The Role of Local Government in the Conservation of Rare Species

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Abstract: *In the U.S. rare and endangered species protection is a public policy responsibility commonly ascribed to the federal or state governments. We make three related claims: 1) the scale of local and regional land use control and open-space acquisitions matches the range sizes of many rare, endemic species, 2) land acquisition is the most attractive approach to conserving many rare taxa, especially endangered flora, and 3) at least some local governments and non-governmental organizations have the policy capacity necessary to identify, acquire, and manage critical habitats for endangered species. Although local involvement can have conservation payoffs throughout the United States, we focus on California in general, and, in particular, use as a case study the biology and political resources of four adjoining counties in the central coast region of the state: San Mateo, Santa Cruz, Santa Clara, and Monterey. We close with a discussion of policy implications for coordinating local, state, and federal conservation efforts. These include 1) brokering land acquisition deals with input from public land managers and private owners, 2) shifting funding priorities for rare, well-known species away from research to habitat acquisition and management, and 3) encouraging biologists to invest more effort in local land use regulations so that they may make more effective use of local land management and conservation opportunities.*

El Papel de los Gobiernos Locales en la Conservación de Especies Raras

Resumen: *En los Estados Unidos la protección de especies raras y amenazadas es una política pública, responsabilidad comunmente adscrita a los gobiernos estatal o federal. Nosotros hacemos tres afirmaciones relacionadas: 1) la escala para el control del uso del suelo a nivel local y regional y la de adquisición de espacios abiertos, corresponde con el rango de tamaños de muchas especies endémicas raras, 2) la adquisición de tierras es la aproximación mas atractiva para la conservación de muchos taxas raros, especialmente de flora amenazada, 3) al menos algunos gobiernos locales y organizaciones no gubernamentales tienen la capacidad política necesaria para identificar, adquirir y manejar habitats críticos para especies amenazadas. Aunque el involucramiento local puede tener valiosos trabajos de conservación a lo largo de los Estados Unidos, nos enfocamos a California en lo general y en lo particular usamos un caso de estudio de los recursos biológicos y políticos de cuatro municipios adyacentes en la región de la costa central del Estado: San Mateo, Santa Cruz, Santa Clara y Monterey. Finalizamos con una discusión sobre las implicaciones de ésta politica en la coordinación de los esfuerzos de conservación a nivel local, estatal y federal. Estas incluyen 1) Negociar los contratos de adquisición de tierras con puntos de vista del público, las personas que manejan la tierra y los propietarios privados, 2) cambiar las prioridades de apoyo en la investigación de especies raras, bien conocidas hacia el apoyo para la adquisición de habitat y manejo y 3) alentar a los biólogos para que realizen un mayor esfuerzo en la reglamentación del uso local de suelo, de tal manera que puedan hacer un uso más efectivo del manejo de la tierra local y las oportunidades de conservación.*

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Introduction

Americans have come to think of the protection of endangered species as a mission falling squarely under the federal bailiwick (Tarlock 1993). Indeed, the idea that any other level of government—especially cities and counties—could play a significant role in the protection of rare species is essentially absent from the minds of biologists, policymakers, and the general public. This is not surprising, given that highly visible conservation battles are fought in federal courts and in the halls of the U.S. Congress, and that most of the administrative responsibilities for endangered species management have fallen to federal agencies. Moreover, many believe that only the federal government could plausibly marshal the necessary administrative expertise and management capacity to identify species in need of protection (in consultation with the scientific community), to design scientifically credible recovery programs, to enforce proscriptions against harm, and, finally, to pay for all of the above.

Endangered species protection also stays on the national agenda for less obvious reasons. Widespread public support often goes to charismatic birds and mammals with large habitat needs—species that span many local or even state jurisdictions. Some of the agendas that initiated the environmental legislation of the late 1960s revolved around the "saving" of just such species; the plight of emotionally-attractive mega-fauna was a matter of national debate, and the nationally symbolic animals that the public cared about (bald eagles, grizzly bears, bison) all require large amounts of habitat and money for effective conservation. In addition, well-known stories of politically charged endangered species battles (over the snail darter and the Tellico Dam, the Northern Spotted Owl and old-growth logging) provide a discouraging lesson to state and local policy entrepreneurs. Mess with species conservation and you're likely to antagonize powerful interests (developers, agribusiness, industry), but your base of support will be latent, ambivalent, inchoate, unorganized, and politically and geographically diffuse (Tobin 1990). National politicians have more consistently gained support—campaign contributions as well as votes—by helping endangered species than have locally-elected officials, largely because they can advocate protection programs outside their electoral districts (Tobin 1990).

Despite all these reasons for concentrating on the development and implementation of federal-level species-protection programs, we make the case here for adding local action to existing national efforts to protect endangered species. The bulk of articles on federal biodiversity protection debate how well or how poorly the U.S. Endangered Species Act performs, and most focus attention on federal- or state-level reforms. In contrast, little work in either the ecological or policy literature focuses on species protection leadership at local or regional levels. County land trusts, cities, and regional parks or open-space districts have been acquiring land for many public purposes for many years, albeit rarely with species conservation as the primary motive. We claim that adding species conservation to the local government agenda is both feasible and desirable, and that it can significantly strengthen endangered species protection.

The large-scale habitat needs of some species militate against local management because so many private and public land holders as well as different units of governance need to be brought into agreement—or, at the very least, compliance—with habitat conservation measures. But because of past habitat destruction or natural endemism, most endangered species, especially plants, occur at far smaller spatial scales than do the most charismatic endangered fauna. It is not uncommon for some endemic plant species to occur in only a handful of small ($<$ 100 ha) habitat patches and to have entire geographic ranges encompassing only one or two counties within a single state. This is the same spatial scale at which local land trusts, county or regional open-space districts, greenbelts, and parks typically operate. We believe that this convergence of scale offers the possibility for highly effective species preservation through governmental mechanisms that conservationists exploit only rarely.

To make clear the promise, as well as the limitations, of local participation in endangered species protection, we explore three claims: (1) that the scale of local and regional land-use control and open-space acquisitions matches the range sizes of many rare, endemic species; (2) that land acquisition is the most attractive approach to conserving many rare taxa, especially endangered flora (Jensen et al. 1993); and (3) at least some local governments and nongovernmental organizations have the policy capacity necessary to identify, acquire, and manage critical habitats for endangered species. We do not argue that local action could replace federal control of endangered species management; local conservation may occur best in partnerships with state and federal scientists, land managers, and policymakers, especially when funding is a key obstacle. We also recognize that local control does not logically imply better environmental protection, much less species conservation (Press 1994). In most circumstances, however, incorporating local organizations into species protection plans can pay enormous dividends in the effective implementation of conservation goals.

Although local involvement can have conservation payoffs throughout the United States, we focus on California in general and, in particular, a case study of the biology and political resources of four adjoining counties in the central coast region of the state: San Mateo, Santa Cruz, Santa Clara, and Monterey (Fig. 1).We will concentrate on the conservation of plants. Other taxa (especially terrestrial and freshwater invertebrates) contain many narrowly endemic species, but the data on endemic plants are typically much better and will best serve to illustrate our arguments.

Figure 1. The state of California, including the four-county study area: Santa Cruz, Santa Clara, San Mateo, and Monterey counties (shaded).

Matching Biological and Policy Scales

It is no coincidence that we focus both on California and on plants in our discussion of endangered species. Although California is home to many rare vertebrates, plants make up the majority of its endangered biota (Jensen et al. 1993). California is home to more plant species than any other state, with approximately 6300 native species, subspecies, and varieties (Skinner & Pavlik 1994). Furthermore, 36% of these taxa are endemic to the state—the highest endemism rate of any state except Hawaii—and the majority of these endemics are rare or uncommon (Skinner & Pavlik 1994). The California Native Plant Society (CNPS), which maintains the most careful and up-to-date records on the California flora, includes 13.6% of the native flora on its lists of taxa "rare or endangered in California and elsewhere" and a full 27.7% of the flora in all of its categories of rare, uncommon, and "of concern" species (Skinner & Pavlik 1994).

A variety of natural causes restrict many rare plants to small geographic and habitat ranges. The most important of these factors are localized edaphic conditions, such as serpentine soils, unusual hydrological circumstances such as vernal pools, unique disturbance regimes, or historic isolation (Kruckeberg 1984; Kruckeberg & Rabinowitz 1985; Baskin & Baskin 1988; Menges 1990; Hickman 1993; Jensen et al. 1993). Because of its geology, hydrology, and climatic history, California is rich in the narrowly endemic species favored by these abiotic factors (Jensen et al. 1993; Skinner & Pavlik 1994). Thus, much of the endemism in California, and elsewhere, is natural, with viable plant populations often occurring on small, isolated habitat patches (Kruckeberg & Rabinowitz 1985).

Because of natural patterns of endemism and the rapid human development that has further restricted their ranges, many rare plants exist in only a few, small populations. Reviewing information at time of listing for plants considered threatened and endangered under the ESA, Wilcove et al. (1993) found the median number of individuals was only 119 and the median number of discrete populations was only three. In a similar review of federally listed plants for which federal recovery plans had been written, Schemske et al. (1994) found that the most common number of discrete populations was one (17.6%) and that more than half of the 91 species included had five or fewer populations.

Similarly detailed data are not available to quantify the exact ranges or population sizes of the 1701 plants included in CNPS's Inventory of Rare and Endangered Plants of California (Skinner & Pavlik 1994). The inventory does list the county-by-county occurrences of rare plants within California (Skinner & Pavlik 1994). Thirty-five percent of the species, subspecies, and varieties included in the inventory occur in only a single county, and an additional 25% occur in only two counties (Fig. 2a). Even more striking, of federally listed species in California, 70.8% occur in only one or two California counties, and none occur in more than seven counties (Fig. 2b). At a smaller scale, we see the same pattern for species that occur within our four-county study area (Fig. 2c). Thus, many plants of concern to conservationists presently exist within the regulatory control of only one or two county governments, and the majority are within the jurisdiction of at most a handful of local governments (note that average county sizes in California are larger than most counties in the U.S., and thus California counties can represent much larger habitat and resource management areas than equivalent jurisdictions in the eastern U.S.).

Although plants typically show more-restricted geographic ranges than do animal species, it is worth noting that many of the most endangered animals occur on minute spatial scales similar to those of rare plants (Fig. 3a). Of the 94 nonmarine animal species listed by either the federal or state government as endangered or threatened and occurring in California, 49% have total ranges that span only one to three California counties (Thelander & Crabtree 1994). Of the 57 listed species endemic to the state, 49% occur in only a single county. As

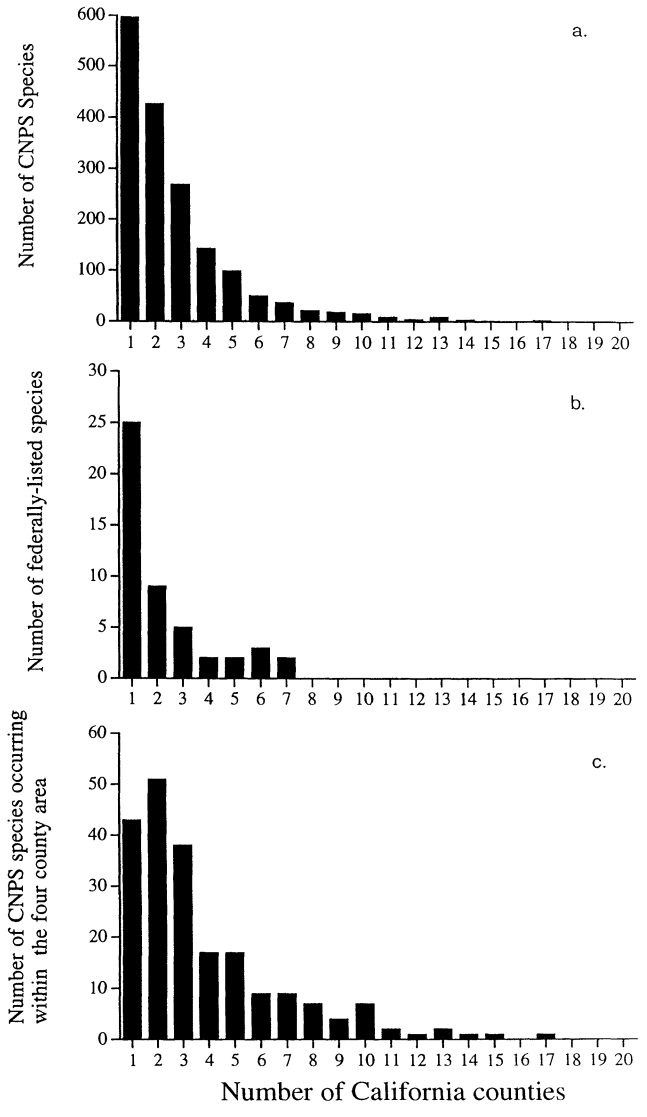

Figure 2. Frequency distributions for the occurrence of rare plants, measured by the number of California counties occupied. Each plot shows the number of California counties occupied by plant species listed by the California Native Plant Society (CNPS) (Skinner & Pavlik 1994): all listed species (n = 1701) (a); only species listed as threatened or endangered by the federal government by 1994 (n = 48) (b); and all listed species that occur within the four-county study area (Santa Cruz, Santa Clara, Monterey, and San Mateo Counties; n = 211) (c). Figure does not include marine or anadromous species or species restricted to the Channel Islands. Data are summarized from current estimated distributions as shown in Thelander and Crabtree (1994).

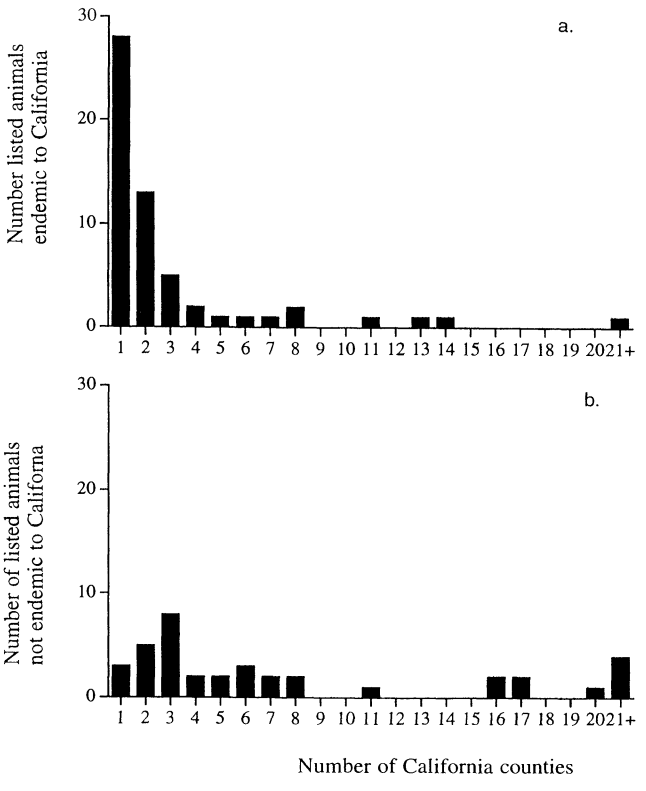

Figure 3. Frequency distributions for the occurrence of rare animals, measured by the number of California counties occupied. Only taxa that are listed as threatened or endangered by the federal or state governments are included: species endemic to California (n = 57) (a); species also occurring outside of California (n = 37) (b).

one would expect, birds are the most likely to occur outside of California, accounting for 25 of the 37 listed species not endemic to the state (Fig. 3b). In contrast, the majority of all other groups, including mammals, are both endemic to the state and to very small areas of the state. Thus, local conservation does not apply only to plants but to other endangered taxa as well.

Although more-precise estimates of habitat distribution are unavailable for most Californian plants, a few examples of population numbers and distributions from our four-county area will help to illustrate the small areas that often support a rare species. At the time of its listing in 1985, the San Mateo thornmint (*Acanthomintha obovata* ssp. *duttonii*), existed as a single population of 1000–2000 individuals living on 180 m^2 of land (Federal Register 1985). *Erysimum teretifolium* is endemic to unique sandy soils scattered through the Santa Cruz Mountains (Marangio & Morgan 1987) and is presently known from approximately 12 locations (Federal Register 1994). Most of these populations occur where there is less than 2 ha of suitable habitat; the largest population exists on a site that in 1983 supported almost 8 ha of habitat but that has been subject to ongoing habitat destruction (Federal Register 1994). The sand-based soil outcrops that support *Erysimum teretifolium* also maintain a diversity of other plants. Approximately 90

taxa are sandhill specialties (Marangio & Morgan 1987). This wealth of rare species exists on a total of 2025 ha of sandhills soils, spread among 20 discrete outcrops. But only about 200 ha of this land supported the richest of the sandhills communities; of this, only 81 ha remain (Marangio & Morgan 1987). As these examples illustrate, a wealth of rare plant species can be supported on just a handful of land parcels, all of moderate to tiny size.

The land areas on which these rare plants exist is similar to—and often smaller than—the areas typically preserved by local and regional landholders for open-space preservation. Nationally, over 1100 local and regional land trusts protect more than 1.1 million ha, 730,000 of these through outright acquisition (Wright 1993; Rogers 1995). A 1991 survey of U.S. land trusts found that 78% had protected fewer than 400 ha; 41% conserve less than 40 ha each (Wright 1993). But despite some of the highest real estate costs in the country, local and regional entities in California, including cities, counties, special open-space districts, and 116 land trusts, have steadily been purchasing parcels in the range of 4–200 ha. They have done so by channeling small shares of property taxes to regional open-space districts and authorities, by local ballot initiatives, and through other forms of public-private partnerships. In addition to land protected by regional, city, and county open-space districts, Jensen et al. (1992) report that some 4.8 million ha of California (approximately 11.9% of the state) are "reserved" by state, federal, and "private conservation groups." Of those 4.8 million ha, Jensen et al. estimate that 2.6 million (6.3% of the state) are reserved for "biodiversity goals."

Locally, the percentage of land protected as undeveloped open space (and hence available for habitat) can be much greater. Indeed, in three of our study counties (Santa Clara, San Mateo, and Santa Cruz), a substantially greater percentage is in protected open space. We use the Greenbelt Alliance's definition of open space: ". . . land that is owned entirely or through an easement by a governmental agency or a not-for-profit organization, and which is or could be in an open space use" (Greenbelt Alliance 1992).

Santa Clara County has the most protected land, with 70,647 ha of land and water (or just over 20% of the total county area in some form of protected open space). In San Mateo county 31,185 ha of land and water are in protected open space (22% of the county; Greenbelt Alliance 1992), in Monterey County (Monterey County Planning Department 1985) about 2.7% (16,807 ha, not including the extensive federal lands in that county), and in Santa Cruz County (Santa Cruz County Planning Department 1994) 15.5%, or 17,729 ha. When local and regional open-space holdings are included, according to a 1992 Greenbelt Alliance report, the San Francisco Bay Area has 347,490 ha of public open space. Almost 38,000 of these hectares have been added in the period 1988–1992; more have probably been added since 1992, but aggregate data are not yet available. The San Francisco area is usually defined as the following nine counties: Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco. The total area of these counties is 1,800,941 ha; thus, the Greenbelt Alliance's estimate represents 19% of this highly urban area. In sum, local land protection is capable of saving more area than is needed to preserve many rare, endemic plants and animals.

Land Acquisition is the Best Way to Save Many Rare Species

Direct acquisition is the most biologically appealing preservation strategy for the small areas that support most rare species. The reasons all relate to the fact that it is small chunks of land that are at stake. The smaller the piece of habitat, the greater the potential edge effects, the more the need for invasive control of exotic species, and the greater the difficulties of multiple-use strategies that mix human uses with the needs of endangered species. For example, the disturbance regimes required by some endemics, especially burning, are not compatible with most other land uses, especially on areas of only a few hectares. Simply put, small reserves require intensive control of anthropogenic impacts, and this control is easiest to attain with direct ownership.

The usual co-occurrence of endemic plants also lends an advantage to outright purchase of habitat remnants. Rare species are not scattered across the landscape. Rather, as in the case of the sandhills plants mentioned above, they often occur in groups that for various reasons are all restricted to the same pieces of land. In our four-county area, two specialized habitats—serpentine outcroppings and coastal dune-coastal scrub areas—harbor the lion's share of the rare plant species. Each of these habitats account for only a miniscule fraction of the four-county area (0.99% for serpentine and less for coastal dune-coastal scrub [Kruckeberg 1984; Grey personal communication]), yet 136 of the 211 plant species occurring in this area (or 64%) are associated with those habitats. Thus, achieving the strong protection conferred by ownership for a subset of these small but particularly important areas is perhaps the best way to save many species at once.

Outright acquisition is an attractive conservation strategy for strictly political reasons as well. Acquisition is often the best way to protect a valuable property from future threats. In essence, once the land is purchased it is no longer subject to the pressures of economic development or the vagaries of changing political majorities. Local governments and nongovernmental organizations also routinely use other conservation options, however, including (1) special-area zoning (in which development rights

are regulated), (2) transferable development rights (TDRs, in which development options are spatially shifted), (3) conservation easements (in which development rights are donated by landowners), and (4) purchased development rights (in which development rights are purchased) (Wright 1994). These methods are more problematic than outright purchase. Special-area zoning is the most controversial option, relying as it does on the private sector to bear the costs of preservation. The TDRs work properly only if relatively abundant and uncontroversial sites exist to which development can be transferred. Conservation easements offer attractive "income and estate tax deductions equal to the value of the development rights retired" (Wright 1994), but landowners are often reluctant to give up development rights in perpetuity. For this reason purchased development rights can be quite expensive. In the case of both conservation easements and purchased development rights, the transaction costs (time, energy, legal counsel) of negotiating agreements between landowners, conservation groups, and local governments can be high.

In addition to these complications, land acquisition, especially by private groups, is far less controversial than other strategies pursued by environmentalists and administrative agencies with responsibilities for biodiversity and other environmental protection. Political conservatives are attracted to land purchases because these use the free market to achieve environmentalist ends; in essence, environmentalists "consume" environmental protection by acquiring rights to the threatened resources. The Nature Conservancy is widely praised and supported by industry precisely because its land-purchase approach appears to be fundamentally fair from a wide variety of political perspectives (Boerner & Kallery 1995).

Local Land Acquisition for Biodiversity Protection

Without a doubt there are substantial obstacles to local acquisition of critical habitat. In California, as in much of the country, new taxes are rarely approved by voters, for reasons both political and procedural (e.g., electoral majority requirements), a particularly serious problem as habitat becomes more expensive to acquire. Partly as a consequence of state budget deficits, local governments are under pressure to develop continually in order to survive and attract an adequate tax base. And since the mid-1980s, as a result of several restrictive U.S. Supreme Court decisions, local governments have felt more keenly constitutional constraints on takings. Finally, habitat protection is often a less salient issue than preserving other environmental amenities, such as air or water quality (Tarlock 1993).

Nonetheless, local governments and nongovernmental organizations often have both the will and the means to pursue the protection of endangered species through open-space preservation. As in many states, local land trusts and open-space districts in our four-county study area have quietly pursued land acquisition for open space over the last two to three decades. The Santa Cruz County Land Trust has acquired over 162 ha in over a dozen parcels, much of which includes sensitive habitat. Operating in Monterey County, the Big Sur Land Trust has acquired over 4000 ha of prime coastal land in over 60 parcels. The Midpeninsula Regional Open Space District, spanning San Mateo and Santa Clara counties, has worked to acquire approximately 14,175 ha, in over 25 separate parcels, of highly-prized habitat on the San Francisco peninsula. Cities, counties, and the state have also shared in efforts to preserve open space in these four counties. Table 1 lists open-space holdings by county

Table 1. Landholders of protected open space in case-study counties in California.

County land and water area (ha)	*Type of owner and land area of holdings (ha)*[a]							
	Public							
	Federal	*State*	*County*	*City*	*Special district*	*Private*[b]	*Local gifts to state parks*	*Williamson Act Program*[c] *(% of county area)*
Santa Clara 341,075	4692	28,890	~16,200	4309	~9720[d]	659	5004	147,232 (43)
San Mateo 137,574	2359	5289	14,917	1023	~5872	1886	1127	18,915 (13.7)
Monterey 861,609	235,123[e]	4335	8212			4260	927	283,038 (32.8)
Santa Cruz 113,951		17,145	455	395 (Greenbelt)		173	4095	8925 (7.8)

[a] *Includes "brokers" of land acquisition, even if they do not actually take title to open space lands for very long.*
[b] *Generally nonprofit organizations. In Santa Clara and San Mateo counties these include the Peninsula Open Space Trust, the Bay Area Open Space Council, the Committee for Green Foothills, and the Greenbelt Alliance.*
[c] *The Williamson Act allows counties to reduce property taxes of landowners who agree to keep their lands in open space and agricultural lands for at least 10 years.*
[d] *Funding for Midpeninsula Regional Open Space District comes from an assessment on property of 1.7¢ per $100 of assessed property value. The assessment provided approximately $10 million in fiscal 1993–1994.*
[e] *Mostly U.S. Forest Service and military. Figure goes down to 223,373 ha if Fort Ord is subtracted.*

and ownership type (including public and private nonprofit organizations) and shows that local efforts to protect open space vary widely—from private landowners who agree to keep their land in open space or agricultural use in exchange for lower property taxes to land trusts to special districts, counties, and city governments. In addition, outright land donations by local residents have, over the years, added substantial acreage of valuable lands to the state park system.

The protected lands have been acquired through a variety of deals and mechanisms. If lands are transferred from private ownership to a nonprofit organization—whether land trust, public entity, or public-private hybrid—sellers may reap substantial tax advantages (sometimes making up for reduced selling prices). Bond issues have long been used by the state to acquire park lands, but cities, counties, and open-space authorities have regularly been able to direct property or sales taxes to acquiring open space.

Some acquisitions by public entities are pursued explicitly for endangered species protection. As of late 1995, for example, Santa Cruz county had raised half of the $3.2 million needed to purchase the 14.6-ha Quail Hollow Quarry, one of the largest remaining parcels of the valuable sand hills habitat. The county's explicit motive for acquiring the site is to protect some 78 unusual plant species (three of them on the federal endangered and threatened species list) and 13 locally rare species of animals (Morgan 1995; A. Schiffrin, personal communication).

What explains a county's willingness and ability to protect open spaces? How is it that substantial support for publicly acquired open-space lands remains high even after many hectares have been acquired? How is it that acquisition efforts continue despite economic downturns? There is no single answer; rather, collective action to pursue a public good like open spaces depends a great deal on what political scientists call environmental "policy capacity" (Robertson & Judd 1989). We argue here that, with respect to conservation, a local governments policy capacity is a composite of five related elements: (1) past and present land-use policies, (2) the administrative capacity of local governments, (3) the nature of land ownership and use, (4) political culture and demographics, and (5) principal sources of funding for land acquisition.

Past and Present Land-Use Policies

Land-use policies embody officially sanctioned preservation efforts and demonstrate how actively public entities manage growth and dedicate scarce public resources to environmental goals. To the zoning and easement tools described earlier, we add a general index of the fiscal burdens counties are willing to shoulder on behalf of environmental protection. These include special fees, taxes, and assessments used to pay for open-space authorities, as well as limits on urban growth rate (usually in percentage per annum) that also bear opportunity costs in the form of foregone property taxes. A high score on this element of policy capacity indicates that public representatives—especially elected officials—perceive that both mandates and constituents exist for preservation efforts.

For example, San Mateo, Santa Clara, and Santa Cruz counties are part of a set of 20 California counties (out of 58) that have passed greenbelt ordinances, urban limit lines, or urban growth boundaries (Governor's Office of Planning and Research 1994). The city of Santa Cruz (population 51,500 in 1994) will have spent close to $5 million between fiscal year 1992–1993 and 1995–1996 on acquisition and maintenance of its 395-ha greenbelt (McMillan & Quintanar 1995). The city of Monterey has also adopted such restrictions, but the county has not. In addition to growth-management regulations, Santa Cruz county has both a Riparian Protection Ordinance and a Sensitive Habitat Ordinance that overlay local zoning requirements as well as state and federal environmental impact restrictions. Santa Clara county's open-space authority plans to raise its revenues through an annual residence fee of $12 per single family (providing approximately $3.8 million/year); as of summer 1995, however, a taxpayer's group had blocked the authority's assessment powers pending a court decision on the legality of these taxes.

Administrative Capacity of Local Governments

Public officials must be able to delegate implementation responsibilities to administrative agencies if their visions are to be realized. In 1990, for example, Santa Cruz county passed a ballot initiative (Measure C) declaring the 1990s the "Decade of the Environment." Measure C requires the county to "protect biological diversity and human health through the protection and restoration of the environment." But if city and county planners have little access to information on biological diversity, such statements remain only exhortative. The county must have sufficient staff to mount credible and adequate policy analysis, to survey local residents, and to manage outreach efforts. Administrative staff must also keep track of land-use trends and identify environmental "hot spots" that require priority attention. A high score on administrative capacity indicates that a county has the ability to marshal what deLeon (1988) calls "advice" to policymakers: multidisciplinary, problem-oriented, normative analysis informed by knowledge both *of* and *in* the policy process. In our case, this amounts to understanding the policy process and applying that understanding, through the use of policy tools, to species protection problems.

For example, counties in California averaged one planner per 7665 residents in 1994 (Governor's Office of Planning and Research 1995). As might be expected, urbanized counties had higher ratios because their population growth outstripped their ability to increase their staffing needs. Monterey and Santa Cruz counties had more planning staff than the state average (1 per 7409 and 1 per 5174 residents in Monterey and Santa Cruz, respectively), whereas the more urban San Mateo and Santa Clara counties had less staff (1 per 10,498 and 1 per 11,501 residents in San Mateo and Santa Clara, respectively). Of course, these numbers are crude indicators of administrative capacity; a fine-grained analysis should assess the skills and numbers of all city and county staff who may be instrumental to environmental policy and planning efforts in general and to species conservation in particular (e.g.: Are there biologists on staff? Is staffing sufficient for workloads? How many years of staff experience does the county have to draw on?).

Finally, the presence or absence of active land trusts or special open-space districts can make the difference between a county that has to lead preservation efforts (Santa Cruz, Monterey) and one that can rely on other organizations to lower the transaction costs of identifying acquisition opportunities, brokering easements and sales, and building coalitions to fund and manage lands (as the Midpeninsula Regional Open Space District does for San Mateo and Santa Clara counties).

The Nature of Land Ownership and Use

Of course, there has to be some relatively undisturbed land available for acquisition. Almost three-fifths of Monterey county is in agricultural land, and about a quarter is held by the federal government, mostly in the Los Padres National Forest and Fort Hunter Liggett Military Reservation. Thus, much of Monterey county is simply not available for purchase. In contrast, the Midpeninsula Regional Open Space District estimates that in order to connect all its holdings into a seamless greenbelt, it needs to preserve 8000–12000 ha in addition to the over 14,000 ha it has already helped set aside in San Mateo and Santa Clara counties. These areas still exist in undeveloped land along the coastal ridges of the San Francisco peninsula.

Thus, the nature of land ownership and use is a third critical component of environmental policy capacity, especially because it concerns habitat protection. Variables in this category include the relative amount of open, developable lands and the intensity of pressure to develop such lands (partly a function of urban density); the costs of land acquisition; and the amount of county land already in some form of protected open space or in state or federal ownership.

Political Culture and Demographics

A fourth piece of the capacity puzzle consists of the county's community itself, specifically its political culture and demographic characteristics. The degree to which a community cultivates a positive regional identity and to which its members are engaged in civic life active in organized groups (Putnam 1993) helps explain people's conception of what is politically necessary and possible. The kind and frequency of political debate about public goods is critical to the success of any collective action, as is the commitment of local political leadership. When there is congruence between the ability for locally implemented public policy to respond to problems or opportunities and the public's perceived need for action, policy outcomes are more likely to succeed. This relationship between the ability to respond and the need for action explains why land use represents the issue area most affected by local government.

The manifestation of a community's will to protect land can take many forms. For example, in 1986 San Mateo county voters approved an open-space initiative with 62% of the vote. In 1990 Santa Clara voters narrowly defeated an advisory vote of approval for an open-space authority, but they voted approval in 1994 with 57% of the vote. The Sempervirens Fund has been operating in the Santa Cruz mountains since 1900 and has arranged for the transfer of several thousand hectares to the state parks system. Residents of Monterey county have donated land and actively pursued open-space preservation (mostly along the coast) at least since the 1920s (Walker 1966).

Demographic variables (income, mobility, property ownership, employment) also affect preservation opportunities, first by controlling much of the pressure to ex-

Table 2. Income, property taxes, voter turnout, and home values in case-study counties.[a]

County	*Per-capita income (1990)*	*Per-capita property tax (1988)*	*1992 voter turnout[b] (%)*	*Median value of owner-occupied housing units (1990)*
Monterey	$7,495	$114	52	$198,200
San Mateo	$10,666	$168	59	$343,900
Santa Clara	$9,518	$169	58	$289,400
Santa Cruz	$8,197	$132	67	$256,100

[a] *Sources: U.S. Bureau of Census 1992; California Department of Finance 1995.*
[b] *Percentage of eligible voters.*

pand and develop open or unincorporated county lands. Second, people with higher incomes and secure employment tend to be more receptive to protecting "post-materialist" goods like environmental "amenities" (Inglehart & Abramson 1994). Table 2 compares county statistics on these factors.

Per-capita income gives a rough indication of residents' ability to contribute to land acquisitions; property taxes indicate some degree of support for government financing; voter turnout is a standard measure of political participation; and home values indicate a rough measure of land-acquisition costs (at least near residential areas). Of our four sample counties Monterey has the lowest figures in each of the categories, San Mateo has the highest except for voter turnout. Such demographic indicators should be interpreted with caution: Santa Cruz county's fiscal resources rank third in our sample, but the county has made consistent efforts at habitat conservation over the years.

Sources of Funding for Land Acquisition

Local entities must be able to raise funds. Practically speaking, this means not only that they must be able to persuade local residents to reach into their pockets, but also that they can convince other organizations or units of governments to join them in partnerships for conservation. Land in these counties is anything but cheap, and any acquisition represents a major community commitment. For example, the Greenbelt Alliance estimated that total public investment in public lands in the San Francisco Bay Area represented close to half a billion dollars, *unadjusted* for inflation (Greenbelt Alliance 1992). Large acquisitions tend to range from $1,200 to $17,000 per hectare, whereas city open spaces and parks can cost far more, from $12,000 up to $1.2 million per hectare.

A recent example is the $6.65 million purchase of the 367-ha Jacques Ridge (Santa Clara county) in early 1995. The cost was split between the Midpeninsula Regional Open Space District and the County of Santa Clara, both of which raised some of the acquisition funds through a state Wildlife Habitat Conservation grant. Similarly, as in so many other locally initiated land acquisition projects, Santa Cruz County is the prime broker of the 14.6-ha Quail Hollow acquisition, building a funding package from federal grants, county resources, state agencies, and foundation funds.

Table 3 shows that habitat land values for a sample of endangered species in our four-county study area are on the lower end of the prices cities and counties spend on open spaces and parks. Furthermore, we expect these estimates to be at the high end for rare species habitat; the species for which there are good range maps are usually the ones that occur in very limited ranges, precisely because of heavy development in their habitats. Thus, Table 3 reflects high land values because we have the best population data for the plants occurring on the most expensive sites. As a rule, habitats of species occurring on less desirable lands would almost certainly be cheaper to acquire.

Although it is tempting to rank our policy capacity factors by their relative importance, it is probably meaningless to do so. This is partly because strong synergisms arise between them (e.g., political culture and funding, or land use policies and administrative capacity) and partly because they each represent different ways of building the "capital" needed for effective implementation of habitat protection goals. Some counties will have more available land at lower costs; others will have citizens with higher expectations of their local government's performance on environmental protection. Strengths in one dimension of policy capacity may compensate for deficiencies in others. But determining a "threshold" above which policy capacity is likely to succeed is not our goal.

Discussion and Recommendations

A focus on local conservation is not antithetical to the ecosystem-management goals of the federal agencies nor to the preservation goals of groups such as the Wildlands Project or The Nature Conservancy. On the contrary, most conservationists understand that habitat conservation is always, in the end, a local land-use matter and thus requires local support. It is likely that, for many parts of the western United States, the regional proposals championed by Michael Soulé and his colleagues in The Wildlands Project, together with very localized protection plans, may provide the mix needed for maximum protection of biodiversity. Local residents and gov-

Table 3. Populations, habitat ranges, and land values for four rare, endemic plant species in the four-county study area.

Species name	*Number of discrete populations*	*Approximate habitat location and area ranges (ha)*	*Range of habitat land values (per ha)*
C. macrocarpa	2	~58.7	~$21,000
E. teritifolium	12	~15-3,240 (75% on 3.8 ha)	$4,900-37,000 $2,400-62,000
C. abramsiani	5	~160	(most parcels are $2,400-12,000)
H. macradenia	5	~35	$12,000-62,000

ernments play three roles in this mix: (1) they broker larger land deals than they could purchase themselves outright; (2) they contribute some habitat conservation through open-space acquisition, perhaps by adding small patches to a larger quilt; and (3) they foster and nurture local sympathies for wildlife and wildness.

Our analysis has several implications for federal- and state-level conservation policy as well. First, locally led land acquisition would benefit from changing current ratios of research, land-acquisition, campaign (initiative), and management dollars that are spent on species protection. Some funds for basic research on species already listed as endangered or threatened would be better spent as matching grants for local habitat acquisition and management. If funds were channeled effectively to the outright purchase of habitat for some rare species, considerably more conservation could often be accomplished faster than by employing biologists to further study the ecology of these species.

Local habitat protection also fits in with federal and state government efforts to redefine their regulatory role. Federal and state agencies are increasingly cooperating with local private and public land managers. John Turner, director of the U.S. Fish and Wildlife Service in the Bush administration, and Douglas Wheeler, director of the California Resources Agency were both keynote speakers at the 1995 Land Trust Alliance conference. They argued (1) that land trusts were becoming increasingly valuable in carrying out conservation activities formerly handled by state and federal agencies and (2) that land trusts can broker public and private partnerships for conservation that try to reconcile multiple goals, one of them being habitat conservation (Rogers 1995). The state of California will increasingly need to rely on local actors for land acquisition; by early 1996 the state had budgeted so little for new parklands that the Department of Parks and Recreation simply disbanded its park lands acquisition division (Rogers 1996).

Land trusts now have sophisticated means to ensure that their preferred land-use and maintenance objectives can be upheld if lands they helped acquire are transferred to state or federal agencies. For example, when land-trust projects are transferred to the state, arrangements must usually be made to recognize the land trust's role, sometimes by allowing it to "co-hold" conservation easements or to have other contractual agreements with state or federal agencies (Myers 1992).

Another implication of our study is that county and state ballot initiatives might be more successful if they were designed to acquire land rather than regulate landowners. Of course, federal mandates require local governments to regulate land uses for environmental protection, but mandates are less often accompanied by program funding than ever before. Local governments would almost certainly view endangered species restrictions more favorably if the federal government made block grants available to purchase critical habitat. Indeed, much of the bad press that accompanies endangered species efforts today could be alleviated if local governments occupied a more central conservation role.

But land acquisition is only part of the picture. Preservation of open space doesn't necessarily include species protection. At a minimum it keeps certain lands relatively free from development, but these protected open spaces are sometimes managed for purposes of recreation (trails, RV hook-ups, mountain bike access, playing fields, stables, docks, and campsites) and agriculture—or even resource extraction—that are incompatible with protecting biodiversity.

Land trusts and organizations such as The Nature Conservancy have an easier time inspiring members and donors to fund land acquisition than they do securing management funds. Rare species habitat must be managed for proper disturbance regimes and removal of exotic species. But operations and management funds for these activities typically require some kind of supplemental endowment, which can be several times larger than the land cost itself (O. Pollock, personal communication). Some conservationists, like those in the Center for Natural Lands Management, have recently dedicated their resources to raising management funds, but the problem of paying for management versus acquisition will only get worse as long-term management costs outrun initial acquisition costs.

We hope our analysis of endemic plant protection will spur conservation biologists to consider taking a multiscaled approach to both the biology of the species they wish to protect and the planning processes they hope to use toward that end. This means that conservation biologists will need to act locally and to learn enough about the maze of local land-use rules and agencies to tap effectively into a potentially powerful avenue of biodiversity protection.

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