## Development of Regional Coastal Wetland Archetypes

Archetypes are representations of a group or class of objects (in this case wetlands) of similar form and structure. Archetypes are useful for analysis of complex and highly variable systems, such as wetlands, because they provide a general model that can be used to explain how a specific group of wetlands function and how they may respond to external pressures or drivers. In this way, they help simplify analysis and communication, and provide a mechanism to generalize or extrapolate knowledge about a given system to similar types of systems (i.e. archetypes).

To aid in the analysis of sea level rise effects, and to support the *Regional Strategy* Update, we aimed to develop a set of coastal wetland archetypes for southern California. Our goal was to define less than 10 archetypes that met the following criteria:

- Based on contemporary wetland boundaries and structure
- Strive for mutually exclusive classes
- Defined mainly by the physical processes that control form and structure
- Reflect functions and services specific to the archetype
- Can be readily mapped

<u>Approach to Defining Archetypes</u>

The archetypes were defined using the following general process:

1. Identify discrete wetlands along the coast of the southern California Bight from Pt. Conception to the U.S.-Mexico border
2. Compile physical structure and process variables for each system
3. Compile vegetation/plant community data for each system
4. Filter wetlands based on completeness of the data for each system and remove systems from analysis with poor data coverage
5. Perform cluster analysis to identify preliminary archetypes
6. Perform discriminate function analysis to identify key predictor variables
7. Overlay vegetation/habitat layers on top of preliminary archetypes
8. Test bias of archetypes to ensure good regional representations
9. "Validate" archetypes against best professional judgement of the Science Advisory Panel (SAP)

Previous wetland mapping was used to define 103 discrete wetlands along the southern California coast. These were identified as follows:

1. All wetlands mapped as estuarine polygons (E1 or E2) by the most recent National Wetlands Inventory (NWI)/California State University, Northridge (CSUN) mapping
2. Additional wetlands were added to this list by the project team based on best professional judgement—these include small wetlands not mapped by NWI
3. The resulting list of wetlands was refined and systems were lumped or split based on consultations with the Science Advisory Panel

We compiled a series of 40 variables related to physical conditions/drivers for each wetland. These variables generally fell into one of five categories:

- Catchment properties (proxy for inputs of water and sediment)
- Wetland dimensions, such as size, slope, ratio of dimensions, etc.
- Proportion of subtidal vs intertidal area
- Inlet dimensions and condition
- Wetland volume/capacity

Using a cluster analysis followed by Discriminant Function Analysis, we determined the subset of predictor variables that generated the most appropriate classification for the region. We assigned each of the 103 wetlands to the archetypes to determine if each system could be classified in a mutually exclusive manner. This final step provided an opportunity to refine the final set of archetypes to ensure they represent all wetland systems in the Bight.

Results

We identified a five-cluster solution that maximized separation and minimized misclassification between clusters. Nine predictor variables explained the majority of the variability between clusters:

- wetland area
- area/depth (erosion area)
- slope from mouth to head
- integrated slope (STD of pixel slope)
- mouth elevation relative to MSL
- mean mouth width
- total area inundated at spill height
- percent wetland >2m at low tide
- total percent subtidal

In assigning archetypes to the 103 mapped coastal wetlands, it became apparent that some historical large depositional river valleys have been fragmented into hydrologically disconnected wetlands that are often mapped or managed separately. A final derivative archetype was added in recognition of historically connected depositional river valleys that may be restored through the regional recovery efforts. Discussions with the Science Advisory Panel also resulted in clarifying that intertidal or supratidal wetlands that fringe archetypes that may be predominantly open water (e.g. small lagoons, open bays and harbors) should be considered a component of that archetype and not be separated out as distinct systems for the purposes of classification. The final seven archetypes carried forward in the analysis are described in Table 1.

**Table 1:** Final archetypes and associated habitats

| Archetype | General Description | Associated Habitats | Example Systems |
|---|---|---|---|
| Small Creek | small creek systems; minimal subtidal habitat area; generally higher gradient | intertidal (Cowardin), Riparian marsh and meadow (CalVeg) | Aliso Canyon Creek, Leo Carrillo |
| Small Lagoon | Small coastal lagoon without an associated creek | Intertidal and subtidal habitats. May have fringing riparian marsh | Dume Lagoon, Andree Clark Bird Refugee |
| Intermittently Open Estuary | Intermittently closing river mouth estuaries | intertidal (Cowardin), Riparian marsh and meadow (CalVeg) | Malibu Creek, Ventura River System |
| Large Perennially-open Lagoon | open basin, extensive subtidal habitat, fringing intertidal; | intertidal emergent, pickleweed and/or cordgrass habitats (CalVeg) | Carpinteria Salt Marsh, Bolsa Chica Fully Tidal |
| Large River Valley Estuary | large, depositional river valleys, fringing marsh; high dynamic ratio | intertidal emergent, pickleweed and/or cordgrass habitats (CalVeg), moderate subtidal area (Cowardin) | Goleta Slough, Tijuana River Estuary |
| Fragmented River Valley Estuary | Currently fragmented large depositional river valley; opportunities for reconnection | intertidal emergent, pickleweed and/or cordgrass habitats (CalVeg), moderate subtidal area (Cowardin) | Ballona Wetlands, Los Cerritos Wetlands |
| Open Bay/Harbor | open water harbors, bays, lagoons; large area, wide & low-lying mouth | dominated by subtidal habitat | Alamitos Bay, Newport Bay |

The distribution of archetypes across the region is shown in Figure 1.

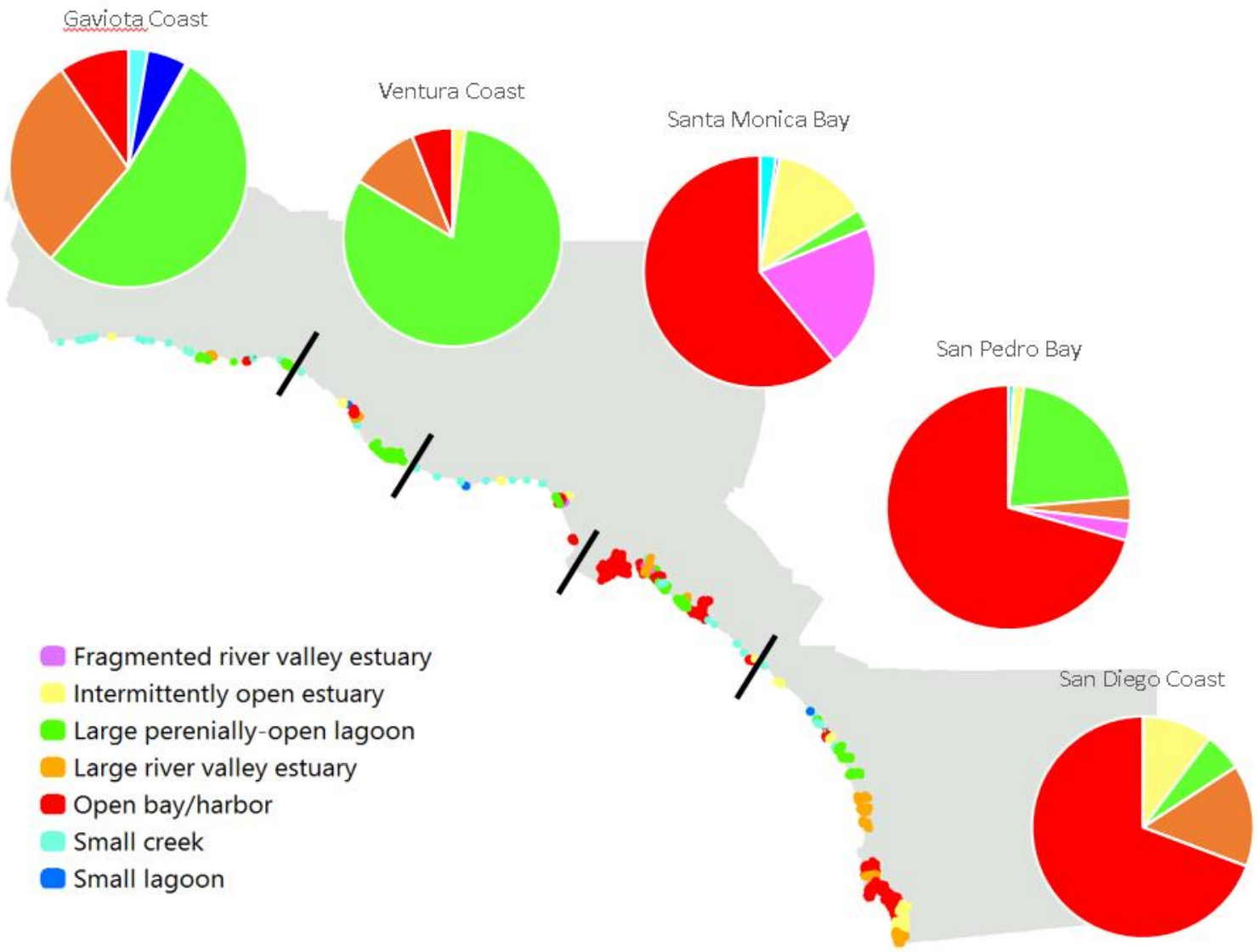


**Figure 1:** Distribution of archetypes across the southern California region. Pie charts show distribution of archetypes by area for each subregion.