

## BRIEF DESCRIPTION OF CASTELPORZIANO ESTATE

The Presidential Estate of Castelporziano lies in Central Italy at the western outskirts of Rome, about 20 km from the city centre and in front of the Tyrrhenian Sea. The Estate ecosystem is well integrated with the urban and the marine environments. It is considered between the State reserves.

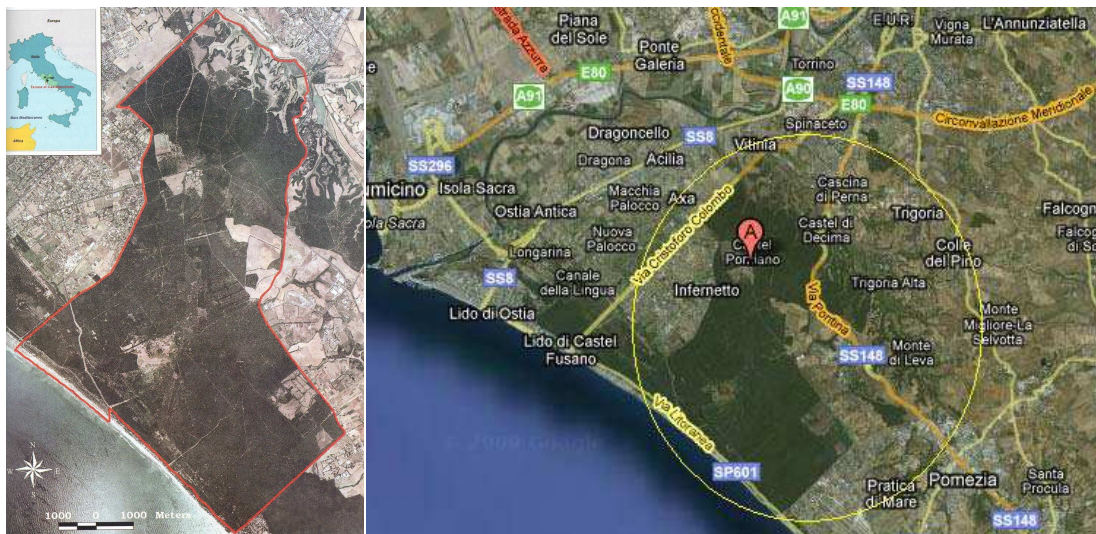


Fig. 1

### History

The whole area surrounding the Estate, as well as the property within the Estate itself, has significant historical importance. Under the thick vegetation one can easily find the remains of early Roman ruins and epigraphic slabs demonstrating the former existence of aqueducts, dwellings, imperial villas as well as villas belonging to great patrician families. As mentioned in books on Roman literature the whole area was used, during the Roman Empire, exclusively as a residential site. The most notable of these ruins are certainly those located not too far from the sea-side and still today showing the existence of the *Vicus Augustanus Laurentium* which reached its highest period of development and splendour between the 1st and 3rd centuries A.D. Later on the whole area, known as the “Laurentino” and geographically comprising also the Castelporziano Estate, slowly declined. The causes of this long decline can be found partly in the lack of proper sanitary conditions, originating from a deficient drainage system. This resulted in an area invested by mosquitos propagating a severe disease, malaria.

During the following period there were several different land owners who held title to parts or all of the Castelporziano Estate. Not all of them were private owners, some religious groups were involved as well. After a period of alternating events and a certain decline once again the Castelporziano Estate regained importance. This occurred during the ownership of the Del Nero family. This family having Tuscan origin has been ruling the Estate for three centuries (from 1561 to 1823); later on the Estate passed under the control of the Grazioli family who proved to be gracious and capable land owners.

It was during their landlords times that the Estate witnessed a vast improvement. Their activities took the form of a project: they upgraded the use of the land, applying timely techniques to the forests and the agricultural sections. They introduced new technical procedures and practises in order to better exploit the terrain. Furthermore significant restoration improved structure and architecture of the Castle.



Fig. 2



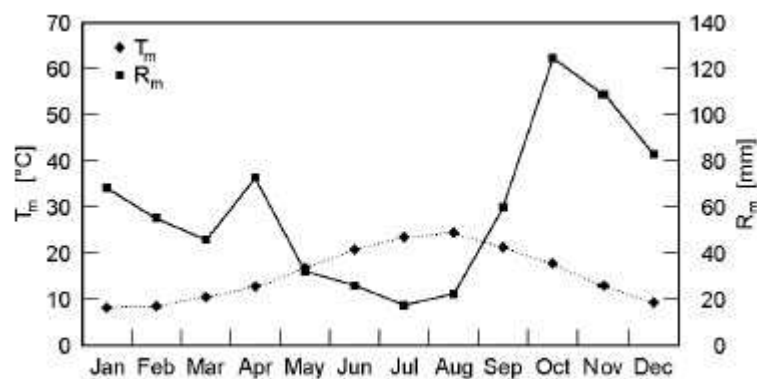
Fig.3

As a consequence the Estate became the residence, for short periods of time, of eminent persons of the period. Some of these were Alexander the Grand Duke of Russia, Pope Gregory XVI, Pope Pious IX and also Francis II of Naples. After the political unification of Italy the ownership of Castelporziano changed again. In the year 1872, when the area of the Estate was slightly larger than it is today, the deed of purchase (between the Italian State and the Castel's former owner, the Duke Grazioli family) was signed by the Minister of Finance. The Italian State acquired this estate and assigned it to the Royal Family. The aim was to use it for hunting and as a country residence serving also to entertaining foreign dignitaries when needed. In 1946, when Italy moved by the Monarchy into a Republic, Castelporziano became part of the property assigned to the office of the President of the Italian Republic. Castelporziano, used by the President mainly for State functions, has often been the meeting place for high level foreign dignitaries, (among the many guests at the Estate it is worth mentioning: President L. Johnson, Queen Elisabeth II of England, Marshal Tito, President Sadat and the Pope John Paul II). A meeting of the forest G8 under the Italian Presidency took place in its castle during 2001.

### Natural and environmental features of Castelporziano

The Presidential Estate of Castelporziano is mainly covered by forests representing the last remaining coastal vegetation strip of Lazio. After incorporating the area of Capocotta in 1986 it is 5.806 hectares wide. This is a Mediterranean ecosystem whose high ecological value has been noted at an international level (UNESCO) and in 1999 the Estate was recognized as Natural Reserve of the State by decree n. 136 of President of the Republic.

Castelporziano is an ecosystem having high naturalistic and environmental value due to the habitat biodiversity and richness of species. Thanks to the restrictions in the public access a number of Mediterranean ecosystem types has been preserved (e.g. *maquis* and *pseudosteppe*). Soil morphology is mainly flat with sandy materials, but the northern part is formed from volcanic and alluvial materials. In the Tyrrhenian coast the average minimum air temperature of the coldest months (January and February) is 4 °C and the average maximum air temperature of the hottest month (August) is 30°C. Total annual rainfall is 714 mm, and dry period is from May to August (98.2 mm total rainfall) (Fig.4).



**Fig. 4** – Climatic Diagram of Castelporziano Meteorological Station for the period 1985-2004. T<sub>m</sub> = Air month temperature; R<sub>m</sub> = total month rainfall (da Gratani & Varone 2006).

The progressive decrease of precipitations in the last years has produced large damages to some ecosystems in this area, in particular in the wet areas called “piscine”. The vegetation is typically Mediterranean bushes along the seacoast. Areas with reforestation of pines, as well as corkwoods, pastures, and small agricultural fields are also present. Castelporziano Presidential estate is considered of great natural, forest and landscape interest and the destination of this territory to Protected Area has requested a management based on biodiversity, multifunction vegetation and preservation of landscape. The aim of the management became therefore the conservation of the forest patrimony as well as the enhancement of the environment. In 2003, the Commission for Monitoring of the Estate, chaired by Prof. G.T. Scarascia Mugnozza, deemed it necessary a revision of the Management Plan for the territory of Castelporziano and to provide the territory of Capocotta with its first management plan. The criteria followed are different from those of traditional management plans aiming to achieve the maximum and even timber production. It was decided to take as a fundamental objective the natural

regeneration, which is a prerequisite for the conservation and sustainability of forests. On the entire area of the Estate, the forest or management classes identified are the following ones:

Classes	Castelporziano and Capocotta	Area (ha)
1	PINE FOREST	752
2	MESOPHILLOUS OAK FOREST	2306,5
3	HOLM OAK FOREST	261,4
4	MEDITERRANEAN MAQUIS	132,5
	MEDITERRANEAN MAQUIS WITH PREDOMINANCE OF HOLM OAK	554,7
5	CORK OAK FOREST	461,5
6	SPECIAL PLANTATIONS	72,6
7	HYGROPHILOUS STANDS	36,9
8	PASTURES	112,6
	AGRICULTURAL ZONES	453
9	ARID GRASSLANDS	662,6
	Total area (ha)	5806,3

The high degree of naturalness is shown by the presence of 5039 species of living organisms, including 1044 species of plants and 2918 species of animals, vertebrates and invertebrates, including 2380 insects. 115 rare plants have been also identified.

### Pine forest

Monumental pinewoods in Castelporziano are considered very interesting and they are composed by even and homogeneous stands whose age ranges from 73 to 142 years-old (Fig. 5). The forest management has to respect the ecological and biodiversity balance because of high environmental and landscape relevance of the site. In Castelporziano area the Italian stone pine (*Pinus pinea* L.) still shows a good growth performance and high adaptability to different environmental factors, despite the general degradation of this species by marine aerosol, forest fires and groundwater lowering occurring in other sites. The surface covered by these stands is about 752 ha (15% of the overall area). The pine-forests are located along the main roads and buildings. The largest cores are in two localities (Cerasolo and Dogana) with less significant portions in the north and south areas in a strip parallel to the coast, almost near the coastal dune sands for dune stabilisation and the protection by winds. The location of pine-forest, along the main roads, enhances the landscape function and represents one of the most distinctive features of Castelporziano. These stands have an artificial origin by seed sowing or plantation of seedlings and such regeneration was carried out between 1866 and 1987. *Pinus pinea* was chosen because its valuable production of pine seeds. These pine-forests are mainly pure stands but in some areas the pine-stone is associated with holm oak and rarely with deciduous oaks (Pignatti et al., 2001). The underwood is composed by typical shrubs of Mediterranean maquis (holm oaks, heathers, mastic trees, phillyreas, strawberry trees and buckthorns) with different density and development depending on the different climate conditions. The holm-oak is very spread and it is used like a subsidiary species in the reforestation activities.

The representative role of the Presidential Estate justifies such long silvicultural turns and it demands a specific protective management which, avoiding broad clearcuts, provides the leftover vegetation in the use of about 30% of biomass. Groups of 3-5 adult plants (merizzi) have been detected for seed spreading together with groups of interesting plants because environmental and landscape features.

With the Natural Reserve institution in 1999 the landscape and protective functions earned more relevance than the productive ones. In esthetic or monumental tree areas the turn is longer than the usual in the productive pine-forests (80 years). Four types of pine-forests have been identified:

- highly monumental landscape pine-forest: a “forest-museum” has been established to preserve the landscape and monumental function and these areas show the result of a careful forest management.
- highly naturalistic value pine-forest. These stands are characterized by relevant naturalness and biodiversity, tree and shrub species are preserved in order to obtain a mixed and uneven-aged stand.

- protective pine-forest. Such forests are located along the coast line to consolidate the sands and as shelter to the sea winds. The vegetative status of pine-stone plants is not optimal because of the proximity of the sea and the low soil fertility.

- productive pine-forest. In these plots the forest management ensures the cones harvesting and the production of a good quality wood at the end of the rotation period.

The biggest part of the monumental pine-forests (96 ha) has been established between 1892 and 1896. According to the traditional silviculture such plants should be soon replaced. The Forest Management Plan (2006) has identified some silvicultural methods with low environmental impact to have a more gradual replacement of stands. The clearcut system with reserves is the main silviculture treatment used for these pine-forests. It was expected to be issued about 30% of the existing plants within the plots under cut. Groups of 3-5 adult plants (merizzi) were chosen for seed spreading and to ensure a soil and renewal protection and the development of shade-tolerant shrubs.



**Fig. 5**

### **Natural ponds in the coastal damp environment**

Inside Castelporziano, there are two Sites of Community Interest (SIC): the coastal strip (IT6030027) and the hygrophilous oak wood (IT6030028). Wet areas called ‘pools’ are among the most important natural environments in Castelporziano. They are small closed basins, free of tributaries, with typical vegetation of marshes and surrounded by high forest species (Fig. 6). They show a high biodiversity and residual fragments of a vegetation once characterizing most of the Tyrrhenian dune flat. These ecosystems have almost completely disappeared because of land reclamation in the early decades of the twentieth century. In Lazio, as well as in Castelporziano, there are a few isolated examples in the Circeo National Park, in Palo Laziale, in the Forest of Foglino and in Torre Astura.

It is possible to distinguish two districts characterized by pools fed primarily by groundwater: one in the northern part of the Estate (Ortaccio, Malpasso, Ponte Ruffo) and the other one covering the inter-dunes depressions and coastal wetlands of Tor Paterno, the whole central part of the Estate is mainly characterized by pools fed by rainwater (Mecella, pers. comm.). The permanence of the groundwater is responsible for the spread of *Parvopotamion* associations, while the frequency of the flooding favors the *Lemnetea* and *Ranunculion* communities.

The pools host macroinvertebrates communities with a higher taxonomic differentiation than the other studied areas in Lazio, thus increasing the specific characteristics of the ponds studied in general and hence their conservation value. Many pools were monitored from 1996 to 2005, studying the stability, the quality and quantity of water levels; the results showed some differences between those in the dune recently developed and those placed in the ancient dune.

In Castelporziano wetlands have been severely reduced not only because of land reclamation carried out in the second half of the ‘800 by Savoia family, but also as a result of the lowering groundwater due to pumping groundwater from outside the Estate and to climate changes too.



To preserve these crucial areas the Direction of the Estate has taken action by creating new wetlands through excavation and closure of the water channels in various parts of the estate.

In these areas there are natural or artificial stands of *Fraxinus oxiphylla* and *Populus* spp. often combined with *Ulmus campestris*. Among these nucleus of hygrophilous vegetation we can see groups of holm oak or isolated pedunculate oak plants and sometimes species of Mediterranean maquis.

Hygrophilous species stands are high forest where ash grows in association with white poplar, aspen and elm. The density (127 ash plants per ha) and their development (43,7 cm of mean diameter at breast height and 22,7 m of dominant height) ensure a continuous canopy and a good vegetative status. No silviculture treatments are expected in the next decade but the implementation of long-term treatments to favour the renewal is necessary.



**Fig. 6**

### **Mesophyllous deciduous oak and Holm oak forest**

The forest surface of Castelporziano belongs to two large zonal biomes of the southern Europe: Holm oak forest and mixed deciduous oak forest. This last one is attributable to the *Quercion frainetto* alliance, where Turkey oak and Hungarian oak are the most important species of the dominant tree layer, while the Downey oak grows in the driest areas.

There are three silvofacies inside these oak stands:

- a) *Carpinus orientalis* silvofacies, where the canopy does not exceed 50% and the Easter Hornbeam creates dense thickets.
- b) *Erica/Phillyrea* silvofacies, appearing in areas covered frequently by fires in the past, heather and phillyrea, along with other evergreen species form an almost impenetrable maquis.
- c) *Laurus nobilis* silvofacies, which represents the most mature vegetation status with a continuous tree layer and the almost total disappearance of the inferior layer; this vegetation type characterizes more humid environments of ravines (*forre*) (Pignatti, 1998).

The forest ecosystems dominated by *Quercus ilex* L. are the typical elements that characterize the coastal areas of the Mediterranean basin, although at present the combined action of factors related to changes in land use and effect of fires resulted in the gradual transformation and fragmentation of primary forests. The Holm oak forest, as a result of the uses in the past decades and parcelling out activities of the '80s, are fragmented and located in the south-western Capocotta, near the border with Castelporziano and, marginally, in the coastal zone.

The forest structure is characterized by two layers: a dominant layer of holm oak trees, 13-16 m high, and a shrub layer of Mediterranean maquis. Several studies concerning carbon flux measurements have proved that the *Q. ilex* stand is a significant carbon sink, with an annual average of more than  $-550 \text{ gC m}^{-2} \text{ year}^{-1}$ , equivalent to 5.5 tons of carbon absorbed by each hectare of the holm oak stand.

In the total area covered by Holm oak stands (about 781,9 ha) in Castelporziano, the Mediterranean maquis with predominance of Holm oak is dominant, while the remaining area is divided between

high forest (117,5 ha) and coppice (109,7 ha). The coppice stands are divided into coppice (reserves per hectare>140) and coppice with reserves (reserves per hectare<140).

In general there are mostly irregular structures, not related to rational silvicultural systems carried out in the past. However the consistent presence of seed-bearing plants, over 90% of the Holm oak forest, ensures a good seed production and an high potential for the renewal.

In recent years the negative impact of wild fauna (*Dama dama*, *Sus scrofa mayoli*, in particular) on the natural regeneration of oak forests has been studied by several authors and the results showed that wild fauna prefers suckers and seedlings of *Quercus cerris* rather than the *Quercus* spp. ones.



**Fig. 7**

## Dunes

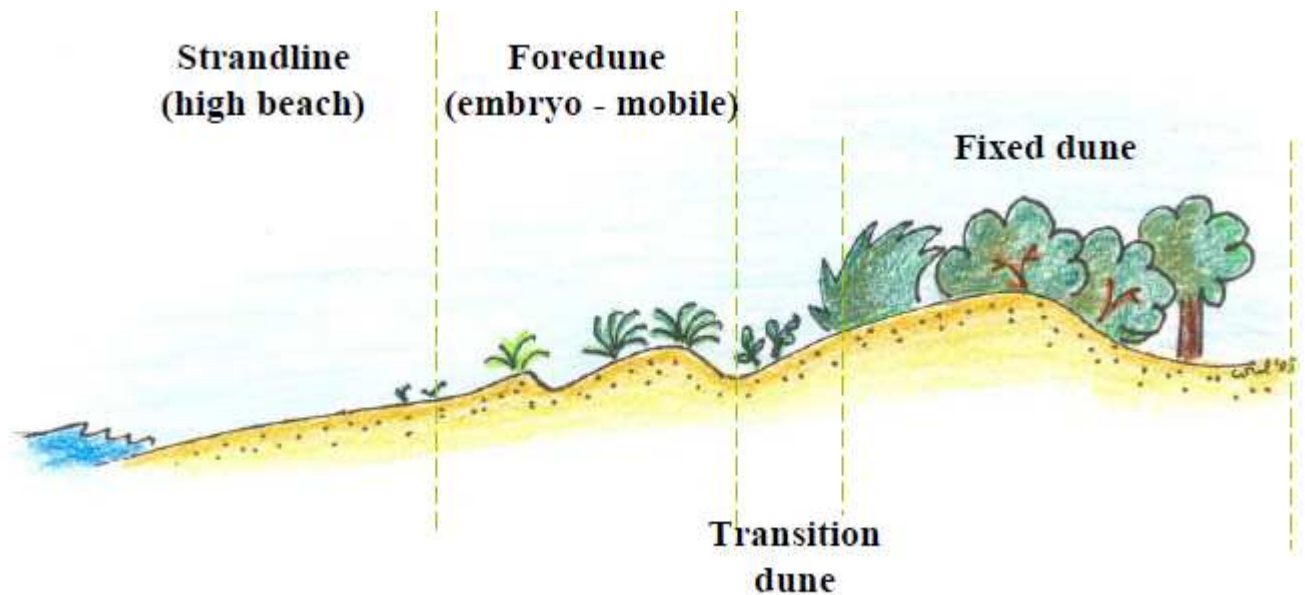
Dunes of Castelporziano represent one of the few examples of undisturbed areas along the coasts of Lazio. From the beach to the inland, five major geomorphological or dune types (facies) have been distinguished: the strandline (high beach), the embryo-dune, the mobile dune (or white dune), the transition dune (or semi-fixed dune) and the fixed dune (grey dune and macchia) (Fig. 8).

The middle and higher beach are colonised by annual, ephemeral and halo-nitrophilous communities, exposed to wind action and occasionally to breaking waves. The vegetation cover of this community type is generally discontinuous and low (never greater than 5%). The most frequent strandline community is *Salsola kali-Cakiletum maritimae*; it is spread over younger dune systems and often forms the first belt of vegetation close to the sea. Furthermore it is a pioneer community consisting chiefly of therophytes, among which *Cakile maritima* subsp. *maritima*, *Salsola kali* and, secondly, *Polygonum maritimum* and *Chamaesyce peplis* (= *Euphorbia peplis*) are the most common.

On embryonic dunes (foredunes), intricately related to beach dynamics, there is a psammophytic geophytic vegetation and the most frequent species are *Echinophora spinosa*, *Anthemis maritima*, *Sporobolus virginicus* and especially *Elymus farctus* subsp. *farctus* (= *Elytrigia juncea*), that forms the first low dunes. The association identified as *Echinophoro-Ammophiletum arundinaceae* grows on higher dunes (1-5 m high and more) and is characterized by the optimal development of *Ammophila arenaria* subsp. *australis*; other frequently occurring species are *Echinophora spinosa*, *Anthemis maritima*, *Eryngium maritimum* and *Pancratium maritimum*.

In the facies called “transition dune” (semi-fixed dunes) (see Fig. 8), the wind action is not as strong as in the *Ammophiletum* zone, and the relief is quite soft with gentle slopes (Pignatti 1993); the amount of sand movement is inferior and the vegetation cover is higher than in the *Ammophiletum*. The two most typical species are *Crucianella maritima* and *Lotus cytisoides*.

On the “fixed dune” the vegetation covers the surface more or less completely and consequently it can be interpreted as being in a more mature stage than in the outer parts of the littoral. The association identified in this group is *Asparago acutifolii – Juniperetum macrocarpae*, characterized by the dominance of the juniper (*Juniperus oxycedrus* subsp. *macrocarpa*) and by other evergreen Mediterranean shrubs such as *Pistacia lentiscus*, *Phillyrea angustifolia*, *Rhamnus alaternus* subsp. *alaternus* and *Quercus ilex* subsp. *ilex*, and lianas such as *Smilax aspera*, *Lonicera implexa* subsp. *implexa* and *Rubia peregrina* subsp. *peregrina*. The association *Quercetum ilicis* follows this more pioneer macchia on the more fixed dune.



**Fig. 8** - Coastal zonation Mediterranean area

## Fauna

Also as a fauna reservoir the Estate is extremely important. As a result of its former use as a game-reserve many big hoofed species still populate Castelporziano, finding there an ideal environment. Wild boars are present in the number of about 600/700, together with 800/1000 fallow-deers, 150/200 roe-deers (mostly of the “italicus” species) and the red-deers (about eighty of these were reintroduced to the Estate after the second world war). The necessary balance between the various animal species and between animals and environmental conditions is maintained thanks to culled continuous control of the natural demography: animals in excess are eliminated or captured, following an appropriate selection methods (Fig. 9).

In addition to the ungulate species many types of small mammalia can be found in the Estate such as; badgers, martens, beech-martens, weasels, foxes, porcupines, hares, wild rabbits and others. The fauna population is completed by a large number of migratory birds: wood-pigeons, doves, woodcocks, snipes, quails. Some stilt-birds are also present and there is a project to create marsh in the proximity of the shore in order to ensure a suitable habitat for water birds.



**Fig. 9**