



GLOSSARY OF TERMS FOR SUBAQUEOUS SOILS, LANDSCAPES, LANDFORMS, AND PARENT MATERIALS OF ESTUARIES AND LAGOONS

Subaqueous Soils Subcommittee
of the
Standing Committee on NCSS Standards
National Cooperative Soil Survey Conference
Corpus Christi, Texas
2005



September 2005

Foreword

Soil surveys have traditionally been restricted to terrestrial environments. Areas with permanent standing water were generally only mapped as soils if emergent vegetation was present. In recent years, soil scientists began to recognize that the soil forming processes of additions, removals, transfers, and transformations were occurring in subaqueous environments of our coastal areas (see: *Demas and Rabenhorst, 2001. Factors of subaqueous soil formation: a system of quantitative pedology for submersed environments in: Geoderma, volume 102, pages 189–204*). The definition of “soil” was revised for the 2nd edition of Soil Taxonomy (in part to reflect this reality. By saying “areas are not considered to have soil if the surface is permanently covered by water too deep (typically more than 2.5 m) for the growth of rooted plants” we allow for the inclusion of areas with submerged aquatic vegetation such as eel grass and kelp beds in estuarine environments.

Interest in describing, characterizing, and mapping subaqueous soils has increased in recent years in selected coastal areas around the country, mostly on the Atlantic and Gulf Coasts. This is the result of a recognition by specialists who are charged with the management and protection of estuarine resources, that soil science and soil survey can make an important contribution to understanding, inventorying, and managing these resources. This is a great compliment to the work of the National Cooperative soil Survey Program. Bringing soil survey to the subaqueous environment presents significant challenges. Our collection of well established procedures, tools, and standards that work so well in the terrestrial environment are not always appropriate here. One area that has been found lacking is the terms to adequately describe subaqueous landscapes, landforms and parent materials.

This glossary is the result of work by the Subaqueous Soils Subcommittee of the Standing Committee on NCSS Standards. It took place as part of the National Cooperative Soil Survey Conference held at Corpus Christi, Texas, May 21-26, 2005. These new terms have been added to the National Soil Survey Handbook, Part 629. They have been reproduced here, along with some selected existing terms that are applicable to coastal environments, for soil scientists and others to use as a standard reference for describing these features consistently. As work continues and new terms are needed, they can be proposed for addition to the NSSH.

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Note: Terms preceded by an asterisk () are subaqueous terms. Also included are a limited number of closely associated subaerial terms to provide a more complete suite of terms for the lagoon/estuarine environment.*

Beach - (a) A gently sloping zone of unconsolidated material, typically with a concave profile, extending landward from the low-water line to the place where there is a definite change in material or physiographic form (such as a cliff) or to the line of permanent vegetation (usually the effective limit of the highest storm waves); a shore of a body of water, formed and washed by waves or tides, usually covered by sand or gravel; (b) the relatively thick and temporary accumulation of loose water-borne material (usually well-sorted sand and pebbles) accompanied by mud, cobbles, boulders, and smoothed rock and shell fragments, that is in active transit along, or deposited on, the shore zone between the limits of low water and high water. (modified from Jackson, 1997)

Back-Barrier Beach: A narrow, elongate, intertidal, sloping landform that is generally parallel with the shoreline located on the lagoon or estuary side of the barrier island, or spit. Compare – Barrier Island.

Back-Barrier Flat: A subaerial, gently sloping landform on the lagoon side of the barrier beach ridge composed predominantly of sand washed over or through the beach ridge during tidal surges; a portion of a barrier flat. Compare – Washover-fan Flat.

Barrier Beach: A narrow, elongate, coarse-textured, intertidal, sloping landform that is generally parallel with the beach ridge component of the barrier island, or spit and adjacent to the ocean. Compare – Barrier Island. (Jackson, 1997; Peterson, 1981).

* **Barrier Cove:** A subaqueous area adjacent to a barrier island or submerged barrier beach that forms a minor embayment or cove within the larger basin. Compare – Cove, Mainland Cove.

Barrier Flat - A relatively flat, low-lying area, commonly including pools of water, separating the exposed or seaward edge of a barrier beach or barrier island from the lagoon behind it. An assemblage of both deflation flats left behind formerly moving dunes and /or storm washover sediments; may be either barren or vegetated. Compare – barrier beach, back-barrier flat. (modified from Jackson, 1997)

Barrier Island: A long, narrow, sandy island that is above high tide and parallel to the shore that commonly has dunes, vegetated zones, and swampy or marshy terranes extending lagoonward from the beach. Compare – barrier beach. (modified from Jackson, 1997)

* **Bay Bottom:** The nearly level or slightly undulating central portion of a submerged, low-energy, depositional estuarine embayment characterized by relatively deep water (1.0 to >2.5 m). Compare – Lagoon Bottom.

* **Cove [water]:** A small, narrow sheltered bay or recess in an estuary, often inside a larger embayment (modified from Jackson, 1997). Compare – Estuary.

Deflation Flat: (colloquial – US Gulf Coast) A series of low ridges and troughs on an essentially flat surface formed by dune field migration during alternating wet and dry periods; a type of interdune. Troughs are eroded down to the wet sand level during drought periods (dune slack), while the ridges are stabilized by vegetation that invades the edge of dune fields during wet periods. Compare – blowout, deflation basin.

* **Dredged Channel:** A roughly linear, deep water area formed by a dredging operation for navigation purposes (after Wells et al., 1994; dredged hole). Compare – Dredge-Deposit Shoal.

* **Dredge-Deposit Shoal:** A subaqueous area, substantially shallower than the surrounding area that resulted from the deposition of materials from dredging and dumping (modified from Demas 1998). Compare – Dredged Channel, Shoal.

Dredge Spoils: Unconsolidated, randomly mixed sediments composed of rock, soil, and/or shell materials extracted and deposited during dredging and dumping activities. Dredge spoils lie unconformably upon natural, undisturbed soil or regolith and can form anthropogenic landforms (e.g. Dredge Spoil Bank). (Schoeneberger and Wysocki, 2005)

Dredge Spoil Bank: A subaerial mound or ridge that permanently stands above the water composed of dredge spoils; randomly mixed sediments deposited during dredging and dumping. Compare – Dredged Channel, Dredge-Deposit Shoal, Filled Marshland. (Schoeneberger and Wysocki, 2005)

Dune Field: An assemblage of moving and/or stabilized dunes, together with sand plains, interdune areas, and the ponds, lakes, or swamps produced by the blocking of waterways by migrating dunes. See dune lake. SW

Dune Slack: A damp depression or trough between dunes in a dune field or dune ridges on a shore, caused by intersecting the capillary fringe of the local water table; a moist type of interdune. (modified from Jackson, 1997)

Estuarine Deposit: Fine-grained sediments (sand, silt, and clay) of marine and fluvial origin commonly containing decomposed organic matter, laid down in the brackish waters of an estuary; characteristically finer sediments than deltaic deposits. Compare – **Fluviomarine Deposit**, Lacustrine Deposit, Lagoonal Deposit, Marine Deposit, Overbank Deposit. (modified from Jackson, 1997)

* **Estuarine Subaqueous Soils:** Soils that form in sediment found in shallow-subtidal environments in protected estuarine coves, bays, inlets, and lagoons. Excluded from the definition of these soils are any areas “permanently covered by water too deep (typically greater than 2.5 m) for the growth of rooted plants.

Estuary: a) A seaward end or the widened funnel-shaped tidal mouth of a river valley where fresh water comes into contact with seawater and where tidal effects are evident (e.g., a tidal river, or a partially enclosed coastal body of water where the tide meets the current of a stream). b) A portion of an ocean or an arm of the sea affected by fresh water. c) A drowned river mouth formed by the subsidence of land near the coast or by the drowning of the lower portion of a non-glacial valley due to the rise of sea level. Compare – Lagoon. (modified from Jackson, 1997)

Filled Marshland: A subaerial soil area composed of fill materials (construction debris, dredged or pumped sandy or shell-rich sediments, etc.) deposited and smoothed to provide building sites and associated uses (e.g. lawns, driveways, parking lots). These fill materials are typically 0.5 to 3 m thick and have been deposited unconformably over natural soils (Schoeneberger and Wysocki, 2005). Compare – Dredge Spoil Bank.

* **Flood-Tidal Delta:** A largely subaqueous (sometimes intertidal), crudely fan-shaped deposit of sand-sized sediment formed on the landward side of a tidal inlet (modified from Boothroyd et al., 1985; Davis, 1994; Ritter et al., 1995). Flood tides transport sediment through the tidal inlet and into the lagoon over a flood ramp where currents slow and dissipate (Davis, 1994). Generally, flood-tidal deltas along microtidal coasts are multi-lobate and unaffected by ebbing currents (modified from Davis, 1994). Compare – Flood-Tidal Delta Slope.

* **Flood-Tidal Delta Flat:** The relatively flat, dominant component of the flood-tidal delta. At extreme low tide this landform may be exposed for a relatively short period (modified from Boothroyd et al., 1985).

* **Flood-Tidal Delta Slope:** An extension of the flood-tidal delta that slopes toward deeper water in a lagoon or estuary, composed of flood channels, inactive lobes (areas of the flood-tidal delta that are not actively accumulating sand as a result of flood tides), and parts of the terminal lobe of the flood-tidal delta (modified from Boothroyd et al., 1985).

* **Fluviomarine Bottom:** The nearly level or slightly undulating, relatively low-energy, depositional environment with relatively deep water (1.0 to >2.5 m) directly adjacent to an incoming stream and composed of interfingered and mixed fluvial and marine sediments (fluviomarine deposits).

Fluviomarine Deposit: Stratified materials (clay, silt, sand, or gravel) formed by both marine and fluvial processes, resulting from non-tidal sea level fluctuations, subsidence, and/or stream migration (e.g. materials originally deposited in a nearshore environment and subsequently reworked by fluvial processes as sea level fell). Compare – Estuarine

Deposit, Lacustrine Deposit, Lagoonal Deposit, Marine Deposit, Overbank Deposit. (Schoeneberger and Wysocki, 2005)

Fluviomarine Terrace: A constructional coastal strip, sloping gently seaward and/or down valley, veneered by or completely composed of unconsolidated fluviomarine deposits (typically silt, sand, fine gravel). Compare – Terrace, Stream Terrace, Marine Terrace. (Schoeneberger and Wysocki, 2005)

Fringe-Tidal Marsh: Narrow salt marsh adjacent to a relatively higher energy environment.

Intertidal: (adjective) The coastal environment between mean low tide and mean high tide that alternates between subaerial and subaqueous depending on the tidal cycle. Compare – Subtidal.

* **Inlet:** A short, narrow waterway connecting a bay, lagoon, or similar body of water. Compare – Tidal Inlet. (modified from Jackson, 1997)

Island: An area of land completely surrounded by water. Compare – Barrier Island. (modified from Jackson, 1997)

Lagoon: A shallow stretch of salt or brackish water, partly or completely separated from a sea or lake by an offshore reef, barrier island, sandbank or spit (modified from Bates and Jackson, 1987)

* **Lagoon Bottom:** The nearly level or slightly undulating central portion of a submerged, low-energy, depositional estuarine basin (McGinn, 1982) characterized by relatively deep water (1.0 to >2.5 m). Compare – Bay Bottom.

* **Lagoon Channel:** A subaqueous, sinuous area within a lagoon that likely represents a relict channel (paleochannel, Wells et al., 1994) that is maintained by strong currents during tidal cycles (Short, 1975).

Lagoonal Deposit: Sand, silt or clay-sized sediments transported and deposited by wind, currents, and storm washover in the relatively low-energy, brackish to saline, shallow waters of a lagoon. Compare – Estuarine Deposit, Fluviomarine Deposit, Marine Deposit.

Longshore Bar [relict]: A narrow, elongate, coarse-textured ridge that once rose near to, or barely above, a pluvial or glacial lake and extended generally parallel to the shore but was separated from it by an intervening trough or lagoon; both the bar and lagoon are now relict features. (Jackson, 1997)

* **Mainland Cove:** A subaqueous area adjacent to the mainland or a submerged mainland beach that forms a minor recess or embayment within the larger basin. Compare – Cove, Barrier Cove.

Marine Deposit: Sediments (predominantly sands, silts and clays) of marine origin laid down in the waters of an ocean. Compare – Estuarine Deposit, Lagoonal Deposit. (Schoeneberger and Wysocki, 2002)

Marine Terrace: A constructional coastal strip, sloping gently seaward, veneered by marine deposits (typically silt, sand, fine gravel). Compare – Terrace, Wave-built Terrace. (Jackson, 1997)

Point Bar [coastal]: Low, arcuate subaerial ridges of sand developed adjacent to an inlet and formed by the lateral accretion or movement of the channel.

- * **Reef:** A ridge-like or mound-like structure, layered or massive, built by sedentary calcareous organisms, especially corals, and consisting mostly of their remains; it is wave-resistant and stands above the surrounding contemporaneously deposited sediment. Reefs may also include a mass or ridge of rocks, especially coral and sometimes sand, gravel, or shells, rising above the surrounding estuary, sea or lake bottom to, or nearly to, the surface (modified from Jackson, 1997).
- * **Relict-Tidal Inlet:** A channel remnant of a former tidal inlet. The channel was cutoff or abandoned by infilling from migrating shore sediments. Compare – Inlet, Tidal Inlet. (Schoeneberger and Wysocki, 2005).
- * **Shoal:** A natural, subaqueous ridge, bank, or bar consisting of, or covered by, sand or other unconsolidated material, rising from the bed of a body of water (e.g. estuarine floor) to near the surface. Compare – Dredge-deposit Shoal, Reef. (modified from Jackson, 1997)

Shore: The narrow strip of land immediately bordering any body of water, esp. the sea or a large lake; specifically the zone over which the ground is alternately exposed and covered by tides or waves, or the zone between high water and low water. (Jackson, 1997)

Shore Complex: Generally a narrow, elongate area that parallels a coastline commonly cutting across diverse inland landforms, and dominated by landforms derived from active coastal processes which give rise to beach ridges, washover fans, beaches, dunes, wave-cut platforms, barrier islands, cliffs, etc. (Schoeneberger and Wysocki, 2005)

Shoreline: The intersection of a specified plane of water with the beach; it migrates with changes of the tide or of the water level. Compare – Strandline, Shore Complex, Barrier Beach. (Jackson, 1997)

Spit: (a) A small point or low tongue or narrow embankment of land, commonly consisting of sand or gravel deposited by longshore transport and having one end attached to the mainland and the other terminating in open water, usually the sea; a

finger-like extension of the beach. (b) A relatively long, narrow shoal or reef extending from the shore into a body of water. (Jackson, 1997)

Subaerial: (adjective) Said of conditions and processes, such as erosion, that exist or operate in the open air on or immediately adjacent to the land surface; or of features and materials, such as eolian deposits, that are formed or situated on the land surface. Compare – Subaqueous. (modified from Jackson, 1997)

* **Subaqueous:** (adjective) Said of conditions and processes, features, or deposits that exist or operate in or under water. Compare – Subaerial. (modified from Jackson, 1997)

* **Subaqueous Landscapes:** Permanently submerged areas that are fundamentally the same as subaerial (terrestrial) systems in that they have a discernable topography composed of mappable, subaqueous landforms.

* **Subaqueous Soils:** Soils that form in sediment found in shallow, permanently flooded environments. *Excluded from the definition of these soils are any areas “permanently covered by water too deep (typically greater than 2.5 m) for the growth of rooted plants.*

Submerged-Upland Tidal Marsh: An extensive, nearly level, intertidal landform composed of unconsolidated sediments (clays, silts and/or sand and organic materials), a resistant root mat, and vegetated dominantly by hydrophytic plants. The mineral sediments largely retain pedogenic horizonation and morphology (e.g. argillic horizons) developed under subaerial conditions prior to submergence due to sea level rise; a type of tidal marsh. Compare – Tidal Marsh.

* **Submerged Back-Barrier Beach:** A permanently submerged extension of the back-barrier beach that generally parallels the boundary between estuary and the barrier island. Compare – Submerged Mainland Beach, Barrier Beach.

* **Submerged Mainland Beach:** A permanently submerged extension of the mainland beach that generally parallels the boundary between an estuary or lagoon and the mainland. Compare – Submerged Back-Barrier Beach, Barrier Beach.

* **Submerged Point Bar [coastal]:** The submerged extension of an exposed (subaerial) point bar.

* **Submerged Wave-Built Terrace:** A subaqueous, relict depositional landform originally constructed by river or longshore sediments deposits along the outer edge of a wave-cut platform and later submerged by rising sea level or subsiding land surface. (modified from Jackson, 1997). Compare Wave – Built Terrace and Wave-Cut Platform.

* **Submerged Wave-Cut Platform:** A subaqueous, relict erosional landform that originally formed as a wave-cut bench and abrasion platform from coastal wave erosion

and later submerged by rising sea level or subsiding land surface. (modified from Jackson, 1997). Compare – Wave-Built Terrace, Wave-Cut Platform.

* **Subtidal:** (adjective) Continuous submergence of substrate in an estuarine or marine ecosystem; these areas are below the mean low tide. (modified from Cowardin et al., 1979). Compare – Intertidal.

* **Subtidal Wetlands:** Permanently inundated areas within estuaries dominated by subaqueous soils and submerged aquatic vegetation.

Swash Zone: The sloping part of the beach that is alternately covered and uncovered by the uprush of waves, and where longshore movement of water occurs in a zigzag (upslope-downslope) manner. (Jackson, 1997). Compare – Shoreline.

Tidal Flat: An extensive, nearly horizontal, barren or sparsely vegetated tract of land that is alternately covered and uncovered by the tide, and consists of unconsolidated sediment (mostly clays, silts and/or sand, and organic materials). Compare – Tidal Marsh, Wind-Tidal Flat. (Jackson, 1997)

* **Tidal Inlet:** Any inlet through which water alternately floods landward with the rising tide and ebbs seaward with the falling tide (Jackson, 1997). Compare – Inlet, Relict Tidal Inlet.

Tidal Marsh: An extensive, nearly level marsh bordering a coast (as in a shallow lagoon, sheltered bay, or estuary) and regularly inundated by high tides; formed mostly of unconsolidated sediments (e.g. clays, silts, and/or sands and organic materials), and the resistant root mat of salt tolerant plants, a marshy tidal flat. Compare – Tidal Flat. (Schoeneberger and Wysocki, 2005; modified from Jackson, 1997)

Washover Fan: A fan-like landform of sand washed over a barrier island or spit during a storm and deposited on the landward side. Washover fans can be small to medium sized and completely subaerial, or they can be quite large and include subaqueous margins extending into adjacent lagoons or estuaries. Large fans can be subdivided into sequential parts: ephemeral washover channel (microfeature) cut through dunes or beach ridges, back-barrier flats, (subaqueous) washover-fan flat, (subaqueous) washover-fan slope. Subaerial portions can range from barren to completely vegetated.

* **Washover-Fan Flat:** A gently sloping, fan-like, subaqueous landform created by overwash from storm surges that transports sediment from the seaward side to the landward side of a barrier island (Jackson, 1997). Sediment is carried through temporary overwash channels that cut through the dune complex on the barrier spit (Fisher and Simpson, 1979; Boothroyd et al., 1985; Davis, 1994) and spill out onto the lagoon-side platform where they coalesce to form a broad belt. Also called Storm-surge Platform Flat (Boothroyd et al., 1979) and Washover Fan Apron (Jackson, 1997). Compare – Washover Fan Slope.

* **Washover-Fan Slope:** A subaqueous extension of a washover-fan flat that slopes toward deeper water of a lagoon or estuary and away from the washover-fan flat. Compare – Washover-Fan Flat.

Wave-built Terrace: A gently sloping coastal feature at the seaward or lakeward edge of a wave-cut platform, constructed by sediment brought by rivers or drifted along the shore or across the platform and deposited in the deeper water beyond (Jackson, 1997). Compare - Submerged Wave-Built Terrace, Beach Plain, Strand Plain.

Wave-cut Platform: A gently sloping surface produced by wave erosion, extending into the sea or lake from the base of the wave-cut cliff. This feature represents both the wave-cut bench and the abrasion platform (Jackson, 1997). Compare - Submerged Wave-Cut Platform.

Wind-tidal Flat: A broad, low-lying, nearly-level sand flat that is alternately inundated by ponded rainwater or by wind-driven bay or estuarine water from storm surges or seiche. Frequent salinity fluctuations and prolonged periods of subaerial exposure preclude establishment of most types of vegetation except for mats of filamentous blue-green algae. Compare – Tidal Flat. (modified from Fisk, 1959).

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