

# Science Foundation Chapter 4

## Appendix 4.1

# Recommended Definition of the Estuarine-Terrestrial Transition Zone

## Guiding Principles and Criteria

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### BACKGROUND

#### Guiding Principles

The Transition zone (T-zone) workgroup developed the following principles to guide its work. These are based on the guiding principles provided by the original Baylands Habitat Goals Report (1999).

- Present a vision of T-zone changes that are needed to conserve or improve the ecological services of the Bay's T-zone. The vision should:
  - Inform local and regional plans to restore the extent and quality of the transition zone without trying to “reach the past;”
  - Support essential physical, ecological, and social services of the T-zone;
  - Give priority to the support of native species of plants and animals, especially threatened, endangered, and other special-status species;
  - Recognize the habitat values of existing land uses such as farming and ranching;
  - Be based on scientific understanding of historical and existing conditions, and sound professional judgment, without undue regard for costs or political conflicts.
- Anticipate the need to modify the vision in the future to reflect improved scientific understanding and practical experience in T-zone restoration and management.

#### Criteria for the Definition

The scientific literature contains many different descriptions and definitions of the area of land and water herein referred to as the Estuarine-Terrestrial Transition Zone (T-zone). Most are based on ecological concepts relating to the distribution and abundance of plants or animals along physical gradients that extend between intertidal and terrestrial or fluvial environments. The terminology for these concepts varies among the various definitions. What is referred to here as the T-zone overlaps with other concepts pertaining to this transitional area.

The workgroup decided that the various local and regional efforts to plan and protect the Bay's T-zone would benefit from a common, standard T-zone definition. It also decided that the definition could be general and did not need to resolve the different uses of scientific terms, as evident in the literature. Based on these beginning agreements, the workgroup developed criteria to evaluate candidate definitions and to finalize the recommended definition, as needed to support T-zone planning and management. The workgroup also recognized the need to align the definition of the T-zone with its needed ecosystem services. The following criteria were developed by the workgroup to recommend a T-zone definition based largely on these reviews and on the workgroup's discussion of the ecosystem services of the T-zone.

1. Dimensionality. The definition should reference the dynamic nature of the T-zone along tidal, fluvial, and terrestrial gradients that vary through space and over time.
2. Inclusivity. The definition should reference the particular kinds of interactions among tidal, fluvial, and terrestrial processes, the functions and services of these processes, and their values to society that distinguish the T-zone from other aspects or components of the greater Estuary, without restrictions in spatial or temporal scale.
3. Credibility. The definition should reflect the state of scientific understanding.
4. Map ability. The definition should either reference landscape indicators of the T-zone or landscape processes that are manifested as remotely visible indicators of the T-zone, such that its regional and local extent can be estimated based on commonly available data.
5. Delineable. The definition should reference physical, chemical, or biological indicators that can be used to determine the spatial limits of the T-zone in the field.
6. Empiricism. The definition should reflect the consensus opinions of the members of the T-zone workgroup based on their collective empirical understanding of the forms and services of the T-zone in the San Francisco Estuary.
7. Parsimony. The definition should be as simple as possible without sacrificing essential meaning for simplicity; the preferred definition should require the least amount of assumption; and the definition should be comprehensive, clear, and not unnecessarily complicated.

The workgroup constructed a definition to meet the criteria listed above. The recommended definition meets some of the criteria better than others, however. It references the suite of intrinsic environmental processes and their services (criterion 1); it is applicable throughout the Estuary and will retain its applicability over time (criterion 2); it is consistent with the scientific understanding synthesized from relevant literature (criterion 3); it is based on the collective experiential understanding of the workgroup members (criterion 6), and it is reasonably simple (criterion 7). Given the natural diversity of T-zone types, the workgroup was not able to develop a definition that meets the mapping and delineation criteria (criteria 5 and 6) as well as the other criteria. The recommended definition is consistent with efforts to estimate the approximate extent of the T-zone based on the current general level of understanding about the controlling physical processes. But, the indicators needed for remote or field-based delineation of the thresholds of

these processes that exactly correspond to the local physical boundaries of the T-zone are not as well known. Some important clarifications of the meaning of the recommended definition are provided below.

- The recommended definition distinguishes the T-zone from the Estuary as a whole, and from the fluvial, terrestrial, estuarine ecosystems bayward and landward of the T-zone.
- With regard to physical processes, the definition is generally met at any given moment by the area that is bounded by the landward influences of estuarine waters on the heights and physio-chemical characteristics of riverine waters; the landward influences of estuarine waters on groundwater height and the physio-chemical characteristics of terrestrial soils and groundwater; and the bayward influences of terrestrial runoff and groundwater on tidal heights and the physio-chemical characteristics of estuarine waters and intertidal sediments.
- With regard to ecological processes, the definition is generally consistent with the spatial distribution of local populations of plants and animals that measurably depend on the T-zone or that are measurably affected by it during some part of their natural history.
- Extreme events, such as “king tides” and major riverine floods strongly influence the range in form, structure, and ecosystem services of the T-zone through space and over time.
- The T-zone surrounds the Estuary, including the tidal reaches of its confluent rivers and streams, regardless of their degree of naturalness.
- The T-zone varies in width along its length and over time due to differences or changes in land use, geology (including topography, hydrology, and soils), and climate (including weather).
- Land use can constrain or release the controlling environmental processes and events, and thus artificially narrow or broaden the T-zone.
- As sea level rises, the T-zone tends to migrate upstream and landward; it is the leading edge of estuarine transgression due to sea level rise.
- Any depiction of the boundary of the T-zone is subject to change.