Conservation Offsets:

A Working Framework for Alberta

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Conserving Alberta's Wild Side

Background

Alberta Conservation Association (ACA) is a not-for-profit, Alberta-based conservation organization with a mission to conserve, protect and enhance fish, wildlife, and habitat for all Albertan's to enjoy, value and use. ACA is not an advocacy group, nor have we undertaken this discussion paper to further the agenda of any particular interest group, other than the conservation goals provided for in our mission statement.

This paper is meant to start a discussion around, what we believe to be, a viable conservation offset framework that could be implemented in Alberta today. We recognize that the system we propose is relatively simplistic and critics will most certainly find areas where improvements to the proposed system can be made in the future; however, it is our firm belief that Alberta cannot afford to wait to develop the "perfect" system. Instead we must adopt the best option we have at the moment and use adaptive management to refine the system as time goes on.

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Introduction

The influence of anthropogenic change on our landscapes is evident everywhere we look. Natural ecosystems are impacted by human growth and development, resulting in significant challenges for the maintenance of biodiversity. Around the world various tools have been proposed or implemented to deal with these challenges, and balance the impacts of human development with the goal of biodiversity conservation.

One of the tools gaining momentum and popularity is the use of biodiversity or conservation offsets (ten Kate et al. 2004, Burgin 2008, Norton 2009, McKenney and Kiesecker 2010, Blundell and Burkey 2007, Underwood 2010). In Western Australia for example, government approval for new development projects requires "net conservation benefits" that go beyond conventional project level mitigation (Blundell and Burkey 2007). Under the US Clean Water Act, developers must provide "compensatory mitigation" for any demonstrated, unavoidable, residual impacts to wetlands. At a species level, adverse impacts to endangered species as a result of development activities can be mitigated by securing species-specific credits or offsets from a conservation bank under the U.S. Endangered Species Act (Dyer et al 2008; ten Kate 2004). In Brazil, industrial and forest offset policies require developers to offset environmental damage through payments to the National Protected Areas System; a policy that ensures a minimum area of natural vegetation is maintained on private landholdings and allows for off-site conservation activities to offset clearing of natural vegetation beyond the required minimum. The European Union's Habitats and Birds Directives contain provisions that allow developers to employ on-site, positive conservation activities to mitigate harm to a site. If these measures are inadequate to ensure the site is not adversely affected and/or that there will be a net positive effect, developers are required to secure compensatory measures to replace the habitat affected (ten Kate 2004).

Experience gained through the application of this tool around the world indicates that conservation offsets can be an effective and operationally efficient method of achieving important conservation objectives. Offsets also provide businesses with an additional mechanism for demonstrating the significance of the "social licence" under which they are allowed to operate and strengthen their environmental reputation. Conservation offsets can provide governments with a means to encourage businesses to invest in greater conservation initiatives outside of their project area and maximize the protection of the public's interests in our natural resources. They can strengthen communities by diversifying corporate investment into local areas and maintaining certain quality-of-life values. Through collaboration and partnerships, conservation organizations can use offsets to become better integrated into business planning cycles and influence conservation actions by playing key roles in the implementation and administration of offsets, resulting in better conservation outcomes.

Need for a Conservation Offset Framework

The use of offsets is in its infancy in Alberta. Alberta offset policy is currently restricted to carbon offsets with respect to the Specified Gas Emitters Regulation and associated Climate Change and Emissions Management Act, and wetland offsets through Alberta Environment's draft Wetland Policy (white area) for wetland compensation. The Alberta Land Stewardship Act (ALSA) establishes the concept of a "stewardship unit" and conservation offset program which are to be used to counterbalance the effects of an activity; however, the details of this system have been left to be enacted by regulation that is still to be developed.

Although there is no provincially regulated conservation offset program in Alberta, public and industry interest in the application of conservation offsets as a tool for dealing with negative impacts to biodiversity is growing. The Alberta Treasury Board's, *Plan for Alberta's Oil Sands* identifies the establishment of a conservation offset program as an objective for the maintenance of biodiversity in the oil sands region (Government of Alberta 2009a). The Pembina Institute has recommended the establishment of a mandatory offset system for all oil sands projects, with a 3:1 offset-to-disturbance ratio, to ensure a net positive environmental benefit (Dyer et al. 2011). The Energy Resource Conservation Board (ERCB) recently released a Joint Review Panel report where it recommends the use of "off-site offsets" as additional mitigation to reduce the overall cumulative effects to wildlife associated with an oil sands development application (Government of Alberta 2011).

The challenge we now face is that Alberta has no formal conservation offset policy to direct how government and industry are to respond to recommendations such as those made by ERCB; recommendations that are intended to protect the public's interests. One of the major obstacles in the development and application of a 'made for Alberta,' conservation offset framework is the inherent complexity associated with understanding ecological values, including the science of ecology and the definition of biodiversity. However, there are additional drivers associated with social and economic values that could be used to initiate framework development and the application of conservation offsets in lieu of this complexity. Not developing an offset framework because of the uncertainty and lack of understanding associated with ecological values only delays the use of this tool and diminishes government's and industries' ability to meet additional objectives associated with the social and economic values.

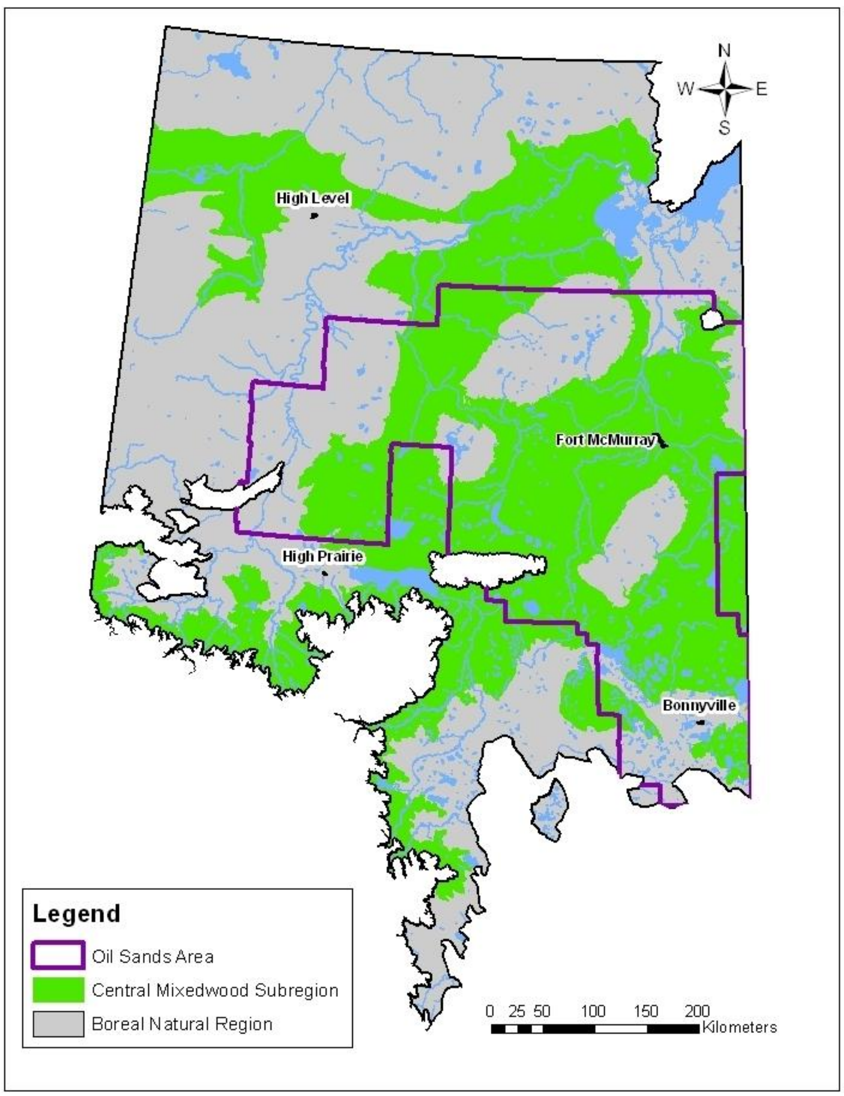
Alberta Conservation Association (ACA) implemented a voluntary, terrestrial, conservation offset program in 2003. The initial project under this program involved the purchase of private land (470 acres/190 ha) around Winagami Lake, securing shoreline and riparian habitat as a means of counterbalancing the effects of an oil sands development on boreal forest biodiversity. Since 2003, the program has grown to include long-term commitments with multiple industry partners and the securement of approximately 4,855 acres/1,965 ha of private land. Albeit a simplistic, voluntary program, this working model has been recognized as a viable foundation for the application of conservation offsets in Alberta by both the Pembina Institute (Schneider and Dyer 2006) and the Canadian Boreal Initiative (Dyer et al. 2008), and several oil sands companies are already participating in the program (Suncor Energy Inc., Total E&P Canada Ltd. and Shell Canada Ltd.).

There are many recognized weaknesses in the simplistic conservation offset model currently being used. Issues like consistency and long-term commitment in the voluntary approach, as well as the measure of biodiversity value, and habitat equivalence exist. However, even with these known issues, the strength of the current voluntary program, and the level of stakeholder interest, indicates that Alberta needs a provincial framework for the application of terrestrial conservation offsets in order to capitalize on the economic, ecological and social benefits of offsets, and maximize conservation outcomes.

Scope

This paper represents a proposed framework for the application of terrestrial conservation offsets in Alberta. It is designed to build from the success of ACA's voluntary program, be simplistic in its approach, cost effective, and compatible with existing policy. In recognition of the ongoing work being done by Alberta Environment with regards to the development and implementation of a new province-wide wetland policy, scheduled to be completed in 2012 (Government of Alberta 2009), this conservation offset framework is designed to offset impacts to terrestrial ecosystems only. While the proposed framework is designed to be implemented across the entire province, the detailed framework discussions provided in this paper are limited to the portion of Alberta's Boreal Forest Natural Region described as the Central Mixedwood Natural Sub-region (Beckingham and Archibald 1996). If there is significant interest to move forward with this proposed framework, follow-up work will be undertaken to develop the appropriate information tables for the entire province. For this paper the Central Mixedwood Natural Area was chosen due to its vast distribution, the immense development pressure it is currently under in the northeast part of the province, and the availability of existing ecological information and knowledge stemming from the numerous studies completed in the area in support of development projects. This geographic scope is expected to provide an adequate amount of available, non-project, private land and allow for conservation benefits to be evaluated at the landscape (10-100^2 km) level.

Figure 1: Central Mixedwood Natural Sub-region of Alberta.



Conservation offsets should be used to mitigate not only the permanent loss of terrestrial habitat, but also any long-term temporal loss of habitat on public land. As a result, we propose that a conservation offset to mitigate the impacts to biodiversity will be required for any development on public land where 1) because of soil disturbance, the ecosite characteristics will be changed, or 2) the ecosite soil characteristics will be maintained, but native vegetation will not be re-established[1] on the site within 5 years from the date of initial disturbance.

Conservation Offset Principles

Before evaluating a conservation offset framework, it is important to have a common understanding of the key principles of a successful and credible system. While there are a range of conservation offset systems in place around the world, there are three key principles on which all systems can be measured:

1) *Additionality* – For any offset to be considered valid it must be shown that the lands identified have, at some point in the future, a legitimate risk of being disturbed, without the protection provided by a conservation offset designation. For instance, identifying an existing Provincial park as a conservation offset would not pass the test of additionality, as the lands within the park are already protected and, as such, there is no legitimate risk of disturbance in the future and therefore no additional conservation occurring as a result of the offset. The same would be true for private lands where a conservation easement already exists to protect the habitat values. A conservation offset would provide no additional conservation value and, as such, would not meet the test of additionality.

Additionality can also be claimed if the offset is a currently disturbed site that will be restored to native habitat. However, the restoration must be over and above what would have been required by law or expected as part of normal operating practices. An offset must provide additional conservation value, over and above what would occur on the land without the offset in place.

2) *Permanence* – Under this proposed framework conservation offsets must be permanent. It is recognized that in many situations industrial developments will reclaim disturbed areas back to original ecological condition; however, the permanence of conservation offsets ensures that there is a net conservation benefit from every development, as is expected for social and economic aspects of developments. While temporary offsets are proposed under some systems, we believe that this ads an unnecessary level of complexity to the system without any foreseeable conservation benefit.

3) *Equivalency* – This principle is by far the most heavily debated aspect of any conservation offset system. At its core is the need to compare the disturbed land to the offset land to determine how similar or “equivalent” the offset is to what will be lost as a result of development. Equivalency encompasses both a measure of physical area, as well as a measure of ecological value. While it is relatively easy to agree upon a measure of physical area (ha, km2, m2, etc.) the measure of ecological value is much more problematic. In theory, to be considered equivalent, a conservation offset should contain the same biodiversity (same species of organisms, in the same relative abundance), with the same physical habitat, as is found in the disturbed area. In reality this is not possible as no two areas of land will be exactly the

[1] Forest vegetation re-establishment is defined as the presence of a community of native forest species consistent with the target (original or control) forest ecosite where there is a minimum of two structural layers consisting of both woody and herbaceous forest species reasonably distributed over the disturbed site (Government of Alberta, 2007).

same. It is the ecological difference (equivalency) between the offset and the disturbed area that generally determines offset ratios (size of the offset) and it is the measurement of this difference where most of the time, costs and complexities of offset systems arise. To reduce the time, costs and complexities of this offset framework, we propose to use a surrogate for biodiversity that encompasses vegetation, soil and site productivity as a coarse measure of ecological equivalency.

Determining Offset Ratios

This conservation offset framework is based on a "like-for-like" exchange of land in order to achieve "no-net loss" or a net gain in biodiversity value. This concept is reliant on accurate baseline biodiversity measures. In Alberta, the ecological classification system developed for northern Alberta by Beckingham and Archibald (1996) serves as a reliable surrogate for this data. Although not a detailed measurement of biodiversity, this hierarchical classification system utilises analysis of vegetation, soil, site and forest productivity to characterise boreal forest ecosystems. This classification system allows for a cost effective, consistent and standardised approach to describing the ecological value and functions of northern boreal ecosystems and provides a structure for determining ecological equivalency. In addition this classification system is widely understood and fully integrated into the environmental regulatory process. It is utilized by both industry and government to describe ecological baseline characteristics, expected impacts, and mitigation targets associated with proposed development projects at both the regional and local scales.

The basic unit of this classification scheme is defined as an ecosite. Ecosites are functional ecological units which developed under similar environmental influences and are based on the interaction of biophysical factors which dictate the availability of moisture and nutrients for plant growth (Beckinham and Archibald 1996). Ecosites were chosen as the preferred unit of measure because they provide a coarse filter representation of ecosystem form and function across the landscape; are well understood and are relatively easily identified using remote sensing techniques and existing predictive models. The relative abundance or rarity of ecosites across the landscape provides a reliable and defendable measure of relative biodiversity value.

For the purpose of demonstrating terrestrial ecosite rarity within the Central Mixedwood Natural Sub-region of Alberta, a sub-sample of publicly available, ecological baseline data, associated with the environmental impact assessment process, were reviewed and summarized in Table 1. Based on the information provided in the environmental impact assessment documents for each of the 21 study areas, we were able to develop a terrestrial ecosite rarity table describing the relative rarity of each terrestrial ecosite within the Central Mixedwood Natural Sub-region. Terrestrial ecosites were defined as sites with a moisture regime between xeric and hygric on the edatopic grid (Appendix A). Bogs, fens, and marshes as described by Beckingham and Archibald (1996) (ecosites i, j, k and l respectively) were not included.

Table 1: Terrestrial Ecosite Rarity within the Central Mixedwood Natural Sub-region of Alberta, compiled from 21 Environmental Impact Assessment, baseline descriptions for oil sands projects covering ~ 500,000 ha.

Ecosite	f	h	e	c	g	b	a	d	Total
Area (ha)	6,406.40	16,014.90	17,592.10	30,137.10	40,147.60	78,691.80	80,243.00	220,201.00	489,433.90
%	1.3	3.3	3.6	6.2	8.2	16.1	16.4	45.0	100.0

Rare ecosites have limited distribution, but often contribute considerably to local and regional species diversity. These areas can support species that may have unique habitat requirements that exist as a result of site-specific conditions that are difficult to restore when disturbed. As a result, this conservation offset framework works on the assumption that a rare ecosite has more ecological value on a per unit basis than a common ecosite. Ecosite rarity as a surrogate for unique biodiversity allows for the determination of offset ratios using both quantity and quality of habitat to ensure that coarse-scale equivalency is achieved.

The preferred offset scenario would be "like-for-like," where the disturbed area is offset with the same area of the same type of ecosite(s). In this case coarse scale equivalency has been achieved in both total area and ecological value. However, when "like-for-like" cannot be achieved, a mechanism for determining equivalency and setting offset ratios is required. Rather than developing accounting processes for determining ecological values of each ecosite, we have proposed a simplistic table based on rarity (Table 2). For the purpose of determining offset ratios, terrestrial ecosites were grouped together into four categories, based on relative rarity.

Conservation offsets characterised by ecosites of equal or greater rarity than a disturbed site must be secured at a ratio of 1:1. Offset habitat characterised by ecosites more common than a disturbed site require securement at a ratio greater than 1:1, up to maximum ratio of 4:1 (e.g., most common (d) ecosite offsetting rarest ecosites (e,f or h) disturbed). As an example, if Proponent X had a development that disturbed 100 ha of ecosite e, the proponent could offset this disturbance with 100 ha of an ecosite of equal rarity. In this case, ecosite e, f or h would count as equivalent rarity and, as such, 100 ha of any combination of these ecosites would meet the offset requirements. Alternatively, if the proponent planned to offset the 100 ha disturbance of ecosite e with ecosite a, they would require 300 ha (3:1) of ecosite a to meet the offset requirements.

Table 2: Offset Ratios Based on Ecosite Rarity in the Central Mixedwood Natural Sub-region of Alberta.

		Disturbance Ecosites			
Offset Ecosites		**e,f,h**	**c,g**	**a,b**	**d**
	e,f,h	1:1	1:1	1:1	1:1
	c,g	2:1	1:1	1:1	1:1
	a,b	3:1	2:1	1:1	1:1
	d	4:1	3:1	2:1	1:1

Offset Ratios Outside of the Natural Sub-Region

In some cases there may be a need or desire to offset a disturbance outside of the same natural sub-region. In this case there are two possibilities: 1) offsetting with an ecosite that exists within the natural sub-region where the disturbance occurred, in which case the offset ratio table for the disturbance natural sub-region would be used and the ratio doubled as a penalty for offsetting outside the natural sub-region (e.g., disturbing ecosite e and offsetting with ecosite a in a different sub-region results in a 6:1 ratio requirement); 2) offsetting with an ecosite that does not exist within the natural sub-region where the disturbance occurred, in which case the ratio will be 10:1.

<u>Successional Stage</u>

Successional stage of an ecosite can play an important role in determining what species are found at a particular point in time; however, trying to match the age of a proposed disturbance ecosite with available age classes of potential offset ecosites creates a level of complexity that we have elected to avoid. Under this proposed conservation offset framework the successional stage will be ignored when determining equivalency. The assumption is that as long as two ecosites have the same classification then both ecosites will provide habitat to the same species at some point along the successional continuum, and areas of the same ecosite classification will progress along the same continuum. As a result, Proponent X can propose to disturb 100 ha of a mature forest of ecosite d and can provide an offset in the form of 100 ha of ecosite d where the trees have been removed. As long as the ecosite classification is the same the successional stage of the site is not relevant for determining equivalency. However, Proponent X will be required to ensure that the offset ecosite is progressing along the anticipated successional stage continuum towards a mature forest. (More detail is provided below in Banking and Tracking).

<u>Offsets on Private Versus Public Land</u>

Conservation offsets can occur on private or public land as long as the offsets meet the test of additionality and permanence. For private land, in most cases additionality is relatively easy to show, given the rate at which private land has been historically cleared and converted to agriculture or real estate developments (Government of Canada 2011). Without an existing conservation easement there is a legitimate risk that sometime in the future most privately held land will be converted from its native state. As well, the restoration of private land back to native habitat will meet the additionality test as the restored lands will be an additional conservation benefit that would not exist without the conservation offset. Permanence for a private land offset would be assured through a conservation easement that would be registered on title and would protect the land from future disturbance.

For public land, the test of additionality will require evidence that there was a risk of the offset lands being disturbed (e.g., future mine development planned, significant subsurface assets that could be developed, potential for urban expansion, etc.). Preventing future development through the establishment of an offset would meet the test of additionality; however, currently it is unclear if there is a legislative mechanism for development rights on public lands to be relinquished and retired permanently, without the establishment of some form of Provincial park. As such, public land offsets may require some form of legislative change to meet the permanence test.

While the restoration of private land back to native habitat clearly meets the additionality test because there is no legal requirement for a private land owner to restore land to native habitat, the case for public lands is less clear. While the restoration of older disturbances, such as seismic lines or abandoned mine sites, would provide a conservation benefit, it is less clear as to whether restoration of these sites is additional to what would be required by law or standard industry practice.

The access to subsurface rights under a conservation offset, particularly on private land but potentially on public land as well, can be problematic. Wherever possible the need for surface disturbance in a conservation offset should be discouraged; however, if surface disturbance is required then the disturbance will be subject to twice the normal offset ratio requirements, even if the disturbance site is on a private land offset.

Banking and Tracking

Under this proposed framework a proponent must have conservation offsets in place prior to receiving final regulatory approvals to proceed with any development that meets the conservation offset requirements (any development on public land, where because of soil disturbance, the ecosite characteristics will be changed, or any development on public land where ecosite soil characteristics will be maintained, but native vegetation will not be re-established on the site within 5 years from the date of initial disturbance).

It is anticipated that many proponents will want to ensure their offset requirements are met well in advance of receiving final approval for development to proceed. As such, a banking and tracking system is proposed as follows: The offset land must be assessed and an ecosite distribution map created. Where required, a restoration plan must be developed to show how the offset lands will be restored back to mature, native vegetation. This assessment and restoration plan must be signed off by a Registered Professional Forester (RPF), Professional Biologist (P.Biol) or Professional Agrologist (P.Ag.). The assessment and restoration plan provides the "inventory" of offset ecosites that the proponent has available (e.g., the classification of each ecosite and the total area of each).

To ensure permanence, a conservation easement must be registered on title for all private land offsets. The conservation easement will be held by Alberta Environment, Alberta Sustainable Resource Development or a third party organization as designated by the Government of Alberta. Once an easement is in place protecting the conservation offset from future development, then the offset will be registered in an on-line, public registry (Table 3). If the proponent has acquired the offset prior to requiring the offset for a development then the registry will show the offset as "inventory". Once a development is identified where the offset is required to allow for final regulatory approvals then the offset becomes "retired" (no longer in inventory) and the specific project that it was retired against is identified. In this way an inventory of ecosites can be banked until such time that a development is identified where the specific ecosite offsets can be used by the proponent. Alternatively, if the proponent finds that the inventory is no longer required then the offsets can be sold to other proponents in need of the offsets.

An identical process can be used for public land offsets; however, the requirements for permanence will have to be addressed for each offset and the public registry will have to indicate how permanence will be achieved.

We propose that land trusts be the land title holders of all private land conservation offsets, and will be responsible for the long-term management of offsets. The following offset acquisition process is based on the current voluntary offset system employed by ACA and involves the following steps:

1) A proponent identifies the type of offset required (total hectares of each ecosite classification, generally identified in the Environmental Impact Assessment process).
2) The proponent engages a land trust to seek out appropriate offset lands.

3) The land trust undertakes an assessment of the lands to determine the ecosite distribution on the land and any requirements for restoration.
4) A report is supplied to the proponent and the proponent approves or rejects the purchase of the lands.
5) Once lands are identified for purchase the proponent supplies funds to the land trust to acquire the land.
6) The land trust purchases the land and becomes the title holder.
7) A conservation easement is registered on title to ensure permanence of the offset.
8) The land is registered on the public registry.

Table 3: Example of Conservation Offset On-Line Public Registry (ALL DATA IS FICTIONAL).

Offset Holder	Land Title Holder	Conservation Easement Holder	Location	Sub-Region	Ecosite	Hectares	Status	Project
Company X	ACA	ASRD	SW-14-23-47-W4M	Central Mixedwood	d	50	Retired	Big River Mine
Company X	ACA	ASRD	SW-14-23-47-W4M	Central Mixedwood	f	14	Inventory	N/A
Company Y	ACA	AENV	NE-22-12-W5M	Dry Mixedwood	b	64	Retired	Long Road

As the land title holder, the land trust will be responsible for ensuring the land is managed in such a manner as to meet the requirements of the conservation easement. If there are restoration requirements, the land trust and proponent will have to agree on appropriate arrangements to allow for the required financial or logistical support to meet the restoration and long-term management needs. Once an offset has been retired, a proponent has met its offset obligations, and holds no further liabilities associated with the offset. As a result, it is assumed that the proponent's cost for the purchase of an offset will be the actual cost of the land, plus any administrative fees charged by the land trust to cover initial assessment, legal costs of the land purchase and any long-term management and restoration costs. The details of how these costs are determined should be worked out between individual proponents and the land trust they choose to work with.

If a proponent finds that the offsets that were purchased and placed on the registry in inventory are not required, the proponent has the option to sell those offsets to another proponent. The price of the offset will be determined solely between the two proponents and the sale does not impact the land trust, except that the "Offset Holder" must be changed on the Public Registry to ensure the new proponent has the newly acquired offset inventory to use as required.

Case Study Cost Analysis

We believe that for a conservation offset system to be successful in Alberta it must be cost effective relative to the overall cost of the development project. To address this concern we have run a case study analysis of two recent oil sands projects, one being a mining operation (Joslyn North Mine) and one being a SAGD operation (Jackfish 1 and 2).

Table 4 represents a case study based on publicly available information with regards to predicted impacts of surface disturbance to terrestrial ecosites within Total E&P Canada's proposed Joslyn North Mine

Project. Land costs for offset securement are estimated at $110,000.00/quarter section (160 acres or 64.7 ha) plus a 20% fee paid to the land trust for long-term management and administration. All offsets were assumed to come from the most common ecosite d, which results in an offset ratio ranging from 1:1 for the most common disturbed ecosites, up to a 4:1 ratio for the rarest ecosites.

Table: 4 Example of Offset Costs for Joslyn North Mine Project Based on Environmental Impact Assessment Data and Highest Offset Ratio (assuming $110,000/quarter section +20% fee).

Disturbed Ecosite(s)	Predicted Upland Disturbance (ha)	Offset Ecosite	Offset Ratio	Offset (ha)	Cost
a,b	812	d	2	1624	
c,g	65	d	3	195	
e,f,h	281	d	4	1124	
d	1551	d	1	1551	
total	**2709**			**4494**	**$9,168,593**

According to Total E&P Canada's reported capital expenditure estimates of 7 billion dollars, for the Joslyn North Mine project, the cost of securing terrestrial conservation offsets for the predicted surface disturbance represents approximately 0.13% of the total capital costs of the project.

The case study analysis for Devon's Jackfish project (phases 1 and 2) is presented in Table 5. As with Total E&P Canada, this analysis is based on publicly available information with regards to predicted impacts of surface disturbance to terrestrial ecosites within Devon's Jackfish SAGD Project. The same assumptions for land costs and fees were applied. All offsets were assumed to be with the most common ecosite d.

Table 5: Example of Offset Costs for Jackfish SAGD Project Based on Environmental Impact Assessment Data and Highest Offset Ratio (assuming $110,000/quarter section +20% fee).

Disturbed Ecosite(s)	Predicted Upland Disturbance (ha)	Offset Ecosite	Offset Ratio	Offset (ha)	Cost
a,b	36	d	2	72	
c,g	117	d	3	352	
e,f,h	6	d	4	23	
d	270	d	1	270	
total	**429**			**717**	**$1,462,812**

According to Devon's reported capital expenditure estimates of 1.62 billion dollars, for the Jackfish Phase 1 and 2 projects, the cost of securing terrestrial conservation offsets for the predicted surface disturbance represents approximately 0.09% of the total capital costs of the project.

The results of the case studies indicate that the cost of implementing this conservation offset framework is relatively small compared to the total capital budget of these two representative oil sand projects. The case studies assumed that the most common ecosite would be used for all offsets and as a result offset ratios were as high as 4:1. If the offsets could be completed with similar ecosites at a 1:1 ratio the costs could be reduced further. Perhaps more important to realize is that under the worst case scenario of having all offsets occur outside of the same natural region (e.g. offset boreal disturbance with grasslands) the ratio would be 10:1 and the costs for each project would be close to 1% of capital expenditure.

The next obvious question with respect to implementing this conservation offset framework is whether or not there is enough land available to allow for offsets on a large scale? Within the Boreal Natural Region of Alberta there are approximately 65,000 km^2 of private land and 267,000 km^2 of Provincial Crown lands (Dyer et al. 2008), as such, there is enough land available to allow for large scale offsets. Other regions of the province have a significantly higher percentage of private land holdings that would be potentially available for offsets.

Basic Conservation Offset Framework Rules

The following rules are meant to recap the major points of this conservation offset framework:

1) This offset framework is based on a "like-for-like" system, where the preferred offset is the same ecosite classification as the disturbed ecosite in 1:1 ratio.

2) Successional stage in not considered for the offset or the disturbance area. The proponent will be required to ensure that the offset ecosite is progressing along the anticipated successional stage continuum towards a mature vegetation community, whatever that may be for that particular ecosite.

3) Offsets can occur on both private and public land, however, test of additionality and permanence must be met.

4) On private land a conservation easement must be used to ensure permanence. On public land appropriate legislative protection must be in place to ensure permanence.

5) It is recognized that for private land offsets there may still be a requirement to allow for some forms of development (e.g., a private land holder cannot prevent the drilling of an oil well on his/her property). As such, development may occur on an offset; however, the proponent creating the disturbance will be required to offset with double the required offset ratio for the disturbance.

6) All conservation offsets will be placed on a public on-line registry.

7) A proponent may purchase conservation offsets and bank those offsets as long as the offsets are registered (e.g., A proponent may purchase 100 ha of private land today as a conservation offset for a project that they undertake sometime in the future, as long as the offsets are registered).

8) Banked conservation offsets that are unused may be sold to another proponent.

9) Offsets must be in place prior to development occurring.

Conclusion

Conservation offsets are not intended to compensate for poor environmental planning or performance, but are defined as additional conservation activities intended to offset the residual, unavoidable damage to biodiversity caused by development projects (ten Kate et al 2004). They are a tool to be used in conjunction with the conventional hierarchical strategies of avoid, minimize, and mitigate, for managing environmental impacts. This proposed conservation offset framework provides incentives for proponents to avoid and minimize disturbance wherever possible through the ecosite ratio tables. The ratio tables that have been developed clearly make it beneficial for proponents to avoid the rarest of ecosites which are assumed to contain some of the highest ecological values on a per unit basis.

We recognize that this framework will be challenged with respect to its ability to fully mitigate impacts to biodiversity. We have avoided the temporal issues around successional stage management, as well as the issues associated with patch size and habitat juxtaposition. These are all relevant issues to consider when attempting to manage for biodiversity; however, these are also exceptionally complex issues that will require a significant amount of time and money before they are fully understood. Unfortunately, given the rate of development occurring and predicted to continue in Alberta, we do not believe that we have the luxury of taking a significant amount of time to establish a more robust conservation offset system. Instead, we are proposing a conservation offset framework that can be implemented today (most of the components are already in place through ACA's voluntary program), and can be improved as time moves forward and relevant data are collected. We have chosen the term "framework" because we believe this document can and should be built upon in the future. We consider this conservation offset framework to deal with biodiversity at a coarse scale, using ecosites as a surrogate for direct measurement of biodiversity. Because we have started at the coarse scale level we can easily add fine scale refinements in the future.

Although this paper concentrated on the Central Mixedwood Natural Sub-region of Alberta's boreal forest, all other areas of the province can be treated in a similar manner. Ecosite information exists for most forested areas of the province and, as such, a similar ecosite rarity table can be developed (Beckingham and Archibald 1996). In the grassland areas of the province the Alberta Government has developed a Grassland Vegetation Inventory (GVI) system which allows for the classification of grassland vegetation communities into ecological units (ecological range sites) similar to forest communities, by grouping vegetation data (from research plots and range surveys) into similar functional units that respond to disturbance in a similar and predictable manner (Beckingham and Archibald 1996; Adams et. al 2005). As such, an ecological range site rarity table can be developed for grassland areas to be used in the same manner as the ecosite table.

Our goal was to develop an offset system that was easily understandable. Ecosites are habitat units that are understood, at least at a basic level by every biologist, forester and agrologist working in Alberta. In addition, every Environmental Impact Assessment associated with major developments such as oil sands requires ecosites to be mapped and, as a result, every proponent already has the information needed to determine offset requirements as part of the EIA process. With relatively little work, ecosite rarity tables can be developed for every natural sub-region of the province, which would allow every proponent to incorporate the costs of offsets directly into their initial budgeting process.

Conservation offsets are an important tool for managing impacts to biodiversity. This tool is used in many other jurisdictions of the world, and is now starting to be expected as a tool to be used in Alberta. More complex systems can be developed; however, this framework exists today and provides a good place for Alberta industry to start.

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Appendix A: Edatopic Grid (adopted from Beckingham and Archibald 1996)