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Private Sector Conservation Investments under the Endangered Species Act

A Guide to Return on Investment Analysis

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Private Sector Conservation Investments under the Endangered Species Act: A Guide to Return on Investment Analysis

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Abstract

The US Endangered Species Act (ESA) protects imperiled species by prohibiting harm to listed species and their habitat. Over the last 20 years, the US Fish and Wildlife Service and National Marine Fisheries Service have developed programs to increase management flexibility under the ESA and to encourage voluntary conservation actions by the private sector—above and beyond what is required for ESA compliance. These programs include Candidate Conservation Agreements, Safe Harbor Agreements, and a new Prelisting Conservation Policy, among others. Why would private landowners and firms voluntarily engage in proactive conservation efforts? We address that question by exploring the incentives created by ESA programs, using a return on investment (ROI) framework to identify the costs and benefits of participation. The paper is relevant to firms affected by current or potential species listings. It is also relevant to NGO and government conservation advocates interested in encouraging more conservation by the private sector. The analysis sheds light on factors likely to affect participation, programs' likely effectiveness, ways to better target partnering or cost-share engagements with the private sector, and the design of future programs to achieve conservation goals.

Key Words: Endangered Species Act, voluntary conservation, incentives, return on investment analysis, Habitat Conservation Plans, Candidate Conservation Agreements with Assurances, Prelisting Conservation Policy, Safe Harbor Agreements

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1. Introduction

Over the last 20 years, the US Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS)[1] have established a variety of programs to encourage species conservation actions by the private sector. These programs, including Candidate Conservation Agreements with Assurances, Prelisting Conservation Policy, and Safe Harbor Agreements, create incentives for businesses to protect and manage land and water resources for the benefit of species listed (or potentially listed) under the US Endangered Species Act (ESA). Because two-thirds of all listed species are present on private lands, and one-third are present only on private lands, conservation investments by the private sector are key to the ESA's long-run success (Evans et al. 2016).

The ESA can affect the private sector by imposing mandatory restrictions on activities that could harm species listed as threatened or endangered. However, the programs described in this paper are voluntary—aimed at conserving species while providing benefits such as regulatory certainty and management options for the private sector. Businesses thus face a choice: to invest their time, money, and personnel in conservation associated with these voluntary programs, or not. How should that choice be analyzed?

This paper focuses on private sector decisionmaking regarding participation in ESA conservation programs, showing how a return on investment (ROI) framework can help private sector conservation managers more effectively evaluate whether voluntary ESA conservation investments are in the interest of the firm. The paper highlights the types of costs and returns that would be considered in these decisions, how they might be evaluated, and the factors that affect ROI from participation. This framing is useful to firms affected by current or potential future

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[1] NMFS is responsible for most marine and anadromous species listed under the ESA. Here we use FWS to refer to both FWS and NMFS, as FWS has jurisdiction over the majority of listed species and has more active agreements under the programs considered here.

species listings, as well as to entities interested in furthering imperiled species conservation. Understanding private investment decisions can help NGOs or public entities better target partnering or cost-share engagement with the private sector to more cost-effectively achieve public conservation goals. Furthermore, understanding firm-specific investment decisions is necessary in order to anticipate the effectiveness of ESA voluntary conservation programs.

ROI and NPV

This paper applies a return on investment (ROI) framework to firms' decision to participate in voluntary ESA conservation programs. ROI analysis is a formal procedure used to depict the scale and timing of an investment's costs and benefits. More specifically, we employ a net present value (NPV) framework, a conventional and widely used approach for assessing the profitability of an investment or project.

NPV as a Form of ROI Analysis

"ROI analysis" in its simplest form estimates the benefits of an investment (the returns) and divides those returns by the amount of investment needed to generate the returns. That yields a measure of benefit per dollar spent. NPV is a more realistic and accurate "version" of ROI analysis because it accounts for how costs and benefits arise over time. Algebraically, NPV equals = $\sum$ (Net incremental cash flow from the investment in each period/$(1+R)^T$) - Initial Investment, where T is the number of time periods in consideration and R is the discount rate.

NPV analysis takes into account the time value of money and discounts future costs and benefits relative to current costs and benefits. Because ESA conservation program investments typically involve future costs and benefits, NPV analysis is the appropriate version of ROI analysis for these applications.

Quantification and the Definition of Returns

Consider a conventional business decision, such as whether or not to develop a new product line. It is relatively easy for a company to put a dollar value on the investment's cost (expected research and development, marketing, distribution, training costs, etc.). The return on the investment is typically harder to estimate, but a variety of market data (current sales, consumer surveys, analysis of competitors, etc.) can be brought to bear to predict future revenues. Note also that in a conventional business investment setting, costs and returns are

denominated in the same terms: dollars. Costs and benefits estimated all in dollar terms allow an analyst to numerically apply the NPV formula and determine whether the investment yields a positive return (and thus is a good investment), or not.

Relative to a conventional business decision, analysis of private sector conservation returns is more difficult. This is true for two general reasons. First, not all conservation returns yield a direct, bottom-line change in a firm's revenues or costs. Second, much of the data needed to quantify conservation returns is not conventional, market-oriented data. For example, as we will see, conservation returns depend on things like ecological conditions and processes, land use and management by other private sector businesses, and legal issues. These factors are difficult to quantify by scientific and legal experts, let alone a company's own financial analysts.

In fact, the ability to boil a conservation program investment down to a dollars-and-cents calculation should be viewed with skepticism. In what follows, readers should not expect an easy-to-collect data checklist and "turn the crank" formula for calculating conservation ROI. Rather, our goal is to:

1. Show how an ROI framework may be applied by private sector conservation managers to clarify their judgments about whether conservation investments are in the interest of the firm; and
2. Provide guidance on the kinds of quantifiable analysis and information needed to give such analysis more certainty.

2. Conservation ROI Analysis: Core Elements

Before turning to a more detailed discussion of how specific ESA conservation programs create possible investment returns, we outline a basic taxonomy for thinking about conservation costs and benefits. The core elements of conservation ROI analysis include conservation's costs, identification of the returns to be considered, the impact of conservation actions on those future returns, and expected returns if conservation does not occur (baseline returns[2]). Also of key importance is how discounting and uncertainty affect current and future costs and benefits. We briefly discuss each of these in turn.

[2] Our use of the term "baseline" should not be confused with its use in ESA Safe Harbor agreements where it refers to the ecological conditions present at a site at the start of an agreement.

Discounting

As noted above, NPV analysis takes into account the time value of money and discounts future costs and benefits relative to current costs and benefits. Discounting implies a reduction in the value of benefits (or costs) that arise in the future. One dollar in the future is worth substantially less than that same dollar today. Thus, the timing of investments, compliance requirements, and benefits is financially important.

Consider a conservation investment made in anticipation of a species being listed. The further in the future that listing is expected to occur, the less motivation there is to invest now, all else equal. In general, the greater the delay between a conservation investment and its future compliance-related benefits, the lower the return on investment—purely due to the effects of discounting.[3]

The Value of Reduced Uncertainty

The cost of future ESA-imposed requirements is uncertain. Will a species be listed? If so, what restrictions might be placed on my business? Some conservation programs act as a kind of hedge against such uncertainty, by formally clarifying which land uses and other resource management actions will be allowable in the future. The ability to reduce such uncertainty has a value. Given a choice between a risky investment and a safe one, an investor will always prefer the safer of the two. In general, risk reduction benefits a firm by lowering its cost of capital. Put another way, in order to acquire capital from an investor, riskier firms have to promise a higher return than a safer firm.[4]

Another virtue of legal clarification (a product of some of these conservation programs) is that it can help reduce future permitting delays and thereby speed firm actions otherwise slowed by an ESA regulatory process.

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[3] However, this incentive to delay, resulting from discounting, may be offset when delays alter costs or returns (independent of discounting effects). For example, delays may increase conservation costs or the likelihood that the species is listed, because the species may become more imperiled and fewer conservation options may be available. We discuss these details in section 3.

[4] This concept is the basis of the so-called capital asset pricing model (CAPM), which says that an asset's expected risk premium varies in direct proportion to an index of risk, called beta.

Conservation's Costs

Participation in conservation programs always requires an investment of some kind. "Direct" (out-of-pocket) costs can take the form of capital and labor investments in vegetation management, habitat restoration, restocking, fencing, and monitoring. Another form of direct cost is the legal and administrative costs associated with participation in an ESA conservation program, including time and costs for conservation plan development. In some cases, technical or funding assistance may be available from FWS or interested NGOs to help offset some of these direct costs.

"Indirect" costs can take the form of habitat and species protections that prohibit the firm from taking future actions beneficial to it (such as using lands for commercial purposes inconsistent with protection). In economic parlance, these are "opportunity" costs borne by the firm. The table below differentiates between these costs, all of which can be immediate or ongoing.

Table 1. Types of Cost Associated with Participation in a Private Sector ESA Conservation Program

Costs	Immediate	Future
Direct	Construction, resource management, plan development *Example*: Capital and labor costs of habitat restoration, legal expenses	Management, operations and maintenance, monitoring *Example*: Ongoing costs of invasive species removal, restocking program, or monitoring
Indirect	Profits lost due to any now prohibited land or water use *Example*: Financial loss due to inability to graze or harvest	Profits lost due to any now prohibited land or water use *Example*: Financial loss due to inability to use lands for future commercial development

Returns to Be Considered

As noted earlier, it is conventional to define ROI returns as the dollars earned as a result of an investment. It is important to note that dollars earned can refer either to revenue generated by the investment or costs saved by the investment. Conservation program participation can "earn dollars" in both ways.[5]

[5] Clearly some landowners pursue conservation for other—ethical or moral—reasons. These motivations are real, may be important to the private sector, and could certainly play a role in decisionmaking. However, we do not incorporate them in our more "bottom-line" financial perspective on returns, both because ethical motivations are difficult to measure and because they are not financial—by definition.

Category 1: Compliance Costs Avoided

One return to private sector conservation program participants—perhaps the most important of all—comes via a reduction in current or future ESA compliance costs. In other words, firms may engage in costly conservation programs in order to reduce other costs (those otherwise imposed on the firm by the ESA). These can include costs associated with delays and uncertainty posed by permitting requirements under the ESA. For example, some voluntary conservation programs enable economic activities to move forward that otherwise would be prohibited under the ESA. Other programs secure permitting for economic activities in advance of needed compliance, thereby avoiding delays in profits streams and also reducing uncertainties. Conservation ROI analysis requires an assessment of how a firm's compliance costs—current and future—will change as a result of participation.

Category 2: Reputation (CSR) Benefits

Another return to participants is the benefit to the firm from being perceived as a proactive conservation steward. Experience with corporate social responsibility (CSR) initiatives suggests that some firms can secure bottom-line benefits (via consumer marketing and employee hiring and retention advantages) from being perceived as an environmental leader. If a firm's environmental reputation is enhanced via participation in ESA programs, it can yield bottom-line benefits. Analysis of marketing and human resource benefits may therefore be important.

Category 3: Social, Ecosystem Services Benefits

Finally, a firm's conservation actions can yield social benefits. In addition to the benefits to threatened and endangered species explicitly targeted by the program agreement, other "ecosystem services" benefits can arise from conservation activities. For example, habitat restoration can also improve aesthetics, recreational features, downstream water quality, and flood protection. Some of these benefits may accrue directly to the firm (e.g., flood protection), but most typically benefit the public more generally.

By definition, social benefits are those that are not captured by the firm. Our assumption, therefore, is that they are not pertinent to the firm's ROI.[6] We note, however, a possible interaction between returns from Categories 2 and 3. Firms that can demonstrate public benefits from their conservation investments can use that information as part of their CSR strategies.

[6] Of course, if ecosystem service benefits were to accrue directly to the firm (e.g. flood protection for the firm's infrastructure), these private benefits should be accounted for in the firm's ROI analysis.

Conservation's social benefits are the focus of most NGO and academic analysis of conservation returns (a field with its own scientific literature and set of practices). We briefly review that field of study in Section 5. Table 2 summarizes these three categories of return.

Table 2. Categories of Returns to Conservation Program Participation

1. Compliance costs avoided	2. Reputation (CSR) benefits	3. Public benefits
Benefits the firm	Benefits the firm	Does not benefit the firm

In principle, all of these returns can be quantified and expressed in dollar terms. In practice, all of these returns present practical challenges to quantification.

The Future Baseline

The final core element of an ROI analysis is an understanding of baseline conditions. Baseline conditions depict returns in the absence of the investment. This is sometimes referred to as the "future without" condition. Because both business and ecological conditions typically change over time, analysis of future conditions is important to ROI analysis.

For example, in order to determine the compliance costs avoided by conservation, it is necessary to predict what compliance costs would be without conservation. In part, as we will see, that is a function of expectations regarding the future state of species and their habitats (on an owner's property and beyond). Also, when businesses consider the opportunity costs of putting conservation restrictions in place today, they need to consider how those restrictions might affect their ability to respond to changing business conditions.

3. Description of Costs and Returns for Specific Conservation Programs

This section describes voluntary private sector conservation programs under the ESA. Different programs are available in different contexts, depending on whether they are for listed versus non-listed species, on public versus private lands, and to avoid harm to species versus create net conservation benefits. The programs also differ in terms of whether or not the program provides regulatory assurances about future compliance requirements. Table 3 highlights the set of voluntary conservation programs available under the ESA and how they differ along these dimensions. Below we describe the kinds of investments and costs associated with each program, as well as how they can create opportunities for returns based on avoided compliance costs (Category 1). We also describe factors likely to affect the probability and magnitude of those compliance cost advantages. We first describe programs applicable to listed species and then programs applicable to currently unlisted, at-risk species that could be listed in the future.

Table 3. Voluntary Conservation Programs and Permitting Processes Under the ESA

	Overview of Program	Participants	Species Covered	Conservation Standard	Assurances to Signatories
Section 7 Consultation and Permitting	Permitting process that enables development and other economic activities to continue while conserving species.	Public or private sector entities whose activities have a federal nexus (i.e., involve federal land or federal funding, or require other federal permitting)	Federally listed and proposed species.	Through consultations with FWS, it must be ensured that activities are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitats.	N/A
Habitat Conservation Plan (HCP) / Section 10 Permitting	Permitting process that enables development and other economic activities to continue while conserving species.	Non-federal entities (public and/or private sector).	Must include a Federally listed species; can also include non-listed species.	Landowner must minimize and mitigate expected incidental "take" to the maximum extent practicable.	Will not be required to carry out additional land management/ conservation actions beyond the terms of the HCP.
Safe Harbor Agreement (SHA)	Agreement in which participants contribute to the recovery of listed species through proactive conservation measures and in exchange receive regulatory assurances regarding future compliance.	Non-federal entities (public and/or private sector).	Federally listed species.	Landowner must provide a net conservation benefit that contributes to species recovery.	Will not be required to carry out additional land management/conservation actions beyond the terms of the SHA. May return to the species' original baseline condition at the end of the SHA term.
Working Lands for Wildlife Initiative	Program that incentivizes participants to conserve specific Federally listed and nonlisted species in exchange for regulatory assurances, technical assistance, and funding.	Agricultural and timber producers	Lesser prairie-chicken, New England cottontail, greater sage-grouse, gopher tortoise, golden-winged warbler, Southwestern willow flycatcher, bog turtle; Program is being extended to other at-risk species as well.	Landowners must implement specified best management practices.	No changes in activities will be required to comply with the ESA so long as the terms of the agreement are achieved.
Conservation Banks	Market-based policy that incentivizes landowners to protect and maintain habitat for listed species in perpetuity in exchange for credits that can be sold to mitigate impacts elsewhere.	Any landowner/land manager can set up a bank, but Federal entities may require special consideration.	Primarily listed species. Candidate species and imperiled species also may be included.	Banked land is protected in perpetuity by a conservation easement, with a management plan and a management endowment. FWS has guidance under the ESA for conservation banks.	The mitigation credit buyer can receive documented credit for their conservation investment and continue with development activities elsewhere.

Table 3 continued. Voluntary Conservation Programs and Permitting Processes Under the ESA

	Overview of Program	Participants	Species Covered	Conservation Standard	Assurances to Signatories
Candidate Conservation Agreement (CCA)	Voluntary agreement to conserve species by removing enough threats to preclude the need to list under the ESA.	Any landowner/land manager.	Species that are candidates, or likely to become candidates for listing under the ESA.	Participants agree to implement specific actions designed to remove or reduce threats to the covered species. Details of agreements vary widely.	None
Candidate Conservation Agreement with Assurances (CCAA)	Agreement in which participant agree to proactively conserve species (by removing enough threats to preclude the need to list under the ESA) in exchange for regulatory assurances regarding future compliance.	Non-federal entities (public and/or private sector)	Species that are candidates, or likely to become candidates, for listing under the ESA.	Participants must implement sufficient conservation measures that the need to list would be precluded if all other relevant landowners/land managers also implemented appropriate conservation measures. Proposed policy change would replace this standard with a requirement to provide "net conservation benefit."	Will not be required to do more than agreed to in the CCAA, even if the covered species is listed under the ESA in the future.
Partners for Fish and Wildlife and Coastal Program	Cooperative agreement between the landowner and FWS to protect, enhance, and restore fish and wildlife habitats with technical and financial support from FWS and other entities	Partners Program: Private landowners, and any non-Federal and non-state landowners. Coastal Program: Any landowner or land manager.	All species, but the focus is on Federally listed, candidate and imperiled species, and their habitats.	Cooperative agreements. Partners: with a minimum duration of 10 years. Coastal: no minimum duration, although long-term conservation is preferred.	None, though agreements could be converted to a CCA or CCAA.
Prelisting Conservation Policy	Policy to encourage conservation of non-listed species by enabling conservation efforts pre-listing to be used to offset impacts to the species post-listing caused by the participant or third party.	Federal and non-federal entities and lands	Species that are candidates, or that may become candidates, for listing under the ESA.	Actions must be beneficial to target species, but the policy requires no specific magnitude of benefit. However, the benefit of actions for which credit is given must be greater than the detriment from the action for which the credit is later redeemed, providing an overall benefit to the species.	None, other than that credits from voluntary prelisting conservation actions may be applied to meeting future mitigation requirements that a landowner or third party may face.

Programs Available for Listed Species

We begin by describing the ESA's effect on businesses absent their participation in a voluntary program and when their lands or waters overlap with a listed species' habitat. In such a situation, the ESA prohibits the take of listed species, where "take" refers to any action that would harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect the species. Significant habitat modifications can also be prohibited. Even when harm is not intended, activities such as agriculture and construction can result in "incidental take," which is accidental take resulting from otherwise lawful activities. Absent appropriate permits, incidental take is prohibited. (However, it is worth noting that, while not frequently applied, the secretary of the interior has the option at the time of listing to issue a 4d rule for threatened species that excludes certain activities from ESA permit requirements, even if the activities occur within the threatened species' habitat. This can reduce compliance costs relative to those triggered if the species is listed as endangered.)

Because of the act's take prohibitions, to fully comply with the ESA (and without engaging in any of its programs) a business typically would need to site its activities outside of a listed species' habitat. While a landowner is not required to proactively conserve listed species (i.e., implement conservation actions), non-permitted take can result in civil or criminal penalties, including a fine of up to $50,000 per violation (Madsen 2015).

Recognizing the restrictiveness of the act's prohibitions, the FWS began introducing a number of programs to provide legal pathways for incidental take, as well as programs to incentivize proactive conservation efforts that are needed to successfully conserve many imperiled species for which the act's harm prohibitions are not sufficient to alleviate threats. Next we describe ESA programs applicable to listed species.

Section 7 and 10 Consultations and Permitting

Given prohibitions under the ESA, businesses have several legal options if they wish to proceed with activities such as timber harvest, infrastructure development and maintenance, or dam operations in a listed species' known habitat. Specifically, a business may seek permission to engage in an otherwise lawful activity through Section 7or 10 consultations and permitting.[7]

[7] Technically, these programs are not voluntary. What is voluntary is the decision to engage in an otherwise lawful activity with the potential to harm a listed species or its habitat. We do not consider the option of illegal take in the current analyses.

Section 7 processes apply to activities where there is a federal nexus, meaning that the activity occurs on public lands, involves federal funds, or requires permits from another federal agency. Otherwise, ESA permitting occurs under Section 10. In both cases, projects must prevent or minimize impacts to species by avoiding, minimizing, and rehabilitating impacts, and projects must offset unavoidable impacts through compensatory mitigation. While net conservation benefits are not required under Section 7 or 10, permits only can be granted under the ESA if they do not "appreciably reduce the likelihood of survival and recovery of the species in the wild" (USFWS and NMFS 1996; Madsen 2015).

Under Section 7, the relevant federal agency (e.g., with which there is a nexus) consults with the FWS to determine the conditions under which the activity can proceed. These conditions are then outlined in an incidental take statement that permits the activity. If the proposed action is likely to jeopardize the continued existence of the species or adversely modify designated critical habitat, the service makes a jeopardy or adverse modification determination. However, the resulting biological opinion must identify any reasonable and prudent alternatives that could allow the project to move forward.

Under Section 10, to acquire permits, the applicant must develop a Habitat Conservation Plan (HCP) that describes the likely impacts, how they are minimized and mitigated, alternative actions considered, the mitigation activities planned, and the funding available to implement those activities. Also required is a draft National Environmental Protection Act (NEPA) analysis that outlines alternative actions considered. These documents then are formally reviewed by the FWS, including an open public comment period, after which the agency may grant an incidental take permit that allows incidental take as long as the HCP guidelines are followed. The permit also provides "no surprises" assurances in which the FWS guarantees that no additional restrictions or actions will be required in the future. These Section 10 agreements can last 5 to 50 years.

The returns from engaging in Section 7 or 10 permitting are the flow of profits from engaging in the permitted activity relative to the profits if the activity were foregone or sited elsewhere. Thus, the primary returns under a Section 7 or 10 permit are the profit-producing activities otherwise not allowed. HCPs under Section 10 also provide benefits in terms of regulatory certainty through their "no surprises" assurances, without which future returns would be lower due to uncertainty about future compliance obligations.

The investment costs associated with Section 7 and 10 permitting include the immediate time, labor, and legal costs of developing an HCP or preparing for a Section 7 consultation. HCP development, for example, requires substantial technical expertise. Implementation of the

conservation agreement and mitigation activities can also be costly and may require activities such as fencing a listed species' habitat, educating employees about the species, reducing predator pressure, trans-locating species, improving in-stream flow and water quality to enhance species viability, restoring key breeding habitat, establishing a conservation easement, restoring disturbed habitat, hiring trained biologists to provide monitoring, habitat creation, or purchasing mitigation bank credits. HCPs also require monitoring over the duration of the agreement. Landowners can only withdraw from an HCP with agreement by all signatories, and failure to uphold the terms of the agreement could result in termination of incidental take permits.

For most businesses, Section 7 consultations often will have a higher ROI than Section 10 HCPs because the former's costs typically are lower. Under Section 7, the relevant federal agency involved in the project leads the consultation process, reducing businesses' administrative costs. Second, Section 7 consultations generally are completed much more quickly, because of applicable statutory timelines, thereby reducing costly delays. In contrast, it is not uncommon for HCP development and approval to take two years or more. Indeed, uncertainty and long time frames make development of green energy infrastructure under Section 10 permitting difficult, due to challenges in completing the project in necessary timelines and increased costs of financing (Keirnan 2015). For these reasons, businesses often look for a federal nexus when desiring to move forward with activities that intersect with a listed species. Nonetheless, renewable energy, oil and gas development, and energy infrastructure all often face lengthy compliance (at best) and project termination (at worst) due to possible listed species impacts (Male and Donlan 2015).

In regions where many similar businesses may benefit from Section 10 permitting, development of a programmatic HCP can greatly reduce costs and time associated with permitting over the long run. Programmatic agreements can be established by a city, county, government agencies, or citizen group. Then, landowners can enroll in the agreement, sometimes paying a fee for mitigation to the administering government or nonprofit entity, and agreeing to abide by a set of required management practices. Once established, a programmatic agreement substantially streamlines the permitting process for participants, thereby reducing costs and uncertainty, and increasing returns.

Safe Harbor Agreements (SHAs)

A Safe Harbor Agreement (SHA) is a voluntary agreement involving private or other non-federal property owners whose conservation actions contribute to the recovery of an ESA-listed species. In exchange for actions that contribute to recovery on non-federal lands, participating property owners receive formal assurances that no additional or different

management activities will be required of them for the duration of the agreement—assuming they fulfill the conditions of the SHA. In addition, at the end of the agreement period, participants may return the enrolled property to the original conditions that existed at the beginning of the SHA.

SHAs aim to create net conservation benefits for listed species. This program is most likely to be of interest to businesses that want to minimize long-term liability associated with a potentially increasing population of a listed species on its land. Why might a listed species population increase?

Increases in listed species abundance can result from conservation actions on nearby lands, such as habitat protection or species' reintroduction projects. Population enhancements also can result unintentionally from status quo business activities that happen to benefit a listed species. For example, profit-maximizing timber harvest rotation lengths may create an ideal mix of early and late successional habitats for a listed species. Also, improvements in a listed species' abundance or habitat quality may result from a deliberate business action aimed at recovery—either for stewardship motivations or strategically in the hope that the species may be de- or down-listed (thereby reducing longer-term compliance costs). In each of these cases, enrollment in a SHA would limit the participant's future compliance obligations by 1) providing assurances that no changes in management will be required of them, beyond the terms of the SHA, for the duration of the agreement; and 2) allowing the landowner at the end of the agreement to return his property to its original documented condition.

There are three primary financial returns from contributing to listed species recovery under a SHA. First, conservation efforts (incidental or purposeful) increase the potential for future reductions in compliance costs associated with the species being de-listed or down-listed. Second, the SHA participant avoids incurring additional compliance costs associated with increasing populations of a listed species on his land, as the agreement permits incidental take associated with agreed-upon, ongoing activities. Third, the option to legally return one's property to its baseline conditions at the end of the agreement enhances long-term management flexibility.

The costs of a SHA include the costs for plan development. If a programmatic agreement already exists in which the landowner can enroll, these costs may not be substantial. In addition, SHAs require that the landowner create a net conservation benefit for the species, through habitat enhancement, reintroduction programs, and other measures. The net benefit requirement can pose substantial costs to SHA participants depending on the existing condition of habitat on the property and whether the conservation benefit is achieved through management that also benefits ongoing economic activity. However, states or other entities can provide grants to landowners

via Section 6 funds to help offset the costs of conservation. NGOs also may provide funding in some cases. Also, SHA policy allows participants to withdraw from agreements prior to their end date by giving advance notice to FWS. This option provides more flexibility to participants and allows FWS to relocate the covered species if feasible.

Working Lands for Wildlife

Another program with some similarity to SHAs and Candidate Conservation Agreements with Assurances (CCAAs, discussed below) is the Working Lands for Wildlife (WLFW) program. The WLWF program is a partnership between the Natural Resources Conservation Service (NRCS) and FWS that has focused on protecting seven at-risk, candidate, and listed species, including the endangered southwestern willow flycatcher and the threatened bog turtle and gopher tortoise. This program currently is being expanded to target more species based on its successes with the original set. WLFW provides funding and technical assistance to agricultural producers in exchange for their implementation of best management practices to contribute to the species' conservation. Also, FWS provides regulatory predictability that no changes in activities will be required to comply with the ESA so long as the terms of the agreement are implemented.

The returns from this program when applied to listed species include regulatory predictability, as well as the potential for future de-listing of the species if a sufficient number of other landowners engage in the program. If de-listing is achieved, future compliance costs and uncertainty are reduced for all potentially regulated parties. Even without de-listing, WLFW participation guarantees that if a participant maintains stipulated conservation practices they can continue their agricultural and forest operations and remain compliant with the ESA for up to 30 years.

The costs of WLFW participation include the time and cost of entering into the agreement and the costs and opportunity costs from implementing the prescribed practices, net of funding provided by NRCS. In many cases, the actions prescribed under the WLFW program are "win-win" activities that have low opportunity costs or provide net benefits to the business over the long term, but may have high upfront costs, such as conifer removal in the sagebrush ecosystem that benefits greater sage-grouse and rangelands. The funding associated with the program aims to overcome these barriers and enhance the ROI of participation.

Conservation Banks

Conservation banking involves a landowner protecting and maintaining habitat for a listed, candidate, or proposed species in exchange for credits issued by the FWS that can be sold

or used to mitigate listed species impacts elsewhere. Banked land is protected in perpetuity by a conservation easement, management plan, and management endowment.

The returns from establishing a conservation bank are the revenues from selling credits. The costs include the purchase cost or opportunity cost of the land easement; the costs of bank planning, development, and maintenance in perpetuity; and the transaction costs, among others. Development of a conservation bank is therefore most likely to have a high ROI when the land is high-quality habitat for the covered species, inexpensive, and there is high demand for mitigation credits. It also is conceivable that a large landowning business could opt to create a conservation bank to provide credits for its own activities, in order to reduce and streamline off-site mitigation costs. This may be particularly attractive if the business owns high-quality habitat with a relatively low opportunity cost, perhaps in part due to ESA restrictions.

Programs Available for (Currently) Un-Listed Species

We next describe several programs applicable to at-risk or candidate species that have not yet been listed under the ESA. These species are not provided legal protections under the ESA, though state regulations may provide some protections. Candidate species are those species that have been found to warrant protection, but for which a final rule has not been issued due to higher immediate priorities. While these species may not yet have formal protections, investing in conservation ahead of ESA protections is believed to provide a number of benefits. Earlier conservation, before a species is highly imperiled, makes it more likely that less-costly measures can be taken to conserve the species, due in part to landowners having greater flexibility in their management choices. In addition, successful conservation may be more likely, such that conservation investments may preclude the need to list the species and avoid associated compliance costs. As such, the FWS has several programs for incentivizing pre-listing conservation.

For each of the programs described below, the landowner faces no current ESA restrictions, but there is the potential for a (or multiple) species on a property to be listed in the future. These programs encourage conservation actions that contribute to a precluded need for listing or that allow a species to be listed as threatened rather than endangered.[8] These outcomes could lead to the avoidance of or reduction in future compliance costs and business risks associated with new listings. Absent prelisting conservation programs, landowners face a higher

[8] As noted previously, if a species is listed as threatened rather than endangered, a 4d rule may sometimes be issued that could exclude certain activities from permitting requirements, thereby reducing compliance obligations.

probability of facing regulatory costs, including future delays and costs associated with permitting under Section 7 or 10 across the species range.[9] The benefits of avoiding a listing also extend to non-participating lands.

Candidate Conservation Agreements (CCAs)

CCAs are formal, voluntary agreements between the FWS and landowners or land managers, including federal land, to support the conservation needs of candidate species or species likely to become candidates in the near future. CCAs do not provide regulatory assurances. The primary private return from CCAs, besides their intrinsic stewardship value, is the potential to avoid a species' listing and the resulting compliance and Section 7 or 10 consultation costs, or for the species to be listed as threatened with favorable 4d exemptions that reduce compliance obligations. However, note that because CCAs lack assurances, CCA conservation actions have the potential to increase liability if the species is ultimately listed. For this reason, businesses engaging in conservation on non-federal lands will—all else equal—gain a higher ROI from participating in Candidate Conservation Agreements with Assurances (CCAAs), described next. CCA investment costs include the opportunity and management costs associated with implementing the approved conservation actions, including any competitive disadvantage the actions could impose, and the costs of plan development. Availability of programmatic agreements can substantially reduce planning and transaction costs, and engagement in CCAs also can serve as a platform for acquiring cost-share funding for the conservation activities.

Avoidance of a species listing may be more likely when threats to the species are well understood and straightforward to address. Also, conservation actions implemented earlier may be more successful at precluding listing, by allowing more time for them to be effective or for adjustments if needed. Avoided listing also is more likely when engagement in CCAs or other prelisting agreements is widespread among landowners, including federal agencies, or when the at-risk species' range is localized to within one or a few landowners' properties. In these cases, conservation efforts may cover greater proportions of the species' range.

Candidate Conservation Agreements with Assurances (CCAAs)

CCAAs build on CCAs by providing non-federal landowners with additional incentives to engage in voluntary, proactive conservation by providing assurances that limit future

[9] In the current analysis we do not consider the potential for preemptive habitat destruction in advance of listing, though it is a documented phenomenon (e.g., Lueck and Michael 2004).

conservation obligations. The CCAA program specifically targets non-federal landowners and guarantees that, if specified conservation activities are implemented, they will not be subject to additional restrictions if the species is listed in the future. More specifically, landowners must take conservation actions that—if undertaken by all other pertinent landowners—would be sufficient to preclude listing.[10] If they do so, participants receive a permit that authorizes a specific level of incidental take of the covered species should it become listed.

The returns from engaging in a CCAA come from both (1) greater regulatory certainty and (2) the potential for conservation actions to preclude listing. Several factors affect the magnitude of returns from regulatory assurances. Expected returns increase with the probability that the species will be listed and regulated under the ESA. Also, the returns from reduced regulatory uncertainty increase with a business's certainty about future management actions, as the participant receives an incidental take permit for the management activities described within the CCAA. The FWS may require detailed information about future impacts of anticipated management (e.g., a new land use) in order to evaluate and cover activities within a CCAA. Assurances reduce uncertainties and compliance costs associated with a species' listing that affects enrolled lands, so long as the participant does not want to alter activities relative to those covered in their CCAA. Without a CCAA, the business could need to undergo Section 7 or 10 consultations to proceed with management if the species is listed, leading to higher compliance costs and costs associated with uncertainty and delays. For these reasons, the returns from CCAA participation also are higher the sooner the species is likely to be listed, because avoided compliance costs will be less discounted the sooner they occur.

Besides regulatory assurances, a primary source of returns from CCAA participation is the potential for conservation actions to (1) preclude the need to list the species or (2) enable it to be listed as "threatened with 4d exemptions," rather than "endangered."[11] Of importance to these returns is the influence that a single business's conservation actions have on the species' expected status. The greater the influence, the greater the expected private returns from participating in the CCAA. Indeed, even single-participant CCAAs have been successful at precluding the need to list highly localized species (because a single landowner was able to mitigate all relevant threats). On the other hand, if numerous landowners affect the level of threat

[10] However, the Services have proposed revisions to the CCAA policy such that CCAAs will require participants to provide a "net conservation benefit", rather than using a standard defined relative to hypothetical actions of other landowners.

[11] It is important to note that "4d rules" have not been historically common though they have received greater emphasis in listings in recent years.

facing a species, a substantial collective effort may be needed to avoid listing. While in many collective action challenges individuals have incentives to free-ride on others' efforts (i.e., reap the benefits of others' conservation efforts without contributing themselves), several factors help to mitigate free-riding under CCAAs. First, to avoid listing, a sufficient level of conservation must be achieved, below which no one enjoys the benefits of avoided listing. Second, the returns from regulatory assurances, described above, provide individual incentives for participation even if the species were to be listed. As with CCAs, listing is most likely to be precluded when conservation needs are well understood and conservation actions have low costs of implementation and are implemented early.

Weighed against the potential returns are the costs to the business of engaging in a CCAA. The costs include the time and money to develop and enroll in a CCAA, though these costs are substantially lower when programmatic agreements are available. In addition, the costs include the direct and opportunity costs of implementing the agreed-upon conservation measures for the duration of the CCAA. These costs can vary substantially based on the needs of the species and the compatibility of existing or desired management activities with the species' conservation needs. For some land management activities, these costs can be quite low, such as when commercially desirable forestry management is beneficial to species. Costs also may be offset by funding available to participants through outside sources. Also relevant to costs is that the landowner can withdraw from a CCAA at any time by providing advance notice to the FWS, as specified in the agreement (typically 30 to 60 days). This helps maintain a business's flexibility to respond to changing conditions or needs and provides the FWS the opportunity to relocate the covered species if feasible.

Prelisting Conservation Policy

The Prelisting Conservation Policy was finalized in January 2017 and provides a mechanism for landowners, government agencies, and others to obtain credit for voluntary conservation efforts that benefit at-risk, unlisted species. To receive credits, conservation actions need to be undertaken within a state- or multistate-administered program[12] and be voluntary (i.e., not be mandated by federal, state, or local law). The conservation credits then can be redeemed or sold later to offset or mitigate potential harmful actions to the species post-listing, if the species is ultimately listed. In other words, credits from prelisting conservation actions can be

[12] In this way, the policy acknowledges the jurisdiction of the states over non-listed species, while ensuring that the actions implemented prior to listing will be accepted as creditable by the FWS post-listing.

used to offset a business's own actions post-listing or sold to other entities within the same service area that need to offset their impacts. The programs will be designed to contribute positively to the species' recovery by requiring that the benefit of a credited prelisting conservation action be greater than the detriment of the action for which the credits are redeemed.

Various crediting and trading programs (e.g., conservation markets) currently are under development in a number of states that may serve as pilot programs for the FWS's Prelisting Conservation Policy. The characteristics of the state-level programs will likely affect both the costs and returns from prelisting conservation.

A primary benefit of participation is the potential to avoid a listing or, if listed, to avoid having the species listed as endangered (rather than threatened). Either of these outcomes could reduce long term compliance costs by avoiding future restrictions and permitting delays. The program, however, does not provide regulatory assurances associated with an eventual listing outcome. Instead, the program, simply establishes that the credits from prelisting conservation can be used to offset or mitigate harm as part of Section 7 or 10 permitting agreements. Alternatively, businesses may opt to sell the credits to third parties to create revenue.

As with other programs, the further in the future a listing decision is likely to be made, the lower the private returns from prelisting conservation investments, as any returns will be more heavily discounted.[13] Returns will also be affected by the likelihood of a species being listed, the contribution of the conservation activities to reducing the likelihood of listing, the mitigation credit ratio (e.g., how much conservation benefit is needed to offset a given amount of detriment to the species), and the expected demand and supply of credits. While avoiding listing would increase returns from avoided compliance costs, a listing outcome is likely to increase credit demand, and hence their value.

The costs of prelisting conservation include the legal, planning, and implementation costs of the conservation actions and crediting agreements. These may include opportunity costs of forgone actions and the costs of any proactive conservation investments, such as acquisition or transfer of land or water for conservation of the target species; the cessation of land uses that negatively affect the species; restoration, enhancement, or continued management of habitat for the species; or participation in translocation or stocking. The policy does not specify a minimum level of conservation investment to participate in the program. Rather, the amount of credits

[13] However, conservation implemented earlier may be less costly, offsetting some of the effects of discounting.

allotted depends on the benefits produced. An advantage of this is that a business may be able to select a set of conservation measures that would provide the greatest conservation "bang for the buck" for the species, and forego those actions that may be more costly.

Habitat Conservation Plans

While HCPs are primarily for listed species, they also can include non-listed, at-risk species within the suite of species that they cover. The benefit to a business of doing so is that they would not need to develop a new HCP (in order to acquire an incidental take permit) if the species were to become listed during the duration of the existing HCP agreement. The required avoidance or mitigation measures would already be specified. This reduces regulatory uncertainties and potential delays in moving forward with planned economic activities. The returns from including a given species will be greatest for species with the highest risk of becoming listed during the duration of the HCP. Of course, including additional species may increase the costs of HCP development (as additional technical expertise may be needed) and the opportunity or direct costs of mitigation may be higher. The additional costs will likely be lower for species that have similar conservation needs to those already included in the plan or for which avoidance or mitigation is relatively easy and inexpensive.

Working Lands for Wildlife Program

In addition to covering two threatened species, the WLFW program also has a program aimed at non-listed, at-risk species, including the lesser prairie-chicken, New England cottontail, greater sage-grouse, gopher tortoise in its eastern range, and golden-winged warbler. This program provides similar profiles of returns and costs as a CCAA, as the programs provide regulatory predictability, technical expertise, and funding in exchange for landowners providing conservation benefits to the covered species. Again, for non-listed species, an aim of the program is to achieve sufficient conservation to avoid the need to list. In fact, several species covered by this program (e.g., New England cottontail, greater sage-grouse) have received "not warranted" listing decisions, in part due to the conservation achieved under the program.

Partners for Fish and Wildlife and Coastal Program

We conclude with a description of the Partners and Coastal programs, which aim to restore fish and wildlife habitats through voluntary agreements between a landowner and FWS. The Partners program is available to any non-federal and non-state landowner, while the coastal program is open to any partner. The programs apply to all species, but they focus on federally-listed, candidate, and imperiled species and their habitats. The FWS typically selects among potential partner projects based on where FWS expertise can contribute most to conservation of

imperiled species. Under this program, partners work one-on-one with a local FWS biologist and receive expert technical and financial assistance for conservation activities that typically aim to restore habitat. To implement a project, a cooperative agreement with a minimum duration of 10 years is signed. Following project completion, the landowner's investment is partially reimbursed based on the cost-sharing formula in the agreement. Agreements may potentially be converted to a CCAA or CCA.

Returns from program participation result primarily from the potential to avoid the need to list (or to list as threatened with 4d exemptions rather than endangered) and the associated reduction in compliance costs, unless the agreement is converted into a CCAA. The costs include those for setting up and designing the agreement, as well as the upfront and opportunity costs of implementing the conservation measures, net of the costs that are offset by the technical and financial assistance provided by FWS and other partners.

Summary

The diverse programs summarized in this section all seek to encourage private sector conservation actions, but differ in the incentives they provide landowners for doing so. Table 4 summarizes the compliance-related returns to voluntary program participation, and Table 5 outlines the factors that enhance those returns. While the applicable categories of returns vary greatly across programs, the types of costs and factors affecting those costs are fairly consistent. In general, the costs of participation are likely to be lower when species status, distribution, and conservation needs are well understood; agreement processes are well established; programmatic agreements are available; conservation activities have a low opportunity cost; baseline economic activities are relatively compatible with species; proactive conservation actions are inexpensive to implement; conservation is implemented earlier when available conservation measures may be less costly; partners contribute technical or financial assistance; and agreements are less complex and cover smaller areas and fewer species.

Table 4. Source of Private Returns from Voluntary Conservation Programs and Permitting Processes Under the ESA

	Avoided Opportunity Cost by Permitting Otherwise Prohibited Activities	Reduced Uncertainty Costs Provided by Regulatory Assurances	Reduced Delay Costs by Establishing Permits/Assurances in Advance of Listing	Reduced Expected Compliance Costs by Reducing Likelihood of Species Listing or Increasing Likelihood of De- or Down-Listing	Revenue Source from Sellable Credits
Section 7 Consultation and Permitting	X				
Habitat Conservation Plan (HCP) / Section 10 Permitting	X	X	X – if nonlisted species included in HCP		
Safe Harbor Agreement (SHA)		X		X	
Working Lands for Wildlife Initiative	X – potentially when applied to listed species	X	X – when applied to nonlisted species	X	
Conservation Banks					X
Candidate Conservation Agreement (CCA)				X	
Candidate Conservation Agreement with Assurances (CCAA)		X	X	X	
Prelisting Conservation Policy				X	X
Partners for Fish and Wildlife and Coastal Program				X	

Table 5. Factors Increasing Private Returns from Voluntary Conservation Programs and Permitting Processes Under the ESA

	Avoided Opportunity Cost by Permitting Otherwise Prohibited Activities	Reduced Uncertainty Costs Provided by Regulatory Assurances	Reduced Delay Costs by Establishing Permits/Assurances in Advance of Listing	Reduced Expected Compliance Costs by Reducing Likelihood of Species Listing or Increasing Likelihood of De- or Down-Listing	Reduced Expected Compliance Costs by Establishing Supply of Mitigation Credits in Advance of Listing	Revenue Source from Sellable Credits
Section 7 Consultation and Permitting	High opportunity cost of otherwise foregone activity					
Habitat Conservation Plan (HCP) / Section 10 Permitting	High opportunity cost of otherwise foregone activity	High costs of regulatory uncertainty (e.g. due to risk aversion by project investors)	For HCPs covering non-listed species: High probability of covered, non-listed species becoming listed; high costs of future project delay			
Safe Harbor Agreement (SHA)		High value associated with being able to return land to baseline conditions in future		Threats to species well understood and addressable. Substantial engagement in conservation by others across species range. High compliance costs associated with listing. High increase in likelihood of de-listing from participation.		
Working Lands for Wildlife Initiative		High value of certainty regarding future management of agricultural lands; High probability of covered, non-listed species becoming listed	High costs of delayed activities if target species were listed; High probability of covered, non-listed species becoming listed	Threats to species well understood and addressable. Substantial engagement in prelisting conservation by others across species range. High expected compliance costs in case of listing. High reduction in listing likelihood from participation.		
Conservation Banks						High demand for credits relative to supply.

Table 5 cont. Factors Increasing Private Returns from Voluntary Conservation Programs and Permitting Processes under the ESA

	Avoided Opportunity Cost by Permitting Otherwise Prohibited Activities	Reduced Uncertainty Costs Provided by Regulatory Assurances	Reduced Delay Costs by Establishing Permits/Assurances in Advance of Listing	Reduced Expected Compliance Costs by Reducing Likelihood of Species Listing or Increasing Likelihood of De- or Down-Listing	Reduced Expected Compliance Costs by Establishing Supply of Mitigation Credits in Advance of Listing	Revenue Source from Sellable Credits
Candidate Conservation Agreement (CCA)				Threats to species well understood and addressable. Substantial engagement in prelisting conservation by others across species range. High expected compliance costs in case of listing. High reduction in listing likelihood from participation.		
Candidate Conservation Agreement with Assurances (CCAA)		High value of certainty regarding future management of enrolled lands; High certainty about desired future use of land when agreement established; High probability of covered, non-listed species becoming listed	High costs of delayed activities if target species were listed; Future land uses known and planned for when agreement established; High probability of covered, non-listed species becoming listed	Threats to species well understood and addressable. Substantial engagement in prelisting conservation by others across species range. High expected compliance costs in case of listing. High reduction in listing likelihood from participation.		
Prelisting Conservation Policy				Threats to species well understood and addressable. Substantial engagement in prelisting conservation by others across species range. High expected compliance costs in case of listing. High reduction in listing likelihood from participation.	Threat reduction costs lower in advance of listing than post-listing; High expected compliance costs in case of listing; fewer delays if mitigation credits established in advance of listing	An established state program; high demand for credits relative to supply; high probability of species being listed
Partners for Fish and Wildlife and Coastal Program				Threats to species well understood and addressable. Substantial engagement in prelisting conservation by others across species range. High expected compliance costs in case of listing. High reduction in listing likelihood from participation.		

4. Prospects for Quantifying the Key Factors

This section offers thoughts on the kinds of data and analyses a company could use to assess the factors affecting conservation ROI described above. An overarching point is that while all of the costs, uncertainties, and benefits described earlier could be converted into monetary terms, it will be very difficult—and perhaps unimportant—to do so.

Is Fully Quantitative ROI Analysis Realistic?

Most business decisions involve a weighing of pros and cons. Not all business decisions, however, rely on quantitative or monetary metrics. To what extent do businesses already quantify environment-related business benefits?

An RFF study conducted in the 1990s offers one—perhaps provocative, and potentially outdated—perspective on this question (Boyd 1998). The study, in cooperation with three firms (Dow Chemical, Monsanto, and DuPont), explored financial decisionmaking and the degree to which environmental costs and benefits were monetarily quantified as pollution prevention investments were evaluated. The study found "relatively little quantification of environment-related financial benefits and costs." One explanation for this is the technical and legal difficulty of predicting future environmental compliance costs. However, the study also found that un-quantified environmental (and legal) benefits were given significant qualitative value in the decisionmaking process.[14]

Our perspective is that firms can (and should) engage in ROI thinking about conservation programs, but should not expect to easily "fill out a spreadsheet" with monetary estimates of costs and benefits.

Direct and Indirect Participation Costs

One exception is the quantification of conservation's direct costs. Direct costs are the investments in engineering, labor, construction, and operation of conservation actions. These are relatively easy to quantify because restoration is a widespread private sector, NGO, and governmental activity with abundant data (for example, available from consulting firms and NGO and academic studies). These costs are more or less "tangible" and consistently collected in

[14] For example, the companies' "paper trails" (strategic analyses, management presentations) were permeated with qualitative depictions of how the proposed investment was likely to affect future environmental and legal conditions.

monetary terms. (In the bulleted items below, we provide thoughts on where corporate conservation managers can get input related to the factors discussed on data and tools pertinent to an ROI analysis.)

- Does the firm have data on restoration and conservation costs? If not, such data is widely available from contractors, consultancies, and the practitioner literature.

In contrast, the indirect costs associated with participation are more speculative and idiosyncratic to specific firms, their operations, and locations. Recall that indirect costs arise when a firm is prohibited (by a voluntary agreement) from operating in ways beneficial to it. For example, if a firm agrees to conserve a parcel of land, that means it cannot develop the land now or in the future, even if it is privately beneficial to do so. Those foregone benefits are a cost to participation. But how large is that cost? That depends on a range of factors related to the firm's specific business opportunities and how those opportunities are likely to change over time, given changing markets and technology.

Conservation of a parcel that is highly unlikely to be commercially valuable has a low opportunity cost. Conservation of a parcel that is highly likely to be commercially valuable has a relatively high opportunity cost. Such rough judgments can be made, short of the ability to monetize them.

- Does the firm have established financial or accounting procedures to quantify the future value of its lands or value of operational flexibility? If so, the impact of conservation restrictions on those values could be incorporated.

Dependence of Costs on Specific Program Requirements

To estimate costs, firms must understand what the specific requirements for participation in a program are. This typically means that a firm must invest in engagement with the FWS or state wildlife agencies before it can begin exploring specific options and estimating costs and benefits.

There are exceptions, however. One in particular is when there is already a programmatic agreement in place. Programmatic agreements are in a sense pre-negotiated and pre-specified. This makes it easier and cheaper for firms to assess the pros and cons of participation.

- Firms should pay close attention to the availability of existing or proposed programmatic agreements. FWS field offices, state wildlife agencies, and specific programs (such as the WLFW) should be monitored for such opportunities. Some programs may also offer financial support to offset costs associated with participation.

Compliance-Based Returns

Quantification of compliance-based returns is complicated by legal and regulatory uncertainties. Will a species be listed and, if so, what regulatory requirements will emerge from that listing? Another complication is that regulatory requirements typically are not generic—that is, they are specific to particular land and water resources in specific places. In effect, firms must biophysically map possible regulatory requirements onto their own land and resource holdings. In other words, even if it was known with certainty that a given species was to be listed in five years and would involve known habitat protections and enhancements, a specific firm would need to conduct ecological analysis of its lands and operations to determine (1) if it will be subject to regulatory constraints or (2) if its lands and operations provide opportunities for voluntary, beyond-compliance conservation.

- Some firms may have established procedures to quantify current and future ESA-related compliance costs. Coordination with in-house legal counsel and regulatory affairs personnel could help clarify current and future baseline compliance costs, as well as compliance-related cost savings from participation in a voluntary conservation program.
- State Wildlife Action Plans[15] or other state conservation strategies can provide useful guidance on both the type and the location of conservation actions most beneficial to particular species.

In order to understand the upside of participation—the returns—it will typically be important for the firm to understand not only the program's costs, but also the assurances and other advantages possible under an agreement. This means that—as with understanding costs—engagement with the FWS may be necessary to understanding the program's benefits. Again, this highlights an advantage to participating in an existing programmatic agreement.

We have also noted the potential for voluntary programs to reduce legal and operational risks (such as when they provide assurance of the ability to maintain current operations even in the event of a future species listing, or when they minimize the threat of noncompliance penalties).

- Does the firm already quantify the value of risk reduction and, in particular, environmental risk reduction? If so, the impact of conservation program participation on regulatory and operational risk could be incorporated.

[15] See http://teaming.com/state-wildlife-action-plans-swaps.

For any pre-listing conservation program, key factors driving the incentive to participate are the probability and timing of future listings.[16] In general, the more likely a species listing is, the higher the returns to participation will be. Also, the nearer that listing is expected, the higher the returns to participation (simply due to discounting). This means that any information on the likelihood and timing of new listings is valuable. Since 2011, the FWS has produced a "Listing Workplan" that provides such information (the most recent workplan sets priorities for the period 2017–2023). Note that inclusion on the workplan list does not mean a species will be listed. Rather, the workplan reflects FWS priorities for and the timing of analyses of the appropriate listing status for species.

- In order to get a sense of the probability and timing of potential future listings, firms should start by consulting the FWS workplan. Firms can also consult *Federal Register* documents as source of information on the status of and threats to species. Regular communication with state or regional FWS offices, as well as state wildlife agencies, also can help firms estimate the timing and likelihood of future listings.

Reputation (CSR) Advantages

Businesses routinely engage in environmentally beneficial behaviors that are not motivated directly by statutes or regulations. They engage in a variety of actions that go beyond compliance and that can loosely be described as voluntary. But while voluntary, these actions should usually not be considered altruistic.[17] The motivation often remains profit maximization. So, apart from compliance-related, bottom-line benefits, will participation in proactive conservation yield bottom-line reputational and marketing benefits? We can only speculate. On one hand, we are not aware of any corporate environmental CSR programs that trumpet participation in ESA voluntary programs. Nor can we point to any evidence that failure to participate has been bad for any firm's reputation. On the other hand, participation in an ESA program that provides net conservation benefits (e.g., a SHA, CCAA, CCA, or Partner agreement) can easily (and legitimately) be marketed as an environmentally and socially beneficial corporate practice.

[16] To be clear, by itself, this information is not enough to calculate an ROI, since firms also need to know the obligations or restrictions imposed by a final listing rule.

[17] As noted earlier, altruistic motivations may play a role in decisionmaking, but are distinct from the profit-oriented motivations we explore in this analysis.

In principle, CSR and reputation enhancements could have a bottom-line value expressible in dollar terms. Our guess, however, is that most firms take a more qualitative approach to weighting reputational factors.

- Does the firm have established procedures to quantify environmental marketing and reputation benefits? If so, the impact of conservation program participation on those benefits could be incorporated.

5. Measuring Social Ecosystem Services Benefits

Previous sections have focused on firm-specific returns to participation in voluntary ESA species conservation programs. But conservation actions undertaken in these programs can yield benefits to society beyond their benefit to target species. Typically, benefits of conservation extend well beyond a particular landowner's property or business interests. To the extent that companies are interested in improving social welfare (which we do not presume), they may be interested in measurement of these broader social benefits. In addition, measuring and communicating these benefits could be beneficial to a firm's marketing and reputation if a clear connection can be made between their conservation actions and social outcomes. Doing so requires analysis of "ecosystem services."

Analysis of Ecosystem Goods and Services

The term "ecosystem services" refers to socially valuable ecological resources. Ecosystem goods and services include the ecological features, qualities, or commodities we value—such as food, timber, clean drinking water, available water for irrigation, transportation, and industry, clean air, scenic beauty, and species important to us for recreational, ethical, or cultural reasons. Ecosystem goods and services also relate to nature's ability to protect us from harm. For example, wetlands and natural coastlines provide a service by protecting against flood damages. And trees and other plants provide a service by sequestering carbon and thereby reducing the costs of mitigating greenhouse gas emissions.

Many private sector decisions (as well as those made by governments and NGOs) affect the delivery of ecosystem goods and services. Carbon sequestration practices, water allocations, land uses, air and water quality regulations, and resource management choices all affect nature's delivery of ecosystem goods and services, as will many of the conservation measures applicable under the ESA programs described above. In general, ESA program conservation projects will generate a cascade of ecological effects—most of which are socially positive. Specific ecosystem services, such as carbon sequestration, improved water quality, aesthetic enhancements valuable

to recreationalists and communities, or reductions in flood risk, represent a set of public returns to conservation.

The evaluation of ecosystem services involves biophysical evaluation associated with the natural sciences, including ecology, hydrology, biology, and soil science. If we want clean air and water, healthy and abundant species populations, pollination, irrigation, and protection from floods and fires, how can we take action to preserve these things? The natural sciences describe how ecosystems function, the factors that threaten ecological functions, and our ability restore, enhance, or protect functions in decline.

When ecologists or other natural scientists speak of ecological processes or functions, they are referring to the transformation of one set of biophysical conditions into another. Ecologists and economists refer to these processes as biophysical production functions (US EPA 2009; Daily and Matson 2008). Biophysical production functions provide the causal link between ecological stresses—from land development, climate change, invasive species—and losses in ecosystem goods and services. They also provide the link between ecological protection or enhancement—from conservation, regulation, restoration—and improvements in ecosystem services. Measurement of these production functions requires investment in evidence-based ecology that explicitly focuses on the relationship between observable stresses to ecological systems and desirable ecological outcomes.

In addition, there is a corresponding range of inquiry focused on the measurement and communication of the social and economic benefits of ecosystem services. As with all of the returns discussed in this report, some are easier to quantify than others. A relatively easy ecosystem service value to quantify is carbon sequestration (Siikamaki et al. 2012). This is due to the existence of many models relating land cover to carbon sequestration and an established "social cost of carbon." It is more difficult to quantify flood risk reduction or water quality benefits. A challenge associated with such ecosystem services is that their beneficiaries are often located far from the conservation action itself. This means that analysis requires ecological production functions that are able to capture the spatial delivery of ecosystem services.

Often, social assessment of ecosystem services takes the form of economic, monetary evaluation of the services' value. It should be noted that there are also non-economic, non-monetary approaches to ecosystem services evaluation (Hagerhall 2001; Boyd and Wainger 2002; Sherrouse et al. 2011).

Most private business will lack the internal natural or social science expertise to conduct analysis of ecosystem services. However, academic, NGO, and governmental scientists are

increasingly developing data and methods to relate conservation actions to socially desirable ecological outcomes. A review of this field is beyond this report's scope. For one summary of the state of practice see the National Ecosystem Services Partnership (2014). Private sector partnership with ecosystem services experts is well underway in many sectors (World Business Council for Sustainable Development 2011).

We stress that these public ecosystem services benefits are, by definition, those that do not contribute to the firm's bottom line.[18] Accordingly, they do not pertain to the "business case" we have emphasized in this report. Firms may nevertheless be interested in how the NGO, academic, and governmental sectors approach conservation ROI analysis.

"Public" Conservation ROI Analysis

The NGO community increasingly practices its own form of conservation ROI analysis. Many conservation NGOs face their own questions about whether a conservation project is worth the investment. (For example, the Nature Conservancy annually spends hundreds of millions of dollars globally on conservation projects.) To help inform that community, scientists and practitioners have developed ROI data and tools to inform the NGO sector. For an overview and synthesis of this field see Boyd et al. (2015).

NGOs' interest in these methods is motivated by the need to wisely deploy scarce financial and institutional resources, make evidence-based decisions, and evaluate and communicate the relevance of conservation to a wider spectrum of stakeholders and supporters.

In one sense, public ROI analysis is equivalent to the firm-specific ROI analysis described throughout this report. Both require an array of linked data on conservation actions, costs, predicted threats, baseline ecological and social conditions, and data to measure or predict the impacts of investment on conservation outcomes. However, there are differences. Most obviously, NGO analyses do not focus on (or particularly care about) whether or not conservation is in the interests of private sector businesses. Rather, they are focused on their own conservation missions.[19] Private and "public/NGO" studies also tend to differ in their geographic scale and need for precision.

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[18] While certain ecosystem service benefits may accrue directly to the firm in some cases (e.g., habitat conservation investments that also protects a firm's infrastructure from flooding) —and hence would be considered in private sector ROI analysis—we consider these as distinct from public benefits.

[19] However, private sector ROI analysis of conservation programs, such as the ESA programs reviewed here actually could be an important input to public conservation ROI analysis for several reasons. First, among the

Firm-specific ROI analysis is an approach for evaluating a single (or a small number of) option(s). In contrast, public conservation ROI analysis typically examines a larger portfolio of options (e.g., land parcels in a region or country). To date, most public conservation ROI studies focus on broad global, national, or regional assessments—and rely on correspondingly "crude" measures of costs and benefits. For example, researchers almost never have access to data on the costs of conservation to specific firms or property owners (whether direct capital and labor costs or indirect opportunity costs). Rather, at best, they rely on national or regional property value data as a proxy for costs.[20]

Historically, public ROI studies have focused on a narrow set of conservation returns: almost always some measure of biodiversity protection, though there is a great deal of variation in how biodiversity is defined. Some studies assume a species is protected if it occurs within at least one protected site, some consider broader landscape conditions and species interactions, and others rely on habitat types as a proxy for species protection. Most studies focus on species measures (e.g., species presence) rather than species-specific habitat needs. There are at least two practical reasons for this approach. First, species-specific habitat needs can be difficult to identify, quantify, or generalize. Second, the relationship between a portfolio of conservation actions and biophysical outcomes (e.g., the effect of the protected sites' spatial configuration on species outcomes) is a product of complex processes that may easily vary by location and conservation objective. Even for conservation NGOS, inclusion of such detail makes it more difficult to model and identify the highest-return conservation portfolio.

A review of this literature underscores other challenges identified earlier in this paper. One of these is how to define future baseline conditions. Because threats to biodiversity vary greatly across locations, it is difficult to establish a generalizable procedure for predicting future conditions. Researchers continue to struggle with the best way to predict biodiversity conditions in the absence of conservation.

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investments that an NGO or public entity could choose is partnering or cost-sharing with a private sector entity to achieve conservation. This strategy could provide a greater bang for their buck in some cases, than going it alone. Second, the programs described in this paper are designed to achieve public conservation goals (i.e., species conservation). Understanding the firm-specific ROI is important for anticipating the effectiveness of such programs for engaging the private sector in achieving conservation outcomes and designing future programs.

[20] Even so, such analyses can yield very useful results. For example, one study (Ando et al. 1998) found that if heterogeneous land prices in the United States are factored into analysis of which parcels to protect, nationwide species conservation targets could be met at one-quarter to one-half the cost of plans that do not account for differences in land prices.

Also, NGO conservation ROI analyses usually only consider biodiversity returns (not a broader suite of ecosystem service benefits).[21] While predicting biodiversity returns is itself a challenge, it is obviously more difficult to predict a wider suite of ecosystem services returns. For example, consider ROI studies that employ species-area relationships to predict biodiversity benefits. Analysis of ecosystem services requires a set of analogous empirical relationships (the ecological production functions described earlier) that translate conservation investments into outcomes like improved water quality.

6. Conclusion

The report shows how an ROI framework can be used by private sector conservation managers to clarify their judgments regarding the business case for conservation investments. We identify—for specific programs and decision contexts—a taxonomy of factors affecting the costs and benefits of voluntary conservation. Finally, we provide guidance on the kinds of quantifiable analysis and information needed to give ROI analysis more certainty. Because ESA conservation program investments typically involve future costs and benefits, ROI analysis should take into account the flow of costs and benefits over time, discounting as appropriate.

Beyond altruistic or marketing advantages, the main potential benefit to firms of voluntary program participation comes from reduced compliance costs. Such reductions are by no means guaranteed. But as we have shown, compliance cost advantages are indeed possible and thus worthy of evaluation.

Finally, we note that the public interest may be served by proactive conservation actions by the private sector. Thus, it is also in the interest of the FWS and other conservation advocates to understand incentives created by these voluntary programs. We hope that the tradeoffs, uncertainties, and information needs identified in this report will be of use to this broader community as well.

[21] Though see Polasky et al. (2005).

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