
WETLANDS CONSERVATION AND ITS VISION FOR TAIWAN

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Abstract

Wetlands provide vital habitats for fish and wildlife while offering numerous other benefits. As in some other countries, however, Taiwan has witnessed the loss of a significant portion of its coastal wetlands due to large-scale reclamation projects along the coast. Most of the wetlands that still remain are seriously being threatened by both human activities and natural changes, such as drainage for agricultural production, filling for industrial development, discharge of wastes and drought. The administrative performance of the existing authorities and legislation in Taiwan has mostly been ineffective in protecting these precious, sensitive areas. This paper introduces the distribution of wetlands in Taiwan and highlights their invaluable functions and potential economic value. It also discussed the recent activities, both initiated by the government and the NGOs, to protect wetlands in Taiwan. Based on the above discussion, the paper identifies the wide-range of current problems related to their management and proposes the vision should have to save wetlands for the future. It argues that establishing clear policies and effective institutional mechanisms on wetland protection and conservation, classifying the wetlands for better management, and fully promoting public awareness and consciousness of the importance of the wetlands will not only be beneficial but will also address the urgent need to safeguard the wetlands in Taiwan. Additionally, the paper recognizes that international cooperation and collaboration on wetland restoration is essential and most challenging.

Keywords: Wetland; Conservation; Taiwan

Introduction

Wetlands support a significant biodiversity and provide many important benefits, goods and functions, many of which are essential to communities as well as to industrial and agricultural activities (Feierabend 1992, Davies and Claridge 1993). In the last two decades, the numerous advantages of wetlands have been well documented (Beazley 1993, Denny, 1991, Davies and Claridge 1993, Kusler 1987, Maltby 1986, Turner 1989). In spite of all of the above gains from these extremely diverse, highly productive ecosystems, they have often been viewed as wastelands, sources of mosquitoes as well as impediments to development and even travel (Kusler 1987). Far too many people, in fact, still hold on to the notion that wetlands have little value and that they need to be converted for more "productive" uses. This common misconception has led to worldwide critical endangerment of a significant portion of these unique habitats (Sebastian and Davies 1994). As in other countries, a large share of coastal wetlands in Taiwan have been lost due to recent efforts at large-scale reclamation, particularly along the western coast (Chiau 1998). Most of the remaining wetlands are threatened by other human activities, such as drainage for agricultural production, filling for industrial development and the discharge of wastes (Chiau and Liu 1994a, 1994b). The climate change, global warming and recent drought for example, has also degraded the stable situation of wetlands. Therefore, saving wetlands has become an issue of urgent importance in Taiwan, one which deserves priority on the national agenda.

I. Present Status of Wetlands in Taiwan

The Island of Taiwan is located in the west Pacific about 160 kilometers (100 miles) from the southeast coast of China. Surrounded by sea, with varying topographical features from mountains to tidelands as well as abundant rainfall -- an average rate of 2,100 millimeters per year, -- a diversity of wetlands has formed on the island. Although most of the wide variety of tidal flats and estuaries are found along the western coast of Taiwan, inland wetlands, such as rivers, lakes and ponds, are found island-wide. A survey conducted by the former Provincial Water Conservancy Bureau estimates the area of tidal flats at 54,000 hectares (Table 1) (Hwang 1996). In addition, according to the ROC Wild Bird Society (1994), some sixteen major wetlands have a total area of about 12,000 hectares in Taiwan with most of them at river mouths (Table 2).

Each major wetland in Taiwan has its own distinct characteristics. Among them, Kuandu, Watzewei, Tungshih, Aurku and Putai are very important for their exuberant mangrove growth. Some tidal flats and river mouths, Hsiangshan, Dahtu Estuary, Tsenwen Estuary and Lanyang Estuary for instance, are well known for their plentiful waterfowl and/or the unique fiddler crab (*Uca Formosensis*). These wetlands have been exceptional sites for bird-watching and outdoor education. Additionally, several lagoon systems are particularly prominent for their biological and aesthetic advantages. Noteworthy is the Chiku Lagoon in southwestern Taiwan which has been a major center of ecotourism because of its rare migratory birds known as the black-face spoonbill (*Platalea minor*). Also, the lagoon at Tapeng Bay in the south has recently been delineated as one of the national scenic areas to meet the growing demand for nature conservation and recreational activities

Table 1. Distribution and size of tidal flats on the west coast of Taiwan (units: ha.)

Regions	Total area of tidal flat	Reclaimable area	Area already reclaimed	Area being reclaimed	Area remaining
North	5,910	1,642	412	--	1,230
Taichung	3,973	3,973	3,973	--	--
Changhwa	15,128	8,716	977	3,578	4,161
Yunlin	7,593	3,160	1,179	1,457	524
Chiayi	13,109	9,284	2,194	--	7,090
Tainan	7,239	3,374	3,374	--	--
South	1,093	1,093	160	--	933
Total	54,045	31,242	12,269	5,035	3,938
(%)		(100%)	(39.3%)	(16.1%)	(44.6%)

(Source: Adapted from Hwang, 1996)

Table 2. Present status of major coastal wetlands in Taiwan

Location	Est. Area (ha)	Bird Species	Adopted Protected Measures	Major Problems
Lanyang Estuary	700	236	Duck conservation area (1972); Nature protected area (1984).	River bed development; disposal of solid wastes.
Litzojian	200	153	None	Filling for private use.
Wuwei Port	100	140	Wildlife protected area.	Proposed power plant project.
Watzewei	20	170	Nature protected area (1983).	Disposal of construction wastes; tourist disturbance; and river pollution.
Kuandu	166	255	Waterfowl conservation area (1983).	Disposal of construction wastes, tourist disturbance.
Linoon	20	71	None	Waste disposal; sand dredging.
Whajiang Bridge	40	101	Conservation area for migratory birds (1983); Duck park (1992).	Reclamation for vegetable gardens; river pollution; and waste disposal.
Hsiensan Tideland	1,000	--	To be delineated as protected area.	Pollution.
Kunnan	3,000	266	None	Tideland reclamation; waste incinerator.
Dahtu	2,260	235	To be delineated by the local government.	Nearby landfill site.
Aurku	1,500	154	Undergoing feasibility study to delineate wildlife protected area.	Industrial development project; coastal highway.
Chiku	3,000	----	A portion of wetland will be established as protected area for black-faced spoonbill.	Reclamation for industrial development.
Tsenwen Estuary	1,500	159	None	Reclamation for fishery and industrial development.
Szutsao	300	161	Mangrove protected area (1993).	Nearby industrial park.
Kaoping Estuary	1,500	109	Mangrove replantation.	Industrial wastewater discharge; waste disposal; and sand exploitation.
Lungluntan	490	174	Scenic area in Kenting National Park (1982).	Bird catching; fish netting.
Tapeng Bay	50	106	Recreational area (1985).	Disturbance from recreation And construction; pesticides.

(Source: Compiled and modified from the ROC Wild Bird Society, 1993; Taiwan's EPA, 1993; Chiau and Liu, 1995; and recent reports from Taiwan newspapers)

Nowadays, such wetlands in Taiwan face grave danger. As illustrated in Table 2, most of the wetlands are facing problems caused by numerous developers hoping to convert these areas to other purposes. Inappropriate human activities, such as tideland reclamation, industrial development, solid waste disposal, wastewater discharge and transportation construction are not uncommon. The site of Kaohsiung Harbor, one of the largest container ship harbors in the world, was formerly the largest mangrove forest in southern Taiwan. Today, however, only thirteen mangrove trees survive in that area (*United Daily News* September 25, 1994). The Environmental Protection Administration (Taiwan's EPA) reported that presently more than 80 projects have been proposed or are already being undertaken along the west coast of Taiwan. Most of them aim at claiming the coastal area for industrial and/or urban development. If all of these projects are fully completed, a very significant portion of the natural shoreline and wetlands will inevitably disappear (Chiau 1998). In the past decade and in the next five years, it is estimated that the extent of tidal flats being filled on the west coast of Taiwan (the Hsiangshan Tideland Reclamation Project, Changhwa Industrial Park and the Off-shore Industrial Park in Yunlin) could reach more than 20,000 hectares or 37% of all tidal flats. Clearly, the more "new land gained" from reclamation projects, the more devastating is the effect on the wetlands.

Several other common administrative practices and ineffective institutional mechanisms too often further aggravate the fate of the wetlands in Taiwan. There are countless examples. First, wetlands have been deemed as major dumpsites for municipal wastes by some local governments. Among the 294 landfill sites in Taiwan Province, as investigated by Taiwan's EPA in 1983, some 178 sites -- or nearly 60% of them -- were located in wetlands (Chiau and Sun 1996). The Ministry of Interior included twelve coastal protected areas in its "Natural Environment Protection Plan of Taiwan's Coastal Areas", but still many more tideland reclamation projects have been proposed for the Changhua-Yunlin-Chiayi Protected Area (Chiau 1998). Further south in Kaohsiung County, though the findings of an official survey are not yet available, it is generally believed that the filling of the wetlands (i.e., Tantseyang and Shaubeihu) have been the major factor in frequent flooding because the runoff can no longer be drained into or retained in the wetlands. This was particularly serious in 1996 and 1997 when a few major typhoons struck the area. The nearby areas suffered from some 2 to 3 meter high floods.

Cases stated above clearly indicate not only the significant problems that Taiwan's wetlands are facing, but they also reveal the chaotic imbalance

that is caused from the conflict between development plans and conservationist policies.

II. Major Obstacles against Wetland Conservation

Exactly what is meant by “wetlands”? Why should wetlands be protected? Who should be given responsibility for them? These three questions make up the core of the issue of wetland conservation. By examining the current problems including those with the present authorities in Taiwan, the major issues and obstacles to wetland protection are summarized in the following.

1. Ambiguous Definition of “Wetlands”

There are more than 50 interpretations of the term, “wetland”, throughout the world (Beazley 1993, Hook 1993). This plethora of definitions has caused considerable confusion with regard to wetland protection, hindered its management and has been the focus of controversy for a long time. Although the definition of wetlands is arguable, each country still needs to develop its own scientific, systematic and objective criteria or procedures to distinguish these sensitive areas; this includes Taiwan. Some administrative regulations loosely include certain types of wetlands, but no laws exclusively associated with conservation in Taiwan have ever defined “wetlands”. Currently, there are a few terms in environmental law, such as “wildlife conservation area” and “important habitat environment” of the Wildlife Conservation Law, which can occasionally but not always be applied to the field of wetland management. Despite the inclusion of river mouths, lagoons, salt marshes, swamps, sand bars, sand dunes and coral reefs, during the process of environmental impact assessment (EIA), many difficulties in delineating wetland boundaries still exist. Besides being delineated arbitrarily in the absence of any criteria, the Taiwan interpretation of the term has been an excuse for administrative delays and ineffectiveness in dealing with related management affairs.

2. Ineffective Laws and Enforcement on Wetland Protection

Since the chief authority overseeing wetland and coastal management has never been identified, development in the coastal areas has increased rapidly. Nevertheless, some partially-related laws do exist and include the following: (1) the Cultural Asset Preservation Law (managing “historical sites”, “ecological conservation areas”, “natural preservation areas”); (2) the Wildlife Conservation Law (delineating “wildlife conservation areas” and “important habitat environments”); (3) the National Park Law (managing

“ecological conservation areas” in national parks); (4) the Regional Planning Law (including “ecological protected areas”); (5) the Urban Planning Law (including “protected areas”); (6) the Fishery Law (establishing “fishery resource protected areas”); and (7) the Tourism Development Law (establishing “scenic areas”). In addition to these, an eighth, the Coastal Zone Management Law, is still in its draft stages and may take a couple of years to be enacted (Chiau 1995). As previously stated, the "Natural Environment Protection Plan of Taiwan's Coastal Areas", though promulgated by the Executive Yuan (i.e., the Cabinet), has received very little support from either subordinate government agencies or private developers. Obviously, this plan without strong support for its enforcement cannot be effectively applied to wetland affairs because of its status at the “administrative” level.

Therefore, “wetland protection” seems to have merely become a propaganda slogan in various institutions. “An Outline of the Current Environmental Protection Policies of the Republic of China” approved by the Executive Yuan in 1987 serves as one example (Environmental Protection Committee 1987). The policy guideline declares that: “Estuary and coastal wetlands, mangrove marshes, and sand dunes must be protected from misuse and gradual encroachment.” Even after ten years of promulgation of the outline, however, no concrete or practical measures have been adopted. Thus, the improvement of the effectiveness of the legislation, enhancing the efforts of various legislative bodies and the clarification and coordination of the activities among related authorities on wetland management have become pressing issues that must be addressed in the very near future.

3. Misconceptions of Wetlands

Even if a few terms – albeit ambiguous – from environmental law exist, most research and concerns about wetlands in Taiwan have concentrated on waterfowl habitats, namely, river mouths. This means they have ignored the importance of other types of wetlands, like lakes, ponds and tidal flats. Moreover, the criteria of “wetlands” have been limited to “areas inhabited by waterfowl”. The huge area of tidal flats and the unique coral reefs within the shallow seas, which should definitely be included among the most important wetlands in Taiwan, have been neglected for far too long. Thus, by not being comprehensive, the concept of a “wetland” is inadequate and needs to be clearly and fully defined.

4. Low Public Awareness of Wetland Values

Only recently have some people in Taiwan started to become aware of the importance of wetlands, and this is partly due to the efforts of the

alternative media. Although an environmental consciousness has been growing in Taiwan, most people still deem wetlands as wastelands or dumps. Compared with the short-term visible benefits of reclamation projects, the less tangible values of wetland conservation seem to be "minor issues" for the public and the government. Thus, how to educate the local people to protect these "muddy" and "waste" lands and how to persuade the politicians and developers to give up their development projects despite their quick economic benefits represent two major challenges to the wetland issues in Taiwan. More specifically, environmental education vis-à-vis the wetlands is difficult to achieve because it must be transmitted through the mainstream media not just towards the general public but also towards the politicians, developers and project managers.

III. Recent Activities Concerning Wetlands Conservation

In response to the rapid loss of wetlands and calls for action by nongovernmental organizations (NGOs), the government of Taiwan has adopted more-active measures than ever before. The major activities recently initiated by both the government and NGOs are summarized herein.

1. Establishing Wetland Parks

With the endorsement of the central government, some local governments have taken actions to save wetlands in their jurisdictions. The delineation of three wetland parks serves as examples. First, the protection of the Guandu Wetland at the edge of metropolitan Taipei represents a typical and lengthy struggle within a complex political environment between development and conservation to save a wetland. Guandu is a part of the floodplain of the Tamsui River as well as one of the major wetlands in Taiwan. It is uniquely located adjacent to an urban area, and with its special environmental characteristics, Guandu has long been an important habitat for various rare migratory birds in winter. In response to concerns about degradation of the environmental quality of the wetland, the government of Taipei City recently authorized NT \$15 billion (US \$535 million) for the purchase of this 57-ha wetland to better ensure its preservation and management. This praiseworthy action is considered a very important victory for local green groups, such as the Wild Bird Society of Taipei City who has been fighting for the preservation of Guandu for more than ten years (Chiau, 1997).

The Niasung Wetland of Kaohsiung County serves as the second

example. With an area of about 3 ha, the Niaosung Wetland is located adjacent to the Kaohsiung Grand Hotel and the entrance to a famous scenic point, Chengching Lake. For several years, it was used as a sedimentation pond for backwash water from a rapid sand filtration unit of the Taiwan Water Company (TWC). Due to the abundance of organic materials in the backwash water, the sedimentation pond gradually became a well-known wetland with various species of flora and fauna. It was designated a nature center and educational park in 1997, representing the first step ever in the movement towards the protection of wetlands in southern Taiwan.

Another case is the establishment of a protected area for Black-faced Spoonbills (*Platalea minor*) in the Chiku Wetland of Tainan County. Although the proposal is still in process, some 703 ha have been delineated for the brand-new wildlife refuge.

2. Establishing a Wetland Conservation Axis

This project was financed by the Council of Agriculture, the lead agency of conservation in Taiwan, and was proposed by Drs. Hwey-Lian Hsien and Chang-Po Chen (Hsieh and Chen, 2001). The approach is to establish a “wetland conservation axis”, which combines previously designated protected areas and wetlands which need to be protected along the west coast of Taiwan. With the adoption of this proposal, it is believed that the continuity and entirety of these diverse wetlands can be maintained. The proposal also calls for partnerships among the government, NGOs, academia, and industries for the successful establishment of the wetland axis.

3. Organizing “Wetlands Taiwan”

In addition to the wild bird societies, “Wetlands Taiwan” was formed about ten years ago and has been one of the most-active NGO concerned with wetland and nature conservation in Taiwan. In addition to actively raising wetland awareness and monitoring the progress of wetland protection by government agencies, Wetlands Taiwan offers a professional consultation service for wetland projects. The organization has also been publishing the monthly Chinese journal *Wetlands in Hope*[?] since 1995.

4. Initiation of Research on Artificial Wetlands

In light of the present problems and in response to increasing concerns over wetland conservation, the Committee on Sustainable Development of the National Science Council (NSC) has granted financial support for a series of research projects on wetlands and coastal resource management (NSC, 1997). According to the Committee’s mid-term plan, coastal zone management, wetland restoration and management, as well as determining the environmental impacts of artificial wetlands have been given high

priority for future research. A small team of several professors was organized and is supported by the NSC; this team is to conduct a three-year research project on man-made wetlands. Having paid much attention to the importance of artificial wetlands, some local governments have also begun their own new projects to establish man-made wetland parks. Two “eco-parks” along the Kaoping River in southern Taiwan are good examples.

5. Organizing Wetland Conferences

International cooperation is deemed important in the field of wetland conservation. In order to facilitate exchanges of information and experience, several NGOs of Taiwan have organized various domestic and international conferences over the past five years. One of the most important regional forums to be held is the 6th Asia-Pacific NGOs’ Environmental Conference (APNEC-6). Wetland conservation has been included as a key theme of this conference. Taiwan is also willing to offer to host another regional conference on cooperation for wetlands conservation in the near future if a consensus can be reached in the region.

IV. Wetlands Conservation Vision for Taiwan

The concept of the “wise use of wetlands” has been even more of a focal issue to the Ramsar Convention since the Wise Use Working Group was set up in 1988. The wise use of wetlands is defined as “their sustainable utilization for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem” (Davis, 1993, p. 9). Undoubtedly, scientific research is important in itself and serves as the basis of planning and management. However, the protection of the wetlands should not be limited to scientific surveys. The role of various authorities deserves the same priority on the national agenda of wetland conservation in Taiwan. In order to wisely use natural resources, preserve genetic banks and to harmonize human activities with the environment, it is imperative that the government pay more attention to the conservation of wetlands. Although there is much to be done about the protection of the wetlands in Taiwan, some small steps towards the ultimate goal of sustainable development have finally been taken and, if continued, are eventually expected to lead to concrete achievements. The wetlands conservation vision for Taiwan is proposed as follows.

1. Declaring a clear conservation policy on wetland protection

Taiwan's rapid economic success has been the focus of much research (Kuo et al. 1981 and Wu 1985 for example). However, with the emphasis on economic benefits there are many impediments to Taiwan's sustainable development. The obscurity of its conservation policies has resulted in the over-development of coastal areas and such sensitive inland areas as hillsides and faults. As suggested by Davis (1993), certain procedures are necessary to improve the institutional arrangements so that wetland policies can be fully integrated into the total planning process and so that adequate mechanisms and procedures can be established to incorporate an integrated, multi-disciplinary approach into the management of wetlands. Accordingly, to save wetlands from the harm of development, Taiwan needs a clear wetland policy for the private and the public sectors to follow.

There are countless models of successful wetland policies world-wide which Taiwan can follow. The United States and Canada, in addition to establishing a permit mechanism, have also adopted a "no net loss" policy which requires developers to re-build the same acreage of wetlands as that which has been destroyed (Silverberg and Dennison 1993, Ontario Ministry of Natural Resources 1992). It is clear that an artificial wetland may not serve the same function as a natural one, but this policy may at least be effective in forcing developers to re-think their development projects more seriously. Perhaps, this policy could maintain the same amount of open area and even the basic functions of wetlands in the region. Additionally, the concept of a "credit bank" is yet another alternative measure for wetland management because it may encourage developers and/or enterprises to pay attention to environmental protection on a regular basis. Some other mechanisms, such as tax incentives and donations (Kusler 1983) or trust funds as ways to acquire wetlands and for their long-term management, deserve further study.

2. Clarifying wetland management among administrative authorities

Official jurisdiction over wetland management needs to be carefully defined and clarified. Under Section 404 of the U. S. Clean Water Act, for instance, there is provision for the Army Corps of Engineers to issue nationwide permits. According to the law, the Environmental Protection Agency (EPA) and Army Corps have concurrent jurisdiction over the dredging and filling of US waters. However, at the same time, the Fish and Wildlife Service (FWS) of the Department of Interior has an important advisory role to those agencies (Silverberg and Dennison 1993). In contrast, in Taiwan, several are major agencies "concerned" with wetlands and coastal zones including the Ministry of Interior (MOI) (coastal zone management, land development), EPA (overall environmental management, environmental

impact assessments), Council for Agriculture (fisheries, mangroves, nature conservation) and the Tourism Bureau of the Ministry of Transportation and Communications (scenic areas) (Chiau 1998). As stated earlier, the issue of wetlands has not yet become one of the major issues on Taiwan's administrative agenda owing to the absence of a clearly defined administrative directive body. The agency which should be fully in charge of the management of wetlands still remains undecided. Thus, framing an official definition or delineation criteria in legislation, clarifying the responsibilities of related agencies, or designating an exclusive authority to handle wetland management have not been achieved.

If an agency, say the MOI or EPA, is assigned to take the lead, it must promptly develop an integrated program with which other agencies must comply. Since Taiwan's EPA is in charge of environmental impact assessments, the author recommends that this agency develop the overall guidelines to protect the wetlands.

3. Establishing a management system for important wetlands

As adopted in many other countries, the delineation and establishment of protected areas have been regarded as the most efficient and the most effective methods to protect important wetlands. Based on the environmental inventory discussed earlier, Taiwan is urged to classify and prioritize its various wetlands for proper management. Currently, some wetlands are promulgated by the local governments of Taiwan to be city parks or protected areas. The Kuandu Wetland of Taipei City, the Niaosung Wetland of Kaohsiung County and the Szutsao Wetland of Tainan City are three examples. However, until recently very few other protected areas have been subject to strict management plans. The establishment of a wetland protected area needs scientific planning and careful management. In addition to a rational land use plan, ecologically sound and effective management measures must be set forth simultaneously.

4. Promoting environmental education and training on wetland protection

The achievement of the management of the wetlands depends on the government's willingness to protect them, on scientific research into their ecological features and on the environmental ethics of the general public. Until the true value of wetlands has been recognized, the management of these areas cannot achieve the established goals. In order to encourage each person to take the initiative to protect our natural resources, environmental education is a long-term yet fundamental step in wetland management. The agencies concerned are encouraged to publish adequate brochures, pamphlets and/or books and make better use of various media to

build awareness of wetland conservation. Additionally, environmental education programs on the issue should be provided for the general public, school teachers, community leaders, elected legislators and other associated parties. A on-going, hands-on capability-building program for local officials should also be provided to achieve better management of wetlands.

5. Establishing an essential environmental information system

For many years, scientific data on environmental affairs in Taiwan have been collected on a project-by-project basis. Few of projects have been systematically inventoried. While reducing the usefulness of such data, this has also hindered the effectiveness of various environmental bodies. Thus, there is a necessity to establish an information system on wetlands for routine management, thereby making all the documentation collected conveniently accessible for the use of all parties concerned.

6. Facilitating international cooperation

The wildlife and ecosystem do not respect man-made boundary. Therefore, the international cooperation on wetland conservation has been deemed as an important issue in the Asia-Pacific region. It can facilitate the exchange of information and experience on wetland conservation as well as improve the performance of wetland protection on the regional scale. This is particularly true in Taiwan for its inexperience on wetland affair and isolated situation in terms of international politics.

V. Concluding Remarks

Wetland protection is still in its infancy in Taiwan. More research on this issue is essential and should be urgently encouraged by the related agencies, such as the NSC and the EPA. In particular, the facilitation of the dissemination of wetland knowledge and information, improvement in the coordination and integration among related the agencies and the strengthening of the effective mechanisms in the protection of precious resources are urgently needed in Taiwan. In other words, the protection of wetlands in this country should seriously involve the proper institutions of the authorities. In addition, more effective communication channels among politicians, academic communities, developers and project managers and the public should be developed. It is mandatory that an open forum and/or integrated mechanisms be established. The international cooperation is also needed to raise the public awareness and to exchange the information and experience. However, the establishment of "ecocentric" ethics may be the most important key point as well as the most severe challenge to "reshape"

our notions of wetlands.

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