



Widespread introduction of constructed wetlands  
for a wastewater treatment of Agro Pontino

LIFE+08 ENV/IT/000406

## CIRCEO NATIONAL PARK

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### ACTION 4.2

## REPORT ON THE STATUS OF COASTAL WETLANDS

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### Ecological and ecosystem aspects of "Pontine" wetlands

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## REPORT ON THE STATUS OF COASTAL WETLANDS

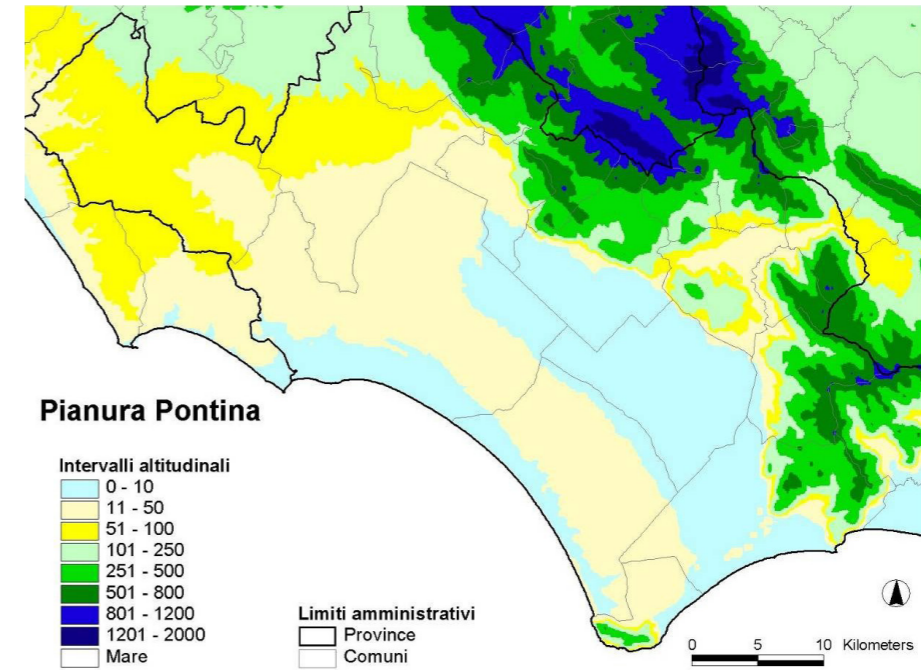


Fig. 1 Morphology of the study area and the surrounding territory. The parts comprised within 0 and 50 m a.s.l. delimit more or less the entire Pontine Plain.

<sup>1</sup>The Pontine Plain (or “Agro Pontino”) is a portion of southern Latium bounded by the volcanic complex of Colli Albani on the North, the Lepini-Ausoni Mountains on the East and the Tyrrhenian Sea on the South and West. If we take the 50 m a.s.l. contour line as its border, the plain has an area of 900 sq. km. (fig. 1).

It is a plain with alluvial and eolic origin, with more depressed areas at the base of Lepini-Ausoni Mts. and higher areas between Latina, Sabaudia and S. Felice Circeo – where the Pliocenic “ancient dune” is located – with a maximum height of 50 m a.s.l. Between this latter part and the sea, there is a flat strip of low and plain land, partially covered by the four coastal lakes (Fogliano, Monaci, Caprolace and Paola), the adjacent marsh areas, and the current dune belt.

In the past, most of the area, especially in its lowest parts, was covered by extensive wetlands, caused by the topography, the poorly permeable substrates, and the large amount of water coming from the surrounding moun-

<sup>1</sup> This document is a summary of the Italian version.



Fig. 2 Excerpt from the Hydrographic Map of Italy of 1895.

tains. The “Pontine Marshes”, where the human presence dates at least to 50,000 years ago, have been subject to several reclamation campaigns, in the pre-Roman and Roman eras, and then from the Renaissance to the present. The last of these campaigns has been carried out during Fascism, and has given rise to the current shape of this territory, by extending the system of the “migliare” roads – parallel roads distanced one mile from each other, each associated to a main drainage canal –, which, in the second half of the XVIII century, were built across the land comprised between the Via Appia and the mountains (fig. 2).

This functional arrangement remained as a reference layout for all the following initiatives, and was the base of the land reclamation of the Twenties/Thirties. At that time, the environment was still inhospitable and dangerous caused to malaria, but it was a resource for the landowners and the communities living on the surrounding hills, who made use of many parts of it as collective resources (“università agrarie”).

More recent interventions have extended the road and infrastructure net-

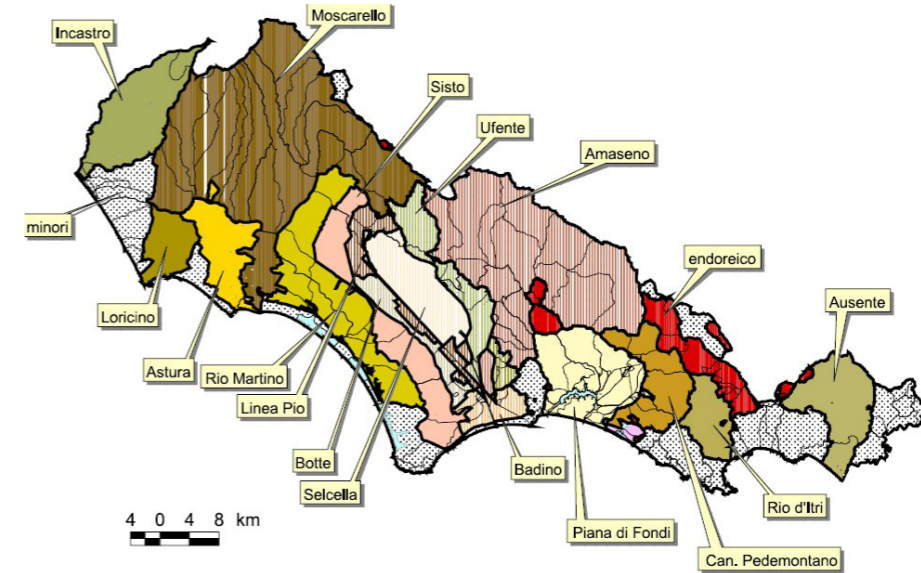


Fig. 3 System of the hydrographic basins of the Province of Latina (Gazzetti et al., 2010).

work, and have led to a considerable increase of urbanisation and industrialisation, also in agriculture, with effects not only on landscape, but also on the lowering of the water table, and on water, air and light pollution.

The hydrographic network of the Pontine Plain is made of watercourses of limited length, fed by small basins, the largest of which is the one feeding “Canale Portatore”, and deriving from the basins of the rivers Amaseno and Ufente and the canals Selcella, Linea Pio, Pedicata and Botte. (fig. 3).

The second basin is the one of “Canale Moscarello” (also known as “Acque Alte”), draining part of the Northwest slopes of the Lepini Mountains and the South and West slopes of the Colli Albani, flowing into the sea at “Foce Verde”. This basin comprises part of the old basin of the Astura river, which has been “cut” by the “Canale Allacciante Astura” during the land reclamation. Currently, the basin of the Astura river is indeed very small.

As regards the hydraulic regimes, there are basically two typologies:

- the watercourses of the carbonate ridges and of the slopes of the Colli Albani volcanoes, characterised by an extremely variable torrential re-

gime, but becoming perennial watercourses down in the plain, thanks to the contribution of spring waters, with flow rates varying between a few dozens of litres per second and more than 15 cubic metres per second, and flood flow rates of about some dozens of cubic metres per second;

- the network realised in the Pontine Plain through the land reclamation: its hydraulic regime is almost completely regulated by the systems of canalisation, regulation and pumping managed by the Consorzio di Bonifica.

As already said, the hydrography of the Pontine Plain has undergone a remarkable transformation through the centuries, in particular as a result of the land reclamation carried out after the proclamation of the “Serpieri” law in 1928.

The Pontine Plain is also served by an internal hydraulic network, needed for the direct drain into the sea through a number of canals:

- Collettore Acque Medie;
- Rio Martino;
- Canale della Botte;
- Canale Linea Pio - Diversivo Linea Pio.

81% of the Agro Pontino is drained through natural slope, while 19% is drained through pumping. The management of the reclamation works has been entrusted in 1996 to the “Consorzio di Bonifica dell’Agro Pontino”. Currently, the natural and artificial water network of the study area has a rather regular outflow regime; sudden increases in flow rates may occur in relation to exceptional rainfalls.

The land reclamation activities have also affected the coastal lakes, in particular the lakes of Fogliano, Monaci and Caprolace, which have been dredged and rectified along their perimeters. Moreover, the watercourses that previously flowed into them have been connected to the artificial network of canals and ditches realised in order to drain the internal waters, giving rise to a gradual increase of salt concentration in the lake waters. In fact, these three lakes currently exchange their waters only with the sea, through a system of canals, the flow of the underground waters, and the human intervention (pumping of water). The works made on the banks and the modifications of the water exchange regime have seriously altered their chemical system and their hydrodynamic features, and as a consequence of this, their waters have become salty, with a salt concentration which is very close to the marine water, or even higher during some periods. All this has led to a modification not only of the lake ecosystem, but also of the ecosystems of many surrounding lake areas.

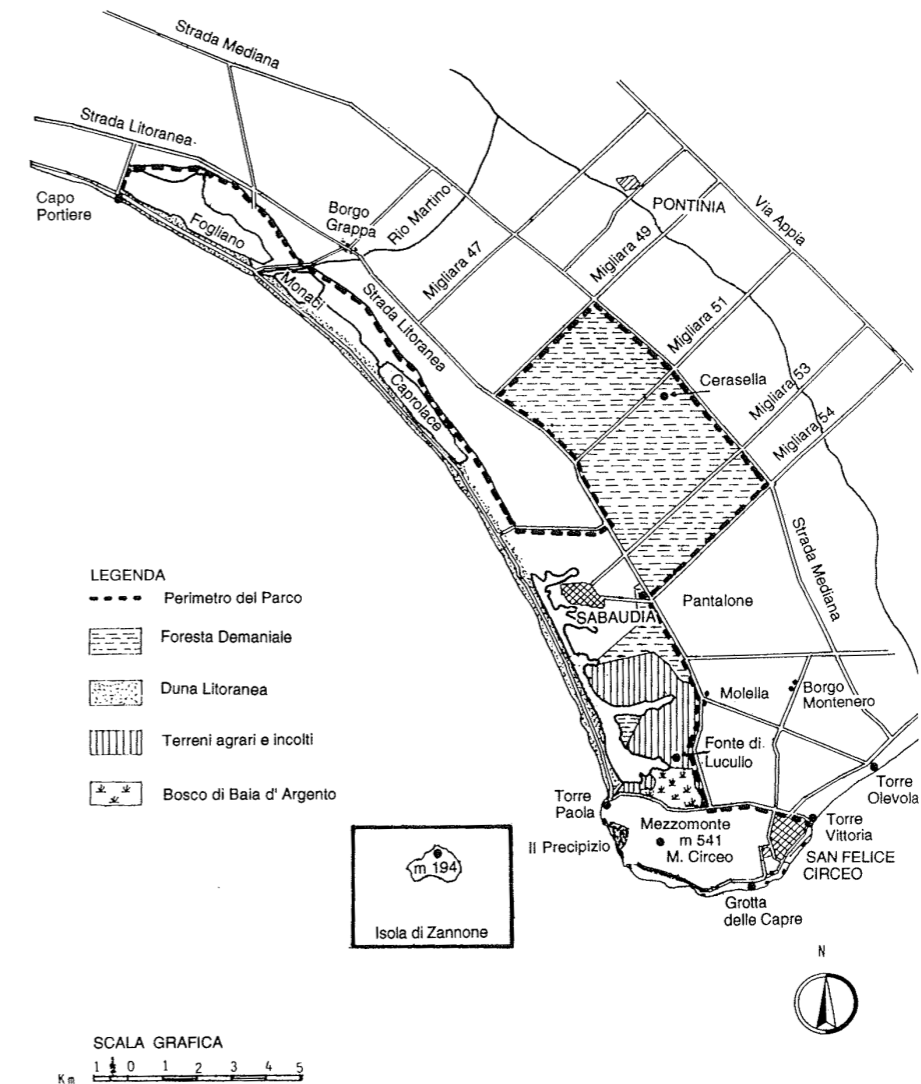


Fig. 4 Circeo National Park: perimeter and main features.

Unlike the other lakes, the Lake of Paola (also known as Lake of Sabaudia, the southernmost coastal lake) still retains its natural boundaries, with five deep inlets. The presence of a minimum influx of fresh water, through the ditches flowing into these inlets, allows the lake to maintain a moderate salt concentration (Fig 4).

There are, in the Pontine Plain, areas of great importance for the conservation of biodiversity. Among these, the Circeo National Park, established in 1934, is important both from the natural and the cultural points of view. It has an extension of 8,917 hectares (Fig. 4), and is characterised by a remarkable variety of environments and, therefore, is an important asset in terms of richness of flora and fauna.

Given the dimensions of its lakes and wetlands, the Park is an important element for the promotion of scientific researches and studies, and of compatible management activities and environmental education, within the purposes of the conservation of the Pontine wetlands. There are also five national natural reserves within the Park, with important restrictions on human activities.

Moreover, there are, in the Pontine Plain, different nodes of the Natura 2000 network: Sites of Community Importance (SCIs) and Special Protection Areas (SPAs), as established under Directives 92/43/EEC (Habitat) and 79/409/EEC (Birds), and important for the presence of habitats and species of Community interest and for the conservation of the wetland ecosystems and of the functionality of the ecological network. In the Circeo Park there are one SPA and seven SCIs – three of them are very important for the hydric habitats and the water species; also, there are four Ramsar areas, i.e. wetland areas which are internationally considered important for the conservation of water ecosystems and, in particular, of migratory birds; each of these areas is connected to one of the coastal lakes.

Moreover, the State Forest of the Circeo National Park has been defined as MAB Reserve (UNESCO Programme “Man and Biosphere”).

Among the protected natural areas, there is also the Natural Monument “Giardino di Ninfa” (Garden of Ninfa), comprising the “Ninfa” SCI.

There are also other constraints, giving restrictions to land use, in particular portions of the area.

All these protected areas are actually the “biodiversity reservoirs” of the Pontine Plain.

A recent national project has highlighted the value of the Circeo National Park in floristic and vegetational terms, including it in the Important Plant Areas network (Blasi et al., 2010b). The conservation of biodiversity is based, however, on the maintenance of the ecosystem functionality and efficiency in the whole area; therefore, besides the analysis of data made on species and habitats in single portions of land, a broader landscape assessment is necessary. Such assessment is, of course, less positive compared to the assessment

of the single protected portions of land which can be found in the Park. The important transformation of the natural landscape made through the repeated reclamation campaigns and the recent urban sprawl has led to an environmental fragmentation, and an isolation of those portions, which are more or less well preserved.

Given the considerable resilience of the plant communities of these environments, and the presence of a dense network of surface water, a reduction of the water pollutants and a redefinition of the management of the land along the rivers, canals and lakes would be enough for considerably increasing the quality of the ecosystems. This is of course not easy to achieve in such a broad area, but it is an objective to be taken into consideration if one wants to comply to the many norms aiming at the conservation of biodiversity (first of all, the European “Habitat”, “Birds” and “Water Framework” Directives).

The agricultural and pasture activities have a great influence on water quality, but it has to be said that traditional agriculture doesn’t eliminate the potentials for natural recovery of the land. Moreover, agricultural areas are, for some species (especially some animal species), important in terms of ecological connectivity, or even functional to their nutrition. On the other hand, the impact of the industrial or residential areas is negative in terms of water, noise and light pollution.

In order to be able to correctly assess the impacts on the ecological functionality in the Pontine Plain, in particular in the wetlands, and evaluate the state of conservation of biodiversity, it is necessary to carry out specific researches.

Some “knowledge gaps” will certainly be filled through the implementation of the actions of the Rewetland project, in particular through the preliminary analyses concerning the four pilot projects.



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