National Ecosystem Services Partnership

FEDERAL RESOURCE MANAGEMENT AND ECOSYSTEM SERVICES GUIDEBOOK

Federal Agency Explorations and Applications: Case 6 (U.S. Fish and Wildlife Service)

Incorporating Consideration of Ecosystem Services into Plans for the San Diego National Wildlife Refuge

Lynn Scarlett and Edward Maillett

FEDERAL AGENCY EXPLORATIONS AND APPLICATIONS: CASE 6

U.S. FISH AND WILDLIFE SERVICE

Incorporating Consideration of Ecosystem Services into Plans for the San Diego National Wildlife Refuge

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FEDERAL RESOURCE MANAGEMENT AND ECOSYSTEM SERVICES

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About This Document

This case is part of the Federal Resource Management and Ecosystem Services (FRMES) Guidebook created by the National Ecosystem Services Partnership (NESP). NESP, housed at the Nicholas Institute for Environmental Policy Solutions, seeks to enhance collaboration within the ecosystem services community and to strengthen coordination of policy implementation and research at the national level. The FRMES Guidebook represents a collaborative effort by federal agencies and outside experts to develop a credible and feasible approach to incorporating ecosystem services into the decision-making processes of federal agencies.

Cases are written and approved by the author(s)' agency, but they have not been peer reviewed. They describe the decision-making context within which that agency is considering or testing an ecosystem services management framework, and they present approaches or innovations that the agency is using to incorporate ecosystem services into its planning and decision-making processes. Cases informed development of the FRMES Guidebook and could be of value to others embarking on ecosystem services planning and management efforts.

To read other federal agency explorations and applications of an ecosystem services management framework, visit www.nespguidebook.com.

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Incorporating Consideration of Ecosystem Services into Plans for the San Diego National Wildlife Refuge

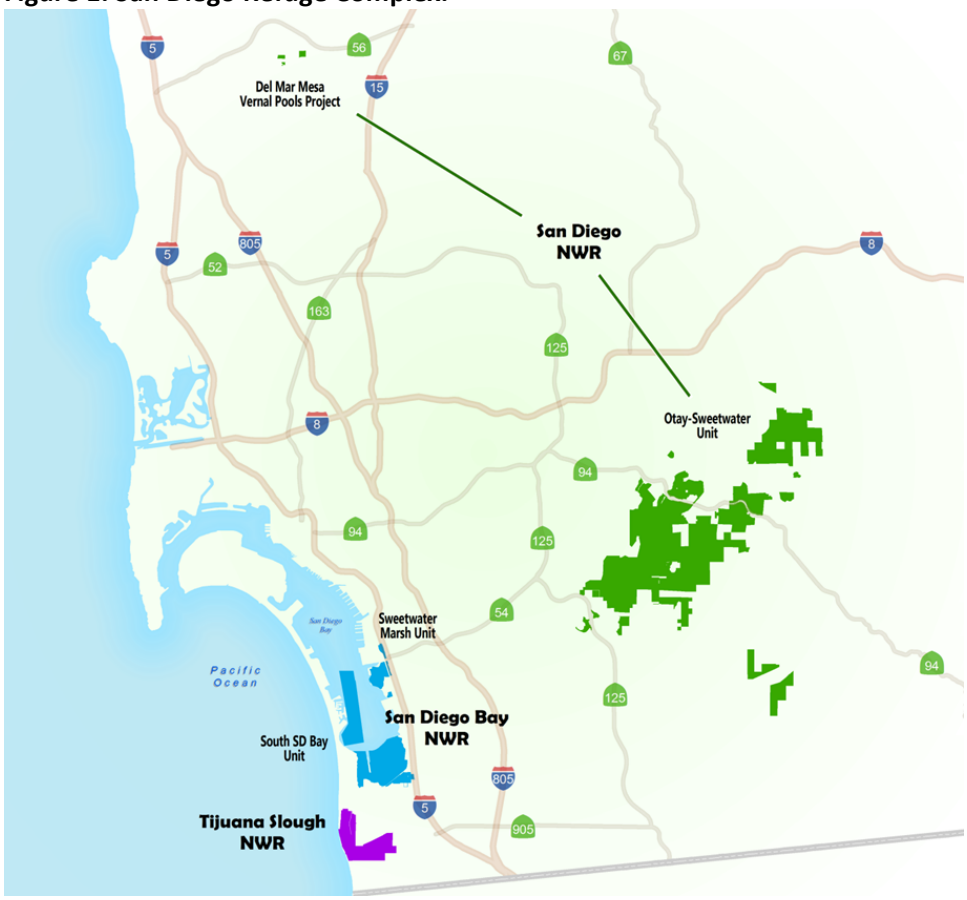
Located in southwestern San Diego County, the San Diego National Wildlife Refuge (NWR) includes the Otay-Sweetwater Unit and the Del Mar Mesa Vernal Pool Unit (see Figure 1).[1] The Otay-Sweetwater Unit (see Figure 2), comprising several noncontiguous parcels, totals 11,470 acres of valleys and foothills, and the Del Mar Mesa Vernal Pool Unit (see Figure 3) totals 60 acres of level mesa top, steep slopes, and eroded canyon lands. These lands of the San Diego NWR form the core biological resource areas within San Diego's Multiple Species Conservation Program (MSCP).[2]

Developed in 1996, the MSCP is a regional agreement among federal, state, county, and local governments, through which federal Section 10 permits under the Endangered Species Act and California Natural Community Conservation Plan (NCCP) permits accommodate economic development and associated land uses while ensuring the protection of species. The MSCP is intended to preserve habitat, water supplies and water quality, and other features of intact coastal lowland Southern California habitats. The MSCP covers a 900-square-mile area of San Diego County and creates a regional habitat preserve network of some 198,000 acres (of which 175,000 have been established by federal, state, local, and other partners).

Conservation of the lands, major water courses, and smaller drainages within the San Diego NWR boundary is an essential component of the regional effort to protect water quality in San Diego County's bays and estuaries. The Del Mar Mesa Vernal Pool Unit is located with the Penasquitos Watershed; water from this area drains into Los Penasquitos Lagoon. The lands within the Otay-Sweetwater Unit are included within the Sweetwater River and Otay River watersheds, both of which are part of the greater San Diego Bay watershed.

[1] http://www.fws.gov/refuge/san_diego/.
[2] http://www.sandiego.gov/planning/programs/mscp/.

Figure 1. San Diego Refuge Complex.



Note: Seal Beach NWR, not depicted, is located approximately 90 miles north in Orange County.

Figure 2. San Diego NWR Otay-Sweetwater Unit.

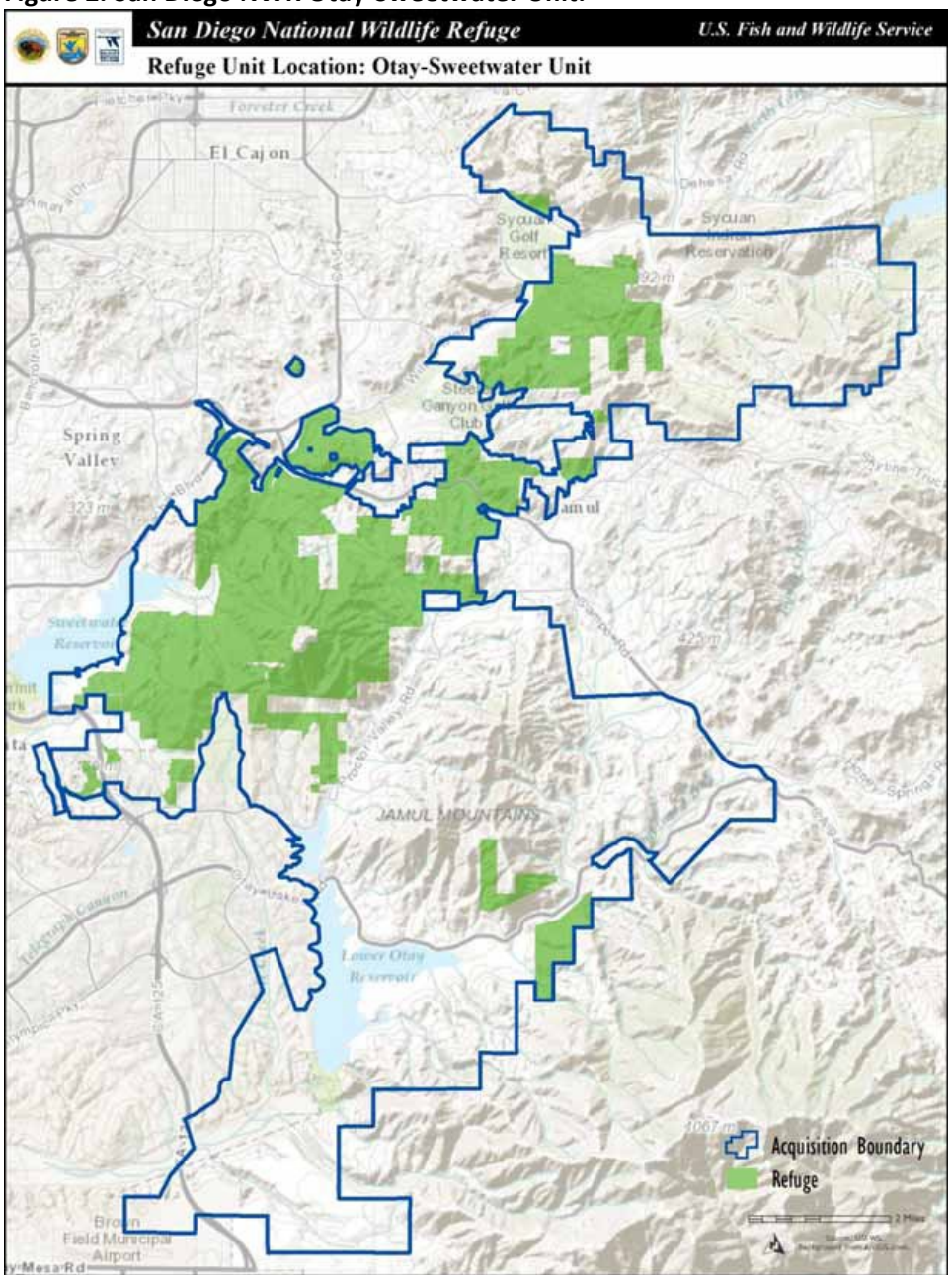
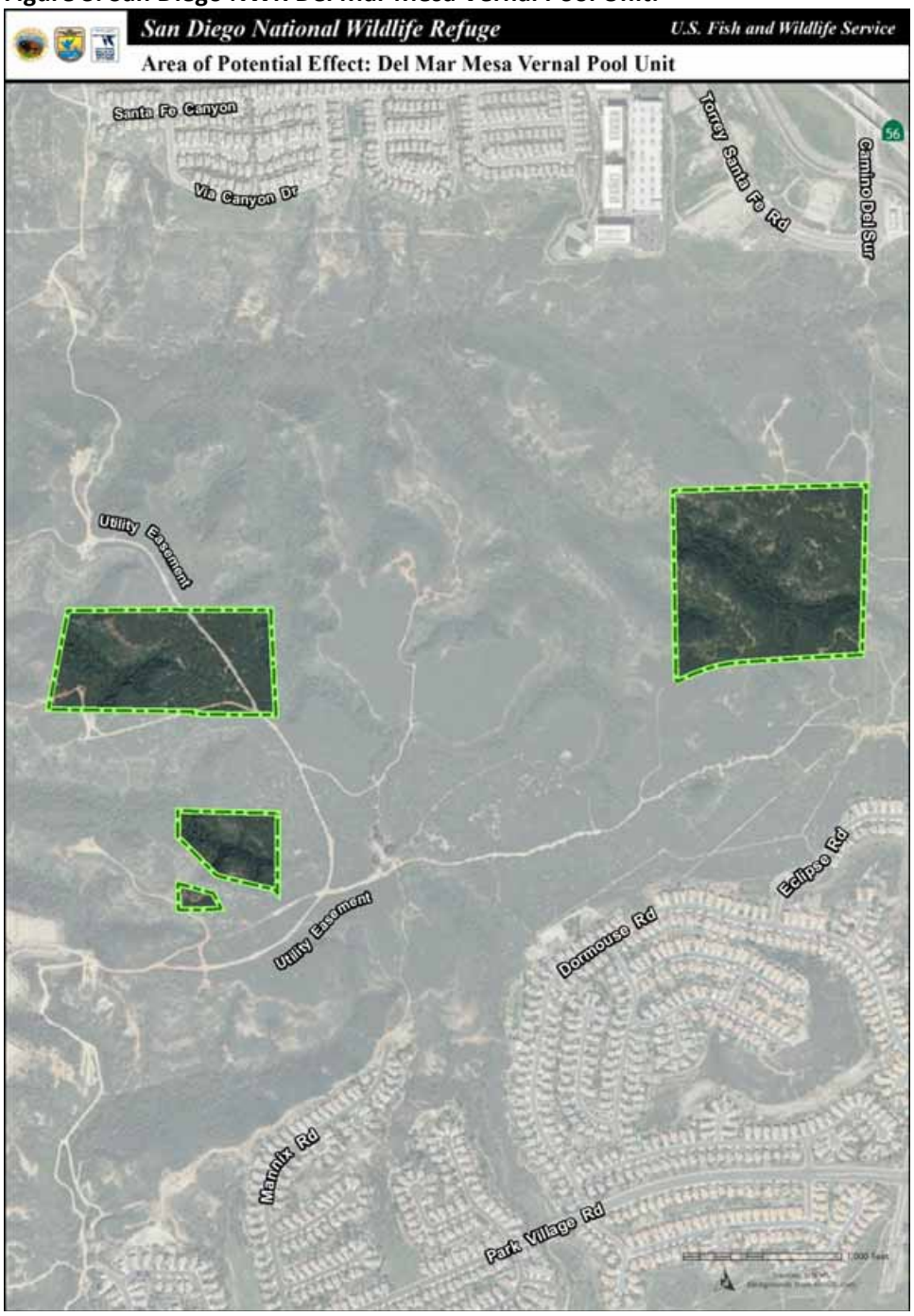


Figure 3. San Diego NWR Del Mar Mesa Vernal Pool Unit.



Two of the three distinctive geographic regions of San Diego County are represented within the San Diego NWR: the low-lying coastal plain and the mountainous Peninsular Range. The flat mesa and steep canyon formations common along the coastal plain characterize the Del Mar Mesa Vernal Pool Unit; the Otay-Sweetwater Unit is characterized by the broad floodplain created by the Sweetwater River and by the steep and rocky foothills of the Peninsular Range. Elevations on Del Mar Mesa range from approximately 320 feet above mean sea level (MSL) in the canyon bottoms to approximately 400 feet about MSL on the mesa. Within the more topographically diverse Otay-Sweetwater Unit, which includes the McGinty Mountain, Las Montanas, Sweetwater River, San Miguel Mountain, and the Otay

Mesa and Lakes management areas, the elevations range from 300 feet MSL to more than 2,300 feet above MSL.

Acquisition of lands for the San Diego NWR began in 1996 to support implementation of the MSCP. The San Diego NWR lies within and adjacent to the second largest city in California and the tenth largest metropolitan area in the United States, with a 2010 population of 1.3 million. Nearly 30% of the population is Hispanic and 16% Asian. Between 2010 and 2014, these populations grew at a faster rate—21% and 24%, respectively—than any other demographic.[3] The San Diego Association of Governments, the area's regional planning agency, projects the total population of the region to increase to more than 1.9 million by 2050.

Management Efforts

Refuge managers and partners perceive potential value in applying an ecosystem services framework to refuge-wide planning and evaluation of management alternatives as well as region-wide priority setting, land acquisition decision making, and communications. Such a framework could inform several management efforts.

At the regional level, the Department of the Interior and the U.S. Forest Service have established the California Desert Southwest Conservation Collaborative to coordinate and focus land acquisitions at the landscape level. Key goals include improved linkages among conserved lands, habitat connectivity, and siting of energy projects to minimize impacts. An ecosystem services framework could enhance consideration and evaluation of how various lands contribute to air and water quality, carbon sequestration, or other benefits to inform priorities and better understand tradeoffs.

Within the southern California region, San Diego, Orange, Riverside, and Imperial counties have multi-species habitat conservation plans, but they are not knitted together into regional efforts. As these urban areas broaden their efforts and seek better coordination, an ecosystem services framework may provide a strategic way to assess multiple goals such as habitat protection, maintenance of water supplies and water quality, stormwater management, and climate mitigation and adaptation.

Under discussion within the San Diego community is a quality-of-life initiative that would add 0.25% to the existing sales tax for open space and related investments. Identifying priority ecosystem services, characterizing them, evaluating them (in narrative terms, monetary terms, or both), and linking them to community needs and uses would help generate support for the initiative, which must be approved by a two-thirds majority vote in a general referendum by the end of 2016. Even if this initiative fails to pass, refuge managers note that state, regional, and local governments will continue to invest in open space land acquisitions as a way to mitigate the impacts of transportation, energy, housing, and other projects. Ecosystem services analyses could be useful in (1) identifying which lands provide the most "value" for "quality-of-life" investments (for example, combining scenic, recreational, air quality, water protection, and habitat protections) and (2) help the various stakeholders complement one another's initiatives so that the total social return on natural capital investments is maximized.

Within the broader community context, the San Diego NWR is updating its comprehensive conservation plan (CCP). The draft plan provides extensive information on the natural, cultural, and other characteristics of the refuge lands. It also describes impacts or potential threats to the health of these lands and the wildlife associated with them. The CCP does not use an ecosystem services framework to describe and evaluate the benefits the refuge provides to local communities, but it does

[3] http://www.sandag.org/resources/demographics_and_other_data/demographics/fastfacts/sand.htm.

discuss wildlife conservation, recreation opportunities, viewsheds, and watershed protection as well as the economic benefits of outdoor recreation. Refuge managers believe ecosystem services characterization, prioritization, and valuation could be useful both in communicating refuge benefits and in assessing resource management options and tradeoffs.

Decision Context

The decision context for the San Diego NWR is complex and, as noted above, plays out at multiple decision-making levels, all of which are dealing with the following resource management issues.

Climate Mitigation and Adaptation

In 2006, the state of California passed legislation (A.B. 32) requiring, among other goals, that overall greenhouse gas emissions in the state be reduced to 1990 levels by 2020.[4] In 2011, the California Air Resources Board adopted cap-and-trade regulatory provisions, which establish market-based decreasing annual aggregate emissions limits for regulated sources or categories of sources that emit greenhouse gas emissions. Protocols for using natural system "offsets," particularly for the carbon sequestration capacity of forests, have been developed. Less understood is the carbon sequestration potential of grasslands, sage scrub and chaparral, and wetlands of the sort that characterize regions of coastal and inland southern California, including the region covered by the MSCP.

By applying an ecosystem services framework, refuge managers and partners could develop a better understanding of how refuge lands and management contribute to carbon sequestration, which in turn could enhance support for the refuge among partners seeking cost-effective offsets for carbon-emitting activities. These activities are of interest to the city of San Diego, which can make its 2020 carbon reduction goals but which faces an estimated 3.5 million ton shortfall toward meeting its 2035 goals. This shortfall is one part of the county of San Diego's shortfall in its 2035 goals. The county is looking at a 13.7% reduction over 2005 levels, not the target 49% reduction. Improved understanding of the carbon sequestration role that non-forest natural systems might play and these systems' relative economic values have increasing policy relevance in future development scenarios.

Transportation Projects and Mitigation

The San Diego Association of Governments (SANDAG), a regional planning entity, established the Environmental Mitigation Program (EMP) for transportation projects to protect, preserve, and restore native habitats as offsets to disturbances caused by regional and local transportation projects.[5] SANDAG administers TransNet, a regional half-cent sales tax for transportation. Originally approved in 1987 as a 20-year transportation funding initiative, it was extended in 2008 for another 40 years to 2048 and is expected to generate $14 billion for highway, transit, local road projects, and other transportation improvements. The EMP was created as part of the 2008 TransNet extension, and it budgeted $650 million for mitigation.

The EMP allows SANDAG to purchase land upfront (at relatively low cost and in relatively large parcels) and to bank it for future mitigation needs, rather than purchasing land in small parcels on a project-by-project basis. SANDAG estimates that a traditional project-by-project approach could cost as much as $850 million over the next 40 years—$200 million more than the early purchase approach. The latter approach is expected to accelerate project delivery while meeting the mitigation needs of major transportation projects in the Regional Transportation Plan. By September 2012, SANDAG had used EMP funding to purchase more than 3,300 acres of habitat in the San Diego region for approximately

[4] http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf.
[5] http://www.keepsandiegomoving.com/EMP/EMP-intro.aspx.

$100 million. EMP funding was also used for research, regional collaboration on land management, post–wildland fire restoration, and other activities.

Neither SANDAG nor the current Regional Transportation Plan use an ecosystem services approach in their analysis of potential mitigation projects. Such an approach could improve the assessment of land parcels and the comparative suite of values they contribute to the community to supplement the more traditional focus on biodiversity and related metrics.

Water Supply, Water Quality, and Stormwater Management

One of the San Diego NWR's key accomplishments is sustaining water quality. Most water for the San Diego region is imported; just 10% comes from local supplies. Nonetheless, these local supplies provide an important contribution to the area's water needs. Refuge lands lie within watersheds that include two local reservoirs, the Sweetwater Reservoir and Lower Otay Reservoir. A key concern of the Sweetwater Authority, prior to purchase of refuge lands, was the potential for reservoir contamination from surface runoff from future development. The Sweetwater Authority is responsible for ensuring safe, reliable sources of drinking water for more than 186,000 residents and had already needed to build one diversion facility to protect the reservoir from contaminated runoff associated with nearby development. It was in the midst of planning a second diversion facility when establishment of the refuge and subsequent protection of lands made that facility unnecessary, saving the Sweetwater Authority and ratepayers more than $1 million in project costs.

A study that attempted to characterize and evaluate the overall role of refuge lands in helping to sustain water supplies and water quality has yet to be undertaken. The role of the refuge in contributing to the permeable surfaces within the urban area has not been evaluated for its contribution to stormwater management and natural recharge of drinking water wells, many of which are also operated by the Sweetwater Authority. However, in 2003 American Forests examined San Diego's urban ecosystems and, using CITYgreen software, U.S. Forest Service tools, and other models and analyses, estimated a value for city trees and associated permeable surfaces in providing air, stormwater, and carbon benefits. Refuge managers perceive some potential utility in updating this analysis, specifically to examine the refuge to inform decisions about further urban land acquisitions.

Economic Benefits of Open Space

The San Diego NWR conserves more than 11,500 acres of open space in the foothills and valleys at the perimeter of metropolitan San Diego. One potential—but unknown—economic benefit of this open space is its role in reinforcing infill development and development density within the metropolitan area. Another as-yet unknown economic benefit of the open space is its provision of recreational opportunities. The 2013 *Banking on Nature* report stated that the total monetary value of economic activity generated by recreational visits to national wildlife refuges nationwide in 2011 totaled nearly $2.4 billion, generating $792.7 million in job income and 35,058 jobs (Carver and Caudill 2013). Other studies have concluded that open space in urban areas can increase economic benefits to nearby private property owners more than open space in rural areas and can have a positive effect on adjacent residential property values, leading to higher property tax revenues for local governments.

A key question is whether the open space boundaries resulting from the San Diego NWR also produce economic benefits in terms of higher property values to homeowners, recreation access, or other values and, if so, how this information might influence decisions regarding the extent and location of additional land conservation.

Social Justice

The Otay Water District, city of San Diego, San Diego County, and the city of Chula Vista have pooled resources for a greenway that will serve to protect the Otay River from its headwaters sources all the way to San Diego Bay. The greenway will provide species with a natural corridor along the watershed and will include public use trails transecting a number of minority and low-income neighborhoods. Although the outdoor recreation benefits of the greenway are qualitatively understood, the economic benefits of open space to these neighborhoods have not been characterized or evaluated. These benefits may include reduced air pollution as well as improved water quality, public health, urban aesthetics, and safety (through reduced flood severity). Better understanding of these potential benefits could inform decisions by refuge managers, the cities, and the county about whether and how to expand the greenway system versus use land for other development purposes.

Biodiversity and Habitat Protection

The San Diego NWR provides a contiguous and connected set of protected lands that contribute to maintaining important habitat types and biodiversity. The economic benefits of this service have not been fully characterized or evaluated. An ecosystem services framework could assist refuge managers and others in prioritizing acquisitions of the additional 27,000 acres needed to attain the MSCP goal of protecting 175,000 acres by helping them evaluate the acquisitions' comparative return on investment. Longer term, it could help inform decisions about whether and how to expand the MSCP system beyond that goal, if deemed necessary for future development mitigation.

Shoreline Protection

San Diego County has 70 miles of shoreline. Its coastal communities are evaluating ways to protect it, deal with sea level rise and saltwater intrusion, meet navigation needs, and so on. Better understanding of natural systems strategies, their benefits, tradeoffs, and cost-effectiveness could inform decisions about shoreline management. The San Diego NWR hopes to promote the restoration of properties in south San Diego Bay by sharing information with local governments about the ecosystem services associated with restoration, especially those that may not get counted under a more traditional cost-benefit financial framework.

Key Players

A key question for the San Diego NWR is how and whether it should take a leadership role in incorporating an ecosystem services approach as it works with partners on natural resource management in the region. Neither the refuge nor the main regional decision-making entities have applied an ecosystem services framework to characterize and evaluate natural resources and land management options in any systematic way.

Although the refuge does describe its biodiversity, recreation, view shed, and other benefits of the in its planning documents, it has not assessed them in ecosystem services terms. The city of San Diego has shown strong interest in understanding and considering natural systems in its planning decisions, an interest reflected in its cooperation with American Forests to use CITYgreen software to assess the air and water quality, carbon, and other benefits of urban tree canopy and permeable surfaces. Several other groups of decision makers, such as those engaged in social justice and transportation planning issues, have not used an ecosystem services framework.

Though many public and private sector decision-makers in the San Diego region do not specifically use an ecosystem services framework, the region (with SANDAG leadership) has pioneered some innovative policy tools that implicitly incorporate "value of nature" considerations. The centerpieces of

these efforts are the city of San Diego's Multiple Species Conservation Program and the San Diego Association of Governments' Environmental Mitigation Program.

Several state-level activities could drive ecosystem services evaluations, particularly those under Assembly Bill 32: Global Warming Solutions Act (AB 32). This act, which was signed in 2006, led the state to set a limit for greenhouse gas emissions in 2020 at 1990 levels. AB 32 further led the state to adopt cap-and-trade regulation that allows major sources of greenhouse gases to trade enforceable emissions permits with one another as the state gradually lowers the overall emissions cap.

Many nongovernmental organizations and academic institutions are interested in building knowledge about ecosystem services:

- The Nature Conservancy (TNC) has a project on urban forests and their associated ecosystem services. Its Coastal Resilience Network along the Ventura Coast and San Francisco Bay may expand into the San Diego region.
- The Energy Policy Initiative Center at the University of San Diego recently conducted an analysis of regional emissions and strategies to achieve AB 32 targets (Anders 2008). Among other factors, this report explored the role of agriculture, forestry, and land use within the San Diego County as both generators and storage of greenhouse gasses.
- The California Landscape Conservation Cooperative is assessing living shoreline (nature-based) solutions to coastal climate change-related challenges.[6]

Other potential partners that may have an interest in advancing an ecosystem services approach to assessing and evaluating natural systems and informing decisions about priorities and tradeoffs include the California Waterfowl Association, California Coastal Conservancy, and River Partners.

Funding

The San Diego NWR has federally appropriated funding for its planning and management, including preparation of its Comprehensive Conservation Plan. Land acquisitions funding could potentially come from the TransNet EMP, North American Wetlands Conservation Act grants, Landscape Conservation Cooperative grants, and the U.S. Fish and Wildlife Service (FWS).

Existing Resources

The San Diego region and SANDAG have a long history of regional and local planning and have committed extensive resources to developing data sources on demographics, zoning densities, economic trends, water quality and supplies, air quality, land cover, land costs, and so on. The city of San Diego has upgraded its vegetation classification data through fine-scale mapping at the one-hectare level. The San Diego NWR Comprehensive Conservation Plan incorporates much of this information as well as draws on its own species and habitat-related databases and state-based information.

The FWS Division of Economics has conducted two pilot studies that could be useful or extended for a more localized study of the San Diego NWR. One study examined the effects on housing values of proximity to a refuge (Taylor, Liu and Hamilton). A second study examined the ecosystem services and valuation associated with four selected refuges across the nation (Patton, Bergstrom, Covich, and Moore 2012). Both studies could serve as a basis for conducting a quantitative assessment of some of the ecosystem services currently provided by the San Diego NWR.

[6] http://californialcc.org.

A recent survey of 45 California refuge units suggested that many are looking for assistance to (1) manage pests and invasive species (2) develop habitat management plans and inventorying and monitoring plans, (3) support water resource inventory and assessments, and (5) collect, manage, and analyze GIS and other data.

Options Considered

The San Diego NWR faces resource management issues for which an ecosystem services framework could be useful. These include decisions about how to prioritize acquisition of additional lands, opportunities to contribute to carbon sequestration needs within the context of AB 32, assessment of watershed quality, assessment of shoreline management options, and assessment of options for contributing to urban quality of life. The refuge faces major tradeoffs: provision of recreation access versus protection of biodiversity and habitat benefits for which the refuge was established in the context of the MSCP. An ecosystem services framework could help the refuge strategically manage resources to maximize benefits to trust resources and the general public, thereby fostering popular support for its conservation activities.

Analysis

Some of the San Diego NWR's analysis of its wildlife, water, and recreation benefits provides a building block for ecosystem services analysis. Other organizations have done some work relevant to that analysis. For example, the Energy Policy Initiative Center at the University of San Diego School of Law (EPIC) characterized carbon sequestration provided by natural land cover in the region, and American Forests evaluated some benefits of urban tree canopy. The California Landscape Cooperative Conservation network might partner with the refuge on a pilot project to determine the usefulness of an ecosystem services approach to landscape management.

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Cover photo: Lisa Cox, U.S. Fish and Wildlife Service

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About the National Ecosystem Services Partnership

The National Ecosystem Services Partnership (NESP) engages both public and private individuals and organizations to enhance collaboration within the ecosystem services community and to strengthen coordination of policy and market implementation and research at the national level. The partnership is an initiative of Duke University's Nicholas Institute for Environmental Policy Solutions and was developed with support from the U.S. Environmental Protection Agency and with donations of expertise and time from many public and private institutions. The partnership is led by Lydia Olander, director of the Ecosystem Services Program at the Nicholas Institute, and draws on the expertise of federal agency staff, academics, NGO leaders, and ecosystem services management practitioners.

About the Nicholas Institute for Environmental Policy Solutions

Established in 2005, the Nicholas Institute for Environmental Policy Solutions at Duke University improves environmental policymaking worldwide through objective, fact-based research in the areas of climate change, the economics of limiting carbon pollution, emerging environmental markets, oceans governance and coastal management, and freshwater management. The Nicholas Institute is part of Duke University and its wider community of world-class scholars. This unique resource allows the Nicholas Institute's team of economists, scientists, lawyers, and policy experts not only to deliver timely, credible analyses to a wide variety of decision makers, but also to convene decision makers to reach a shared understanding of this century's most pressing environmental problems.

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