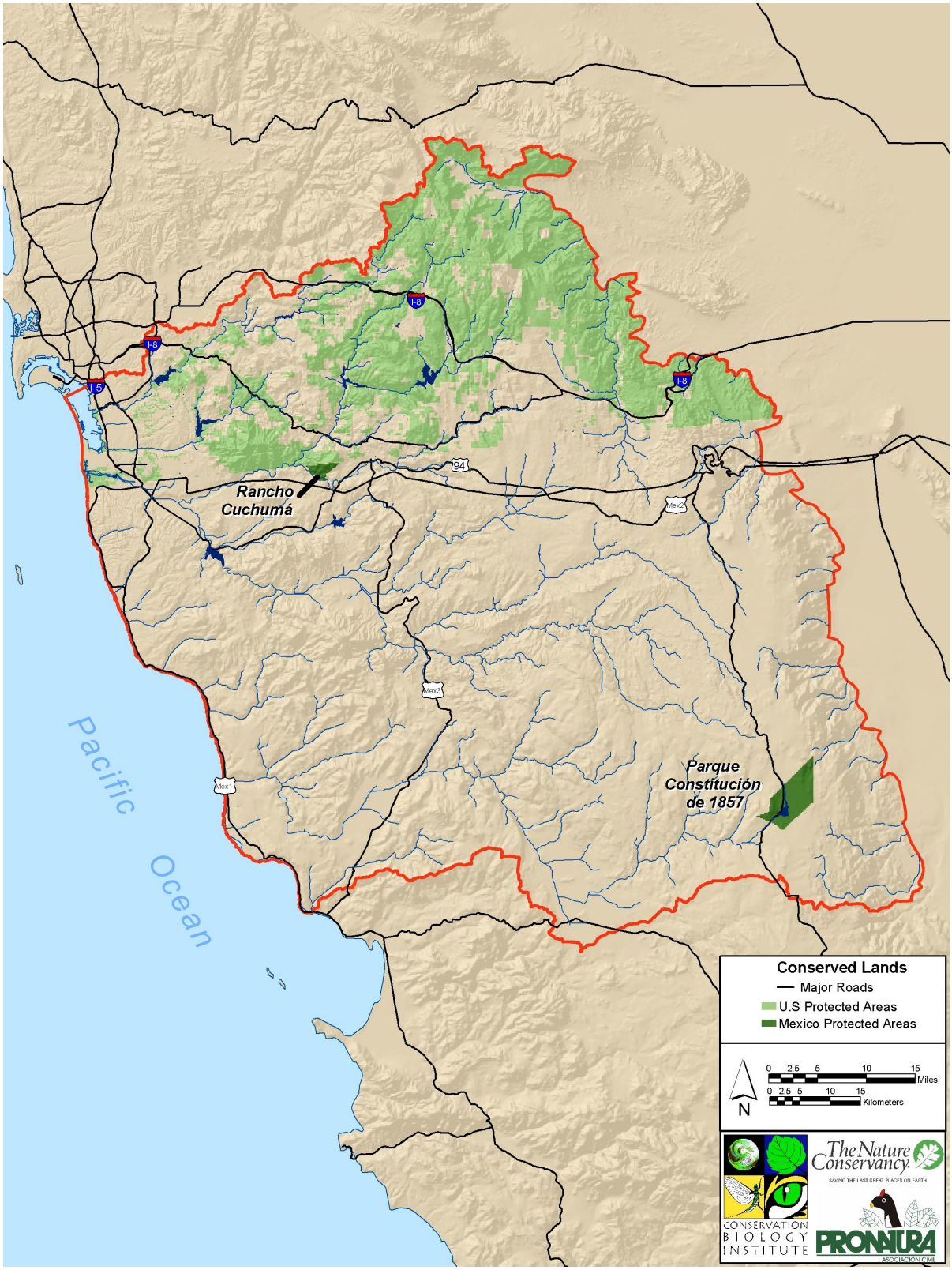

Figure 8. Existing conserved lands.

4. LAS CALIFORNIAS BINATIONAL CONSERVATION NETWORK

The Las Californias region supports a rich, yet fragile, landscape that ranges from intact wildlands to areas dominated by human land uses. Conservation values and objectives differ across this integrity gradient, ranging from protection of biological resources and ecosystem processes in areas removed from urban centers, to maintaining habitat connectivity and habitat quality for resources less sensitive to human alterations, to promoting open space and riverine greenbelts in urban areas for sustaining human health and quality of life. Our conservation vision for this landscape is a network of nodes of biodiversity that are buffered and interconnected by relatively intact land, embedded in a matrix of lands that have undergone varying degrees of human modification and whose current resource values may be more compatible with human land uses. Each of these components of the network supports conservation values that contribute to the region's character and the tapestry of biodiversity for which the region as a whole is renowned.

Conservation and Management Objectives

Figure 9 represents our conservation vision for the border region that encompasses a range of conservation objectives and functions within distinct conservation categories:

- *Category A—Protect large, intact habitat blocks to conserve irreplaceable resources and to maintain natural ecological processes, such as fire and stream flow regimes that require large landscapes to function.*

- *Category B—Require land uses and management that maintain habitat integrity and allow natural ecological processes to continue.*

- *Category C—Promote sustainable land uses and maximize biological resource values by preserving the rural character of the backcountry through low-density residential development and extensive agriculture (e.g., grazing), providing parkland and open space, protecting isolated high value resources (e.g., vernal pools), and maintaining a landscape permeable to wildlife movement.*

- *Category D—Focus conservation and management efforts on riparian greenbelts and other open spaces that improve air and water quality, enhance human health and quality of life, and protect isolated resources (e.g., vernal pools) and local wildlife.*

- *Critical Opportunity Areas—Specific locations where conservation values are imminently threatened if conservation actions are not initiated in the short-term.*

The following sections describe the biological resources of the geographic areas corresponding to these conservation objectives, generally organized by three major bioclimatic zones—coastal zone, inland zone, and montane zone (including the escarpment and transition to desert

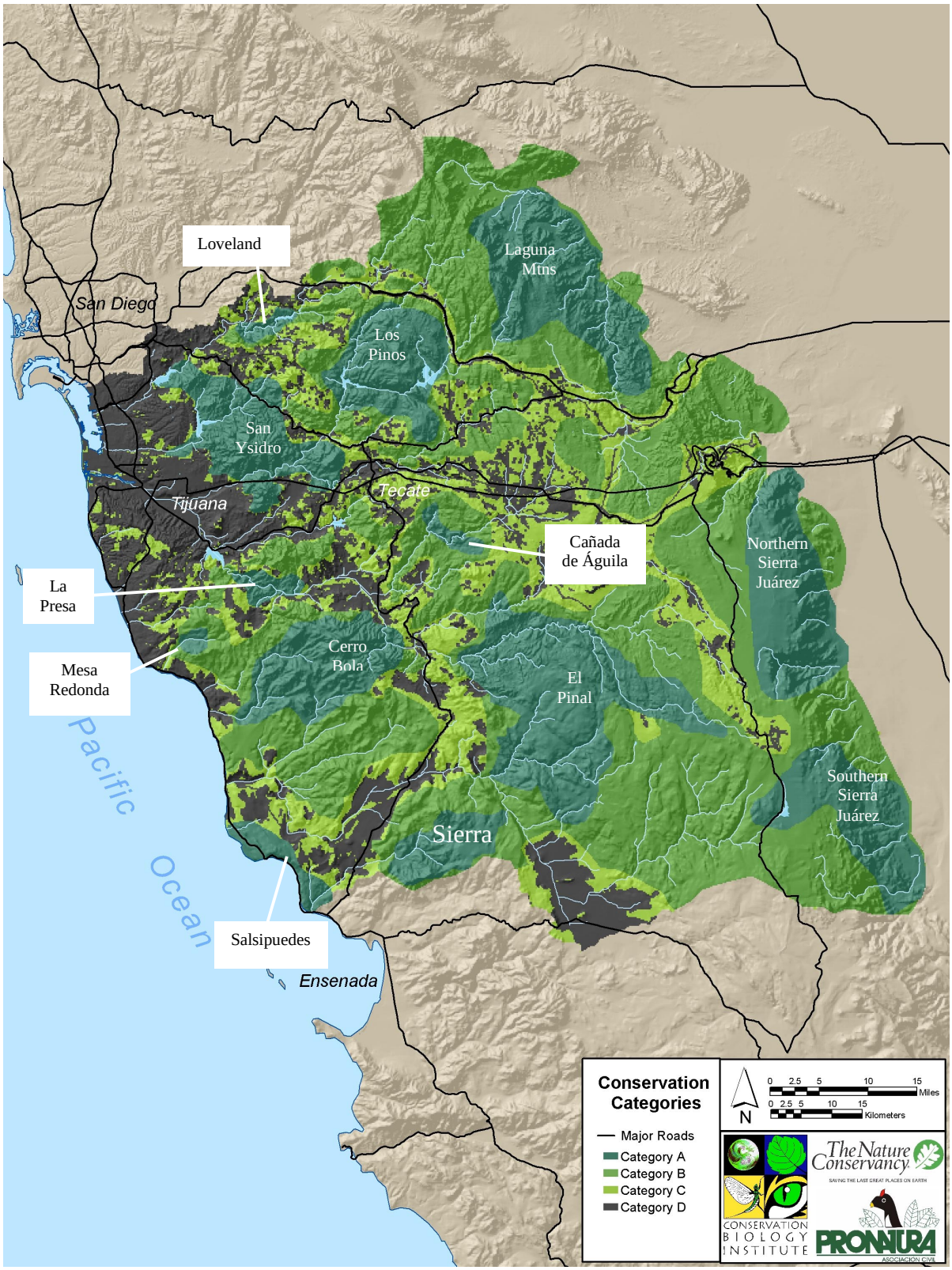

Figure 9. Las Californias binational conservation network.

communities on the eastern side of the Peninsular Ranges). However, the border region is surprisingly understudied, considering it resides between two academic and research centers—San Diego (e.g., San Diego State University, University of California, San Diego) and Ensenada (e.g., UABC, CICESE, COLEF). Most of these areas, especially in Baja California, have not been comprehensively surveyed, and there is minimal, often anecdotal, information on the biological resources that characterize them. Field investigation is essential in this rapidly developing region, lest important conservation and management needs not be recognized until conservation opportunities have been foreclosed. We emphasize the need for focused field studies to further define the biological characteristics and conservation values in the border region.

Coastal Zone

Loveland

This unit includes land protected as a result of the Multiple Species Conservation Program (MSCP) in San Diego County, including one of the last remaining intact patches of Diegan coastal sage scrub in the California portion of the study area, a resource that has largely been lost to development along the coast. This area is at an elevation of about 1,500 ft (470 m). The Sweetwater River corridor supports arroyo toads (*Bufo californicus*), least Bell's vireos (*Vireo bellii pusillus*), southwestern willow flycatchers (*Empidonax traillii extimus*), and other neotropical migrant bird species, and is adjacent to coastal sage scrub habitat occupied by California gnatcatchers (*Polioptila californica*). Except for the Sweetwater River corridor, which connects Loveland to the inland valley and ultimately to the Laguna Mountains, this unit is largely surrounded by development and has relatively little Category B lands as a buffer. It is separated from San Ysidro by Lyons Valley and Lawson Valley (Category C), which are rural landscapes important for species dispersal.

San Ysidro

This unit includes Otay Mountain, Cerro San Isidro, San Miguel Mountain, and Tecate Peak, which are gabbroic or metavolcanic in composition. Elevations in the unit range from less than 500 ft to over 3,000 ft (150-1,000 m) at the tops of Tecate Peak, Otay Mountain, and Cerro San Isidro. This area supports some of the largest remaining intact patches of Diegan coastal sage scrub (including coastal sage scrub with abundant cactus patches) in the border region, supporting core populations of California gnatcatchers and coastal cactus wrens (*Campylorhynchus brunneicapillus couesi*). This unit also supports mafic chaparral communities, important riparian habitat along the Tijuana and Tecate rivers, and vernal pools on the mesa tops. The San Ysidro unit supports concentrations of sensitive and endemic plant species [e.g., Tecate cypress, Jennifer's monardella (*Mondardella stoneana*), Baja California bird bush (*Ornithostaphylos orcuttii*), coast barrel cactus (*Ferocactus viridescens*), small-leaved rose (*Rosa minutifolia*), variegated dudleya (*Dudleya variegata*), Mexican flannelbush (*Fremontodendron mexicanum*), Cedros Island oak (*Quercus cedrosensis*), Otay mesa mint (*Pogogyne nudiuscula*), prostrate navarretia (*Navarretia fossalis*), San Diego button-celery (*Eryngium aristulatum* var. *parishii*)]. The Thorne's hairstreak butterfly (*Mitoura thornei*) is an endemic species here, whose larvae are obligate to Tecate cypress. Jesus Maria Mesa, on the

southwestern flank of Cerro San Isidro, supports vernal pools and a population of Quino checkerspot butterfly (*Euphydryas editha quino*) that uses habitat on both sides of the border and is likely important to recovery of the species (USFWS 2000).

The San Ysidro unit includes the Otay Mountain Wilderness Area and Cerro Cuchumá (Tecate Peak), which is protected by a historic Mexican private lands conservation easement. It also supports the San Diego National Wildlife Refuge lands around Sweetwater Reservoir and lands administered by the Bureau of Land Management (BLM), U.S. Fish and Wildlife Service, California Department of Fish and Game, City of San Diego, California Department of Forestry, and County of San Diego.

San Ysidro is surrounded on the north, west, and south by development (Category D areas). Cottonwood Creek, which supports arroyo toads, provides an important hydrographic and habitat linkage between San Ysidro and Los Pinos to the east. State Road-94 and Honey Springs Road bisect Category B lands that buffer the eastern side of the San Ysidro unit. Proposed *areas verdes* and other open spaces identified by Pronatura (2004) in Tijuana provide open space and restoration opportunities (see Critical Opportunity Areas and Appendix C).

Mesa Redonda and La Presa

These units range in elevation from less than 1,000 ft to nearly 2,000 ft (300-650 m) at the tops of Mesa Redonda and the small peaks in these units (e.g., Cerro la Avena). Mesa Redonda and La Presa support Diegan coastal sage scrub, including patches of Nuttall's scrub oak (*Quercus dumosa*). La Presa is associated with the canyon upstream of Presa Rodriguez on the las Palmas drainage. Presa Rodriguez supports foraging by waterfowl, herons, egrets, and golden eagles (*Aquila chrysaetos*) (Pronatura 2004). This unit also supports some stands of Tecate cypress and other irreplaceable resources in the coastal zone.

These two Category A units are virtually isolated by encroaching coastal development around Tijuana and Rosarito. Category B lands connect and buffer these units and connect La Presa to Cerro Bola to the south. Roads and associated development separate La Presa from Cañada de Águila to the east and San Ysidro unit to the north. This represents a critical opportunity area (see below).

Cerro Bola

The Cerro Bola unit includes the metavolcanic peaks of Cerro Bola and Cerro Gordo and volcanic tablelands to the south. Elevations in this unit range from less than 1,000 ft to over 4,200 ft (300-1,300 m) at the top of Cerro Bola. The western portion of this unit supports the largest patch of intact Diegan coastal sage scrub in the Baja portion of the border region. The Cerro Bola unit also includes a large area of mafic chaparral that supports many rare and endemic plant species [e.g., Bola ceanothus (*Ceanothus bolensis*) and Bola manzanita (*Arctostaphylos bolensis*), Gander's pitcher sage (*Lepechinia ganderi*), Tecate cypress] (Wells 1992, Boyd and Keeley 2002). Vernal pools on the clay terraces of Valle de las Palmas support rare and endemic plant species [e.g., prostrate navarretia, little mousetail (*Myosurus minimus* ssp. *apus*), San Diego button-celery], including a potentially undescribed species of mesa mint

(*Pogogyne* sp. *nova*) (Oberbauer personal communication). Arroyos draining the eastern side of Cerro Bola (e.g., Cañada las Palmas) support the westernmost population of California fan palms (*Washingtonia filifera*), which is the only population of this species on the western side of the Peninsular Ranges divide. This unit straddles three watersheds—Las Palmas, El Bajio (Cañon El Descanso), and the downstream end of the Rio Guadalupe watershed.

Cerro Bola is largely surrounded and buffered by Category B areas. Roads and development along the coast and Highway-3 and agriculture in the Valle Guadalupe separate Cerro Bola from other units. The Category C areas along Highway-3 between Cerro Bola and El Pinal represent a critical opportunity area, where maintaining landscape permeability is important.

Salsipuedes

Salsipuedes supports the only sizeable patch of Martirian succulent scrub, a unique division of coastal sage scrub with a significant component of stem succulents, semi-succulents [e.g., cliff spurge (*Euphorbia misera*), yuccas (*Yucca* spp.)], and shrubs typical of coastal sage scrub [e.g., sages (*Artemisia* spp.), flat-topped buckwheat (*Eriogonum fasciculatum*), jojoba (*Simmondsia chinensis*)]. Buckeye (*Aesculus parryi*) reaches its northernmost distribution here. This unit supports irreplaceable resources and is highly threatened by encroaching development on all sides. The Tijuana-Ensenada tollroad bisects it. Salsipuedes will require protection and focused management efforts to maintain its conservation value.

Sierra Blanca

This unit includes Sierra Blanca, Cerro Miracielo, Cerro Blanco, Cerro Venado Macho, and Cerro Apodaca. The Sierra Blanca unit ranges in elevation from less than 1,000 ft to over 4,200 ft (300-1,300 m) at the top of Sierra Blanca. This unit supports a coastal chaparral community that includes rare and endemic plant species such as manzanita (*Arctostaphylos incognita*), Moran manzanita (*Arctostaphylos moranii*), Tecate cypress, wart-stemmed ceanothus (*Ceanothus verrucosus*), Cedros Island oak, and Baja California bird bush (Minnich 1987, Wells 1992, Keeley et al. 1997). There are also relict populations of Coulter pine and knobcone pine (Minnich 1987), which persist because of the high winter rainfall that occurs in the Sierra Blanca (Minnich et al. 2000).

While connected to El Pinal to the north, development associated with the outskirts of Ensenada is encroaching from the south. Highway-1, Valle Guadalupe, and Highway-3 separate Sierra Blanca from Salsipuedes and Cerro Bola, respectively (critical opportunity areas).

Inland Zone

Los Pinos

This unit includes Los Pinos Mountain, Corte Madera Mountain, Long Valley Peak, and Hauser Mountain. Elevations range from about 1,500 ft to over 4,200 ft (500-1,300 m). Los Pinos and Corte Madera Mountains are comprised of gabbroic rocks and support a diversity of chaparral communities, including mafic mixed chaparral, northern mixed chaparral, chamise chaparral,

scrub oak chaparral, and red shank chaparral. Isolated stands of Coulter pines occur on Corte Madera Mountain. Pine Valley Creek and Cottonwood Creek flow through the U.S. Forest Service Pine Creek Wilderness Area and the BLM Hauser Mountain Wilderness Area, respectively, and represent largely intact hydrologic units. Arroyo toads occur in Pine Valley Creek and Cottonwood Creek, upstream of Morena Reservoir. This unit represents the only core habitat area in the inland zone of the California border region. It is largely public land administered by the U.S. Forest Service, BLM, and City of San Diego Water Department.

Interstate-8, State Road-94, and Buckman Springs Road and associated development separate Los Pinos from the Laguna Mountains unit. Pine Valley Creek and associated habitat serve as a linkage, via the Pine Valley Creek bridge on Interstate-8. In the Campo area east of Los Pinos, the La Posta Linkage (critical opportunity area) has been identified as the last remaining connection between National Forest lands to the north and habitats in Baja California (CBI 2003). Other Category C lands, including the areas around Potrero, Lyons Valley, Engineer Springs, El Hongo, and Tecate, may also serve to maintain habitat connectivity between the Laguna Mountains and Baja California. This critical opportunity area to the south and east of Los Pinos warrants immediate conservation actions (Appendix C).

Cañada de Águila

This unit consists of a ridge in the foothills of the Peninsular Ranges, which range in elevation from about 2,500 ft to over 3,500 ft (800-1,300 m). Portions of this unit are gabbroic in composition (Gastil et al. 1975). The Cañada de Águila unit supports Diegan sage scrub, chamise and mixed chaparral, and oak woodlands (Minnich and Franco Vizcaìno 1998). Category B lands connect Cañada de Águila to El Pinal to the south. Highway-2 and associated development between Tecate and El Hongo are a barrier to the north. Cañada de Águila and isolated Category B lands surrounding Presa Carrizo to the west represent centrally located *stepping stones* of intact habitat that is important for maintaining habitat connectivity in both north-south and east-west directions. Thus, the entire region around Cañada de Águila is a critical opportunity area.

El Pinal

El Pinal is located on the west slope of the Sierra Juárez and ranges in elevation from about 2,000 ft to over 4,800 ft (650-1,500 m). Gabbroic rock occurs in two locations within this unit—in the west near San Antonio Las Minas and La Hiedra, and in the east at Cerros Corte de Madera and Cerro El Alamar (Gastil et al. 1975). El Pinal supports chamise and red shank chaparral, oak woodland, mountain meadow, and patches of Jeffrey pine forest at its highest elevations (Minnich and Franco Vizcaìno 1998). It also includes a largely intact hydrologic unit associated with Las Calabazas drainage in Cañada El Testerazo. Arroyo toads have been documented at the lower end of Las Calabazas (Lovich et al. in preparation). El Pinal is buffered and connected to Sierra Blanca and Southern Sierra Juárez by Category B lands; however, Category C and D lands along Highway-3 (critical opportunity area) separate it from Cerro Bola.

Montane Zone

Laguna Mountains

The Laguna Mountains unit is comprised of the Laguna, Jacumba, In-Ko-Pah, and Tierra Blanca mountains. Elevations in this unit range from 5,500 ft at the crest to about 1,600 ft (1,800-525 m) at the base of the eastern escarpment. As the montane zone includes the eastern side of the Peninsular Ranges, this unit includes the transition from montane to Sonoran Desert communities, including montane chaparral, Jeffrey pine and mixed conifer forests, pinyon and juniper woodland, and Sonoran Desert scrub. It also includes watercourses that drain both slopes of the Peninsular Ranges. Eastern drainages support California fan palm oases. Big Laguna Lake is a large ephemeral pond, surrounded by extensive wet meadows. This unit supports the southernmost U.S. population of the Peninsular bighorn sheep, which is currently isolated from the Méxican population in the Sierra Juárez. Carrizo Gorge is a crucial desert water supply and supports an important bighorn sheep lambing area. This is the only core habitat unit in the montane zone of the California border region. It is largely public land administered by BLM and Anza-Borrego Desert State Park.

Category C and D lands associated with development in Boulevard, El Hongo, Jacumba, Jacumé, and La Rumorosa, along Interstate-8, Highway-94, and Highway-2, are barriers to habitat connectivity. The Jacumba Wilderness is an important stepping stone between the Laguna Mountains and Northern Sierra Juárez. The Category C and D lands along the highways represent critical opportunity areas (Appendix C).

Northern Sierra Juárez

This unit lies on the plateau of the northern Sierra Juárez, generally at an elevation range of 3,800 to 4,400 ft (1,250-1,400 m), but also includes parts of the eastern escarpment down to elevations less than 1,000 ft (300 m). California fan palm oases occur along the canyons of the eastern escarpment, including Cañon Tajo. Vegetation communities include red shank chaparral, oak woodland, pinyon and juniper woodland, scattered mountain meadows, and Sonoran Desert scrub (Minnich and Franco Vizcaìno 1998). This unit supports the northernmost Méxican population of Peninsular bighorn sheep, which is currently isolated from the U.S. population.

Category B lands connect the Northern Sierra Juárez unit with the Southern Sierra Juárez. The Mexican highway from El Condor to El Coyote separates the Northern Sierra Juárez from El Pinal; La Rumorosa, Interstate-8, and Highway-2 separate it from the Laguna Mountains, as discussed above (critical opportunity areas).

Southern Sierra Juárez

The Southern Sierra Juárez includes the Parque Constitución de 1857, which is one of two state parks in Baja California. It supports red shank and montane chaparral, canyon oak woodland, mixed pinyon forest, and Jeffery pine forest, with scattered isolated stands of Coulter pines (Minnich 1987, Minnich and Franco Vizcaìno 1998). The stands of Coulter pines represent the northernmost limit of this species in Baja California (Minnich 1987). The northern reported

limit of Cuyamaca cypress (*Cupressus stephensonii*) (Minnich 1987) in Baja California is immediately south on Mesa Huicual, and it is likely that Cuyamaca cypress occurs within the southern portion of this unit as well. Laguna Juárez is a large ephemeral lake surrounded by mountain meadows. California fan palm oases line the canyons of the eastern escarpment. Peninsular bighorn sheep also are supported in this unit.

Category C and D lands along Highway-3, from Ojos Negros to Colonia Lázaro Cárdenas outside the study area, abut this area on the south.

Critical Opportunity Areas—Maintaining Regional Connectivity

Human development is quickly compromising our ability to maintain regional habitat connectivity in portions of the border region. We have identified several critical opportunity areas, where conservation values of existing habitat blocks are imminently threatened unless focused conservation actions are taken. This is particularly evident along the international border, where coordinated conservation actions on both sides of the border are needed to allow species dispersal and large-scale ecological processes (e.g., natural fire and stream flow regimes) to continue and thus to protect the values of previous conservation investments. Both north-south and east-west habitat connectivity is important to support the variety of plants and wildlife that converge along this coastal-mountains-desert transect and low elevation to high elevation habitat gradient.

Appendix C spotlights three major groupings of critical opportunity areas along the international border within each of the three bioclimatic zones described above (Figure 10). These areas have been the focus of recent conservation planning efforts by Pronatura, in the Tecate-Tijuana corridor, and by the Missing Linkages project conducted by the South Coast Wildlands Project and its partners. Conservation actions may range from maintaining low-density rural land uses and conducting community education programs, to facilitating localized wildlife movement over or under highways, to developing conservation or agricultural leases, to strategic, focused acquisitions.

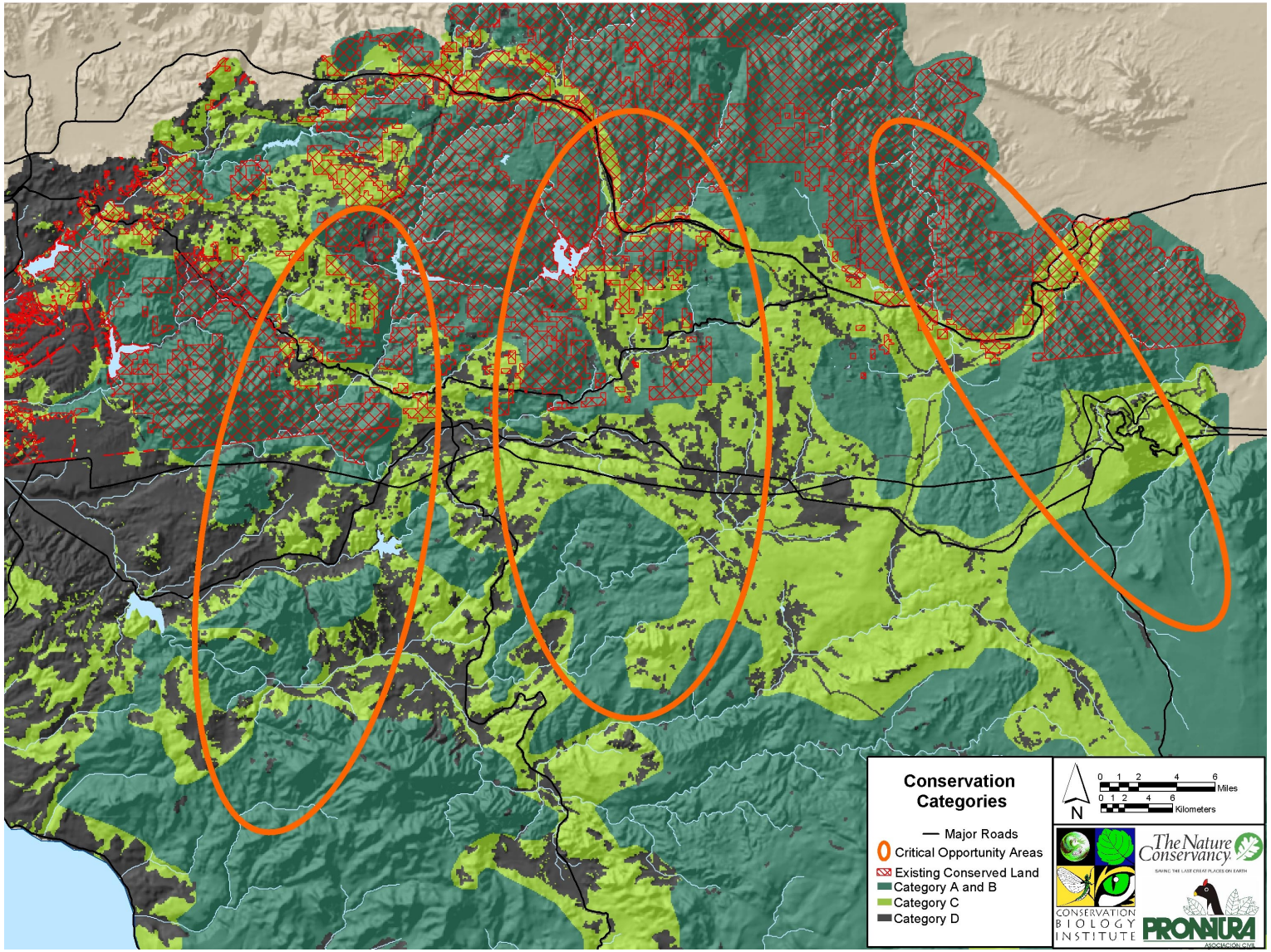

Figure 10. Critical opportunity areas along the U.S.-México border.

5. CONSIDERATIONS FOR IMPLEMENTING A BINATIONAL CONSERVATION VISION

The Las Californias vision represents an optimal open space configuration for biodiversity conservation in the border region. As such, it highlights a shared dependence on natural resources and thus conservation implementation across borders. Institutions on both sides of the border are grappling with the challenge of meeting the needs of an ever-burgeoning human population, improving (or at least maintaining) standards of living and quality of life, and sustaining economic growth in the region. The Las Californias vision is largely compatible with fulfillment of these goals. The sustainable conservation goals of the Las Californias vision complement efforts to protect open space and watersheds, create recreational and educational growth opportunities, cultivate tourism and business investment, and preserve a rich agricultural and cultural heritage. This complementarity of diverse interests presents opportunities for advancing a common conservation vision.

This section addresses some of the societal elements that will influence implementation strategies—land ownership and conservation patterns, land use regulations, and economic challenges—and presents some suggested approaches that rely on multiple partners and programs and the development of a new paradigm for regional planning that recognizes the global importance of the Las Californias vision.

Land Ownership and Conservation Patterns

California and Baja California are at very different stages of implementing the conservation vision. In California, public lands—which can serve as building blocks of a reserve network—represent approximately 61% of undeveloped land in the border region. Most of these federal, state, and locally-administered lands have been set aside as conserved or multi-use open space (Figure 8):

- Federal. The largest area of protected land in the California portion of the border region is under federal ownership (approximately 324,287 acres [129,715 ha]). These lands include the Cleveland National Forest (encompassing Pine Creek Wilderness and Hauser Wilderness), National Wildlife Refuges administered by the U.S. Fish and Wildlife Service, and other properties administered by BLM such as Otay Mountain Wilderness, Sawtooth Mountains Wilderness, Carrizo Gorge Wilderness, and Jacumba Wilderness.
- State. The State of California administers 103,855 acres [41,542 ha] in the border region. The Department of Fish and Game manages Ecological Reserves and Wildlife Management Areas, while the Department of Parks and Recreation manages Anza-Borrego Desert State Park, the largest state park in California (including Sombrero Peak Wilderness and Carrizo Canyon Wilderness), Cuyamaca Rancho State Park in the Cuyamaca Mountains, and Border Field State Park on the coast. The Department of Forestry and Fire Protection administers a single property on the border, Tecate Peak.
- Local. The City of San Diego, City of Chula Vista, and County of San Diego own MSCP lands, which are conserved as mitigation for development impacts in the region. The

City of San Diego Water Department also owns watershed lands around Otay Lakes, Barrett, and Morena reservoirs, which are protected to prevent degradation of the municipal water supply.

In contrast, <1% of undeveloped land in the Baja border region is in public ownership. The Parque Constitución de 1857, encompassing approximately 12,350 ac (5,000 ha), is the only government-decreed protected area in the region (Figure 8). The conservation easement (*servidumbre ecológica*) that Pronatura developed with Fundación la Puerta for Rancho Cuchumá represents the only other designated conservation area in the region.

Land Use Regulations

In California, a suite of federal, state, and local land use regulations and conservation programs provide some protection of biological resources on private lands. Development projects are subject to environmental review under the California Environmental Quality Act and must comply with a host of other environmental regulations and permitting requirements. Projects that may cause significant adverse impacts to natural resources or jeopardize the continued existence of state-listed endangered or threatened species must mitigate these impacts by modifying the project or by providing long-term conservation and management of natural resources that would be affected by the project. For example, land developers and other project proponents often purchase land or establish conservation easements on land as mitigation for project-related biological impacts. Historically, open space mitigation was accomplished on a project-by-project basis; the result was a fragmented patchwork of conserved land that cannot sustain biological resources over the long term. In 1991, California adopted the Natural Community Conservation Planning (NCCP) Act, which allows local jurisdictions to plan for conservation of ecosystems and ecosystem processes while allowing for economic growth. NCCP plans have resulted in a significant amount of open space conservation in San Diego County and are an important conservation tool for local governments.

In Baja California, federal, state, or municipal government agencies can define natural protected areas (*áreas naturales protegidas*) by decree. However, private land owners within natural protected areas often have not been compensated for economic losses associated with the decreed land use limitations (although this may be changing through incentives and land expropriation). Consequently, these private lands may not be managed in a manner consistent with the protection of natural resource values. State and municipal plans regulate and control land use and production activities, provide for environmental protection, and allow for preservation and sustainable use of natural resources. For example, scientists from the Universidad Autónoma de Baja California are assisting the City of Tijuana with the identification of important natural resource areas (*áreas verdes*) as part of the *ordenamiento ecológico* for the city. The *ordenamiento* will be used to guide land development within Tijuana. In addition to *planes de ordenamiento,* federal and state environmental laws (*Ley General del Equilibrio Ecológico y la Protección al Ambiente* and *Ley de Protección al Ambiente para el Estado de Baja California*) require an environmental impact study (*manifestación de impacto ambiental*) for any development project. If the project will have negative environmental consequences, the developer is required to take mitigation actions to minimize impacts and/or restore natural conditions.

The Importance of Private and Communal Lands to Fulfilling the Conservation Vision

Perhaps the greatest difference in implementing mechanisms between California and Baja California is the availability in California of financial compensation and incentives for imposing land use restrictions. However, nongovernmental organizations in México are working to change this by exploring mechanisms to transfer land use rights for the purpose of conserving natural resources on private lands (Gutiérrez Lacayo et al. 2002). Legal conservation tools that allow landowners to voluntarily restrict the type and amount of development to protect natural resources are relatively new in Mexico. The conservation easement (*servidumbre ecológica*) that Pronatura developed for Rancho Cuchumá is a good example of this effort. The *servidumbre ecológica* is a voluntary legal agreement between two or more property owners in which the land use rights of one are restricted and provided to another, with the objective of preserving natural resources, scenic beauty, or historical and cultural values of the land for a designated period of time or in perpetuity. The *servidumbre* stays with the land and not with the property owner. *Servidumbres ecológicas* can be used to conserve areas of biological richness, protect endangered species, allow use as wildlife movement corridors, or maintain sustainable land use practices. Restrictions that may be placed on properties can vary by property and include policies forbidding hunting, cutting, or clearing trees and other vegetation, impeding wildlife movement, burning, construction, subdividing the property, or increasing housing density.

Although the extensive mosaic of public lands north of the border provides a substantial anchor for conservation work on both sides of the border, there is nonetheless important work required there to fulfill the biodiversity protection goals of the Las Californias vision. Private inholdings, for example, are interspersed throughout the public lands mosaic north of the border; those that compromise the viability of the surrounding natural habitats must be identified and prioritized for conservation action. Fragmentation by development or roads is an ongoing concern for maintaining connectivity for species and natural processes and, thus, viability and value of conserved lands. Management and monitoring of public lands will continue to pose significant scientific, political, and financial challenges.

The continued ecological function of private lands within the border region is an integral component of the Las Californias vision. Yet, rural traditions on both sides of the border face considerable economic challenges. In Baja California, collectives (*ejidos*) own a majority of the undeveloped land; land use decisions are made by the members of the collective (*ejidatarios*). In general, the lack of financial resources and incentives for private and social landowners to land uses supportive of conservation goals has constrained resource protection efforts. Both sides of the border are experiencing the subdivision of large ranches. In general, smaller and smaller lot sizes can be found as one moves towards the coast or the border, or inward toward the urban centers. Subdivision frustrates conservation—lands become more expensive, biodiversity values more compromised, landscapes less permeable, and social challenges more complex. A necessary strategy to implement the vision must focus on private or communal lands to ensure that they support the mosaic of public and private lands that will protect the irreplaceable conservation value of the region.

Strategies for Implementation

Implementation of this binational conservation vision will face many cultural, institutional, legal, and socioeconomic obstacles. Differences in legal mechanisms and available financial resources for achieving land conservation in the two countries (see White et al. 2004 for a review of the constraints to conservation in the border region) underscore the importance of a multifaceted approach to implementation—with different conservation actors, implementing different conservation strategies, appropriate for different portions of the border region, that vary based on ownership, land use, socioeconomic factors, and level of participation by government and nongovernmental organizations and community groups.

The following outlines examples of potential strategies for achieving the myriad conservation objectives in the border region. This list is not intended to be exhaustive or complete, but rather to be illustrative of the diversity of strategies necessary to achieve the vision's goals.

1. Establish a public policy framework that supports and provides incentives for conservation.

a. Ensure that the following support and reinforce the goals of the binational conservation vision:
   - San Diego County General (Zoning) Plan 2020
   - East County Subarea of the San Diego MSCP
   - Tijuana, Tecate, and Ensenada *ordenamiento ecológicos*

b. Ensure that the Las Californias vision is integrated into state and federal maps in Baja California (e.g., maps showing *áreas naturales protegidas*).

c. Develop intergovernmental Memoranda of Understanding to raise the visibility of conservation efforts and to maximize efficient use of funds.

2. Develop and implement new mechanisms to protect lands.

a. Promote the establishment of an International Peace Park.

b. Foster the development of U.S. Homeland Security and Border programs that are synergistic with conservation (e.g., increased conservation of open space in the border region could facilitate border enforcement, without the need for extensive physical barriers that may preclude wildlife movement).

c. Promote establishment of a United Nations Educational, Scientific, and Cultural Organization (UNESCO) Biosphere Reserve and possible World Heritage Site status.

d. Create a Las Californias program within the California Resources Agency, and include Baja California representatives on the California Biodiversity Council.

e. Support Binational Watershed Management Agreements for the Tijuana River Watershed.

f. Explore potential conservation incentives through North American Free Trade Agreement (NAFTA) programs.

g. Continue to develop, through strategic application, *servidumbres ecológicas.*

h. Explore the interface of sustainable community development and conservation.
   - Promote ecotourism projects.
   - Use the Management and Sustainable Use of Wildlife policy under México's General Law of Wildlife, which provides for conservation of managed species while improving quality of life for local communities (Cariño 2004; e.g., *Unidades de Manejo y Aptovechamiento de la Vida Silvestre*, or UMAs, could be applied to bighorn sheep conservation.).

i. Develop support for a Binational Wildlife Corridor (Parque-to-Park Binational Corridor).

j. Explore focused programmatic pre-mitigation programs for large infrastructure developments in California.

k. Explore the potential for mitigating impacts of California development in Baja California.

l. Develop mechanisms in Baja California to require and enforce meaningful mitigation for environmental impacts of industrial development.

3. Secure adequate funding for conservation initiatives.

a. Establish a privately-funded and managed Las Californias Ventures Fund to seed border region conservation strategies, seize and create opportunities, and leverage public spending.

b. Encourage state and federal delegations to support the Las Californias vision (e.g., through funding support of NCCP, National Wildlife Refuge, BLM, and Forest Service acquisition and land management budgets as well as Méxican conservation programs).

c. Work with government and nongovernmental partners to undertake strategic acquisition and management programs in the border region.

d. Investigate the potential for BLM land swaps to secure and maximize the conservation value of holdings along the border.

e. Coordinate with government agencies to ensure acquisition priorities support the Las Californias vision.

f. Support propositions that authorize bonds for conservation and management of natural open space, water resources, and park lands.

g. Develop presentations and organize field trips to generate interest and funding.

4. Develop public education and outreach that fosters understanding and appreciation of Las Californias vision goals.

a. Support public education and outreach by community groups and institutions.

b. Include programs within federal, state, and local agencies that emphasize the interdependence of resources in the border region.

5. Foster conservation-compatible land use practices for private lands, working landscapes, and rural communities.

a. Support private lands conservation initiatives that maintain conservation values in the border region.

b. Promote preservation of agricultural communities and sensitive land management practices.

c. Develop and implement legal and policy tools that encourage working landscapes and rural communities that are compatible with conservation values.

d. Work with the Natural Resources Conservation Service and nongovernmental organizations to secure easements and funds for farmers and ranchers that use sensitive land management practices.

6. Foster scientific research and exploration in the border region.

a. Promote geographically and taxonomically comprehensive field surveys so as to fill data gaps and ground-truth the land categorization in the conservation vision.

b. Support an update of this Las Californias vision as changes in land use and data availability/quality warrant.

c. Cultivate future, local conservation scientists and practitioners through the support of university student biologists.

d. Update state and federal endangered species lists on both sides of the border.

e. Develop science-based management and monitoring programs, and create an infrastructure to implement them.

f. Encourage analyses to evaluate target species' viability in Conservation Category A and B areas.

g. Use tracking studies of large mammals to inform locations of regional wildlife movement corridors.

7. Conduct focused (e.g., parcel-level) planning, especially in critical opportunity areas.

a. Investigate and resolve land tenure in the Baja California portion of the border region.

b. Initiate parcel-level land use planning, particularly in critical opportunity areas, to ensure that future land uses are compatible with existing conservation functions.

c. Conduct parcel-level planning in selected critical opportunity areas to identify specific needs to restore wildlife corridor functions for target species (e.g., vegetated road overpasses, road undercrossings, etc.).

8. Advance regional coordination in land management and monitoring.

a. Expand existing binational coordination efforts (e.g., fire-fighting programs) to address natural resources issues.

b. Use the Rancho Cuchumá/Tecate Peak binational conservation area as a staging ground for binational cooperation on land management and monitoring by developing a coordinated monitoring program for the border region.

c. Increase monitoring efforts for species that are of binational concern (e.g., bighorn sheep, mountain lion, etc.).

9. *Develop Urban Greening programs.*

a. Identify candidate areas for establishing urban green-spaces (*áreas verdes*).

b. Develop community partnerships to plan and implement green-space development in existing developed areas.

c. Integrate green-space projects into new development.

d. Link upland green-spaces with riparian greenbelts.

10. Build an effective Border Coalition to strengthen conservation capacity and coordination.

a. Convene Border Roundtables to foster communication and coordination among conservation practitioners, government agencies, scientists, and stakeholders.

b. Build land management and land trust capacity on both sides of the border.

c. Improve effectiveness of nongovernmental organizations through capacity-building, training, and mentorship.

d. Develop partnerships and strategic alliances.
   - Build administrative *sister park* relationships between Parque Constitución de 1857 in México and state and federal lands in the U.S.
   - Build relationships with indigenous communities to support preservation of historic and cultural resources through implementation of the Las Californias vision.

6. SUMMARY

The border region of California and Baja California—Las Californias—lies at the center of one of the world's biodiversity hotspots, harboring ecosystems and species that occur nowhere else on earth. It is also a growing, multi-national metropolitan area of more than 5 million people. The integrity and functionality of ecosystems in the border region, as well as the health, economy, and standard of living of its residents, depend on a system of open space reserves that are interconnected across the international border. The urgency of this need cannot be overstated, as the ever-growing human footprint of development is beginning to preclude opportunities for protecting a functional open space system.

However, there are institutional and political constraints to a binational conservation effort in this region. There is a tremendous difference in land ownership and conservation patterns in the two countries, with a far greater percentage of both public ownership and conserved land in California than in Baja California. Moreover, differences in legal mechanisms and available financial resources for achieving land conservation in the two countries complicate coordination.

Creating a Las Californias Binational Conservation Initiative vision takes a systematic, phased approach to conservation in the border region. The planning phase uses a science-based approach, with uniform conservation targets and goals, to identify significant natural resource areas. The objective of the planning phase is to identify areas that must be linked to conserve representative biodiversity, functional ecological processes, and wildlife movement across the region. The long-term goal for the initiative is for U.S. and Méxican governments, academic and research institutions, and nongovernmental conservation organizations to embrace and adopt a shared conservation vision for the region, and to refine this vision over time with focused research and planning.

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