans or other documents describing their approach to achieving conservation objectives. These documents adhere to the above standards and practices, but often do not specify a landscape-scale approach, even when one would seem highly appropriate. For example, the Edmonton & Area Land Trust Business Plan (Heidenreich 2006) lists one of its goals as conserving, protecting, and restoring natural areas, including natural corridors and appropriate natural interconnections. Protecting corridors and interconnections would seem to require a landscape-scale prioritization process or at least a supra-parcel view, but still no landscape-scale model was presented or required by which the organization could prioritize its projects.

In the documents from land trust organizations, provincial overviews of challenges and strengths, and national standards and practices a landscape-scale approach would seem most appropriate for achieving conservation objectives, but it is not required and very few details for achieving it are included. So the question of whether land trust organizations have adopted such an approach remains. Based on our research, there are suggestions that a landscape-scale approach has been partially adopted for the two largest land trust organizations. For the remaining CLTOs, a parcel-level, opportunistic process is most common. Thus, there is room for improvement.

Conservation Land Trust Organizations in Alberta

Our research on CLTOs in Alberta shows that most rely on parcel-level indicators for marking decisions about which project to pursue, not a landscape-scale approach. There are two exceptions to this; however, even there, numerous components of a fully developed landscape-scale approach are missing. This section of the paper discusses the findings of our interviews paired with an assessment of that aspect of the prioritization process.

Parcel Attributes: Species Measures and Biophysical Inventories

According to our interviews, many CLTOs are using what amounts to species measures, specifically presence-absence data (extinction threat) and flagship or umbrella species to determine conservation priorities. For instance, Alan Gardener, Executive Director of the Southern Alberta Land Trust Society (SALTS), lists a number of species SALTS uses to prioritize lands. These species include grizzly bears, fescue grassland, and other native grass species. Brad Fenson, from Alberta Fish and Game Association, noted the use of umbrella species when determining conservation priorities. Alberta Fish and Game focuses on game species, but it realises that if certain other species are present, then the game species will also likely be present. Finally, Todd Zimmerling, President and CEO of Alberta Conservation Association (ACA), remarked that ACA is concerned with protecting tracts of land so that species will be around in the future. These comments reflect a strong focus on the presence/absence of species, which operate largely at a parcel level.

To determine species composition and number, all organizations interviewed conduct biophysical inventories that measure the presence of various vascular plants, fish, and wildlife. Even small organizations, like Crooked Creek Conservation Society (CCCS), use biophysical inventories to determine conservation priorities. CCCS employed a botanist to survey its property in order to establish a baseline inventory (Harvey Scott, volunteer with CCCS). Maureen Heffring, Chair of the Foothills Land Trust (FLT), also noted the use of wildlife and habitat biologists to conduct biophysical surveys and baseline studies to look for the presence of individual species. According to Heffring, a more comprehensive survey that looks beyond species counts is too costly, both in terms of dollars as well as time. Thus they rely on the proxy measure of species counts. Heffring also noted that the surveys FLT conducts are targeted toward groups not individuals, because it is too costly to count every instance of a species. Instead, FLT focuses on groups of species and groups of individuals.

Finally, Western Sky Land Trust (WSLT) also conducts site surveys to determine the conservation values of their projects. According to Tracey Tarves, Executive Director of Western

Sky Land Trust, the survey “focuses on five values: agricultural, natural, heritage, scenic and recreational.” If an initial assessment indicates these values are present, WSLT then sends out a biologist for a more detailed survey. Once that survey determined the conservation values were significant, a proposal was put forward to the board for a decision.

Limitations to Species Measures/Biophysical Surveys

While species measures are quite common, they are not without their problems. Andleman and Fagan (2000) suggest that species counts, such as are done in CLTOs inventories, have lower utility in protecting regional biota and consequently deem them a poor choice for allocating scarce conservation resources. Ozaki *et al.* (2006) also demonstrated that when a species can adjust to changes in habitat conditions, it might not act as an effective umbrella species despite having large home ranges. According to Roberge and Anglestam (2004), there is little evidence that supports the usefulness of single species umbrellas selected because of their large habitat range requirements. Instead, multiple species schemes that consider the occurrence of a range of habitat types and landscape attributes can provide a sound approach for rapid conservation action. But they caution that selecting umbrella species is not a conservation panacea for it cannot guarantee the protection of all species and should not be used alone as guideline for the conservation.

The idea that a parcel of land is important to protect because it contains a threatened, endangered, or vulnerable species often relies the International Union for Conservation of Nature's (IUCN's) Red List of threatened species. Increasingly, the IUCN's Red List is accepted as the standard for the classification of the likelihood of a species going extinct under current conditions (Mace *et al.* 2008). Presumably, then, the Red List could provide a reliable indication of which parcel contains threatened species and thus is worthy of protection.

However, there remain some limitations to its application. Mace *et al.* (2008) outline 6 features that remain open for debate regarding the use of the Red List to establish conservation priorities:

- 1) Measuring extinction threat is not equivalent to assessing priorities for conservation actions. There are other factors that should be included.
- 2) The Red List includes species that already have conservation activities directed at maintaining their populations. A species may also require action even if not listed as threatened.
- 3) The IUCN Red List assesses the status of a species globally and does not account for local or regional extinctions and yet effective conservation actions typically take place at sub-national levels.

- 4) The IUCN Red List is a probabilistic assessment of the likelihood of a species going extinct in some time frame, but it does not provide a robust prediction about the fate of a species.
- 5) The Red List system measures extinction risk but it does not measure rarity, ecological role, economic importance, etc., which typically would be important in setting conservation action priorities.
- 6) The criteria do not reflect the general status of biodiversity within a full historical context and therefore do not adequately reflect the continual degradation of ecological health within a region.

The parcel-level indicators discussed also have another limitation: they all relate solely to species data. Higgins *et al.* (2004) argue that non-species components of biodiversity should play an important role in the design of protected areas. They reason that while species data is essential to conservation planning, it still is inadequate in representing other aspects of biodiversity (ecosystems, habitats, and ecological processes) and in ensuring that the full spectrum of terrestrial, freshwater and marine ecosystems are effectively conserved as protected areas. Available species data are also inadequate for planning protected areas because only a tiny portion of the world's species has been well documented. Hence, it is not only about saving the relatively few species with well known distributions, but also conservationists must protect a diversity of ecosystems to incorporate the many unknown and poorly studied species and communities and to conserve ecological and evolutionary processes that are necessary to sustain biodiversity.

The case of Western Sky Land Trust (WSLT) is slightly different. The problem with WSLT's process is that the five values it emphasizes (agricultural, natural, heritage, scenic, and recreational) are sufficiently broad so as to be present on most parcels of land. Thus, although WSLT claims its property makes important contributions to the overall landscape integrity, the survey it conducts to assess the specific values of the parcel cannot precisely quantify those contributions. Quite probably WSLT is correct: the parcel it protected does have conservation value in terms of agricultural, natural, heritage, scenic and recreational attributes. However, how much value and whether there may have been another parcel of land with higher value is difficult to assess because WSLT focuses on broadly defined benefits operating at the parcel level. These parcel-level factors are sufficiently coarse in many cases so as to make it difficult to see how a CLTO could distinguish a higher priority project from a lower priority one.

In the end, data from our interviews show that species measures and biophysical surveys are the most common type of justification for and measurement of conservation value used by CLTOs in the province. Due to the concerns listed

in this section, however, we suggest that species measures and biophysical surveys alone are inadequate for determining where to direct conservation efforts.

Parcel Attributes: Vulnerability Assessment

In addition to species measures, some CLTOs in the province take into account how vulnerable a parcel is that they might wish to protect. In essence, the more likely a parcel will be lost to development, the more pressing it is to protect that parcel. The Nature Conservancy of Canada (NCC), for instance, recognizes that it cannot protect everything. Thus it attempts to protect only "the most critical, the highest conservation values ... and then use[s] more of the outreach extension or work with other land trusts to do the secondary areas" (Renny Grilz, NCC Director of Conservation for Alberta). This approach appears to be a variation of the benefits-loss approach outlined below. This approach selects sites most critical to conservation and most irreplaceable.

Vulnerability assessments should also include an accounting of the likelihood of future land conversion. Interestingly enough, there is one smaller land trust that does appear to be considering future land conversion in its prioritization process. According to its pamphlet, Western Sky Land Trust geographically focuses its efforts because of the phenomenal economic and population growth that area is undergoing. WSLT was established because "the general public [was] expressing concerns about the rate at which landscapes were being lost" (Your Landscape of Tomorrow n.d., 1). This statement of concern for future land conversion is an important element in assessing the vulnerability of any parcel of land.

Limitations to the Vulnerability Assessments Used By CLTOs

As important as vulnerability assessments are, Newburn *et al.* (2005) surveyed 74 papers and found that only 48 % of them cite potential land conversion as a justification for conservation. Even "fewer (21 %) include development threat in their calculation of relative conservation priorities. Most of these plans rely on coarse indicators of relative vulnerability across the landscape, such as the spatial distribution of existing threats" (1412–1413). Western Sky Land Trust's vulnerability assessment, while accounting for future land conversion, uses this type of coarse-grained approach that is not spatially specific enough to determine an individual parcel's vulnerability status within the broader landscape. While the region WSLT works in is certainly under high development threat, not every area within that region is subject to the same level of threat. By treating the region essentially as one homogeneous entity internal differences in conversion potential remain hidden, and some of these differences could well be important for landscape-scale prioritization.

Vulnerability assessments are most effective when price is appropriately factored in. Newburn *et al.* (2005) discussed three different pricing strategies for planning conservation projects: benefit-cost (selects sites based on the highest ratio of benefits to land cost), benefit-loss (targets sites that are most irreplaceable), and benefit-loss-cost (which minimizes the expected loss of benefits due to future land-use conversion and takes acquisition costs into account). They note that selecting lowest cost sites results in larger areas being protected but that the more vulnerable sites may not be protected. Similarly, Armsworth *et al.* (2006) found that using only a maximal coverage strategy resulted in reserves being established for the protection of species there were already being adequately protected on open land.

On the other hand, selecting only the most vulnerable sites results in a smaller area being protected because of the higher costs per hectare. As a result, Newburn *et al.* (2005) advocate for a benefits-loss-cost approach over the other two. This is in part because the “benefit-loss targeting selection rule omits the component for land costs and, hence, does not provide a mechanism to screen out sites with extremely high land costs” (1416). Alternatively, benefit-cost targeting “omits the component for land-use conversion, implicitly assuming that all sites have the same probability of land-use conversion” (1416). Newburn *et al.*’s (2005) benefit-loss-cost approach minimizes the expected loss of benefits due to future land-use conversion and takes acquisition costs into account. NCC’s benefit-loss approach does not expressly account for such extremely high land costs, which may render that method less than optimal in terms of allocating monies for conservation projects.

Parcel Attributes: Location

The location of a parcel is another important factor to consider when choosing priority areas to protect. Areas that lie adjacent to already existing protected areas should normally receive a higher prioritization because they effectively increase the functional size of the overall protected area, and larger areas afford ecological niches for more species, support a greater biodiversity of species, especially larger animals, and allow for certain ecosystem functions that smaller areas cannot. Some research (e.g., McDonald *et al.* 2007; Rissman and Merenlender 2008) has discovered that newer projects undertaken by CLTOs are indeed situated more often near older protected areas.

This is mirrored in our research. CLTOs in the province are generally aware of the importance of location. When possible, they select projects near areas already protected in some manner. WSLT, for example, deemed the 23.9-hectare project it has completed especially important in part because it is located next to a provincial park and is part of the Bow River corridor. As such, it “will help ensure the long-term

sustainability of this landscape, for people and wildlife, for generations to come” (Western Sky Land Trust: Your Landscape of Tomorrow n.d.: 2). As Pam Wright (Executive Director, Edmonton Area Land Trust) noted, “you might find that there is a tremendous resource [of] native species in an area that’s relatively untouched but it might be a relatively small island of an old landscape with hundreds of ... edible species in it but it’s surrounded by development or surrounded by no protection and you have to consider how appropriate is that within the regional picture.” As these examples show, many CLTOs in the province recognize the importance in choosing parcels strategically located in the region.

Limitations to Location

As important as location is, it is not as straightforward as always choosing areas next to other protected areas. Older protected areas were often established at a time when conservation was not considered an important value (e.g., a national park established to enhance tourism instead of protect nature). Thus, if land trusts focus their conservation efforts near older established protected areas, then there is the risk that important contemporary conservation attributes, such as biodiversity, will not be adequately protected (McDonald *et al.* 2007).

Finally, there remain value-based questions that cannot be resolved simply by choosing areas near other protected areas. For instance, whether protecting an area lying near a large national park is more effective in achieving conservation goals than protecting a smaller area in an underrepresented landscape type is a difficult question to answer. In part it involves further value-based questions, such as the one Newburn *et al.* (2005) ask: “[w]hat is the trade-off between conserving a hectare of wetland or a hectare of montane forest? Even if one had complete and accurate information on all species distributions and habitat requirements, this question of relative conservation value would remain” (1418).

Proactive Vs. Reactive CLTOs

Adequately planning for conservation across a landscape requires that organizations be proactive instead of only waiting for opportunities to come their way. Many CLTOs in the province appear to be more reactive than they would like. For example, in spite of extensive eco-zone and regional planning Grilz admits that NCC is still reactive in one significant way: it relies on a landowner to contact NCC before a project is considered. Once the landowner contacts NCC, the parcel is checked on the map to see whether it falls within the high priority landscapes NCC has already identified. If it does, NCC will follow up with the landowner. Grilz’s characterization of NCC as reactive is born out by Tarves, who noted that the project Western Sky Land Trust completed in the Bow River corridor was pursued because a landowner initiated it.

Instead of actively pursuing regional planning and prioritization, WSLT, like most CLTOs in Alberta, is reliant on willing landowners to step forward. Waiting for projects could produce gaps in regional planning because it depends on landowners being aware of CLTOs and/or the various mechanisms available for private conservation. Landowners who do not have this knowledge may not come forward and thus gaps ensue.

Two Examples of Regional Planning by CLTOs

Two CLTOs have moved beyond species measures toward both including a broader suite of ecological goods and services when determining conservation priorities and conducting regional planning. Ducks Unlimited Canada has an express goal of maintaining and enhancing waterfowl populations in North America and the wetlands they depend on. As Brian Ilnicki, Head of Industry and Government Relations for DUC Alberta, says,

[DUC] focus[es] on our wetlands, conservation, and restoration and for benefits more than just biodiversity benefits. So we're saying surface water protection or surface water conservation and restoration is important because it provides stock water.... Our wetlands are holding water and the natural features of wetland purifies water, removes phosphorus, nitrogen, sediment loading, etc. There are biodiversity benefits. There are forage benefits. There are flood attenuation benefits. It's a whole suite of what we call wetland values.

Though these benefits are largely parcel level benefits, DUC does recognize much more than species data as key for determining the value of a project. DUC is also engaged in landscape-level planning. For example, it works in conjunction with the North American Waterfowl Management Plan to

restore waterfowl populations to mid 1970s levels. ... and that translates into X-number of acres provincially and then we take those provincial projects and break them up into more landscape based targets. So we have a detailed landscape plan similar to what those natural area plans are that NCC has. It's exactly same process. (Ilnicki)

This is an example where a landscape-scale approach is clearly indicated and applied by Ducks Unlimited.

Furthermore, DUC has initiated The Spatial and Temporal Variation in Nesting Success of Prairie Ducks Study that “is examining how nesting success of prairie waterfowl varies in relation to landscape composition throughout Prairie Canada, providing key feedback to enhance planning tool predictions” (Emery *et al.* 2009: 1). This project spanned Alberta, Saskatchewan, and Manitoba and included 120 specific study

sites. “Patterns observed in this study are currently being incorporated into decision-support tools used to guide habitat management activities throughout the Canadian portion of the PPR [Prairie Pothole Region]” (8).

This study is another example of how DUC is involved in larger-than-parcel level planning and study. It shows the sorts of initiatives that are needed if organizations are to base their decisions on scientifically detailed, landscape-scale information. Unfortunately, because most CLTOs in the province are small and/or volunteer based, such intensive study is beyond their ability and expertise.

The other example of systematic landscape-scale planning currently in use by a CLTO in Alberta is the process the Nature Conservancy of Canada (NCC) uses. NCC has protected almost 69,000 hectares in the province. According to Grilz, around 2003 NCC began to more systematically plan its projects. Prior to this NCC had a “very ad hoc or reactive approach to conservation” (Grilz). Then NCC began a process called eco-regional assessments that covered various eco-zones across the Prairie Provinces. After this high level planning, NCC went through a more regional process of natural area conservation planning and “identified fifteen key landscapes or natural areas in Alberta where we want to focus our conservation efforts” (Grilz). A number of these conservation targets are largely focussed on specific species. However, NCC is also aware of the need to protect the habitat required by these species and conducts studies to determine the health of the habitat in the fifteen landscapes it has identified as important for conservation. NCC identifies its conservation targets, and then uses GIS data to map them out and to help inform its conservation decisions.

Section Summary

From the interviews we conducted and the promotional documents from the CLTOs themselves, it seems safe to conclude that there are four places CLTOs in Alberta could improve their prioritization process: 1) land trust organizations in Alberta are reacting to landowners approaching them, rather than applying a benefits-loss-cost approach to target landowners with potential projects, 2) the indicators used to make decisions about a project focus substantially on parcel-level attributes not landscape-level ones, 3) the indicators are also applied retroactively to justify projects already underway (i.e., already brought forward by a landowner), and 4) these indicators are coarse-grained enough to offer regular justification for parcels. Not all CLTOs suffer from all these problems or to the same degree, but none are immune from all of them either.

These four points work together: because CLTOs are reactive, biophysical surveys are often not used to identify which parcel to pursue but rather how valuable an already identified parcel is. Furthermore, because these surveys are fairly coarse-

grained and focused on parcel attributes, such justification may not be accurate. For instance, with the exception of NCC and DUC, the prioritization processes Albertan land trust organizations use do not seem to be discerning enough to exclude parcels that provide the benefits the CLTO emphasizes but still may not be the best choice. Consequently, because so many projects could be justified by the methods used and CLTOs are largely reactive, a first come first chosen system results. Once a proposed project makes it through the initial criteria (e.g., it is range land, or it has scenic value, or it contains a number of native species), there is very little left to rank the parcel's contribution to overall landscape integrity or to filter out those projects that do contribute but not quite as much as others.

The process used by CLTOs in Alberta is not so much wrong as incomplete. Biophysical surveys and parcel attributes such as location are necessary components of a robust prioritization process. However, they alone are insufficient. Regional planning, such as what DUC and NCC conduct, is also necessary but still not sufficient. From our research, we conclude that no CLTO in the province has all of the components of a landscape-scale approach. Furthermore, the elements missing seem to be central to a landscape-scale approach. These missing landscape-scale elements include 1) issues of scale, 2) patch shape, 3) leveraging effects, 4) model iteration, and 5) historical and social changes. These factors will be discussed next.

A Robust Landscape-Scale Prioritization Approach

A landscape-scale approach is necessary because it emphasizes a larger-scale view than provided by traditional site-based conservation (Wu *et al.* 2011). This larger-scale view would allow CLTOs to identify valuable ecological services and threatened ecological assets that do not appear in parcel-level analyses. As Kazmierski *et al.* (2004) have observed,

Proponents of landscape-level approaches assert that long-term maintenance of biodiversity requires a strategy that considers biogeography and landscape pattern above local patterns. Landscape ecology offers a framework for broader landscape planning; it is being used as a framework for the preservation of spatial connections among ecosystems to maintain important ecological structures, such as corridors for animal movement, and vital ecological functions such as hydrological flux and storage. (711)

Without such an approach, CLTOs may not be choosing parcels that effectively protect across the landscape the ecological benefits they deem important. The following represent components of a landscape-scale approach that were missing in our interviews and literature review of CLTO documents.

Consideration of Scale

Conducting a landscape-scale analysis requires consideration of multiple spatial and temporal scales (see Moreno-Mateos and Comin 2010). As Kotliar and Wiens (1990) noted, “[s]tudies restricted to a single level may yield different results, depending on which level is selected for study” (258). For example, some researchers (e.g., Krauss *et al.* 2003) have shown that species respond differently to processes that act at different scales, as witnessed, for example, by species that are affected by patch size but not by isolation. Consideration of scale and analysis of multiple scales, then, seems necessary in order to most effectively determine conservation priorities.

Scale here refers not only to the spatial dimension, but also temporal, economic, and social. Quite possibly some ecological processes operate at a different scale than economic ones related to budget allocations or real estate speculation. “A more thorough exploration of the importance of scale mismatches between ecological processes, like community turnover or species’ dispersal, and economic factors, like the substitutability of land for development, would be worthwhile” (Armsworth *et al.* 2006: 5407).

Then there is the issue of scale fragmentation. When CLTOs prioritize and protect individual projects with little attention to the landscape mosaic, scale fragmentation can occur, and as Morris (2008) notes, this can lead to untenable management complexity: numerous projects undertaken by multiple organizations “with varying goals and capacities on tens of thousands of individual parcels of land creates enormous challenges for land management” (1222). A landscape-scale prioritization method could be useful in dealing with scale fragmentation because it would provide an over-arching plan for the purpose, designation, and management of the individual parcels in a region.

When CLTOs prioritize parcels without considering these issues of scale, they may even be missing out on capitalizing on certain support for their projects, which may weaken their attempts at fundraising and obtaining political and public support. For example, Wallace *et al.* (2008) found that community-separation, floodplain protection, contiguity, and landscape connectivity benefits were accruing, but going unnoticed by private land conservation efforts. That the benefits most commonly over-looked were landscape-scale benefits suggests that private conservation efforts are aligned more with smaller, parcel-level approaches.

Parcel Shape

Evaluations of a parcel's contribution to the overall landscape mosaic should include shape, location, and threat/vulnerability. Because some CLTOs in the province already consider location and threat/vulnerability assessment, these aspects were discussed above. Here we consider the role that shape plays.

The shape of the parcel is an important factor because longer or irregularly shaped parcels are subject to more edge effects. Ecological edges are the boundaries or transition zones between two adjacent land cover types, such as protected areas and areas agricultural lands. Along the edges important differences in ecological features, such as soil moisture and content and species composition, occur. These differences can have important implications for land management. Edges also interact with one another; thus a landscape with a higher amount of edges also has the potential for more edge interactions (Porensky and Young 2013). In determining how valuable a parcel is, CLTOs should consider the parcel's shape, especially in terms of the amount and type of edge effects.

Leveraging

According to the literature, there is one assumption that may be mistakenly guiding some CLTOs in their decisions about which projects to pursue: leveraging. Leveraging suggests that a protected area will positively affect nearby land-use (i.e., that it will mitigate development pressures). There is an assumption that this leveraging effect will occur, but in recent studies this effect has been found to be negative in some cases. Private land conservation activities can in fact affect the supply of and demand for land in local markets, and “local market dynamics, in turn, will determine the amount of conservation achieved and cost of any future conservation efforts” (Armsworth *et al.* 2006: 5403). However, in at least some studies, the positive leveraging effect was found to be minimal or even non-existent: newly established protected areas had little to no effect on mitigating the rate of land conversion in nearby locations (McDonald *et al.* 2007; see also Butsic *et al.* 2013).

In two of the three sites McDonald *et al.* (2007) studied, areas with more land protection had higher rates of conversion in the vicinity. This is consistent with other work (e.g., Armsworth *et al.* 2006) that showed, based on economic models, “that biodiversity conservation can create positive feedbacks in the land market, increasing development” (McDonald *et al.* 2007: 1534). When land trust organizations choose parcels partly based on an assumed leverage effect, they may be banking on an unreliable outcome. As McDonald *et al.* (2007) note, “although we found evidence that land protection tended to be associated with future land protection nearby, the presence of protected lands did not have an inhibitory effect on nearby land development; if anything, the opposite seemed true” (1534).

Model Iteration

A robust landscape-scale model should be iterated as the landscape mosaic changes. Once decisions are made and projects completed, the landscape mosaic changes as new conservation areas are added to the existing matrix. This means that the models CLTOs use should be iterated every few years so as to include the newly established conservation areas (Strager and Rosenberger 2007). The new areas, as we have seen, can have an effect on surrounding land use decisions, the price of parcels both within and without target areas (i.e., positive or negative leveraging), and whether a subsequent area will lie in close proximity to another protected area. With more protected areas being added to a region, many of these factors will change and subsequent decisions and priorities may need to alter.

Historical and Social Factors

In addition to the above factors, which are mainly ecological and economic, there are social and historical factors to consider in a robust landscape-scale approach. Some research has pointed to the importance of incorporating insights from social science and humanities into landscape planning and conservation (e.g., Fox *et al.* 2006; Higgins *et al.* 2012; Moon *et al.* 2012). Martín-López *et al.* (2009), for instance, described the importance of the non-material cultural benefits of protected areas, such as spiritual enrichment, cognitive development, reflection, recreation, tourism, and aesthetic experiences. The authors argue that these factors need to be measured on multiple spatial and temporal scales in order to more fully account for their value.

In another study, Hobbs (2009) indicated that in addition to ecology, both historical and socio-political factors should be integrated into planning decisions, but that this is rarely done. These factors include the broader trends of historical land use, socio-political changes in society that impact land-use decisions, and cultural perceptions of environmental value. What any society or group of people value as meaningful to them and thus worthy of protection is the product of numerous factors (e.g., psychology, history, philosophy, sociology, and religion). To Hobbs' list, we would add that environmental justice should also be considered. Providing green spaces and a healthy natural environment for underprivileged populations and communities would direct conservation efforts differently than the current neoliberalized model of private conservation. Consideration of socio-political factors such as these entails a broader understanding of the scope of stakeholders and directs our attention to fundamental questions such as ‘What is the goal of protection?’ and ‘Who should determine this?’ As Hobbs asks, “[a]re decisions to be driven primarily by pragmatic land use issues such as the provision of food and fibre or the fulfilment of clearly stated narrow conservation goals, or

are they to be guided more by consideration of what was there in the past as a guide to what ‘should be’ there now?” (2857). Often, Hobbs says, decisions are made 1) based on the view of a powerful minority of stakeholders, 2) with incomplete information about the ecological and socioeconomic settings in place, 3) according to the idea that there is a ‘correct’ ecosystem for the region, or 4) in an ad hoc manner that assumes that doing something is bound to be better than doing nothing.

Conclusions/Recommendations

At a national level in Canada, Campbell and Rubec (2006) recognize that “[t]here has been a paradigm shift in the conservation community over the past few years; one that is characterized by pursuing a landscape approach rather than protecting individual parcels of land” (11). This high-level statement needs to be tempered by analysis of what CLTOs are actually doing in their day-to-day operations. Is this paradigm shift largely an abstract one, or does it manifest in concrete choices made? To answer this, we examined the guidelines for and documentation from land trust organizations to determine whether there is a clear and detailed landscape-scale process outlined for them to adopt. We also conducted thirteen in-depth interviews regarding private land conservation in Alberta in which we asked about their procurement process.

Our findings are mirrored partly in two other publications. The first, by Cook and Inman (2012), analyzed voluntary conservation in England. They list eight challenges, half of which are applicable to CLTOs in Alberta. First, just as in England, CLTOs in Alberta are not always able to access the same level of expertise governments can (e.g., scientists, policy-makers, and civil servants). Second, because of the plethora of organizations and mission scopes, duplication of effort can occur. Third, and related, this plethora can also lead to conflict in conservation goals and allocation of economic resources. Fourth, while there are legal instruments CLTOs can use to pursue projects, a lack of financing and/or staffing can hinder their efforts.

The second publication contained the results a 2012 survey conducted by The Institute for Governance on behalf of The Canadian Land Trust Alliance (n.d.). This survey found significant challenges facing land trust organizations in the country. Key issues were 1) poor communication, 2) lack of clarity surrounding roles and responsibilities leading to duplication of effort, and 3) funding limitations. These are reproduced at a provincial level in Alberta. More specifically, our research indicates that in terms of the prioritization process these three issues could be contributing to suboptimal choices for projects. Furthermore, there is a potential reinforcing circuit whereby duplication and less than optimal prioritization might lead to lower funding, which in turn could reduce the movement’s effectiveness and further more funding limitations.

Many of these challenges could be alleviated with a landscape-scale approach. Of the thirteen aspects we identified in a landscape-scale approach, CLTOs have adopted only seven (Table 2). And even then, not all of have adopted them to the same degree; so strengthening these seven aspects is desirable. Partially adopting only seven of thirteen aspects could easily be contributing to the challenges identified in the literature above. For example, duplication of effort can result from scale fragmentation and mismatch. As our research indicates, a landscape-scale approach would help achieve optimal conversation across the province.

One of the major barriers to this, of course, is funding. The question, then, is how to help CLTOs begin to develop a landscape-scale approach that would identify the optimal projects to pursue but leave them with enough funds to do so. The survey conducted by The Institute for Governance (n.d.) supports increased communication and we would further specify that one crucial aspect of this is communication on prioritization processes. Communicating a detailed landscape-scale approach to prioritization that CLTOs could adopt would save them the cost of developing such a method themselves.

We would also echo the observation that “an array of federal policies, non-governmental programs, data bases, scientific expertise and economic incentives...could be explored for their potential benefit to trusts in keeping with a landscape approach” (Campbell and Rubec 2006: 11). The problem, again, is that the documents on standards and practices for land trust organizations at federal and provincial levels contain little aside from specifying that a survey needs to be done and that a landscape perspective is important. So a two-step solution is needed: first, develop a landscape-scale approach to private land conservation that CLTOs could adopt, and second, communicate such an approach to the CLTOs. Were such

Table 2 Aspects of a robust landscape-scale prioritization process

| Characteristic | Used by at Least Some CLTOs | Absent in Data |
|------------------------------------|-----------------------------|----------------|
| Parcel Size | X | |
| Parcel Location | X | |
| Species Indicators | X | |
| Biophysical Inventories | X | |
| Vulnerability Assessment | X | |
| Proactive Approach | X | |
| Regional Planning | X | |
| Parcel Shape | | X |
| Benefit-Cost-Loss Accounting | | X |
| Multiple Scales and Type of Scales | | X |
| Leveraging | | X |
| Model Iteration | | X |
| Historical and Social Factors | | X |

an approach to be disseminated to CLTOs, they would not have to bear the costs of developing one themselves.

Another suggestion arising from our research is to combine and share resources better. NCC and DUC have both already conducted regional planning maps and identified priorities. It would be beneficial for smaller CLTOs to have access to this information. Such sharing of resources is beginning to happen: there is a memorandum of understanding between DUC, NCC, Alberta Fish and Game, and Alberta Conservation Association that stipulates that these four organizations will do joint projects, engage in joint planning, make joint purchases or hold joint easements whenever their interests align. The next step in this sharing process would be to more directly involve the smaller CLTOs when appropriate and relevant.

One initiative that could potentially involve the smaller land trusts in the province is the Alberta Land Trust Alliance (www.landtrusts-alberta.ca/). ALTA's mission is to "represent the land trust community and build capacity in land trusts to conserve diverse and ecologically important landscapes." The provincial land trust alliance was an important step toward this end; however, now that its government funding has been cut, its future viability is jeopardized (The Institute for Governance, n.d.).

Similarly, the Canadian Land Trust Alliance (CLTA) can act as a clearinghouse of information on best practices for conservation land trust organizations. CLTA could also lobby the provincial government to collect data on regional land use patterns, development pressures, landscape priorities, and shifting socio-historical patterns related to conservation values. The government could then make these data available to local land trusts to assist with their planning process.

Conservation land trust organizations in Alberta have come a long way since the first one was established in 1983 (Fenson). In the absence of adequate government initiatives to protect the landscape and given the continually growing development pressures in Alberta, private land conservation efforts perform an essential role. Although we see room for improvement, we must stress that these organizations are providing a service no one else does, and they are doing it with limited budgets, limited staff, and limited time.

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