STACKING OF MULTIPLE ENVIRONMENTAL CREDITS:

AN ALBERTA DISCUSSION PAPER

by

David W. Poulton

for

Alberta Innovates Bio Solutions

Vers 1.1

August 28, 2014

TABLE OF CONTENTS

INTRODUCTION

Alberta is developing market-based tools to enhance the management of certain ecosystem functions and services. Such tools have been enabled under the *Climate Change and Emissions Management Act* (SA 2003, c C-16.7), the *Water Act* (RSA 2000, c W-3), and the *Alberta Land Stewardship Act* (SA 2009, c A26.8), dealing respectively with greenhouse gas emissions, wetlands, and a potentially wide array of landscape-based ecological components. In each of these regimes the permitting of industrial development or operations may be facilitated by the generation of positive environmental credits through actions to enhance environmental values or security. Similar programs exist or are contemplated at the federal level. Other programs, such as water quality offsetting, have been developed outside of Canada, and it is conceivable that they might eventually be developed and applied in Alberta.

As each of these market mechanisms develops, the possibility will no doubt arise that more than one type of credit will be generated on a single site. For example, a restored wetland may provide habitat for members of a species at risk, and may sequester carbon. Does the restoration of that single wetland then produce a credit in the wetland system, a credit in the species at risk system, and a credit in the carbon system, all of which can be used in their respective regulatory regimes and markets? This question has become known as the issue of credit "stacking." This paper is intended to stimulate consideration and discussion of this important policy issue in advance of a claim for such multiple credits being put before regulators in Alberta and Canada.

The paper begins with a brief review of the various offset and ecosystem service market systems which either currently operate in Alberta or which are under development. This is intended to draw attention to the potential complementarities or conflicts which might arise as these systems are implemented in various combinations on the same pieces of the landscape.

It then turns to the definition of stacking, and distinguishes stacking from some other related concepts. This is an important exercise, for the term is used in a variety of ways, some quite loose. It is helpful to be clear about what the concept entails, and what it does not, if we are to arrive at its appropriate policy treatment.

Alas, the conceptual clarity which might be found through a discussion of definitions is not always, or perhaps often, matched in the complex web of relationships which make up ecosystems. The next topic touched on, therefore, is the challenge that the complexity of ecosystems poses for the implementation of stacking. In light of that discussion the advantages and risks of stacking are reviewed, as are a series of principles and considerations, which are offered as guides to the development of principled approach to policy in this area.

Finally, some possible alternative approaches to the stacking issue are offered, and conclusions drawn.

Alberta and Canada is not alone in facing this issue. In fact, it has been a very active issue in ecosystem market systems in the United States for the last decade. In the appendices to this paper, some specific experiences and policies are set out, in the hope that these examples will stimulate discussion of how Alberta might approach the stacking issue.

ENVIRONMENTAL CREDITS IN ALBERTA

At least six systems for generating environmental credits may be applicable to one part or another of the Alberta landscape. Three of these are provincial and three are federal, and all are set out in Figure 1. The common element among all these systems is that they provide a means whereby an industry or prospective developer may offset its negative environmental impact by producing or purchasing credits representing a counterbalancing positive environmental impact.

Some of these systems are well-developed and relatively long-standing, while others are under development or review. One, the conservation offset system being developed under the *Alberta Land Stewardship Act*, may not be a single system at all, but may be a template on which many media-specific or regional systems are based (Andy Ridge, AESRD, AACO meeting, March 19, 2014).

All of the systems listed in Figure 1 are programs consciously designed to include offset credits as a tool of environmental management. Not all offsets occur in such a programmatic context, however. There are also a wide range of offsets which may be required by regulators on a project-by-project basis pursuant to the mandate of the particular regulator or to federal or provincial environmental assessments. These piecemeal offset requirements

FIGURE 1.

Actual & Potential Environmental Credit Systems in Alberta

	Legislation & Policy	**Applies to**	**Currency Unit**	**Represents**	**Responsible Agency**
Provincial					
Greenhouse Gases	*Climate Change and Emissions Management Act* s. 5 • *Specified Gas Emitters Regulation* • Alberta's 2008 Climate Change Strategy	Facilities emitting GHGs ≥ 100,000 tonnes CO_2e	Tonnes CO_2e	Contribution to global climate change	AESRD
Wetlands	*Water Act* s. 38 Alberta Wetland Policy	All activities	Area X "relative wetland value"	2 possibilities: • "Full range of wetland functions and values" (p 15) • Metrics of "relative wetland value" (p 12): o Biodiversity & ecological health o Water quality improvement o Hydrological function o Human uses	AESRD AER
Other Conservation Offsets	*Alberta Land Stewardship Act* ss 45-47. • Land-Use Framework • Regional plans • Media-specific plans and		Stewardship Unit		

	strategies				
Federal					
Fish & Fish Habitat	*Fisheries Act 1985* s. 35(2) • Fisheries Protection Policy Statement, Oct 2013	All activities	Still under development: "adult fish equivalent"	Fisheries productivity	DFO CEAA
Species at Risk	*Species at Risk Act* s. 73	All activities	Under development	Life requisites of target species	Environment Canada Canadian Wildlife Service CEAA
Wetlands	Federal Policy on Wetland Mitigation	All activities	Area and functional analysis	Full suite of wetland functions (broad inclusive definition)	All federal departments, co-ordinated by Canadian Wildlife Service

are not dealt with directly in this paper, but their presence should be borne in mind in considering possible policy positions on stacking.

While Alberta is attempting to develop a common approach and set of principles for application to the broad sphere of ecosystem credits, few of the policies in existence draw a clear connection to one another, or consider how they are to operate harmoniously on the landscape. The very real possibility exists, therefore, that creditable actions on a piece of land under one system may produce outcomes which are creditable under one or more other systems.[1] It is this possibility which invokes the issue of stacking.

DEFINITION

In keeping with the relatively new development of credit systems for ecosystem services, "stacking" is a term which has arisen in the past five to ten years. Increasingly it has been recognized to have a core meaning: *the recognition and sale of more than one type of ecosystem service credit from the same piece of land*. The key components are 1) multiple types of credits, 2) the credits arise from conditions which overlap on a single piece of land. A vivid simile which illustrates the concept is that it is like selling both the meat and the wool from a sheep (Cooley & Olander 2011). Under this notion of stacking, the sale of one type of environmental credit does not preclude the recognition and a sale of a second (or more) type of credit, even though they arise on the exact same site.

The concept of stacking may best be understood by contrasting it to the notion of "bundling." A single environmental credit (for reforestation, for a hypothetical example) may be seen to encompass a wide range of ecosystem services and values: habitat for many species of resident or migratory wildlife, water flow regulation, water quality regulation, carbon sequestration, recreational and scenic values, etc. A unified credit for reforestation can thus be seen to be a bundle of these many benefits. The key to stacking is the unbundling of these components, such that each may be recognized and credited separately in its own right. Thus, the reforestation credit might be unbundled into a biodiversity credit (or several credits for particular species or clusters of species), a water flow regulation credit, a water quality credit,

[1] Likewise, the action may produce outcomes deemed negative by another system. The implications and management of that situation are beyond the scope of this paper, but ought to receive attention.

etc. Stacking, if allowed, would see each such credit recognized and available for use in its own regulatory market.

The stacking issue highlights a much larger question which taunts environmental credit systems as they seek to incorporate market features. That question is how to appropriately aggregate different credits. Stacking is largely based on the disaggregation or unbundling of credits, which allows for greater flexibility of use and fungibility in a credit market. Conversely, the rejection of unbundling in favour of recognizing the unified value of a complex ecosystem is a tacit acceptance of the aggregation of different credits by default by nature and geography. This may be ecologically prudent, but may result in an encumbrance on the functioning of environmental credit markets, foregoing potential environmental benefits produced by fluid market operation.

It is important to note that the definition includes both the recognition and *sale* of the credit. Up to the point of sale of a credit, its precise characterization is largely a matter for reflection by the holder of the credit. It has no effect on the offset system, nor on any development rights. It is when the sale is made, however, that controversy is courted (Fox, Gardner & Maki, 2011), for the sale of each credit may permit a corresponding development project. The sale of multiple credits might potentially permit multiple development projects, all based upon offsetting positive action on a single piece of land. The extent of that possibility depends on the accounting and aggregation rules which apply to both development and offset projects. As discussed below, ecological effectiveness dictates that such rules should be symmetrical (Robertson et al 2014).

"Stacking" is also sometimes used more generally to refer to the recognition and sale of credits in some combination arising from a single conservation project. Some variations include:

- Where multiple types of credits are generated and sold from separate sub-units of a single property that do not spatially overlap ("horizontal stacking": Cooley & Olander 2011) (Fox, Gardner & Maki 2011; Robertson et al 2014);
- Where multiple types of credits are recognized from a single site, but bundled and sold together (Robertson et al 2014; NRC 2011);

- "Temporal stacking," where different types of credits are recognized and sold in successive timeframes (Cooley & Olander 2011);
- Establishing credits on public land (US National Parks Service, as cited in Fox, Gardner & Maki 2011)
- Recognizing and selling credits from conservation activity which was funded from a government program (Fox, Gardner & Maki 2011);
- Where the generation and sale of credits is based on actions which are otherwise incented by subsidies, favourable tax treatment, etc. (Cooley and Olander 2011; Fox, Gardner & Maki 2011);

These situations are often non-controversial, or have their own controversies. They are, however, not generally considered to be "true" stacking (Fox, Gardner & Maki 2011), and as such will not be focused upon here. This paper focuses on true stacking, though the case study of the Willamette Partnership does bring out how the conceptualization in the first variation above (different credits from non-overlapping sub-units on a property) might be used to find an acceptable compromise way to handle this issue.

ADVANTAGES AND RISKS

The principle advantage of stacking is that it allows a greater range of ecosystem services to be separately recognized and financially awarded. A landowner may receive multiple payments for the multiple benefits which his or her stewardship activities create or sustain. In economic terms, the positive externalities of stewardship are more fully captured and rewarded by the combined environmental markets. This potentially has both economic and environmental benefits.

From an economic perspective, the combination of payments enabled by stacking may make some stewardship activities financially viable, where they would be cost-prohibitive if only one credit were to be received. Also, if the price of any or all of the credits is determined by market forces, then the combination of credits may help mitigate the risk of price fluctuations in any one of them, providing greater revenue stability to the landowner. Finally, the recognition and rewarding of the production of different and distinct ecosystem services may incent a

landowner to care for a more full range of ecosystem values than if only certain services are creditable. (Conversely, if only one value is rewarded, there is a fear that other values may be compromised in favour of that one.) In all these ways, stacking may stimulate more and better stewardship of natural resources, and the consequent provision of more ecosystem services.

Each segregated ecosystem credit in the stack will carry only a portion of the value of the previously bundled credit. In fact, if the unbundling of ecosystems services is done perfectly, the combined value of the stacked credits should approximate the united value of the bundle. The landowner, however, may have increased transaction costs as he or she seeks to realize value from the various markets.

The principal disadvantage of stacking is the risk that compensatory actions will be over-recognized. As a result more disturbance would be improperly permitted, and natural ecosystem services lost. If a single offset site and set of conservation actions may yield several kinds of credits, and each of those credits is used to permit the negative impacts of its own development project, then the result will be several developments, and their disturbance, proceeding, permitted by a single conservation project. This is a kind of reverse multiplier, whereby several development projects are permitted on the foundation of our confidence in the methodologies of our respective credit mechanisms and the integrity of the stacking process. Such an outcome may be rationalized by the logic of the currencies and accounting methods of the different environmental credit markets, but we should be cognizant of the weaknesses and risks of this approach.

First, the strict segregation of different currencies runs counter to the knowledge that ecosystems themselves do not, in general, easily break down into independent components, a point which I shall elaborate upon momentarily.

Second, each currency and accounting carries within it certain approximations, compromises and uncertainties. This is simply part of the process of reducing highly complex ecosystems to manageable numbers. Stacking based upon such approximations may result in the margin of error of each type of credit being compounded by those of other types, and the larger total potential error playing out at the expense of natural ecosystems. Put another way,

development interests will get the benefit of the doubt in our methodologies. Natural ecosystems will bear the risk.

Third, by allowing development on several sites to be offset by positive action on a single site, we are courting enhanced risk by placing all our ecosystem service eggs in one basket. A single site is more susceptible to disruptive forces (whether natural or anthropogenic) than are a series of sites. If the offset site underperforms or fails altogether, for whatever reason, the loss on the site will be compounded by the multiple developments that it played a role in permitting (Gardner & Fox 2013).

Finally, one must consider the relationship of any rule respecting stacking to the general requirement of that all ecosystem credits demonstrate additionality. If a single action on a single piece of land produces two different credits, is there anything additional about the second credit? (See the Neuse River example in Appendix 1 for a case that illustrates this point.)

The issue of additionality is not easily dealt by most environmental credit systems, including land-based ones. . As J.B. Ruhl points out, few if any of our environmental laws have a clear conception of what constitutes "baseline" behaviour against which additionality of any type is measured (Ruhl 2010). Ruhl suggests that this reflects the fact that our notion of property has never defined precisely what environmental obligations run with land ownership. While particular obligations may be prescribed by statute, or decided in case law, the notion of land ownership itself is largely silent in terms of what it means for environmental protection. (In Alberta we see this situation reflected in the heated debate of recent years respecting the relationship of landowners' "rights" versus regional planning.) If each environmental credit market wrestles with this issue on its own, it is certainly not surprising if they do not necessarily come to complementary conclusions. The result is potentially inconsistent notions of additionality, and difficulties in conceiving of accurate accounting and stacking.

INTEGRATION AND SEGREGATION OF ECOSYSTEM COMPONENTS

Conceptually stacking relies on the neat segregation of different ecosystem components or functions, and the services they provide. For the most part, however, these components and functions are not independent of one another. Rather functions are linked in a variety of ways, some so complex that we can probably not fully comprehend them. For example, as aquatic

plants grow in a wetland they obstruct the free flow of water (flow regulation), the extract nutrients from the water and soil (water quality regulation), and provide both food and habitat for wildlife. Can we properly separate each of these functions, or are they all simply different aspects, and ways of describing, the growth of vegetation? Describing the different functions is much easier than unbundling them conceptually so that each may be assessed in its own right.

If such unbundling is not done accurately and with integrity, there is a significant risk that the credit that we segregate out will not in fact represent an independent function. The total of the segregated credits will distort the nature of the full complement of ecosystem services. In turn, as all of those separate credits are used to offset impacts elsewhere, they will not accurately reflect the true offset value of the wetland complex. In fact, there is the very real possibility that different types of credits will represent things which are intimately linked, or may even be simply different ways of describing the same thing. (To return to the sheep metaphor, one may be able to sell both the wool and the meat, but will have difficulty selling both the wool and the insulation services.) In short, components may overlap, and therefore be unintentionally double counted. As those credits are used to offset for impacts elsewhere, there is a very significant risk that the positive value of our offset wetland will be exaggerated, and this will result in more negative impacts on the ecosystem as whole.

A principled and beneficial use of stacking, therefore, requires a very clear delineation of the ecosystem services that each credit represents, and a very clear understanding of the relationship between those components in the ecosystem. The closer the relationship between credited functions, the greater the risk of double-counting and overall loss to the ecosystem. This places an onus on those responsible for each of the ecosystem service markets to precisely define what ecosystem service it is that a credit in that market represents (something I have tried to represent in the fifth column of Figure 1).

Note that this precise delineation of functions, and the separate treatment of the credits which result, runs contrary to the general thrust of ecosystem management and protection, which tends to emphasize the important of maintaining intact systems (Robertson et al 2014).

An Alberta Example: Wetlands and Carbon

In this regard an examination of Alberta's new wetland credit offsetting system is instructive. According to the *Alberta Wetland Policy* "[w]etlands are highly diverse, productive ecosystems that provide a host of ecological services, and form an integral part of Alberta's diverse landscapes." (p. 4) From this broad description one might think that a wetland credit represents a bundle of that "host of ecological services," and may in fact represent the full value of ecosystem services that a wetland produces. This would dictate against stacking any other type of credit with a wetland credit, for any other type of credit would double count the value already included in the comprehensive bundle of the wetland credit.

However, as one reads on in the policy one find repeated references to four environmental services from wetlands: 1) biodiversity and ecosystem health (presumably including "sustain[ing] vast populations of migratory waterfowl" and "support[ing] a diverse array of flora and fauna" (p. 4); 2) water quality improvement; 3) hydrological function; and 4) human uses (list at page 12). These functions are described at the beginning of the policy (p. 4) and are also used as the basis (together with relative abundance) for the assessment of the "relative wetland value" of each wetland, which determines the extent of offsetting obligations. Does a wetland credit, therefore, only encompass these four functions and no others? If that is so, then other ecosystem services from a wetland are thus are left unaccounted for, and perhaps "up for grabs."

An important case in point: carbon. Some (though certainly not all) wetlands act as carbon sinks, sequestering greenhouse gases (GHGs), yet this function does not appear to be recognized by the *Alberta Wetland Policy* -- carbon and GHGs are not mentioned in the policy.

On the other hand, the Specified Gas Emitters Regulation (under the *Climate Change and Emissions Management Act)* provides that certain land management practices (among other activities) that sequester carbon or reduce carbon emissions may be used to generate carbon credits. These credits may be sold to large industrial emitters to offset GHG emissions. While there is not currently a protocol for allowing carbon credits to be generated through the restoration or maintenance of wetlands, it is certainly conceivable that one might be developed and approved. (Several wetland carbon credit protocols are being tested in the United States: Gardner & Fox 2013.) Should such a protocol be approved, it will not be long until Alberta regulators are squarely faced with the question of whether the restoration of a wetland will yield

both wetland credits and carbon credits, each to be applied in its own regulatory market. That is stacking, and if allowed, it will be justified on the basis that carbon sequestration was not an ecosystem service contemplated by the wetland policy or encompassed by a wetland credit.

The treatment of carbon, then, turns on the scope of the wetland credit, which is less than clear. This illustrates the importance of having clarity about what a given type of credit does and does not represent.

This example also illustrates the important principle of symmetry of aggregation and accounting for both the impact and offset projects. The wetland credit and debit system appears to be quite symmetrical, with both the losses and gains to wetland being assessed by the same rules respecting relative wetland value. This is not true, however, of the carbon market. Under the current SGER system carbon offset credits may be claimed (again assuming the eventual development of a wetlands carbon protocol) by agricultural landowners creating appropriate wetlands. The converse is not true, however. A landowner who destroys a wetland may be held to account for the loss of relative wetland values, but is not accountable for the carbon outcomes of his action. This is because the SGER regime only holds large industrial emitters accountable for their carbon outputs. Thus a landowner who destroys one wetland and creates or restores another, will be able to balance the resulting wetland debits and credits, but will have a pure gain in the carbon credits, a clear violation of the principle of symmetry.

PRINCIPLES AND CONSIDERATIONS

Through various policy considerations and experiences, a series of principles and considerations have been prescribed in the academic literature with respect to stacking (especially Gardener & Fox 2013; Robertson et al 2014). Note that these are called principles and considerations rather than rules in that they do not categorically prescribe actions, but rather lay out factors which will tend toward the proper conception and use of stacking, and will tend to discourage abuse or double-counting. As these are not firm rules, and are drawn from a variety of sources, the following are not necessarily perfectly consistent. Nevertheless, each point raises important considerations

1) Ecosystem services which are best stacked are those which are most easily severable from each other. The closer or more uncertainty the relationship with other components,

the greater the risk that a credit for one ecosystem service will include (perhaps unknown to us) aspects of another, such that some degree of double-counting will occur (Fox 2008; Cooley & Olander 2011; Gardner & Fox 2013; Robertson et al 2014). Determining the relationship of different ecosystem components may be beyond current technologies and methodologies, such that the degree of this risk is unknowable (Robertson et al 2014). Fox suggests, however, that in such cases the risk of double-counting may be compensated for by an increase in the multiplier ratio applied to such transactions (Fox 2008). To use multipliers in this way, however, the two or more credits in the stack will have to be each recognized in full cognizance of the stacking (i.e., of the full range of credits to be recognized), which in turn suggests that all credits are best recognized and certified at the same time (See point 8, below). Multipliers are not, therefore, a straight forward solution to this problem.

2) For reasons set out in point 1), ecosystem credits which encompass a bundle of ecosystem services should not form part of a stack of credits (Gardner & Fox 2013). This point assumes that a bundle of services is likely to include the subtle and complex interrelationship of components and functions, and that its conceptual boundaries may therefore be more difficult to determine, than is the case for a single discrete function or service.

3) The unbundling and stacking of ecosystem service credits should not be used where it will result in increased habitat loss. One offset project should not be used to permit multiple development projects of a total size greater than the offset project (Gardner & Fox 2013).

4) The use of stacking should encourage the management of the offset site for its full range of ecosystem services, rather than promoting certain values at the expense of others. (Gardner & Fox 2013).

5) Each credit recognized should bring demonstrable additionality (Gardner & Fox 2013, Robertson et al 2014). The requirement of additionality should be applied to each recognized credit (and service it represents) and to the project as whole.

6) Each stacked credit should have its additionality measured using clear and comparable baselines. Unfortunately, inadequate prescriptions of baselines, objectives, and measures of additionality are extremely common in offset systems. Where baselines are different between offset systems or (just as likely) simply unclear, then the measure of different types of credits may be inconsistent, making both additionality and stacking problematic (Ruhl 2010, Robertson et al. 2014).

7) Rules for stacking or bundling, and all aspects of accounting, should be symmetrical for both development and offset sites (Robertson et al 2014). This means that currency and metrics, accounting rules, the breadth of application and exemptions should apply equally and in the same manner to the development activity as to the offset. This prevents the total amount of offset credits being different (especially larger) than the total number of credits required of a development project actually having impacts of the same type and scale.

8) Stacking is best done when the full suite of credits for an offset project are conceived of, recognized, and sold at the same time (Cooley & Olander 2011). This allows for creation and recognition of each credit to be done in full cognizance of the relationship between the credits, and their relationship to the larger ecosystem and offset project. It also allows for the adjustment of multipliers (as suggested in point 1 above). Further, it tends to act as guarantee of additionality, in that where a credit is recognized after the suite of actions which produces it (and other credits), there is a greater potential that that later credit may not in fact represent additional value. This is related to point 9) below in that actions without the immediate recognition of credits clearly do not need the credits to drive the action.

9) Stacking should only be allowed where the incremental payment from the sale of the second credit is necessary to drive the both the primary conservation action, as well as any additional action for the second credit (WRI 2009).

10) The risk of double-counting increases where the different types of credits are overseen by different agencies particularly if the agencies are poorly co-ordinated (Fox 2008).

11) There should be complete transparency of all aspects of stacking, with the administrator and regulator of each type of credit fully aware of the treatment of the other types (Gardner & Fox 2013).

12) Where stacking is allowed there should not only be good communication between the relevant agencies, but they should use the same, or at least reconcilable, accounting methodology for debits and credits, to maintain a basis for comparison of the multiple types of credits (Fox 2008).

Many of these principles, and the challenges they bring to the design of a workable stacking system are reflected in the following quote from Robertson et al (2014):

> Economists have begun developing theoretical approaches to stacking, yet ecologists have expressed concern that these approaches often depend on unrealistically simplistic ecological models. Successful stacked markets will require a better understanding of the ecology determining the interrelationships between the functions that may be stacked. Finally, ecologists will need to play an active role in the legal process, as the property law of ecosystem services evolves. Policy makers need to recognize that the scientific challenges of stacking are substantial and push the boundaries of basic ecological science; implementing stacking policy also poses new logistical challenges for seemingly routine activities such as project monitoring and measurement. It may be appropriate to begin by adopting policies that recognize some ecosystem services as inseparable from each other (eg nitrogen and phosphorus from the same site, two endangered species in a predator—prey relationship), reducing the set of legally stackable credit types. Moving toward stacked credits will require more thorough regulatory oversight and cooperation among government agencies, and regulators will have to assess and certify each credit type independently while tracking sales across a kaleidoscope of spatially overlapping markets. (at 192, references omitted)

ALTERNATIVE APPROACHES

Alberta as yet has no policy on how its various environmental credit systems might interact. Presumably wise policy lies somewhere between open permission of stacking (and ignoring of its risks) and an outright prohibition, which would deprive Alberta of stacking's potential benefits. Some possibilities for a sound middle ground are suggested by the appendices which set out the treatment of stacking and similar issues in specific cases (Appendix I), and also in stated policy positions of other jurisdictions (federal and outside Canada) (Appendix II).

Some other ideas which have been presented or might be considered are:

- White & Penelope (2013) suggest that rather than focus on the complexities of ecosystems as a means of unbundling, we ought to give emphasis to properly recognizing all values presented in the bundled credit , while leaving it as an integrated unit (a process they call "unstacking"). The Alberta wetland credit may be seen to be an example of this in recognizing four functions within a single wetland credit.
- Fox (2008) suggests that the potential for double-counting due to ecosystem interconnectedness may be compensated for by increasing multiplier ratios where credits are stacked.
- In a variation on Fox`s suggestion, if the degree of risk of inadvertent double-counting could be approximated, an appropriate discount factor could be applied to either all of the credits in a stack, or all those to be sold after the first. For example a wetland might produce wetlands credits without discount, but carbon credits discounted by fifty percent. This would allow some incentive to the landowner to manage for a greater range of ecosystems services, but partially guard against the risk of double-counting.

CONCLUSION

The stacking of environmental credits has the potential to enhance the operation of offset systems by giving more full recognition and value to the many ecosystem services which a single site might provide. Doing so, however, however, depends on us having a good understanding of the often complex interrelationships of ecosystem components and functions. Only from a firm foundation of such understanding can we undertake the work of defining the precise nature of credits, and where the boundaries between them might be distinct or blurred. Our efforts in that regard, and available human and administrative resources, are always going to be limited. This means that there will always be an element of risk in stacking. Similar risks are inherent in any conservation offsetting, but stacking compounds them. This paper has not aimed to provide an answer to this vexing issue, but rather to lay out a series of considerations which might guide us eventually to wise policy in this area.

Appendix I

Situational Cases Studies

1) **Neuse River, North Carolina** (Sources: Gardner & Fox 2014; Kenny 2009; Robertson et al 2014)

Probably the most extreme and controversial example of true stacking arose in the Neuse River watershed of North Carolina. In 2000 the U.S. government, through the Army Corps of Engineers, authorized the Environmental Banc & Exchange (EBX, a private for-profit habitat banker) to sell wetland credits from a wetland bank consisting of three sites along the banks of the Neuse River. This was done pursuant to the process developed by the Corps and the Environmental Protection Agency under the federal *Clean Water Act*. The credits were all sold for $3.8 million to the North Carolina Department of Transportation to compensate for disturbances to wetlands elsewhere in the state.

Several years later the State of North Carolina established a program of water quality trading, whereby excess nutrients flowing into a watershed could be offset by credits generated by activities that would reduce nutrient loading. In 2008 EBX, at the suggestion of the North Carolina Division of Water Quality, applied for and received certification of nutrient offset credits for the same sites on the Neuse River, without any requirement of additional action. These credits were sold for $700,000 to the North Carolina Ecosystem Enhancement Program in 2009. The price for which the credits sold was discounted as EBX had not had to undertake any extra action to produce them.

To summarize, certification and sale of both wetland compensation credits (federally administered) and nutrient offset credits (state-administered) were sought and received for the same conservation actions taken on the same three pieces of land. This situation was highly controversial, sparking public debate and an official inquiry. It ultimately led to North Carolina placing a moratorium of the certification of nutrient credits on land on which wetland credits had previously been certified.

2) Willamette Partnership, Oregon

As stated on its website (*http://willamettepartnership.org/)*:

> The Willamette Partnership is a diverse coalition of conservation, city, business, farm, and science leaders in the Willamette River basin [of northwest Oregon] who are working to shift the way people think about, value, manage, and regulate the environment. The Partnership includes people from Clean Water Services (the wastewater management service for the Tualatin River Basin), the Oregon Business Council, Wildwood, Inc. (an urban design and development firm), Defenders of Wildlife, Willamette Riverkeeper, The Conifer Group (a multifaceted real estate development company), the Oregon Association of Nurseries, Weyerhaeuser, the Oregon Association of Conservation Districts, SOLV (an organization that builds community though volunteer action), the Network of Oregon Watershed Councils, Portland's Bureau of Environmental Services, local law firms, and the state's universities.
>
> We all want ecological resiliency. We believe naturally functioning ecosystems form the cornerstone of livable communities and a healthy, sustainable economy. To get this, we need to increase the pace, scope, and effectiveness of conservation. This means:
>
> - Integrated and strategic investment in ecosystems
> - A fair and transparent system for people to buy and sell environmental restoration benefits
> - Business models to move beyond compliance-based projects to stewardship of ecosystems.

The Willamette Partnership was formed in 2004 with a mission to "expand the pace, scope, and effectiveness of restoration" (Willamette 2013). In 2009, with the financial support of the U.S. Natural Resource Conservation Service and the participation of twenty-seven federal and state agencies and civil society groups, the Partnership developed an Ecosystem Credit Accounting System (ECAS) to which all participants agreed. The ECAS was a key component in the pursuit of the goal to establish workable ecosystem service markets in the Willamette region of Oregon, and to act as a pilot project for the development of markets elsewhere. The original ECAS of 2009 (Version 1.1) was updated and revised in 2013 (Version 2.0), based on the first few years of experience.

The Partnership deals with nine different types of ecosystem credits, three in each of three broad categories: water quality, aquatic habitat, and upland habitat. Many of these credit types may be generated from the same "accounting unit." An accounting unit is a single piece of

land. Multiple contiguous units may be merged into a single accounting unit (presumably this is a matter for the project developer's discretion). The sale or transfer or credits of one credit type from an accounting unit results, according to the Willamette protocol, in the proportionate reduction in each of the other credit types. The Partnership's General Crediting Protocol offers the following example (at 23):

> . . . in an accounting unit containing 1.44 wetland credits (functional acres), 622 salmon habitat credits (functional linear feet) and 2.6 million thermal credits (kcals/day), the sale of 311 salmon credits, which represents 50% of the available credits, results in a 50% reduction of available wetland and thermal credits.

No such discounting occurs, however, where the credits are generated on different accounting units.

The result of this is that a project developer has the opportunity to arrange both the configuration of accounting units and the sale of different credit types to take maximum advantage of market conditions, but does so within constraints that tend to assure that the credit system is not exploited to the detriment of the environment.

This approach appears to be based on the notion that ecosystem services exist in roughly equal proportions upon a single piece of land or accounting unit. This assumption may not be borne out in any particular case. The further that reality departs from the assumption, however, the stronger the incentive on the project developers to segregate the project into different accounting units to take full advantage of the actual credits found within the smaller units. This option presumably keeps the results of the system grounded in the realities of the landscape.

3) Assorted Other U.S. Cases

According to Gardner & Fox (2013), writing in the context of the United States:

> It is the unbundling of credits for sale in multiple markets that gives rise to concerns. . . . [A]gencies are generally reluctant to permit such transactions. Federal rules that expressly address the issue tend to prohibit selling stacked credits in multiple markets. Any federal approvals appear to be on an ad hoc basis. State agencies have exhibited a bit more flexibility, but they too have yet to issue clear rules on when selling stacked credits is permissible. (p. 137)

The following is a brief summary of these ad hoc cases, drawing heavily on Gardner & Fox.

a) Ohlone Preserve Conservation Bank, Alameda County, California: Multiple Federal Endangered Species

The Ohlone Preserve is a 640 acre site that provides habitat for three endangered species: the California red-legged frog, the Alameda whipsnake, and the California salamander. The sole agency responsible for all three is the U.S. Fish and Wildlife Service. The federal endangered species habitat offsetting system credits the habitat of each individual species, using acres as the currency. Different species have different multiplier ratios applied to them. There is a general rule that if an acre is inhabited by more than one species, that acre may be credited for any of the species or as a multi-species site, but the use of any one type of such credits results in the proportional reduction of credits available for all of other species (similar to the Willamette approach). Further, the FWS prohibits credits generated from the same piece of land from being sold separately, so the credits must be sold together to offset a development that impacts the same suite of species. This precludes the possibility of a single offset site providing credits which allow multiple developments.

b) Lyonia Preserve, Volusia Country Florida: Federal and State Endangered Species

The Lyonia Preserve provides habitat for both the Florida scrub Jay (a federally protected endangered species) and the gopher tortoise (a state protected species). Both the FWS and the relevant state agencies have agreed that these two types of credits can be generated from the same piece of land, and can be sold separately. The rationale offered for this is that each species requires its own type of management, and that the credits for the species use very different currencies. Credits for scrub jay are generated based on area, whereas credits for tortoises are based upon live individuals of the species. They therefore represent quite distinct things. It is felt that each may be used to permit separate developments impacting those specific aspects.

c) Van Vleck Ranch Mitigation Bank, Sacramento County, California: Wetlands and Endangered Species

The Van Vleck contains both upland and wetland features. These are not stacked, as each occupies its own piece of the landscape. The wetlands, however, are both creditable on their own behalf (under the federal wetlands compensation system) and as habitat for vernal pool shrimp (under the *Endangered Species Act*). The responsible agencies have agreed that either type of credit may be sold from the site, but not both. The credits cannot be unbundled and sold separately.

d) Florida Panther Conservation Bank, Hendry County, Florida: Endangered Species and Carbon Credits

This is a 472 acre bank intended to provide connectivity in panther habitat. As such it produces credits under the federal endangered species habitat compensation system. While there is not currently any regulated carbon market into which the site could provide credits, its banking agreement provides that, with Fish and Wildlife Service approval, the bank may participate in carbon banking systems if appropriate. There is thus a potential for stacking of carbon and endangered species credits, though this is contingent on agency approval and on "appropriate" circumstances.

4) Climate, Community & Biodiversity Alliance

The Climate, Community & Biodiversity Alliance (CCBA) is a partnership of five international conservation and social development civil society groups (CCBA 2013). Concerned that the emerging market in land-based carbon credits was incenting land management practices that emphasized carbon sequestration over the welfare of local communities and biodiversity, the CCBA sought to develop a certification system which would recognize the value of projects which combined effective climate change mitigation with community benefits and biodiversity conservation. The result was the CCB Standards which were first developed in 2005, and were updated into a third edition in 2013 (CCBA 2013).

The CCB Standards are a series of protocols that support a certification system which project proponents may use to indicate their project's carbon, social and environmental merits. Because the certification is based on positive contribution to all three values of climate change mitigation, community benefits, and biodiversity conservation it may be seen as a process based on bundling.

This CCB process does not give rise to ecosystem credits. Its significance to our concern with stacking is that CCB certification can be added to carbon credits generated under the protocols of various carbon markets. In particular, a variation on the CCB Standards has been developed by the CCBA in collaboration with others, to be specifically applicable to projects under the REDD+ (Reduced Emissions from Deforestation and Forest Degradation) (REDD+ SES 2012). (REDD+ is a system of protocols to credit carbon management through forest management, under the Clean Development Mechanism of the Kyoto Protocol.) The intention is that the CCB standards certification will add to the value of carbon credits generated under other systems. Thus the CCBA claims, with respect to the second edition of the Standards:

> Several investors and offset buyers have declared their intention to give a preference to, give a premium to, or exclusively purchase land-based carbon offsets derived from CCB projects, because of the importance they give to use of good social and environmental practices and the delivery of multiple benefits. Credits from projects also using multiple-benefits standards have been shown to attract higher prices. VCS projects also certified to CCB Standards saw an additional average $0.5/tCO2e, trading at an average of $9.1/tCO2e compared with $8.5/tCO2e for credits only using VCS. (CCBA 2013 at 3, references omitted).

The CCB certification system is not a case of stacking different types of credits, but it is a demonstration of how extra value may be brought to an ecosystem service credit market through the recognition of other ecosystem and social values.

Appendix II

Sample Policy Statements and Regulations

1) Environment Canada

The *Operational Framework for Use of Conservation Allowances*, published in 2012 by Environment Canada, states: "Where there is overlap in federal and provincial conservation allowance [i.e., offset] programs, a single conservation allowance may suffice if it meets the criteria of both jurisdictions." (Environment Canada 2012, at 3).

2) U.S. Federal Rule on Wetland Compensation (33 CFR 332.3 (j))

(j) Relationship to other federal, tribal, state, and local programs.

(1) Compensatory mitigation projects for DA [Department of the Army] permits may also be used to satisfy the environmental requirements of other programs, such as tribal, state, or local wetlands regulatory programs, other federal programs such as the Surface Mining Control and Reclamation Act, Corps civil works projects, and Department of Defense military construction projects, consistent with the terms and requirements of these programs and subject to the following considerations:

(i) The compensatory mitigation project must include appropriate compensation required by the DA permit for unavoidable impacts to aquatic resources authorized by that permit.

(ii) Under no circumstances may the same credits be used to provide mitigation for more than one permitted activity. However, where appropriate, compensatory mitigation projects, including mitigation banks and in-lieu fee projects, may be designed to holistically address requirements under multiple programs and authorities for the same activity.

(2) Except for projects undertaken by federal agencies, or where federal funding is specifically authorized to provide compensatory mitigation, federally-funded aquatic resource restoration or conservation projects undertaken for purposes other than compensatory mitigation, such as the Wetlands Reserve Program, Conservation Reserve Program, and Partners for Wildlife Program activities, cannot be used for the purpose of generating compensatory mitigation credits for activities authorized by DA permits. However, compensatory mitigation credits may be generated by activities undertaken in conjunction with, but supplemental to, such programs in order to maximize the overall ecological benefits of the restoration or conservation project.

(3) Compensatory mitigation projects may also be used to provide compensatory mitigation under the Endangered Species Act or for Habitat Conservation Plans, as long as they comply with the requirements of paragraph (j)(1) of this section.

3) Australia

Excerpt from Australian Government, *Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (2012) at 22-23:

> 7.6 Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs. Offsets must deliver a conservation gain for the impacted protected matter, and that conservation gain must be new, or additional to what is already required by a duty of care or to any environmental planning laws at any level of government. It is important to note however that this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action (see section 7.6.1).
>
> This requirement would, however, generally prohibit using a piece of land already set aside in the conservation estate or using a site that is already unable to be built upon due to zoning laws (a foreshore reserve for instance) as an offset for a proposed action.
>
> Environmental offsets must also be additional to what has been paid for under other schemes or programs on a *pro rata* basis. For instance, if a landholder is receiving stewardship funding from a program such as *Caring for our Country*, then the conservation gain achieved through fulfilling the program's contract is not eligible to be used as an offset. Similarly, the conservation gain achieved while participating in another scheme (such as the *Carbon Farming Initiative*), would also not be eligible for use as an offset.
>
> However, if the proposed offset is for further activities that achieve additional conservation gain on the same piece of land, then those additional activities may be eligible for use as offsets. For example, if a piece of land is being used as an offset to preserve and manage that land for the protected matter, then it may be permissible to use that piece of land to offset another proposed action where:
>
> • there are no perverse outcomes e.g. there is no conflict between the management of the two offsets, such as the need for conflicting fire regimes; and
>
> • synergies are produced e.g. releasing and actively managing captive bred animals (offset 2) into an already protected and managed area for the same species (offset 1) may increase the survival rate of the released animals and increase the viability of the existing population.
>
> Whether or not an offset is considered to be additional will be assessed on a case by case basis. Where a proponent or offset provider seeks to secure an advanced

offset, it must sufficiently document the establishment of that offset, including relevant baseline data, to demonstrate to the department that it is additional.

7.6.1 Links with state and territory approval processes

All of the states and territories have laws that protect the environment. The majority of proposed actions that need approval under the EPBC Act also require environmental approval from the relevant state or territory government before they can proceed.

It is important to note that while there are many similarities between the environmental laws of the states and territories and the EPBC Act, they also differ in a fundamental way. The EPBC Act focuses on protecting matters of national environmental significance and only protects the broader environment in certain circumstances.

State and territory laws on the other hand usually protect the environment as a whole (for example air quality, noise pollution, water quality, biodiversity, and heritage values). These differing legislative objectives result in different assessment processes and can result in different offset requirements.

As a consequence, some proponents may need to provide offsets under both state or territory laws and the EPBC Act for the same action. A state or territory offset will count toward an offset under the EPBC Act to the extent that it compensates for the residual impact to the protected matter identified under the EPBC Act.

Making an early referral provides an opportunity to align the impact assessment processes of the relevant state or territory with the EPBC Act to the extent that this is possible.

REFERENCES

Legislation and Policy Documents

Alberta

Alberta Land Stewardship Act, SA 2009, c A26.8.

Climate Change and Emissions Management Act, SA 2003, c C-16.7.

Specified Gas Emitters Regulation, Alta Reg 139/2007, as amended.

Water Act, RSA 2000, c W-3.

Alberta Government 2013, *Alberta Wetland Policy* (np: Alberta Government).

Canada

Fisheries Act 1985, RSC 1985, c F-14, as amended.

Species at Risk Act, SC 2002, c 29.

Environment Canada 1996, Wildlife Conservation Branch, Canadian Wildlife Service, *The Federal Policy on Wetland Conservation – Implementation Guide for Federal Wetland Managers* (Ottawa: Environment Canada).

Environment Canada 2012, *Operational Framework for Use of Conservation Allowances* (Ottawa: Environment Canada) online: Environment Canada < http://www.ec.gc.ca/ee-ea/default.asp?lang=En&n=DAB7DD13-1&printfullpage=true>.

Australia

Australian Government, Department of Sustainability, Environment, Water, Population and Communities, Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (Canberra: Commonwealth of Australia, 2012)

United States of America

Clean Water Act, 33 USC 1251.

Rule on Wetland Compensation, 33 CFR 332

Secondary Sources

Climate, Community & Biodiversity Alliance 2013, *Climate, Community & Biodiversity Standards*, Third Edition (n.p.: CCBA), available online: CCBA <https://s3.amazonaws.com/CCBA/Third_Edition/CCB_Standards_Third_Edition_December_2013.pdf>.

Cooley, David & Lydia Olander 2011, *Stacking Ecosystem Services Payments: Risks and Solutions*, revised ed (np: Duke University Nicholas Institute for Environmental Policy Solutions,.

Fox, Jessica2008, "Getting Two for One: Opportunities and Challenges for Credit Stacking" in Nathaniel Carroll, Jessica Fox & Ricardo Bayon, *Conservation & Biodiversity Banking: A Guide to Setting Up and Running Biodiversity Credit Trading Systems* (London, UK & Sterling, VA: Earthscan) 171.

Fox, Jessica, Royal C. Gardner & Todd Maki 2011, "Stacking Opportunities and Risks in Environmental Credit Markets" 41 ELR 10121.

Gardner, Royal C. & Jessica Fox 2013, "The Legal Status of Environmental Credit Stacking" 40:4 Ecological Law Quarterly 101, online: Social Science Research Network <http://ssrn.com/abstract=2375858>.

Kenny, Alice 2009, "When is Credit-Stacking a Double-Dip?" online: Ecosystem Marketplace <http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=7147&section=home1>.

REDD+ Social & Environmental Standards 2012, *REDD+ Social & Environmental Standards* Version 2 (NP: REDD+ SES) available online: REDD+ SES <http://www.redd-standards.org/index.php?option=com_eywafm&task=cat_view&gid=45&Itemid=185>.

Ridge, Andy, Executive Director, Water Policy Branch, Alberta Environment and Sustainable Resource Development, Presentation to Alberta Association for Conservation Offsets, March 19, 2014.

Robertson, Morgan et al 2014, “Stacking Ecosystem Services” (12:3 Frontiers in Ecology and Environment 186.

Ruhl, J.B. 2010, "Stacking and Bundling and Bears, Oh My!" 24-25 National Wetlands Newsletter 24.

White, Wayne & Jemma Penelope 2013, "Stacking and Unstacking: The Economics, the Conservation, and the Conversation" 35:2 National Wetlands Newsletter 6.

Willamette Partnership 2013, *Ecosystem Credit Accounting System: General Crediting Protocol Version 2.0* (Portland, Oregon: Willamette Partnership), available online: Willamette Partnership <http://willamettepartnership.org/ecosystem-credit-accounting/general-crediting-protocol/General%20Crediting%20Protocol%20v2.0_2013%2011%2001_Final.pdf>.

World Resources Institute 2009, "Stacking Payments for Ecosystem Services" (Washington DC: World Resources Institute).