Comparative Analysis of the Determining Factors that Define Service Area Perimeters of Conservation Banks in California

米国カリフォルニア州のコンサバーションバンクのサービスエリア境界の決定要因の比較分析

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Abstract: Determination of service area perimeters, within which a bank can sell its mitigation credit, is at the forefront of the interplay between bank owners' economic demands and biodiversity conservation regulation. Our broad-scale analysis of current service area perimeters identified influential determining factors for 135 SA maps of 53 conservation banks in California. We also introduced the “Bank-Service area” (B-S) rate as an indicator of tension between economic and environmental stakeholders. As the result of a U.S. federal guidance in 2003 that SA perimeters should correspond to recovery units, approximately half of the explained factors were recovery units. The B-S rate appears to have increased since 2000. Including the SA itself, this rate is expected to converge into certain values.

Key Words: biodiversity offset, conservation bank, California, service area

要旨：サービスエリア（あるバンクのシケージョンクレジットが販売可能な地域）の境界の決定は、バンク所有者の経済的要請と生物多様性保全政策の利害を左右する。本研究では、カリフォルニア州の53のコンサバーションバンクと135枚のサービスエリア地図を比較解析し、サービスエリアの場合、その境界決定要因の分析を行った。また、B-S比（バンクの面積／サービスエリアの面積）という指標を用い、経済と環境の均衡状態を評価した。2003年の連邦ガイダンスに基づいて、保護増殖計画単位（Recovery Unit）が最大の決定要因だった。B-S比は2000年以降上昇していった。サービスエリアも含め、この値は今後一定になると推測される。

キーワード：生物多様性オフセット、コンサバーションバンク、カリフォルニア、サービスエリア

INTRODUCTION

The American system of conservation banking (CBing) is a market-based method for offsetting adverse impacts of development projects by private developers and government agencies on species (spp.) listed as threatened (TH) or endangered (EN) under the federal Endangered Species Act (ESA) and in state ESA and its habitat (Section 7 for federal agencies' activities and Section 10 for non-federal activities in the federal ESA). Conservation banks (CBs) can produce conservation credits based on their conservation activities, and developers can buy them instead of offsetting their projects' impact by themselves. The CB then becomes a permanently protected and managed area for the listed spp. and its habitat. This is considered to be a win-win system from the viewpoint of people promoting a new financial mechanism for biodiversity conservation. That is, on the economic side, both bank sponsors and property owners (bankers) and developers win by earning money using their lands and reducing their mitigation costs, respectively, while on the environmental side, federal and state environmental agencies are able to implement their conservation policy based on federal and state ESA.

Each bank has service areas (SAs) for each credit sp. and habitat. The bankers can sell their credits to developers who need to compensate for projects they undertake within the area. In the bank approval process, the SA is requested by the bankers and approved by an inter-agency bank review team consisting of potentially related agencies such as the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service, and California Department of Fish and Game (DFG) (Pers. Comm. from Little, J., 2010).

Determination of SAs is at the center of the balance between economic demand and environmental regulation (Bean et al., 2008). For this financial mechanism to be most effective in the field of biodiversity conservation, it is important to clarify a compromise between economic and environment stakeholders.

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Few studies have tried to elucidate the current factors involved in defining the SA perimeters of CBs. One paper addresses one aspect of SA\(^2\) focusing on mitigation banks but not on CBs\(^8\) (Robertson and Hayden, 2008). There is also a discussion of SA boundary determination criteria, but this also focuses mainly on mitigation banks and lacks a comprehensive review based on each SA of CBs (Martin and Brumbaugh, 2010).

In this study, we begin with a brief review of the current situation of CBs and SAs in California (CA). We then search laws and guidelines describing determination criteria of SA perimeters. Next, we classify each SA perimeter into several possible determination factors and look at the current trends among them. Finally, we analyze the relationship between bank area (BA), or square measure of a bank, and SA in order to estimate the current tension between bankers and administrative agencies.

1 DATA AND METHODS

1.1 Data

In this study, we filtered 97 banks in the following way and defined them as CBs for this study. First, we listed 110 banks from the following three lists, eliminating duplications: “Speciesbanking.com (SB.com)\(^6\) 101 banks”, “FWS Sacramento office bank list\(^9\) 57 banks”, and “DFG bank list\(^8\) 55 banks”\(^9\). Secondly, we excluded 13 banks whose names ended with “mitigation bank”, though we made several exceptions\(^8\). We collected the following information for each bank: established date, bank status (active, sold out, pending, inactive), county location, area, the common names of spp. sold as credit or spp. distributed in the habitat sold as credit, the resource management type for each sp. or habitat (Preservation, Creation, Restoration, combinations thereof), status of each sp. on the federal and state EN spp. lists, and SA map.\(^8\) We also interviewed concerned people and companies, such as DFG and FWS, who know the current situation and issues surrounding SA.

1.2 Methods

First we briefly review the current situation of SA of CBs. We focused on the following categories: the number of available SA maps publicly through web sites, counties covered by CBs and accumulated CB area, the number of credit spp. for each taxon, EN status on both federal and state lists, and resource management type. Since we could not get each “area” of the SAs from web sites, we calculated them using free GIS software, MANDARA\(^8\). Secondly, we searched relevant laws and guidelines about SA determination criteria at both the federal and state levels. Thirdly, based on the results of the second step, we determined any criteria that defined SA perimeter and then classified the perimeter of each SA into those criteria. We could only classify each SA perimeter objectively when there was a description added in each bank agreement document.\(^8\) Moreover, we analyzed the data in the same way with respect to credit spp. differences. This step clarifies whether or not the current practice of determining SA perimeter follows the rules in terms of total banks and credit spp., identifying discrepancies between those rules and current practices. Lastly, we focused on the relationship between BA and SA. We set an indicator called the “Bank-Service area” (B-S) rate (%) in order to assess the current tension between economic and administrative sides on SAs. The B-S rate is obtained simply by dividing BA by SA. The most favorable characteristic is to express the benefits of the economic side in terms of area unit. It is often difficult to obtain financial data from bankers for non-business purposes. Moreover, using unit of area allows for direct comparison with conservation benefits which is often difficult to evaluate in monetary terms. A low B-S rate indicates an advantageous situation for bankers, whereas a high rate favors conservation policy. Obviously, the larger SA against BA is, the more potential customers or the higher development possibilities are expected to be exist in the SA, leading to high revenue for bankers. On the other hand, high B-S rate represents the dominance of protected area for listed spp. in the SA, where development projects have various impacts to listed spp.. We analyzed those data using B-S rates and simple BA and SA scatter graphs in chronological order for total banks and certain credit spp. and discuss general applicability of B-S rate.

2 RESULTS
2.1 The current situation of conservation banks

1) General

The total number of obtained SA maps was 141 from 53 banks. The maps were not obtainable from 44 banks of the 97 banks. This indicated that there were some cases where one bank had several SA maps corresponding to multiple credit spp. The 97 banks and SA maps were defined as subject CBs in our study. The study covered 67% (53/79) of almost all of the CBs with a status of active and sold out in CA, excluding "pending" and "inactive" banks, of which there were 14 and 4, respectively. All 97 banks in CA are situated in 25 of the state’s 88 counties. The top bank-holding county was Sacramento (14 banks). The total area of 97 banks was about 188 km² (46,452.94 acres). This area is equivalent to about 25% of the state’s conservation area, including Ecological Reserves of 526 km² and conservation easement areas of 300 km², which are relatively strictly preserved (DFG, 2007).

2) Credit spp. and management types

Ninety-seven banks are selling or have sold 64 spp. covering 13% of the federally listed spp10, (39 spp. in this study/309 spp. in CA12). The study selected as subjects 26 spp.13. For selection criteria, we set three conditions: i) the existence of SA maps for the spp., ii) the spp. is listed as EN or Threatened (TH) by federal jurisdiction, and iii) the spp. is targeted by at least three banks.

The status of credit spp. in the federal and state EN spp. lists were as follows (as “the number of spp. in total CBs/the number of subject spp. in this study), the federal list: EN 25/13, EN and TH14 32, TH 11/9; the state list: EN 17/8, TH 7/6.

The most dominant management type in all 97 banks in this study was Preservation, 77%. The next most common types were the combination of Preservation and Creation, 13%, and only Creation, 6%. In this study corresponding to 135 SA maps, the values were 78%, 13%, and 7%, respectively, which indicates proper reflection of the parent population.

3) SA of each category

Table 1 summarizes the average BA (km²) and SA (km²) of each described category and the results of the Mann-Whitney U-test (calculated using Excel 2003) between “EN and TH” and “Preservation and Creation”. The most preferred taxa for credits was crustacean including three spp.16 distributed in the vernal pool (VP) habitat. Actually, the two preferred spp. (first VP Fairy Shrimp, second VP Tadpole Shrimp) are VP-dependent. There would be two reasons for this: VP contains a lot of endangered spp., which can become credits, and CA’s VP regions are mainly situated in the Central Valley (p63. DFG 2007), which has been intensively developed since the 1990s and will continue to see urban sprawl in the coming decades (p12. Beatley and Manning, 1997). For a more holistic perspective of the SA, it is worth focusing on the VP habitat and its dependent spp.

There was no significant difference in either spp. status or management types (Table 1).

2.2 Support of SA determination

The CBing system began in CA on the authority of the state’s “Official Policy on Conservation Banks”, dated April 7, 1995. This policy does not include any clear description of determination criteria of the SA perimeter. On May 2, 2003, FWS issued the “Guidance for the Establishment, Use, and Operation of Conservation Banks” (the Guidance). In the Guidance, for the first time, an SA perimeter was defined in the
context of bank site location: "banks generally should be located within areas designated in recovery plans as recovery units or other applicable recovery focal area, and their Service Areas should correspond to the recovery areas in which they are located" (C-2, p.8, the Guidance).

A recovery plan (RP) is required by the FWS for the purpose of recovering listed EN and TH spp., or ultimately to remove spp. from the list, using the most available science, based on ESA Section 4(f). Each RP covers single or multiple spp.19. In this study, there are eight relevant plans. They cover 20 credit spp., and there is no RP yet for four endangered spp.20 In some RPs, clear recovery units (RUs) with maps are set, but others are not, and in such cases we estimated roughly the border of the recovery focal area and applied its line as a RU. If there was no RP, we used the Habitat Conservation Plan (HCP)/ Natural Community Conservation Plan (NCCP) designated area as a possible determination factor.

2.3 Factors in SA perimeter determination

The most influential factor excluding the portion of the chart classified as ‘other’, was found to be the RUs. In response to result 2.2, we further selected the five other most possible factors for SA boundary determination (Table 2) and classified each SA perimeter into them. In this way, for example, one SA map could be categorized into several factors at one time, which means the perimeter of the SA was determined by several factors.

We assigned all banks into three periods based on the date of establishment21 (Period 1: before 1995, there was no official policy for CBs but there were several pilot and pioneer CBs; Period 2: there was still no clear definition of the criteria for determining a SA perimeter, but the number of CBs was increasing; Period 3: after the Guidance, the SA perimeter has been determined mainly by the RU).

The three furthermost bars to the left of Figure 1 show a clear trend of change in the determining factors for all SA maps including 26 spp. in the three periods. After the Guidance, a large percentage of the determining factors moved from less-scientific criteria to the RU. The percentage of instances in which a county boundary was a determining factor was stable throughout the periods. Although most boundaries only for the California Tiger Salamander (CTS) were clearly based on the genetic population, the percentage of genetic population slightly increased. The two furthermost bars to the right of Figure 1 show changes in the determining factor focusing on only vernal pool (VP) spp.22 before and after the Guidance. The percentage of RP-based SA increased dramatically.
2.4. B-S rate and BA-SA graphs

1) The trend of changes in B-S rate

In the total of 135 SA maps, 80% of the B-S rates were less than 0.05%. After the Guidance, the portion of B-S rates over 0.05% increased (Table 3). Tables 4 and 5 show the trends in B-S rate change in VP spp. and CTS. They also indicated gradual increase tendency in B-S rate (shaded columns).

2) BA-SA graphs for credit spp.

To clarify the effect of the Guidance, we made BA-SA scatter graphs for VP spp. in the period after 2003 (Figure 2) and for CTS (Figure 3). Each plot represents BA and SA of each SA map. In the Figure 2 and 3, different objects mean different RUs (VP1 to VP5) and different genetic populations (GP1 to GP3), respectively. The plots tended to make several bands (circled with black line) depending on the area and number of RUs or genetic populations.

DISCUSSION AND CONCLUSIONS

We performed the first broad-scale comparative analysis of SA in the US CBing system. We found the rapid shift to RU as the most important SA determining factor, which means the Guidance was effectively followed. To fill the gap between the Guidance and future practices, we first have to wait to complete the RP for CTS 29, the third most preferred credit spp.. If it is made, the number of SA following the RU will increase. Secondly, factors that are not based on the goal of recovery (i.e., County and Road) should be removed. For example, the agencies should actively encourage counties to allow for situting SAs on land within a county. Finally, we have to identify factors other than those discussed in this study.

As we showed in the Figure 1, it will be important over time to take genetic information into account for the determination of SA perimeters in the recovery strategy either with or without RP. Otherwise, if there are different genetic populations in the same RUs or SAs, not only in-kind offsets for the same spp. but out-of-kind offsets for genetic populations could occur. Grasping appropriately the present genetic situation can also avoid unstable results and thus lead to a consensus on recovery (p12 Goble, 2009).

We also introduced B-S rate as a new indicator of balance between economic demands and conservation aims. If the Guidance works effectively, SAs would accurately converge into several RP-based values regardless of BAs. In keeping with this trend, the B-S
rate would also head toward several values, even though the rate demonstrated upward trend for the past decade (Table 3, 4, and 5). This is because bankers would set the most optimal BA, considering the number of approved credits and expected development project affecting the credit spp. and habitat within the provided SA or RU. Basically, the larger BA can get more approved credits, as administrative agencies tend to apply a basis of "one acre of BA for one conservation credit". As far as the SA is determined by RU, the potential demand of credit does not change. The land price and the number of other banks within the same RU would constrain the largest possible BA when taking into account those factors as well as seeking the value of optimal BA are issues in the future.

Furthermore, it is to be noted that the B-S rate would vary depending on the target for the comparison. This is because if SAs of different locations are provided, the factors described above would differ significantly in each SA. In this study, we observed that the B-S rate showed the same chronological tendency even in two different data set, all SAs (Table 3) and the ones of specific credit spp. (Table 4 and 5). In this context, the latter is expected to be preferable analysis due to stable condition. If it is considered for the rate to apply generally, it should be improved with including other factors.

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NOTES

1 The market size has reached $300 million per annum in the USA (Madsen et al., 2010), and as of 2009 the accumulated BA is over 186 km² in CA. Bay et al. (2006) listed specific reasons for the significant progress of this system particularly in CA (p.31).

2 In this study, the SA changed followed by a county-level legislative change.

3 The mitigation banking system is the original CBing system. It mainly restores degraded wetlands and replaces their functions to earn wetland mitigation credits authorized by the US Army Corps of Engineers.

4 This is a spp. credit trading information clearinghouse system.

5 Ecosystem Marketplaces (5/2/2010 updated) each bank page <http://speciesbanking.com> (5/2/2010 last access).


7 We got the latest list from a DFO staff member when we interviewed the staff (2/23/2010).

8 The reason why we selected those lists were that the first list covered almost all banks that sold spp. credit in CA (Madsen et al., 2010) and that the two latter lists were made by two main CB regulatory authorities in CA.

9 Exception. The banks with names ending in "Mitigation Complex" or "Habitat Bank", which are selling species credits, 8 banks on the FWS list, and 2 banks which appear to have CBing agreements based on SB.com.

10 We mainly used the SB.com website as our information source.

We also looked through the other two lists above and banker or manager web sites directly. We also referred to official contract documents between bankers and government agencies for approval of conservation credits as far as conservation banks authored to DFO. They provide the objective description of SA perimeter. We also referred to the RIBITS web site. This is basically for mitigation banks but sometimes contains information of CBs too. Even though we searched public and free information on the internet as comprehensively as possible, we could not fill in so many columns. RIBITS- US Army Corps of Engineers (4/29/2010 updated) Regional Internet Bank Information Tracking System (RIBITS) http://www.erdc.usace.army.mil/pld/erkpwpb/ia/fact_sheets/product_page.jsp?product_name=1141454564955998Main_Topic=30937913113520 (4/29/2010 last access).


13 Mammals 5 spp., Birds 7, Reptiles 7, Amphibians 2, Fishes 3, Insects 6, Plants 31, and Crustaceans 3.

14 This is following that of the state of Hawaii (377 spp.). FWS Environmental Conservation Online System (ECOS) (5/27/2010 updated) Species listed in each state based on published historic range and population data http://ecos.fws.gov/tess/public/stateExistingListings.jsp (5/28/2010 last access).

15 Mammals 3, Birds 2, Reptiles 3, Amphibians 2, Fishes 2, Insects 1, Plants 10, and Crustaceans 3.

16 Within a few spp., different populations are listed as different categories. We expressed "EN" and "TH". When summarizing average map BA and SA of each "EN" and "TH" category in Table 1, 2, and 3, is simply dealt with those spp. as independent number, which means both "EN" and "TH" category included above spp. allowing different assessment.

17 We excluded six maps associated with 6 spp., and analyzed by reusing 135 SA maps. These spp. had only one SA map each effectively and were not listed in the federal ESA, which means they do not have RP.

18 VP Fairy Shrimp, VP Tadpole Shrimp, and Conservancy Fairy Shrimp.


21 85% of the total listed spp. have RP (Madsen et al., 2010).

22 CTS, Burke’s Goldfield, Sebastopol Meadowfoam, Sonoma Sunshine

23 The Service Area is determined during the bank approval process and is rarely changed (Pers. Comm. from Little, J. 2010).

24 10 subject spp. in this study on the VEPF FWS, 2000.


REFERENCES


