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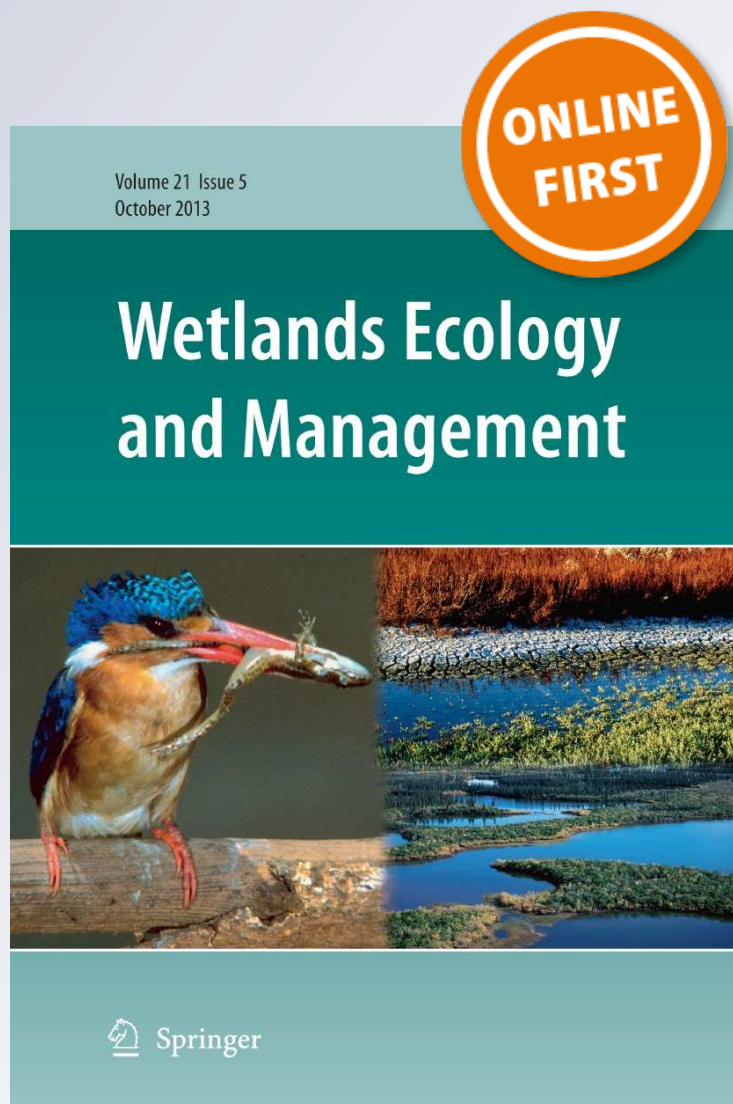
**Hem Nalini Morzaria-Luna, Alejandro
Castillo-López, Gustavo D. Danemann &
Peggy Turk-Boyer**

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Conservation strategies for coastal wetlands in the Gulf of California, Mexico

Hem Nalini Morzaria-Luna ·
Alejandro Castillo-López · Gustavo
D. Danemann · Peggy Turk-Boyer

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Abstract Wetlands worldwide, the fisheries they support, and the communities that depend on them are threatened by habitat modification. We describe strategies being used for wetland conservation in the Gulf of California, Mexico, their effectiveness, and challenges for implementation. We base our analysis on the authors' experience working for local environmental non-governmental organizations and available literature. The strategies discussed include public and private policy instruments such as Environmental Impact Evaluations, environmental land easements, concessions and transfer agreements, Natural Protected Areas, and international agreements such as the Ramsar convention and the North American Wetlands Conservation Act. We present examples from the Gulf of California that highlight some of the challenges to wetland conservation. These challenges range from governmental failure to enforce existing environmental legislation, lack of verification of requirements for development projects, to low economic penalties for

wetland modification or destruction. We found that in the Gulf of California successful conservation of coastal wetlands required a combination of policy instruments and relied on integrating science, management, and public participation through partnerships between non-governmental institutions, academic institutions, community stakeholders, and government agencies.

Keywords Gulf of California · Mexico · Coastal wetland · Wetland conservation

Introduction

Wetlands are some of the most productive and ecologically valuable ecosystems (Millennium Ecosystem Assessment 2005). They perform critical ecosystem functions and services as stopovers for migratory birds, critical nursing grounds, production of raw materials and food, maintenance of coastal fisheries, coastal protection, erosion control, and carbon sequestration (Barbier et al. 2010). Despite their importance and increased efforts to preserve them, wetlands are still being transformed for development and aquaculture at a rapid pace. Globally about 50 % of wetland area has disappeared (Zedler and Kercher 2005). Since the 1970s, a greater awareness of the importance of wetland ecosystem functions, coupled with growing concerns among environmentalists and new environmental legislation

H. N. Morzaria-Luna (✉) · A. Castillo-López ·
P. Turk-Boyer
Centro Intercultural de Estudios de Desiertos y Océanos,
A.C., Edif. Agustín Cortes, s/n, CP 83550 Puerto Peñasco,
SON, Mexico
e-mail: hmozarialuna@gmail.com

Present Address:

A. Castillo-López · G. D. Danemann
Marine Conservation and Sustainable Fishing Program,
Pronatura Noroeste A.C., Calle Décima No 60,
CP 22800 Ensenada, BC, Mexico

(Kim 2010), have resulted in a range of conservation and management approaches (i.e. Cools et al. 2013; Ma et al. 2013). These approaches include policy instruments at the international, national, state, and local levels that aim to preserve wetland functions (Kim 2010), by implementing wetland restoration programs (Verhoeven 2013), requiring mitigation for wetland loss (Burgin 2010; Rubec and Hanson 2009) and providing resources and monetary incentives for wetland conservation (Brinson and Eckles 2010; Neuman and Belcher 2011).

Mexico has demonstrated a strong commitment to conserving wetlands, through a comprehensive legal and regulatory framework that promotes wetland conservation and sustainable use (Travieso-Bello 2009). Nonetheless, around 62.1 % of Mexican wetlands, including brackish, marine and freshwater wetlands, have been lost (Landgrave and Moreno-Casasola 2012). Wetland losses are concentrated in arid and coastal areas, driven by diversions of freshwater for agriculture and human use, conversion to other uses such as shrimp farming, industrial, residential, and recreation, and degradation from pollution, channelization, road construction, and sedimentation (Contreras-Espinosa and Warner 2004; Landgrave and Moreno-Casasola 2012). Despite the existing legal framework, environmental law in Mexico is not always applied or enforced for the benefit of wetland conservation. Coastal planning at the regional and local levels is either lacking, too late, or not comprehensive enough, and often does not consider wetland conservation and other environmental issues (Székeley et al. 2004).

The majority of Mexico's wetlands are coastal; they are found in low-lying areas periodically flooded by tidal waters and include salt marshes, mangroves, brackish, and freshwater wetlands (Contreras-Espinosa and Warner 2004; Lara-Lara et al. 2008). These wetlands provide important ecosystem functions and environmental services not found in any other systems (Brusca et al. 2006). For example, in the Gulf of California, a large marine ecosystem of high global conservation priority (Carvajal et al. 2010), coastal wetlands support important commercial species, provide critical habitat for migratory birds and harbor a large biodiversity (Brusca et al. 2006; Glenn et al. 2006). Despite their importance, coastal wetlands in the Gulf of California are threatened by degradation of coastal habitats (Lara-Lara et al. 2008). Although only

~ 10 % of the region's coastal wetlands are highly impacted (Brusca et al. 2006), development threats are rapidly increasing (Enríquez Acosta 2008).

Mexico has benefited from strong social participation in conservation efforts in the Gulf of California, aimed at preserving the region's biodiversity and unique habitats including coastal wetlands (Enríquez-Andrade et al. 2005; García-Frapolli et al. 2009). These efforts have led to the establishment of natural protected areas covering more than 9 million ha, as of 2010 (Carvajal et al. 2010). Despite increased protection, socioeconomic changes still threaten biodiversity conservation, making it necessary to implement and learn from alternate and complementary conservation strategies. We describe the strategies being used today for wetland conservation in the Gulf of California, Mexico, as part of the efforts being made to preserve regional biodiversity. While no attempt was made to identify all local examples of wetland conservation in the region, we describe six broad types of policy instruments being used for short and long-term wetland conservation in the Gulf of California, including: reviews of Environmental Impact Evaluation,¹ acquiring management rights for the Federal Maritime-Terrestrial Zone,² establishing environmental easements,³ Natural Protected Areas, application of international programs, and strategies that link local communities and conservation. In this paper we: (1) provide a brief background on the ecological characteristics of coastal wetlands in the Gulf of California. For a complete review of the biophysical characteristics, ecosystem services, and plant and animal communities of wetlands in this region, the reader is referred to recent papers (Aburto-Oropeza et al. 2008; Brusca et al. 2006; Danemann et al. 2005; Glenn et al. 2006; Valdes-Casillas et al. 1999; Whitmore et al. 2005); (2) summarize the land tenure system and legal and institutional framework as they apply to coastal wetlands in Mexico; and (3) describe and offer specific examples of wetland conservation strategies that provide useful insights on effectiveness and challenges for implementation, or that illustrate unique approaches to conservation. Our findings are transferable to other regions in Mexico and to other countries

¹ Evaluación de Impacto Ambiental.

² Zona Federal Marítimo Terrestre.

³ Servidumbres Ecológicas.

as many of the policy instruments described here for wetland conservation are common elsewhere.

Previous articles have addressed some of the specific wetland conservation strategies used in Mexico that we discuss here, including environmental easements (Gutiérrez-Lacayo et al. 2003; Vargás et al. 2007), Natural Protected Areas (Brusca and Bryner 2004; Villalobos 2000), international programs (i.e. North American Wetlands Conservation Act and the Ramsar Convention), particularly in the context of waterfowl conservation (Abarca and Cervantes 1996; Cervantes 2007; CONANP 2005; Pérez-Arteaga et al. 2002; Travieso-Bello 2009; Vega et al. 2006; Wilson and Ryan 1997). Several authors have analyzed the regulations and institutional framework applicable to wetlands in Mexico (Carillo 2007; Cortina-Segovia et al. 2007; Zárate-Lomelí 2004). We focus on how these and other policy instruments can be used in integrated ways to maximize their effectiveness for wetland conservation.

Research methods

We used the methodological approach known as 'Action Learning', where learning comes from concrete experience (Zuber-Skerritt 2002). In this approach, it is important to reflect on and evaluate the process and outcomes of real problems using the researcher's particular perspective (O'Toole et al. 2008). Our research arose from our experience in wetland conservation in the Gulf of California as staff members for two environmental non-governmental organizations (ENGOS) in the region, focused on natural resource management and conservation: Pronatura Noroeste, A.C. and the Centro Intercultural de Estudios de Desiertos y Océanos, A.C. ('CEDO'). Thus, our daily work allowed us to be actors in projects and initiatives that aimed to conserve wetland habitats. We carried out a reflective exercise to identify the different strategies used for wetland conservation, to understand the challenges to their implementation, and to evaluate their effectiveness. We selected representational stories for each conservation strategy, stories that could be used to extend the reader's understanding. We complemented our initial analysis with a comprehensive review of existing information on wetland conservation strategies in Mexico, from peer-reviewed sources, and gray

literature. Finally, we issue recommendations on the factors that may assist implementation of conservation strategies and what obstacles must be overcome or minimized.

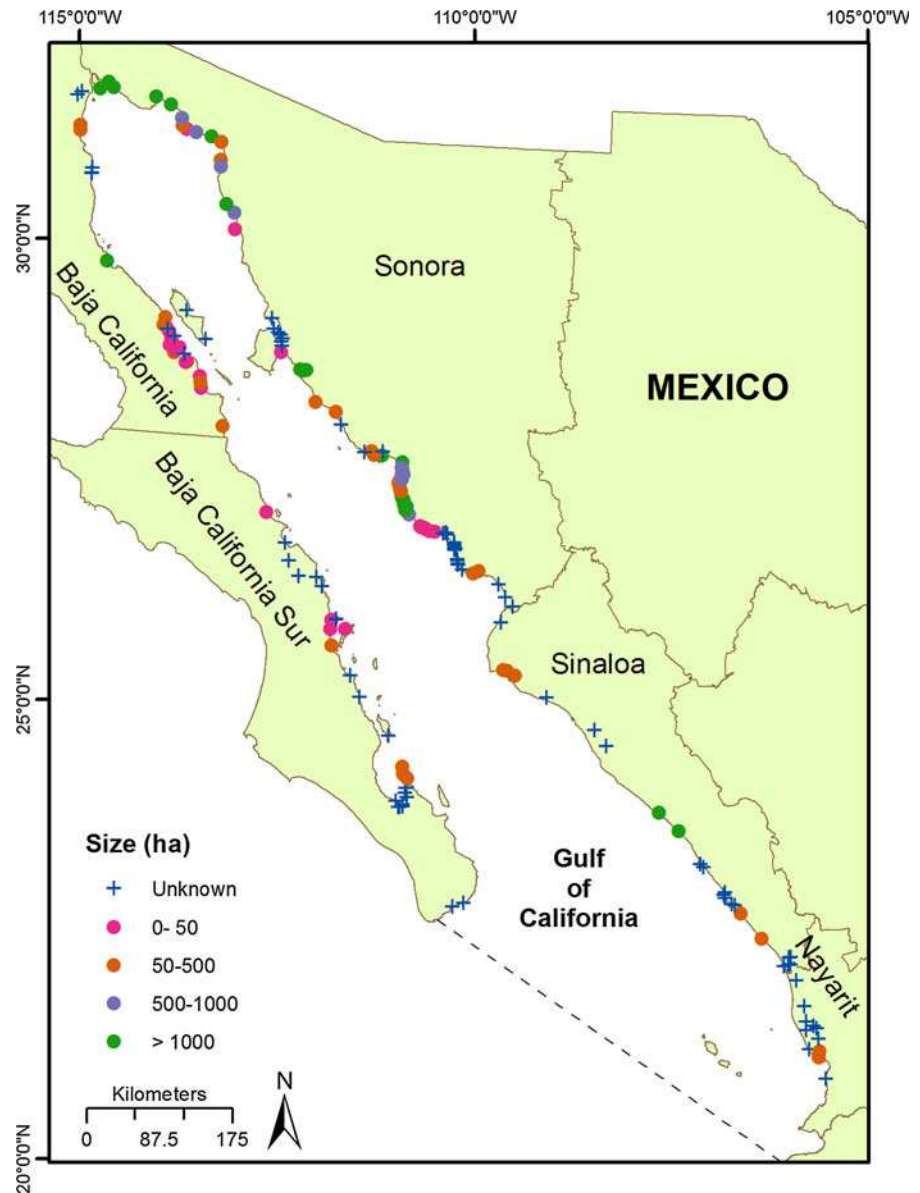
The Gulf of California and its coastal wetlands

The Gulf of California is a large, semi-enclosed sea that extends over 260,000 km², bordered by the Mexican states of Baja California Sur, Baja California, Sonora, Sinaloa, and Nayarit. Its southern limit is demarcated by Cabo San Lucas, Baja California Sur to the west, and Cabo Corrientes, Jalisco to the east (Fig. 1) (Brusca et al. 2005). The Gulf of California is one of the most biodiverse and productive seas in the world (Lluch-Cota et al. 2007). The Gulf has a variety of topographic and bathymetric features resulting in diverse coastal and marine habitats (Case and Cody 1983), including coastal lagoons, wetlands, oceanic islands, reefs, and underwater seamounts (Carvajal et al. 2010). The geographic isolation and the array of habitats have resulted in high biodiversity, including endemic and rare species (Lluch-Cota et al. 2007). The region accounts for 10 % of Mexico's Gross Domestic Product; the main human activities are tourism, fisheries, and aquaculture (Enríquez-Andrade et al. 2005).

Due to its relative isolation, the Gulf of California and the Baja California Peninsula were scarcely populated until the 1940s (Enríquez Acosta 2008). Starting in the 1970s, the National Fund for Tourism Promotion⁴ began implementing mass tourism development projects in Los Cabos and Loreto as a way to spur investment and create jobs (FONATUR 2001). Even when the projects are not completed (i.e. the Escalera Náutica—Mar de Cortes project, which aimed to build marinas and associated infrastructure along the Gulf of California), they fuel land speculation further increasing land and resource privatization and shifting the area's economy from rural subsistence (Pesenti and Dean 2003). Following the 2008 global recession, development pressures on coastal wetlands in the Gulf of California diminished (Bracamonte-Sierra et al. 2008); nonetheless, investment in coastal tourism infrastructure is expected to resume as the world economy recovers.

⁴ Fondo Nacional de Fomento al Turismo, FONATUR.

Fig. 1 Distribution and size of coastal wetlands in the Gulf of California. Modified from Brusca et al. (2006) with permission



Coastal wetlands in the Gulf of California represent oases of high productivity within a dry, low-productivity desert ecosystem, particularly along the Baja California Peninsula and the coast of Sonora (Glenn et al. 2006). These wetlands are critical reproduction and nesting sites for many species (Hinojosa-Huerta et al. 2004), they act as nursery grounds for larval and juvenile stages of several fish and invertebrate species (Aburto-Oropeza et al. 2008), serve as buffers during storms (Brusca et al. 2006), and support important commercial fisheries (Sala et al. 2002). There are 208 coastal wetlands in the Gulf of California (Fig. 1);

most are either very small (≤ 50 ha) or large ($\geq 1,000$ ha) (Brusca et al. 2006). The northern Gulf (above the Midriff islands) has only non-mangrove estuaries, while wetlands in the central and southern Gulf (from the Midriff islands to the mouth of the Gulf) are almost exclusively mangrove estuaries (Glenn et al. 2006).

Non-mangrove estuaries are hypersaline negative estuaries, locally known as esteros, which lack perennial freshwater input and as a result have higher salinities at the head than at the mouth (Glenn et al. 2006). Physically, the esteros are a complex of

intertidal sand and mud flats, tidal channels, and marshes dominated by salt marsh halophytes, including *Distichlis palmeri*, *Batis maritima*, *Frankenia salina*, *Monanthonchloe littoralis* and *Salicornia virginica* (Felger 2000). Esteros are lightly impacted by human development, and most of the impacts to date come from tourism-related development (Glenn et al. 2006).

Mangrove wetlands are dominated by three species: the red mangrove (*Rhizophora mangle*) is most common on the seaward edge, the black mangrove (*Avicennia germinans*) has highest density in the landward zone, and white mangrove (*Laguncularia racemosa*) is found between red and black mangroves (Whitmore et al. 2005). In the southern Gulf of California, mangrove wetlands receive freshwater input from perennial river flows (Brusca et al. 2006). Mangrove wetlands, particularly those in the states of Sonora, Sinaloa, and Nayarit suffer indirect impacts from adjacent shrimp farming, including eutrophication, hypersalinity, and altered hydrological patterns (Páez-Osuna et al. 2003).

Land tenure system

There are three major land tenure types in Mexico: federal, private, and communal lands. Communal lands were established after the Mexican Revolution in 1917, the most common types are *ejidos* and *comunidades*. In *ejidos*, land was distributed to peasant groups without the rights to sell or parcel the land; nationwide, over 930 million km² were placed under this kind of collective ownership (Yetman 2000). *Comunidades* are lands worked collectively, usually by indigenous groups. The administration and management of communal lands is collective and requires that property owners manage their resources productively (usually for food production) to retain the use rights (Valdez et al. 2006). In the 1970s, the agrarian law was modified to allow *ejidos* unsuitable for agricultural production to be used for tourism development (Bringas-Rabago 1999). Then, in 1992 the Mexican Constitution was modified to allow the division of *ejidos* into individual parcels that could be bought and sold, as *ejidos* were seen as obstacles to free trade (Brusca and Bryner, 2004). Since most coastal lands were held by *ejidos* prior to 1992, these changes resulted in the rapid privatization of coastal lands and their conversion to tourism resorts and

residential developments (Bracamonte-Sierra et al. 2008). Foreigners cannot own property outright in coastal areas (within 50 km of the coast). However, to overcome this legal limitation Mexican banks hold deeds in renewable 50-year trusts (Bringas-Rabago 1999).

Legal and institutional framework

We present an overview of the regulations and institutional framework applicable to wetlands. For a detailed analysis refer to Carillo (2007) and Cortina-Segovia et al. (2007). The main instrument for wetland legislation is found in the Mexican Constitution, which establishes the national property and jurisdiction over freshwater and marine bodies of water, including coastal wetlands. The National Water Law⁵ defines wetlands as transition areas between aquatic and terrestrial systems, subject to permanent and temporal inundation, with limits defined by permanent or seasonal hydrophilic vegetation; areas with hydric soils; and lacustrine areas or with permanent wet soils from riverine discharge. Relevant federal legislation concerning environmental policy instruments is found within the General Law of Environmental Equilibrium and Environmental Protection,⁶ which outlines instruments such as Environmental Impact Assessments, Management Plans,⁷ Natural Protected Areas, and Official Mexican Norms.⁸ This General Law also identifies economic instruments that can be used to encourage environmental protection including fiscal, financial, and market incentives. The state and municipal governments have input over coastal wetlands, particularly regarding land use in surrounding areas. Other relevant legislation includes the General Law of Wildlife,⁹ the General Law for Climate Change,¹⁰ the General Law of National Property,¹¹ and the Ports Law.¹²

⁵ Ley de Aguas Nacionales.

⁶ Ley General del Equilibrio Ecológico y la Protección al Ambiente.

⁷ Programas de manejo.

⁸ Norma Oficial Mexicana.

⁹ Ley General de Vida Silvestre.

¹⁰ Ley General de Cambio Climático.

¹¹ Ley General de Bienes Nacionales.

¹² Ley de Puertos.

Specific legal protections exist only for mangrove wetlands under article 60 TER of the General Law of Wildlife, which prohibits the destruction of mangroves. Maintaining comprehensive protection of mangrove wetlands has been a difficult process that underscores the challenges of adjudicating legal protection to all wetlands. Mangroves were originally protected by an Official Mexican Norm, a type of regulation that specifies limits, parameters, and procedures for a given activity (NOM-022-ECOL-1993; DOF 2003). As a result of lobbying by industry groups, the Norm was modified in 2003 to allow mangrove conversion in exchange for monetary compensation (Whitmore et al. 2005). The protections originally found in the Norm were restored in 2007 through a modification to the General Law of Wildlife (DOF 2007). Following pressure from tourism trade groups, the Senate proposed an amendment related to mangrove conversion to the General Law of Environmental Equilibrium and Environmental Protection in 2009. The amendment aimed to exempt projects of “national economic importance” from undergoing an Environmental Impact Evaluation (Cámara de Diputados 2009). The amendment was defeated, but it is likely that interest groups will continue to push for legislative changes that would allow mangrove conversion.

The legal instruments that apply to coastal zone management also deal directly or indirectly with coastal wetlands. There are 34 individual laws and regulations at the federal level and 17 at the state level that are relevant to the coastal zone, in addition to international treaties, state and municipal development plans, and sectorial development plans (Zárate-Lomelí 2004). There are also ten state secretariats and several government institutions that carry out activities related to coastal zone management (Carillo 2007). Other instruments of environmental planning include Ecological Zoning Plans¹³ which are designed to regulate land use and economic activities in order to protect natural resources and promote their sustainable use. Another approach to manage coastal zone development is the Integral Sustainable Coastal Administrations¹⁴ system, which transfers coastal management to the Communications and Transportation

Secretariat,¹⁵ who can then turn control over to a Municipal government. This system allows municipalities to sign direct contracts with private investors, which could further accelerate wetland conversion (Guido 2006).

Currently, Mexico has no national wetland policy. The Environmental Secretariat has established a National Committee for Priority Wetlands¹⁶ within the Commission for Natural Protected Areas. This is a technical committee composed of members of public and private agencies and other stakeholders. The committee advises the Secretariat on relevant wetland issues and facilitates communication between interested parties.

A national policy for the sustainable development of coasts and oceans was published in 2006 and an inter-sectorial committee¹⁷ was established in 2008 to coordinate coastal zone planning and sustainable management of oceans and coasts (DOF 2008). This committee has developed a National Mangrove Strategy, which directs the implementation of a national framework for mangrove management and conservation.¹⁸ Another relevant strategy for wetland conservation is the National Strategy for Shorebird Conservation (SEMARNAT 2008). These efforts are too recent to assess their impact on wetland conservation. In Mexico, priorities, programs, and strategies can shift with each presidential administration; a new administration took office in December 2012.

A variety of agencies have jurisdictional responsibility over wetlands in Mexico. The National Water Commission¹⁹ is charged, through the National Water Law, with creating an inventory of wetlands, proposing relevant legislation, and other actions aimed at wetland conservation. In practice, the participation of the National Water Commission in wetland conservation efforts is limited. For example, in the Gulf of California, the commission has primarily participated in conservation efforts in the Delta of the Colorado

¹⁵ Secretaría de Comunicaciones y Transportes.

¹⁶ Comité Nacional de Humedales Prioritarios.

¹⁷ Comisión Intersecretarial para el Manejo Sustentable de Mares y Costas.

¹⁸ As of May 2013 the strategy was not yet published, although final proofs are available http://www.semarnat.gob.mx/temas/ordenamientoecologico/cimares/Documents/nueva%20cimares/ENAEEM_ver.edicion.pdf.

¹⁹ Comisión Nacional del Agua, CONAGUA.

¹³ Programa de Ordenamiento Ecológico.

¹⁴ Administraciones Costeras Integrales Sustentables.

River. In general, the Environmental Secretariat²⁰ establishes the necessary policy instruments for wetland protection, conservation, and management, through different offices including the National Commission for Natural Protected Areas.²¹ The Federal Environmental Protection Agency²² enforces environmental legislation.

Policy instruments for wetland conservation

Environmental Impact Evaluation

The Environmental Impact Evaluation is a public policy instrument that aims to prevent, mitigate, and restore environmental damage and to regulate development to minimize negative impacts (SEMARNAT 2011). A detailed discussion of the use of the Environmental Impact Evaluation as a policy instrument and its relationship with other legal tools is found in INE (2000). Briefly, an Environmental Impact Evaluation is required for any proposed development project with potential environmental impacts. Dependent on the scope of the possible impacts, project proponents submit either a particular (site-specific) or regional Environmental Impact Assessment²³ (EIA) as part of the Evaluation process. Regional EIAs are required of large scale projects such as highways, dams, aquatic farms over 500 ha, and those projects with cumulative or synergistic impacts, within a specific ecological area, or that could alter the hydrologic regime (DOF 2012).

The EIA is a technical study that analyzes and describes environmental conditions prior to the project and defines and proposes measures needed to prevent, mitigate, or compensate expected impacts. Submitted projects are listed in the Ecological Gazette²⁴ and are publicly available. Anyone can request a public hearing, submit comments to the EIA, and/or propose preventive or mitigation actions. The Environmental Secretariat evaluates the project, taking into account

both the EIA and any submitted comments. If authorized, the permit will detail mitigation, prevention, or restoration actions.

Environmental Impact Evaluations have been used successfully by ENGOs to identify and block projects that threaten coastal wetlands and as a short-term conservation tool. One example is found in the Puerto Peñasco coastal corridor, in Northwestern Sonora. In 2006, the ENGO CEDO found that a development company was excavating a channel without an approved EIA. The developer planned to dredge 235 ha of Estero La Cholla, a hypersaline salt marsh, to build a residential marina, with houses accessible by rowboats. Although Estero La Cholla is small and already highly impacted, it is located within the Upper Gulf of California and Colorado River Delta Biosphere Reserve and its socioeconomic and ecological relevance remain high (Glenn et al. 2006). CEDO filed a complaint with the Federal Environmental Protection Agency emphasizing the lack of an EIA for the project, which forced the developers to submit one. After the EIA was submitted, CEDO requested a public hearing and submitted a detailed analysis of the EIA which included information on the ecological importance of the area, a legal analysis, a survey of local residents, and letters of support from scientists and stakeholders. The ENGO also launched a media campaign in the local, regional, and national press. After the Environmental Secretariat reviewed the EIA, it suggested that the developers withdraw the EIA so it wouldn't be rejected. In 2006, the developers submitted a second EIA that excluded the residential marina component. This second EIA was successfully challenged due to its possible negative effects on essential rocky reef habitat. In 2007, the developer submitted a third EIA that only included the residential marina in Estero La Cholla and development of the surrounding coastal area. The Environmental Secretariat approved the project without the residential marina. Although this ruling temporarily prohibited conversion of Estero La Cholla into a marina, there is no limit on the number of times an EIA can be resubmitted. In 2012, a new EIA was submitted for a cruise ship pier over the rocky reef. Although CEDO again challenged the EIA, the project was approved (SGPA 2012).

As shown in this example, close vigilance by ENGOs (or other interested group) is required to identify submitted projects with potential impacts to

²⁰ Secretaría de Medio Ambiente y Recursos Naturales, SEMARNAT.

²¹ Comisión Nacional de Áreas Naturales Protegidas, CONANP.

²² Procuraduría Federal de Protección al Ambiente, PROFEPA.

²³ Manifestación de Impacto Ambiental.

²⁴ Gaceta ecológica.

coastal wetlands. An EIA review often requires a detailed technical and legal rebuttal of the EIA, letters from stakeholders, such as local fishermen and researchers, and broad public support through media campaigns aimed at the local, regional, and/or national levels. The required legal expertise is something Mexican ENGOs rarely have available in-house. Partnering with environmental law organizations is therefore key for a successful review of the EIA. This process requires constant diligence and resources to review the weekly list of submitted EIAs. For example in Puerto Peñasco, 33 EIAs were submitted during 2005 (Guido 2006). There are other obstacles to using the Environmental Impact Evaluation process to identify and reject projects with high environmental impacts. These include the government's limited capacity to adequately evaluate assessments, the lack of follow-up and coordination among authorities (Federal Environmental Protection Agency and Environmental Secretariat), the ability of developers to resubmit previously rejected EIAs with few modifications, and the lack of defined scientific or technical criteria to evaluate environmental damages (Carillo 2007; Zárate-Lomelí 2004).

If a project is authorized, ENGOs often conduct on-site monitoring to ensure that the restrictions and mitigation requirements are met. There is no regular field supervision of compliance with the conditions stated in an EIA authorization by environmental authorities, rather they respond to complaints. If damage to natural resources occurs, the Federal Environmental Protection Agency can stop the project (temporarily or permanently), take over any elements that are responsible for the damage, and mitigate negative impacts, although there are no guidelines for impact mitigation (Cortina-Segovia et al. 2007). Even when public pressure is present, the Federal Environmental Protection Agency is frequently ineffective due to a discretionary application of existing legislation, insufficient and inexperienced personnel, and a lack of technical and/or logistical resources. Furthermore, fines paid by development projects for environmental damages are not necessarily directed to mitigation actions for the project that originated them; their use is discretionary.

Once a project is approved, officials in governmental agencies are reluctant to question their own decisions, even when scientific, technical, or legal arguments are against them. A good example of the challenges of reversing impacts once they occur is seen at Estero San

José, a desert oasis in Baja California Sur. Estero San José is a State Reserve located near "Los Cabos", one of the Mexico's most visited destinations (in 2000 it received 900,000 visitors; [Herrera-Ulloa et al. 2003](#)). A developer was permitted to build a 520-slip marina, hotel, and residential complex over 800 ha adjacent to Estero San José (Puerto Los Cabos 2002). During construction, the developer obtained a permit for 'conservation purposes' from the State Government of Baja California Sur to use a section of palm forest separating its property from the Estero. The developer used the palm forest as a staging area; then, as the marina was being excavated, sediment fill was dumped over adjacent wetland vegetation to form a levee to protect the marina in case of flooding. Ecological damage from the levee may continue as rain spreads the unconsolidated fill. The construction of the dike and the staging area in Estero San José violated the reserve's zoning plan (Gobierno de Baja California Sur 1994). Neither the State nor the municipality denounced the fill or the misuse of the conservation permit for the palm forest. Instead, when the reserve's zoning plan was reviewed in 2004, the marina and staging area were re-zoned for tourism use and the levee was reclassified as an area for "ecological rehabilitation" (Gobierno del Estado de Baja California Sur 2004). When construction was completed, the developer converted the staging area and the remaining palm forest into a "desert botanical garden" (Puerto Los Cabos 2009). Los Ángeles del Estero, a local ENGO, submitted complaints to the Federal Environmental Protection Agency regarding the environmental damage to the wetland (CEMDA 2008) and filed a lawsuit against Puerto Los Cabos in 2007, in collaboration with the Centro Mexicano de Derecho Ambiental, an environmental law organization. Although the developer lost the case, they were only fined 20,000 USD and no mitigation or restoration actions were required. The case of Estero San José illustrates the need to detect proposed developments that might negatively impact coastal wetlands and halt them before approval. It also underscores the importance of other policy instruments used for wetland conservation, as described in the following sections.

Management rights over the Federal Zone

The Federal Maritime-Terrestrial Zone is the area extending 20 m inland from the highest tide line on beaches and from the limits of coastal wetlands,

lagoons, or any natural body of seawater that is linked to the sea (DOF 1991). The Environmental Secretariat manages use of the Federal Zone through permits, transfer agreements, and concessions; authorization is not required for individual use (walking on the beach, etc.). As specified by current regulations (DOF 1991), permits are granted for up to 2 years for short-term activities such as beach vendors. Transfer agreements²⁵ grant long-term use and exploitation of the Federal Zone to other public municipal, state, or federal agencies. Concessions grant long-term use of the Federal Zone to private and social groups.

Concessions and transfer agreements provide a clear framework to “acquire” management rights for key wetland habitats and are the newest policy instrument used by ENGOs in Mexico to conserve wetlands. Concessions can be costly and politically controversial for large wetlands, but are strategic for small sections, as they give legal interest to the concessionaire over the entire wetland. The first Federal Zone concession for conservation purposes was granted to the ENGO Terra Peninsular in April 2009 over a section of Bahía San Quintín, on the Pacific Coast of Baja California; this section of Federal Zone area is now dedicated to preserve the bay’s ecological functions and environmental services (TNC 2010). Previously, concessions for conservation had been granted to developers accompanying EIAs but never to an ENGO.

Initially, it was unclear whether ENGOs needed to pay applicable fees. This issue was important since costs could be a significant obstacle to the widespread use of conservation concessions. The Federal Fees Law²⁶ was modified in 2012 to clarify that ENGOs carrying out conservation actions in the Federal Zone are exempt from paying applicable fees. ENGO are also collaborating with government agencies to prepare requests for use of the Federal Zone by providing the logistical and technological capacity to carry out the fieldwork needed. The government agencies can then directly solicit a transfer agreement. To date, transfer agreements have been granted for protection of the Federal Zone surrounding coastal wetlands in eight sites (Table 1; Fig. 2).

The Puerto Peñasco coastal corridor, in the Northwestern Sonora, is a good example of how Federal Zone concessions and transfer agreements are being implemented for wetland conservation. Along this corridor, there are 45,757 ha of non-mangrove hypersaline negative estuaries (Glenn et al. 2006). Here, pressures from tourism development are high due to the proximity to the US border (Bracamonte-Sierra et al. 2008). The ENGO CEDO has been working on transferring management rights for the Federal Zone surrounding three coastal wetlands in this coastal corridor. The Bahía Adair wetland complex is located within the Upper Gulf of California and Colorado River Delta Biosphere Reserve and is a Wetland of International Importance under the Ramsar convention (see section E. International programs on more on this designation). In collaboration with the Biosphere Reserve, CEDO requested nine Federal Zone transfer agreements totaling 306 ha on behalf of the National Commission for Natural Protected Areas. To date, seven agreements have been published in the Official Registry and two are pending. When all the transfer requests are granted, the Commission will be responsible for management of the Federal Zone around this wetland complex and may limit development projects with negative environmental impacts for the wetlands. Since most of the land within the Biosphere Reserve is held privately and in communal property (*ejidos*) this will be an opportunity for the Commission to take “ownership” and manage land in one of the Reserve’s most important habitats. Similarly, CEDO was granted two concessions for 4.4 ha of Federal Zone in Bahía San Jorge, another Ramsar site. CEDO later rescinded these concessions to avoid possible fees; the request was then combined with six additional transfer agreements over 259 ha to be granted directly to the National Commission for Natural Protected Areas. In a third wetland, Estero Morúa, CEDO worked with the municipal government of Puerto Peñasco to request a transfer agreement on behalf of the municipality to protect a nesting colony of Least tern (*Sternula antillarum*), a federally protected bird (DOF 2009).

There are multiple challenges for ENGOs and government agencies acquiring Federal Zone use rights. These challenges include identifying and delineating essential conservation areas, designing and implementing clear conservation actions in those critical areas in order to maintain rights, and coordinating conservation concessions with other tools such

²⁵ Acuerdos de destino.

²⁶ Ley Federal de Derechos.

Table 1 Public and private policy instruments implemented in coastal wetlands of the Gulf of California

Name	State	Date declared	Category	Area (ha)	Management plan
1 El Vizcaíno	BCS	30-Nov-88	Biosphere Reserve	2,493,091	Published*
2 Bahía de Loreto	BCS	19-Jul-96	National Park/Ramsar site	206,581	Published*
3 Balandra	BCS	30-Nov-12	Area for Protection of Flora and Fauna/ Ramsar site/ Transfer agreement Federal Zone	2,513	In development
4 Humedales El Mogote—Ensenada de La Paz	BCS	2-Feb-08	Ramsar site/WHSRN regional importance site/Transfer agreement Federal Zone	9,184	–
5 Isla Espíritu Santo	BCS	3-Oct-12	Transfer agreement Federal Zone	38	–
6 Sistema Ripario de la Cuenca y Estero de San José del Cabo	BCS	2-Feb-08	Ramsar site/State Reserve	124,219	–
7 Bahía de los Ángeles y Canales de Ballenas y Salsipuedes	BC	5-Jun-07	Biosphere Reserve/Concession for Federal Zone	387,957	Published ^{c,*}
8 Corredor Costero La Asamblea—San Francisquito	BC	27-Nov-05	Ramsar site	44,304	–
9 Isla Rasa	BC	2-Feb-06	Ramsar site	66	–
10 Islas del Golfo de California	BCS, BC, SON, SIN	02-Ago-78	Area for Protection of Flora and Fauna/ Transfer agreement Federal Zone	321,631	Published*
11 Humedales del Delta del Río Colorado	BC, SON	20-Mar-96	Ramsar site/WHSRN international importance site ^a	250,000	–
12 Alto Golfo de California y Delta del Río Colorado	BC, SON	10-Jun-93	Biosphere Reserve	934,756	Published*
13 Humedales de Bahía Adair	SON	2-Feb-09	Ramsar site/Transfer agreement Federal Zone ^a	42,430	Completed ^c
14 Estero Morúa	SON	30-Nov-09	Transfer agreement Federal Zone	7	–
15 Bahía San Jorge	SON	2-Feb-10	Ramsar site	12,198	–
16 Canal del Infiernillo y estuarios del territorio Comcaac (Xepe Coosot)	SON	27-Nov-09	Ramsar site	29,700	–
17 Estero El Soldado	SON	2-Feb-11	Ramsar site/State Reserve	349	–
18 Complejo Lagunar Bahía Guásimas—Estero Lobos	SON	2-Feb-08	Ramsar site	135,198	–
19 Humedales de Yavaros—Moroncarit	SON	2-Feb-09	Ramsar site/Environmental easement	13,627	–
20 Sistema Lagunar Agiabampo – Bacrehuis – Río Fuerte Antiguo	SIN; SON	2-Feb-08	Ramsar site	90,804	–
21 Laguna Playa Colorada – Santa María La Reforma	SIN	2-Feb-04	Ramsar site/WHSRN hemispheric importance site	53,140	–

Table 1 continued

	Name	State	Date declared	Category	Area (ha)	Management plan
22	Sistema Lagunar San Ignacio—Navachiste—Macapule	SIN	2-Feb-08	Ramsar site/State Reserve	79,873	–
23	Lagunas de Santa María—Topolobampo—Ohuira	SIN	2-Feb-09	Ramsar site	225,000	–
24	Ensenada de Pabellones	SIN	2-Feb-08	Ramsar site/WHSRN international importance site/Environmental easement	40,639	–
25	Playa Ceuta (Sistema Lagunar Ceuta)	SIN	2-Feb-08	Ramsar site/ Sanctuary/WHSRN regional importance site	1,497	–
26	Meseta de Caxaxtla	SIN	27-Nov-00	Area for Protection of Flora and Fauna/ Transfer agreement Federal Zone (Bahía de Piaxtla)	50,862	–
27	Playa El Verde Camacho	SIN	2-Feb-04	Ramsar site/Sanctuary/State Reserve	6,554	–
28	Islas del Municipio de Mazatlán	SIN	26-Apr-91	State Reserve		
29	Laguna Huizache—Caimanero	SIN	2-Feb-07	Ramsar site/WHSRN regional importance site	48,283	–
30	Marismas Nacionales	SIN, NAY	22-Jun-95	Ramsar site/WHSRN international importance site	200,000	Published ^{d,*}
31	Marismas Nacionales	NAY	12-May-10	Biosphere Reserve ^c	133, 854	–
32	Islas Marías	NAY	27-Nov-00	Biosphere Reserve	641,285	Published
33	La Tovar	NAY	2-Feb-08	Ramsar site	5,733	–

Includes Natural Protected Areas, Ramsar sites, State Reserves, sites of conservation importance in the Western Hemisphere Shorebird Reserve Network (WHSRN), environmental easements, and transfer agreements and concessions for the Federal Zone. Area and date declared are indicated for the first listed designation. States are Baja California (BC), Baja California Sur (BCS), Sonora (SON), Sinaloa (SIN), and Nayarit (NAY). Numbering corresponds to Fig. 2. We include whether the site has management plan and if it contains management actions specific for coastal wetlands (*). Data from (CONANP 2012a; CONANP 2012b; WHSRN 2009b)

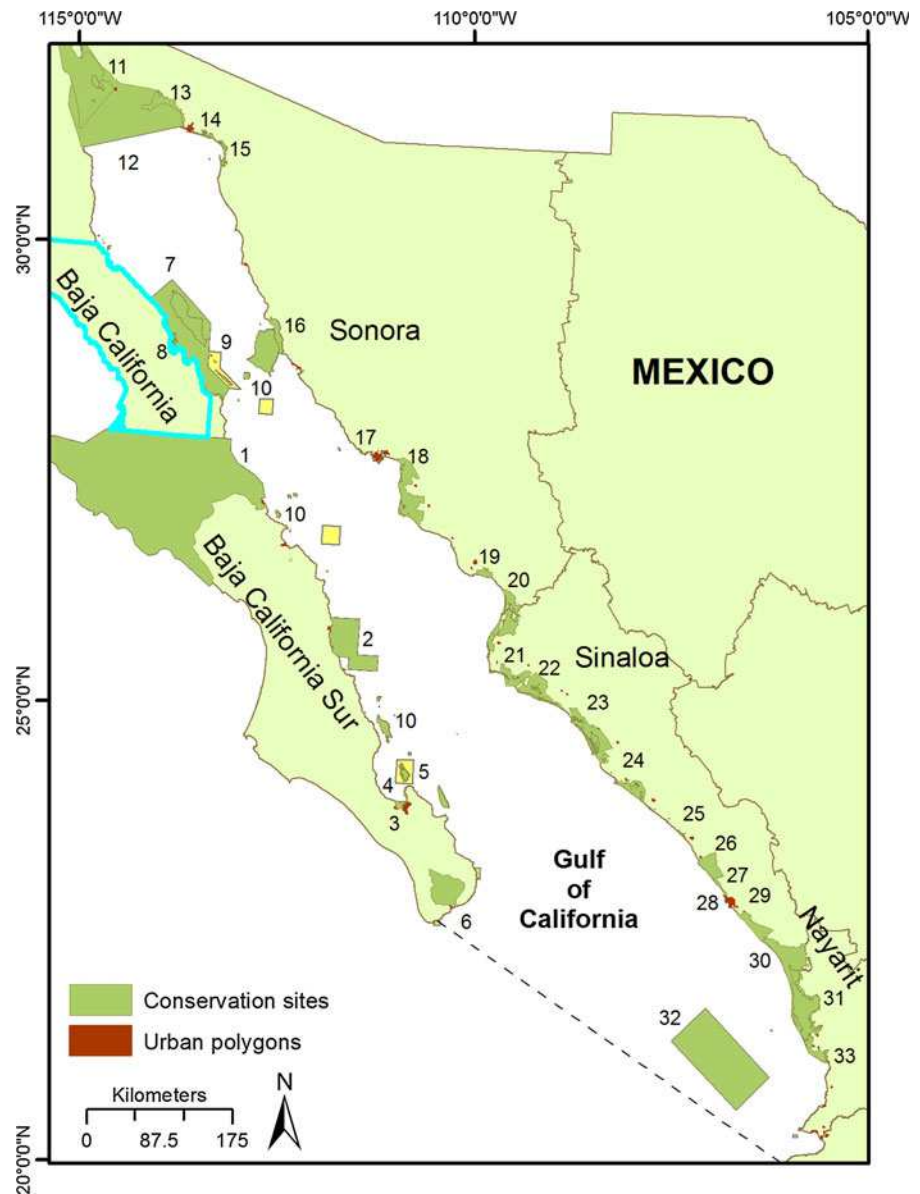
^a Ramsar site is located within the Alto Golfo de California y Delta del Río Colorado Biosphere Reserve

^b Completed plans are awaiting review and publication (CEDES 2013, COFEMER 2013)

^c A Biosphere Reserve encompassing the section of Marismas Nacionales within the state of Sinaloa is awaiting ratification

^d Regional management plan for conservation, management, and use of mangroves (SEMARNAT 2012)

Fig. 2 Sites in the Gulf of California under one or more policy instruments directed at wetland conservation. Numbers correspond to Table 1, where site names, type of policy instrument, and sources are found. Also shown are coastal urban areas (2010); source Instituto Nacional de Estadística y Geografía (2009)



as municipal development plans, and environmental, territorial, marine, and Natural Protected Area management plans. Another obstacle is that the Environmental Secretariat gives higher priority to requests for development than to those for conservation because; further the Secretariat needs to evaluate and approve relevant conservation projects without impeding activities in the whole coastal region. Whether concessions will actually protect wetlands against development threats will be tested on a case by case basis by the Environmental Secretariat; during the review process for proposed developments the legal interest

of the concessionaire and the ecological benefits of conservation are weighed against the economic benefits of proposed development projects.

Environmental easement

The environmental easement²⁷ is a legal tool used for voluntary conservation in Mexico. This easement is a voluntary, legally binding agreement between two or

²⁷ Servidumbres ecológicas.

more landowners in which the land use rights of the landowners are restricted, with the goal of preserving in perpetuity the ecosystem services, scenic beauty, or cultural and historical values of the land (White et al. 2000). At least two parcels of land are needed to establish an easement. In one parcel use rights will be restricted, for example limiting development rights (this property is called the servient estate). Another parcel is then identified (called the dominant estate), which benefits from the environmental services provided by the servient estate. For example, if a wetland serves as a stopover site for migratory birds that nest in a different site, the wetland would be the servient estate and the nesting site the dominant estate. The landowners entering an easement maintain ownership and receive some kind of compensation or incentive in exchange for the restrictions on land use. Easements are attached to the land not to the owner (White et al. 2000). If the property is sold the easement will pass to the new owner. The only way to terminate the easement is through consolidation, if the owner of the dominant estate purchases the servient one. To lessen the possibility of consolidation, several dominant estates may be included in the easement contract (SEPA Project 2007; Vargas et al. 2007). Environmental easements are a significant option where land adjacent to priority areas is privately owned (White et al. 2000).

Environmental easements began to be implemented by the ENGO Pronatura México, A.C. in 1998 (SEPA Project 2007). The first environmental easement used to protect coastal wetlands was fostered by Pronatura Noroeste in the Punta La Asamblea—Punta San Francisquito coastal corridor, on the eastern coast of Baja California, in 2003. Throughout the process Pronatura Noroeste acted as a legal steward. First, Pronatura Noroeste identified priority areas for conservation along the coastal corridor using a spatial portfolio optimization tool (Vargas et al. 2007). This tool allowed the selection of areas using specified conservation goals. The process yielded a portfolio of seven priority sites, where Pronatura Noroeste guided the establishment of a network of environmental easements (Gutiérrez-Lacayo et al. 2003). In this network, the contracts limit the use and activities on the 456 ha that surround the wetland Estero Guadalupe, effectively assuring the conservation of the site while landowners retain their property rights (Vargas et al. 2007). Once the contract was finalized, Pronatura

Noroeste assumed responsibility to monitor that the conditions of the easement are met. The landowner received a monetary payment as an incentive to establish the easement (SEPA Project 2007). In other cases, incentives can also include technical support to establish a business compatible with the easement's purpose and limitations, payment from an endowment fund to provide long-term financing for sustainable development projects, or payments from the federal government for the environmental services provided by the property. The socio-economic conditions in the nearby town of Bahía de los Ángeles, the presence of adequate incentives, and the extensive work with the community allowed Pronatura Noroeste to formalize these long-term conservation contracts. The project stimulated landowners' interest in establishing easements in hopes of receiving similar remunerations (SEPA Project 2007). Even when several properties in Bahía de los Ángeles have recently been acquired by one single individual, the environmental easements have not been questioned.

The use of environmental easements has several benefits. These agreements can be very flexible, particularly in terms of specifying what activities can be carried out on the property. They can be established for any property size, on both private and communal lands, and they do not require the intervention of government agencies. Easements can serve as planning tools for land use and zoning within Natural Protected Areas (Vargas et al. 2007). Cost can be a challenge to the wide application of environmental easements. In many areas of the Gulf of California, tourism development has fueled land speculation leading landowners to expect monetary incentives equivalent to market prices. Additionally, in many cases title irregularities in land surrounding wetlands make environmental easements unfeasible.

Natural Protected Areas

Natural Protected Areas are federally designated areas (through presidential decree) of representative ecosystems that are subject to specific regimes of protection, conservation, restoration, and development in accordance with current legislation, management plans, and zoning plans, as specified by the General Law of Environmental Equilibrium and Environmental Protection (DOF 2013a). Natural Protected Areas are designated and managed by the

National Commission for Natural Protected Areas with the goal of conserving Mexico's biodiversity while promoting alternative economic activities and regional development (CONANP 2012a). Site conservation through Natural Protected Areas is Mexico's main federal public instrument for biodiversity conservation (García-Frapolli et al. 2009). Table 1 summarizes the Natural Protected Areas declared in the Gulf of California that include coastal wetlands.

The most common and well-studied type of federally designated Natural Protected Areas is the Biosphere Reserve (Villalobos 2000), which is similar but independent of reserves in the UNESCO Man and the Biosphere Program. Biosphere Reserves include core areas subject to strict conservation, surrounded by buffer zones divided into zones where resources are managed sustainably, as specified by the reserve's management plan (Castillo et al. 2003). Land within protected areas is not necessarily owned by the state, it is most often private or communal land. Thus, reserve management requires active participation of local residents and stakeholders. Inclusion of coastal wetlands within a Biosphere Reserve is the most permanent and enforceable protection available. Because Biosphere Reserves are federally designated, management can have more continuity, especially when a strong technical advisory committee is formed. Nonetheless, designating a site as a Biosphere Reserves is a long and detailed process that requires an environmental study and stakeholder involvement and support (Halffter 2011).

Currently, there are five Biosphere Reserves in the Gulf of California that include coastal wetlands (see Table 1; Fig. 2); three have published management plans and plans for the other two reserves are in development (CONANP 2012a). Management plans are crucial for wetland conservation within Natural Protected Areas since they are the main instrument that establishes the policies, strategies, and specific activities allowed within each zone of the reserve including conservation, protection, exploitation, and research (Villalobos 2000). For example, the Alto Golfo Biosphere Reserve includes over 34,000 ha of coastal wetlands, including salt flats and tidal marshes. The reserve's management plan specifies that certain tidal marshes of high importance for migratory birds can only be used for low-impact activities, while in others mining of surrounding salt flats is allowed (CONANP 2007).

Although Mexican environmental agencies have made progress in the establishment and management of Biosphere Reserves, many challenges remain to make these reserves effective. Some common problems include a top-down decision-making process, unequal stakeholder involvement, conflicts with the use of the natural resources, and exclusion of stakeholders' perspectives, values, and beliefs from the management process (García-Frapolli et al. 2009; Halffter 2011; Villalobos 2000). Biosphere Reserves in the Gulf of California have been used in conjunction to other strategies including environmental easements, Federal Zone transfer agreements, and Ramsar sites to increase the effectiveness of conservation actions, especially where pressure from threats to ecosystems is high.

In the Gulf of California, there are also coastal wetlands within sites designated under other Natural Protected Area categories: Sanctuary, National Park, and Area for Protection of Flora and Fauna (Table 1; Fig. 2). Natural protected areas can also be established at the state or municipal level. There are no municipal reserves encompassing coastal wetlands in the Gulf of California, and only five state reserves (Table 1). Funds to design and implement management plans are not always available at the state level, and continuity in environmental policy, monitoring and enforcement are more challenging than at the federal level.

International programs

Here, we discuss three international programs, the Ramsar Convention on Wetlands of International Importance, the North American Waterfowl Management Plan, and the Western Hemisphere Shorebird Reserve Network. The two former programs are binding international agreements that promote site conservation, help set conservation priorities, and attract conservation funds while participation in the latter is voluntary and non-legally binding.

Mexico has been a member of the Ramsar Convention on Wetlands of International Importance since 1986. The convention established a framework for national action and international cooperation for wetland conservation (Ramsar Convention Secretariat 1996). As part of the convention, Mexico is committed to: (1) designate wetlands that meet the Ramsar criteria and guarantee their effective management, (2) promote rational wetland use through appropriate

policy, management and legislation, and (3) cooperate in trans-border wetland issues (Travieso-Bello 2009). The definition of wetlands under the Ramsar Convention is broader than under the General Water Law (see Legal and institutional framework section); the Convention considers as wetlands marine areas where depth does not exceed 6 m at low tide (Ramsar Convention Secretariat 1996). As a result, Ramsar sites may also include islands and coral reefs. Wetlands are selected for designation as Ramsar sites based on their international significance in terms of ecology, botany, zoology, limnology or hydrology, and particularly based on their use by waterfowl during any season (Ramsar Convention Secretariat 1996). The importance of Mexican wetlands as critical stopover and wintering grounds for North American migratory birds has been a key factor in the establishment of Ramsar sites (Perez-Arteaga et al. 2002; Vega et al. 2006). To date, there are 138 Ramsar sites in Mexico; 23 sites in the Gulf of California include coastal wetlands (Table 1; Fig. 2) (CONANP 2012b). Mexico treats sites receiving the Ramsar designation as Natural Protected Areas and they are managed by the National Commission for Natural Protected Areas.

The guidelines set by the Ramsar Convention require that management of sites declared as Wetlands of International Importance be guided by a management and conservation plan (Travieso-Bello 2009). In the Gulf of California, most Ramsar sites have no management plan (Table 1); in some cases, plans exist for another protected area designation (i.e. Biosphere Reserve) overlapping the Ramsar site which may include specific conservation or management criteria for coastal wetlands. The region's first independent management plan for a Ramsar site was produced for the Bahía Adair wetland complex within the Upper Gulf of California and Colorado River Delta Biosphere Reserve by the ENGO CEDO. This plan includes specific zoning recommendations for individual wetlands (CEDES 2013). When this Biosphere Reserve's management plan is updated again, it can incorporate the Ramsar site's zoning and management actions which would then give further legal strength to the Ramsar designation.

An important issue for Ramsar sites outside of Natural Protected Areas is that the zoning restrictions contained in the management plan are not enforceable, because these sites are not designated by presidential decree. However, Article 133 of the Mexican

Constitution states that international treaties signed by the President of Mexico and approved by the Mexican Senate should be considered as a Mexican Law (DOF 2013b). Additionally, article 4 of the Mexican Constitution enshrines the right to a healthy environment and Mexico is party to the International Covenant on Economic, Social and Cultural Rights which also includes this right. If environmental conservation is accepted as part of the human right to a healthy environment (Boyd 2011), the Ramsar Convention should be considered as an international treaty dealing with a human rights (sensu Ramsar Convention Secretariat 2012), and therefore at the same hierarchical level as a Mexican federal law. Further, the Constitution was recently modified to assure that human rights would be recognized and interpreted in accordance with the Mexican Constitution and international treaties (DOF 2011). Under these legal precedents, in theory no authority can act or authorize any activity that goes against the conditions established in the designation of a given wetland as a Ramsar site, or against the restrictions or regulations indicated in its management plan when published. This adherence to the Ramsar Convention should be enforced by the National Commission for Natural Protected Areas.

Additionally, Mexico is subject to international pressure to comply with the Ramsar designation, such was the case for a proposed mass-tourism development in two Ramsar sites, Huizache-Caimanero and Marismas Nacionales (AIDA and CEMDA 2009; FONATUR 2011), which contain over 240,000 ha of mangrove wetlands along the coasts of the states of Sinaloa and Nayarit (CONANP 2012b). Five Mexican and international ENGOs requested that the Ramsar Secretariat review the projects for possible negative impacts, that the Secretariat remind Mexico to comply with the Ramsar Convention's commitments, and if necessary that it include the aforementioned Ramsar sites in the Montreux Record (AIDA and CEMDA 2009). The Record is a list of Ramsar sites where changes in ecological character have occurred, are occurring, or are likely to occur (Ramsar Convention Secretariat 1996). As a result of this intervention, the Ramsar Convention sent a technical committee to review the project. The resulting report urged further studies to analyze the project's cumulative impacts and determined that development was not viable in the scope, size, and design proposed (Ramsar Convention

on Wetlands 2010). The project was finally approved, and although the permit reduced from 40,000 to 10,000 the number of rooms there is still ample concern for possible negative effects on the Ramsar sites (AIDA and CEMDA 2009). The ENGOs involved will now have to monitor that the permit conditions are met and denounce any negative impacts.

Currently, Mexico is just beginning to use the Ramsar designation as a policy driver at the national level and as leverage to promote and encourage citizen participation, economic benefits, and wetland conservation at the local level as occurs in other countries (i.e. the UK and Japan; Fletcher et al. 2011). For example, the development of the Bahía Adair management plan involved local landowners in planning zoning rules. These landowners successfully organized and formed their own civil association; the group is now actively involved in the steering council of the Upper Gulf of California and Colorado River Delta Biosphere Reserve, has successfully secured funding for economic development, and is participating in monitoring bird populations and anthropogenic impacts within the Ramsar site (CEDES 2013).

The North American Waterfowl Management Plan was signed by the US and Canada in 1986 and by Mexico in 1994. The Plan sets a framework for cooperative efforts to conserve wetlands for migratory birds (NAWMP 2007). In 1989, the US Congress passed the North American Wetlands Conservation Act (NAWCA) which set as one of its objectives to encourage wetland conservation through public-private partnerships. NAWCA made funding available to projects that further its objectives and is considered one of the most successful international conservation initiatives, having supported management and conservation actions in the most important Mexican wetlands (Wilson and Ryan 1997). From 1991 to 2006, NAWCA awarded \$25.7 million USD to 195 projects (NAWMP 2007). In fiscal year 2012, NAWCA provided US\$2.8 million of funding to conservation projects in Mexico, including projects to establish environmental easements in the Marismas Nacionales wetlands and land purchases in Bahía Santa Maria, Sinaloa, to conserve waterfowl and shorebird habitat (USFWS 2012).

The Western Hemisphere Shorebird Reserve Network (WHSRN) aims to protect a network of key habitats used by shorebirds throughout its migratory range (Cervantes 2007). The WHSRN works with

partners to establish local, regional, and international recognition for key sites, raise public awareness, and generate conservation funding opportunities (WHSRN 2009a). Mexico's Environmental Secretariat consulted with the network to issue the Strategy for the Conservation and Management of Shorebirds and their Habitats in Mexico (SEMARNAT 2008). This document serves as a guide for identifying specific, prioritized actions and sites for shorebird conservation. There are currently seven WHSRN sites in the Gulf of California of regional, hemispheric, or international importance (Table 1; Fig. 2) (WHSRN 2009b).

Linking local communities and conservation

Approaches that promote the welfare and cooperation of local communities are being integrated into conservation strategies for Mexican wetlands, including emphasizing local community involvement (i.e. in Ramsar sites and Natural Protected Areas), adopting shared management, awarding cash compensations (i.e. when establishing environmental easements) or other incentives, and encouraging tourism and other low-impact activities. These approaches promote the sustainable use of wetlands, such that their ecological, economical, and cultural values are maintained and recognized, and retain the dependence of local communities on their natural resources. Commercial fishermen targeting shrimp, blue crab and other wetland-dependent species will act as conservation stewards as long as their activities remain economically important. Fishers can become involved in monitoring and are often the first to notice when destructive activities take place. They also participate in making formal denouncements to authorities regarding such activities.

Within Natural Protected Areas, the Conservation Program for Sustainable Development²⁸ aims to promote conservation through the direct participation of stakeholders and landowners. The program provides financing for projects that include conservation and restoration actions, training courses, or for-profit activities (i.e. ecotourism, aquaculture; CONANP 2012c). There are other examples in the Gulf of California where local communities are being

²⁸ Programa de Conservación para el Desarrollo Sostenible (PROCODSES).

Table 2 Policy instruments used for wetland conservation in the Gulf of California

Policy instrument	Level of protection	Legal basis	Scope	Conservation use
Environmental Impact Evaluation	Short-term	Federal legislation	Required of all proposed development projects with potential environmental impacts at a local or regional scale	Prevent impacts and development on wetland areas
Management rights over the Federal Zone	Long-term	Regulations governing the Federal Zone	Applicable to the Federal Zone, 20 m from the highest tideline or limit of a coastal wetland	Provide legal interest to the holder over an entire wetland
Environmental easements	Long-term	Voluntary legal contracts	Established on private land surrounding wetlands, between one or more landowners and an environmental non-governmental organizations	Prevent impacts and development on adjacent wetland areas through a series of self-imposed restrictions
Natural Protected Areas	Long-term	Federal legislation	Established over areas of representative ecosystems, either public or private land	Site conservation while promoting alternative economic activities and regional development
Ramsar Convention on Wetlands of International Importance	Long-term	International treaty	Representative wetland ecosystems meeting Ramsar Convention criteria on biological importance	Site conservation
North American Waterfowl Management Plan	Short and long-term	Trilateral agreement, US, Mexico, and Canada	Wetlands used as waterfowl habitat	Provides funding for conservation actions, including easements and land purchases
Western Hemisphere Shorebird Reserve Network	Short and long-term	Voluntary network	Wetlands used as shore bird habitat	Promote recognition for key sites, raise public awareness, and generate conservation funding

involved directly in conservation, although these projects are in their early stages. The ENGO Pronatura Noroeste is implementing a project to train local resource users as natural history guides and birdwatchers in Estero San José; while the ENGO CEDO is implementing the NaturArte Ecotourism Corridor, a project that integrates community businesses in a marketing, training, and tourism operation network that aims to increase their dependence on healthy, beautiful estuaries, while also generating a secondary income for landholders (more about this project can be found in www.cedonaturarte.org).

Conclusions

A variety of tools are being used to conserve coastal wetlands in the Gulf of California, including natural protected areas at federal, state, and municipal levels, environmental impact assessment reviews, conservation concessions and transfer agreements of the

Federal Maritime-Terrestrial Zone, international agreements (i.e. the Ramsar Convention), and private conservation contracts (i.e. easements) (Table 2). Unfortunately, efforts to conserve the region's wetlands have been very costly, not always successful, and in many cases dependent on political decisions.

We found that no single policy instrument assures permanent wetland conservation. As described throughout the document, laws supporting conservation can be modified, and permits challenged, particularly as governmental administrations change. Wetlands in the Gulf of California under the umbrella of only one policy instrument have suffered habitat conversion and damaging impacts. Two examples include Estero La Cholla, Sonora, within the Upper Gulf of California and Colorado River Delta Biosphere Reserve (Glenn et al. 2006), and El Mogote, Baja California Sur, where mangroves were protected by an Official Mexican Norm (CEMDA 2011). In both cases, ecological impacts spurred the implementation of additional conservation tools.

To ensure that wetland conservation is legally binding and effective it is necessary to link several conservation instruments, i.e. a natural protected area designation and/or the Ramsar designation with private land conservation or Federal Zone concessions. When these tools are applied in concert with active participation of local stakeholders, they become even stronger in practice. A clear example is the case of Bahía Balandra, an important recreation area lined with 22.5 ha of mangrove nearby the city of La Paz, Baja California Sur (Municipio de La Paz 2006). Between 2003 and 2004, developers requested a concession for the Federal Zone of this Bay; out of concern over the ecological effects and the loss of public space the bay was declared a municipal reserve in 2005 (Cariño-Olvera et al. 2008). This municipal designation was revoked following a suit brought about by the developer. Following a public campaign led by a stakeholder coalition, Bahía Balandra was declared a Ramsar site in 2008, use rights over the Federal Zone were transferred to the National Commission for Natural Protected Areas in 2011, and the site was designated a Natural Protected Area in 2012. The ENGO Sociedad de Historia Natural Niparajá played a key role in the coalition by leading the development of the technical justification study to support both the municipal and federal protected area designations (Cariño-Olvera et al. 2008).

Successful conservation of coastal wetlands in the Gulf of California has relied on integrating science, management, and public participation through partnerships between ENGOs, academic institutions, community stakeholders, and government agencies. Multiple strategies are needed; particularly those that can help generate national and international pressure on developers and authorities. The development and application of policy instrument for wetland conservation in the Gulf has been necessarily reactive, as new threats to wetland ecosystems in the region have arisen and required innovative strategies. Once a new policy instrument is implemented, communication and collaboration amongst organizations in the region has facilitated application in other sites. As the case of Balandra and others presented in this paper emphasize, Mexican ENGOs play an important role in conservation; this has also been the case in other regions of the world (Redford et al. 2003). The ENGOs mentioned in this study, as well as many others, have supported wetland conservation by

monitoring developments, reviewing EIAs, implementing private conservation agreements (i.e. environmental easements), and working with the local, state and federal government to implement management actions and policy instruments.

One of the main strengths for wetland conservation in the Gulf of California is the existence of a comprehensive legal and policy framework in Mexico, as well as clearly defined strategies for the protection of public and private lands. Nevertheless, the permitting system and regulations give more weight to development than environmental conservation. Additionally, government corruption, the lack of expertise with environmental issues within governmental institutions, and the lack of long-term institutional memory encourage developments with high environmental impacts. As long as both economic pressures and incentives for wetland conversion remain high along the coasts of the Gulf of California, implementation and development of new policy instruments directed at wetland conservation will be needed.

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