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Thirty years of species conservation banking in the U.S.: Comparing policy to practice

Maria Jose Carreras Gamarra[a,*], Theodore P. Toombs[a,b]

[a] Environmental Defense Fund, Ecosystems Program, 1875 Connecticut Ave. NW Washington D.C., 20009, USA
[b] Colorado State University, Fort Collins, CO 80523, USA

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ABSTRACT

Thirteen years after the release of the U.S. Fish and Wildlife Service "Guidance for the establishment, use, and operation of conservation banks", a draft "Endangered Species Act Compensatory Mitigation Policy" has been released. Understanding whether this draft Policy improves the existing Guidance and incorporates lessons learned requires a review of the practices of currently approved banks. We assess the practices that species conservation banks report, compare them with the 2003 Guidance and international biodiversity offset principles, and assess the degree to which the draft Policy advances conservation banking policy. Results show that banks have generally been well aligned to the recommendations of the 2003 Guidance, but fall significantly short when compared to the analyzed offset principles. Although the draft Policy significantly advances conservation banking policy, future policy updates that provide clear minimum standards on accounting methods, estimation of counterfactual scenarios and monitoring practices are still necessary, together with a greater transparency through reporting and the adoption of new methods and tools to meet the no net loss/net benefit goal.

1. Introduction

Species conservation banking has become an accepted compensatory mitigation and endangered species recovery tool across the U.S. However, more than three decades after the establishment of the first bank, the success of the approach in terms of species recovery is still unclear (Fox and Nino-Murcia, 2005; Madsen et al., 2010; Pawliczek and Sullivan, 2011; Wilcove and Lee, 2004). According to referenced researchers, the reasons stem from a lack of transparency in their design and execution, outdated policy, lack of adequate accounting, lack of evidence of net benefit, and a lack of innovative on-the-ground pilot initiatives (Bunn et al., 2013; Fox and Nino-Murcia, 2005; Gelcich et al., 2016; Mills, 2004; Pawliczek and Sullivan, 2011). The lack of systematic monitoring and evaluation of species conservation banking policy, practice, and outcomes contributes to the lack of clarity on its successes and failures.

Species Conservation Banks (SCBs) are one of the available compensatory mitigation mechanisms recognized by the U.S. Fish and Wildlife Service (USFWS), along with in-lieu fee, permittee responsible mitigation, Habitat Exchanges, and other third party mitigation arrangements. SCBs are parcels of land conserved and managed in perpetuity for listed or candidate species through a legal instrument, and are meant to offset adverse residual impacts occurring elsewhere. A project proponent can buy credits (i.e., conservation benefits to the species) from a bank to offset the project's impacts through a one-time purchase ([USFWS] U.S. Fish and Wildlife Service, 2003). The first Species Conservation Bank (SCB) was established in California in 1986 for the least tern (*Sternula antillarum*) and fish associated with intertidal and subtidal habitats ([RIBITS] Regulatory In-Lieu Fee Bank Information Tracking System, 2016). Nine years later the first SCB policy was issued by the State of California (California Natural Resources Agency, 1995). By 2002, the first bank was established outside of California (in Arizona), and one year later the USFWS issued national guidance ([USFWS] U.S. Fish and Wildlife Service, 2003). Given the large number of SCBs in existence and their long track record, assessment of current banking practices can serve to inform future policy updates.

Only one comprehensive review of SCBs in the U.S. has been published (Fox and Nino-Murcia, 2005). This effort, which included 35 of the now 138 approved banks, concluded that "conservation banking offers at least a partial solution to the conservation versus development conflict over biodiversity," although many ecological uncertainties remain (Fox and Nino-Murcia, 2005, p. 996). The authors offer suggestions to improve the practice and reach its full potential to contribute to species recovery and eventual delisting. These include a comprehensive information platform that effectively ensures transparency and

* Corresponding author at: 3803 13th St. NW Washington D.C., 20011, USA.
E-mail addresses: mjosec@iadb.org (M.J. Carreras Gamarra), ttoombs@edf.org (T.P. Toombs).

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promotes information sharing and the development of objective credit and debit metrics.

Clear standards and regulations that reduce uncertainty, increase transparency, and adequately address current deficiencies are broadly considered essential to overcome the challenges faced by conservation banking programs and drive investment in mitigation (Bunn et al., 2013; Mills, 2004). The [USFWS] U.S. Fish and Wildlife Service (2003) "Guidance for the establishment, use, and operation of conservation banks" (hereafter "Guidance") was developed in 2003 to serve this role (Fox and Nino-Murcia, 2005; Mann and Absher, 2013). Modeled after California's 1995 policy, its intent was to streamline banking processes and turn the approach into an accessible and widespread tool for achieving recovery of endangered species (Fox and Nino-Murcia, 2005; Mann and Absher, 2013). Despite lessons learned from on-the-ground experience, and the rapid growth of peer-reviewed literature on offset practices (Gelcich et al., 2016), no major changes in federal species conservation banking policy have been made since the Guidance was released. In recognition, and as part of the effort to overhaul all mitigation policies, the U.S. Department of the Interior launched the Draft Endangered Species Act Compensatory Mitigation Policy (hereafter "draft Policy") in 2016 ([USFWS] U.S. Fish and Wildlife Service, 2016), which is intended to replace the Guidance and other regulatory documents.

Understanding whether the draft Policy will improve the existing Guidance and incorporate lessons learned over time requires a baseline understanding of the current performance of approved banks. The following research questions guide our assessment: (1) What are the characteristics of current SCB practices? (2) How well does current practice meet the recommendations in the 2003 Guidance? (3) How well does current practice compare to international biodiversity offset principles ([BBOP] Business and Biodiversity Offsets Program, 2009), as a more frequently updated global benchmark for SCB and other similar offset programs? and (4) What are the implications of the 2016 draft Policy if it were to be adopted in the U.S.? To answer these questions we: (1) review and summarize the reported practices of all federally approved SCBs in the U.S.; (2) compare these results with the recommendations articulated by the Guidance and international best practices; and (3) assess the differences between the two U.S. policies and the degree of change in banking practices that might be required to meet the new draft Policy if it were to be adopted.

Our focus on SCBs over other types of compensatory mitigation was based on several issues. First, there is a need to carefully reassess banks with a larger data set, since the last assessment was in 2005 and covered only one quarter of currently approved banks (Fox and Nino-Murcia, 2005). Secondly, SCBs have been held to relatively high regulatory standards compared to in-lieu fee and permittee responsible mitigation. Third, SCBs have the most accessible track record of implementation, when compared to other approaches. Finally, because of the above there is potential for SCBs to contribute substantially to the recovery of species and to reduce conflicts between development and species protection. We acknowledge that a focus on SCBs prevents drawing broad conclusions of the overall effectiveness of compensatory mitigation under the U.S. Endangered Species Act (ESA) which, although imperative, requires a broader analysis that goes beyond the scope of the present assessment.

2. Methods

2.1. Document review and synthesis

We used the Regulatory in-lieu Fee and Bank Information Tracking System (RIBITS), an online database developed by the U.S. Army Corps of Engineers, to obtain information on all federally approved SCBs in the U.S. (https://ribits.usace.army.mil). We excluded permittee-responsible mitigation and in-lieu fee mitigation from the analysis. We compiled all SCBs in RIBITS and synthesized the available reported information based on the following categories:

- Category 1: general practices:
  - Status
  - Target
  - Location
  - Type of ownership
  - Approval date
  - Transactions
- Category 2: availability of documentation
- Category 3: credit accounting (where credits are the translation of the values of the natural resources of the area):
  - Consideration of habitat quality
  - Currency or method used
  - Equivalency
- Category 4: other reported practices:
  - Goal of biodiversity offsets (no net loss/net benefit) and principles of biodiversity offsets related to credit accounting: additionality, like-for-like.
  - Technical concepts of offsets (e.g., leakage, counterfactual scenario, proximity)
  - Methods to address uncertainties/risks of offset success
  - Social aspects
  - Management and monitoring activities
  - Legal, administrative, and financial aspects

The general practices included in Category 1 are useful for determining the general design of SCBs. Since there is no standardized reporting format, the number and type of documents available for each SCB varies widely. This lack of consistency and its implications are addressed in Category 2. The method used for calculating credits (Category 3) was determined using the transaction data provided by the credit ledger and, where available, any credit evaluation documents. Credit accounting is a key aspect of SCB practice, and the method used is suggestive of the ecological performance of SCBs. The other reported practices (Category 4), although not exhaustive, are useful for determining the scientific and technical elements of banking and are explicitly highlighted in the documents available in RIBITS (where available), in national polices relevant to conservation banking practices, and/or in biodiversity offset principles of best practice.

Our assessment was limited to the data available in the credit ledger, for information about credit accounting, and in the documents posted on RIBITS, which were reviewed for keywords that relate to the SCB practices outlined above. If the practice was reported in the available documentation, and language was included suggesting how it was addressed or accomplished, then we considered that the SCB fulfill that category; practices that were not reported resulted in SCBs not fulfilling the corresponding category. Our assumption was that the documents were fully inclusive of all practices implemented, and that the reported practices reflect the full actual implementation on-the-ground. We cannot discern whether SCBs are implementing practices that are not mentioned, or not fully implementing those that are reported from RIBITS. However, RIBITS is the only federally-managed database that centralizes documentation related to SCBs, and the only federal platform with the potential of providing a snapshot of bank practices without resorting to field assessments.

2.2. Comparison of U.S. species mitigation policies to SCB practice

We reviewed the 2003 Guidance and the 2016 draft Policy to identify the primary SCB recommendations and requirements included in each. The policies were first analyzed separately, and then in comparison to each other, identifying the primary differences between the Guidance and the draft Policy. We then compared the recommendations in the Guidance to SCB reported practices to determine the degree to which SCBs are consistent with the Guidance recommendations.

2.3. Comparison of international biodiversity offset principles to U.S. mitigation policy and SCB practice

We finally assessed the degree to which the new draft Policy moves away from the Guidance and approximates international biodiversity offset principles as defined by the Business and Biodiversity Offsets Program's (BBOP) ten Principles on Biodiversity Offsets ([BBOP] Business and Biodiversity Offsets Program, 2009; hereafter "Principles"), and the degree to which current SCB practice meet the Principles. The Principles were assumed to be the benchmark for comparison because: 1) BBOP has been in existence for almost 15 years and has been actively testing and developing best practices on biodiversity offsets and conservation banking globally; 2) > 80 worldwide experts, practitioners, and organizations actively support the organization; 3) BBOP has published extensive research on the topic; and 4) BBOP is directly involved in the design of offset policies and strategies, interacting with governments and offset developers worldwide. The Principles help define a level playing field for companies, while providing guarantees to environmental stakeholders and financial institutions. As such, even though SCBs are not expected to comply with the Principles, they can serve as an appropriate benchmark for future improvement of banking practices.

3. Results

As of August 2016, a total of 154 SCBs were listed on RIBITS (119 approved banks, 19 sold out and 16 pending for approval). We excluded pending SCBs from our analysis due to the absence of documentation for them in the system. No documentation was available for an additional 43 of the remaining 138 approved or approved and completed (i.e., banks that have sold all of their credits) SCBs. We reviewed, compiled, and synthesized information on the credit accounting and other listed reported practices of the 95 SCBs for which we found data (see Appendix A for detailed results).

3.1. General Species Conservation Bank practices

General practices of SCBs are summarized in Table 1. Since the first SCB was established in 1986, the annual rate of bank establishment has been constantly increasing: while only 11 SCBs were established in the first 10 years, 59 have been approved in the last decade. The 138 SCBs reviewed cover 195,896 acres (79,276 ha) of land across 16 different states, intended to manage and protect habitat for 77 species. Although most of the covered species are federally and/or state listed, a limited number of plant species included within the California Rare Plant Ranking System are also covered (e.g., Dwarf Downingia, *Downingia pusilla*), as well as species under review for federal listing (e.g., Lesser Prairie-Chicken, *Tympanuchus pallidicinctus*). SCBs are also in place for one species that has been delisted due to recovery (Delmarva Peninsula fox squirrel, *Sciurus niger cinereus*), and for one species that has been recently withdrawn from the candidates species list (Greater Sage-Grouse, *Centrocercus urophasianus*). Although all SCBs are species-focused, higher levels of biodiversity organization (sensu Noss, 1990) can be targeted, such as habitat, ecosystem, or both.

More than 50% of SCBs are located in California and the state harbors the most acreage in banks (32% of total acreage of SCBs in the U.S). Between 1986 and 2000, all SCBs were established in California, which continued to dominate SCB delineation from 2000 to 2010. After 2010 the trend changed, and the number of new banks established in other states outpaced the rate in California. The state's leadership in SCB establishment is likely due to the existence of both federal and state biodiversity protection laws that drive demand, the large pool of potential credit buyers, and relatively high credit prices (Fox and Nino-Murcia, 2005).

3.2. Availability of documentation

Only 69% of approved SCBs make their documentation available in RIBITS, and the number and type of documents available varies significantly. For some banks only the Conservation Banking Agreement (CBA) has been uploaded (6%); for others, several administrative documents, legal agreements, and/or management plans are available in the on-line repository, providing information on banking practices that are usually not included in CBAs (e.g., credit evaluation tables, conservation easement deeds, development plans).

Table 1
General practices of 154[a] Species Conservation Banks in the U.S as documented in the RIBITS[b] database.

Characteristic		Data[b] (n = 138)
Status	Approved	119 (77%)
	Sold-out	19 (12%)
	Pending	16 (11%)[a]
Target species	Number of species covered	77, both federally and state listed species
	Most targeted species	Vernal Pool Fairy Shrimp, targeted by 35 SCBs
Location	States	16 out of 50 (32%) of the states have SCBs
	States with the largest # of SCBs	California (100, 72%), followed by Florida (12, 9%)
Ownership	Private-commercial	113 (82%)
	Single-client	13 (9%)
	Combination public/private	6 (4%)
	Public - commercial	4 (3%)
	Private - nonprofit	2 (2%)
Establishment	Establishment of first SCB	1986
	Period with largest # of SCBs established	2007–2010 (37 SCBs).
	SCBs established per year	On average, 4.5
	Annual growth rate	17.20%
Area	Total	195,896 acres (79,276 ha) of land are covered by SCBs
	Per bank	17% of SCBs are < 100 acres (40 ha). Size ranges from 5 to 50,5000 acres (2–204,366 ha)
	Per state	California has the largest area (32%); Wyoming follows (26%)
Documentation	SCBs with documents in RIBITS	31% of all SCBs do not have any documents available
	Type of available documents	6% provide only the CB Agreement (or equivalent); 51% have management, operations and/or development plans available
Transactions	Per bank	67% of SCBs between 1 and 150 transactions; 12% no transactions; 4% over 150 transactions
	SCBs with > 50% of credits withdrawn	41

[a] 16 pending SCBs are not included in the analysis.
[b] Information available in RIBITS as of August 2016.

Table 2
Comparison between 2003 Guidance ([USFWS] U.S. Fish and Wildlife Service, 2003) recommendations and reported practices in the 95 Species Conservation Banks with documentation in the RIBITS database.

Category	Guidance language	Level of requirement according to language[b]	Corresponding reported practice
1. General characteristics			
Size	"Sufficient size to ensure the maintenance of ecologic al integrity in perpetuity"	L	24 are smaller than 100 acres (40 ha); Smallest one is 5 acres (2 ha)[a]
Target species	Listed and/or candidate species	N/A	77 (56%) target multiple levels of biodiversity[a]
Location	"SCB could be (…) situated in a strategic location that would add to an already established conserved area"	L	33% are located adjacent to protected areas
2. Credit accounting			
Habitat quality	"When determining credit values, some of the biological criterion that may be considered include habitat quality"	L	13% include habitat quality[a,c]
Currency	"Currency may take the form of surrogates (…) such as occupied acres"	L	'1 credit = 1 acre' of habitat used by 70%[a]
Consistency in method used	USFWS "will use a consistent methodology for determining credits"	H	Method case-dependent; 7 SCBs use Proportionate Credit Formula
3. Other reported practices			
Goal of biodiversity offsets and principles related to credit accounting:			
No net loss/net gain goal	"Producing conservation benefits for the species for which the bank is being established" (no net loss objective not mentioned)	N/A	No net loss/net gain included in 11% of CBAs
Additionality	"Land used to establish SCBs must not be previously designated for conservation purposes"	L	Concept included in 6% of CBAs
Technical concepts related to biodiversity offsets			
Perpetuity	SCBs are "sites where habitat and/or other ecosystem resources are conserved and managed in perpetuity"	H	All (but 1) are established in perpetuity
Methods to address uncertainties/risks of offset success			
Mitigation ratios	"Allows different ratios to be applied"	M	Used by 12%
Mechanisms to mitigate financial risk	"The CBA must identify and include a requirement for adequate funding to provide for the SCB's perpetual (…) costs"	H	Almost all SCBs have endowment funds. 67% include additional mechanisms to mitigate risk
Mechanisms to increase success	"Every CBA should specify the methods for (…) setting performance standards to calculate credits"	H	Included in 40%
Force Majeure	"The bank should not be held responsible for offsetting acts of nature that are unforeseen, or foreseeable but unpredictable"	H	In none of the CBAs the bank developer holds the risk in case of force majeure events
Remedial actions	"The CBA will stipulate the general procedures for identifying (…) remedial measures"	H	Included in 23% of CBAs
Management and monitoring activities			
Management of offset area	"Management needs should be anticipated and provided"	H	74% of SCBs have management, operations and/or development plans in RIBITS
Monitoring	"Monitoring is the responsibility of the conservation bank"	H	All (but 3) CBAs require monitoring of the offset area
Baseline	"The CBA should include a description of the biological value of the bank (…) This may include a (…) biological resources inventory"	L	47% have developed a baseline
Integration with conservation plans	"SCBs sited in these areas [identified in recovery plans] can create mitigation opportunities that (…) contribute to the conservation of the species"	L	50% of SCBs complement/support other government conservation plans
Social aspects			
Engagement	"If approving the CBA is controversial, the Service may want to publish in the Federal Register advance notice of its intent to do so and invite public comment on the proposed CBA"	L	Public engagement and participation not included in SCB documentation
Legal, administrative, and financial aspects			
Management and monitoring responsibilities	"Monitoring is the responsibility of the conservation bank"; "The choice of management strategies and the responsibility for engaging them to meet bank goals reside with the bank sponsor"	H	In all SCBs, besides Force Majeure events, bank developer bears the full financial risk. Successors responsible of management and monitoring

CBAs = Conservation Bank Agreement.
[a] These results consider the 138 SCBs reviewed.
[b] N/A: does not apply; L: low; M: medium; H: high.
[c] No information on how this credit determination stack up against debit determination is provided.

3.3. Credit accounting

The documentation suggests that the majority of SCBs do not include measures of habitat quality (79%) for credit calculation. In 70% of banks one acre (0.4 ha) equals one credit, meaning that credits are based only on the habitat area (acreage), irrespective of quality. Six percent use a mitigation ratio or multiplier for calculating credits, and 4% determine credits based on the number of individuals of the covered species that the area could potentially accommodate. No SCB documents the project impacts (debits) being compensated for through the purchase of the credits (offset gains), nor the methods used for calculating them. Without this information, it is not possible to determine whether the bank fully offsets the impacts.

3.4. Other reported practices

Many of the SCBs report practices for components related to the success of the strategy from a management (and monitoring), legal,

administrative and financial perspective. All but one SCB included legal documentation that protects the area in perpetuity. Additionally, to reduce financial risk, which is always held by the bank owner, at least until all the credits are sold, almost all SCBs establish endowment funds, and 67% have additional financial assurances in place, as stipulated in the documentation available. In terms of management and monitoring, almost every SCB reviewed (92) included documentation stipulating monitoring of the bank area and reporting of the monitoring results; in 74% there is explicit reference to parcel level adaptive management as a way to improve outcomes over time.

On the other hand, as a result of the lack of consideration of habitat quality when calculating credits, and lack of information on the debits being generated and compensated for in each transaction, documentation for few of the analyzed banks (ten) makes reference to, or explicitly addresses the goal of no net loss or net benefit. The related concepts of like-for-like and additionality were similarly ignored. Given this situation, SCBs tend not to fulfill criteria that relate to the success of the strategy from a scientific perspective, including the consideration of basic offset technicalities (proximity to impact area, time-lags, leakage, etc.), and the implementation of methods to address uncertainties and risks. Resultant trends on technical concepts of offsets and methods to address uncertainties/risks of offset success from the reviewed documentation support this asseveration.

Consideration of technical concepts of offsets:

- Four banks make reference to, or explicitly address, issues of time lags.
- Seventeen banks make reference to the existence of irreplaceable resources (i.e., limits to what can be an offset due to irreplaceability and/or vulnerability of biodiversity components).
- No SCB presents documentation that addresses the concepts of counterfactual scenarios, cost-shifting, and leakage.
- Four SCBs (%) highlight the benefits of shorter distances between the bank area and the development project (proximity).
- Although all SCBs compensate for impacts located within the same Service Areas, 26% allow the compensation of impacts outside their Service Area. In terms of establishing banks in locations that amplify conservation benefits, 33% of SCBs are adjacent to protected areas and 50% are located in areas that are identified in conservation plans such as species status assessments, Federal and State recovery plans, Habitat Conservation Plans, and others.
- Sixty-seven percent of the SCBs do not appear to include measures related to the landscape context when calculating credits.
- The majority (74%) of SCBs are located in habitats occupied by at least one of the species covered, 10% are not, and require either relocating individuals to the bank area or restoring bank habitat to make it suitable for recolonization.

Methods to address uncertainties/risks of offset success

- 12% of SCBs explicitly rely only on mitigation ratios for addressing risks of offset success.
- For 40% of SCBs, credits are released and made available for sale only after bank owners have achieved certain performance standards, which are explicitly stated in the corresponding CBAs.
- 23% of SCBs include detailed contingency measures within the documentation available. These measures are required if performance standards are not met.

3.5. Comparison between 2003 Guidance and reported practices

The following Guidance recommendations are met by all or the majority of SCBs and are reported upon within the reviewed documentation: (1) consideration of the habitat function or habitat requirements of the covered species for specific functions such as breeding and foraging; (2) the inclusion of mechanisms to mitigate financial risk; (3) protection of the bank area in perpetuity; (4) anticipated definition of management strategies; and (5) monitoring activities, where the bank owner or successors are responsible (Table 2).

Although there appears to be a clear alignment between reported practices and the Guidance, we identified that when the Guidance gives more than one option for a particular aspect or process, SCBs' reported practices tend to satisfy the less rigorous of the alternatives, and do not go beyond Guidance recommendations. Furthermore, SCBs are less likely to include those aspects where the Guidance is drafted as a general recommendation or preference, rather than as a clear requirement, and for those items that can be inferred from the text, but that are not explicitly included. More than one option is provided in the Guidance for how to quantify credits, consider mitigation ratios, use monitoring protocols, and others. For example, the Guidance recommends basing credit values on a number of biological criteria, such as habitat quality or number of nesting pairs when appropriate. At the same time, the Guidance allows SCBs to determine credits as simply 'one credit equals one debit' thereby eliminating the need for any kind of quality measure. These are two very different standards; as stated above, most banks (79%) use the latter and more simplistic system, without incorporating any measure of quality.

Finally, recommendations that are referenced in the Guidance, but are not explicitly stated or are drafted as general preferences include: strategically locating SCBs to expand reserve networks; using specific currencies and considering habitat quality when determining credits; considering additionality; among others. Most SCBs do not report upon these aspects in their documentation (Table 2).

3.6. Comparison between international Principles, U.S. mitigation policy and SCB's reported practices.

The recommendations included in the 2003 USFWS Guidance do not meet all the Principles ([BBOP] Business and Biodiversity Offsets Program, 2009). Where the Principles and Guidance are aligned, SCBs' reported practices tend to meet those Principles. SCBs' reported practices tend not to meet Principles that are not in alignment with the Guidance. The percentage of SCBs with documentation available in RIBITS that explicitly report upon each of the Principles included in the analysis is presented in Table 3.

Four of the Principles assessed, which are in alignment with the Guidance, were met by > 90% of the SCBs' reported practices (Table 3). On the other hand, no SCB explicitly refer to the mitigation hierarchy Principle in their documentation, which is not mentioned in the Guidance. While banks are not explicitly or solely responsible for following the mitigation hierarchy, it is the framework for mitigation within which the compensatory aspect is nested, as evidenced by language in the draft Policy ([USFWS] U.S. Fish and Wildlife Service, 2016). The same is the case for seven other Principles, five of which are not addressed in the Guidance.

The new draft Policy, which replaces the Guidance, advances the standard for species conservation banking, moving it closer to international biodiversity offset Principles. New specifications, statements and requirements that improve compensatory mitigation practices and processes from both a practical and scientific perspective include: (1) a clear goal of no net loss/net benefit; (2) adherence to the mitigation hierarchy; and (3) need for additionality.

Consistent with the Principles, the draft Policy repeatedly states that the mitigation goal is to achieve "a net gain or, at a minimum, no net loss in the status of affected resources" ([USFWS] U.S. Fish and Wildlife Service, 2016). It also effectively places the practice of compensatory mitigation within the mitigation hierarchy framework, and indicates that compensation should be applied (1) only for residual unavoidable impacts, and (2) after all reasonable avoidance and minimization measures have been applied. The draft Policy explicitly indicates that credits can only be issued if additionality can be clearly demonstrated and is legally attainable. Finally, more specific and explicit

Table 3
Comparison between international biodiversity offset principles and reported practices in U.S. Species Conservation Banks.

Principles	Number and % of SCBs addressing the Principle (n = 95)
1. Adherence to the mitigation hierarchy	
Adherence to the mitigation hierarchy	0
2. Limits to what can be offset	
Consideration of limits to what can be offset	17; 18%
3. Landscape context	
Incorporation of the landscape context	21; 22%
Cultural and/or social values considered when determining offset areas	9; < 10%
4. No net loss	
Addresses a set of key biodiversity components at species, habitats and ecosystem levels	54; 57%
Quantification of (impact) losses and (offset) gains	0
Achievement of no net loss or net gain as main goal	10; 11%
Like-for-like/like-for-better approach	40; 42%
Consideration of time-lag issues between the impact and delivery of the offset.	4; < 10%
5. Additional conservation outcomes	
Achievement of additional/supplemental conservation outcomes	6; < 10%
Avoidance of leakage (impact displacement) processes	0
6. Stakeholder participation	
Stakeholder participation in decision making	2; < 10%
7. Equity	
Equitable sharing of rights, responsibilities, risks and rewards among stakeholders	0
Respect of rights of indigenous peoples and local communities	0
8. Long-term outcomes	
Achievement of long term environmental outcomes	94; > 90%
Independent auditing/verification of offset strategy and compliance	0
Monitoring of overall offset strategy	0
Implementation of adaptive management practices	70; 74%
Ensuring financial sustainability/long term funding of project	94; > 90%
Offsets need to be legally secured in the long term by the appropriate mechanism	95; 100%
9. Transparency	
Transparency - during design, implementation and communication of results	0 (besides reporting)
10. Science and traditional knowledge	
Best available scientific knowledge and methods have been used in offset design and implementation, including consultation with scientific experts	95; 100%

requirements related to different technical concepts of biodiversity offsets include appropriate bank size and location, incorporation of the landscape context, stakeholder participation and engagement, auditing, transparency, and time-lags.

4. Discussion and conclusion

Lack of data availability and limited tracking continue to pose the barriers to analyzing banking and other types of compensatory mitigation practices identified by Fox and Nino-Murcia (2005). Even though our analysis included 103 more SCBs than the previous analysis, our results show that information availability remains a major limiting factor. The highly variable documentation not only reduces transparency, but also limits opportunities for stakeholder engagement and hinders the potential for improvement of policy and practice (Environmental Law Institute, 2007; Owley, 2015).

Despite these data limitations, we found that SCBs have generally been well aligned with the Guidance (Table 2). For example, alignment is strong around legal and administrative aspects, financial assurances, project duration (i.e., perpetuity), and monitoring and adaptive management (Table 2). Alignment is less strong around the Principles of biodiversity offsets ([BBOP] Business and Biodiversity Offsets Program, 2009), such as accounting for landscape context, following the mitigation hierarchy, using quality in credit calculations, and addressing additionality. This lack of alignment is not surprising given the goal of SCBs as expressed in the Guidance to produce "conservation benefits for the species for which the bank is being established" ([USFWS] U.S. Fish and Wildlife Service, 2003); the current goal of SCB does not require that the no net loss/net benefit be attained. Because no net loss/net benefit is not an explicit goal, striving for equivalency between impact losses and offset gains is not necessary to adhere to the Guidance. This explains why credit determination is not linked to debit determination through a common metric in conservation banking practices. The Guidance goal also diminishes the need to follow the mitigation hierarchy to ensure that avoidance and minimization come prior to offsetting, to ensure and prove additionality, and to set limits on what can be offset; three international Principles of biodiversity offsets to which the majority of SCBs' reported practice are not aligned.

The draft Policy advances the Guidance significantly, moving banking policy closer to the Principles. Most apparent is the shift in the goal of SCBs from "conservation benefit" to "improve (i.e., net benefit) or, at minimum, to maintain (i.e., no net loss) the current status of affected resources" ([USFWS] U.S. Fish and Wildlife Service, 2016). The draft Policy is also consistent with the Principles in requiring that project proponents follow the mitigation hierarchy, ensure additionality, consider distance from impact areas to offset sites, and mitigate following a like-for-like approach; practices that are not required in the Guidance. Other significant advancements, consistent with the Principles, include requiring monitoring and adaptive management not only for the site, but for the overall offset strategy, and a greater emphasis on integrating SCBs into landscape level planning efforts to increase their effectiveness. There is recognition in the draft Policy that in order to meet the more rigorous goal of no net loss/net benefit, adherence to these Principles will be necessary.

While the draft Policy is a significant advancement over the Guidance, it falls short in three main aspects that are considered crucial to meet the new species conservation banking goal it establishes: (i) the draft Policy still allows the use of area alone (or area combined with a mitigation ratio) as a measure of credits. Not only is this inconsistent with a no net loss/net benefit goal, but this form of simplistic accounting ignores variation in habitat quality or condition, and makes equivalency between impacts and offsets impossible to establish (Quetier and Lavorel, 2011; Gardner et al., 2013; Gibbons et al., 2015). Following the Principles, quality should be required as a component of habitat-based aggregated biodiversity offset metrics as it recognizes the inherent biological variability in habitat across space and time ([BBOP] Business and Biodiversity Offsets Program, 2012). Mitigation ratios (used in 12% of SCBs) are tools for risk reduction and not proper substitutes for measures of quality; (ii) including variation in habitat quality is only meaningful when it is possible to ascertain what the condition of the habitat would have been without the establishment of the SCB (i.e., when the counterfactual scenario is specified; Maron et al., 2012). However, the draft Policy does not reveal the counterfactual scenario assumed, against which to compare the no net loss/net benefit goal, which hinders the understanding of what it is trying to achieve and impedes ensuring additionality; and (iii) the draft Policy does not explicitly state how offset gains (credits) should be linked to project impacts (debits). Linking the two processes through a common metric and making it explicit through a transparent tracking platform would enable determination of the equivalency between offset gains and impact losses and the broader level of attainment of the no net loss/net benefit goal (Gardner et al., 2013; Gibbons et al., 2015).

In order to keep improving banking practices and maximize their

potential to contribute towards species recovery, our analysis suggests three additional areas for improvement as policies continue to be updated. First, policy that sets clear minimum standards, as opposed to less specific recommendations and preferences, is likely to be more consistently followed. Specific minimum standards would improve the quality of banks and the consistency of practice and processes among USFWS regions. Standards would also promote efficiency, predictability, certainty and fairness among bank owners and developers, all of which are required for streamlining banking processes and ensuring that species conservation banking functions as a widespread and accessible tool for achieving the recovery of endangered species. Future policy updates should outline minimum standards for incorporating habitat quality when accounting for impacts and offsets, defining a counterfactual scenario, and linking credits and debits.

Second, greater transparency through reporting is an urgent need that has been identified by previous researchers (Fox and Nino-Murcia, 2005). Reporting could be improved by making the RIBITS data base more user-friendly and requiring that all approved banks upload documents in a timely manner. In addition, standardized reporting practices that support the availability of consistent and comparable data across SCBs should be mandated (Langpap and Kerkvliet, 2012; Madsen et al., 2010).

Third, SCBs will need to adopt new methods and tools to meet the no net loss/net benefit goal stated in the draft Policy and establish equivalency between impacts and offsets. Following the mitigation hierarchy and integrating with landscape level planning will be more important than before (McKenney and Kiesecker, 2010), as well as developing tools and processes for defining and establishing baselines and calculating additionality. On-the-ground experimental pilot approaches that demonstrate new modes of compensatory mitigation and compare the obtained results with current banking practices are crucial (Gelcich et al., 2016). Such efforts should draw lessons from biodiversity offset policy and implementation in other countries like Australia, France, and New Zealand, biodiversity initiatives underway in the U.S., and from U.S. wetlands mitigation (Turner et al., 2001; Virah-Sawmy et al., 2014; Miller et al., 2015; Norton, 2009; Kreuter et al., 2016). Program-wide adaptive management processes that facilitate adaptive learning and management should be incorporated as an important component of such pilots.

While the evaluation of whether the SCB mechanism is sufficient for protection and recovery of listed species remains elusive, stakeholders and practitioners should seek to advance SCB policy and practice. Future policy updates should strive for clear standards conducive to achieving the no net loss/net benefit goal and ensuring transparency, while future banking practice should seek innovative tools capable of achieving such standards and demonstrate new approaches that cost-effectively address species recovery needs though pilot initiatives. Ultimately, we will only understand the effectiveness of compensatory mitigation policy in meeting species recovery goals through improved monitoring and evaluation of SCBs and other related mechanisms, and field studies that examine on-the-ground outcomes.

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Appendix A. Supplementary data

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