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Classification and Characterization of the Sustainable Wetland Bello Horizonte

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Abstract

This research seeks to generate the classification and characterizationof the sustainable wetland Bello Horizonte according to the Ramsar Convention, due to the information gaps it presents, is used satellite images of the Google Earth Pro, are analyzed and overlap of the study district geographical layers, identifying vegetation cover, land use, hydrology, ecosystems, and climates using geographic information systems. The benefits for the promotion of its conservation as a natural resource and fragile ecosystem could be reached with more research and potentization in a sustainable way, such as the implementation of clean technologies for its conservation, maintenance, recovery, and income generation as a future place with great tourism potential, according to Peruvian National Forestry and Wildlife Authority (SERFOR) and the Peruvian Ministry of Environment (MINAM), and that provides ecosystem services to the populations, the main one being the provision of water in a coastal and desert zone, it is the habitat of different species of flora and fauna; the methodology applied is based on the collection of field information and the systematization of data through a geographic information system.

Keywords; *Classification, characterization, wetland, GIS, clean technology, ecosystem, sustainability.*

I. INTRODUCTION

Wetlands are considered the "link" between systems that are not completely aquatic and terrestrial. The Ramsar Convention defines them as “those extensions of marshes, swamps, and peat bogs, or surfaces covered with water, whether natural or artificial [1], permanent or temporary, stagnant or ordinary, sweet, brackish or salty, including extensions of seawater whose depth at low tide does not exceed six meters.

The ecological functions of the wetland that derive from its hydrological, geological, biological, and chemical characteristics are useful and important for man, constituting ecological values. Some of the recognized functions and values include habitat for wildlife and aquatic life, teaching and research sites, recycling and transformation of nutrients, alteration of flood flows, aquifer recharge, particle retention, high productivity, recreation, and stabilization ground [2].

According to the Ramsar Convention Manual, in 1990, the Conference of the Contracting Parties approved a mandatory "Wetland Type Classification System", which it later amended. The system identifies 42 types of wetlands, grouped into three categories, 12 called "marine and coastal", 20 called, "continental" and 10called "artificial". [3]

A methodology of recent use for landscape-level work, whether to detect current coverage or changes over time, is Geographic Information Systems (GIS) [4]. Several studies have used this tool in the field of wetland analysis to highlight its benefits as well as allow the evaluation of vast areas as well as the direct measurement of land use changes induced by

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human activity [5] [2]. The purpose of this study is to determine the classification of the Bello Horizonte wetland.

II. MATERIALS AND METHODS

2.1. Study area

The Bello Horizonte wetland belongs to the buffer zone of the Villa Pantanos. Located south of the city of Lima, between the districts of Chorrillos, Santiago de Surco, San Juan de Miraflores, and Villa El Salvador, in the province and department from Lima, as in figure 1 shows, It has an area of 4 424 m² and a perimeter of 1057 m.

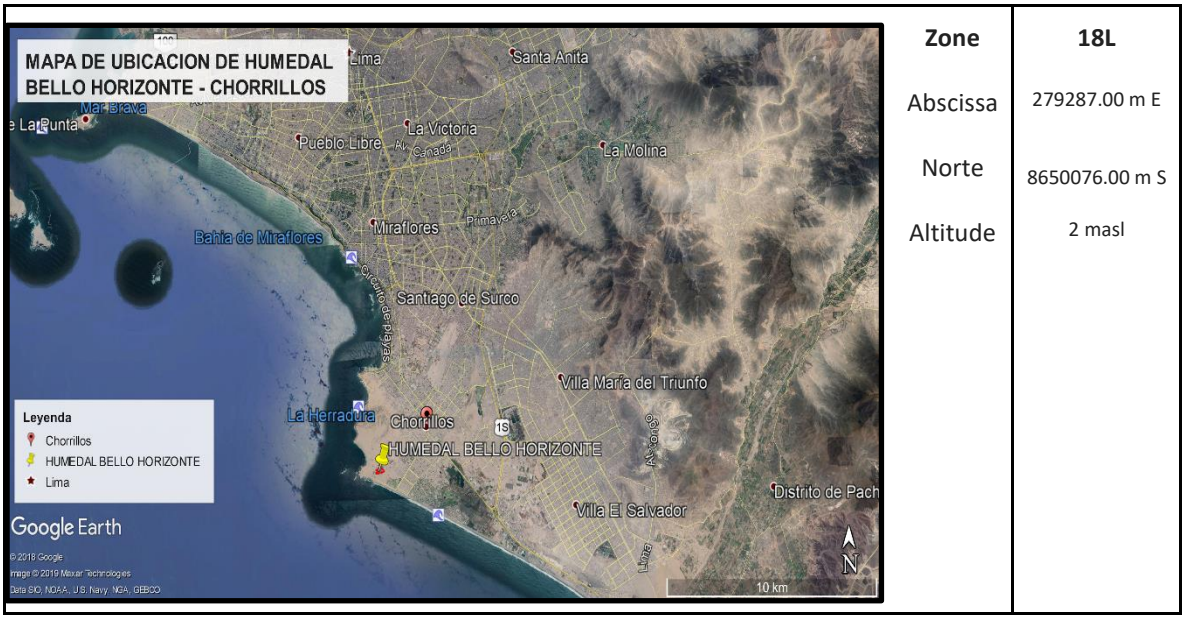

Figure 1. Location of Callao, location map of the Wetland in the district of Chorrillos, Lima. Google Earthand UTM Location of Bello Horizonte wetland

The criteria for classifying wetlands are described in figure 1, according to the Ramsar subsystem classification [3].

Table 2. Criteria for the classification of wetlands in the state of Tabasco (Ramsar subsystems).

Category	Criterion
Coastal wetland (subsiste-mas F e I)	Coastal surfaces with the influence of seawater up to 20 km from the coast (estuaries and coastal lagoons), with Solonchack and Histosoles soil; halophilic vegetation: mangrove, saline pastures, and floating vegetation.
Riparian wetland	Own surfaces of the perennial rivers, of the third and fourth-order, with Fluvisoles soils; gallery vegetation Salix Humboldtian(willow).
Lake wetland (subsystem O)	Areas of continental lagoons over 100 ha, with Gleysoles and Histosoles soils; floating hydrophilic vegetation.
Palustre or bread wetland tano (Tp subsystem	Flooded, shallow areas of freshwater, with Histosoles and Gleysoles soils; emerging hydrophilic vegetation.

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2.2. Hydrological aspect

The Rímac aquifer also reaches groundwater through the Surco channel (north to south) and through the area called Villa's neck (formed by Cerros Morro Solar and the Zig Zag hills), however[6], the runoff from the Rímac waters Through this neck is decreasing. Water arrives from the Swedish canal, but only regularly from January to March since its primary use is agricultural. This channel1 is contaminated with sewage.

Figure 2. Distribution of the Surco river, on the left bank of the Bello Horizonte wetland

2.3. Soil Appearance

The study area is located on the left bank of the lower part of the Rímac river valley. The coastal "plain" has swamp units with poor drainage soils and water table outcrop very close to the surface.

The soils present imperfect drainage, slow surface runoff, no risk of erosion, are susceptible to flooding, and have an effective root depth of 65 cm.

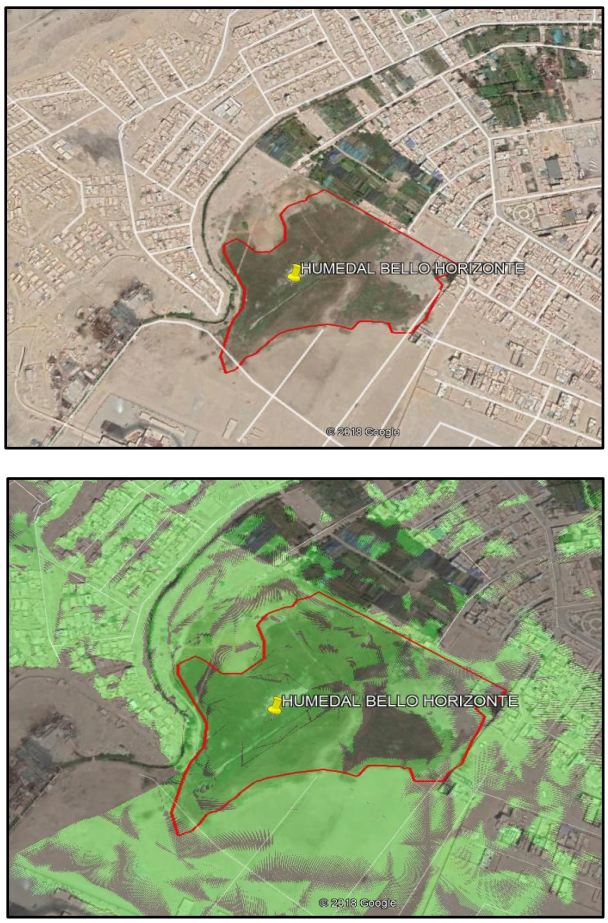

Figure 3. The limiting factors are topography, poor drainage, and salinity (from strong to very strong).

2.4. Vegetation aspect

According to the research carried out, the vegetation cover map indicates that the study area is in the coastal desert zone, despite being in that area, it has hydrophilic flora, such as saltgrass (Distichlisspicata), small areas of totorales (Schoenoplectuscalifornicus), scarce shrub species.

In times past in this area, we can find a variety of hydrophilic flora, ivy, bowling, ephemeral herbs, and vegetation with less foliation due to the humid environment of the place[7].

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Groundwater motivates the presence of water outcrops (springs), but the excessive exploitation of aquifer waters is causing the almost total disappearance of these springs.

Figure 4. Distribution of the study area in the coastal desert vegetation cover.

III. METHODOLOGY

The research presents a qualitative approach since bibliographic references and interviews taken in the field were examined to establish a relationship between them and determine the strength of association between the variables with which one is going to work.

This work was carried out by analyzing satellite images of the Google Earth Pro, overlapping district geographical layers, vegetation cover, land use, and hydrology, using the ARC GIS 10.5

For greater ease, the area of the Bello Horizonte Wetland was delimited first in the Google Earth Pro; the image was exported in KMZ format, then converted to shp format, to be able to export it to the ARC GIS and thus be able to visualize the previously delimited area, then superimposed the previously mentioned layers, the superposition of this cartographic information allowed to classify the wetlands under the categories proposed by Ramsar.

IV. RESULTS

Through the "System of Classification of Wetlands Types" of the Ramsar Convention Manual, the search for satellite images through Google Earth and the superposition of layers, joining the different types of geographical bases allowed to delimit the wetlands, we first obtained an area of 44 424 m² m² and a perimeter of 1057 m.

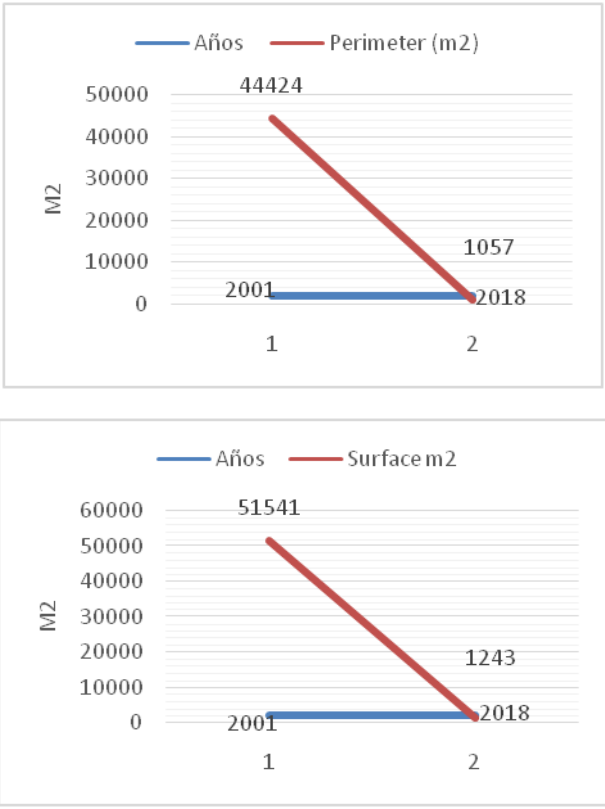

Figure 5. Behavioral trend of areas of the loss of wetland coverage.

Figure 5. Distribution in 2001, the midle Figure distribution in 2018and the last figure Superposition of areas for visualization of the loss of wetland coverage.

Therefore it was determined that the area is in the coastal desert area[3], [8] having a vegetation cover composed mostly of saltgrass (Distichlisspicata), small areas of totorales (Schoenoplectuscalifornicus), few shrub species, but due to population growth these areas have been reduced and, above all, degraded.

Where great loss in the surface was obtained using the superposition of areas by satellite images in the year 2001 and the year 2018 making a comparison of the distribution as the show in the figure 8.

As for the hydrological aspect of the Rimac aquifer, groundwater arrives through the Groove channel

(north to south) and through the area called Villa's neck. However, the runoff of the Rimac waters through this neck is decreasing[9]. Water arrives from the Swedish canal, but only regularly from January to March since its primary use is agricultural.

The soil was determined that the coastal plain has swamp units with poor drainage soils and outcrops of the water table very close to the surface. The soils present imperfect drainage, slow surface runoff, without risk of erosion, are susceptible to flooding. The limiting factors are topography, poor drainage, and salinity (from strong to very strong).

Therefore, having this information, it was determined that the Bello Horizonte Wetland is of the class of marine / coastal Wetlands, in the classification of water types, they are found in estuarine waters (subsystem F), being its category of Water Wetland estuarine, because the study area is located on the left bank of the lower part of the Rímac river valley and being very close to the sea, by infiltration of the waters, they manage to converge. Therefore the water is mixed Sweet river and saltwater of the sea.

V. CONCLUSIONS

The classification and characterization of the Bello Horizonte wetland in the district of Chorrillos is a first step to know the level of importance that these bodies of water have in the conservation of the biological diversity that it houses.

On the Peruvian coasts, there are small bodies of water, which over time have formed ecosystems that provide various benefits, despite this not enough research is done, thus having information gaps, mostly geographic, impeding the dissemination of information.

Demographic growth is also one of the sources of pressure that generate great impact on these coastal wetland ecosystems, given that there is no good territorial planning in the country, and the lack of environmental education that exists in the population, by becoming aware of all the ecosystem services they provide, these would be better preserved and not reach the point of degradation and even the disappearance of these ecosystems.

The use of Google Earth and GIS allowed the classification of the Bello Horizonte Wetland, facilitating the analysis of information acquired, for later this information is helpful for the study of flora, fauna, land uses, hydrology, conservation, and recovery of the ecosystem.

VI. RECOMMENDATIONS

It is recommended to continue with the research to generate more information and fill in these existing gaps sincethe time of the investigation, little information was found in the area where the study was conducted.

Provide environmental awareness talks for the recovery and conservation of the Bello Horizonte Wetland.

Implement remediation models with the use of clean technologies, to avoid their total degradation of the coastal zone.

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