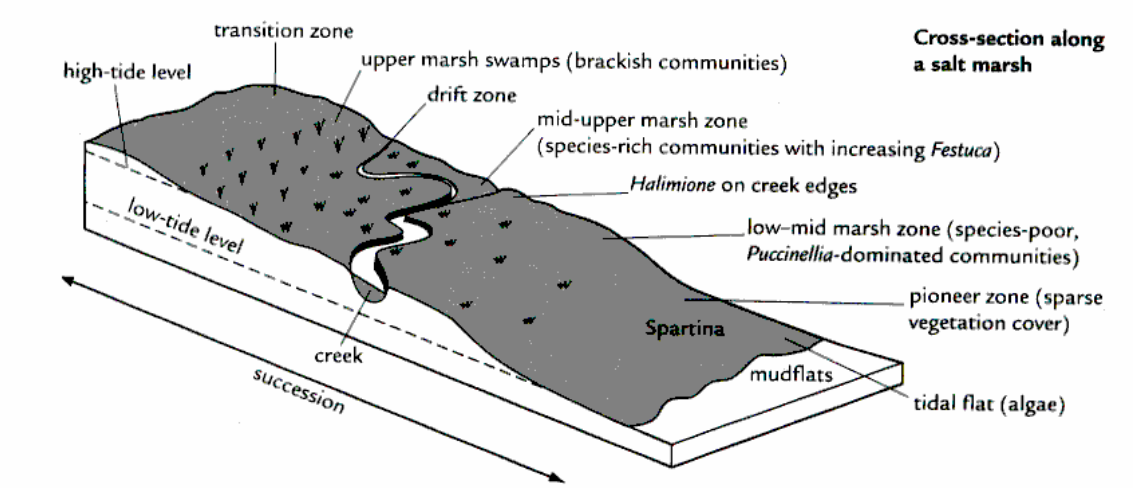
AS Geography 1.3 Coastal Environments *Student Notes*

How and why plan succession develops from a pioneer community in a salt marsh ecosystem (halosere).

You need to understand the concept of succession and you should be able to describe and explain the succession in a salt marsh system. You should be able to use transect diagrams to describe the spatial dimension of the succession but you must also appreciate that it is the temporal dimension that is the focus of the idea of succession.

Salt marshes form where wave energy is low, in estuaries and in the lee of spits and bars. There also has to be an input of fine sits and clays. The clays flocculate in seawater and are deposited in the form of mudflats: a process known as **coastal accretion**. The accretion is promoted by vegetation that is adapted to periodic inundation by salt water. The sediments are filtered out of the tidal water as the tide ebbs. In this way, the level of the land is gradually built up and the vegetated marshland spreads across the estuary or tidal flat.

The rate of development is slow at first when the vegetation is sporadic. Towards the end of the process, the height of the marsh is such that tidal flooding is infrequent and accretion slows down. The accretion is uneven, allowing the development of tidal creeks and saltpans. Creeks are the channels used by the ebbing and flowing tides. Pans form in hollows where water collects and then evaporates leading to high salt concentrations that exclude most plants, except some algae.



The succession on a salt marsh is called a halosere.

1. The pioneer species include green algae such as *Enteromorpha and* eel grass that forms on exposed mud and can withstand long periods submerged by saltwater for most of the 12 hour cycle.

2. Other pioneers include *Salicornia* and *Suaeda maritime and Spartina townsendii.* These **halophytic** (salt tolerant) plants grow on the **"slob zone"** (or pioneer zone) with a maximum of 4/12 hours exposure above the tide. These plants can also cope with anaerobic soils, a high pH level and waterlogged conditions. Adaptations include hollow stems, which allow oxygen to the plant roots from the air and an ability to secrete salt through the leaves. The long roots of *spartina* anchor it in the mud and allow mud to be collected so the water becomes shallower.

3. The increasingly shallow water allows new early colonisers to establish themselves and the formation of the "**sward zone**". Plants here require 8/12 hours exposure above the tidal water. These include sea lavender, sea aster and grasses. The sward zone is usually broken by creeks and saltpans. The mud continues to accumulate and some fresh water starts to accumulate on top of the denser salty water in the muddy, humus rich salt marsh soils.

4. The **upper sward zone** is only covered by spring tides and here juncus and other freshwater rushes will grow.

5. The climax is reached when there is no further flooding and alder, ash and eventually oak trees start to grow.

Examples of salt marshes can be found in the Taw and Torridge estuaries and in the lee of the Pebble Ridge Spit ant Westward Ho! In Dorset, large areas of salt marsh can be found around the shore of Poole harbour. The diagram below summarises the process of succession in a salt marsh.

SALT MARSHES

Examples include Scolt Head Island in East Anglia and Newtown on the Isle of Wight.

Salt marshes are very productive and fertile ecosystems because of their high oxygen content, nutrient availability, and light availability, and because of the cleaning action of the tides.

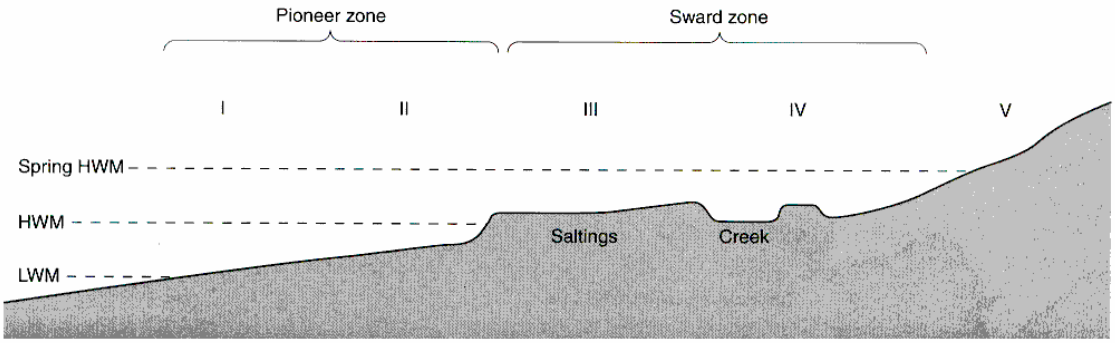
I **Colonisers** on bare mud flats: algae (enteromorpha), eel grass, and marsh samphire (salicornia) increase the amount of deposition of silt. These plants can tolerate alkaline conditions and regular inundation by sea-water.

II **Halophytic vegetation** such as rice grass and spartina (cord grass) build up the salt marsh by as much as 5 cm per annum. Their roots anchor into the soft mud; the vegetation is taller and longer living than salicornia but not as salt tolerant.

III Sea lavendar **grasses**: inundated only at spring tides. Less salt tolerant.

IV A **raised salt marsh** with creeks may be formed, including turf grasses such as fescue and rushes (juncus). Inundation is rare.

V Inundation absent: ash and alder.



How and why salt marsh systems are modified by human activity.

You should appreciate that human modifications can be short term or long term and both deliberate and unintentional.

- Salt marshes provide flat, coastal location, which have proved to be attractive for coastal industrial location. Salt marshes in the Tees estuary have been reclaimed for oil refineries, a steelworks and chemical factories. In the Mersey Estuary, a wide range of land uses have encroached into reclaimed salt marshes including a marina, a petrochemical plant, cultivated land, an airport, a sewage plant and housing.

- Some salt marshes in the Taw/Torridge estuaries have been drained for agricultural use. Once drained and desalinated the humus rich soils are fertile and easy to cultivate.

- Salt marshes, such as those on the North Norfolk coast, have been managed and controlled to encourage wildlife. This is well exemplified by the RSPB reserve at Titchwell Marsh where rare wading birds such as avocets, bar-tailed godwits, redshanks, dunlins, plovers and bitterns are successfully encouraged.

- Sea level changes, caused by global warming, are likely to threaten many salt marshes, unless additional land is provided for the marsh to “relocate” inland. At Nothey Island, near Maldon, in the Blackwater estuary, an experiment in managed retreat is being tried in which the sea wall has been removed, allowing the sea to reclaim former marshland (once drained for farmland), creating a new natural protection. The general retreat of all flood embankments is under consideration, rather than attempting to maintain and raise sea walls at great expense. This would allow the salt marshes to gradually relocate as sea levels rise.

- Salt marshes can suffer pollution or eutrophication from pesticide and fertiliser outwash from agricultural land, changing species composition. Sewage pollution was a major problem in the Torridge estuary until recent upgrading of the sewerage system.