Species Coverage in Multispecies Habitat Conservation Plans: Where's the Science?

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Habitat conservation plans (HCPs) permit the incidental take of threatened or endangered species listed under the federal Endangered Species Act. The US Fish and Wildlife Service (USFWS) and the NOAA Fisheries Service endorse multispecies HCPs, claiming that they offer advantages for both conservation and development. However, the conservation benefits of multispecies plans to individual covered species may be overestimated. We reviewed the species selected for coverage in 22 multispecies HCPs from USFWS Region 1. We found that conservation measures were often not clearly defined, and that the presence of the species in the planning area was not even confirmed for 41 percent of covered species. While we do not question the conservation value of multispecies plans, our study suggests that changes are needed to achieve full conservation potential.

Keywords: habitat conservation plans, endangered species, conservation planning, covered species, multispecies

Since its creation in 1982, the incidental take permit program of the Endangered Species Act (ESA) has grown to encompass a substantial land area. By the end of 2005, the US Fish and Wildlife Service (USFWS) had approved almost 450 habitat conservation plans (HCPs) covering nearly 16 million hectares (40 million acres; USFWS 2005). The HCP program, which is intended to allow development to the extent compatible with conservation, forces the USFWS and NOAA Fisheries Service (formerly the National Oceanic and Atmospheric Administration's National Marine Fisheries Service) to mediate conflicts between development and the conservation of endangered species. Given the rapid growth of this program in the 1990s, several attempts have been made to evaluate the scientific quality or conservation effectiveness of HCPs. For example, in a seminal paper Harding and colleagues (2001) reviewed 43 HCPs to assess the availability and use of scientific data and the level of scientific input in the planning process. Other evaluations have focused on the guidance provided by USFWS (Smallwood 2000), the use of adaptive management (Wilhere 2002), or the use of indicators in improving conservation and planning (Smallwood et al. 1998). In this article, we extend this work to focus specifically on the scientific quality or conservation potential of HCPs for individual species covered by multispecies plans.

As originally enacted in 1973, the ESA flatly prohibited the "take," broadly defined, of endangered animal species. In 1982, recognizing that take was not always inconsistent with conservation, Congress added a provision (section 10[a][1][B]) that allows the wildlife agencies (USFWS and NOAA Fisheries) to issue permits for the incidental take of listed species under certain circumstances. To obtain an incidental take permit, the applicant must submit an HCP. Permits are required only for the incidental take of federally listed species, but the wildlife agencies strongly encourage permittees to include state-listed, proposed, candidate, rare, and other species in their HCPs. Because the habitats and activities covered by HCPs can vary widely, the wildlife agencies have declined to promulgate "exhaustive, cookbook regulations" for implementing section 10 (USFWS and NMFS 1996). Instead, they have published a handbook establishing flexible guidelines for HCP development (USFWS and NMFS 1996).

HCPs frequently cover multiple species, some federally listed and others not. We focus exclusively on such multiple-species HCPs (MSHCPs) because the wildlife agencies promote the multispecies approach so strongly. The agencies state that this approach both increases certainty for the permittee in case of future listings and increases the "biological value" of the plans by providing for "ecosystem planning" and

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early consideration of the needs of unlisted species (USFWS and NMFS 1996). In this study, we seek to evaluate the claim that MSHCPs provide special conservation value. While a comprehensive planning approach at the community, habitat, or ecosystem level may seem reasonable and efficient, it carries the risk that the needs of particular species may be overlooked. For example, Smallwood and colleagues (1998) concluded that many MSHCPs intended to provide comprehensive coverage for multiple species were actually focused on just one species. Similarly, two recent studies suggest that multiple-species recovery plans may not be as effective as single-species plans. Boersma and colleagues (2001) and Taylor and colleagues (2005) found that species covered under multiple-species plans were generally less likely to show improving trends in status than species covered under single-species plans.

The USFWS and NOAA Fisheries Service provide no guidance regarding the selection of species to include in an MSHCP, leaving those decisions to the applicant. The ESA provides legal standards that to some extent limit the ability of USFWS to grant coverage for any species in an incidental take permit. For each species to be covered, whether or not it is federally listed at the time the permit is issued, the HCP must specify the expected impacts of the permitted take, the steps the applicant will take to minimize and mitigate those impacts, and the funding available to implement these steps. A permit may be issued only if the agency determines that the take will be incidental (in other words, taking is not the purpose of the proposed activity); that the applicant will minimize and mitigate the impacts of the taking to the maximum extent practicable; that adequate funding will be provided; and that the take will not "appreciably reduce the likelihood of the survival and recovery of the species in the wild." Implementation of the plan may not jeopardize the continued existence of the species, but need not contribute to recovery (USFWS and NMFS 1996).

Congress intended incidental take permits to reduce conflicts between conservation and economic development (Thornton 1991). As a result, the permit process balances uncomfortably at the intersection of two very different visions of conservation planning. A comprehensive, multispecies approach appeals to conservation biologists because it is thought to improve the likelihood of creating an effective reserve system (Beatley 1994). Permittees, however, have incentives to cover as many species as possible in the permit in order to protect themselves against the effect of future listings—if a species that is not covered by the plan is subsequently listed under the ESA, this could hinder the continued activities of the permittee. Superficially, the inclusion of additional species in an HCP would seem to satisfy both interests, increasing both certainty for the permittee and overall conservation value. But the selection and treatment of covered species is critical. The conservation gains of adding species to the permit may be illusory if the species added are not effectively provided for in the plan.

To gauge the extent to which MSHCPs incorporate science-based conservation planning, we evaluated (a) whether or not covered species were confirmed in the planning area, and (b) whether or not the plan contained specific conservation measures for the covered species. We describe these two criteria in more detail below.

Reviewing species coverage in multispecies habitat conservation plans

We limited our analysis to plans approved by USFWS Region 1, because this region is responsible for approximately 85 percent of the approved multispecies plans countrywide (USFWS 2005) and has aggressively pursued multispecies planning. We acknowledge that our results may not be generalizable to other regions.

Within Region 1, we evaluated all 22 plans approved before 31 December 2004 that met three selection criteria. First, each HCP included at least one federally listed species and one unlisted species. We focused on these types of plans in order to evaluate the proactive multispecies conservation strategy strongly endorsed by the USFWS in its HCP handbook. We suspect that providing adequate coverage for unlisted species presents the greatest challenges, because many species are little studied before listing. The sensitivity of as yet unlisted species to various threats, in particular, is likely to be poorly understood. Second, we limited our review to terrestrial plans, because the two aquatic MSHCPs employed very different conservation strategies, and we concluded that they were simply not comparable to the terrestrial plans. Third, we analyzed plans only when all supporting documents were available from the USFWS office, including the final approved HCP, all appendixes, and the implementation agreement. We eliminated seven plans because we could not obtain all of the information describing the plans and their implementation.

For each of the 22 HCPs, we determined how many of the covered species had been confirmed in the planning area. We considered a species confirmed if the plan indicated that the species had been located in the planning area through current or recent surveys, reports, or other data sources. We considered species unconfirmed if they were presumed to be present without site-specific supporting data. For example, the use of range maps from field guides was not considered an adequate evaluation of a species' presence.

It is possible that a plan failed to describe evidence of some species that had been confirmed in the planning area. However, the ESA requires that the plans adequately document the conservation outcomes of the proposed activities, and the plans should contain all new data gathered for the permit application. The omission of data necessary for the evaluation of a plan's effectiveness is in itself a serious flaw in the plan.

We also evaluated the proportion of covered species for which the plans included species-specific conservation measures. Our definition of "species-specific" was not demanding. It required only an explicit link in the plan between conservation measures and the individual species. Any plan that explained how conserving habitat would benefit the

Table 1. Summary information for the 22 habitat conservation plans reviewed, from Region 1 of the US Fish and Wildlife Service.

Plan name	Date of USFWS approval	Permit duration (years)	Reported planning area in acres (hectares)		Number of species in plan	Species presence unconfirmed (percentage)	Percentage of unconfirmed species without species-specific conservation measures
Clark County	September 2000	30	5,000,000	(2,023,450)	79	11.4	100
Kern Water Bank	October 1997	75	19,900	(8053)	161	21.1	100
County of San Diego	June 1996	50	251,132	(101,631)	85	25.9	100
Arco Western Energy	October 1995	30	120,320	(48,692)	13	30.8	100
Orange County	December 1995	75	208,000	(84,176)	42	31	100
City of Carlsbad	June 1995	30	1955	(791)	63	42.9	100
Metropolitan Bakersfield	April 1994	20	261,018	(105,631)	9	44.4	100
Coast Range Conifers	October 1994	NA	155	(63)	10	60	100
San Diego Gas and Electric	October 1995	25	400	(162)	110	60	100
Chevron Pipeline	September 1995	50	25.5	(10.3)	17	76.5	100
San Diego Multispecies Conservation Plan	August 1996	50	582,243	(235,628)	85	15.3	69.2
Cedar River Watershed	April 2000	50	90,545	(36,643)	82	54.9	93.3
Nuevo Torch	February 1999	30	21,900	(8863)	25	68	5.9
Natomas Basin	November 1997	50	53,342	(21,587)	26	84.6	31.8
Seneca/Enron Oil and Gas	April 1998	30	650	(263)	9	88.9	12.5
Western Riverside County	June 2004	75	1,300,000	(526,097)	146	1	0
Lake Matthews	July 1995	50	5994	(2426)	64	23.4	0
Tacoma Water	July 2000	50	15,173	(6140)	32	31.3	0
Pacific Lumber Company	January 1999	50	211,700	(85,673)	17	35.3	0
Rancho Bella Vista	December 1999	30	938	(380)	14	35.7	0
Washington Department of Natural Resources	September 1997	70	1,800,000	(728,442)	101	61.4	0
Ocean Trails	July 1996	10	428	(173)	8	0	NA

NA, not applicable.
Note: "Reported planning area" is not the final size of the reserve, as a portion of the area is developed as part of the permit agreement. The number of covered species in each habitat conservation plan includes both listed and unlisted species.

species in question, or that included management measures explicitly linked to the individual species, was scored as having species-specific conservation measures. Some plans relied on generalized management of habitat types, assuming that this umbrella approach would benefit multiple species. Unless the plan somehow justified the link between habitat management and the expected response of an individual species, we did not count it as species-specific conservation. However, if the plan drew an explicit link by citing either data or a conceptual model suggesting the species would respond positively to the planned conservation actions, we counted those measures as species-specific.

Results

All of the evaluated plans were approved by the USFWS between 1994 and 2004. They covered from 8 to 161 species, and areas ranging from approximately 10 hectares to more than 2 million hectares. Permits issued on the basis of these plans run from 10 to 75 years (table 1). Only 17.5 percent of the species included in the plans were federally listed. Unlisted species were predominantly plants and birds (37.1 percent and 26.6 percent of the unlisted species, respectively; table 2).

Confirmation of species in the planning area. On average, 41 percent of the species covered in the plans had not been confirmed in the planning area (standard deviation = 25.5; table 1). In only one plan (Ocean Trails) was the presence of all covered species confirmed. At the other extreme, in another (Seneca Resources Corp./Enron Oil and Gas), the presence of 89 percent of the covered species was not confirmed. Plants made up the highest proportion of unconfirmed species (32 percent). Birds (21.5 percent), mammals (18.3 percent), and reptiles and amphibians (14.5 percent) were also frequently not confirmed in the area (table 1). Insects, other invertebrates, and fish were least likely to be covered without having been confirmed in the planning area (6.7 percent, 5.5 percent, and 1.5 percent respectively; table 1).

The plans presented a number of reasons for the failure to confirm the presence of covered species in the planning area. The most common explanations were that the species was known to occur nearby (34.3 percent) or to occupy habitat of the type found in the planning area (28.6 percent). Life history also played a role: A wide geographic range that might overlap the plan area accounted for 8.0 percent of the species not confirmed in the plan area (examples included grizzly

Table 2. Taxonomic distribution of listed and unlisted species included in each habitat conservation plan reviewed, from Region 1 of the US Fish and Wildlife Service.

Plan	Total number of species	Number of species in each taxonomic group (listed/unlisted)							
		Plants	Birds	Mammals	Reptiles and amphibians	Fishes	Insects	Other invertebrates	Percentage listed in ESA
Ocean Trails	8	0/6	1/1	0/0	0/0	0/0	0/0	0/0	12.5
Metro Bakersfield	9	5/0	0/0	2/1	1/0	0/0	0/0	0/0	88.9
Seneca/Enron Oil and Gas	9	1/1	1/1	1/3	1/0	0/0	0/0	0/0	44.4
Coast Range Conifers	10	0/1	3/0	0/4	0/2	0/0	0/0	0/0	30.0
Arco Western Energy	13	2/2	0/2	2/3	1/1	0/0	0/0	0/0	38.5
Rancho Bella Vista	14	2/3	2/3	0/0	0/2	0/0	0/1	1/0	35.7
Pacific Lumber Company	17	0/0	5/1	0/2	0/5	2/2	0/0	0/0	41.2
Chevron Pipeline	17	4/3	0/2	1/5	1/1	0/0	0/0	0/0	35.3
Nuevo Torch	25	4/7	1/3	2/5	1/2	0/0	0/0	0/0	32.0
Natomas Basin	26	3/4	2/7	0/0	1/3	0/0	1/0	4/1	42.3
Tacoma Water	32	0/0	4/5	3/2	0/7	3/8	0/0	0/0	31.3
Orange County	42	0/9	4/11	1/3	1/10	0/0	0/1	1/1	16.7
City of Carlsbad	63	0/26	3/11	0/7	0/14	0/0	0/2	0/0	4.8
Lake Matthews	64	2/13	4/25	1/9	0/8	0/0	0/2	0/0	10.9
Clark County	79	0/41	0/8	0/4	3/13	0/0	0/8	0/2	3.8
Cedar River Watershed	82	0/0	4/17	3/16	0/14	3/6	0/14	0/5	12.2
San Diego Multispecies Conservation Plan	85	5/40	9/19	0/3	1/4	0/0	0/2	1/1	18.8
County of San Diego	85	5/40	9/19	0/3	1/4	0/0	0/2	1/1	18.8
Washington Department of Natural Resources	101	4/34	5/13	4/10	0/9	2/9	1/5	0/5	15.8
San Diego Gas and Electric	110	5/46	9/20	2/11	1/12	0/0	0/2	1/1	16.4
Western Riverside County	146	11/52	4/41	2/12	3/14	1/1	2/0	2/1	17.1
Kern Water Bank	161	5/39	7/54	2/25	2/15	0/2	1/5	4/0	13.0

ESA, Endangered Species Act.
Note: On average, only 26 percent of the species included across plans were federally listed.

bears and golden eagles), and another 3.2 percent were covered because they might pass through the planning area during their migration (e.g., Canada geese). A small number of species (2.7 percent) were included on the basis of the possibility that they would be introduced into the planning area in the future for purposes of recovery. Only 3.2 percent of the species were included on the basis of historic records that could not be presently verified. No explanation was given for the inclusion of 9.4 percent of the unconfirmed species.

Species-specific conservation measures. Of the species that did not have specific conservation actions, more than 85 percent were also not confirmed in the planning area. We elected to focus on the unconfirmed species in our evaluation of the species-specific conservation actions, suspecting that treatment of these species would be most strongly information limited. We also wanted to highlight the compounding effect that may occur if a species that is not confirmed in the planning area also is not the subject of targeted conservation actions. Nearly two-thirds of the species not confirmed in the planning area lacked species-specific conservation actions (table 1). Variability between the plans was high. Six plans provided species-specific conservation actions for each unconfirmed species, while 10 did not provide specific conservation actions for any unconfirmed species.

Discussion

Several studies have looked at the scientific foundation and conservation promise of HCPs (Hood 1998, Smallwood et al. 1998, Kareiva et al. 1999, Bowler 2000, Smallwood 2000, Harding et al. 2001, Wilhere 2002), highlighting a variety of shortcomings of the process. However, little attention has been paid specifically to MSHCPs and the process of providing coverage for species. Our review has identified three shortcomings of MSHCPs that can substantially limit their conservation potential. First, many plans are overbroad, covering species for which they provide no localized scientific information. The lack of information makes it difficult to predict the effectiveness of a plan when an incidental take permit is issued, or to evaluate it during the permit term. Second, most unconfirmed species also did not have specific conservation actions. Finally, taking our results as a whole, we found high levels of variability across plans in the species they covered, the levels of justification for that coverage, and the extent to which they offered species-specific conservation actions.

Confirmed presence of species in the planning area. The HCP handbook states that species should not be included in a plan if significant gaps in information hinder the development of suitable conservation or mitigation measures (USFWS and NMFS 1996). Furthermore, the statute itself sets up a min-

imum informational threshold, forbidding coverage unless the agency can ensure that the permitted action will not jeopardize the continued existence of the species. Noss and colleagues (1997) expressed concern over whether species should be covered in HCPs when their vulnerability and status is not well understood. They recommended excluding poorly understood species from coverage until more information was obtained. Other assessments of the HCP process have indicated that plans lack an adequate scientific basis, and have recommended that the wildlife agencies not approve permits without a minimum level of data (Kareiva et al. 1999, Reichhardt 1999, Harding et al. 2001). USFWS contends that it does not "lack adequate scientific data and analysis to support many of the approved HCPs" (USFWS 1999). Our results strongly contradict that statement. It is alarming that an average of 41 percent of all covered species in the plans we reviewed were never confirmed in the planning area.

The plans presented a number of reasons for the failure to confirm the presence of a covered species. In one plan (Kern Water Bank), coverage was sought for several species on the basis of the expectation that they might be reintroduced to the planning area in the future. In others, however, it was simply assumed that a species could be present, on the basis of historic records, known occurrences nearby, migratory patterns, known geographic range, or the presence of habitats with which the species is known to be associated. No plans reported that the up-front costs prohibited confirmation of the species' presence in the planning area.

Permit coverage for species that are not confirmed in the planning area may not seem to pose a conservation dilemma. Further reflection, though, reveals the problem. A species not confirmed in the planning area may be either present or absent. If the species is absent, there is no conservation cost to covering it in the permit, and the unnecessary mitigation may provide a net conservation benefit to other species. If the species is in fact present but has not been located in the planning area, however, allowing its coverage in an incidental take permit could well be problematic. The context is critical. The species will be adequately protected if it is uniformly distributed across the planning area, if its habitat needs are reasonably well understood, and if the plan imposes uniform restrictions designed to protect those habitat needs. But most plans call for nonuniform land use, allowing development of some areas in exchange for preservation of others. Since all species show variation in their spatial distribution at some scale, the absence of information on the geographic distribution of covered species in the area makes it impossible to evaluate the trade-offs inherent in this model.

For example, the recovery plan for the Quino checkerspot butterfly (*Euphydryas editha quino*) recognizes the complex spatial structure of this species' population dynamics and targets recovery "on landscape-level protection of metapopulations that experience marked fluctuations in density and geographic distribution on a scale of 5 to 10 years" (USFWS 2003). If no geographic data existed for this species, or for other species showing spatially distributed habitat use and population dynamics, a plan could not ensure that those areas set aside for conservation in an MSHCP would result in no jeopardy.

We believe this situation may be common in MSHCPs, for three reasons. First, rare or endemic species by definition have a high degree of spatial variation in abundance, being absent from most areas and present in only a few. In such cases, geographic data are critical to understanding the appropriate scales for planning reserves (Schwartz 1999, Schwartz et al. 2002). Second, ecologists now know that a wide variety of organisms show variable population dynamics, in which the movement of individuals can affect local populations in many ways, including their persistence (Chepko-Sade and Halpin 1987, Rhodes et al. 1996, Hanski and Gilpin 1997, Tilman and Kareiva 1997, Clobert 2001). How patterns of development within MSHCPs will affect these processes cannot be ascertained without some minimal level of information on geographic distribution. Third, literature on habitat use indicates that even abundant species have preferred habitats, roosting or nesting locations, or foraging areas, and plans that allow the exploitation of these higher-quality habitats while conserving less used, lower-quality habitats could have a negative impact on the species (Morrison et al. 1998, Scott et al. 2002). In all of these circumstances, data on species distribution within the planning area are likely to be crucial to ensuring that the plan preserves appropriate habitat.

We are not insisting on exhaustive surveys for all covered species, but at a minimum, assumptions of occurrence should be justified, and the possibility of geographic heterogeneity should be considered. In addition, if coverage is granted for a species not confirmed in the planning area, periodic monitoring for it, at a reasonable level of effort, should be required. Without at least that level of localized consideration, plans cannot assure adequate protection within the planning area. In some cases, the species may be secure in other locations outside the planning area, making localized monitoring and conservation a lower priority. In those cases, however, the plans should explicitly acknowledge the possibility that the species will be lost from the planning area, so that decisions elsewhere do not assume otherwise.

Courts have required the USFWS to prove that listed species occur in an area in order to establish take (*Arizona Cattle Growers' Association v. US Fish and Wildlife Service,* 273 F.3d 1229 [9th Cir. 2001]; *Defenders of Wildlife v. Bernal,* 204 F.3d 920 [9th Cir. 2000]), and legislation passed in 2005 by the House of Representatives (H.R. 3824) would emphasize the importance of empirical data to listing decisions. Landowner representatives, including the Home Builders Association of Northern California, have argued that similar reasoning should be applied to critical habitat designation; areas should not be eligible for designation as critical habitat unless field surveys have confirmed the presence of the species (Pacific Legal Foundation 2004). Simply as a matter of logical consistency, field surveys should similarly be required to justify incidental take.

Species-specific conservation measures. The lack of any species-specific conservation measures for nearly two-thirds of species not confirmed in the planning area is difficult to square with the ESA's requirements that plans ensure that permitted activities will not cause jeopardy, and that permittees minimize and mitigate the impacts of their take to the maximum extent practicable. USFWS admits there are "few ironclad rules for mitigation programs," but does say those programs should address the "specific needs of the species" (USFWS and NMFS 1996).

It is apparent from our data that most of the species not confirmed in the planning area receive no individualized attention in MSHCPs. While these plans may provide some level of habitat conservation, they do not account for the individual conservation needs of covered species. It seems to have become routine practice simply to assume that generalized habitat conservation will adequately protect all species found in the habitat. However, the finding of Taylor and colleagues (2005) that 40 to 50 percent of listed species in multispecies plans showed declining trends suggests that this assumption may not be justified.

Ideally, an HCP should detail specific conservation actions for each covered species. A science-based approach would synthesize existing data and expert opinion to develop detailed, species-specific conservation actions. We are leery of reliance on generalized conservation actions for two very different reasons. The first is procedural. The plans are the only record available to the public to explain why a permit was issued. To facilitate public oversight of agency action, an important aspect of the ESA (Doremus 1999), HCPs must contain sufficient information to assure an educated reader that covered species will in fact be protected.

Our second concern is substantive. Habitat-based HCPs rely on the assumption that ensuring the ecological integrity of natural habitats, or simply protecting designated areas from development intrusions, will automatically protect the associated species (USFWS and NMFS 1996). Multispecies plans minimize the importance of species-specific conservation actions, emphasizing a more holistic approach to management and protection (Kareiva et al. 1999). However, there is often no empirical evidence to support claims that this umbrella approach will actually protect a range of species (Fleishman et al. 2001), and Taylor and colleagues (2005) suggest that this approach does not work as well as dedicated plans for individual species. The fact that some species are inconsistently associated with their preferred habitat type makes reliance solely on a habitat-based strategy questionable (Niemi et al. 1997). In addition, narrowly endemic species may not be adequately protected through an umbrella approach (Schwartz 1999). Multispecies HCPs will therefore frequently need some species-specific conservation actions in addition to the more general, habitat-based approaches.

A 2000 addendum to the HCP handbook suggests that adaptive management can be used to overcome uncertainty associated with species-specific conservation (USFWS and NMFS 2000). However the "no surprises" rule (50 CFR 17.22, 17.32), which provides that permittees will not be required to provide more money or land for conservation efforts once an HCP has been approved, effectively precludes most adaptive management. In fact, most incidental take permits preclude any changes in the extent of mitigation during the course of the permit (Doremus 2001), and few HCPs incorporate genuine adaptive management (Wilhere 2002). Even if current litigation results in a softening of the assurances provided to permittees, our finding that no species-specific conservation actions, including simple surveys, are planned for a large proportion of covered species makes effective adaptive management unlikely.

In sum, multispecies planning will not always guarantee effective conservation. Other evaluations have shown that multispecies recovery plans tend to reflect poorer understanding of the biology of the species (in comparison with single-species plans), and to lack suitable adaptive management provisions (Clark and Harvey 2002). Kareiva and colleagues (1999) found that multispecies HCPs had higher "quality" impact assessments than did single-species plans, but this approach did not improve the assessment of a species' status, take, mitigation, or monitoring (Kareiva et al. 1999, Harding et al. 2001). Our results agree with these studies. We found that many multispecies HCPs ignore the potential importance of species-specific conservation actions. The lack of species-specific conservation actions in multispecies HCPs is most likely driven by lack of information about the status or needs of many of the covered species.

Conclusions

HCPs cover a large number of species not known to be present in the planning area, and often lack species-specific conservation actions. These features are readily explained by the shortage of high-quality, site-specific biological information. This fundamental lack of information, and hence of species-specific planning, may be why species in MSHCPs have increased chances of population decline and reduced chances of increase compared with species with dedicated plans (Taylor et al. 2005).

HCPs could be important tools for generating conservation information. Permit applicants, seeking the economic benefits of development, have strong incentives to generate and disclose information about the status of those species on their property. Furthermore, the requirement that permitted activities not jeopardize the continued existence of the species gives the wildlife agencies a legal basis for requiring that information.

Unfortunately, our results suggest that, rather than demanding more information, USFWS has been inclined to issue permits in the absence of data, relying instead on professional judgment. That is a dangerous practice. A number of studies have demonstrated that even experts often commit systematic errors in making subjective decisions about risk in the absence of complete information (Burgman et al. 1996, Regan et al. 2002). Given the high levels of uncertainty and the differences of opinion among scientists

when it comes to reserve planning, it is crucial that the HCP planning process include as much real data as possible, as well as quantitative, model-based decisionmaking.

We recommend a thorough assessment of the policies and procedures involved in granting species coverage in an HCP. Scientific and legal standards should be well articulated and standardized. Furthermore, identifying gaps in information should be a first step in the planning process, as this will force planners to admit where high levels of uncertainty exist and to remedy these through information-generating activities either before or during the implementation of a plan.

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