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A R T I C L E S

Habitat Conservation Plans and Climate Change: Recommendations for Policy

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Summary

Habitat conservation plans (HCPs) are critical tools for managing species and their habitats. Climate change poses special challenges for successful habitat conservation planning, but there are several steps to take to address these challenges. Key provisions in government regulations and guidance are at odds with considering climate change in HCPs, and revisions are recommended, including reliance on adaptive management. By looking to these recommended best practices, habitat conservation planning can be strengthened not only to address climate change, but to better reflect the changing context and environment in which HCPs must be implemented.

I. Introduction

The first habitat conservation plan (HCP)—the San Bruno Mountain HCP, covering 3,500 acres in California—was approved by the U.S. Fish and Wildlife Service (FWS) in 1986. Since then, approximately 690 HCPs have been approved by FWS and the National Marine Fisheries Service (NMFS, collectively, the Services).¹ HCPs cover over 80 million acres of land with diverse habitats, including Florida scrub, long leaf pine, limestone karst, Southwest desert, and old growth timber. The vast majority of HCPs have been approved since January 1998, a reflection of the success of policies, developed during the William Clinton Administration and refined during the George W. Bush Administration, that were designed to provide incentives for landowners to protect rare habitats. The Services published their “Habitat Conservation Planning and Incidental Take Permit Processing Handbook” in 1996, and an addendum to the HCP Handbook in 2000. The Handbook provides guidance to the Services on the processing of HCPs, to applicants preparing HCPs and navigating through the regulatory process, and to interested stakeholders.

Climate change is not mentioned in the Endangered Species Act (ESA),² its implementing regulations, or the HCP Handbook. The impact of climate change on threatened and endangered species and their habitats was not considered by the U.S. Congress when the ESA was enacted, or by the Services when the regulations were promulgated and the Handbook was written. But it is apparent today that climate change is having an impact on fish and wildlife and, even if aggressive mitigation strategies are implemented in the near term, will continue to affect natural systems for decades to come. Recognizing this, the Services have published reports, studies, and policies that highlight the importance of incorporating climate change effects into conservation strategies, pursuant to the U.S. Department of the Interior’s Climate Change Adaptation Plan.³

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1. More information on the HCP program developed and administered by FWS and NMFS is available at Environmental Conservation Online System (ECOS), http://ecos.fws.gov/conserv_plans/PlanReport.
2. 16 U.S.C. §§1531-1544, ELR STAT. ESA §§2-18.
3. See, e.g., U.S. FWS, CONSIDERING MULTIPLE FUTURES: SCENARIO PLANNING TO ADDRESS UNCERTAINTY IN NATURAL RESOURCE CONSERVATION (2014), available at www.fws.gov/home/climatechange/pdf/scenario-planning-report.pdf; U.S. DEP’T OF THE INTERIOR (DOI), CLIMATE CHANGE ADAPTATION PLAN (2014), available at <http://www.doi.gov/greening/sus->

The Services, however, have not yet formulated a policy to deal specifically with climate change in the context of HCPs for endangered and threatened species. As a result, there is wide variation among HCPs across the country; some plans incorporate a detailed monitoring and management framework while others merely mention the uncertainties associated with climate change.

This Article sketches the challenges that climate change poses for successful habitat conservation planning for endangered species, highlights key policy issues, and makes recommendations at several levels. First, we identify significant overarching complexities associated with addressing climate change in HCPs, and recommend steps to deal with them. Second, at a detailed level, we identify key provisions in the Services' regulations and the Handbook that seem to be at odds—some requiring that climate change be taken into account while others complicate that task—and recommend revisions. We conclude that improving the use of adaptive management in HCPs is critical. Finally, we suggest that effective conservation planning in the face of climate change requires that habitat conservation planning be considered in the larger geographic and policy context, and coordinated with other conservation practices. Many, though perhaps not all, of our recommendations would qualify as “best practices” for habitat conservation planning, irrespective of the existence of climate change as an additional stressor.

II. The Legal Background for Habitat Conservation Planning

Section 9 of the ESA prohibits the “take” of any species of fish or wildlife that has been listed as endangered by the Services.⁴ “Take” is defined broadly in the Act as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”⁵ Joint Service regulations further define “harm” as “an act which actually kills or injures wildlife,” including “significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.”⁶ The U.S. Supreme Court upheld that regulatory definition in 1995 in *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*.⁷

So-called incidental take—take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity—may be authorized by the Services pursu-

ant to ESA §10(a)(1)(B) (for nonfederal actors). Created by Congress in 1982, the incidental take provision requires that a permit applicant submit a conservation plan specifying the impacts that will result from the taking, the steps the applicant will take to minimize and mitigate those impacts, alternative actions that the applicant considered, and any other measures the Services deem necessary and appropriate.⁸ The Service must issue the permit if it finds that the taking is incidental, the applicant will minimize and mitigate the impacts of the taking to the maximum extent practicable (the MEP standard), the applicant will ensure adequate funding for the conservation plan, and the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.⁹

In addition, ESA §7 requires all federal agencies to consult with the Services to ensure that “any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification” of critical habitat.¹⁰ In the context of the approval of an HCP, the Service must carry out an intraagency consultation to ensure that issuance of the incidental take permit will not result in jeopardy to a listed species.¹¹ It is Service policy to integrate the §7 review process with the development of the HCP pursuant to §10, to avoid unnecessary delays to the permit applicant.¹² That integration makes sense because the §7 “no jeopardy” standard is nearly identical to the finding required under §10 that the taking “will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.” In fact, that language in §10 was borrowed directly from the regulatory definition of jeopardy.¹³ Destruction or adverse modification of critical habitat is defined as “a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species.”¹⁴

The Services seem to regard the §7 standard as identifying the allowable increment of take for any species, and allocate that increment among competing uses through the consultation process. Whether a proposed action will cause jeopardy or adverse modification is evaluated by considering the action's effects when added to the environmental baseline. The Services' Joint Regulations provide that:

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 con-

tainability_plan/upload/2014_DOI_Climate_Change_Adaptation_Plan.pdf. The Plan was developed pursuant to Exec. Order No. 13653, Preparing the United States for the Impacts of Climate Change (Nov. 1, 2013), available at <https://www.whitehouse.gov/the-press-office/2013/11/01/executive-order-preparing-united-states-impacts-climate-change>.

4. 16 U.S.C. §1538(a)(1)(C). The take prohibition has been extended by the Services to almost all listed threatened fish and wildlife species pursuant to regulation. The authority to regulate to conserve threatened species is found at 16 U.S.C. §533(d).

5. 16 U.S.C. §1532(19).

6. 50 C.F.R. §17.3 (2009).

7. 515 U.S. 687, 25 ELR 21194 (1995).

8. 16 U.S.C. §1538(a)(2)(A); 50 C.F.R. §§17.22(b)(1), 17.32(b)(1) & 222.22.

9. *Id.* §1538(a)(2)(B).

10. 16 U.S.C. §1536(a)(2).

11. U.S. FWS & NMFS, HABITAT CONSERVATION PLANNING HANDBOOK 3-15 (1996) [hereinafter HCP HANDBOOK].

12. *Id.* at 3-16.

13. H.R. CONF. REP. NO. 97-835 (1982), reprinted in 1982 U.S.C.A.N. 2860, 2870.

14. 50 C.F.R. §402.02.

sultation, and the impact of State or private actions which are contemporaneous with the consultation in process.¹⁵

The first projects in line for consultation have first claim on the available increment of take.

A. *The Relationship Between Jeopardy and Adverse Modification and Recovery*

The relationship between jeopardy and recovery is somewhat murky. The Services' Joint Regulations define jeopardy by reference to both impacts on the species survival *and* recovery, in the conjunctive. Recovery, which implies reaching a level of population size and security sufficient that the species no longer requires ESA listing, is a higher standard than mere survival. Under the Joint Regulations, since a jeopardy finding requires a determination that *both* survival *and* recovery will be impaired, it would appear that impacts on recovery alone will never justify such a finding. However, interfering with recovery when the species is already badly reduced may itself put survival at risk, failing the jeopardy standard.¹⁶

Similar confusion surrounds the "destruction or adverse modification of critical habitat" prong. As with jeopardy, the Joint Regulations define adverse modification as an impact that appreciably diminishes the value of critical habitat for both survival and recovery. However, two federal circuit courts have struck down that definition, concluding that adverse modification must include changes that diminish the likelihood of recovery alone,¹⁷ and two other circuits appear to agree.¹⁸

Accordingly, there is some confusion about precisely what must be shown in order to determine that a federal action is consistent with the substantive standards of §7(a)(2). The same can be said with respect to the standard for issuing an incidental take permit under §10. Congress created the incidental take program to accommodate a proposal to combine development and conservation at San Bruno Mountain in California, home to two listed butterfly species.¹⁹ The San Bruno Mountain plan, which was the model for the HCP program,²⁰ affirmatively contributed to recovery by providing a net benefit to the species.²¹ None-

theless, the language of §10 does not explicitly require that HCPs provide an affirmative benefit to the species, and the Services have consistently interpreted the law not to impose such a requirement. The only court to directly consider the issue has endorsed the Services' position.²² While they do not believe HCPs must promote recovery, the Services have said that the biological goals of HCPs should be "consistent with" recovery, and that "applicants should be encouraged to develop HCPs that produce a net positive effect on a species."²³

B. "No Surprises"

The incidental take program languished in obscurity from 1982 to 1994, with few HCP approvals or even applications. Then-Secretary of the Interior Bruce Babbitt revived interest in the program, in large part by issuing the "No Surprises" policy, which assures permittees that they can rely on the terms of any HCP they negotiate with the Services. Since 1994, most of the HCPs approved by the Services have included No Surprises assurances with respect to all species that are deemed to be "adequately covered" by the HCP.²⁴

The No Surprises policy rests on evidence that Congress intended the incidental take program to result in deals binding on the government as well as on the permittee. The original HCP agreement for San Bruno Mountain development included a promise by the Services that no additional mitigation beyond that specified in the agreement would be required.²⁵ According to several commentators, that promise was essential to the developers' agreement.²⁶ Indeed, the U.S. House of Representatives Conference Report specifically explained that:

The Committee intends that the Secretary may utilize this provision to approve conservation plans which provide long-term commitments regarding the conservation of listed as well as unlisted species and long-term assurance to the proponent of the plan that the terms of the plan will be adhered to and that further mitigation requirements will only be imposed in accordance with the terms of the plan.²⁷

As currently codified in Service regulations, the No Surprises rule distinguishes between "changed circumstances"

15. *Id.*

16. NMFS, *THE HABITAT APPROACH: IMPLEMENTATION OF SECTION 7 OF THE ENDANGERED SPECIES ACT FOR ACTIONS AFFECTING THE HABITAT OF PACIFIC ANADROMOUS SALMONIDS* (1999).

17. *Gifford Pinchot Task Force v. U.S. Fish & Wildlife Serv.*, 378 F.3d 1059 (9th Cir. 2004); *Sierra Club v. U.S. Fish & Wildlife Serv.*, 245 F.3d 434, 31 ELR 20500 (5th Cir. 2001).

18. *New Mexico Cattle Growers Ass'n v. U.S. Fish & Wildlife Serv.*, 248 F.3d 1277, 31 ELR 20614 (10th Cir. 2001); *Miccosukee Tribe of Indians of Fla. v. United States*, 566 F.3d 1257 (11th Cir. 2009).

19. Robert D. Thornton, *Searching for Consensus and Predictability: Habitat Conservation Planning Under the Endangered Species Act of 1973*, 21 ENVTL. L. 605, 621 (1991).

20. H.R. CONF. REP. NO. 97-835 (1982), reprinted in 1982 U.S.C.C.A.N. 2860, 2871-72.

21. See Craig Anthony Arnold, *Conserving Habitats and Building Habitats: The Emerging Impact of the Endangered Species Act on Land Use Development*, 10 STAN. ENVTL. L.J. 1, 20-21 (1991) (reporting that biological study of San Bruno Mountain found that development would affect the habitat of listed butterflies, but "even if no development occurred, the butterflies' grassland

habitat eventually would be lost because of encroaching brush and illegal off-road vehicular activity").

22. *Spirit of the Sage Council v. Kempthorne*, 511 F. Supp. 2d 31, 42-43 (D.D.C. 2007).

23. Notice of Availability of a Final Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 65 Fed. Reg. 35242, 35243 (June 1, 2000).

24. "Adequately covered" means the species addressed in an HCP that has satisfied the issuance criteria in ESA §10(a)(2)(B), 16 U.S.C. §1538(a)(2)(B). See HCP HANDBOOK, *supra* note 11, at 3-30.

25. The relevant provision is quoted in full in Donald C. Baur & Karen L. Donovan, *The No Surprises Policy: Contracts 101 Meets the Endangered Species Act*, 27 ENVTL. L. 767, 773 n.30 (1997).

26. *Id.*; Thornton, *supra* note 19, at 625.

27. H.R. CONF. REP. NO. 97-385, at 30 (1982), reprinted in 1982 U.S.C.C.A.N. 2871.

and “unforeseen circumstances.” An HCP may specify that additional mitigation measures will be required of the applicant under changed circumstances.²⁸ However, if circumstances that were unforeseen during negotiation of the agreement later require additional conservation measures, the Services have only limited authority to require changes in the conservation plan. They cannot require additional financial commitments or impose new restrictions on land or resource use unless the permittee agrees.²⁹

Pursuant to the Services’ No Surprises policy and regulations, the permit holder is guaranteed that, provided she complies with the terms and conditions of the HCP, the Services will not seek any additional mitigation through the HCP, even if unforeseen circumstances occur that threaten the covered species.³⁰ This means that the Services will not require additional land, additional restrictions on land use, or additional funds from permittees who are implementing an approved HCP. If additional mitigation measures are deemed necessary after the permit has been issued, the obligation to provide those measures rests not with the permit holder, but with the federal government or others.³¹

The only exception to No Surprises is in the case of “extraordinary circumstances”; however, that exception is a narrow one. The Services have the burden in all instances of demonstrating that extraordinary circumstances exist. Even if the Services meet that burden, any additional mitigation measures imposed on the permit holder must be limited to modifications of already conserved habitat areas, lands already protected by the HCP, or to the operating provisions of the HCP. Additional payments of funds for conservation or commitments of land will not be required unless the permittee consents.³²

III. Accounting for Climate Change in HCPs

Climate change poses serious difficulties for conservation planning, difficulties that must be addressed on both publicly owned lands and privately managed preserves. When designing an HCP, it is important to evaluate the potential future impacts to the covered species and their habitats that will result from climate change, just as impacts from fragmentation, disease, predation, and other threats must be considered. In some instances, changes in temperature and precipitation patterns will simply exacerbate existing threats to endangered species, such as habitat loss and fragmentation, invasive species, disease, and extreme events, such as floods, droughts, and wild fires.

But because of climate change, there is the real possibility that preserves set aside today for endangered species may no longer provide suitable habitat for those species within the next few decades. In the context of HCPs, there are two distinct challenges: (1) accounting for climate change

appropriately in evaluating new HCPs; and (2) ensuring the survival of species covered by HCPs that have already been approved. The question of who should bear the cost of conservation when climate change is a principal stressor is intertwined with these issues.

Current law requires that climate change be taken into account in several ways in the HCP approval process. First, using the best available scientific evidence, federal agencies must consider the effects of climate change when determining whether a proposed action is consistent with the substantive requirements of §7(a)(2). Climate change is an element of the “baseline” conditions in light of which the effects of the proposed action should be evaluated.³³ If available models and other evidence suggest that climate change is likely to make a species more vulnerable to habitat loss or other impacts, the jeopardy threshold should be adjusted accordingly. In other words, in some cases, the existence of climate change impacts will affect the level of take that can be authorized through an incidental take permit. Where the effects of climate change are merely speculative, however, the Ninth Circuit has held that they need not be considered.³⁴

In addition to factoring in the impacts of climate change when establishing the jeopardy baseline for the species, the Services should consider climate change in HCPs when addressing scientific uncertainty, evaluating proposed preserve designs, evaluating adaptive management plans, and assessing the plan in the context of the affected ecosystem as a whole. Below we briefly describe several HCPs that have incorporated climate change in some way to date, and then we make recommendations for taking climate change more fully into account in new and existing HCPs.

IV. A Snapshot of Regional HCPs

The HCPs that have been approved by the Services to date cover a broad range of activities. Some are small in scale and scope, encompassing a small amount of habitat for a single species. Others cover much larger areas, occasionally even the entire range of the covered species, and include multiple participants and complicated structures for participation, monitoring, and oversight. Much of the total acreage encompassed by HCPs is concentrated in a relatively small number of regional HCPs (RHCPs): 96% of the acreage covered by HCPs is in just 38 regional plans.

For a number of years, the Services have encouraged the creation of regional plans because of their potential to simplify the administrative burden of compliance with the ESA and the opportunity that they present to conserve large blocks of habitat on a scale that would not be possible with numerous individual HCPs spread across the land-

28. 50 C.F.R. §§17.22(b)(5), 17.32(b)(5).

29. *Id.*

30. 50 C.F.R. §17.22; 63 Fed. Reg. 8859 (Feb. 23, 1998).

31. See HCP HANDBOOK, *supra* note 11, at 3-29 and 3-30.

32. *Id.* at 3-30 and 3-31.

33. *Natural Res. Def. Council v. Kempthorne*, 506 F. Supp. 2d 322, 369 (E.D. Cal. 2007); *Pacific Coast Fed’n of Fishermens Ass’ns v. Gutierrez*, 606 F. Supp. 2d 112 (E.D. Cal. 2008).

34. *Center for Biological Diversity v. Kempthorne*, 588 F.3d 701 (9th Cir. 2009) (interpreting the Marine Mammal Protection Act (MMPA)), 16 U.S.C. §§1361-1421h, ELR STAT. MMPA §§2-410).

scape.³⁵ Particularly for listed species that occur primarily on private land, RHCPs are a critical conservation tool, because of the opportunity to protect or restore relatively unfragmented blocks of habitat. For species whose chances for survival will be further undermined by climate change, RHCPs could provide an important safety net, especially when developed in conjunction with other conservation efforts such as safe harbor agreements, mitigation banks, and conservation on public lands.

We recently analyzed 35 of the largest RHCPs, covering a total of approximately 31 million acres of land. We selected a representative sample of plans in a variety of ecosystems, established for a range of species. We chose plans that have been established in both urban and rural settings, in disparate political environments, with different types of entities holding the permits. Many of the large urban HCPs are administered by county or other local government agencies. Plans that cover forest practices and timber operations across broad landscapes are administered by timber companies in some cases and state regulatory agencies in others. A recent large-scale plan approved in California is administered by the Fruit Growers Supply Company, and in central Texas, the Edwards Aquifer Authority administers a plan that covers take caused by groundwater pumping.

We reviewed the plans to determine: (1) whether they address climate change explicitly, and if so how they address it; and (2) how the plans incorporate adaptive management. We conducted telephone interviews with Service staff, state regulatory personnel, and others involved with implementation of the plans. We asked about monitoring results, whether adaptive management is being carried out, and whether climate change impacts have been observed in the preserve areas (for plans where preserves have been established).

We grouped RHCPs into two broad categories. “rural/forest HCPs” are the largest in geographic scope, covering forest practices, agricultural management, and groundwater pumping across large areas. For example, the Washington State Forest Practices Habitat Conservation Plan (FPHCP) covers forest practices on most of the forest land in the state of Washington, approximately 9.3 million acres.³⁶ Plum Creek Timber Company holds HCPs that authorize take associated with its operations in Montana (1.3 million acres), as well as in Arkansas, Georgia, Louisiana, Washington, and Wisconsin. The forest HCPs are almost all multi-species plans. They tend to rely on best management practices designed to minimize take and, sometimes, restore habitat for the covered species. Though some of the forest HCPs include areas in which timber harvest is restricted, generally speaking, they do not create preserves for endangered species. The Fruit Growers Supply Company HCP in California covers take of the northern

spotted owl and coho salmon caused by agricultural practices, and includes restrictions on timber management. The Edwards Aquifer Recovery Implementation Plan covers take of several spring-dependent species caused by pumping from the Edwards Aquifer. It relies on mitigation measures ranging from voluntary water conservation to aquatic habitat maintenance and restoration.

The second category of RHCPs is the “urban HCP,” most of which have been developed in urbanizing areas in California and Texas. The usual model for an urban HCP is the establishment of a preserve area (or series of preserves) for the covered species within a defined “permit area” in return for authorization to take the species in the remainder of the permit area. In some RHCPs, the preserve area is rather small relative to the permit area (for example, the Balcones Canyonlands Conservation Plan in Austin, Texas, requires protection of approximately 30,000 acres in a permit area that exceeds 640,000 acres). The preserves are sometimes established on private lands and sometimes on a mixture of public and private land. The Coachella Valley Multi-Species HCP in California, for example, includes over 550,000 acres of federal, state, and nonprofit-conserved land in its core preserve area, along with 166,380 acres of privately owned “complementary” preserve land.

Of the 35 plans we reviewed, 14 mention or address climate change in some way. Before 2008, none of the large-scale HCPs we reviewed mentioned climate change. Since 2010, many HCPs refer to climate change, but the extent to which they are designed to address the potential effects of climate change varies greatly from plan to plan. The Williamson County, Texas, plan, approved in 2008, lists climate change as a “changed circumstance,” but states that there is insufficient knowledge about the impacts of climate change on the covered species to design conservation measures to respond.³⁷ At the other end of the spectrum, the Santa Clara Valley HCP/Natural Community Conservation Plan (NCCP) in California, approved in 2013, incorporates a preserve design that purports to anticipate some of the effects of climate change.³⁸

The Coachella Valley Multi-Species HCP, which was approved in 2008 and covers 1.2 million acres, includes among its goals “manag[ing] the system adaptively to be responsive to short-term and long-term environmental change, including climate change.”³⁹ The Coachella Valley plan includes a detailed monitoring and adaptive management program. In addition, the reserve design includes “biological corridors” that are intended to give the covered species “the opportunity for . . . adaptation in response to potential climate change.”⁴⁰ The Washington State FPHCP “acknowledges that the effects of global cli-

35. See HCP HANDBOOK, *supra* note 11, at 1-14 and 1-15.

36. WASHINGTON STATE DEPT OF NATURAL RES., FOREST PRACTICES HABITAT CONSERVATION PLAN (FPHCP) (2005), *available at* http://www.dnr.wa.gov/BusinessPermits/Topics/ForestPracticesHCP/Pages/fp_hcp.aspx.

37. WILLIAMSON CNTY. REGIONAL HABITAT CONSERVATION PLAN 10-5 (2008), *available at* http://www.wilco.org/Portals/0/Departments/Conservation_Foundation/WilCo_RHCP_08-08-08_Opt.pdf.

38. Santa Clara Valley HCP, app. F, *available at* <http://scv-habitatagency.org/DocumentCenter/Home/View/114>.

39. Final Recirculated Coachella Valley Multi-Species Habitat Conservation Plan and Natural Community Conservation Plan 3-1 (2007), *available at* http://www.cvmshcp.org/Plan_Documents.htm#plan.

40. *Id.* at ES-5.

mate change may have an effect on riparian and aquatic resources, including covered species and their habitat, over the life of the FPHCP.⁴¹ The plan states that the potential effects of climate change—changes in stream temperature and hydrology and riparian habitat—will be monitored for and addressed through the plan's adaptive management program.⁴²

In the course of interviewing Service staff and others involved in implementation of the plans, we learned that staff involved in plan development may regard climate change as a significant stressor, potentially even the most significant threat over the long term to covered species and their habitat, but that they often see the effects of climate change as difficult to single out. The HCPs that contain the most detailed provisions related to climate change are very new, so it is likely too soon to evaluate how effective they will be over the life of the permit in achieving the HCP's conservation goals. It is also possible that monitoring programs established by plans that do not directly mention climate change will detect changes to habitat and other impacts of climate change, along with the impacts of covered activities and other stressors. Provided that the monitoring plan is comprehensive enough, it may matter little what the cause of the observed changes is. More important will be the adaptive management response.

V. Recommendations for Responding to the Climate Change Challenge

A. Filling the Information Gap

The ESA requires that the Services use “the best scientific and commercial data available” when determining that approval of an HCP will not jeopardize the covered species' continued existence.⁴³ Over the years, a persistent criticism of the HCP program has been that conservation plans often contain inadequate performance measures and goals, and may be based on limited science.⁴⁴ Limited information is a problem for the Services when implementing the HCP program as well as other conservation programs for listed species. There is often insufficient biological data available about species' life cycles, habitat requirements, and responses to stressors like habitat fragmentation and invasive species.

With respect to climate change, the challenges associated with designing effective conservation strategies based on sound science are particularly acute. Perhaps the most serious problem is the uncertainty and relatively coarse resolution of the regional climate change models. Regional

models, which are intended to predict changes in temperature, precipitation, humidity, and other factors at a regional scale, are usually downscaled from global climate models.

Generally, a regional model's resolution should not exceed about one-twelfth of the global climate model feeding into it.⁴⁵ Because the resolution of global climate models is limited by computational capacity, the format resolution is at best 100-200 square kilometers.⁴⁶ The actual resolution is closer to 1,000 square kilometers,⁴⁷ much larger than the scale of most HCP reserves, and indeed, larger than the covered area for all but the largest HCPs. Certain techniques, such as statistical downscaling, can be used to downscale models to a watershed or landscape scale, but the techniques are not always reliable. In addition, the available models may disagree sharply regarding particular variables in particular places. Given the uncertainty of regional models, Service staff report that they are uncomfortable predicting climate impacts or incorporating mitigation strategies in HCPs that are specifically designed to respond to climate change.

Even assuming that techniques such as statistical downscaling can be used to project accurately climate impacts at the landscape level, the ecological responses of affected species, habitats, and ecosystems to those impacts are often unknown. It is therefore difficult to design a conservation strategy for an HCP that planners can feel confident will remain viable in the future when climate change impacts become apparent.

Given the significant unknowns associated with climate change at the regional scale and associated impacts on listed species, it is critical that the Services expand their capacity to develop, review, and use models that will be useful to them in designing HCPs and implementing other conservation programs. The Services should develop a coherent scientific model geared to their particular mission. The National Fish, Wildlife and Plants Climate Adaptation Strategy articulates useful principles that the Services should include in HCPs, including scenario planning to address the uncertainties of regional climate change impacts. We applaud the Services' partnership with the U.S. Geological Survey (USGS) National Climate Change and Wildlife Science Center, which is designed to increase the capacity to refine and forecast climate change at multiple scales, and encourage the Services to increase the resources devoted to collaboration with other agencies and academic researchers to amplify this effort.

In addition to partnerships and collaborations, we recommend that the Services: (1) Hire their own climatologists and modelers, to enhance their capacity to assimilate the latest modeling information into their programs as it becomes available; and (2) Expand their capacity to

41. WASHINGTON STATE FPHCP, *supra* note 36, at 1-11.

42. *Id.* app. H.

43. 16 U.S.C. §1536(a)(2).

44. See, e.g., LAURA C. HOOD, DEFENDERS OF WILDLIFE, FRAYED SAFETY NETS: CONSERVATION PLANNING UNDER THE ENDANGERED SPECIES ACT (1998); LAURA C. HOOD, NAT'L CTR. FOR ECOLOGICAL ANALYSIS & SYNTHESIS, USING SCIENCE IN HABITAT CONSERVATION PLANNING (1999); Laura Watchman et al., *Science and Uncertainty in Habitat Conservation Planning*, 89 AM. SCIENTIST 351-59 (2001).

45. Markku Rummukainen, *State of the Art With Regional Climate Change Models*, 1 CLIMATE CHANGE 82-96 (2010). See also Emma B. Suckling & Leonard A. Smith, *An Evaluation of Decadal Probability Forecasts From State-of-the-Art Climate Models*, 26 J. CLIMATE 9334-47 (2013), available at <http://dx.doi.org/10.1175/JCLI-D-12-00485.i>.

46. Rummukainen, *supra* note 45.

47. *Id.*

synthesize the best available science on climate change, especially with regard to ecological impacts, so that the information can be accessed by Service staff and incorporated into HCPs and other Service conservation programs more effectively.

B. *New HCPs: Planning to Address Uncertainty*

I. Scenario Evaluation Can Highlight Key Uncertainties

Even in the absence of perfect information about the impacts of climate change on local landscapes and species, it is possible to make some predictions that are useful in conservation planning. The Intergovernmental Panel on Climate Change (IPCC) predicts with a “high degree of certainty” that global temperatures will rise 2-11 degrees Fahrenheit by 2100, depending on the extent and success of strategies to reduce emissions of greenhouse gases.⁴⁸ The precise regional effects are uncertain, but it is extremely likely, according to the IPCC, that there will be regional changes in the water cycle and an increase in extreme events. Other changes are also expected, including sea-level rise in coastal areas, acidification of the oceans, and altered seasons, which in turn leads to changes in the timing of migrations and the availability of food and forage habitat. These likely effects can and should be considered by the Services in the context of new HCPs.

We recognize that it will often be difficult or impossible to downscale climate models with confidence to the geographic scale relevant for HCPs. Even so, there are still several steps the Services could take to address possible climate impacts. We recommend that the Services:

1. Require detailed baseline inventories (species and habitat baselines) for HCPs that cover species likely to be affected by climate change. The baseline information should include all the known important drivers of the species’ status (e.g., prey, susceptibility to pathogens and disease, water requirements, and sensitivity to disturbance). Detailed baseline information would make it easier to evaluate changes that occur during the life of the permit. Changes might be the result of activities covered by the permit, the impacts of climate change, or a combination of the two. Baseline data would also make it easier to evaluate the success of adaptive management techniques during the plan’s implementation.
2. Develop guidance on what constitutes “take” in the context of a changing climate. The guidance should recognize the fact that stressors will interact, so that impacts from “conventional” stressors may decrease resilience to climate change. Developers or local extractive users should not bear responsibility for correcting the effects of climate change. But in a climate-

challenged world, the impacts of local development may be magnified, for example if it affects areas that are likely to be important to the species in the future. Where that sort of interaction can be foreseen, developers should bear at least a share of the responsibility for increased future harm. We acknowledge that the extent to which local developers should bear the costs of protecting species from impacts that are cumulative or synergistic is a difficult question. We do not pretend to have those answers yet, but urge the Services to at least begin that conversation. To the extent the Services conclude that the public should bear some of those costs, they must be built into future budget requests.

3. Use the best available climate models to develop scenarios that would anticipate a range of baseline shifts attributable to climate change. For example, the Services could develop a “high,” “medium,” and “low” scenario linked to the projected changes in temperature, changes in levels and timing of precipitation, and similar factors. The scenarios would be factored into the Services’ evaluation of the possible impacts of the actions that will be covered by the permit and into the design of the mitigation plan and the adaptive management program.
4. Design monitoring plans to detect key changes to baseline conditions that might be harmful to covered species and could indicate which of multiple possible scenarios is actually unfolding.
5. Where models indicate uncertainty about key variables such as precipitation or habitat shifts, the permit should require that activities be staged so that take does not outrun effective conservation measures, and data accumulated from monitoring can be incorporated into an evolving conservation plan.

2. Preserve Design Should Accommodate Potential Climate-Driven Changes

As noted above, climate change may exacerbate more conventional threats to endangered species, such as habitat fragmentation, exotic species, and disease. Many conservation strategies, such as controlling exotics and increasing connectivity, are appropriate for HCPs regardless of whether climate change poses an additional threat to the covered species. For HCPs that cover species likely to be at additional risk because of climate change, we recommend that the Services consider:

1. Approving preserve designs that optimize the covered species’ ability to shift spatially if existing habitat becomes unsuitable. For example, an HCP might include an elongated preserve design to make it possible for the species to shift to a higher elevation or more northern latitude if conditions change in the future. In some cases, this will involve protecting

48. IPCC, FIFTH ASSESSMENT REPORT, CLIMATE CHANGE 2014, *available at* www.ipcc.ch/report/ar5/wg2/.

currently unoccupied habitat, if the best available data indicate that covered species are likely to shift into those areas.

2. Establishing preserves in areas remote from the permit area of urban plans, in order to avoid creating a “donut” preserve that will become unsuitable in the future. This, too, may involve protecting currently unoccupied habitat that, according to the best available data, is likely to become suitable in the future. In evaluating whether to approve this approach, it will be critical to ensure that sufficient *current* habitat is protected through the plan as well, so that the species does not lose too much current habitat before it shifts to a new area. It will require a delicate balancing act to develop a long-term conservation strategy for species that occur in rapidly urbanizing areas.
3. Using other conservation programs, such as conservation banking and safe harbor agreements to protect currently unoccupied habitat. Under some circumstances, this could mean allowing developers and others to mitigate for impacts to current habitat through the protection of likely *future* habitat protected in conservation banks. Conservation banks and safe harbor agreements could also be used to augment publicly owned preserve lands in the HCP’s permit area, if models suggest that the ranges of covered species are shifting away from the area, or to provide additional “buffers” for the preserves.
4. Establishing a shifting preserve system for species whose range is predicted to move across the landscape. This could be done through the creative use of term easements and options, and safe harbor agreements with private landowners to protect areas not yet occupied but which could become important to the long-term conservation of the species. Any shifting preserve system should be linked closely to the plan’s monitoring plan.
5. Requiring significant buffers for preserves established in urban plans, to reduce the likelihood of catastrophic loss caused by extreme climate events and to address “edge” impacts. This would be a way to build in a “margin of error” for species likely to be vulnerable to climate change.
6. Giving the “benefit of the doubt” to the species when evaluating proposed preserve designs. For those species that are vulnerable to climate change, it will be critical to protect more habitat, in more locations, at more elevations and latitudes than would be the case without climate change. The Services should recognize this fact and adjust their expectations for habitat protection in RHCPs accordingly. It may be appropriate for the federal government to defray at least a portion of the cost of conservation that goes beyond the baseline without climate change.

3. Adaptive Management Should Be Used Appropriately

Meaningful adaptive management plans will be essential to HCPs that cover species likely to be affected by climate change. Adaptive management is the only mechanism through which it will be possible to make corrections to the plans’ approved management techniques. Our review of HCPs revealed a considerable range of adaptive management approaches and a good number of plans without any adaptive management provisions at all. The approaches built into HCPs ranged from very detailed plans overseen by a panel of scientists (for example, the Orange County Southern Subregion NCCP/HCP) to vague commitments to adjust management practices “as warranted.” We learned that many permit holders are monitoring solely to demonstrate compliance with the provisions of the HCP, with no monitoring designed to evaluate the extent to which the plan is achieving its ecological objectives. Without such monitoring, it is difficult, if not impossible, to do meaningful adaptive management. We identified no plans in which habitat management techniques have been adjusted in response to monitoring data.

Adaptive management is a critical component of any HCP that covers species that may be affected by climate change, because of the inherent uncertainty of predicted impacts. We therefore recommend that the Services require that new HCPs that cover climate-vulnerable species include a rigorous adaptive management plan with the following components, which are drawn from the scientific literature⁴⁹:

1. Clear and measurable biological goals for the HCP that are based on the threats to the species covered by the plan. These goals should include land management goals for preserves established by the plan, as well as specific goals linked to the health of the covered species.
2. Measurable milestones that can be used to evaluate progress toward the biological goals at specific intervals.
3. A monitoring plan covering not only implementation of the steps outlined in the HCP, but also the status of covered species and their habitats. The monitoring plan should be geared to resolving key uncertainties over time.
4. Feedback processes for delivering information generated through monitoring to the permit holder and the Services.
5. Clear decisionmaking processes for evaluating the information and deciding whether to continue,

49. George F. Wilhere, *Adaptive Management in Habitat Conservation Plans*, 16 CONSERVATION BIOLOGY 20 (2002); Holly Doremus et al., *Making Good Use of Adaptive Management* (Ctr. for Progressive Reform. White Paper No. 1104, 2011), available at http://progressivereform.org/articles/Adaptive_Management_1104.pdf.

modify, or stop actions, refine objectives, or alter the monitoring process.⁵⁰

6. Clear, objective “triggers,” specified conditions whose occurrence will mandate changes in management or mitigation measures. The response to each trigger must also be specified in as much detail as possible.⁵¹
7. Sufficient funding to support monitoring and data analysis for the term of the plan.⁵²

Adaptive management, however, must not be used as an excuse to issue a permit when it cannot be ensured that the permitted activities are not likely to cause jeopardy or adverse modification of critical habitat.⁵³ Because climate change will increase the stresses on many listed species, some permits may have to be denied. There is an inherent tension in HCPs between the principles of adaptive management, which dictate evolving management practices that respond to monitoring data, and the desire for economic certainty on the part of permittees. As George Wilhere has written, it may be necessary to include economic incentives for permittees in HCPs that incorporate adaptive management provisions, to ensure that the programs get off the ground.⁵⁴ For example, federal funding or technical assistance for biological monitoring or restoration practices may be appropriate in some cases.

4. Consider Ecosystems, Not Just Species

Congress intended that HCPs should be ecosystem-focused, rather than species-focused, conservation tools. The legislature also envisioned HCPs as addressing conservation goals broadly, rather than as simply satisfying the regulatory requirements of the ESA. As explained in the House Conference Report on the amendments that created the incidental take program:

In enacting the Endangered Species Act, Congress recognized that individual species should not be viewed in isolation, but must be viewed in terms of their relationship to the ecosystem of which they form a constituent element. Although the regulatory mechanisms of the Act focus on species that are formally listed as endangered or threatened, the purposes and policies of the Act are far broader than simply providing for the conservation of individual species or individual members of listed species. This is consistent with the purposes of several other fish and wildlife statutes (e.g., Fish and Wildlife Act of 1956, Fish and Wildlife Coordination Act) which are intended to authorize the Secretary to cooperate with the states and private entities on matters regarding conserva-

tion of all fish and wildlife resources of this nation. The conservation plan will implement the broader purposes of all of those statutes and allow unlisted species to be addressed in the plan.⁵⁵

It has become common for HCPs to address unlisted as well as listed species, but the larger goals have remained largely unrealized. Climate change provides an opportunity to reframe HCPs as more generalized conservation tools. For example, the Services should consider providing additional incentives for plans to create preserves that will provide conservation value under climate change, even if their value for the covered listed species diminishes over time.

C. Existing HCPs: Addressing the Threat of Climate Change

From our review of RHCPs, it is apparent that the Services have little information about the extent to which climate change may be affecting the ecosystems and species covered by the plans. One reason for this is the difficulty of separating the impacts of climate change from the impacts of other stressors on the species. To ensure that existing plans remain viable for the species they cover, it is critical that the Services assess the potential impact of climate change on the preserves that have been created by existing plans and the effectiveness of conservation strategies they include. We therefore recommend that the Services evaluate approved HCPs for vulnerability to climate change.

The evaluation should be prioritized by focusing on: (1) HCPs that cover species that have been identified by the Services, the International Union for Conservation of Nature, or another credible body as being vulnerable to climate change; (2) HCPs that encompass a significant portion of the covered species’ range; and (3) HCPs that cover species that occur exclusively on private lands, because publicly owned conservation lands, managed by state and federal agencies, cannot be relied upon for protection of those species’ habitats. The review should evaluate the extent to which the HCPs are achieving the biological goals and objectives articulated in the plans and whether the monitoring and reporting provisions have worked as intended. The review should also identify any impacts to the habitats and species covered by the plans that may be attributable to climate change.

If the review indicates that any of the HCPs are not functioning as expected, or that climate change seems to be impacting the viability of the plans, there may be consequences for the species’ status, identification of critical habitat, consultations with federal agencies on federal projects, and the authorized take levels and mitigation strategies incorporated into future HCPs that cover the same species. The review may also indicate a need for a revised conservation strategy for the HCP. Given the fact

50. The Plum Creek HCP established a committee to evaluate the monitoring data and devise appropriate management responses.

51. *Natural Res. Def. Council v. Kempthorne*, 506 F. Supp. 2d 322 (E.D. Cal. 2007); Doremus et al., *supra* note 49, at 11.

52. Doremus et al., *supra* note 49, at 13.

53. *Id.* at 6.

54. Wilhere, *supra* note 49, at 26.

55. H.R. CONF. REP. NO. 97-835 (1982), *reprinted in* 1982 U.S.C.C.A.N. 2860, 2871.

that No Surprises assurances have been incorporated into most HCPs since 1996, it is likely that the Services would have to bear any additional costs associated with revised conservation strategies in the plans. It is important that these costs be assessed and documented sooner rather than later, so that the Services can incorporate the costs into their budget planning.

D. The “No Surprises” Challenge

As discussed above, the No Surprises policy has proven to be a significant inducement for private entities to engage in conservation planning. For obvious reasons, permittees desire certainty with respect to their regulatory obligations and dislike open-ended commitments, so the No Surprises policy has been popular with them. No Surprises is problematic in the context of climate change, however, because of the substantial uncertainty of predicting regional climate change impacts in the future. A good deal of the problem can be addressed through detailed, effective adaptive management provisions. But we also recommend that the Services consider modifying their implementation of the No Surprises policy in two ways.

First, the Services should negotiate “changed circumstances” provisions that take into account the prospects for climate change, requiring additional mitigation, replacement of preserves in a more suitable area, or even reduced development if climate change makes the conservation strategy in the plan less effective than anticipated. That sort of negotiation may be less problematic than the Services suspect. As a lawyer who represents developers explained early in Secretary Babbitt’s HCP experiment, “Most HCP applicants are willing to agree at the outset to adjustments in their plans to meet new problems that may develop. What applicants will not accept is subsequent unilateral decisionmaking by the federal government which imposes new conditions.”⁵⁶

Second, the level of regulatory assurances provided should be calibrated to the level of confidence about projected climate change impacts; the permittee’s willingness to make financial and other commitments to address climate change, should it become a problem for the covered species; or the extent to which the plan contributes to recovery rather than simply avoiding jeopardy. Stated another way, those permittees who are willing to pay more as a hedge against the uncertainty that climate change represents should be rewarded with greater certainty about the adequacy of their commitment than those who are not. Examples include: (1) agreement to pay for extensive monitoring and adaptive management; (2) agreement to provide “extra” buffers to the plan’s preserve areas; or (3) agreement to set aside an escrow fund that would be available for additional habitat protection during the term of the permit, should climate change cause a degradation of the habitat preserves established in the HCP.

VI. Existing Law: Barriers and Opportunities to Incorporating Climate Change in HCPs

We reviewed the ESA, Joint Service regulations, and HCP Handbook and Addendum to determine whether they contain provisions that would make it challenging for the Services to incorporate climate change into HCPs. We found both potential barriers and potential opportunities. Following are lists of elements in both categories: first, a list of provisions that we identified as potentially limiting the Services’ discretion; and, second, a list of sections that appear to mandate the consideration of climate change impacts in HCPs. We recommend that the Services revise the HCP Handbook to more directly address climate change and require permittees to incorporate the impacts of climate change into their take estimates and mitigation strategies.

A. Potential Barriers to Incorporating Climate Change in HCPs

Section 10(a)(2)(A) of the ESA requires the applicant to specify impacts *from the taking* and steps that will be taken to mitigate those impacts. In practice, the Services have interpreted this language narrowly; only the impacts associated with the proposed activity are considered in the incidental take statement. This narrow interpretive approach makes it difficult for the Services to consider the temporal aspect of take—that is, the possibility mentioned above that an activity today may make the species more vulnerable to climate change in the future.

The HCP Handbook similarly contains language that could be construed to circumscribe the extent to which climate change is evaluated and accounted for in crafting HCPs. The HCP Handbook should be revised as follows:

1. HCP Handbook (3-10): In the determination of proposed activities, the applicant must provide a description of all actions within the planning area that are likely to result in incidental take *for which the applicant or landowner has some form of control*. We recommend that the italicized language be deleted from the Handbook and that the description of actions in the planning area include all activities likely to result in incidental take (whether the applicant has control over them or not) and a description of the likely impacts of climate change on the planning area during the permit term.
2. HCP Handbook (3-17): The consideration of indirect effects of the proposed action may be considered in the conservation plan only if they are likely to result in jeopardy and the effects are reasonably foreseeable *and a proximate consequence of the activities proposed in the HCP*. We recommend that the italicized language be deleted. Indirect effects, including effects that may be exacerbated by the impacts of

56. Baur & Donovan, *supra* note 25, at 769.

climate change, should be considered in the conservation plan.

3. HCP Handbook (3-19): Mitigation programs and standards should be commensurate with the impacts they are intended to address. This could limit the Services' discretion to incorporate mitigation measures that would provide some "insurance" against future impacts from climate change, such as large buffers between preserves and developed areas. We recommend that the HCP Handbook include language to encourage the Services to work with applicants to develop innovative strategies to protect buffer areas and provide "redundancies" in conservation plans, to protect species from unanticipated effects of climate change.
4. Handbook (3-21): Generally, the location of replacement habitats should be as close as possible to the area of impact and must include similar habitat types and support the same species covered by the HCP. This provision could be a barrier to the establishment of preserves in locations remote from the area of impact or preserves designed to protect ecosystem function, rather than a single species. We recommend that this language be deleted and instead that the location of replacement habitats should be based on an evaluation of the short- and long-term habitat requirements of the species, taking into account projected impacts of climate change.
5. Handbook (3-30) and Joint Regulations: No Surprises policy, the challenges of which are discussed above.

B. Opportunities to Incorporate Climate Change

Section 7(a)(2) of the ESA provides that HCPs must be based on the best available scientific and commercial data. This information should include the best available information about climate change, including the regional climate models and existing data about how the species will be affected by climate change. In addition to the provisions discussed above, we recommend that climate change be explicitly acknowledged in the following provisions of the HCP Handbook:

1. HCP Handbook (1-15): Applicants should be encouraged to develop HCPs that produce a net positive effect on the covered species. Whether the HCP would produce a "net positive effect" should be determined after taking into account potential climate change impacts to habitat.
2. Handbook (3-8): Population viability analyses (PVAs) should be used to develop HCPs, especially take authorization. PVAs should take into account stressors related to and/or exacerbated by climate change.

3. Handbook (3-14): Determining anticipated incidental take levels: The authorized take level in the permit must comply with the issuance criteria in the statute (essentially the jeopardy standard) that it will not "appreciably reduce the likelihood of survival and recovery of the species in the wild." As noted above, this analysis has focused on the take associated with the activity at issue in the permit. If climate change threatens the species by impacting the quality or quantity of its habitat in the future, for example, or increasing its vulnerability to pathogens or exotic species, that increased vulnerability should be taken into account by the Services when establishing the level of take to be authorized in the permit. In other words, the permit should acknowledge the existence of climate change by authorizing less take from the covered activity. Climate change may modify the baseline from which authorized take is calculated.
4. ESA §10(a)(2)(A)(iv) and Handbook (7-5): The HCP may include "such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan." This provision appears to give the Services the flexibility to incorporate various conservation strategies to address climate change, if warranted.
5. Handbook (3-25): Adaptive Management: The Handbook and the Addendum to the Handbook recommend that adaptive management be incorporated into HCPs to address uncertainty in the conservation of a species covered by the plan.⁵⁷ The Handbook and Addendum should state clearly that adaptive management must address the impacts of climate change.

VII. Putting the HCP Program Into the Larger Conservation Context

Climate change increases the need to see all the nation's various conservation policies as an integrated whole. Rather than being evaluated and modified in isolation, the HCP program should be considered as one of many conservation programs within and beyond the scope of the ESA.

Within the Endangered Species Program, the Services must consider impacts on recovery when they prepare biological opinions.⁵⁸ In order to do that effectively, they must consult the relevant recovery plans. Since consultation is a necessary step in the process of approving incidental take permits, the Services must take recovery plans into account when negotiating HCPs. They must also take into account other permitting and conservation efforts that will affect the same covered species. In the past, individual HCPs have sometimes been executed with little apparent regard to other HCPs, even those drafted nearly concur-

57. 65 Fed. Reg. 35242, 35252 (June 1, 2000).

58. *Wild Fish Conservancy v. Salazar*, 628 F.3d 513, 518, 40 ELR 20037 (9th Cir. 2010); *National Wildlife Fed'n v. NMFS*, 524 F.3d 917, 931 (9th Cir. 2008).

rently within the same region and dealing with the same species.⁵⁹ In a rapidly warming world, information must be effectively shared and considered. A centralized, readily searchable database of approved and in-process HCPs would be helpful, as would regular opportunities for staff involved in HCP negotiations at different field offices to interact and discuss applications and recent actions.

The HCP program could also be better coordinated with ESA §6 funding of state conservation programs, with Candidate Conservation Agreements used to forestall listing, and with safe harbor agreements. Candidate conservation agreements and safe harbor agreements both have the potential to be useful tools for the Services to use when addressing the uncertainty inherent in HCPs' preserve design. Safe harbor agreements with private landowners not covered by the HCP could be used to provide temporary protection of habitats that might in the future be folded into an HCP's preserve system, should the existing preserve become unsuitable or prove to be inadequate. Similarly, candidate conservation agreements could be used to protect habitat for species that are likely to become listed due to climate change.

Beyond the ESA, HCP negotiations should be coordinated with public land management and acquisition pro-

grams. The effectiveness of preserves set aside in HCPs will be enhanced by proximity to other protected areas. Those protected areas can provide buffers and protection from edge impacts and fragmentation. For almost all species, bigger is better when it comes to conservation areas.

VIII. Conclusion

Climate change poses new, difficult challenges for the Services as they carry out their conservation mission. Globally, as many as one in six species are at an increased risk of extinction due to climate change.⁶⁰ But the complexities of the threats, and the uncertainty inherent in the climate models, make it difficult to address climate change effectively. In the context of HCPs, which authorize the take of listed species under certain circumstances, it is essential that the Services consider the impacts of climate change and ensure that those impacts are taken into account in the plans' conservation strategies. The Services must do so with limited information, but pursuant to a structure that ensures new data will be taken into account as it becomes available, and the conservation plan adjusted as necessary. The species covered by HCPs cannot afford to wait for better information.

59. See Holly Doremus, *Data Gaps in Natural Resource Management: Sniffing for Leaks Along the Information Pipeline*, 83 IND. L.J. 407, 432 n.128 (2008) (noting that two HCPs submitted for the Utah prairie dog by the same consultant in the same county on the same day did not mention each other).

60. Mark Urban, *Accelerating Extinction Risk From Climate Change*, 348 SCIENCE 571 (2015), available at <http://www.sciencemag.org/content/348/6234/571.abstract>.