MANAGEMENT OF GRAZING IN WETLANDS

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Summary

The periodically exposed areas of grass and herbs characteristic of many freshwater wetlands are well known and appreciated pastures that have been utilized by herdsmen and shepherds since the beginning of mammal domestication, started ~7000 years ago. An important ecological feature of many freshwater habitats, such as shallow lakes, swamps, and marshes, is their periodical fluctuations in water level. These seasonal changes in water level expose highly productive soils and patches of grass, herbs, or algae that are particularly rich as feeding ground for wild grazers as well as for livestock and which are the object of *en masse* feeding migrations of cattle, sheep, and goats herded by humans. Grazing in wetlands is often conducted on a subsistence as well as on an extensive or semi-extensive basis and, apart from a few cases, is not considered one of the major threats to wetlands. However, both the worldwide trend leading to the conversion of extensive livestock rearing into intensive livestock rearing, and the high population growth taking place in tropical regions, can put stronger grazing pressure on many wetlands and their limited resources. For these reasons, further conservation plans of wetlands have to take grazing into consideration as an important pressure. The value of wetlands as local grazing lands must be put within a holistic frame, capable of balancing the local economical issues with the more general (and sometimes difficult to measure in economic terms) ecological functions performed by these biological systems. The case studies presented in this overview show that traditional, extensive, livestock rearing can coexist with plans addressed to conservation, by means of a form of partnership, comanagement, between local users and the state.

1. Wetlands as Grazing Grounds

Productivity levels of freshwater–wetland ecosystems are among the highest in the world and this productivity can support an astonishingly high number of animal species, often forming very dense populations. Although the ecological definition of primary productivity is fairly a recent one, its material meaning in terms of quantity of grass and herbs, and of their quality as food, have been well known to herdsmen and shepherds since the beginning of mammal domestication, ~7000 years ago. In fact, an important ecological feature of many freshwater habitats—which are spread throughout all continents except Antarctica—and common to a wide range of habitats, such as shallow lakes, swamps, and marshes, is their periodical fluctuations in water level. During either dry seasons or dry periods lasting as long as several years, water-level fluctuations expose highly productive soils and patches of grass, herbs, or algae that are particularly rich as feeding grounds for wild grazers as well as for livestock. Any area of temporarily submerged swamps and marshes, and any shoreline of lakes that undergo strong periodical changes in water level, can support two different faunas at different times of year, or of their peculiar cycle, and livestock can exploit new food resources not available for them during the unfavorable seasons and periods.

Since the beginning of mammal domestication, the periodical exposure of good grazing lands within the wetlands led to *en mass* feeding migrations of cattle, sheep, and goats herded by humans and this still occurs in some parts of the world. As already pointed out, the periodical changes in water levels can occur on a seasonal basis, such as in the semiarid areas of the Eastern Asian and Southern American plateaus, or on more undetermined basis, such as the case of the Sebkhas, the shallow, salty depressions of the arid climates of Northern Africa that regularly dry out for several years at a time. In both cases, the local communities of herdsmen have a long history of coevolution with the cyclic changes in water level; they are well aware of the broad temporal patterns of water changes and learned when to use the wetlands as grazing lands. For this reason, shallow freshwater habitats have become important grazing resources on which herders rely, sometimes feeding spectacular numbers of livestock. In the inner delta of the Niger River, for instance, some 500 000 people move to the floodplains for postflood dry season grazing, together with about one million sheep and about the same amount of goats. Furthermore, the Kaufe Flats of Zambia, known to be one of the most productive habitats of the world in ecological terms, sustain not only 30 000 Kafue Lechwe antelopes, *Kobus leche kafuensis*, but also a high number of cattle, traditionally led by the local herdsmen to graze on the highly productive vegetation and not conflicting with the wild grazers.

Wetlands, with their patterns of water fluctuation, should thus be considered an important resource for livestock rearing in most of the world environments, but they are crucial for subsistence livestock rearing in harsher tropical and subtropical environments. In the Northern African and Arabian deserts, for instance, camel and sheep rearing is totally dependent on permanent wetlands, such as oases, and temporary freshwater systems, represented by Sebkhas and Playas, both of which are low, flat, barren areas from which rainwater quickly evaporates, often leaving behind deposits of salt. Another harsh environment (described in Section 1.1.) where seasonal ponds and

marshes are the only possible feeding grounds for domesticated camelids and sheep is La Puna, the High Andean Plateau of the Central Andes.

1.1. Wetlands and Traditional Seasonal Grazing: La Puna, Argentina–Bolivia–Chile–Peru

La Puna, the High Andean Plateau of the Central Andes, is shared by Argentina, Bolivia, Chile, and Peru at an altitude of 3500–4000 m. It is a cold, desert region characterized by extreme temperature variations, due to intense solar radiation and strong winds. The average annual temperature does not exceed 10 °C, while the rainfall is ~500 mm y^{-1}. Three ecological units can be distinguished on an altitudinal basis: prepuna, dominated by small sparse woods of the column-like cactus cardón (*Trichocereus* sp.) and the tree churqui (*Prosopis ferox*); Puna *sensu stricto*, characterized by steppes of grasses and hard-leaf tola (*Parastrephia* sp.) and scattered queñoa forests; and the high Andean region, with largely exposed rocky soils with grasses and cushion plants adapted to these drier conditions.

Many of the rivers flowing to downstream forested regions originate here, but others end in lakes and *salares*, salt basins of different sizes, never reaching the sea. The water volume of all streams and water bodies varies between the drier winter season and the wetter summer season, with rains and snowmelt occurring between October and March. Some wetlands are shallow and contain saline and hypersaline water, where diatoms dominate the planktonic flora. Other water bodies are real lakes, only slightly saline, and have abundant submerged vegetation and a rich zooplankton diversity, especially in terms of crustacean species. During the dry season, the natural shrinkage of these latter wetlands exposes a cover of macrophytes and algae called *colcha* on which domestic animals feed. Other less common types of wetlands to be found in La Puna are the *bofedales*. These high-altitude peatlands are flooded by surface water or filled up by the upwelling of underground fresh water. Their vegetation is compact and cushion-like, composed by various species of grasses, rushes, and sedges, which remain green almost all year. These peatlands are crucial sources of food for wild and domestic herbivores and they serve as water reservoirs, especially during the dry season.

Throughout La Puna, some important wetlands are considered of international importance as reservoirs of biodiversity and thus they have been or are being designated as Ramsar sites: the Laguna Colorada (Bolivia); the Salar de Surire National Nature Monument and the Lauca National Park (Chile); and the Laguna de Pozuelos National Nature Monument (Ramsar Site and Biosphere Reserve) and Lagunas Vilama and Pululos (Argentina). In fact, the threatened vicuña (*Vicugna vicugna*) and the Puna Rhea (*Pterocnemia pennata*) graze on the steppes and *bofedales*. The Andean Condor (*Vultur gryphus*) is also common and it feeds on dead llamas. Yet the greatest biodiversity is associated with the lakes and *salares*; the great variety and number of birds, many of them endemic to La Puna, is particularly striking.

The designation as Ramsar sites, and the consequent protection, of these rich wetlands were made necessary by the various threats these endemic habitats are experiencing. Trees and bushes are used for fuel in homes and mines and as material for building enclosures and houses. However, the growth of many of these plants is slow and the

loss of vegetation cover due to both cutting and overgrazing increases the erosion of the poorly developed, fragile soil.

Severe aridity, with drought periods that can last several years, is frequent and can cause the disappearance of some of the wetlands and the reduction of others. In addition to this natural process, wetlands are facing other threats: siltation, drainage, and pollution of the water. Siltation is the result of the accumulation of sediments carried by the water as part of natural processes and the loss of soil due to human activities (e.g., loss of vegetation cover through firewood collection and overgrazing). Mining and salt extraction are contributing to wetland pollution or the loss of wetlands as large amounts of water are used to process the minerals.

On La Puna, extensive livestock rearing (camelids and sheep) and mining are the main activities, while potatoes, corn, and other crops are grown in some areas. The Spanish invasion dramatically changed the social system, transforming sedentary farmers into seminomadic shepherds and introducing domestic sheep and goats to the llama ranges. Shepherds build *pircas* (rock enclosures forming paddocks or corrals where pastures are managed) around *bofedales*, to manage the use of these rich pastures by livestock, and these paddocks can be seen scattered throughout the landscape. Since that dramatic change, animal grazing has been associated with the wetland cycle as animals are moved to higher or lower areas to take advantage of the seasonal changes in vegetation growth. For example, the *colchas* might be used during the winter while the *bofedales* in higher areas are used in the summer.

2. Grazing in Wetlands: Should This Threat Be Prohibited?

Livestock grazing on wetlands is often conducted on a subsistence as well as on an extensive basis and, moreover, grazing pressure is present only on a restricted part of wetland types: coral reefs and mangroves, for instance, are not under such pressure. Thus grazing is not considered one of the major threats to the world's wetlands. However, there are some sound reasons to take this human-controlled activity into consideration in future management plans regarding wetlands. First, it must be pointed out that in temperate regions there is a trend leading to the conversion of extensive into intensive livestock rearing and this trend can put more pressure on temperate wetlands.

The second point to take into consideration, mainly related to the use of tropical and subtropical freshwater systems, is that the low pressure due to the presence of extensive rearing will be counterbalanced by the high population growth of these regions and the constant desertification trend present in many tropical regions that will led more and more people to rely on less and less water resources and wetlands. Moreover, in these tropical regions, grazing of herds cannot be simply banned from threaten wet areas, because the local communities may rely on herds for their subsistence, and preventing them from using these pastures will reduce their chances of survival. Thus, management plans for wetlands cannot ignore the management of herds and their grazing potential.

On the other hand, it cannot be disregarded that wetlands are not just important grazing lands, but that they also provide ecological functions of decisive importance for the environment, they supply a large variety of resources for communities (of which food

for herds is to be considered a minor one) and, last but not least, they are actually threatened by unwise human exploitation in many parts of the world. Thus, their conservation, sustainable management, and wise use are of primary importance both from a worldwide and a local point of view, and grazing activities must be taken into account as a part of this holistic view.

Another serious problem in developing management plans for wetland resources is the enormous variety of wetland types and characteristics; for example, a sustainable management plan for coral reefs cannot be simply transferred to a temperate bog system, and vice versa. Starting from this point, an important first step towards a common approach to wetland systems was the adoption of the Convention on Wetlands of International Importance, signed at Ramsar, and thus commonly known as the Ramsar Convention. The primary ecological role considered in the first wetlands management plans after Ramsar Convention was their function as waterfowl habitats with biodiversity of global value and the main rationale of those plans was to aim at wetland conservation as biodiversity reservoirs. This approach led to conservation plans often based on designation of protected areas, which, in the initial stages, did not consider the socio-economic importance of wetlands for local people and did not legitimize traditional wetland use, thus preventing neighboring communities from accessing the resources that were part of their life. The effect of ignoring local users, which in many freshwater habitats were represented by herders, was particularly crucial in tropical regions, where, as stated above, marshes and swamps are utilized by subsistence users. Moreover, traditional and extensive grazing by cattle had in some cases been well established for decades and became important for the ecosystem as a whole and for the food web of the ecosystem itself, such as the case of Palo Verde wetlands.

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Biographical Sketches

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