MedWet

Volume III

Mediterranean Wetland Inventory: Habitat Description System

J.C. Farinha, L.T. Costa, G. Zalidis, A. Mantzavelas,
E. Fitoka, N. Hecker & P. Tomàs Vives

ICN
Instituto da Conservação da Natureza

WETLANDS
INTERNATIONAL

THE GOULANDRIS NATURAL HISTORY MUSEUM
GREEK BIOTOPE / WETLAND CENTRE

MedWet

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Dar Fatma peatland, Tunisia

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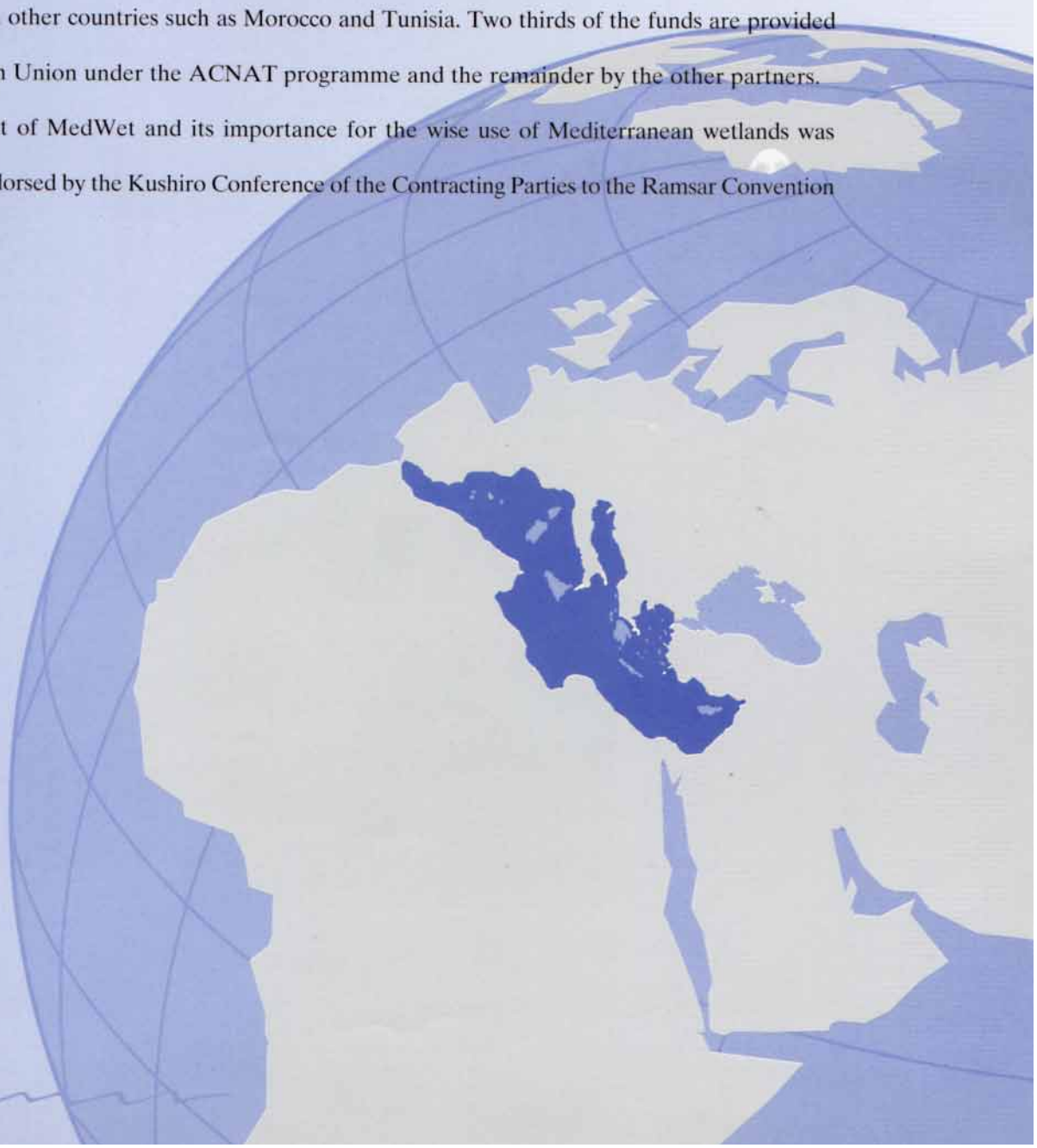
The Medwet Action

The Mediterranean basin is rich in wetlands of great ecological, social and economic value. Yet these important natural assets have been considerably degraded or destroyed, mainly during the 20th century. To stop and reverse this loss, and to ensure the wise use of wetlands throughout the Mediterranean, a concerted long-term collaborative action has been initiated under the name of MedWet.

A three year preparatory project was launched in late 1992 by the European Commission, the Ramsar Convention on Wetlands of International Importance, the governments of France, Italy, Spain, Greece and Portugal, the World Wide Fund for Nature, Wetlands International (former IWRB) and the Station Biologique de la Tour du Valat.

This project focuses on that part of the Mediterranean included within the European Union, with pilot activities in other countries such as Morocco and Tunisia. Two thirds of the funds are provided by the European Union under the ACNAT programme and the remainder by the other partners.

The concept of MedWet and its importance for the wise use of Mediterranean wetlands was unanimously endorsed by the Kushiro Conference of the Contracting Parties to the Ramsar Convention in June 1993.



One of the methodologies developed under the MedWet project concerns Mediterranean wetland inventory. This subproject was undertaken jointly by the Instituto da Conservação da Natureza (ICN) of Portugal and Wetlands International, together with the assistance of a number of other agencies and partners.

The MedWet inventory work aimed to assess the status of existing wetland inventories in the Mediterranean region in order to identify the gaps and review the adequacy of the methods used, and to prepare a standard methodology for carrying out inventories of Mediterranean wetlands.

The MedWet Inventory Methodology includes a Manual for Mediterranean wetland inventory and a suite of publications on separate but linked tools, which allow wetland inventories to be conducted at a number of different levels. The whole methodology can be found in the set of five volumes comprising:

Volume I

Mediterranean Wetland Inventory: A Reference Manual

explains the inventory process and provides a basic introduction to each of the inventory tools.

Volume II

Mediterranean Wetland Inventory: Data Recording

presents the inventory Datasheets and their Guidelines.

Volume III

Mediterranean Wetland Inventory: Habitat Description System

explains the MedWet Habitat Description system and gives guidelines for its application.

Volume IV

Mediterranean Wetland Inventory: Photointerpretation and Cartographic Conventions

describes the MedWet mapping conventions.

Volume V

Mediterranean Wetland Inventory: Database Manual

presents the MedWet inventory Database software and user Manual for data storage (available as a separate publication).

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This manual presents the work done within the MedWet sub-project during the last three years to sets out a hierchical system to describe the Mediterranean wetland habitats. The production of this manual was totally dependent upon the large number of persons who has contributed their views and expertise. We would like to thank all of them for their support.

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Testing the Habitat Description System was also an essential step. Apart from field testing in Portugal by ICN and in Greece by EKBY staff, other pilot studies and test sites were carried out. We would like to acknowledge all those people that helped in some way to test the Habitat Description System: Mohamed Dakki, Mohamed El-Agbani and Bouchta El Fellah (Morocco), Francesca Crespí-Ramis and Raphaël Mathevet (France) and Jose Antonio Torres-Esquivias, Baldomero Moreno Arroyo and Armando Alcala-Zamora (Spain).

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1 Introduction

1. Introduction

This publication sets out a hierarchical system for making detailed descriptions of Mediterranean wetland habitats which is based on explicit criteria regarding the possession of specific attributes. This habitat description system can be used as a framework for a wide scale inventory of Mediterranean wetlands, and is intended to describe ecological units that have certain homogeneous natural attributes. The use of these units for mapping purposes, by drawing boundaries, not only provides data for inventory and analysis, but also provides information for monitoring and management. With habitat maps, the wetland managers or researchers can identify and locate the problems, quantify the size of the problems and provide, in some instances, certain types of baseline data.

The MedWet system for the description of wetland habitats is based on the well documented and comprehensive system established by Cowardin *et al.* (1979) for the "National Wetland Inventory of the United Sates of America". Certain modifications to its structure and categories were made to ensure that the system was appropriate to Mediterranean conditions. This system was designed to meet the following needs:

a to describe and define wetland habitats in a way that allows consistent application of the terminology;

b to provide easily recognisable units for inventory and mapping purposes;

c to arrange these units in a hierarchical structure (levels); and to provide wetland categories which can be compared directly to existing classification systems in the Mediterranean region, namely the CORINE and Ramsar systems.

see
Volume I
Mediterranean Wetland Inventory: A Reference Manual
Chapter 2

Among the advantages of using a hierarchical habitat description system are:

a to combine different levels of information detail and survey intensity without any loss of data;

b to make use of remotely detectable parameters in the habitat description system process, so that the maximum amount of information may be obtained with a minimum amount of field work;

c to make a detailed habitat description through the use of successive levels, making it possible to produce a map of uniform quality and accuracy; and

d to allow the application to a mapping program.

Wetlands

The approach proposed for the MedWet habitat description system distinguishes wetland areas on the basis of presence or absence of essential attributes, rather than on a general statement of their physiographic appearance.

Cowardin *et al.* (1979) defined wetland as *lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water* and include associated deepwater habitats. It is important to note that this definition includes the permanently flooded deepwater areas, often considered as an aquatic habitat rather than a wetland, since water and not air is the principal medium in which dominant organisms must live.

For the purposes of the MedWet habitat description system, wetlands must neet **one** or **more** of the following criteria:

see
Volume I
Mediterranean Wetland Inventory: A Reference Manual
Chapter 5

- at least periodically the land predominantly supports hydrophytes;

Hydrophytes *are defined as any plant growing in water or on a substrate that at least periodi-*

cally is deficient in oxygen as a result of excessive water content (Cowardin *et al.* 1979).

- the substrate is predominantly undrained hydric soil;

  Hydric soil *conditions exist when the soil is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.*

- the substrate is non-soil and is saturated with water, or covered by shallow water at some time during the growing season of each year.

It is obvious from these attributes that theoretically there could be wetlands that do not adjoin permanent or seasonal bodies of water and others which are never covered by surface water. In fact, such wetlands usually comprise a very small percentage of the total wetland complex.

For the future Mediterranean-wide application of this system, complete lists of Mediterranean wetland plants and hydric soils should be prepared.

Boundaries

The boundary between wetland and non-wetland is designated as:

☑ the boundary between land with predominantly hydrophytic cover and land with mesophytic or xerophytic cover;

☑ the boundary between soil that is predominantly hydric and soil that is predominantly non-hydric;

☑ where there is neither vegetation or soil, the boundary between land that is flooded or saturated at some time each year and land that is not.

Wetlands lying below a depth of six metres at low tide shoreward in marine waters are outside the scope of the MedWet habitat description system.

2 Use of the Habitat Description System

2. Use of the habitat description system

The MedWet habitat description system was developed to be used throughout the Mediterranean region and by individuals and organisations with varied interests and objectives. The habitat description system employs: 5 System names, 6 Subsystem names, 8 Class names, 22 Subclass names, an unspecified number of Dominance Types, and several Modifiers. It is, of necessity, a complex system when viewed in its entirety, but the use of the system for a specific purpose at a local site should be simple and straightforward. Artificial keys to the Systems, Subsystems and Classes (**Appendix A**) are furnished to aid the user of the system, but reference to detailed definitions in the text is also required.

To illustrate the application of this system a representative group of Mediterranean wetlands was identified and described according to the MedWet habitat description system (**Appendix B**).

Before attempting to apply the habitat description system, the user should consider the following points:

- ☑ Information about the area to be described must be available before the system can be applied;
- ☑ It is important that users pay particular attention to the definitions in the habitat description system. Attempts to modify these will lead to lack of uniformity in application;
- ☑ The system is designated for use at varying levels:

  a The **Systems** and **Subsystems** are most important in applications involving large regions or an entire country. They serve to organise the Classes into meaningful assemblages of information for data storage and retrieval.

  b The **Classes** and **Subclasses** are basic to wetland mapping, and should be easily recognisable to users from a wide variety of disciplines. However, Class designations apply to average conditions persisting in the vegetative growing season over a period of years. Since many wetlands are dynamic and subject to rapid change in appearance, the proper application of the habitat description system of wetlands may require data over several seasons and periods of years; users should not rely on single observations of either Water Salinity or Water Regime. A summary of the habitat description system and the letter coding system, as it is applied for MedWet inventories and production of wetland maps, is given in **Appendix C**

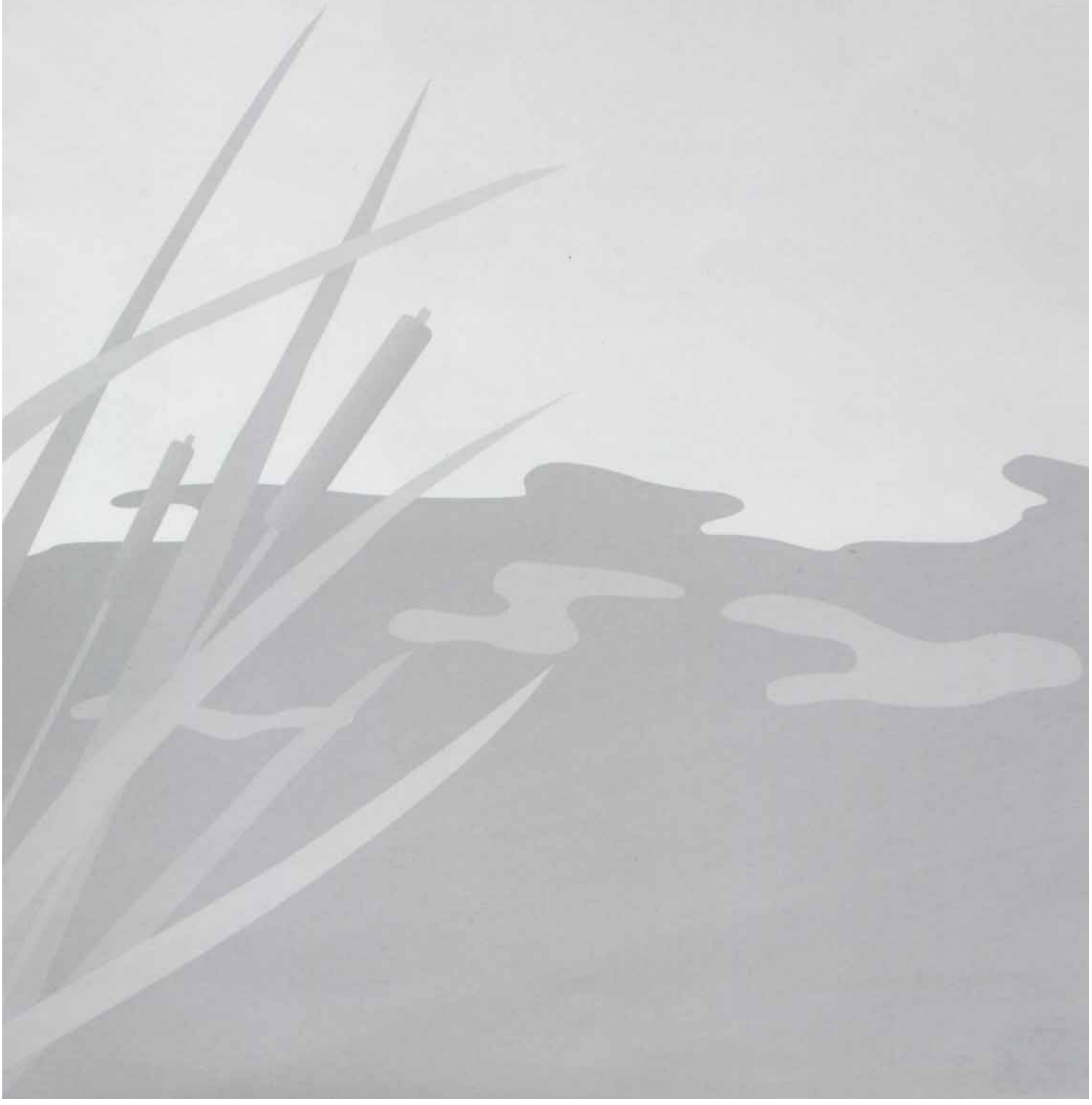
  c The **Dominance Type** is most important for detailed regional studies and the management and monitoring of individual wetland habitats.

- ☑ One of the principal uses of this system will be the inventory and mapping of wetland habitats. A habitat description sytem used in mapping is scale-specific, both for the minimum size of units mapped and the degree of detail attainable. It is necessary for the user to use a specific set of mapping conventions for each application and to relate them to the generalised habitat description system described. For example, details of a small wetland basin with concentric rings of vegetation about the deepest zone may be mapped at the 1:5,000 scale, whereas at the 1:20,000 scale the entire wetland might be as a single unit, and at 1:100,000 scale may be smaller than the smallest mappable unit.

see **Volume IV** Mediterranean Wetland Inventory: Photointerpretation and Cartographic Conventions

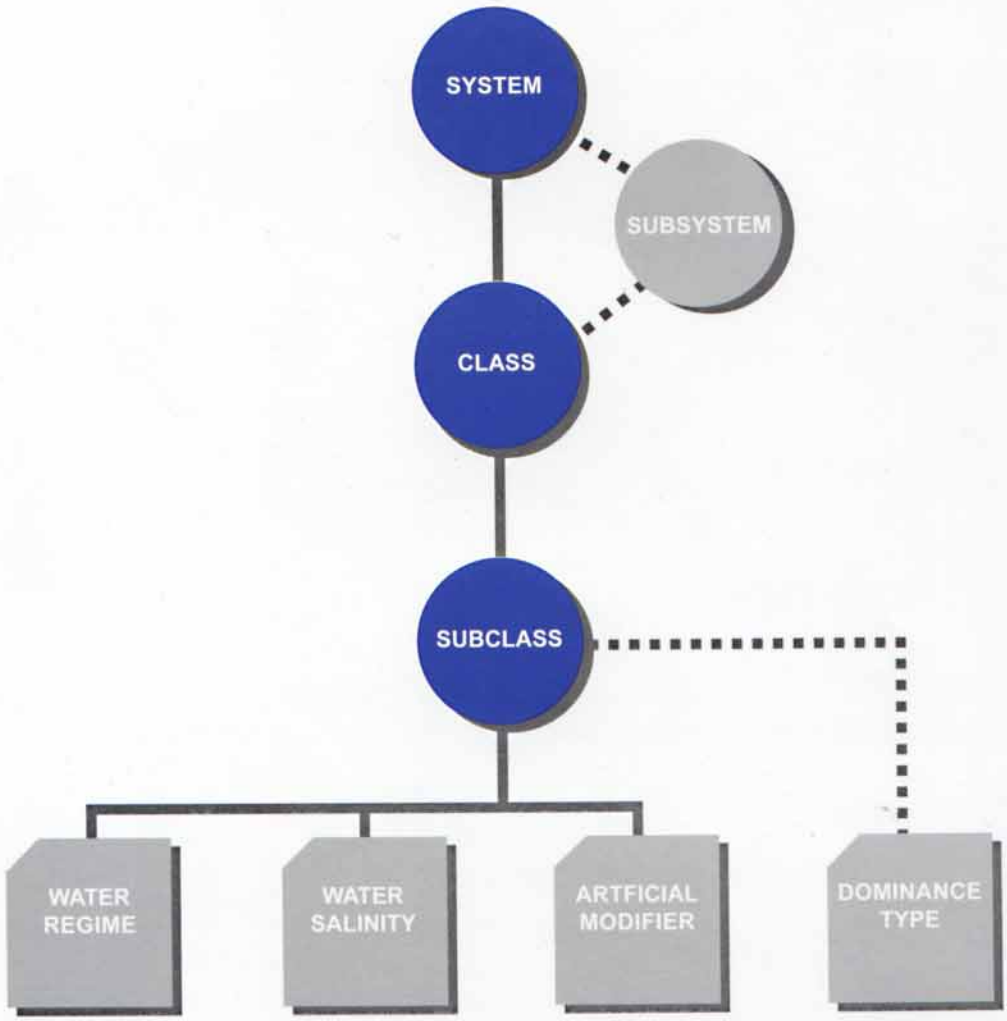
see **Volume IV** Mediterranean Wetland Inventory: Photointerpretation and Cartographic Conventions

3 The Habitat Description System



3. The Habitat Description System

The structure of the MedWet habitat description system progresses from Systems and Subsystems at the most general level, to Class, Subclass and Dominance Types at the lowest levels. Figure 1 lists the habitat description system structure to the Class level; a key to the Systems, Subsystems and Classes is given in **Appendix A**. The habitat description system also includes modifiers to describe water regime, water salinity and a list of Artificial Modifiers for habitats which have been either created or modified by humans.



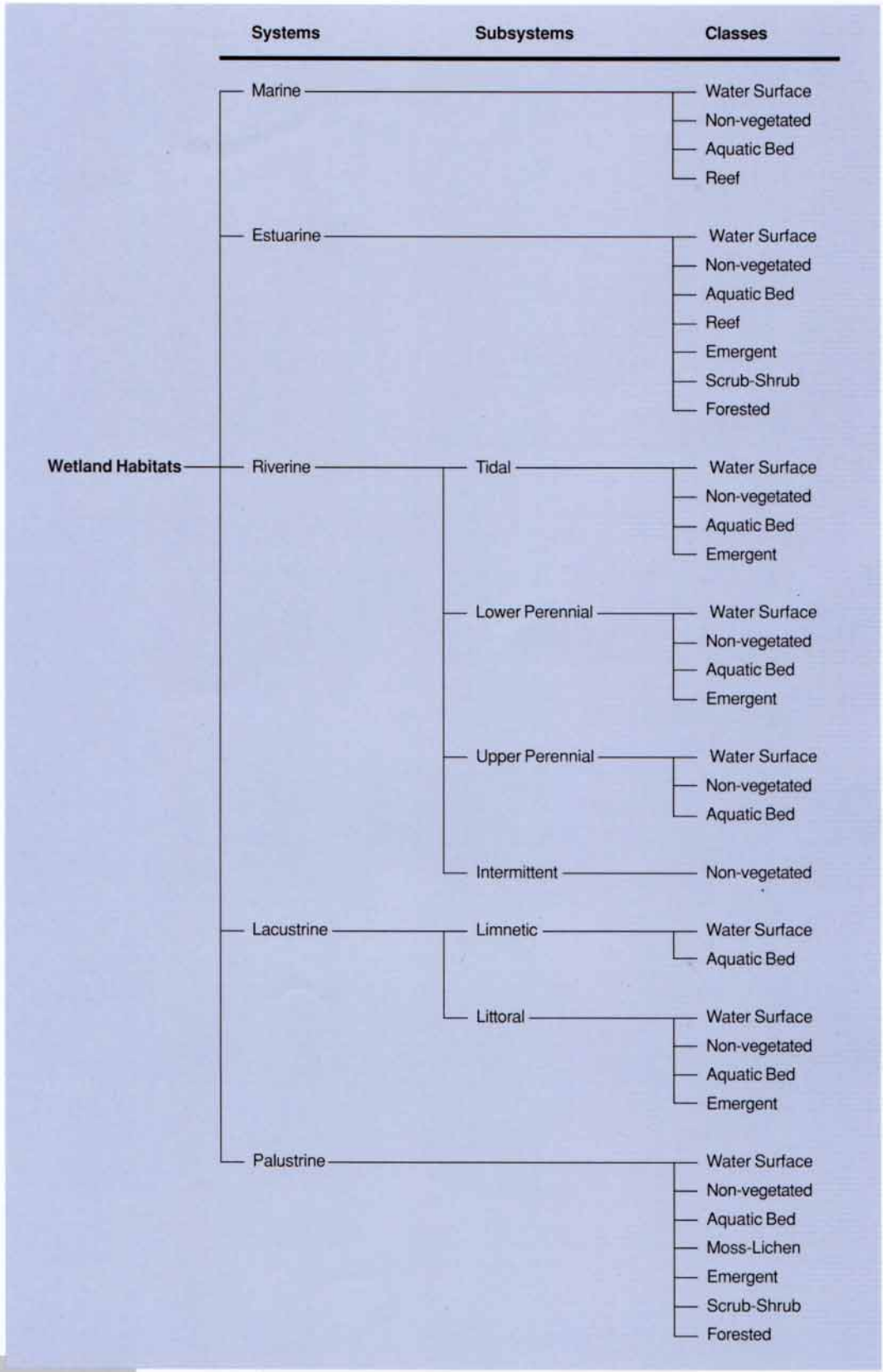


Figure 1. Habitat description system hierarchy of wetland habitats, showing Systems, Subsystems and Classes.

3 The Habitat Description System

3.1. Wetland Systems and Subsystems

3.1. Wetland Systems and Subsystems

Systems

The term System refers to a complex of wetland habitats that share the influence of similar hydrologic, geomorphologic, chemical or biological factors.

Five major Systems are identified: ***Marine***; ***Estuarine***; ***Riverine***; ***Lacustrine*** and ***Palustrine*** (Fig. 2).

The characteristics of the above five systems are generally well accepted; however there is not general agreement as to which attributes should be used to delineate the Systems in space. As Bormann and Likens (1969) pointed out, boundaries of ecosystems are defined to meet practical needs.

Subsystems

Subsystems are more specific subdivisions of the System, based on an energetic description. The Marine, Estuarine and Palustrine systems have no Subsystem; the Riverine System comprise four Subsystems: Tidal, Lower Perennial, Upper Perennial and Intermittent; and the Lacustrine System comprises two Subsystems: Littoral and Limnetic.

3.1.1. Marine System

Definition

The Marine System consists of permanent shallow waters less than six meters deep at low tide and associated exposed coastlines (Fig. 3). The salinity exceeds 30 g/l, with little or no dilution except outside the mouths of Estuarine Systems. Unlike many coastal areas, the Mediterranean sea has a very narrow tidal range along most of its coastline (Fig. 4). In these regions water levels and wetland processes are therefore influenced more by storm events and wind direction than tidal cycles. The main

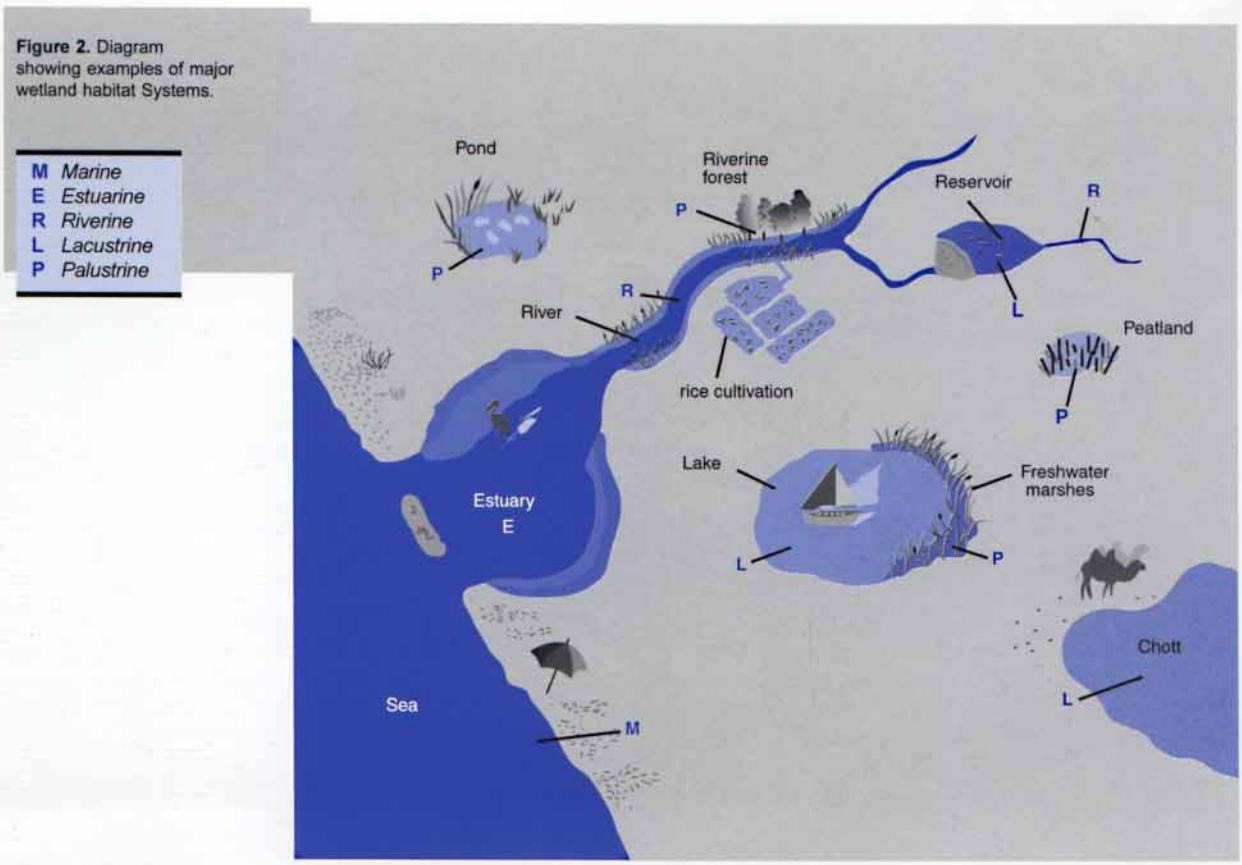


Figure 2. Diagram showing examples of major wetland habitat Systems.

Figure 3. Distinguishing features and examples of habitats in the Marine System.

Greece

WATER REGIME

- ***a*** *Permanently flooded*
- ***b*** *Subtidal*
- ***c*** *Irregularly exposed*
- ***d*** *Regularly flooded*
- ***e*** *Irregularly flooded*

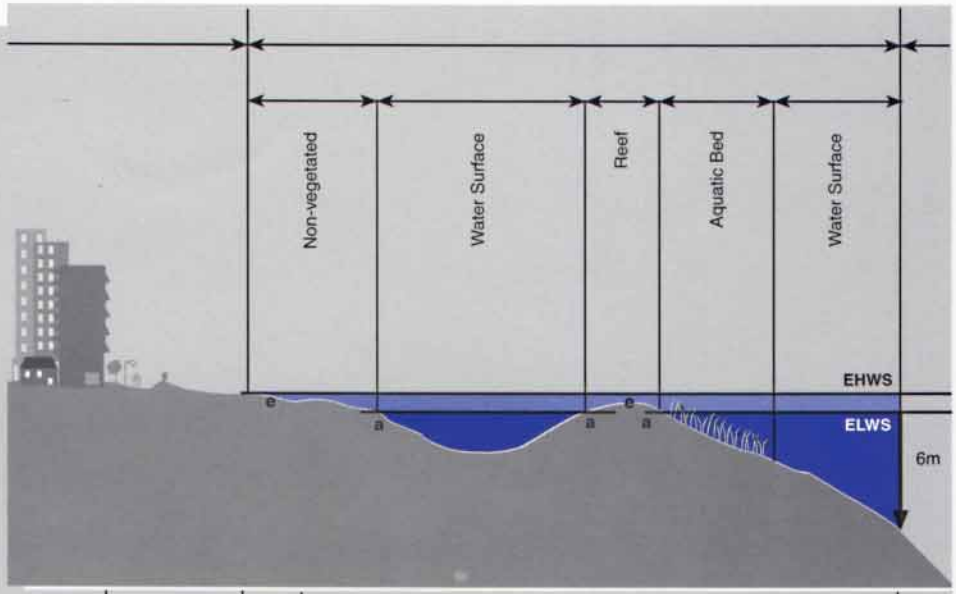
EHWS *- Extreme high water of spring tides;*

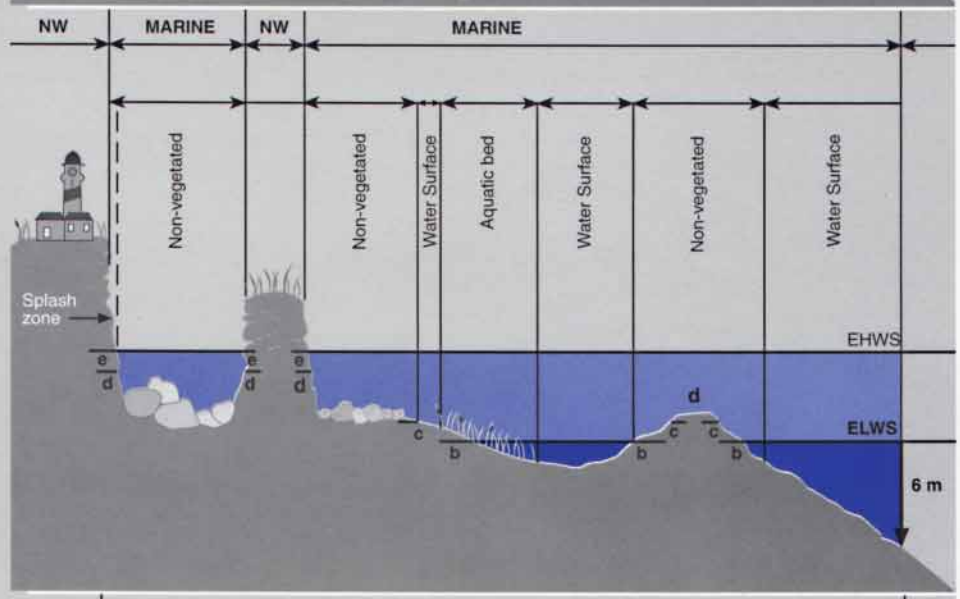
ELWS *- Extreme low water of spring tides.*

NW *- Non-wetland*

SW coast, Portugal

Marroco





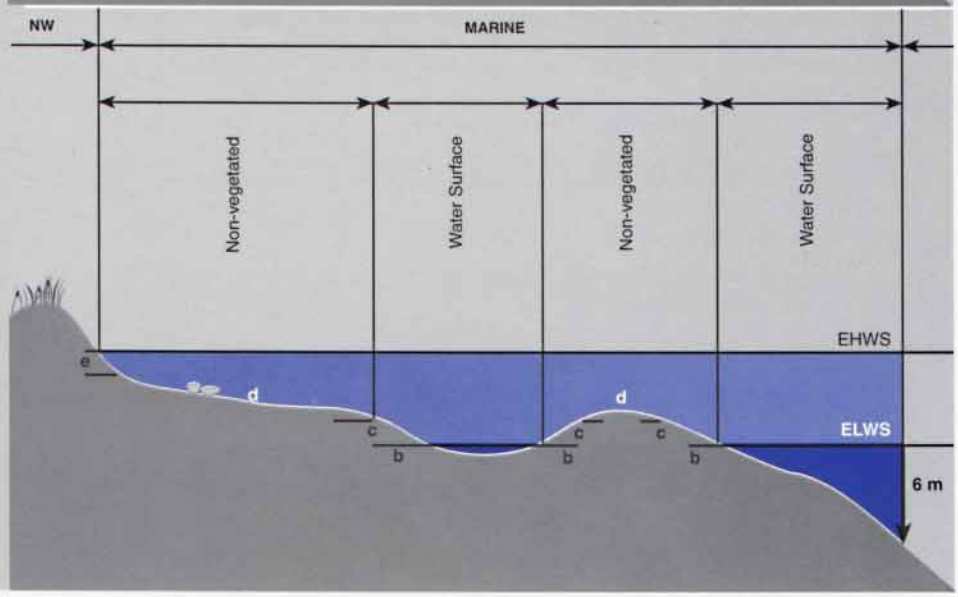


Figura 4.
Beach at Ouranoupoli, Greece; shallow marine water with a narrow tidal range (Marine System).

Photo: J.C. Farinha

exceptions are the Mediterranean regions borded by the Atlantic Ocean (Portugal, south-western coasts of Spain and Morocco) which have a high energy coastline with an evident intertidal zone.

The Marine System occurs in all zones bordering the mainland and islands of the Mediterranean region. Shallow coastal indentations or bays, gulfs and straits without appreciable freshwater inflow, and coasts with exposed rocky islands that provide the mainland with little or no shelter from wind and waves, are also considered part of the Marine System because they generally support typical marine biota.

Boundaries

The Marine System extends from a depth of six meters at low tide shoreward to one of the following:

- ☐ the non-wetland limit of the wetland (in coastlines with weak tides), including the associated splash zone (Fig. 5A);
- ☐ the landward limit of tidal inundation (extreme high water of spring tides or annual storm surge), including the splash zone from breaking waves (Fig. 5B);
- ☐ the seaward limit of wetland emergents, trees or shrubs (Fig. 5B);
- ☐ the seaward limit of the Estuarine System where this limit is determined by factors other than vegetation (Fig. 8B).

Marine Subsystems

No Subsystems are defined for the Marine System.

Marine Classes
Water Surface, Non-vegetated (e.g. rocky shore, and sandy shore), Aquatic Bed (e.g. sea-grasses and algae) and Reef

Marine Water Regime Modifiers
Permanently flooded, Subtidal, Irregularly exposed, Regularly flooded, Irregularly flooded and Saturated

Marine Salinity Modifiers
Euhaline and Hyperhaline

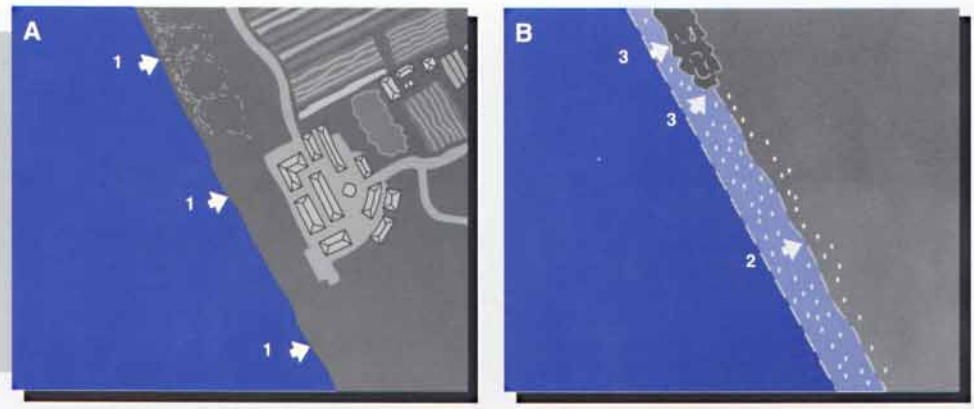


Figure 5 A, B
Marine boundaries:
A - Mediterranean Sea
B - Atlantic Ocean

1- *Non-wetland limit of the wetland*

2- *Landward limit of tidal inundation*

3- *Seaward limit of wetland shrubs*

3.1.2. Estuarine System

Definition

The Estuarine System consists of habitats with low energy and variable salinity influenced, and often semi-enclosed, by land but with open, partly obstructed or sporadic access to the Marine System (Fig. 6). The salinity may be periodically increased above that of the sea by evaporation.

Estuarine habitats include lagoons, salt marshes bordering the estuaries in areas with an evident intertidal zone (Fig. 7), and depressional areas behind dune systems that are occasionally inundated with brackish or saline waters during storm surge. Coastal areas that are brackish from remnant salinity or from subsurface seepage are considered Palustrine. Inundation from tides or annual storm surges would be required in order for these areas to be described Estuarine. The Estuarine System consists of marshes dominated by halophytic vegetation such as *Salicornia* spp. and *Juncus maritimus*, by exposed mud and sand flats that are non-vegetated or dominated by algal species or, in case of lagoons, they can support submerged vegetation such as *Zostera* spp. or *Ruppia maritima*.

Boundaries

The Estuarine System is bounded:

- ☑ at the upstream end to where marine derived salts measure less than 0.5 g/l during the period of average annual low flow (Fig. 8A);
- ☑ at the landward side by habitats that are not inundated by tides or storm surges (Fig. 8A);
- ☑ at the downstream end, in the absence of salinity data, by an imaginary line closing the mouth of a river, bay or sound (Fig. 8B);
- ☑ at the seaward limit of wetland emergents, shrubs or trees where they are not included by the above imaginary line (Fig. 8C).

The Estuarine System also includes offshore areas of continuously diluted sea water (e.g. the salt marsh at Golf of Gabès).

Estuarine Subsystems

No Subsystems are defined for the Estuarine System.

Figure 6. Distinguishing features and examples of habitats in the Estuarine System.

Greece

WATER REGIME

- ***a*** *Permanently flooded*
- ***b*** *Subtidal*
- ***c*** *Irregularly exposed*
- ***d*** *Regularly flooded*
- ***e*** *Irregularly flooded*
- ***f*** *Semi-permanently flooded*
- ***g*** *Seasonally flooded*
- ***h*** *Temporarily flooded*
- ***i*** *Saturated*

EHWS - *Extreme high water of spring tides;*

ELWS - *Extreme low water of spring tides.*

NW - *Non-wetland*

Tejo estuary, Portugal

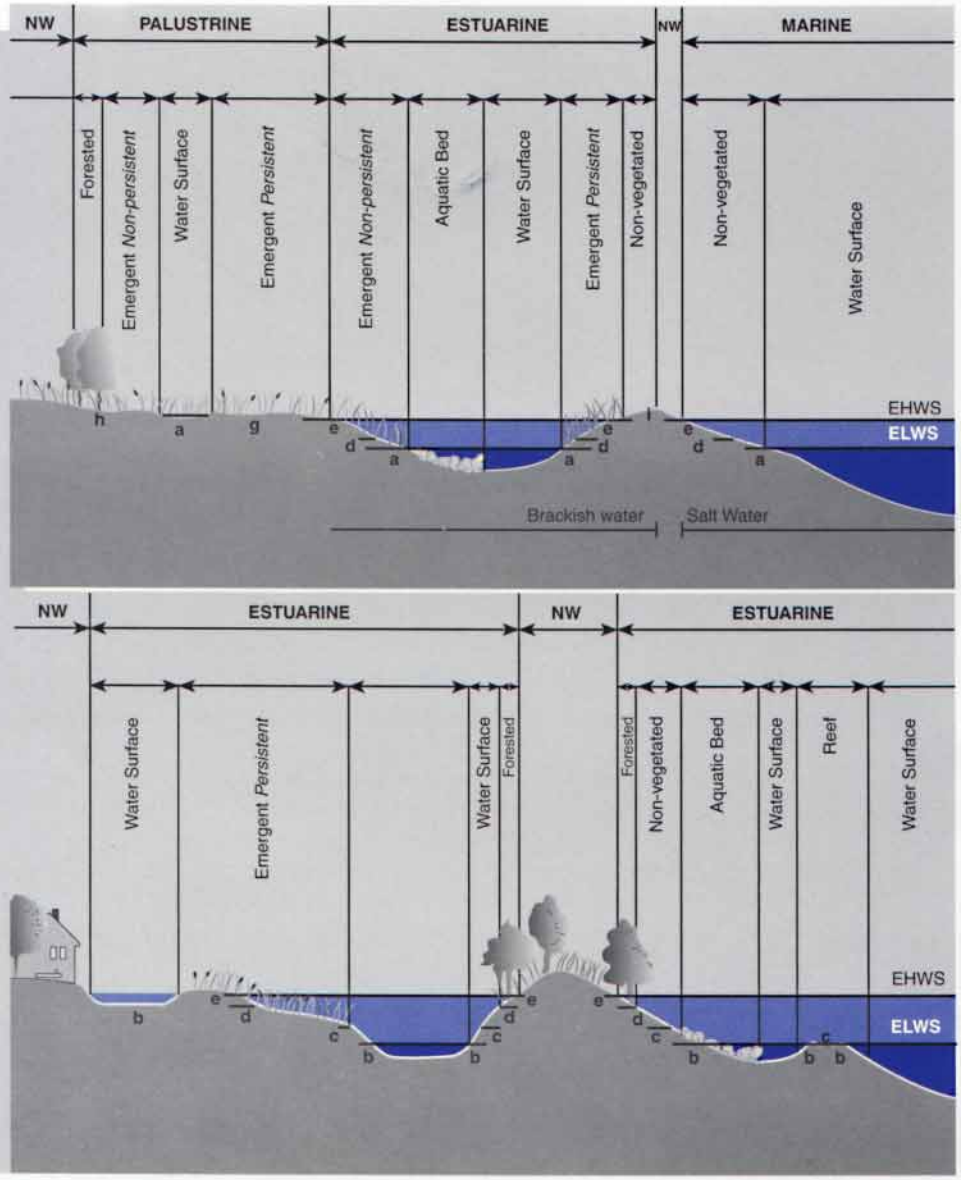


Figure 7.
Sado estuary, Portugal; regularly flooded salt marsh and mud flat bordering the estuary (Estuarine System).

Photo: J.C. Farinha

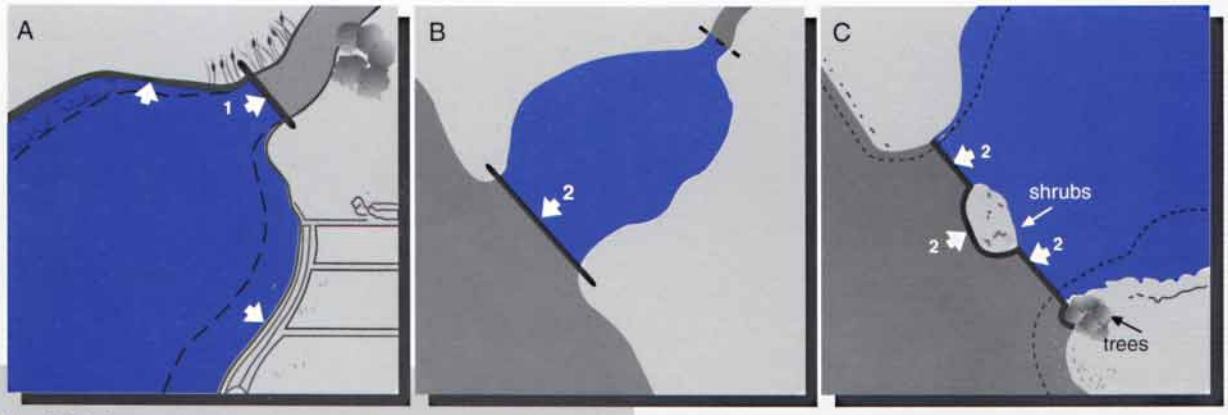


Figure 8 A, B, C
Estuarine boundaries:
1 *- Estuarine-Riverine boundary* ***2*** *- Marine-Estuarine boundary*

Estuarine Classes
Water Surface, (e.g. lagoons and salt marsh ponds), Non-vegetated (e.g. sand bars and mud flats), Aquatic Bed (seagrasses), Reef, Emergent, Scrub-Shrub and Forested

Estuarine Water Regime Modifiers
Permanently flooded, Subtidal, Irregularly exposed, Regularly flooded, Irregularly flooded and Saturated

Estuarine Water Salinity
Oligohaline, Mesohaline, Polyhaline, Mixohaline, Euhaline and Hyperhaline

3.1.3. Riverine System

Definition

The Riverine System (Fig.9) is contained in natural or artificial channels where water is usually, but not always, flowing, with the exception of all wetlands within an open channel:

☑ dominated by mosses or lichens, persistent emergents (e.g. *Phragmites* spp.), shrubs or trees;

☑ with sea-derived salinity in excess of 0.5 g/l.

Non-wetland islands or islands of Palustrine wetlands (e.g. *Salix* spp. shrubs) may occur in the Riverine channels or on adjacent flooded plains, but in this case, they are not a part of the Riverine System. Oxbow lakes are placed in the Palustrine or Lacustrine Systems unless they are connected to a Riverine System by an open channel at both ends, either permanently or intermittently.

Boundaries

The Riverine System is bounded (Fig. 10):

☑ on the landward side by: the non-wetland; the channel bank including natural and man-made levees; or wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens.

☑ at the downstream end by: where the concentration of marine derived salts exceeds 0.5 g/l during the period of annual average flow; or where the channel enters a natural or artificial lake.

☑ at the upstream end by: where tributary streams originate or where the channel leaves a lake.

Figure 9. Distinguishing features and examples of habitats in the Riverine System.

SUBSYSTEMS

- **A** *Lower and Upper Perennial*
- **B** *Tidal*
- **C** *Intermittent*

WATER REGIME

- ***a*** *Permanently flooded*
- ***b*** *Semi-permanently flooded*
- ***c*** *Seasonally flooded*
- ***d*** *Temporarily flooded*
- ***e*** *Saturated*
- ***f*** *Intermittently flooded*
- ***g*** *Permanently flooded-tidal*
- ***h*** *Semi-permanently flooded-tidal*
- ***i*** *Regularly flooded*
- ***j*** *Seasonally flooded-tidal*
- ***k*** *Temporarily flooded-tidal*

NW - *Non-wetland*
P - *Palustrine*

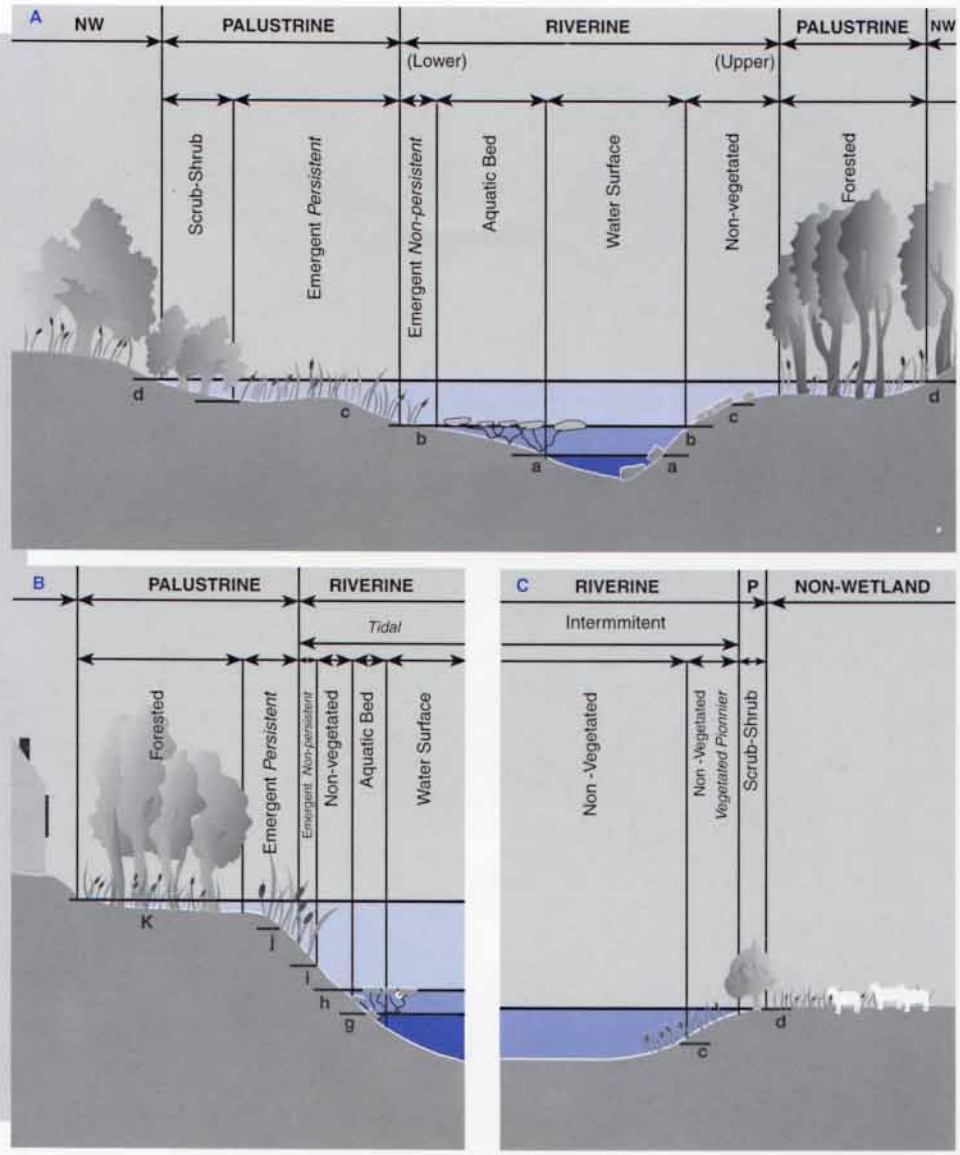
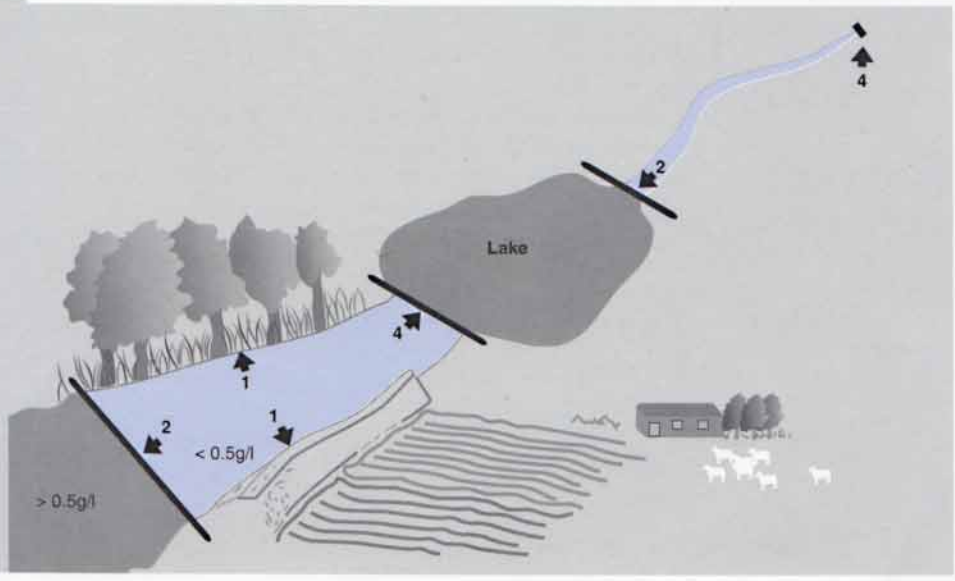


Figure 10.
Riverine boundaries.

1 - *Non-wetland limit of the wetland; the channel bank including natural and man-made levées; wetlands dominated by trees, shrubs and emergents*

2 - *downstream end where the concentration of marine derived salts exceeds 0.5 g/l; or* ***(3)*** *where the channel enters a natural or artificial lake;*

4 - *at the upstream end where tributary streams orginate or where the channel leaves a lake.*



Springs discharging into a Riverine channel are considered part of the Riverine System. If springs are isolated then they are considered as Palustrine.

Riverine Subsystems

Tidal

The stream gradient is low and water velocity fluctuates under tidal influence: the streambed is mainly mud with occasional patches of sand; oxygen deficits may sometimes occur and substrate fauna is similar to that of the Lower Perennial Subsystem; and adjacent floodplain is typically well developed.

Lower Perennial

The stream gradient is low and water velocity is slow: there is no tidal influence and some water flows throughout the year; substrate consists mainly of sand and mud; oxygen deficits may sometimes occur, and substrate fauna is typically composed of species which reach their greatest abundance in still water, and true planktonic organisms are common; gradient is lower than that of the Upper Perennial Subsystem and the adjacent floodplain is well developed.

Upper Perennial

The stream gradient is high and velocity of the water is fast: there is no tidal influence and some water flows throughout the year; substrate consist of rocks, cobbles or gravel, with occasional patches of sand; natural dissolved oxygen concentration is normally near saturation; fauna is characteristic of running water, and there are few or no planktonic forms; gradient is high compared with that of the Lower Perennial Subsystem, and there is very little floodplain development.

Intermittent

The stream gradient is variable and the river channel contains non-flowing water for only part of the year. When water is not flowing, it may remain in isolated pools or more frequently surface water is absent.

Riverine Classes
Water Surface, Non-vegetated (e.g. sand bars), Aquatic Bed and Emergent

Riverine Water Regime Modifiers
Permanently flooded, Semi-permanently flooded, Seasonally flooded, Temporarily flooded, Saturated, Intermittently flooded, Artificially flooded, Permanently flooded-tidal, Semi-permanently flooded-tidal, Regularly flooded, Seasonally flooded-tidal and Temporarily flooded-tidal

Riverine Water Salinity
Fresh, Oligosaline, Mesosaline, Polysaline, Mixosaline, Eusaline and Hypersaline

3.1.4. Lacustrine System

Definition

The Lacustrine System includes wetland habitats situated in a topographic depression or a dammed river channel. The total area exceeds 8 ha and the associated exposed or shallow shore vegetatition comprises aquatic bed (e.g. pondweed, water lily) or nonpersistent emergents (Fig.11). In this System are excluded persistent emergents, shrubs and trees with greater than 30% aerial coverage.

In similar wetland habitats totalling less than 8 ha, they are also included in the Lacustrine System if they have at least **one** of the following characteristics:

- ☐ the water depth in the deepest part of the depression exceeds 2m at low water;
- ☐ a wave-formed or bedrock feature makes up all or part of the shoreline boundary.

Lacustrine habitats include permanently flooded lakes, reservoirs and intermittent lakes (Fig. 12). Typically, there are extensive areas of deep water and there is considerable wave action. Islands of Palustrine wetland may lie within the boundaries of the Lacustrine System.

Boundaries

The Lacustrine System is bounded

- ☑ on the landward side by non-wetland;
- ☑ on shoreward side by wetland dominated by lichens, emergent mosses, persistent emergent vegetation (e.g. *Phragmites australis*), shrubs or trees.

Lacustrine System habitats formed by the damming of a river are bounded by a contour approximating the normal spillway elevation or normal pool elevation, except where Palustrine wetlands extend lakeward of that boundary (Fig. 13A).

Where a river enters a lake, the extension of the Lacustrine shoreline forms the Riverine-Lacustrine boundary (Fig. 13B).

Lacustrine Subsystems

Limnetic

All habitats lying at a depth of 2 meters below low water within the Lacustrine System. Many small or comparatively shallow Lacustrine systems have no Limnetic Subsystem.

Littoral

All wetland habitats in the Lacustrine System extending from the shoreward boundary of the system to a depth of 2 meters below low water, or to the maximum extent of Non-persistent Emergent if these grow at depth greater than 2 meters.

The boundary between the Limnetic and Littoral Subsytems at 2 m was selected because it represents the maximum depth to which emergent plants normally grow.

Lacustrine Classes
Water Surface, Non-vegetated, Aquatic Bed and Emergent

Lacustrine Water Regime Modifiers
Permanently flooded, Semi-permanently flooded, Seasonally flooded, Temporarily flooded, Saturated, Intermittently flooded and Artificially flooded

Lacustrine Water Salinity
Fresh, Oligosaline, Mesosaline, Polysaline, Mixosaline, Eusaline and Hypersaline

Figure 12. Distinguishing features and examples of habitats in the Lacustrine System.

WATER REGIME

- ***a*** *Permanently flooded*
- ***b*** *Semi-permanently flooded*
- ***c*** *Seasonally flooded*
- ***d*** *Temporarily flooded*
- ***e*** *Saturated*

NW - *Non-wetland*

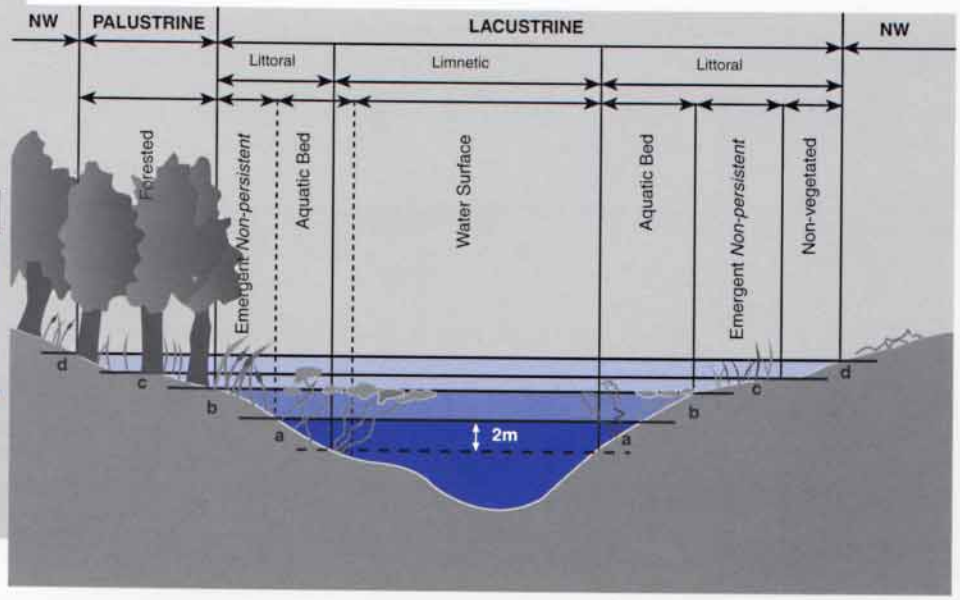


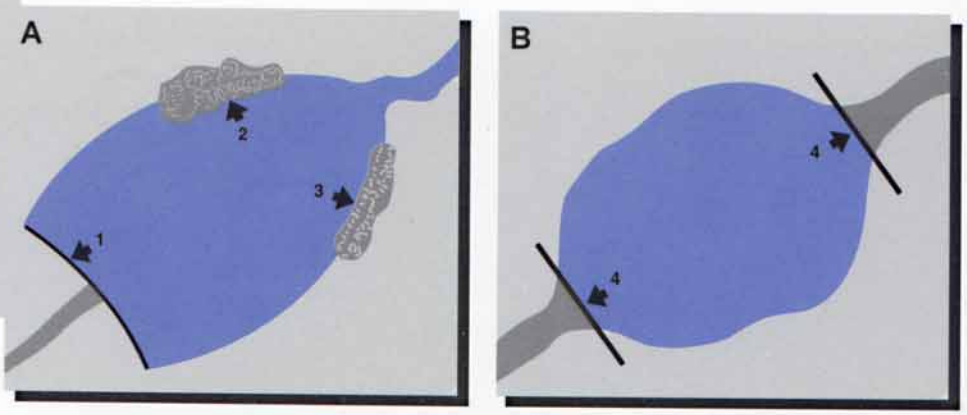
Figure 12.
Sebkhet de Metbasta, Tunisia; intermittently salt lake (Lacustrine System).

Photo: Faouzi Maamouri

Figure 13 A, B
Lacustrine boundaries.

1- Boundary formed by the contour of a dam or the Palustrine system
2- Trees and
3- Emergent vegetation

4- Riverine-Lacustrine boundary



3.1.5 Palustrine System

Definition

The Palustrine System includes all non-tidal wetlands dominated by emergent mosses or lichens, persistent emergents, shrubs or trees (Fig. 14). Wetland habitats lacking such vegetation, and those dominated by aquatic bed or by non-persistent emergent vegetation, are also included in the Palustrine System if they exhibit **all** of the following characteristics:

- ☑ the total area is less than 8 ha;
- ☑ there is not an active wave-formed or bedrock shoreline feature;
- ☑ the water depth in the deepest part of the depression is less than 2m at low water.

Palustrine wetland habitats may be situated shoreward of lakes, adjacent to river channels, inland of estuaries, on river floodplains, in isolated catchments, on slopes, or as islands in lakes or rivers (Fig. 15).

Boundaries

The Palustrine System is bounded:

- ☑ by Non-wetland;
- ☑ by any of the other four Systems.

Palustrine Subsystem

No Subsystems are defined for the Palustrine System.

Palustrine Classes
Water Surface, Non-vegetated, Aquatic Bed, Moss-Lichen, Emergent, Scrub-Shrub and Forested

Palustrine Water Regime Modifiers
Permanently flooded, Semi-permanently flooded, Seasonally flooded, Temporarily flooded, Saturated, Intermittently flooded, Artificially flooded, Permanently flooded-tidal, Semi-permanently flooded-tidal, Regularly flooded, Seasonally flooded-tidal and Temporarily flooded-tidal

Palustrine Water Salinity
Fresh, Oligosaline, Mesosaline, Polysaline, Mixosaline, Eusaline and Hypersaline

Figure 14. Distinguishing features and examples of habitats in the Palustrine System.

WATER REGIME

- ***a*** *Permanently flooded*
- ***b*** *Semi-permanently flooded*
- ***c*** *Seasonally flooded*
- ***d*** *Temporarily flooded*
- ***e*** *Saturated*

NW - *Non-wetland*
P - *Palustrine*

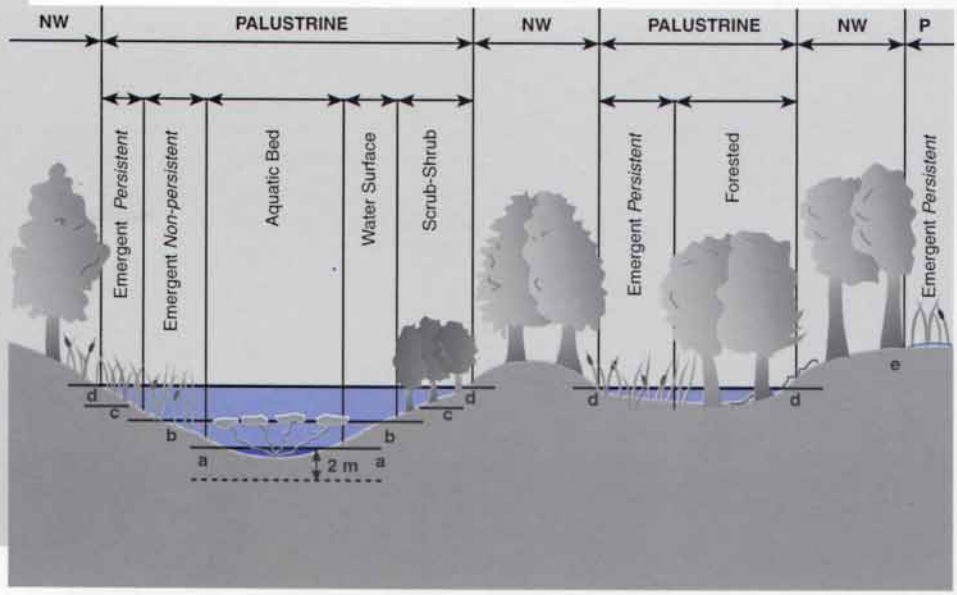


Figure 15.
Poço da Barbaróxa de Cima, Lagoa de Santo André, Portugal; permanent freshwater marsh dominated by *Phragmites australis* (Palustrine System).

Photo: J.C. Farinha

Lake Kerkini, Greece; seasonally flooded forest (Palustrine System).

Photo: J.C. Farinha

3 The Habitat Description System

3.2. Wetland Classes

3.2. Wetland Classes

The Classes describe the general appearance of the habitat in terms of dominant life forms or provide a description for non-vegetated wetland. They are easily recognisable during field surveys or mapping using aerial photography. If vegetation covers less than 30% of the substrate, Classes are distinguished on the basis of physiography and composition of the substrate (Water Surface, Non-vegetated and Reef).

If vegetation covers 30% or more of the substrate, Classes are distinguished on the basis of the life form of the plants (Aquatic Bed, Moss-Lichen, Emergent wetland, Scrub-shrub and Forested wetland) that constitute the uppermost strata or layer of vegetation and possess an aerial coverage of 30% or greater.

The following examples illustrate the classification procedure.

- An area with 50% aerial coverage of trees over a scrub layer of 60% would be classified as **Forested wetland**.
- An area with 20% aerial coverage of trees over the same (60%) shrub layer would be classified as **Scrub-Shrub wetland**.
- An area where trees and or shrubs both cover less than 30%, but in combination have an aerial coverage of 30%, or more would be classified as a **Scrub-Shrub wetland**.
- An area where trees and shrubs both cover less than 30%, but the total vegetation cover (except pioneer species) is 30%, or greater would be classified according to the appropriate Class for the predominant life form below the shrub layer.

Pioneer species that briefly invade wetlands when conditions are favourable are treated at the Subclass level because they are transient and often not true wetland species.

Classes

Water Surface

This Class can be found in all Systems and includes all water surfaces with a vegetative cover less than 30%. Water Surface describes the permanently flooded and irregularly flooded non-vegetated portions of estuaries, deltas, gulfs, coastal lagoons, rivers, lakes and ponds. For inland wetlands (e.g. Riverine, Lacustrine and Palustrine), this Class is also used for water surfaces that may become dry during some portion of the growing season. If an area is covered with water for half or more of the growing season, the area is classified as Water Surface. If the substrate is uncovered by water for more than half of the growing season, the area is classified as Non-vegetated surface.

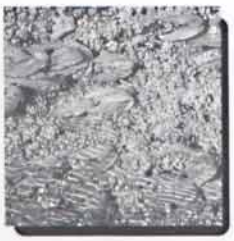
In the Marine and Estuarine Systems, the Water Surface Class applies only to Subtidal, Permanently flooded and Irregularly flooded areas. Mud flats or other Non-vegetated areas that are regularly or irregularly flooded are classified as Non-vegetated.

Water Surface Subclasses
Rock, Cobbles/Gravel, Sand, Mud, Organic and Salt Crust

Non-vegetated

This Class includes surfaces that have less than 30% aerial cover of vegetation other than pioneering plants. Common examples include rocky shores along Marine coastlines, Marine and Estuarine mud and sand flats, exposed shores on the margins of lakes, reservoirs, and riverine sand bars.

Non-vegetated Subclasses
Rock, Cobbles/Gravel, Sand, Mud, Organic, Salt Crust and Vegetated Pioneer



Aquatic Bed

This Class includes wetlands dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Aquatic beds generally occur in water less than 2 m deep. They represent a diverse group of plant communities that require surface water for optimum growth and sexual reproduction. They are best developed in relatively permanent or seasonally flooded water (e.g. lakes and ponds), or under conditions of repeated flooding such as occurs in tidal areas that are inundated daily.

Aquatic Bed Subclasses
Algal, Aquatic Moss, Rooted Vascular, Floating-leaved and Floating Vascular.

Reef

This Class includes ridge-like or mound-like structures and adjacent flats formed by the colonisation and growth of sedentary invertebrates, shellfish beds or artificial structures. Reefs are characterised by their elevation above the surrounding substrate and their interference with normal wave flow.

Reef Subclasses
Mollusc, Worm and Coral.

Moss-Lichen

This Class includes wetlands where mosses or lichens cover substrates other than rocks, and emergents make up less than 30% of the aerial coverage. Mosses and lichens usually form a ground cover under a dominant layer of trees, shrubs or emergents. In some instances higher plants are uncommon and mosses and lichens dominate the flora. They occur only in the Palustrine System.

Moss-Lichen Subclasses
Moss and Lichen

Emergent

This Class is characterised by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. In relatively stable conditions, emergent wetlands maintain the same appearance year after year. However, in strongly seasonal conditions they may revert to an open phase for several years. They are usually dominated by perennial plants. They occur in all Systems except the Marine.
Areas colonised by pioneer plants that become established during periods of low water are not Emergent wetlands and should be classified as Non-vegetated substrate.

Emergent Subclasses
Persistent and Non-persistent.

Scrub-Shrub

This Class includes areas dominated by woody vegetation less than 6m tall. It is characterised by true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Shrub wetlands are most common in riparian areas that are Temporarily or Seasonally flooded. They also occur in coastal plains, inland saline areas and deltas. They occur only in Estuarine and Palustrine Systems and may be a successional stage leading to Forested wetland.

Scrub-Shrub Subclasses
Deciduous, Evergreen and Dead.

Forested

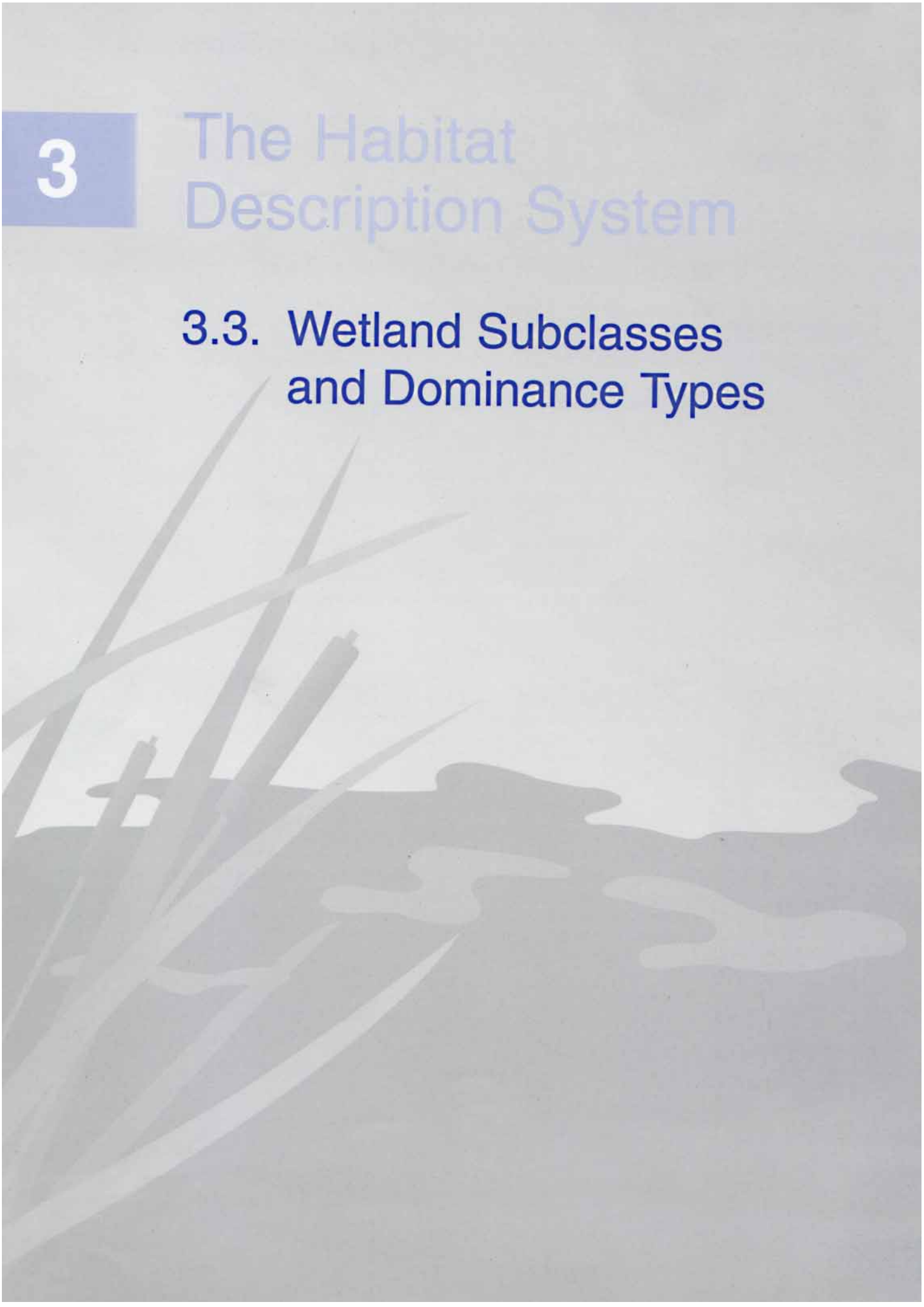
This Class is characterised by woody vegetation that is 6m tall or taller. Tree dominated wetlands occur primarily as Temporarily flooded forests in the floodplains of rivers, streams and deltas.

They occur only in Estuarine and Palustrine Systems.

Forested Subclasses
Deciduous, Evergreen and Dead.

3 The Habitat Description System

3.3. Wetland Subclasses and Dominance Types



3.3. Wetland Subclasses and Dominance Types

Subclasses

The Subclasses describe more detailed differences of the habitats on the basis of:

a finer distinctions in substrate material, unless the substrate is covered by an aereal coverage of pioneering vascular plants of 30% or more (Water Surface, Non-vegetated);

b the predominant life form (Aquatic Bed, Moss-Lichen, Emergent, Scrub-Shrub, Forested) (Fig.16);

c the type of organism that formed the reef.

For example:

- Emergent wetland is divided into the Subclasses Persistent and Non-persistent;
- Reef is divided into the Subclasses Mollusc, Worm or Coral.

Mud

This Subclass includes all wetland habitats with unconsolidated substrates where the particles smaller than stones are predominantly clay and silt size (fine mineral sediments less than 0.02 mm in diameter) and have an aereal coverage of 25% or greater. The vegetative cover is less than 30%. Where unconsolidated shores are not subjected to strong wave and current action, the mud Subclass may take the form of extensive flats.

Sand

This Subclass includes all wetlands habitats with unconsolidated substrates where the particles smaller than stones are predominantly sand size (size range of particles: 0.02 - 2.00 mm) and have an aereal coverage of 25% or greater. The vegetative cover is less than 30%. The Subclass may take the form of shores, beaches, bars and flats.

Cobbles-Gravel

In this Subclass at least 25% of the substrate is covered by unconsolidated particles smaller than stones characterised by cobbles and gravel (size range of particles: 2.00 - 200.00 mm). The vegetative cover is less than 30%. Sand, silt and shell fragments often fill the spaces between the larger particles. Where unconsolidated shores are subject to strong wave and current action, the Cobble-Gravel Subclass may take the form of beaches, bars or extensive flats. In Riverine System channels subject to strong water flow, the Cobble-Gravel Subclass may take the form of stream bars.

Rock

This Subclass includes all wetland habitats with substrates having an aereal cover of bedrock, stones and boulders alone or in combination with 75% or more of the surface (size range of particles: > 200.00 mm). The vegetative cover is less than 30%.

Organic

This Subclass includes all wetland habitats with unconsolidated substrates where the particles smaller than stones are predominantly organic rather than mineral material and have an aereal coverage of 25 % or greater. The vegetative cover is less than 30%. Within the substrate Class the organic material is predominantly organic soil.

Salt crust

This Subclass includes all wetland habitats where the particles smaller than stones are predominantly salt crust, and have an aereal coverage of 25% or greater. The vegetative cover is less than 30%.

Vegetated Pioneer

This Subclass includes some substrates that are exposed for a sufficient period to be colonised by herbaceous annuals or seedling herbaceous perennials which are usually killed by rising water levels and may be removed before the beginning of the next growing season, and have an aereal cover of 30% or greater. Many of the pioneer species are not hydrophytes but are weedy mesophytes that cannot tolerate wet soils or flooding.

Mollusc

This Subclass occurs in the Estuarine System with a substrate composed of molluscs. The aereal cover of vegetation is 30% or less. Reef molluscs are adapted to great variations in water level, salinity and temperature, and these same factors control their distribution.

Worm

Worm reefs are constructed by large colonies of Sabellarid worms living in individual tubes constructed from cemented sand grains. The aereal cover of vegetation is 30% or less.

Coral

This Subclass lies almost entirely within the Permanently flooded area of the Marine System, although the upper part of certain reefs may be exposed. The substrate is composed of corals that are characterized by Odum (1971) as stable, well-adapted, highly diverse, and highly productive ecosystems with a great degree of internal symbiosis.

Algal

This Subclass includes wetland habitats with vegetation dominated by macrophytic algae growing in water or on an associated splash zone. The aereal cover of vegetation is 30% or greater. Algal beds are widespread in the Marine and Estuarine Systems where they occupy substrates characterised by a wide range of sediments, depths and textures.

Aquatic Moss

This Subclass includes wetland habitats with vegetation dominated by Aquatic Mosses. The aereal cover of vegetation is 30% or greater. They occur primarily in the Riverine System and in permanently flooded parts of some Lacustrine Systems.

Moss

This Subclass includes wetland habitats with vegetation dominated by mosses. The aereal cover of vegetation is 30% or greater. These wetlands are uncommon and additional field information is required on their occurrence.

Lichen

This Subclass includes wetland habitats with vegetation dominated by lichens. The aereal cover of vegetation is 30% or greater. These wetlands are uncommon and additional field information is required on their occurrence.

Floating Vascular

This Subclass includes wetland habitats with vegetation dominated by vascular species which float freely either in water or at the surface. The aereal cover of vegetation is 30% or greater. They occur predominantly in sheltered waters. Beds of floating vascular species (e.g. *Salvinia* sp., *Lemna* sp., *Azolla* sp.) may be moved by wind or water currents.

Rooted Vascular

This Subclass includes wetland habitats with vegetation dominated by submergent vascular species rooted to the substrate. The aereal cover of vegetation is 30% or greater. They occur in the Marine and Estuarine Systems as sea grass beds. In the Riverine, Lacustrine and Palustrine Systems rooted vascular plants occur at all depths in both flowing and standing water.

Floating-leaved

This Subclass includes wetland habitats with vegetation dominated by submergent vascular species with floating leaves. The aereal cover of vegetation is 30% or greater. They occur predominantly in shallowed waters and are characterised by water-lilies (*Nymphaea* spp.).

Non-persistent

This Subclass includes wetlands with vegetation dominated predominantly by vascular hydrophytes that normally fall to the surface of the substrate or below the surface of the water at the end of the growing season. The aereal cover of vegetation is 30% or greater. At certain seasons there may be no obvious signs of emergent vegetation. The Subclass occurs extensively in the shoreward areas of the Lacustrine and Riverine Systems, particularly in small Palustrine wetlands, predominantly in sheltered areas.

Persistent

This Subclass includes wetlands with vegetation dominated predominantly by vascular hydrophytes that normally remain standing until the beginning of the next growing season. The aereal cover of vegetation is 30% or greater. The Subclass occurs extensively along the landward margins of the Estuarine System and on marine plains dominated by marsh communities such us *Spartina maritima, Salicornia* and *Spergularia* in the wetter portions of saltmarshes, *Halimione portulacoides* in more elevated areas, and *Limonium, Artemisia maritima* and *Puccinellia* in the upper saltmarsh fringe. Persistent wetlands also occur extensively throughout the Palustrine System where they contain a wide array of narrow and broad-leaved species such us *Phragmites* and associated vegetation such us *Cyperus*, *Rumex* and *Scirpus*.

Deciduous

This Subclass includes all wetlands with vegetation dominated by woody shrubs or trees where 50% or more of the species are deciduous. The aereal cover of vegetation is 30% or greater.

Evergreen

This Subclass includes all wetlands with vegetation dominated by woody shrubs or trees where 50% or more of the species are evergreen. The aereal cover of vegetation is 30% or greater. These wetlands are uncommon in the Mediterranean region and additional field information is required on their occurrence.

Dead

This Subclass includes all wetlands with vegetation dominated by dead woody shrubs or trees. The aereal cover of vegetation is 30% or greater. These wetlands are usually produced by prolonged rises in the water table resulting from natural or man made causes. Such wetlands may also result from other factors such as fire, salt spray, air pollution, herbicide, etc..

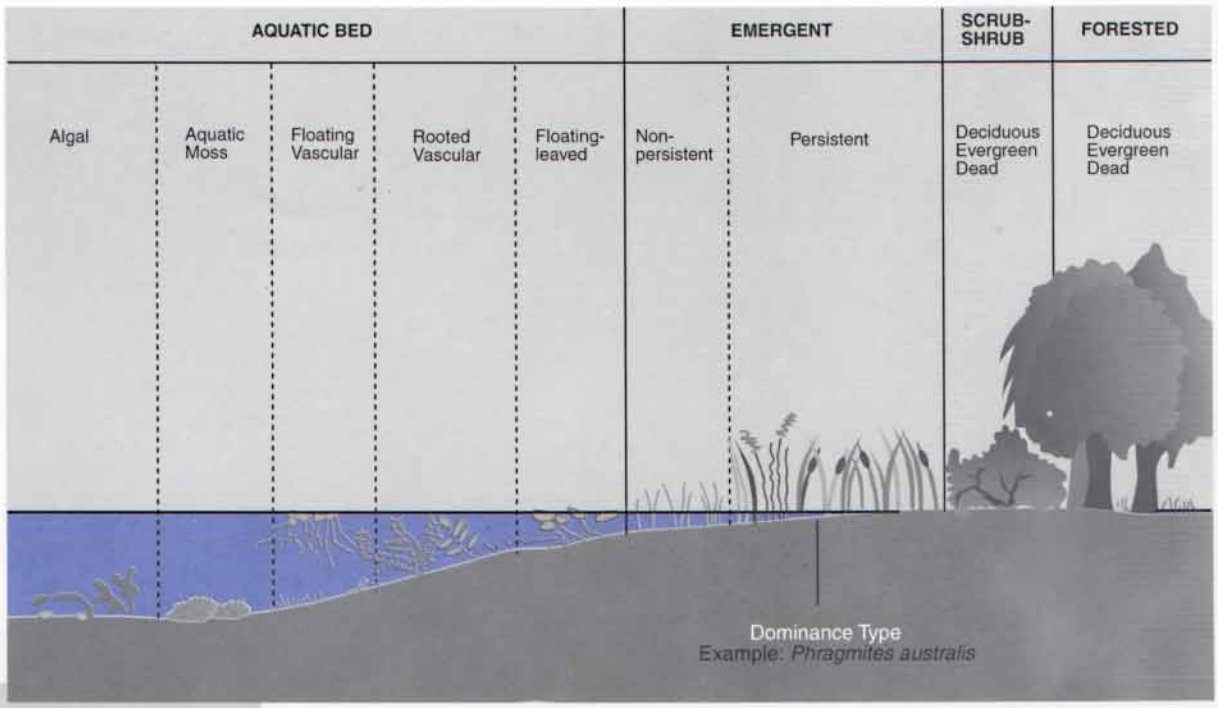


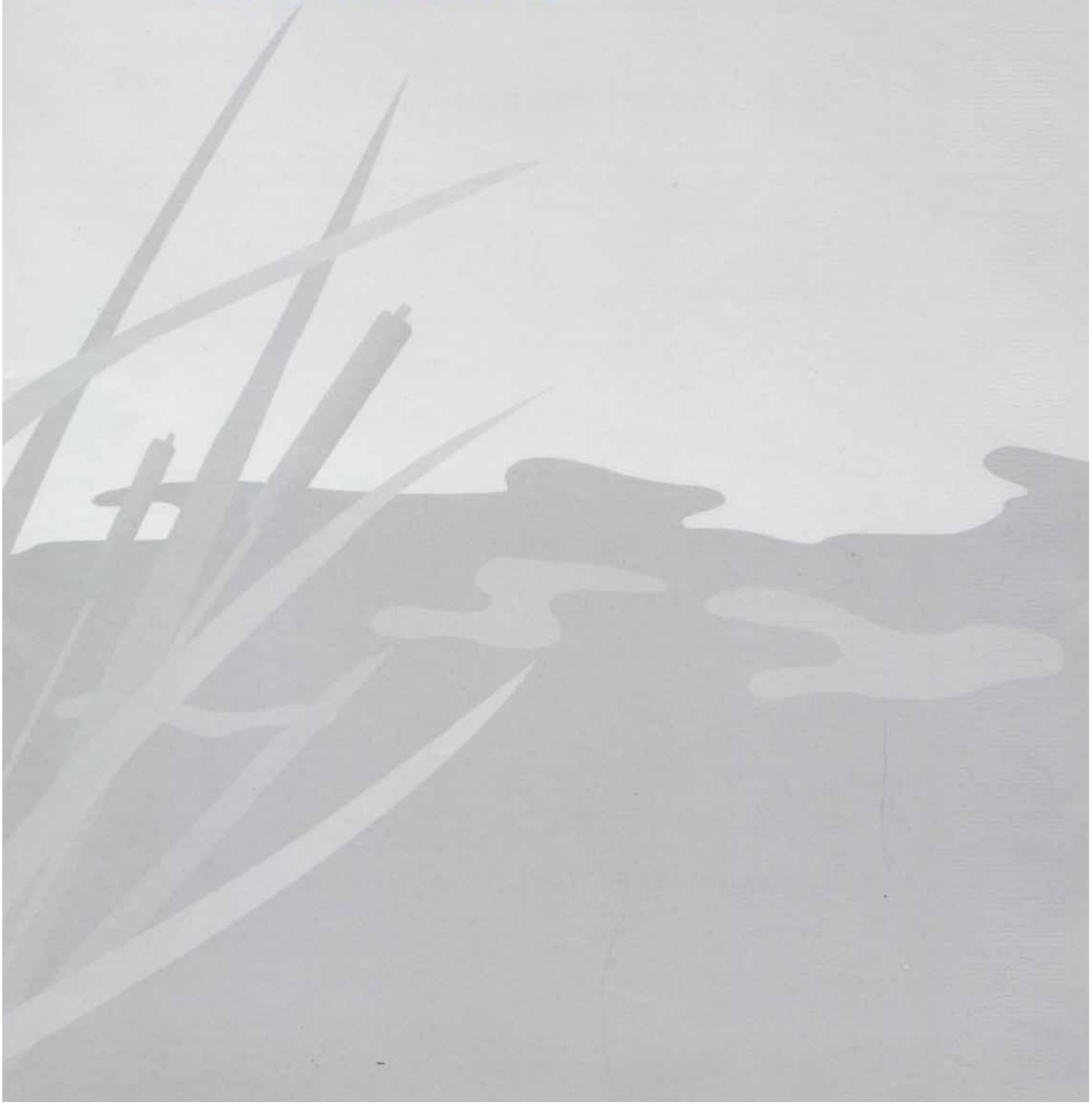
Figure 16.
Subclasses of the life form type Classes

Dominance Types

The Dominance Type is most important to users interested in more detailed studies. The more common procedure will be to identify Dominance Types on the basis of dominant plant species (Appendix B). These units present in an area tend to reflect environmental conditions over a period of time. For instance, Persistent Emergent Wetland with 75% aereal cover of *Phragmites* sp. and 25% aereal cover of *Cyperus* sp. would be designated as *Phragmites* sp. Dominance Type.

3 The Habitat Description System

3.4. Modifiers



3.4. Modifiers

To describe wetland habitats fully it was necessary to apply certain Modifiers in the habitat description hierarchy. There are three groups of modifiers: Water Regime, Salinity and Artificial Modifiers. The Modifiers were adapted from existing descriptions (Cowardin *et al.* 1979) or were developed specifically for the MedWet system.

3.4.1. Water Regime Modifiers

Precise descriptions of hydrologic features requires detailed knowledge of the duration and the timing of surface inundation, both yearly and long term, as well as an indication of groundwater fluctuations. Because such information is seldom available, especially in the Mediterranean region, the water regime described below constitutes generalised categories (Table 1).

Marine and Estuarine Systems

Marine and Estuarine Systems in the Mediterranean region are usually influenced by weak marine-derived tides, where the tidal variation is so small that it does not allow differentiation of these zones from permanently flooded habitats; however, in a few areas there are large marine-derived tides which create flooded and exposed zones.

Permanently flooded

The substrate is continuously covered with water with a small tidal variation and the adjacent intertidal area is determined by the slope of the shore line and the degree of exposure of the site to wind and waves. Within Estuarine intertidal areas, adjacent to this Permanently flooded water regime, the permanent ponds or artificially excavated habitats are considered Permanently flooded.

Subtidal

The substrate is continuously covered with water with large tidal range. Within Estuarine intertidal areas, adjacent to this Subtidal water regime, the permanent ponds or artificially excavated habitats are considered Subtidal.

Irregularly exposed

The land surface is exposed by tides less often than daily. Water regimes of areas where water is occasionally absent (e.g. wind tides or spring tides) are considered irregularly exposed.

Regularly flooded

The substrate is alternately flooded and exposed by tides at least once daily. Marine and Estuarine Systems with weak tides also include seaward areas that are usually covered with water but are occasionally exposed during wind tides or spring tides. Typical regularly flooded areas include tidal mud flats and seaward fringes of salt marshes.

Irregularly flooded

Tidal water floods the land surface less often than daily. The area must be flooded by tide at least once yearly as a result of extreme high tide. The irregular flooding may be due to normal tidal cycles (e.g. spring tides) or storm surges. Typical irregularly flooded areas include salt marshes above the zone of daily flooding, and the upper zone of Marine and Estuarine beaches.

Saturated

The substrate is saturated to the surface for extended periods, but surface water is never or only occasionally present. It applies in the Estuarine System to areas where wetness is primarily due to capillary rise.

Riverine, Lacustrine and Palustrine Systems

The water regimes in these systems are defined in relation to the growing season. In the case of the Portuguese wetlands this generally last from March to October. The rest of the year is defined as the dormant season, a time when even extended periods of flooding may have little influence on the development of plant communities.

Non-tidal parts of the Riverine, Lacustrine and Palustrine Systems are not influenced by sea-derived tides, but may be affected by wind or seiches in lakes.

Permanently flooded

The substrate is continuously covered with water throughout the year. Permanently flooded habitats include the continuously flooded portions of lakes, river channels, ponds and marshes. These include the land surface exposed by years of extreme drought.

Semi-permanently flooded

Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the soil surface.

Seasonally flooded

Surface water is present for extended periods during the growing season. Inundation periods range from approximately 6 weeks to most of the growing season. When surface water is absent, the water table is often near the land surface. Common examples of seasonally flooded wetlands include *Phragmites* marshes, *Typha* stands and wet *Juncus* meadows.

Temporarily flooded

Surface water is present for brief periods (approximately 3 to 6 weeks) during the growing season. When surface water is absent, the water table usually lies well below the soil surface. Examples of temporarily flooded wetlands include shrub areas on river and stream floodplains, and briefly flooded grass meadows.

Intermittently flooded

The substrate is usually exposed, but surface water is present for variable periods without detectable seasonal periodicity. Weeks, months or even years may intervene between periods of inundation. The dominant plant communities under this regime may change as soil moisture conditions change. The areas to fall within the definition of wetland must have hydric soil or support hydrophytes. Examples of Intermittently Flooded wetlands include chotts typical from the northern edge of the Sahara. These salt lakes rarely hold water for longer than four months at time, usually in winter (Pearce & Crivelli 1994).

Saturated

The substrate is saturated to the surface for extended periods during the growing season, but surface water is never or seldom present. Wetlands with organic soils typically have saturated water regimes.

Tidal areas

Tidally influenced parts of the Riverine and Palustrine Systems require careful selection of water regime modifiers. The flooded fresh tidal waters are designated by the appropriate Non-tidal modifier but with the word tidal added. The only exception to this are the areas that are regularly flooded by fresh tidal water. In these areas, the Regularly Flooded tidal modifier should be used.

Permanently flooded-tidal

Fresh tidal water floods the surface at all times of the year in all years. Fresh tidal water floods the surface throughout the growing season in most years. Include the land surface exposed by years of extreme drought.

Semi-permanently flooded-tidal

Fresh tidal water floods the surface throughout the growing season in most years.

Regularly flooded

Fresh tidal water alternately floods and exposes the land surface at least once daily.

Table 1. Distribution of the Water Regime within the Class level.

(**1**) Wetlands that are covered by water for more than half of the growing season.
(**2**) Wetlands that are uncovered by water for more than half of the growing season.

	CLASSES							
WATER REGIME	**Open Water**	**Non-Vegetated**	**Aquatic Bed**	**Reef**	**Moss-Lichen**	**Emergent**	**Scrub-Srub**	**Forested**
MARINE and ESTUARINE								
Permanently flooded	○		○	○				
Subtidal	○		○	○				
Irregularly exposed		○	○	○			○	○
Regularly flooded		○	○	○		○	○	○
Irregularly flooded		○		○		○	○	○
RIVERINE, LACUSTRINE and PALUSTRINE								
Permanently flooded	○		○			○	○	○
Semi-permanently flooded	○		○			○	○	○
Seasonally flooded	○(1)	○(2)	○			○	○	○
Temporarilyflooded		○				○	○	○
Intermittently flooded		○				○	○	○
Saturated		○			○	○	○	○
Tidal areas								
Permanently flooded-tidal	○		○			○	○	○
Semi-permanently flooded-tidal	○		○			○	○	○
Regularly flooded		○	○			○	○	○
Seasonally flooded-tidal	○(1)	○(2)	○			○	○	○
Temporarily flooded-tidal		○				○	○	○
Artificiallly flooded	○	○	○	○	○	○	○	○

Seasonally flooded-tidal

Fresh tidal water floods the surface for extended periods during the growing season in most years.

Temporarily flooded-tidal

Fresh tidal water floods the surface for brief periods of the growing season.

Artificially flooded areas

In the case of artificially flooded areas the amount and duration of flooding is controlled by means of pumps or siphons in combination with dams. The vegetation growing on these areas cannot be considered a reliable indicator of water regime. Examples of Artificially Flooded wetlands are some agricultural lands managed under a rice-soybean rotation, and wildlife management areas where forests, crops, or pioneer plants may be flooded to attract wetland wildlife. Neither wetlands within, or resulting from leakage from, man-made impoundments, nor irrigated pasture lands supplied by diversion ditches or artesian wells, are included under this modifier. In cases, where the water regime is known, this **Artificially Flooded** modifier can be replaced with any non-tidal water regime: **Permanently flooded**; **Semi-permanently flooded**; **Seasonally flooded**; **Temporarily flooded**; **Intermittently flooded** and **Saturated**.

3.4.2. Salinity Modifiers

The accurate characterisation of water salinity of a wetland, can be difficult due to problems with measurements and the variation of the values due to changes with season, weather, time of day and other factors. Differences in salinity are reflected in the species composition of plants and animals. Salinity also has important implications for the use and management of wetlands related to irrigation, agriculture, grazing, and drinking water.

The salinity of coastal and inland waters differ as a result of the concentrations of various salts. The salinity of coastal waters is dominated by sodium chloride (NaCl). The term "haline" is used to indicate the dominance of marine salts. In case of salinity of inland waters the term used is "saline", where four major cations (calcium, magnesium, sodium and potassium) and three major anions (carbonate, sulfate and chloride) dominate.

Seven classes of salinity are considered, expressed in g/l (grams per litre), in order to define the salinity of the wetland (Table 2).

Table 2. Salinity Modifiers used in this habitat description system.

Coastal modifiers	Inland modifiers	Salinity (g/l)
Fresh	Fresh	< 0.5
Oligohaline	Oligosaline	0.5 - 5.0
Mesohaline	Mesosaline	5.0 - 18.0
Polyhaline	Polysaline	18.0 - 30.0
Mixohaline (Brackish)	Mixosaline (Brackish)	0.5 - 30.0
Euhaline	Eusaline	30.0 - 40.0
Hyperhaline	Hypersaline	> 40.0

3.4.3. Artificial Modifiers

Many wetlands are man-made, and many natural ones have been modified to some degree by human activities. The following Artificial Modifiers are used to describe modified and created wetland environments. When used, the Artificial Modifier can be applied additionally to the wetland habitat description system.

Farmed

The soil surface has been mechanically or physically altered for production of crops, but hydrophytes will become re-established if farming is discontinued (e.g. farmed intermittent lake bottoms; transitional zones from agriculture to wetlands especially in drained areas of Deltas).

Artificial substrate

Substrates that were created by man using natural or synthetic materials. Jetties and breakwaters are examples of Non-vegetated Artificial shores.

Spoil

Wetland habitat where the substrate is a result of the deposition of spoil materials.

Excavated

A wetland lying within a basin or channel excavated by man (e.g. landcut canals, ditches, earth tanks (stock) and farm ponds, excavation pits).

Diked/Impounded

Created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water. The normal spillway elevation (contour) determines the boundary of the wetland formed behind a dam.

Partially Drained/Ditched

The water level has been artificially lowered, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes. Drained areas are not considered wetland if they can no longer support hydrophytes. This modifier is used to indicate extensive ditch networks in wetlands.

Some mixed Artificial Modifiers can be used.
However, mixing should be limited to the following modifiers:

Farmed - Diked/Impounded;
Artificial - Excavated;
Artificial - Diked/Impounded;
Artificial - Excavated - Diked/Impounded;
Spoil - Excavated;
Spoil - Diked/Impounded;
Spoil - Excavated - Diked/Impounded; and
Excavated - Diked/Impounded.

4 References

4. REFERENCES

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5 Appendices

Key to Systems, Subsystems and Classes of wetland habitats*

Key to the Systems

1. Water regime influenced by marine water, and salinity due to marine-derived salts 0.5 ppt or greater.

2. Semi-enclosed by land, but with open, partly obstructed or sporadic access to the marine waters. Halinity wide ranging because of evaporation or mixing of marine water with runoff from land ..... **ESTUARINE**

2. Little or no obstruction to open sea present. Halinity usually euhaline. Little mixing of water with runoff from land **3**

3. Emergents, trees, or shrubs present ..... **ESTUARINE**

3. Emergents, trees, or shrubs absent ..... **MARINE**

1. Water regime not influenced by marine waters or, if influenced, the salinity is less than 0.5 ppt.

4. Persistent emergents, trees, shrubs, or emergent mosses cover 30% or more of the area ..... **PALUSTRINE**

4. Persistent emergents, trees, shrubs, or emergent mosses cover 30% of substrate but non-persistent emergents may be widespread during some seasons of year **5**

5. Situated in a channel; water, when present, usually flowing ..... **RIVERINE**

5. Situated in a basin, catchment, or on level or sloping ground, water usually not flowing **6**

6. Area 8 ha or greater ..... **LACUSTRINE**

6. Area less than 8 ha **7**

7. Wave-formed or bedrock shoreline feature present or water depth 2m or more ..... **LACUSTRINE**

7. No wave-formed or bedrock shoreline feature present and water less than 2m deep ..... **PALUSTRINE**

Key to the Subsystems

1. Water regime influenced by marine tides ..... **TIDAL**

1. Water regime not influenced by marine tides **2**

2. Situated in a channel **3**

3. Gradient is high **4**

4. Water flow is continuous and fast ..... **UPPER PERENNIAL**

4. Water flow is non-continuous ..... **INTERMITTENT**

3. Gradient is low **5**

5. Water flow is continuous and slow ..... **LOWER PERENNIAL**

5. Water flow is non-continuous ..... **INTERMITTENT**

2. Situated in a basin, catchment, or depression, or on level or sloping ground; water usually not flowing **6**

6. Water depth greater than 2.0 m ..... **LIMNETIC**

6. Water depth less than 2.0 m ..... **LITTORAL**

* adapted from Cowardin *et al.* 1979 and Blackman *et al.* 1992.

Key to the Classes

1. During the growing season of most years, aereal cover by vegetation is less than 30%.

2. Substrate comprising a ridge or mound formed by colonization of sedentary invertebrates (corals, oysters, tube forms) ..... **REEF**

2. Substrate of rock or various-sized sediments often occupied by invertebrates but not formed by colonization of sedentary invertebrates **3**

3. Water regime permanently flooded. Substrate non-vegetated **4**

4. Area covered with water for half or more of the growing season ..... **WATER SURFACE**

4. Area uncovered with water for half or more of the growing season ..... **NON-VEGETATED**

3. Water regime other than permanently flooded ..... **NON-VEGETATED**

1. During the growing season of most years, percentage of area covered by vegetation is 30% or greater.

5. Vegetation composed of pioneering annuals or seedling perennials, often not hydrophytes, occurring only at time of substrate exposure ..... **NON-VEGETATED** (Vegetated Pioneer)

5. Vegetation composed of algae, bryophytes, lichens, or vascular plants that are usually hydrophytic perennials **6**

6. Vegetation composed predominantly of non-vascular species **7**

7. Vegetation macrophytic algae, mosses, or lichens growing in water or the splash zone of shores ..... **AQUATIC BED**

7. Vegetation mosses or lichens usually growing on organic soils and always outside the splash zone of shores ..... **MOSS-LICHEN**

6. Vegetation composed predominantly of vascular species **8**

8. Vegetation herbaceous 9

9. Vegetation emergents ..... **EMERGENT**

9. Vegetation submergent, floating leaved, or floating .. **AQUATIC BED**

8. Vegetation trees or shrubs **10**

10. Dominants less than 6 m tall ..... **SCRUB-SHRUB**

10. Dominants 6 m tall or taller ..... **FORESTED**

APPENDIX B

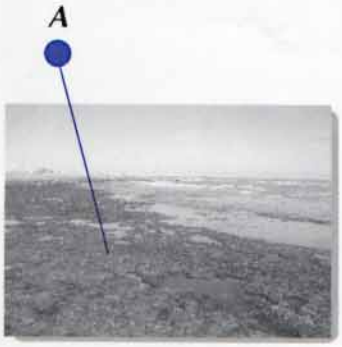
Illustration of a representative group of Mediterranean Wetlands to show the application of the habitat description system.

Systems	Subsystems	Classes	Subclasses	Water Regime	Water Salinity	Artificial Modifier	Page
Marine	-	Water Surface	Sand	Permanently flooded	Hyperhaline	-	58
Marine	-	Non- vegetated	Rock	Irregularly flooded	Euhaline	-	57
Marine	-	Non-vegetated	Rock	Regularly flooded	Euhaline	-	57
Marine	-	Non-vegetated	Sand	Irregularly flooded	Hyperhaline	-	58
Marine	-	Non-vegetated	Sand	Regularly flooded	Euhaline	-	58
Marine	-	Aquatic Bed	Algal	Regularly flooded	Euhaline	-	57
Estuarine	-	Water Surface	Sand	Subtidal	Euhaline	-	60
Estuarine	-	Water Surface	Mud	Subtidal	Mixohaline	-	60
Estuarine	-	Water Surface	Mud	Artificially flooded	Hyperhaline	Excavated	62
Estuarine	-	Water Surface	Unknown	Permanently flooded	Mixohaline	-	61
Estuarine	-	Water Surface	Unknown	Permanently flooded	Hyperhaline	-	61
Estuarine	-	Non-vegetated	Rock	Irregularly flooded	Euhaline	Artificial substrate	59
Estuarine	-	Non-vegetated	Sand	Regularly flooded	Euhaline	-	60
Estuarine	-	Non-vegetated	Mud	Regularly flooded	Mixohaline	-	60
Estuarine	-	Aquatic Bed	Algal	Regularly flooded	Euhaline	Artificial substrate	59
Estuarine	-	Aquatic Bed	Algal	Artificially flooded	Hyperhaline	Artificial Excavated	62
Estuarine	-	Emergent	Persistent	Regularly flooded	Hyperhaline	-	59
Estuarine	-	Emergent	Persistent	Irregularly flooded	Mixohaline	-	61
Riverine	Tidal	Non-vegetated	Mud	Regularly flooded	Fresh	-	63
Riverine	Tidal	Emergent	Persistent	Seasonally flooded-tidal	Fresh	-	63
Riverine	Lower Perennial	Water Surface	Rock	Semi-permanently flooded	Mixosaline	-	67
Riverine	Lower Perennial	Water Surface	Unknown	Permanently flooded	Fresh	-	64, 65
Riverine	Lower Perennial	Water Surface	Unknown	Permanently flooded	Fresh	Excavated	63
Riverine	Lower Perennial	Water Surface	Unknown	Permanently flooded	Fresh	Artificial Excavated	73
Riverine	Lower Perennial	Non-vegetated	Cobbles/ Gravel	Seasonally flooded	Fresh	-	64, 65
Riverine	Lower Perennial	Non-vegetated	Vegetated Pioneer	Temporarily flooded	Fresh	-	65

Systems	Subsystems	Classes	Subclasses	Water Regime	Water Salinity	Artificial Modifier	*Page*
Riverine	Lower Perennial	Aquatic Bed	Floating Vascular	Permanently flooded	Fresh	Excavated	**63**
Riverine	Upper Perennial	Water Surface	Rock	Permanently flooded	Fresh	-	**66**
Riverine	Intermittent	Non-vegetated	Unknown	Intermittently flooded	Fresh	-	**66**
Lacustrine	Limnetic	Water Surface	Mud	Semi-permanently flooded	Fresh	Diked/ Impounded	**67**
Lacustrine	Limnetic	Water Surface	Unknown	Permanently flooded	Fresh	-	**68**
Lacustrine	Littoral	Water Surface	Mud	Artificially flooded	Hyperhaline	Excavated	**70**
Lacustrine	Littoral	Water Surface	Salt crust	Intermittently flooded	Hypersaline	-	**70**
Lacustrine	Littoral	Water Surface	Unknown	Permanently flooded	Oligosaline	-	**69**
Lacustrine	Littoral	Non-vegetated	Sand	Unknown	Oligosaline	-	**69**
Lacustrine	Littoral	Non-vegetated	Vegetated Pioneer	Intermittently flooded	Fresh	Diked/ Impounded	**67**
Lacustrine	Littoral	Aquatic Bed	Floating Leaved	Permanently flooded	Fresh	-	**68**
Palustrine	-	Water Surface	Cobbles/ Gravel	Semi-permanently flooded	Fresh	-	**65**
Palustrine	-	Water Surface	Sand	Seasonally flooded	Fresh	Excavated	**77**
Palustrine	-	Water Surface	Mud	Permanently flooded	Euhaline	Excavated	**73**
Palustrine	-	Water Surface	Mud	Seasonally flooded	Fresh	-	**71**
Palustrine	-	Water surface	Mud	Artificially flooded	Hyperhaline	Excavated	**74**
Palustrine	-	Water surface	Unknown	Artificially flooded	Hyperhaline	Excavated	**61, 74**
Palustrine	-	Non-vegetated	Mud	Seasonally flooded	Mixohaline	-	**72**
Palustrine	-	Non-vegetated	Organic	Seasonally flooded	Fresh	-	**76**
Palustrine	-	Non-vegetated	Vegetated Pioneer	Seasonally flooded	Mesosaline	-	**76**
Palustrine	-	Moss-Lichen	Moss	Temporarily flooded	Fresh	-	**78**
Palustrine	-	Emergent	Persistent	Saturated	Fresh	-	**68**
Palustrine	-	Emergent	Persistent	Seasonally flooded	Mixohaline	-	**72**
Palustrine	-	Emergent	Persistent	Temporarily flooded	Fresh	-	**71**
Palustrine	-	Emergent	Persistent	Temporarily flooded	Mixohaline	-	**75**
Palustrine	-	Emergent	Unknown	Temporarily flooded	Fresh	Farmed	**77**

Systems	Subsystems	Classes	Subclasses	Water Regime	Water Salinity	Artificial Modifier	*Page*
Palustrine	-	Emergent	Persistent	Intermittently flooded	Mixosaline	-	**78**
Palustrine	-	Emergent	Persistent	Saturated	Fresh	-	**78**
Palustrine	-	Emergent	Persistent	Saturated	Fresh	Excavated	**72**
Palustrine	-	Emergent	Non-persistent	Permanently flooded	Fresh	-	**71**
Palustrine	-	Emergent	Non-persistent	Seasonally flooded	Fresh	Excavated	**73**
Palustrine	-	Shrub-Scrub	Deciduous	Saturated	Oligosaline	-	**69**
Palustrine	-	Forested	Deciduous	Seasonally flooded	Fresh	-	**64, 75, 76**
Palustrine	-	Forested	Evergreen	Saturated	Fresh	-	**69**

Beach at El Jadida, Morocco; rocky marine shore covered by algae; photographed at low tide.
Photo: J.C. Farinha

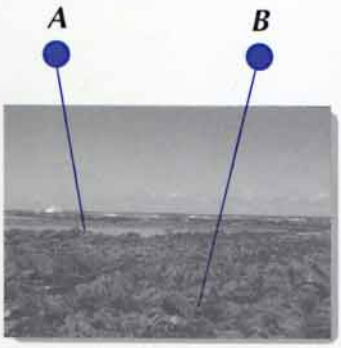


A

System: **Marine**
Class: **Aquatic Bed**
Water Regime: **Regularly flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Algal**
Water Salinity: **Euhaline**
Dominance type: ***Fucus* spp. *and Ulva* spp.**

Skhirat, Morocco; rocky marine shore.
Photo: R. Rufino



A

System: **Marine**
Class: **Non-vegetated**
Water Regime: **Regularly flooded**
Artificial Modifier: **-**

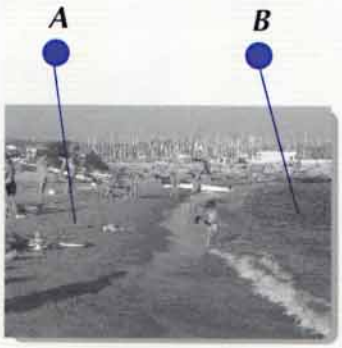
Subsystem: **-**
Subclass: **Rock**
Water Salinity: **Euhaline**
Dominance type: **-**

B

System: **Marine**
Class: **Non-vegetated**
Water Regime: **Irregularly flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Rock**
Water Salinity: **Euhaline**
Dominance type: **-**

Port-de-Miramar, France; coastline with a narrow tidal range. Upper beach is flooded by storm events.
Photo: J.C. Farinha



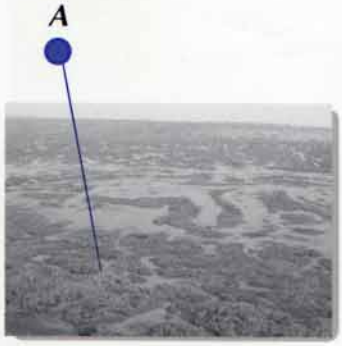
A *System:* **Marine**
Class: **Non-vegetated**
Water Regime: **Irregularly flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Sand**
Water Salinity: **Hyperhaline**
Dominance type: **-**

B *System:* **Marine**
Class: **Water Surface**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Sand**
Water Salinity: **Hyperhaline**
Dominance type: **-**

Falésia beach, Algarve, Portugal; sandy shore; photographed at low and high tide.
Photo: J.C. Farinha

A *System:* **Marine**
Class: **Non-vegetated**
Water Regime: **Regularly flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Sand**
Water Salinity: **Euhaline**
Dominance type: **-**

Salt marsh at Golf of Gabès, Tunisia; the one-metre tidal range is enough to create inter-tidal mud flats covering 200 square kilometres.
Photo: F. Maamouri

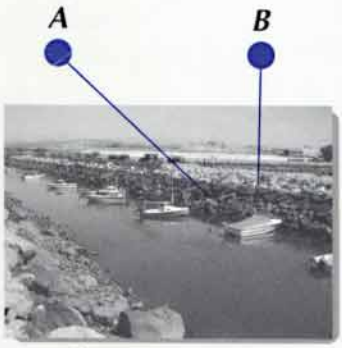


A

System: **Estuarine**
Class: **Emergent**
Water Regime: **Regularly flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Hyperhaline**
Dominance type: **-**

Vila Moura breakwater, Algarve, Portugal; the photos where taken at low and high tide.
Photo: J.C. Farinha



A

System: **Estuarine**
Class: **Aquatic Bed**
Water Regime: **Regularly flooded**
Artificial Modifier: **Artificial substrate**

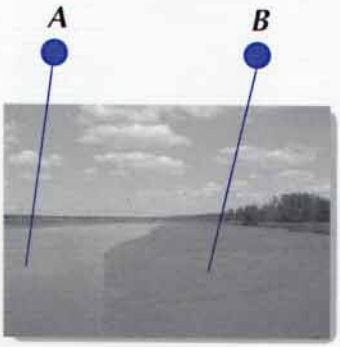
Subsystem: **-**
Subclass: **Algal**
Water Salinity: **Euhaline**
Dominance type: ***Fucus* spp.**

B

System: **Estuarine**
Class: **Non-vegetated**
Water Regime: **Irregularly flooded**
Artificial Modifier: **Artificial substrate**

Subsystem: **-**
Subclass: **Rock**
Water Salinity: **Euhaline**
Dominance type: **-**

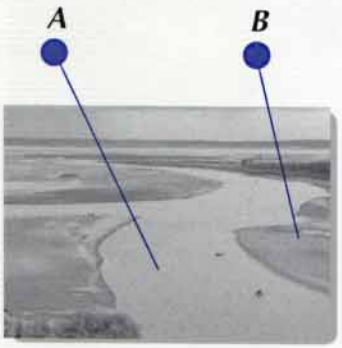
Marateca channel, Sado estuary, Portugal; estuarine waters; the photo was taken at low tide; the channel is entirely flooded at high tide.
Photo: J.C. Farinha



A *System:* **Estuarine**
Class: **Water Surface**
Water Regime: **Subtidal**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Mud**
Water Salinity: **Mixohaline**
Dominance type: **-**

B *System:* **Estuarine**
Class: **Non-vegetated**
Water Regime: **Regularly flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Mud**
Water Salinity: **Mixohaline**
Dominance type: **-**

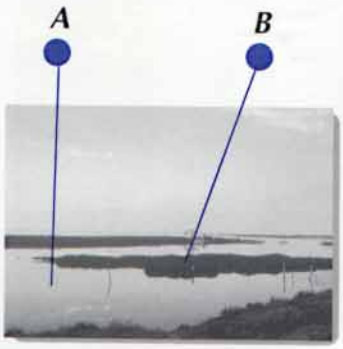
Merja Zerga (Atlantic coast), Morocco; coastal brackish lagoon.
Photo: J.C. Farinha



A *System:* **Estuarine**
Class: **Water Surface**
Water Regime: **Subtidal**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Sand**
Water Salinity: **Euhaline**
Dominance type: **-**

B *System:* **Estuarine**
Class: **Non-vegetated**
Water Regime: **Regularly flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Sand**
Water Salinity: **Euhaline**
Dominance type: **-**

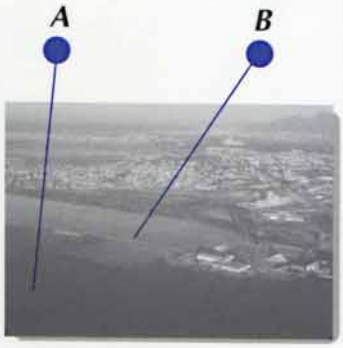
Evros Delta, Anatoliki Makedonia-Thraki, Greece.
Photo: E. Fitoka



A *System:* **Estuarine**
Class: **Water Surface**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **-**
Water Salinity: **Mixohaline**
Dominance type: **-**

B *System:* **Estuarine**
Class: **Emergent**
Water Regime: **Irregularly flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Mixohaline**
Dominance type: **-**

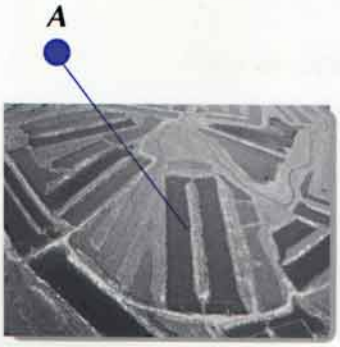
Lake of Tunis (A), Tunisia; the photo shows also the salines de Rades (B), where water is pumped from the lake into man-made evaporation tanks.
Photo: F. Maamouri



A *System:* **Estuarine**
Class: **Water Surface**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **-**
Water Salinity: **Hyperhaline**
Dominance type: **-**

B *System:* **Palustrine**
Class: **WaterSurface**
Water Regime: **Artificially flooded**
Artificial Modifier: **Excavated**
Subsystem: **-**
Subclass: **-**
Water Salinity: **Hyperhaline**
Dominance type: **-**

Castro Marim salines, Algarve, Portugal; the evaporation tanks are closed by gates and flooded by tidal flux.
Photo: J.C. Farinha

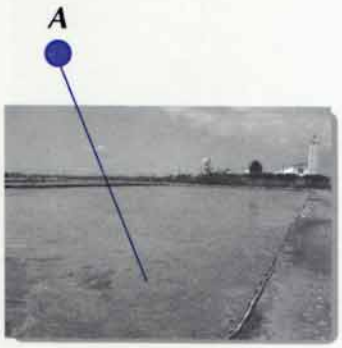


A

System: **Estuarine**
Class: **Water Surface**
Water Regime: **Artificially flooded**
Artificial Modifier: **Excavated**

Subsystem: **-**
Subclass: **Mud**
Water Salinity: **Hyperhaline**
Dominance type: **-**

Samouco salines, Tejo estuary, Portugal.
Photo: J.C. Farinha

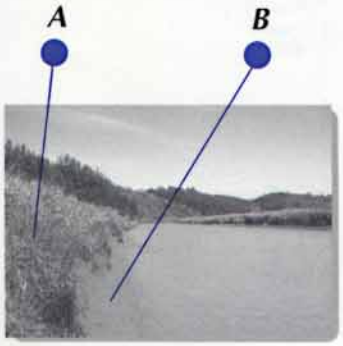


A

System: **Estuarine**
Class: **Aquatic Bed**
Water Regime: **Artificially flooded**
Artificial Modifier: **Artificial - Excavated**

Subsystem: **-**
Subclass: **Algal**
Water Salinity: **Hyperhaline**
Dominance type: **-**

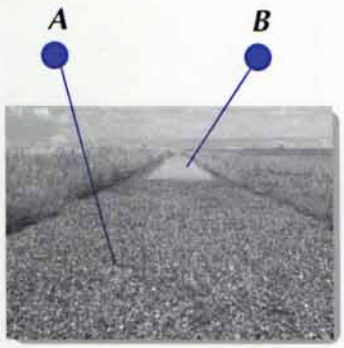
Mira river, Portugal; the water flows slowly, under tidal influence; photographed at low tide.
Photo: J.C. Farinha



A
System: **Riverine**
Class: **Emergent**
Water Regime: **Seasonally flooded-tidal**
Artificial Modifier: **-**
Subsystem: **Tidal**
Subclass: **Persistent**
Water Salinity: **Fresh**
Dominance type: ***Arundo donax***

B
System: **Riverine**
Class: **Non-vegetated**
Water Regime: **Regularly flooded**
Artificial Modifier: **-**
Subsystem: **Tidal**
Subclass: **Mud**
Water Salinity: **Fresh**
Dominance type: **-**

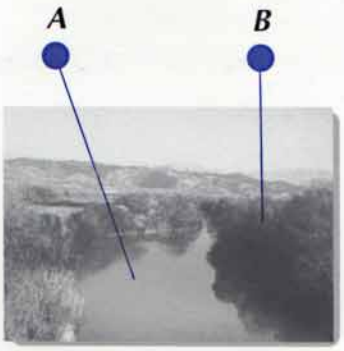
Ponta da Erva, Tejo estuary, Portugal; Irrigation channel.
Photo: J.C. Farinha



A
System: **Riverine**
Class: **Aquatic Bed**
Water Regime: **Permanently flooded**
Artificial Modifier: **Excavated**
Subsystem: **Lower Perennial**
Subclass: **Floating Vascular**
Water Salinity: **Fresh**
Dominance type: ***Eichhornia crassipes***

B
System: **Riverine**
Class: **Water Surface**
Water Regime: **Permanently flooded**
Artificial Modifier: **Excavated**
Subsystem: **Lower Perennial**
Subclass: **-**
Water Salinity: **Fresh**
Dominance type: **-**

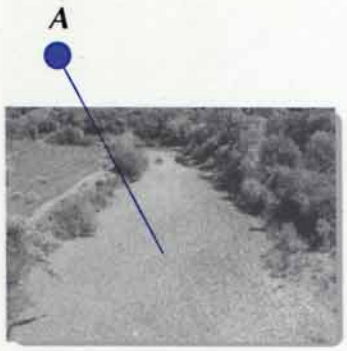
Kalamas River, rises in the S cliffs of the Mitsikeli mountain, flows S SW and discharges in to the Ionean Sea, Greece.
Photo: F. Pergantis



A
System: **Riverine**
Class: **Water Surface**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**
Subsystem: **Lower Perennial**
Subclass: **-**
Water Salinity: **Fresh**
Dominance type: **-**

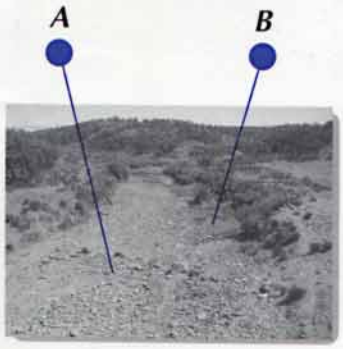
B
System: **Palustrine**
Class: **Forested**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**
Subsystem: **-**
Subclass: **Deciduous**
Water Salinity: **Fresh**
Dominance type: **-**

Odelouca River, Portugal; the entire channel is flooded approximately two to four months each year.
Photo: J.C. Farinha



A
System: **Riverine**
Class: **Non-vegetated**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**
Subsystem: **Lower Perennial**
Subclass: **Cobbles/Gravel**
Water Salinity: **Fresh**
Dominance type: **-**

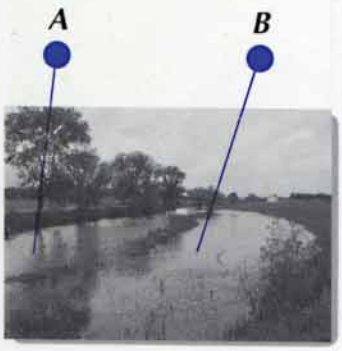
Mira river, Portugal; the flow dries out, remnant water stays in a few isolated pools, in depressions of the river bed.
Photo: J.C. Farinha



A *System:* **Riverine** | *Subsystem:* **Lower Perennial**
Class: **Non-vegetated** | *Subclass:* **Cobbles/Gravel**
Water Regime: **Seasonally flooded** | *Water Salinity:* **Fresh**
Artificial Modifier: **-** | *Dominance type:* **-**

B *System:* **Palustrine** | *Subsystem:* **-**
Class: **Water Surface** | *Subclass:* **Cobbles/Gravel**
Water Regime: **Semi-permanently flooded** | *Water Salinity:* **Fresh**
Artificial Modifier: **-** | *Dominance type:* **-**

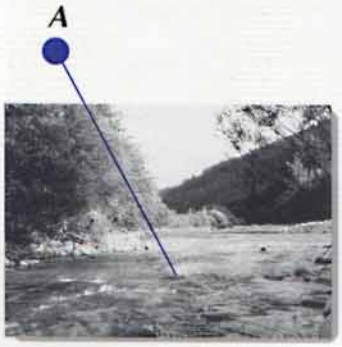
Degebe river, Portugal; the floodplain is inundated for brief periods only, after major storms.
Photo: J.C. Farinha

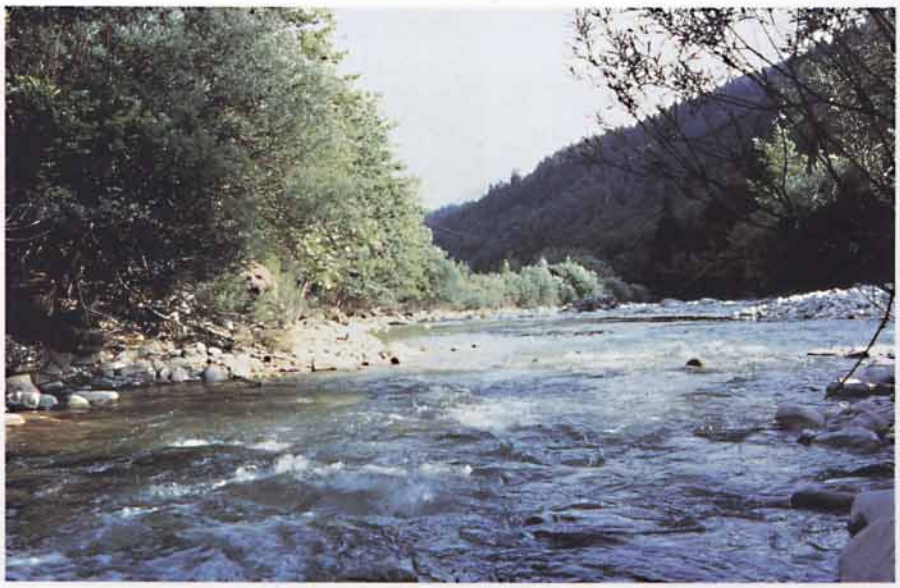


A *System:* **Riverine** | *Subsystem:* **Lower Perennial**
Class: **Water Surface** | *Subclass:* **-**
Water Regime: **Permanently flooded** | *Water Salinity:* **Fresh**
Artificial Modifier: **-** | *Dominance type:* **-**

B *System:* **Riverine** | *Subsystem:* **Lower Perennial**
Class: **Non-vegetated** | *Subclass:* **Vegetated Pioneer**
Water Regime: **Temporarily flooded** | *Water Salinity:* **Fresh**
Artificial Modifier: **-** | *Dominance type:* **-**

Acheloos River, rises in the S Pindos mountain range, flows S SW and discharges into the Ionean Sea, Greece.
Photo: S. Kazantidis

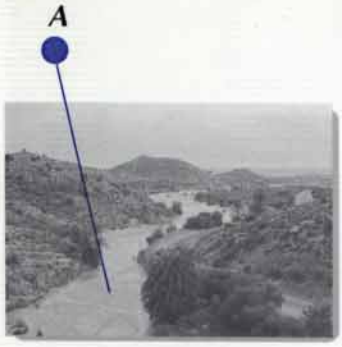




A *System:* **Riverine**
Class: **Water Surface**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**

Subsystem: **Upper Perennial**
Subclass: **Rock**
Water Salinity: **Fresh**
Dominance type: **-**

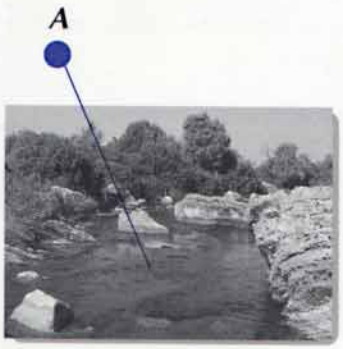
Oued Cherichira, Tunisia; water flows for brief periods only, after rainfall, which is irregular and unpredictable.
Photo: F. Maamouri

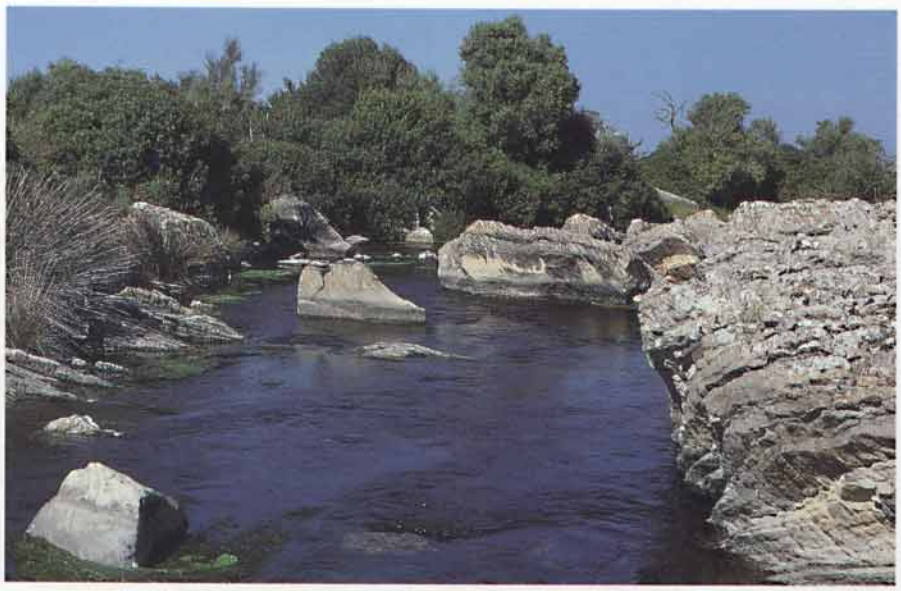


A *System:* **Riverine**
Class: **Non-vegetated**
Water Regime: **Intermittently flooded**
Artificial Modifier: **-**

Subsystem: **Intermittent**
Subclass: **-**
Water Salinity: **Fresh**
Dominance type: **-**

Torrent del Rec, Mallorca, Balearic Islands; this river receives brackish water from a spring.
Photo: T. Tomàs Vives



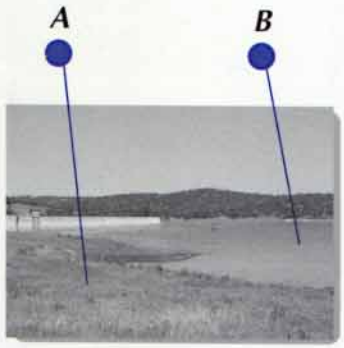


A

System: **Riverine**
Class: **Water Surface**
Water Regime: **Semi-permanently flooded**
Artificial Modifier: **-**

Subsystem: **Lower Perennial**
Subclass: **Rock**
Water Salinity: **Mixosaline**
Dominance type: **-**

Divor dam, Évora, Portugal; water levels may fluctuate considerably in time and the maximum volume of stored water is attained only in some years.
Photo: J.C. Farinha



A

System: **Lacustrine**
Class: **Non-vegetated**
Water Regime: **Intermittently flooded**
Artificial Modifier: **Diked/Impounded**

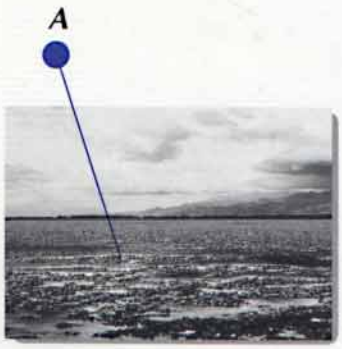
Subsystem: **Littoral**
Subclass: **Vegetated Pioneer**
Water Salinity: **Fresh**
Dominance type: **-**

B

System: **Lacustrine**
Class: **Water Surface**
Water Regime: **Semi-permanently flooded**
Artificial Modifier: **Diked/Impounded**

Subsystem: **Limnetic**
Subclass: **Mud**
Water Salinity: **Fresh**
Dominance type: **-**

Kerkini Lake, Kentriki Makedonia, Greece.
Photo: H. Jerrentrup

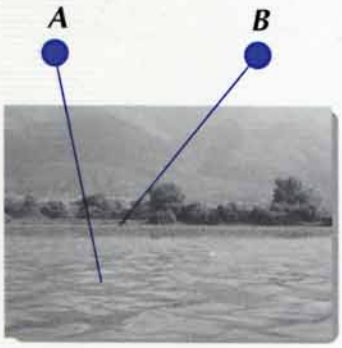


A

System: **Lacustrine**
Class: **Aquatic Bed**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**

Subsystem: **Littoral**
Subclass: **Floating Leaved**
Water Salinity: **Fresh**
Dominance type: **-**

Kerkini Lake, Kentriki Makedonia, Greece;
Photo: E. Fitoka



A

System: **Lacustrine**
Class: **Water Surface**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**

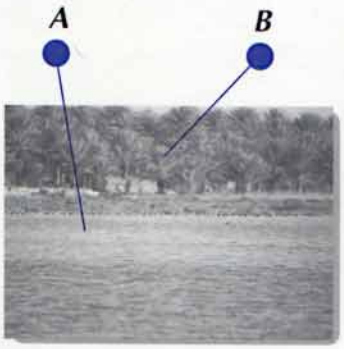
Subsystem: **Limnetic**
Subclass: **-**
Water Salinity: **Fresh**
Dominance type: **-**

B

System: **Palustrine**
Class: **Emergent**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Fresh**
Dominance type: **-**

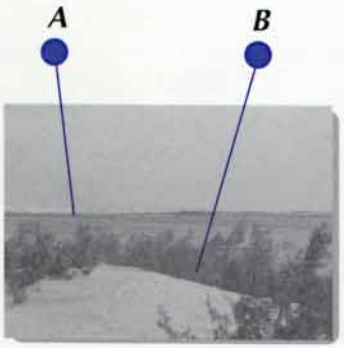
Oasis de Blidette, Tunisia.
Photo: F. Maamouri



A *System:* **Lacustrine** *Subsystem:* **Littoral**
Class: **Water Surface** *Subclass:* **-**
Water Regime: **Permanently flooded** *Water Salinity:* **Oligosaline**
Artificial Modifier: **-** *Dominance type:* **-**

B *System:* **Palustrine** *Subsystem:* **-**
Class: **Forested** *Subclass:* **Evergreen**
Water Regime: **Saturated** *Water Salinity:* **Fresh**
Artificial Modifier: **-** *Dominance type:* **-**

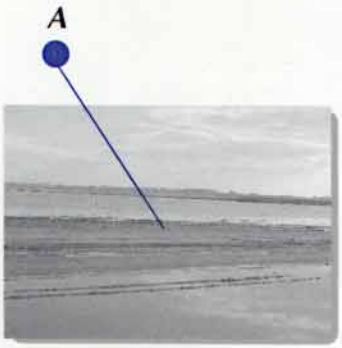
Example 26
Oasis de Nouïl, Tunisia.
Photo: F. Maamouri



A *System:* **Lacustrine** *Subsystem:* **Littoral**
Class: **Non-vegetated** *Subclass:* **Sand**
Water Regime: **-** *Water Salinity:* **Oligosaline**
Artificial Modifier: **-** *Dominance type:* **-**

B *System:* **Palustrine** *Subsystem:* **-**
Class: **Shrub-Scrub** *Subclass:* **Deciduous**
Water Regime: **Saturated** *Water Salinity:* **Oligosaline**
Artificial Modifier: **-** *Dominance type:* ***Tamarix* spp.**

Chott El Fejaj, Tunisia.
Photo: F. Maamouri

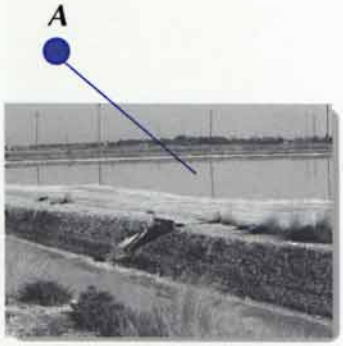


A

System: **Lacustrine**
Class: **Water Surface**
Water Regime: **Intermittently flooded**
Artificial Modifier: **-**

Subsystem: **Littoral**
Subclass: **Salt crust**
Water Salinity: **Hypersaline**
Dominance type: **-**

Salina di Cervia, North Italy;
cristalisation ponds,
industrial salina of 800 ha.
Photo: N. Baccetti

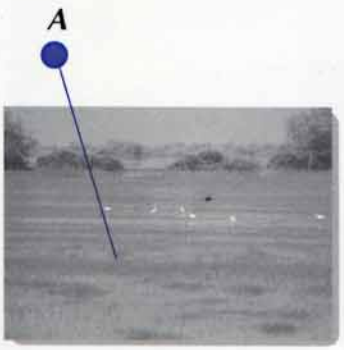


A

System: **Lacustrine**
Class: **Water Surface**
Water Regime: **Artificially flooded**
Artificial Modifier: **Excavated**

Subsystem: **Littoral**
Subclass: **Mud**
Water Salinity: **Hyperhaline**
Dominance type: **-**

Kerkini Lake, Kentriki Makedonia, Greece.
Photo: E. Fitoka

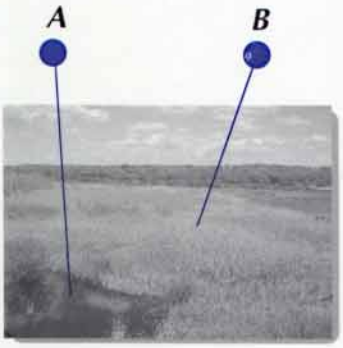


A

System: **Palustrine**
Class: **Emergent**
Water Regime: **Permanently flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Non-persistent**
Water Salinity: **Fresh**
Dominance type: **-**

Arrábidas, Sado estuary, Portugal; Seasonal freshwater marsh
Photo: J.C. Farinha



A

System: **Palustrine**
Class: **Water Surface**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**

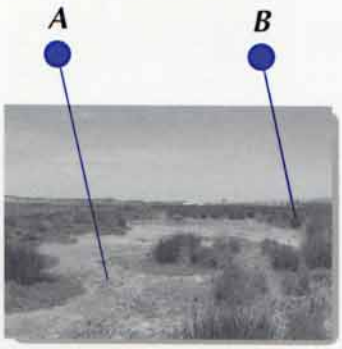
Subsystem: **-**
Subclass: **Mud**
Water Salinity: **Fresh**
Dominance type: **-**

B

System: **Palustrine**
Class: **Emergent**
Water Regime: **Temporarily flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Fresh**
Dominance type: ***Phragmites australis***

Sidi-Moussa/Souk-el-Jemâa, Morocco; seasonal brackish marsh.
Photo: J.C. Farinha



A

System: **Palustrine**
Class: **Non-vegetated**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**

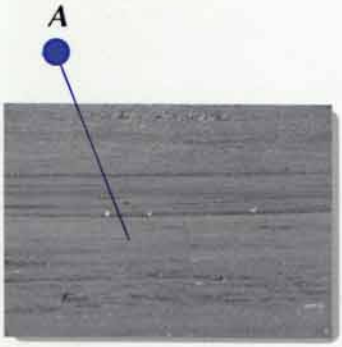
Subsystem: **-**
Subclass: **Mud**
Water Salinity: **Mixohaline**
Dominance type: **-**

B

System: **Palustrine**
Class: **Emergent**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Mixohaline**
Dominance type: **-**

Sidi-Ali, Middle Atlas, Morocco; montane meadow.
Photo: R. Rufino

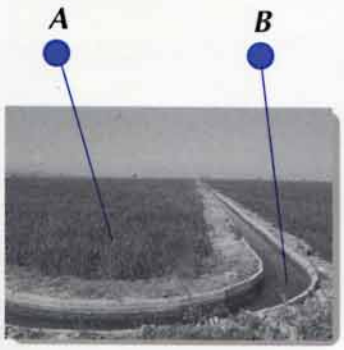


A

System: **Palustrine**
Class: **Emergent**
Water Regime: **Saturated**
Artificial Modifier: **Excavated**

Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Fresh**
Dominance type: **-**

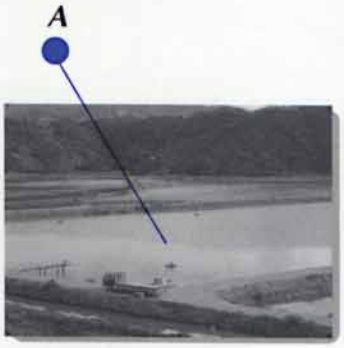
Ebro Delta, Spain; ricefields.
Photo: J.C. Farinha



A *System:* **Palustrine** *Subsystem:* **-**
Class: **Emergent** *Subclass:* **Non-persistent**
Water Regime: **Seasonally flooded** *Water Salinity:* **Fresh**
Artificial Modifier: **Excavated** *Dominance type:* **-**

B *System:* **Riverine** *Subsystem:* **Lower Perennial**
Class: **Water Surface** *Subclass:* **-**
Water Regime: **Permanently flooded** *Water Salinity:* **Fresh**
Artificial Modifier: **Artificial-Excavated** *Dominance type:* **-**

Mira estuary, Portugal; intensive fish farm; water is pumped directly from the estuary into the tanks.
Photo: J.C. Farinha



A *System:* **Palustrine** *Subsystem:* **-**
Class: **Water Surface** *Subclass:* **Mud**
Water Regime: **Permanently flooded** *Water Salinity:* **Euhaline**
Artificial Modifier: **Excavated** *Dominance type:* **-**

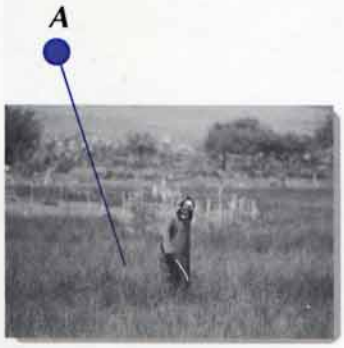
Sidi-Moussa/Souek-el-Jemâa, Morocco; salines which salt water pumped directly from the Atlantic Ocean.
Photo: J.C. Farinha

A *System:* **Palustrine** *Subsystem:* **-**
Class: **Water Surface** *Subclass:* **Mud**
Water Regime: **Artificially flooded** *Water Salinity:* **Hyperhaline**
Artificial Modifier: **Excavated** *Dominance type:* **-**

Traditional salina near Marsala, Sicily, Italy; dutch-type wind mill is used to pump water and to process the salt.
Photo: A. De Faveri

A *System:* **Palustrine** *Subsystem:* **-**
Class: **Water Surface** *Subclass:* **-**
Water Regime: **Artificially flooded** *Water Salinity:* **Hyperhaline**
Artificial Modifier: **Excavated** *Dominance type:* **-**

Merja Zerga, Morocco; the saltmarsh is not flooded by water from the coastal lagoon. The soil is brackish from residual salinity.
Photo: J.C. Farinha



A

System: **Palustrine**
Class: **Emergent**
Water Regime: **Temporarily flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Mixohaline**
Dominance type: **-**

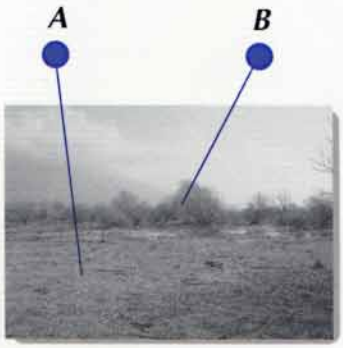
Kerkini Lake, Kentriki Makedonia, Greece.
Photo: E. Fitoka

A

System: **Palustrine**
Class: **Forested**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Deciduous**
Water Salinity: **Fresh**
Dominance type: **-**

Kerkini Lake, Kentriki Makedonia, Greece.
Photo: E. Fitoka



A

System: **Palustrine**
Class: **Non-vegetated**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Organic**
Water Salinity: **Fresh**
Dominance type: **-**

B

System: **Palustrine**
Class: **Forested**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Decidious**
Water Salinity: **Fresh**
Dominance type: **-**

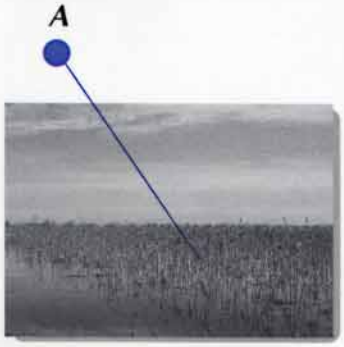
Nestos Delta, Anatoliki Makedonia-Tharaki, Greece.
Photo: E. Fitoka

A

System: **Palustrine**
Class: **Non-vegetated**
Water Regime: **Seasonally flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Vegetated Pioneer**
Water Salinity: **Mesosaline**
Dominance type: **-**

Paul do Boquilobo, Golegã, Portugal; all natural vegetation in this wetland has been removed and water stands in stubble from the previous year.
Photo: J.C. Farinha

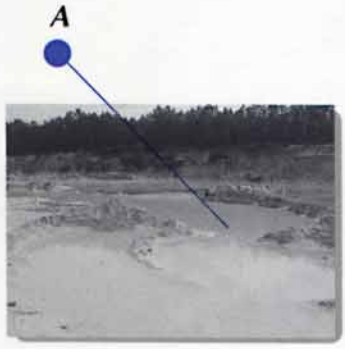


A

System: **Palustrine**
Class: **Emergent**
Water Regime: **Temporarily flooded**
Artificial Modifier: **Farmed**

Subsystem: **-**
Subclass: **-**
Water Salinity: **Fresh**
Dominance type: **-**

Example 42
Pinhal de Leiria, Portugal; inundated sand pit.
Photo: J.C. Farinha

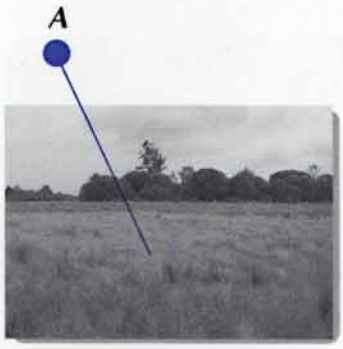


A

System: **Palustrine**
Class: **Water Surface**
Water Regime: **Seasonally flooded**
Artificial Modifier: **Excavated**

Subsystem: **-**
Subclass: **Sand**
Water Salinity: **Fresh**
Dominance type: **-**

Lagoa Salgada, Alcácer do Sal, Portugal; intermittent brackish marsh.
Photo: J.C. Farinha

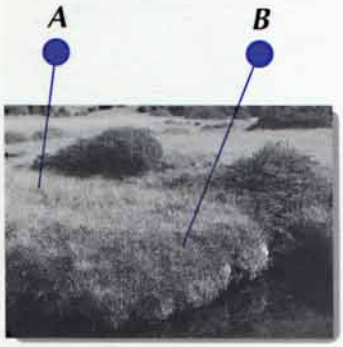


A

System: **Palustrine**
Class: **Emergent**
Water Regime: **Intermittently flooded**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Mixosaline**
Dominance type: ***Juncus* spp.**

Serra da Estrela, Portugal; peatland
Photos: J. Mateus (Lab. de Paleoecologia, Museu Lab. Jardim Botânico, Lisboa)



A

System: **Palustrine**
Class: **Emergent**
Water Regime: **Saturated**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Persistent**
Water Salinity: **Fresh**
Dominance type: ***Nardus stricta* and *Juncus squarrosus***

B

System: **Palustrine**
Class: **Moss-Lichen**
Water Regime: **Saturated**
Artificial Modifier: **-**

Subsystem: **-**
Subclass: **Moss**
Water Salinity: **Fresh**
Dominance type: ***Sphagnum* spp.**

MedWet habitat description system, the letter coding system and map legend

Use of Wetland Legend

The MedWet sub-project on Inventory and Monitoring recommends, at the most detailed level, the detailed description of Mediterranean wetland habitats according to the habitat description scheme presented in this handbook. Wetland habitats should be labelled using the letter code listed in the wetland legend. The habitat description code of each mapped unit should include the appropriate System, Subsystem, Class, Subclass, Water Regime, Salinity, Artificial Modifier and Dominance Type.

SYSTEMS, SUBSYSTEMS, CLASSES and SUBCLASSES

SYSTEMS	SUBSYSTEMS	CLASSES	SUBCLASSES
M Marine		**O** Water Surface	
	- No Subsystem		**R** Rock
E Estuarine			**C** Cobbles/Gravel
	- No Subsystem		**S** Sand
R Riverine			**M** Mud
	T Tidal		**O** Organic
	W Lower Perennial		**G** Gypsum
	U Upper Perennial		**A** Salt crust
	E Intermittent		**K** Unknown Bottom (**1**)
	K Unknown Perennial (**1**)	**S** Non-vegetated	
L Lacustrine			**R** Rock
	M Limnetic		**C** Cobbles/Gravel
	L Littoral		**S** Sand
P Palustrine			**M** Mud
	- No Subsystem		**O** Organic
U Non-wetland (**2**)			**A** Salt crust
			V Vegetated Pioneer
		A Aquatic Bed	
			A Algal
			M Aquatic Moss
			F Floating Vascular
			L Floating-leaved
			R Rooted Vascular
			Z Unknown Submergent (**1**)
			X Unknown Surface (**1**)
		R Reef	
			C Coral
			M Mollusc
			W Worm
		M Moss-Lichen	
			M Moss
			L Lichen
		E Emergent	
			P Persistent
			N Non-persistent
		U Scrub-Shrub	
			D Deciduous
			E Evergreen
			A Dead
		F Forested	
			D Deciduous
			E Evergreen
			A Dead

(1) Not included in the MedWet habitat description system. Created for mapping purposes.

(2) May include wetlands that could not be inventoried because of the procedure used, or due to mapping conventions.

WATER REGIME MODIFIERS

MARINE and ESTUARINE	RIVERINE, LACUSTRINE and PALUSTRINE
P Permanently flooded	**P** Permanently flooded
S Subtidal	**L** Semi-permanently flooded
A Irregularly exposed	**S** Seasonally flooded
R Regularly flooded	**T** Temporarily flooded
G Irregularly flooded	**I** Intermittently flooded
U Saturated	**U** Saturated
MARINE, ESTUARINE RIVERINE, LACUSTRINE and PALUSTRINE	**Tidal areas** (Riverine and Palustrine)
K Unknown (**1**)	**F** Permanently flooded-tidal
	Y Semi-permanently flooded-tidal
	R Regularly flooded
	E Seasonally flooded-tidal
	M Temporarily flooded-tidal
	Artificially flooded areas
	A Artificially flooded

(1) Not included in the MedWet habitat description system. Created for mapping purposes.

WATER SALINITY MODIFIERS

Coastal Halinity	Inland Salinity
F Fresh	**F** Fresh
O Oligohaline	
M Mesohaline	
P Polyhaline	
B Mixohaline (Brackish)	**X** Mixosaline
S Euhaline	**E** Eusaline
H Hyperhaline	**Y** Hypersaline

ARTIFICIAL MODIFIERS

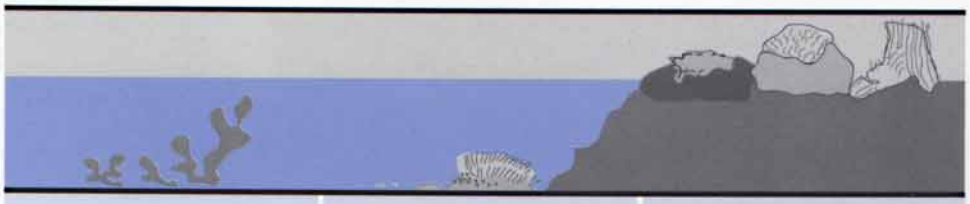
F Farmed	**B** Farmed - Diked/Impounded
A Artificial substrate	**C** Artificial - Excavated
S Spoil	**G** Artificial - Diked/Impounded
E Excavated	**H** Artificial - Excavated - Diked/Impounded
D Diked/Impounded	**J** Spoil - Excavated
P Partially Drained/Ditched	**L** Spoil - Diked/Impounded
	M Spoil - Excavated - Diked/Impounded
	N Excavated - Diked/Impounded

DOMINANCE TYPE

For example, if an area has been classified in the Forested class, the Dominance Type is labelled by the Latin name of the dominant species or by the combination of species (maximum three co-dominant species). The lists of Dominance Types will evolve as detailed wetland inventory work proceeds.

Dominance Types of the different wetland Classes and Subclasses of the Habitat description system

(based on Greek and Portuguese wetland vegetation).



Aquatic Bed

Fucus spp.

Ulva spp.

Sphagnum auriculatum

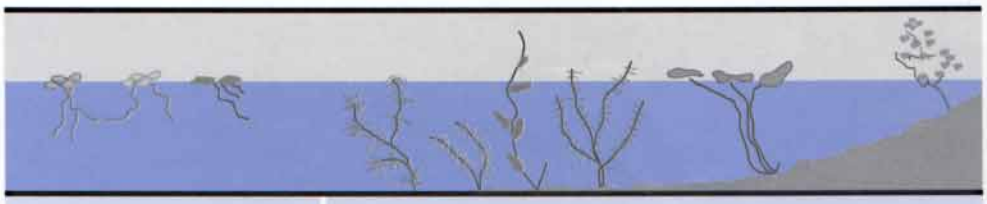
Algal	Aquatic Moss	Moss
Chaetomorpha linum	*Barbula ehrenbergii*	*Sphagnum* auriculatum
Chara spp.	*Fissidens crassipes*	*Sphagnum compactum*
Cladophora spp.	*Fontinallis* spp.	*Sphagnum molle*
Enteromorpha intestinalis	*Riccia* spp.	
Fucus spp.	*Ricciella fluitans*	
Laminaria spp.	*Ricciocarpus natans*	
Nitella spp.	*Riella cosoniana*	
Ulva spp.		

Aquatic Bed


Ranunculus aquatilis


Potamogeton spp.


Nymphaea alba



Floating Vascular	Rooted Vascular/Floating-leaved
Azolla caroliniana	*Callitriche obtusangula*
Azolla filiculoides	*Callitriche* spp.
Eichhornia crassipes	*Ceratophyllum demersum*
Lemna gibba	*Ceratophyllum submersum*
Lemna minor	*Cymodocea nodosa*
Spirodela polyrrhiza	*Elodea canadensis*
Trapa natans	*Groelandia densa*
Wolfia arrhiza	*Hydrocharis morsus-ranae*
	Lemna trisulca
	Myriophylum alterniflorum
	Myriophylum spicatum
	Myriophyllum verticillatum
	Najas graccilima
	Najas marina
	Najas minor
	Nuphar lutea
	Nymphaea alba
	Nymphoides peltata
	Polygonatum amphybium
	Posidonia oceanica
	Potamogeton crispus
	Potamogeton filiformis
	Potamogeton gramineus
	Potamogeton lucens
	Potamogeton natans
	Potamogeton nodosus
	Potamogeton pectinatus
	Potamogeton pussilus
	Potamogeton trichoides
	Ranunculus aquatilis
	Ranunculus fluitans
	Ranunchulus trichophyllus
	Ruppia maritima
	Urticularia vulgaris
	Vallisneria spiralis
	Zannichellia palustris
	Zostera noltii (nana)
	Zostera marina

Emergent

Halimione portucaloides

Scirpus lacustris

Non-persistent / Persistent

Aeluropus litoralis
Agropyrum junceum
Agrostis alba
Alisma gramineum
Alisma plantago-aquatíca
Anthemis arvensis
Apium graveolens
Apium nodiflorum
Arthrocnemum fruticosum
Arthrocnemum glaucum
Arundo donax
Aster tripolium
Atriplex hastata
Atriplex rosea
Bassia hirsuta
Bupleurum tenuissium
Bupleurum tricopodum
Butomus umbellatus
Cacile maritima
Calamagrostis epigeios
Carex distans
Carex divisa
Carex nigra
Carex vulpina
Centaurea diffusa
Cirisium creticum
Cladium mariscus
Crypsis aculeata
Cuscuta australis
Cyperus fuscus
Cyperus longus
Cyperus rotundus
Eleocharis palustris
Eleocharis multicaulis
Elymus arenarius
Elymus giganteus
Equisetum arvense
Equisetum maximum
Equisetum telmateia
Glyceria declinata
Halimione portucaloides
Holcus lanatus
Iris pseudacorus
Juncus acutus
Juncus articulatus
Juncus bufonius
Juncus gerardii
Juncus heldreichianus
Juncus maritimus
Juncus squarrosus
Juncus subulatus
Leucojum aestivum
Limonium bellidiflorum
Limonium gmelinii
Lythrum salicaria
Lythrum virgatum
Mentha pulegium
Montia verna
Narcissus tazetta
Nardus stricta
Nastirtium officinale
Oenanthe aquatica
Oenanthe crocata
Oenanthe fistulosa
Phalaris arundinacea
Phragmites australis
Picreus badius
Picreus longus
Plantago major
Polygonum maritimum
Puccinelia distans
Puccinelia festuciformis
Rumex conglomeratum
Rumex conglomeratus
Rumex crispus
Rumex hydrolapathum
Salicornia europea
Salicornia fruticosa
Salicornia herbacea
Salicornia radicans
Salicornia ramosissima
Salsola soda
Scirpus lacustris
Scirpus litoralis
Scirpus maritimus
Scirpus tabernaemontani
Sparganium erectum
Spartina maritima
Spergularia marina
Spergularia media
Spergularia salina
Statice angustifolia
Statice sinuata
Suaeda maritima
Suaeda splendens
Tragus racemosus
Typha angustifolia
Typha dominguensis
Typha latifolia
Veronica anagalloides
Xanthium spinosum

Scrub-Shrub/ Forested

Tamarix spp.

Deciduous	Evergreen
Alnus glutinosa	*Nerium oleander*
Aristolochia clematis	*Phoenix theophrastii*
Fraxinus angustifolia	*Securinega tinctoria*
Myrica gale	
Periploca graeca	
Platanus orientalis	
Populus alba	
Populus nigra	
Salix alba	
Salix atrocinerea	
Salix fragilis	
Salix salviifolia	
Salix triandra	
Tamarix africana	
Tamarix hampeana	
Tamarix parviflora	
Tamarix smyrnensis	
Vitex agnus-castus	
Ulmus minor	
Ulmus laevis (efusa)	
Ulmus procera	
Ulmus glabra (scabra)	

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