



Existing Conservation Priorities

To understand existing priority areas within each mediterranean region we review site-based, conservation ‘blueprints’ which have been identified for the purposes of terrestrial biodiversity conservation. Information has been compiled from internet based searches and with assistance from colleagues in each of the regions. We categorize these efforts by ‘Government’, ‘Non-government’ and ‘Research’ efforts, although some span multiple categories. Where possible, we also include information on the extent to which these priority areas are likely to be funded or implemented in the future. The review focuses on priority areas encompassed within the extent of the mediterranean ecoregions defined by the World Wildlife Fund (WWF) (Olson et al. 2001), consequently, some in-depth and rigorous conservation plans, such as the Sierra Nevada Ecosystem Project in California, are not included, in addition, priorities identified of primarily other purposes, e.g., ecosystem services, prime farmland, scenery or recreation are not included.

Regional Conservation Priorities

Mediterranean Basin

Government

(a) Natura 2000

<http://www.natura.org/>

The Natura 2000 is the foundation of conservation in the European Union countries with the aim of maintaining and restoring endangered habitats and species of Community interest (Torkler 2006). More specifically the objective of

Natura 2000 is “to promote the conservation of natural habitats and the habitats of wild fauna and flora while taking into account the economic, social and cultural requirements and specific regional and local characteristics of each Member State”. Consequently the intention of the network is also to bring considerable economic and social benefits, such as ecosystem services, food and wood products, and employment opportunities such as ecotourism (Torkler 2006). The Natura 2000 is the ecological network of sites designated by EU Member States under two directives: the Birds Directive signed in 1979 requires the establishment of Special Protection Areas (SPAs) for over 181 bird species and the Habitats Directive signed in 1992 which requires Special Areas of Conservation (SACs) to be designated for over 230 animal and 483 plant species and 198 habitat types (Eurosite 2006).

Management of Natura 2000 sites is undertaken by each EU Member State by conservation authorities in each country working in collaboration with other organizations, charities, and private landowners. Once the sites are declared provisions for protection must be made, including an assessment of projects or plans that might damage the integrity of the site. Funding for the sites for infrastructure, staff, and management activities is expected to come from each country, but assistance for urgent or innovative conservation work is available through the EU LIFE-Nature project managed by the Directorate of the European Commission. There are also provisions within the Habitats Directive that provides the possibility of Community co-financing of some activities if required. Other sources of funding from the EU include structural agricultural and rural development funds, fisheries funds, plus a fund specifically devoted for the environment (approximately €2,1 Billion). NGOs such as the World Wildlife Fund and other partners in the region have produced a guide for EU member states on the financing of Natura 2000 sites (Torkler 2006).

(b) The Emerald Network

http://www.coe.int/t/e/cultural_cooperation/environment/nature_and_biological_diversity/ecological_networks/The_Emerald_Network/

The Emerald Network represents Areas of Special Conservation Interest (ASCIs) which are an outcome from the Bern Convention, 1989, which involves 51 contracting parties and observer states. ASCIs are defined as “those areas of a great ecological value for both the threatened and endemic species listed in the Appendices of the Bern Convention and for the endangered habitat types identified by the Standing Committee as requiring species conservation measures”. The Habitats Directive (1979) of Natura 2000 was developed to comply with the Bern Convention, thus the Natura 2000 network contributes to the ASCIs of the Emerald Network. For non EU member state signatories of the convention the ASCIs represent the equivalent of the Natura 2000. Once ASCIs are identified the Convention recommends certain actions to ensure they are properly managed, e.g., creating management plans, mapping and monitoring

sites, however, no recommendation is given to provide legal protection to ASCIs (Council of Europe 2006). However, since the Bern Convention is an international political agreement, rather than legislation like the EU Habitats Directive its enforcement might be weaker.

(c) Specially Protected Areas of Mediterranean Importance

http://www.rac-spa.org/carasp.php?id_page=48.php

Specially Protected Areas of Mediterranean Importance (SPAMIs) are part of a wider international effort - under the United Nations Environment Programme's (UNEP) Mediterranean Action Plan, to protect the Mediterranean Sea. The program was created out of the Barcelona Convention in 1976. The Mediterranean Action Plan (MAP) involves 20 countries adjacent to the Mediterranean Sea and the European Union. The MAP has six Protocols which support the Barcelona Convention which focus primarily on pollution issues but one of the six Protocols addresses biodiversity and protected areas. The Regional Activity Centre of the MAP draws up legislation, prepares reports to the Parties, action plans for endangered species, and organizes training activities for SPA managers.

In 1995 a new Protocol developed under the Barcelona Convention, developed a new category called "SPAMI" (Specially Protected Areas of Mediterranean Importance) for coastal and marine protected areas. SPAMIs are "sites of importance for conserving the components of biological diversity in the Mediterranean area or the habitats of endangered species and are of special interest at the scientific, aesthetic, cultural or educational levels". SPAMIs must contain representative, rare or unique ecosystems with adequate conservation and large enough to ensure the continuation of natural ecological processes. In addition, some SPAMIs take into account local participation and the sustainable use of natural resources in the surrounding area (López & Correas 2003). Once a site has been proposed all contracting parties decide whether it will be included, after which the State proposing them are responsible for their protection and management. Twelve SPAMIs are currently designated

(d) MedWet

<http://www.medwet.org/medwetnew/en/index.asp>

In 1999 MedWet was established within the Mediterranean Basin as an inter-regional structure involving 25 Mediterranean governments, international institutions and nongovernmental organizations for the implementation of the Ramsar convention (López & Correas 2003). The organization mobilizes scientific and technical capacity in the Mediterranean through a network of four centers in EU countries. Funding for MedWet comes from the EU - initially to

work in five member states and then expanding to five non-EU countries (Albania, Algeria, Croatia, Morocco, Tunisia), and more recently (1998-2000) Medwet has twinned deltas in Egypt, France, Greece, Italy, Spain and Turkey. The focus of MedWet is on training, developing a wide range of tools and guidance, e.g., wetland management handbook, participation of local people, training and capacity building, information and public awareness (López & Correias 2003).

Non-Governmental Organizations

(a) World Wildlife Fund Mediterranean Programme Office

http://www.panda.org/about_wwf/where_we_work/europe/what_we_do/mediterranean/index.cfm

The WWF Mediterranean Program Office undertook a Forest Gap Analysis which provides a rapid assessment of biodiversity, conservation status and threat of different forest types in Mediterranean ecoregions, with a particular focus is on identifying non-represented forest types. Some of the priorities identified include: all mountain conifer and mixed forest sub-ecoregions (e.g., the Middle Atlas in Morocco, Corsica and the Dinaric Alps), which are characterized by high numbers of endemic plants, threatened relic forests and endangered vertebrates (e.g., the Iberian ibex and Anatolian leopard). Other priorities include sclerophyllous and dry conifer forest sub-ecoregions, found in the southwestern Iberian Peninsular and southwest Anatolia, Turkey. WWF has also identified coastal priorities by estimating tourism activity. This has been estimated by comparing the light intensity during the winter and summer seasons which is considered to be an indicator of tourism activity. This information was integrated with biological data from other analyses which led to 10 priorities being identified, including the Corso-Sardinian coast, the Cilician coast in Turkey and the Dalmatian coast in Croatia.

(b) Key Biodiversity Areas and Important Plant Areas

While there are undoubtedly prioritization efforts for biodiversity which have occurred within many of the 22 countries encompassed by the Mediterranean ecoregions, a review of all of these is outside the scope of this report, however we highlight two in particular.

<http://www.sifiryokolus.org/english/index.php?page=1>

Key Biodiversity Areas (KBAs) is a concept developed by a number of organizations including BirdLife International, Conservation International and Plantlife International, to designate areas of global conservation importance. In Turkey, the identification of KBAs has been undertaken by the NGO Doğa

Derneği and the Royal Society for the Protection of Birds. Criteria for identifying sites include that they are large enough (or interconnected) to support viable populations of four classes of species: globally threatened, restricted range, large concentrations of species, and biome restricted assemblages (Doğa Derneği 2004). In Turkey 266 KBAs have been identified, covering 19% of the country's area, of which 80% currently lack formal protection status. Doğa Derneği is currently working in a number of KBAs, e.g., protecting the Bald Ibis by working with the local community and developing ecotourism or conserving the Caucasian Black Grouse in another KBA.

<http://www.plantlife.org.uk/international/plantlife-ipas.html>.

Important Plant Areas (IPAs) developed by PlantLife International based in the United Kingdom aims to focus conservation attention on plant communities and ecosystems, rather than just imperiled species. IPAs also succeed in increasing the spatial resolution and detail of the existing priority sites identified for plants which was conducted in the identification of Centers of Plant Diversity (WWF & IUCN 1994). IPAs are identified based on three broad criteria: threatened species, botanical richness, and degree of threatened habitat both in a global and regional context (PlantLife International 2006). They have been identified to varying degrees in countries within the Mediterranean Basin. Turkey for example, conducted the first national inventory of IPAs (122 areas identified), IPAs have been published for two regions in Spain - Valencia and Navarra, and there has been a preliminary identification of sites in Italy.

Research

(a) Hotspots for Plant Endemism - Médail and Quezel 1997

Hotspots of plant endemism in the Mediterranean Basin center on two areas: a western center which encompasses Morocco and the Iberian Peninsula and an eastern center that includes Turkey and Greece. The Macaronesian islands and the islands in the Mediterranean Sea also have high rates of endemism (Médail & Verlaque 1997). The authors identified 10 hotspots of plant endemism and describe the number of endemic species and threats experienced in each. A number of other published papers have identified spatial priorities in the Mediterranean Basin which support some of these hotspots. These include restricted mountain ranges which harbor many endemic plants with extremely narrow distributions, for example, limestone mountain ranges (Akeroyd 1999). Lowlands have also been highlighted, containing populations of rare or disjunct species which show considerable diversity, e.g. knapweeds (*Centaurea*) (Akeroyd 1999) as well as dunes (Médail & Verlaque 1997). This echoes other findings which state the most threatened endemics occur at low altitudes, from 0-800 m (Médail & Verlaque 1997), e.g., in Corsica, 80% of the endemics are found in this region.

Chile

Government

(a). National Biodiversity Strategy - Comisión Nacional de Medio Ambiente

<http://www.conama.cl/portal/1301/channel.html>

In accordance with the Convention on Biological Diversity, in May 2002, the government's National Environmental Agency (Comisión Nacional de Medio Ambiente, CONAMA) developed a list of potential conservation sites for terrestrial and marine conservation (Comisión Nacional de Medio Ambiente (CONAMA) 2003). The goal was to identify sites of high priority for conservation with opportunities for protection and eventually to develop an action plan to ensure effective biodiversity protection of each of the sites. Priority sites were generated through collaboration between government authorities, public sector, and academics in expert workshops in each of the 13 administrative regions in Chile. Sites for biodiversity conservation were developed based on four criteria: (1) ecosystems currently unrepresented within existing protected areas; (2) biodiversity features: species richness, endemism, rarity, endangered status; (3) Threats; and (4) Feasibility of implementation, e.g., land ownership characteristics. For each region between 40-100 sites were identified of which the top five sites were selected with a goal of achieving 50% representation under official protection by March 2006.

The sites were officially endorsed in December 2003 and beginning in 2003 a National Action Plan to implement was started involving all interested parties including NGOs and the private sector. As of June 2006, 67 sites had been identified by CONAMA to be implemented in the next 10 years (Tognelli et al.), although the current status of implementation is not known.

(b). Regulations

In 1995 the first environmental law was approved which regulates the requirement of environmental impact assessments and declarations for large development projects, which is in theory supported with regulations relating to endangered species.

Non-governmental Organizations

The Nature Conservancy

<http://www.nature.org/wherewework/southamerica/chile/>

The Nature Conservancy's Southern Andes Conservation Program undertook a rapid conservation assessment of the Chilean matorral ecoregion in 2006. The assessment used conservation planning software and identified a number of biodiversity elements including 41 ecosystems based on the vegetation mapping by Luebert and Pliscoff (Luebert & Pliscoff 2005), 60 plant species and 136 vertebrate species with mapped distributions. The 'cost surface' layer included an accessibility, land-use and fire frequency. The representation of all biodiversity elements within existing protected areas was determined and conservation goals established. The assessment identified a combination of specific sites that reached these defined conservation goals for all conservation targets which, in many cases, included the sites proposed by CONAMA (although boundaries need to be slightly revised). The portfolio sites proposed by TNC accounted for 14.2% of the proposed ecoregion area and Priority 1 sites accounted for 1.5% of the area.

Research

(a) Chilean Vertebrate Gap Analysis - Tognelli et al. (submitted)

Research was conducted to assess how well the existing protected areas in Chile (including all IUCN categories, private reserves, and Ramsar sites) represent the 653 terrestrial vertebrate species present. A spatial Gap analysis determined that over 13% of vertebrate species were not covered by any existing protected areas and over 73% of Chilean vertebrate species have only a small fraction of their geographic ranges currently protected (Tognelli et al.). A component of the analysis identifies the representation of vertebrates if the 67 priority sites proposed by CONAMA (Comisión Nacional de Medio Ambiente (CONAMA) 2003) are implemented and found 39 species were unrepresented. The authors identified major gaps in representation are concentrated in the northern coastal and central valley area which also are experiencing some high human-related impacts.

(b) Red Book of Native Flora and High Priority Sites - Squeo et al.

<http://www.biouls.cl/lrojo/>.

A research effort to compile lists of the native IUCN Red Book status flora and high priority sites for conservation has been undertaken by a collaborative research effort for Región de Coquimbo (IV) and is underway for Region II and Region III (Squeo et al. 2006). The objectives of the study were to assess the state of the native vascular flora in the region, identify centers of plant endemism, and define high priority sites for the conservation of threatened flora. This was determined based on the extinction risk of species (extinct, in danger, vulnerable, and not in danger) which was estimated using a number of indicators including species abundance, distribution, and representation across different vegetation formations. Information was compiled from georeferenced specimen locations from university herbaria and the National Museum of Natural History and complemented by data collected in the field from 1999-2001 and published literature. In the Coquimbo Region 4 priority sites have been identified characterized by their area, the number of native vascular plant species, number of Chilean endemic species, and the number of species in each extinction risk class.

Australia

Government

(a) National Reserve System for Australia using the Interim Biogeographic Regionalization of Australia (IBRA) units

<http://www.deh.gov.au/parks/nrs/ibra/>

Beginning in 1997, the Government's Natural Heritage Trust of Australia developed a series of processes to ensure that the protected areas network was 'comprehensive, adequate and representative' (CAR). The analysis used the 85 units of the Interim Biogeographic Regionalization of Australia as a framework (IBRA; see Section X for details) with the aim of identifying key gaps in the protected areas network for terrestrial ecosystems (Department of Environment and Heritage 2005b). For each IBRA unit, a number of attributes were generated using the National Vegetation Initiative data including the percent of each unit protected, an indication of the number of unrepresented vegetation types within each unit, the dominant land use and threats, and alternative management measures. IBRA units were then prioritized for funding under the National Reserve System Programme (very high, high, medium, or low) to reflect the value that increased protection would contribute to increasing the representation of the reserve system nationally. The IBRA CAR program is used extensively by state governments who can access funding for acquisition if undertaken within this framework.

(b) National Biodiversity Hotspots

<http://www.deh.gov.au/biodiversity/hotspots/programme.html>.

In 2003, the Australian government identified fifteen biodiversity hotspots for the continent. Areas designated as hotspots are characterized by: largely intact natural ecosystems, well represented native species and communities, and a high diversity of locally endemic species (Department of the Environment and Heritage 2006). The hotspots were delineated by the government's Threatened Species Scientific Committee with input from experts in each state and territory. The goal of identifying hotspots is to "increase public awareness of environmental heritage at risk and to support strategic action to conserve it".

The national government has allocated \$36 million for the 'Maintaining Australia's Biodiversity Hotspots Programme' which seeks to improve the conservation of biodiversity hotspots on private and leasehold land. The program makes direct financial support to landowners to help them protect existing natural habitat with high conservation values ('stewardship payments') and also targets areas of high biodiversity value for acquisition ('voluntary land acquisitions'). Applicants for both funding components are assessed on their value for money. The government is also planning to work with non-governmental conservation organizations, identified through a competitive bidding process, to act as 'national delivery agents' to deliver \$21 million of projects over two years.

(c) Systematic Spatial Prioritization for Australia

A national spatial prioritization approach has been undertaken in 2006 by the University of Queensland under contract to the Australia Department of Environment and Heritage (Carwardine et al. 2006). The goal is to provide DEH with an overview of prioritization approaches available and how priorities for investment might be systematically identified. In the prioritization effort four different types of biodiversity surrogates were used to represent Australia's biodiversity: major vegetation classes, environmental classes grouped based on a number of environmental variables, species of national environmental significance, and bird atlas data, together with three types of cost data. Analysis was undertaken using MARXAN software planning units of 10 km² x 10 km². The next steps of the project are to include ecological processes, such as connectivity and animal movements, and threats to biodiversity including salinity, grazing, and weeds.

(d) Regulatory and Policy Framework

<http://www.deh.gov.au/epbc/about/index.html>.

<http://www.deh.gov.au/biodiversity/threatened/index.html>

At the national level the Environment Protection and Biodiversity Conservation Act 1999 is the key legislation for protecting the environment, it “streamlines national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places” (Department of Environment and Heritage 2005a). Within the Act there are four main components: assessments and approvals for actions likely to have a significant impact on any Commonwealth environment (within or outside Australia); wildlife and other permits; compliance and enforcement mechanisms; and biodiversity conservation provisions.

Biodiversity conservation is promoted through the Act by the provision of strong protection for threatened species and ecological communities, migratory, marine and other protected species (Department of Environment and Heritage 2005a). This component provides for the identification, listing, and development of recovery plans for threatened species and ecological communities as well as reducing key threats where necessary (Department of Environment and Heritage 2006). Nominations for species and communities can be by the public, which are then assessed by the Threatened Species Scientific Committee. Each state also has its own environmental legislation, for example, the Wildlife Conservation Act (1950) in Western Australia.

Government and Non-Government

<http://wwf.org.au/publications/southwest-australia-ecoregion-jewel-booklet/>

In 2002 the need for conservation planning at the scale of the southwestern Australia was recognized in order to provide a long-term vision for the landscape and the resources needed to achieve it (Gole 2006). In 2003, a consortium of stakeholders including government agencies, environmental NGOs, universities and community representatives formed the Southwest Australia Ecoregion Initiative. The role of the partnership program is to provide a collective view on the value of the biodiversity of the Southwest Australia Ecoregion and to chart a way forward that will ensure the conservation of the biodiversity and natural resources of the ecoregion (Gole 2006). Key aims of this effort are to conduct a biodiversity assessment and develop a comprehensive and collaborative conservation strategy to attract additional funds for priority actions and threats. An initial workshop was held in September 2006.

Collaborative research efforts have also been undertaken in the southwestern Australia which have identified areas of biodiversity importance. For example, research conducted between the Kings Park and Botanic Garden and the Department of Conservation and Land Management’s Western Australian Herbarium mapped plant species richness and plant endemic richness (defined

as having a geographic distribution occupying <10,000 km²) represented in 0.25° latitude x 0.25° longitude gridcells (Hopper & Gioia 2004).

California, USA

Government

As far back as the 1970s the California Legislature recognized the need for a statewide land use policy to ensure protection the state's resources, ensure land preservation, and identify environmental goals. However, there is still no overall policy defining goals and objectives for statewide land use (California State Auditor - Bureau of State Audits 2000), one possible reason being the size and complexity of the environmental community. As a result, there are multiple entities in California involved in acquiring land for preservation and restoration, including state and federal agencies, private and nonprofit organizations, working in accordance with the missions and objectives of each group. Despite an absence of a statewide approach, there is co-ordination between different groups at a regional scale, for example, the CALFED Bay-Delta Program which encourages coordination among its federal and state agencies or Joint Ventures which integrate state, federal agencies and non-governmental organizations focused on a particular geographic region.

(a) Regulatory and Policy Framework

Much of the protection of California's biodiversity is conducted through regulatory mechanisms at both the federal (U.S. Fish and Wildlife Service) and state (Department of Fish and Game) levels. This includes the Endangered Species Acts (ESA) to identify and protect individual species which have already significantly declined and also provisions similar to ESA which are evoked by other laws such as the Clean Water Act, Clean Air Act, and Forest Management Act, that require the agencies responsible to recover impacted populations in consultation with the U.S. Fish and Wildlife Service or the California Department of Fish and Game. Non-single species mechanisms include Habitat Conservation Plans, under the federal state ESA and the Natural Community Conservation Planning Act (NCCP) under state law with a goal of conserving natural communities at the ecosystem scale while accommodating compatible land use (NCCP 2006).

(1) Endangered Species Acts

http://www.fws.gov/endangered/pubs/ESA%20BASICS_050806.pdf

The Endangered Species Acts are an important driver of policy on both public and private lands. There are both state and federal Endangered Species Acts (ESAs), the federal one is generally stronger and more often utilized, but activities under the California ESA occur for taxa with state but no federal protection. Under the ESA listed species are protected by prohibiting the ‘take’ of listed animals and the interstate or international trade in listed plants and animals, except without a permit which is granted for certain conservation and scientific purposes (U.S. Fish & Wildlife Service 1998). Before a ‘take’ permit is granted, a biological assessment and in some cases a recovery plan must be conducted on the impacts of economic activities on the listed species, which are reviewed by the U.S. Fish and Wildlife and other federal agencies. As part of the recovery plan for the conservation of the listed species conservation, ‘critical habitat’ (U.S. Fish & Wildlife Service 2005) may be identified, e.g., in California critical habitats have been designated for the Valley Elderberry Longhorn Beetle and California Red Legged Frog (Sacramento Fish and Wildlife Office 2006). Another important component of the ESA is Section 8 consultations, which requires any federal entity performing an action that affects a listed species to consult first with the U.S. Fish and Wildlife Service. Failure to do this is frequently cause for successful litigation to hold up the proposed actions. The process often results in negotiated settlements which often do not lead to comprehensive protection of the species.

(2) Natural Community Conservation Planning (NCCP)

<http://www.dfg.ca.gov/ncccp/index.html>.

As an alternative to species by species management, The Natural Community Conservation Planning (NCCP) program takes a broad-based ecosystem approach to planning for the protection of plants, animals, and their habitats. These regional conservation plans aim to provide a suite of biological, regulatory, fiscal, land-owner protection, and public participation provisions that will work over time (Hopkins 2004). The first NCCP effort was for the coastal sage scrub habitat of Southern California - heavily fragmented with about 100 threatened or endangered species spanning three counties, 59 local government jurisdictions, and scores of landowners, which was organized into eleven NCCP planning ‘subregions’ to develop conservation plans (NCCP 2006). There are now over 32 active NCCP’s in the state cover more than 7 million acres of the state, a third of which have been approved and permitted.

(b) California Natural Diversity Database for rare species and vegetation

<http://www.dfg.ca.gov/bdb/html/cnddb.html>

The core data for many regulatory activities and conservation planning efforts is the California Natural Diversity Database (CNDDDB), providing valuable data for

informing these approaches (although not specifically conservation priorities). The CNDDDB is the official record for the recorded locations of regulated rare species and in some cases habitats, and provides core data for the regulatory mechanisms of the state and federal Endangered Species Acts, Migratory Bird Treaties, and is integral to many Environmental Impact Reports and Assessments. The database was established in the 1980's as part of a nationwide network of 'natural heritage programs' now overseen by NatureServe (previously part of The Nature Conservancy) and maintained by the California Department of Fish and Game's Habitat Conservation Division. The goal of the program is to conserve California's biological diversity by providing government agencies, the private sector, and conservation groups with information to promote better-informed land-use decisions and improved resource management (Bittman 2001). The CNDDDB records positive sighting data on special status plants, animals, and natural communities from a variety of sources. With more than 40,000 records it comprises the most complete set of information on the state's declining and /or vulnerable taxa (Hunting 2004). For each taxon's occurrence, associated information includes the precision of location data, date of observation, current occurrence status - ranking each observation to reflect its status in the state ("S" rank) and global distribution ("G" rank).

Although the database represents one of the largest, state-wide, long-term datasets its coverage is patchy for a number of reasons. It relies on voluntary records so data may be lacking from certain regions - such as some highly protected lands (e.g., national parks or wilderness areas) owing to the difficulty of acquiring collecting permits, or a bias towards private lands under recent development, since many records result from Environmental Impact Reports associated with real estate development. In addition, the submittal of new observations often exceeds the capacity to enter the data and entry of new observations is prioritized independent on the status of the occurrence (Hunting 2004), although new funding has assisted data entry in becoming more efficient.

(c) Significant Natural Areas

One of the early efforts to identify priority sites was conducted under the Significant Natural Areas Program (SNAP) of the state's Department of Fish and Game. The program was established to identify high-priority sites for the conservation of California's biodiversity and to inform resource decision-makers about the importance of these sites (Department of Fish and Game 2000). Recognizing the ongoing decline of California's natural habitat and the lack of coordination between activities between public agencies and private organizations, a consortium of 16 conservation groups formed in 1978 to develop a comprehensive inventory of important areas to guide the allocation of limited resources and avoid duplication of effort between organizations.

Specific goals of the SNAP included: identifying the most significant natural areas in the state for sensitive species, seeking the long-term perpetuation of these

areas, and providing coordinating services for other public agencies and private organizations interested in protecting natural areas. Significant Natural Areas (SNA's) were identified using the CNDDDB data, expert input, and field verification according to a number of criteria (e.g., areas supporting rare species or habitats or representative examples of habitats within California). Levels of protection or threat were not considered. Identification of SNAs was undertaken primarily for internal planning purposes and educational purposes and did not imply any additional jurisdiction by the Department in these areas. In addition, others have criticized the SNAP for the uneven distribution of sites (resulting from the voluntary submission process) and the lack of statewide context for each site (Cooper 2004).

(d) California GAP analysis

http://www.biogeog.ucsb.edu/projects/gap/gap_rep.html

Initiated in 1990, the California Gap Analysis Project was one of the first efforts towards a more systematic assessment of species and communities. The Gap Analysis was a cooperative effort between the U.S. Fish and Wildlife Service and then U.S. Geological Survey, and researchers at the University of California, Santa Barbara, with the involvement of many other public and private organizations. The main objective was to measure the degree of protection of species or communities within existing protected areas. This involved the development of GIS databases of land-cover, wildlife habitats, predictions of native wildlife species distributions, and land stewardship data (and their dissemination) and the identification of land-cover types and wildlife species that are inadequately represented in existing biodiversity management areas (Davis et al. 1998). Land cover data was generated from a combination of satellite imagery, color infra-red photography, and vegetation field surveys, resulting in 194 natural plant community types and 27 land use classes. Distributions for 455 native vertebrate species were predicted using GIS modeling with habitat types ranked according to their suitability for each species. Finally, improvements were made to existing land ownership and management databases along with a scoring system to reflect the degree of management for biodiversity purposes.

The California Gap identified both priority community types and priority places for conservation. Plant communities were assigned to seven categories according to the rarity of the community and the degree of protection. For broadly distributed community types the identification of priorities also included an index of threat based on a combination of roadedness and projected population growth. Special attention was also given to selected plant communities, such as vernal pools, at resolutions too fine to be adequately represented in the land-cover data. To identify priority places, the analysis ranked all 7.5 minute quadrangles across the state based on a number of criteria including the aforementioned rarity and protection categories and the amount of the quadrangle in lower status protection classes, to develop an index of site

vulnerability. While the GAP analysis represents the first systematic state-wide assessment resulting in valuable land cover and vertebrate species datasets available for other analyses, the application of results into project level actions was relatively limited.

(e) The California Unified Watershed Assessment

While the California Gap analysis generated valuable datasets and reports on the protection of species and communities, one of its limitations was a focus on simply protected versus unprotected areas that did not account for other mechanisms of protection such as private lands with conservation easements, together with a species-based focus. The next iteration of assessments, for example the Unified Watershed Assessment (UWA), attempted to advance conservation assessments and account for multiple use areas, ideas of working landscapes and incorporate and weight various criteria, including biodiversity, water quality and resource condition, permitting different policy conclusions to be realized.

A UWA was conducted by each state in response to the federal government's Clean Water Action Plan (1998). In California, the UWA involved a collaborative process with federal agencies (e.g., U.S. Department of Agriculture Natural Resources Conservation Service) and state agencies (e.g., The Water Resources Control Board), stakeholders, and the public with the aim of categorizing watersheds to guide the allocation of federal resources for watershed protection. Watersheds were assigned to four categories: Category I watersheds represented candidates for increased restoration activities due to impaired water quality and natural resource goals (e.g., water quality or aquatic species); Category II have good water quality that can be sustained and improved; Category III are located within pristine or sensitive areas on federal, state, or tribal land that need protection; and Category IV are watershed where more information is needed to assign them to a category.

Category I watersheds were further categorized into 66 priority watersheds to receive new federal funds between 1999 and 2000. Priorities were determined on the basis of three factors: high value (in terms of water quality, aquatic systems, anadromous fish, and species richness of several different taxa, both aquatic and terrestrial), high risks to maintaining those values (e.g., stresses from human population growth, loss of habitat) and institutional capacity for achieving improvements (e.g., presence of established watershed groups) (Clean Water Action Plan 1998). Roughly 25 experts representing a number of agencies, tribes, NGOs and universities were involved in the evaluation and ranking, and ended up recommending watersheds for directed funding toward watershed restoration.

(f) California Legacy Project

<http://legacy.ca.gov/about.epl>

Using the UWA assessment framework the California Legacy Project was initiated under the Gray Davis administration in 2001, which was a statewide effort to attempt to synthesize the multiple efforts of government departments and NGOs working on biodiversity conservation. The aim of the Project was to develop a conservation blueprint for departments within the California Resources Agency for “assessing the state’s natural resources and habitat, and developing a long-term set of priorities and targets for future investment in resource protection, habitat acquisition, and preservation”. Specific project goals included: to develop a strategic context for statewide conservation investments; build on local conservation planning efforts, identify priority actions for conservation, and coordinate conservation actions among partners (CA Legacy Project 2000).

One component of the Project developed by a working group convened by the University of California Santa Barbara’s National Center for Ecological Analysis and Synthesis (NCEAS) was to develop a framework for setting conservation priorities. The aim of the framework was to help decision makers to evaluate current opportunities and to help planners develop long-term conservation strategies that highlight general areas, species and communities for more focused analysis and collaborative planning (Davis et al. 2003). The framework focused on three types of conservation goals (Resource Production Capacity, Natural Capital, and Public Open Space) and mapped conservation value and investment priorities using spatial data and derived indices to reflect the ecological condition of landscapes to maintain native biodiversity. These included; land conversion, residential housing impact, road effects, forest structure and a series methods to evaluate the conservation value of sites (e.g., hotspots of rare or endemic species) (Davis et al. 2003).

The Legacy Project held nine bioregional workshops across California in 2002-2003 with the aim of eliciting information about existing regional conservation plans and priorities (Arounsack et al. 2003), although information collected at the bioregional scale was never fully integrated at the state-wide scale. The project formally ended after about three years after it started with the change from the in administration. However, the project helped identify important considerations for priority areas and some of the ideas and infrastructure of the project continue today in a public-private collaborative effort of the Great Places Program which is conducting a pilot project in the San Joaquin Valley. The Program aims to improve the protection and conservation of natural resources in the state by enhancing the efficient of land use and transportation decision-making (Information Center for the Environment 2006).

(g) California Department of Fish and Game - State Wildlife Action Plan

<http://www.dfg.ca.gov/habitats/wdp/>

The Department of Fish and Game (DFG) has a key role in acquiring land for preservation and ecosystem restoration throughout the state. Its Lands Committee sets priorities for land acquisition which are then used by the Wildlife Conservation Board to allocate funds to acquire land for the Department. Also generated by the DFG, and a required element for states to receive federal highway funds, is state wildlife plan (Bunn et al. 2005), although this has not yet been approved by the U.S. Fish and Wildlife Service. The plan provides an inventory of biodiversity resources and threats in the state together with policy action recommendations, but no spatial location priorities.

(h) State Conservancies

Under the California Resources Agency, the state created seven state conservancies to acquire and protect undeveloped lands in specific regions of the state (California State Auditor - Bureau of State Audits 2000). Some of these, for example, the State Coastal Conservancy, have identified priority areas within their region which assist in guiding future acquisitions by either them or other entities interested in the region. Sources of funding for acquisitions are received from bond acts, grants and the State's General Fund.

(i) Federal Government Agencies

There are a number of other federal government groups who manage land in California, although the existence of defined future priority areas is unknown. For example, the US Fish and Wildlife Service (USFWS) who manage land for wildlife in the state and will occasionally accept other lands gifted to the agency as part of mitigation. The US National Park Service manages 23 different units in California including nine national parks, the US Forest Service manages wilderness areas as well as Natural Research Study areas and working landscapes, and similarly, the US Bureau of Land Management includes areas with specified land use permitted as well as wilderness and roadless areas. Finally the US Military (Army, Navy, Air Force, and Marines) have large land holdings throughout California, representing often surprisingly intact ecosystems.

Non-Governmental Organizations

Within California there are many non-governmental organizations working at the state, regional, and local scale whose goals include the protection of biodiversity, many of whom have developed spatial priorities for conservation. These groups can be classed into several categories. National-level organizations like The Nature Conservancy and Audubon conduct national and state level fund raising, and have both land acquisition and policy advocacy branches in California. California-state focused groups, such as the California Wilderness Coalition and Save the Redwoods League, often target specific habitats or lands in their

conservation plans and may or may not be involved in advocacy. There are also groups working at the intermediate, ecoregion scales focusing on the preservation of biodiversity, ecological connectivity, or ecosystem processes apparent at this scale, for example, The Conception Coast Project, South Coast Wildlands Project, and the Bay Area Open Space Council. These groups often develop plans for conservation but also are often forced to work with larger coalitions to acquire property. Finally, at the regional, county and watershed level one finds an increasingly complex interweaving of groups. The following section lists some of the larger non-governmental groups who have identified priorities for biodiversity conservation in California.

(a) The Nature Conservancy - Ecoregion Planning Assessments

<http://www.nature.org/wherewework/northamerica/states/california/>

The Nature Conservancy (TNC) of California, one of the largest private non-governmental organizations, began developing in 1996 ecoregion-based conservation assessments to determine how much and what parts of the natural landscape are needed to maintain biological diversity over the long term (The Nature Conservancy 2006). Through analyzing data and collaboration with experts, the assessments aim to define an overall ecological vision for the success of the organization's mission within an ecoregion and to make informed conservation decisions on where to invest scarce conservation funds and staff resources.

The primary product of an ecoregional assessment is an 'ecoregional portfolio' - a map of ecologically linked lands and waters that collectively capture the full array of species and natural systems that define an ecoregion to inform the efforts of the Conservancy and its partners (The Nature Conservancy 2006). The approach for determining the ecoregional portfolio involves a number of steps: selecting conservation targets (both coarse filter such as the ecological systems in the ecoregion and fine filter such as rare or endemic species), setting conservation goals (e.g., number of species occurrences or percent of area to represent), assessing the viability of occurrences, designing the portfolio of conservation areas (using the conservation planning software), identifying threats, and determining actions to conserve the portfolio. The resulting portfolio constitutes a suite of conservation areas to inform the efforts of the Conservancy and its partners and building a shared responsibility for biodiversity conservation. These priorities help guide fundraising from private sources as well as influence other entities, such as the Wildlife Conservation Board and state conservancies.

(b) Audubon California - Important Bird Areas

<Http://www.audubon-ca.org/IBA.htm>

As part of the worldwide effort coordinated by Birdlife International, Audubon California has identified Important Bird Areas (IBA) to help protect sites within the state deemed most critical to birds. Beginning in the mid-1990s, over 150 IBAs were identified and described by 2003. Areas were generally defined using natural boundaries both geologic (e.g., portions of mountain ranges) and biotic (wetlands and associated uplands) (Cooper 2004). The IBA's, which are all less than 100,000 acres in extent, need to meet one of four criteria; contain >10% of California or 1% of the global population of one or more sensitive taxa, have more than 10 listed sensitive (including federal and state threatened and endangered) species regularly occurring, or more than 10,000 shorebirds or more than 5,000 waterfowl possible on a one-day count (Cooper 2004).

Although IBAs have no regulatory authority, IBAs identified as high priority are likely to receive support from national Audubon and the Audubon California chapter to develop conservation plans and strategies and identify potential sources of funding. In cases where IBAs experience high levels of threat (e.g., urban sprawl, expansion of agriculture, invasive species) the Audubon California chapter will collaborate with appropriate partners through an IBA Stewardship Program in an attempt to reduce these threats. While IBA's present an important first step for identifying sites for the conservation of birds in California, IBAs differ in the amount of information available on each area and lack a standardized approach for assessing the threat and importance of the area, although work is currently being undertaken to address this (Audubon California 2006).

(c) California Wilderness Coalition - Wildlands Projects

<http://www.calwild.org/>

The California Wilderness Coalition (CWC), formed in 1976, is dedicated to protecting California's wild places and native biodiversity on a statewide level. Through advocacy and public education and coordinating efforts with local organizations, policy makers, business people and community leader they build support for threatened wild places (California Wilderness Coalition 2005). CWC's California Wildlands Project has been instrumental in undertaking conservation planning efforts to identify priorities to ensure the long-term survival of biodiversity. Annual reports detail California's 10 most threatened wild places (California Wilderness Coalition 2006). However, more indepth planning efforts use principles such as Wildland Conservation Areas and Wildland Linkages in a number of California's bioregions which aim to guide CWC and other land managers and planners in wildlands conservation. Potential wildland cores were inventoried by field campaigns involving citizen groups, who identified ~3 million hectares of Wilderness quality lands not managed on public lands in the state (California Wilderness Coalition 2001). The distribution of these areas has become the conservation focus of groups working on wilderness legislation.

Some efforts were also made to examine potential connections between core wilderness areas. In the central coast bioregion, for example, a conservation network assessment involved three steps (Thorne et al. 2002); first, core habitat areas and habitat linkages to maintain connectivity for three focal wildlife species - mountain lion, San Joaquin kit fox and the pronghorn antelope, were identified. Second, the resulting mammal network was evaluated for the degree to which it represented other elements of biodiversity - such as oak woodlands, The Nature Conservancy's portfolio sites, and serpentine outcrops. A degree of overlap was identified for these elements within the 68% of the bioregion identified based on the network for focal mammals. Third, regional watersheds were assessed on the impact from roads and their suitability for the three mammal species. Four implementation strategies for the central coast were identified including: (1) the encouragement of collaborative efforts between conservation groups and locals such as county planners and agency biologists to identify and agree upon priorities and opportunities for habitat connectivity and protection; (2) the use of conservation easements on large privately held parcels that comprise core habitat regions; (3) the use of funds to acquire high biodiversity value parcels that fall outside the network; and (4) the implementation of conservation and restoration that can benefit multiple conservation targets simultaneously (Thorne et al. 2002). Similar guides for wildlands conservation have been developed for the South Coast bioregion (Hunter et al. 2003) as well as the Sierra Nevada bioregion (Shilling et al. 2002).

In terms of legislation advocacy, CWC has teamed with the Wilderness Society and other environmental groups in recent advocacy, which has led to a number of federal bills over the past eight years that have added protected wilderness in California. For example, the California Wild Heritage Wilderness Act seeks to protect 2.5 million acres of public lands across the state and free-flowing portions of 22 rivers.

(d) Missing Linkages - Restoring Connectivity to California's Landscape

<http://www.calwild.org/resources/pubs/linkages/index.htm>

The Missing Linkages assessment, sponsored by both government agencies and environmental NGOs, addressed state-wide habitat connectivity issues by identifying the location and threats to important wildlife corridors (Penrod 2000). A one-day workshop in 2000 was convened with land managers, planners, conservationists, and scientists to identify the location of three types of linkages for key species or ecological processes. Types of linkages included Landscape Linkages (e.g., riparian corridors), Connectivity Choke-Points (e.g., narrow peninsula of habitat surrounded by human dominated landscape) and Missing Links (e.g. major highway dividing large blocks of habitat). Although all taxonomic groups were considered, mammals - particularly carnivores, were represented in 73% of the linkages. In total, 232 linkages were identified with corresponding descriptions (over a third are Landscape Linkages) with riparian habitat and/or waterways the primary connectivity conduit. Barriers to wildlife

movement were also documented (roads and highways accounting for over half of the barriers) and 24 different types of habitat threats were recognized (the primary ones being urbanization, roads, agriculture, and invasive species, logging) (Penrod 2000). Linkages were prioritized based on four criteria; target species, overall threat, conservation opportunity, and the existence of documentation. About a quarter of the linkages were ranked as high priority and 43% as medium priority (the South Coast ecoregion had the highest number of high and medium priority linkages and the Modoc Plateau the least).

The Missing Linkages assessment strove to identify linkages for wildlife, using scientifically credible methods, to increase awareness and guide future conservation efforts (Penrod 2000), providing a valuable resource for other conservation groups.

The adoption of linkages as conservation priorities has not been accomplished to date at the state-level and has varied from region to region. The most advanced implementation underway is in the southern coastal ecoregion by the South Coast Wildlands Project, which has successfully partnered with the California Department of Transportation and other government agencies to begin implementation of linkage protection and restoration.

Another example of implementation is by a coalition of groups working on two chokepoint linkages identified in the central coast region around the Santa Cruz Mountains by Thorne et al. (2006). Several other groups are developing finer-scaled linkage assessments for parts of the region, including the Information Center for the Environment at the University of California, Davis and the Conception Coast Project.

(e) Land Trusts, Land Conservancies, and Watershed Groups

Land Trusts are private groups who work with a focus on protection. They pioneered approaches such as conservation easements, which provide tax benefits to land donors, and leave the land in private ownership but bar future development. They also directly acquire land and manage it as well as buy land, sell, or donate it to the government or other land-management groups to manage. In California there has been an increase in land trusts from 2000-2005 from 132 to 198 (Boxall 2006).

In contrast, Land Conservancies are publicly funded, often with bond money, and their role focuses on long-term management of the land. An example of a collaborative effort between a number of land conservancies and academic researchers is the Green Visions Plan for 21st Century Southern California. A joint venture between the University of Southern California and four land conservancies in the region their mission is to provide a guide to habitat conservation, watershed health and recreational open space for the Los Angeles metropolitan region (Green Visions Plan 2004). Long-term goals for the Green Visions Plan are to protect and restore natural areas to ensure the persistence of

biodiversity and restore natural function to hydrological cycles to maximize groundwater recharge and improve storm water quality.

Finally, Watershed Groups and Councils are composed of a variety of groups, working within some loosely defined ecological region, for example the American River Watershed Group. These groups may acquire land but are often focused on the management and restoration of habitats in the watershed with an emphasis on water quality and supply. In some cases, these groups have developed the capacity to manage lands for conservation themselves and in some cases can serve as the recipients of lands acquired through mitigation that are not accepted by government agencies for management.

Baja California, Mexico

Government

(a) Priority Terrestrial Regions - CONABIO

<http://www.conabio.gob.mx/>

The Mexican National Biodiversity Commission (CONABIO) developed a program to identify areas of high biodiversity as priorities for conservation (Priority Terrestrial Regions - RTP) (Arriaga et al. 2000). The goal was to identify areas at the national scale where physical and biotic conditions result in diverse ecological environments. High priority areas harbor high species richness and endemic richness, significant biological integrity, and have high likelihood of successful conservation. The effort was supported by the WWF, the U.S. Agency for International Development (USAID), The Nature Conservancy, and the Mexican Fund for the Conservation of Nature (FNCZ) as well as the government's National Institute of Ecology.

Collaboration between experts and academics led to 152 terrestrial high priority regions being identified, covering an area of 515,558 km² (approximately one quarter of the country). Each of these sites is described based on nine major factors: including geographic location, climate, soils, ecosystems, human influence, and endemism. Within each of these major categories the area is ranked according to a number of criteria - for example, its ecological functional integrity or extraordinary natural phenomenon. Three of these priority areas overlap in part with the mediterranean ecoregion extent in northern Baja; the Sierra de Juárez (4,568 km²), Santa María-El Descanso (572 km²) and Punta

Banda-Eréndira (459 km²) (Comisión Nacional para el Conocimiento y uso de la Biodiversidad 2004a).

(b) Important Bird Areas - AICAS

<http://conabioweb.conabio.gob.mx/aicas/doctos/aicasmapa.html>

A program to identify Important Bird Areas (Áreas de Importancia para la Conservación de las Aves (AICAS) was an initiative of CIPAMEX (Sección Mexicana del Consejo Internacional para la preservación de las aves) and BirdLife International with the support of the Commission for the Environmental Cooperation of North America (CCA) (Comisión Nacional para el Conocimiento y uso de la Biodiversidad 2004b). In 1996, 40 experts from NGOs and universities around Mexico proposed 193 priority areas which were reviewed and digitized into a GIS database. A second phase of workshops created four regional groups which reviewed the priority areas according to criteria developed by BirdLife International and selected five areas of highest priority within each region for the development of a conservation implementation plan. A book is currently being developed which, among other things, is intended to assist decisions makers involved in prioritizing areas and allocating resources for conservation.

Non-Governmental Organizations

(a) Las Californias Binational Conservation Initiative

<http://www.consbio.org/cbi/projects/show.php?page=lcbi>

The Initiative conducted by Pronatura, a nonprofit conservation and sustainable development organization in Mexico, The Nature Conservancy, and the Conservation Biology Institute, sought to develop a binational conservation vision for the region spanning the southern California and northern Baja California, Mexico. The Initiative used a science-based approach to identify significant natural resource areas, with an objective of identifying areas that must be linked to conserve representative biodiversity, functional ecological processes, and wildlife movement across the region (Conservation Biology Institute et al. 2004). Other goals include promoting collaboration in implementing land protection strategies which lays the foundation for a binational park system that connects the Parque Constitución de 1857 in México to wilderness areas, forests, and park land in the USA.

A conservation area network was developed using the conservation planning software (Spatial Portfolio Optimization Tool (SPOT)) and, owing to the lack of fine resolution data on species distributions, digital land cover information on

vegetation communities stratified by climate and biodiversity gradients were used to define biological resource conservation targets. Human modifications of the landscape were included by weighting areas of urbanization, agriculture, and buffers around major and minor roads. Five different goals were articulated for the SPOT runs: e.g., prioritizing irreplaceability or emphasizing habitat intactness. The most frequently selected areas from a series of SPOT runs were combined and further refined using additional information, such as fine-filter targets (Groves & The Nature Conservancy 2003) to prioritize the landscape for different conservation objectives.

(b) Conservation Priorities for Terrestrial Baja California Peninsula

Between 2001-2003 four workshops were held with regional experts to identify priority regions for flora and fauna conservation in the peninsula (Franco et al. 2005). Participants proposed critical areas for conservation and rank them based on six criteria; endemism, biological diversity, conservation representation, potential for inhabitants to use the natural resources, degree of threat, and cultural importance. The prioritization exercise also identified and emphasized the importance of conservation corridors for retaining ecosystem integrity - for example a coastal scrub corridor and the chaparral corridor, both of which overlap with the WWF mediterranean ecoregion extent. Each of the corridors contains a number of priority areas. The results of the planning exercise are currently being written up as a 'Conservation Atlas for the Peninsula of Baja California'.

Research

(a) Plant Endemism and Natural Protected Areas in Baja - Riemann and Ezcurra (2005)

The authors (Riemann & Ezcurra 2005) compiled point locations of vascular plant data for Baja California and Baja California Sur from herbaria. Analysis was conducted to assess the number of endemic species and subspecies and varieties within the five phytogeographic regions occurring in the Baja California peninsular. Across the entire peninsula 754 endemic species and subspecies were recorded, of these 567 were recorded in protected areas. More specifically, in the coastal mediterranean region, characterized by sage and succulent-rosette scrub, chaparral, and temperate forest, 134 endemic plants (defined as endemic to the peninsular) were recorded in the region, 35 of which were not in protected areas. The authors propose a 11,992 km² protected area from the coast to 600 m in elevation which would protect a further 176 taxa. In the montane mediterranean region, encompassing the Sierra de Juárez and San Pedro Mártir, a 12,836 km²

area stretching from 800-3,100 m in elevation is recommended to complement the two National Parks already there (Constitución de 1957 National Park and the San Pedro Mártir National Park). This protection would capture another 19 endemic plant taxa.

(b) Distribution of woody legumes in Baja - Garcillán et al. (2003)

Garcillan and colleagues used herbaria data to assess biogeographic patterns of woody legumes in the peninsula (Garcillán et al. 2003). Woody legumes are considered one of the most distinctive elements of the Sonoran and Baja California Deserts, known particularly for their role as nurse plants to ameliorate harsh environmental conditions for other plants (Ezcurra et al. 2002). Sixty-nine of the 78 species recorded using 205 gridcells across the region could be classified into five distribution groups, the mediterranean region falling in the North region. While woody legumes are present in the North the endemism peaks in the driest deserts of the peninsula, and in the Cape Region in the southern tip of Baja. The Cape, for example, has a ratio of 12 endemic, 2 regional, and 13 continental species compared to ratios of 1, 6, and 5 for the North. An assessment of the conservation status of these hotspots reported these to be generally unprotected and should be flagged as priorities for future conservation efforts.

(c) National Gap Analysis - Cantú et al. (2001)

<http://www.gap.uidaho.edu/Bulletins/10/Mexico.htm>.

A Gap analysis was undertaken in Mexico and at finer resolution for two regions, Nuevo Leon and Tamaulipas (Cantú et al. 2001). The goal of the analysis was to assess the adequacy of existing protected areas and those proposed by CONABIO to capture the variation in elevation, climate, physiography, floristic divisions, potential vegetation types, land use, and taxonomic areas. Findings indicated of the 127 existing federal reserves, only areas > 3,000 m in elevation were adequately represented (defined in this study as having >12% protection). However, when the current protected areas network is supplemented with the additional proposed areas 29% of the country's land would be protected, resulting in all elevation zones, climatic and physiographic provinces being adequately represented.

South Africa

Government

(a) The National Spatial Biodiversity Assessment

<http://www.sanbi.org/biodiversity/nsba.htm>

As part of South Africa's obligations as a signatory to the Convention on Biological Diversity (CBD) it has developed a National Biodiversity Strategy and Action Plan (NBSAP). The plan provides a framework for the conservation and sustainable use of South Africa's biodiversity and equitable sharing of benefits from use of genetic resources (Driver et al. 2005). The National Spatial Biodiversity Assessment (NSBA, 2004) was conducted by the South Africa National Biodiversity Institute (SANBI), a public organization established in 2004 by the National Environmental Management Biodiversity Act, and was the first comprehensive spatial assessment of biodiversity in South Africa. The assessment informed the NBSAP and also provided valuable information to guide other public and private sector activities (Driver et al. 2005). The NSBA is not in itself a strategy and action plan but identifies geographic priority areas, which are recognized as one way of focusing the development of national strategies and actions particularly the synergies between biodiversity conservation and socio-economic development challenges (Driver et al. 2005). Using spatial data, systematic conservation planning methods, and workshops with experts and stakeholders the current status and protection levels were assessed and conservation priorities identified for four environments: terrestrial, freshwater, estuarine, and marine.

The terrestrial assessment involved assessing the status of natural ecosystems (Mucina & Rutherford 2004) both in their degree of protection and transformed area using the National Land Cover database (Fairbanks et al. 2000) depicting cropland, mines, and urban development and roads. Ecosystems were categorized into four classes: least threatened, critical, endangered, and vulnerable. Quarter degree gridcell units were prioritized with reference to the distribution of species, ecosystems and ecological processes, which were then grouped according to topography and biome into nine units. A future pressures index, generated by a number of modeled inputs, including human population density increase, alien plant invasion suitability, and habitat fragmentation index, suitability of land for crop agriculture, land afforestation, and mining were integrated and each of the nine regions assigned an overall rank. Information was combined and nine broad geographic priority areas for conservation action were identified based on highly scoring areas. The Cape Floristic Region is delineated as a broad priority area ranking eighth lowest priority out of nine classes.

A further component of the NSBA is a list of actions proposed for conserving terrestrial biodiversity in priority areas which include: working with the production sectors, strengthening bioregional programs, minimizing loss of habitat, preventing and managing the spread of invasive alien species, and expanding formal protected areas to achieve biodiversity targets. The NSBA also provides a valuable set of indicators which, with future updates in trends can help to inform Environmental Management Plans and Environmental Implementation Plans.

(b) Cape Action Plan for the Environment (CAPE)

<http://www.capeaction.org.za/home.php>

Beginning in 1999 a two-year systematic conservation planning effort was undertaken in the Cape Floristic Region through the Cape Action Plan for the Environment (CAPE) -funded by the Global Environmental Facility (GEF) (which requires co-financing by the country). The goal of the CAPE was to develop a strategy and action plan for the conservation of the Cape Floristic Region's (CFR) biodiversity (Younge & Ashwell 2000) in order to achieve effective conservation of the CFR's biodiversity by 2020 (Cowling et al. 2003; Lochner et al. 2003). The planning process involved experts, data, and conservation planning software (C-Plan) and focused on five different biodiversity features: land classes (as a surrogate for plants), locality records for Proteaceae and selected vertebrates, large and medium-sized mammals, and ecological and evolutionary processes (e.g., edaphic interfaces and upland-lowland interfaces). Planning units for the analysis were sixteenth-degree squares (approximate 39 km²). The outcome of the plan indicated 42% (40,000km²) of the CFR area, which covers a total of 87,892 km², be allocated to some form of conservation management to promote the persistence biodiversity.

Three broad implementation themes were developed from the CAPE planning exercise: the protection of biodiversity in priority areas, the promotion of sustainable use of biodiversity to protect ecosystem services, and the strengthening of institutions and promotion of governance and community involvement in conservation (Gelderblom et al. 2003). The details of these themes were developed in collaboration with the institutes involved in implementing them. More specifically, the CAPE planning phase is followed by a 20-year implementation program known as the Cape Action for People and the Environment (CAPE) (www.capeaction.org.za) a program of the South African government and international donors. The CAPE program focuses on the broad priority areas identified in the CAPE systematic conservation plan (1999) but also includes fine scale biodiversity planning within these broad priority areas. Development of finer-scale priorities is necessary to inform decision making particularly on land use decisions, for example, environmental impact assessments, areas to prioritize for protection, or the granting of permits by the Department of Water and Agriculture. This prioritization was funded by a NGO - the Botanical Society. The refinement of priorities included for example, the identification of corridors in lowland areas to connect coastal and montane areas. With these priorities mapped the CAPE program, through the government's CAPE Nature housed at SANBI, is working with provincial, municipal and national agencies to mainstream priorities with implementation projects. Findings from the CAPE program will be integrated with municipal planning and land use decision-making, including capacity building of partners to use these products.

(c) Regulatory and Policy Framework

There are two key pieces of legislation that are part of the National Environmental Management legislation: the Protected Areas Act for the declaration of protected areas and the Biodiversity Act (Driver et al. 2005). The Biodiversity Act provides for the listing of threatened and protected ecosystems (critically endangered, endangered, vulnerable and protected). The Act, under the National Biodiversity Framework, also requires management plans for threatened ecosystems and species. The Act was also responsible for establishing the South Africa National Biodiversity Institute (SANBI) - making South Africa one of the few countries with a public sector institute dedicated to biodiversity (Driver et al. 2005) - the organization's role includes monitoring and reporting on the status of biodiversity as well as a coordinating and facilitating role.

Research

(a) Analysis of Broad Habitat Units in the Cape Floristic Region - Rouget et al. (2003)

At a regional scale, Rouget et al. (Rouget et al. 2003) conducted an analysis of the representation of protected areas in the Cape Floristic Region, an area of 87,892 km² which overlaps the maximum extent of the WWF mediterranean ecoregions in South Africa. The authors assessed the conservation status of 16 primary and 88 secondary Broad Habitat Units (generated based on climate, topography, geology, and vegetation). Summary statistics include: 20% of the Cape Floristic Region is protected, however, protection is skewed towards high elevation areas (>530 m), steep slopes (>10%), high roughness and high altitudinal variation, leaving low elevation areas with little protection and conservation areas are most strongly correlated with geology, e.g., over-protection of sandstone substrata. The authors also assessed the protection of ecological processes such as edaphic interfaces and upland-lowland interfaces within the existing protected area network, finding them poorly represented.

(b) Representation of Proteaceae in the Protected Areas Network - Pyke et al. (2005)

At a finer spatial scale Pyke et al. (2005) consider the representation of 301 Proteaceae species in the current protected areas network using both historical and projected climate data from 2050. The authors' key findings were that by 2050 the current protected areas network would represent an increasingly skewed sample of the climatic conditions currently occupied Proteaceae species.

