

# **The *Oncor* Geodatabase for the Columbia Estuary Ecosystem Restoration Program: Handbook of Data Reduction Procedures, Workbooks, and Exchange Templates**

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**Appendix D**  
**Analysis Questions**

# Appendix D

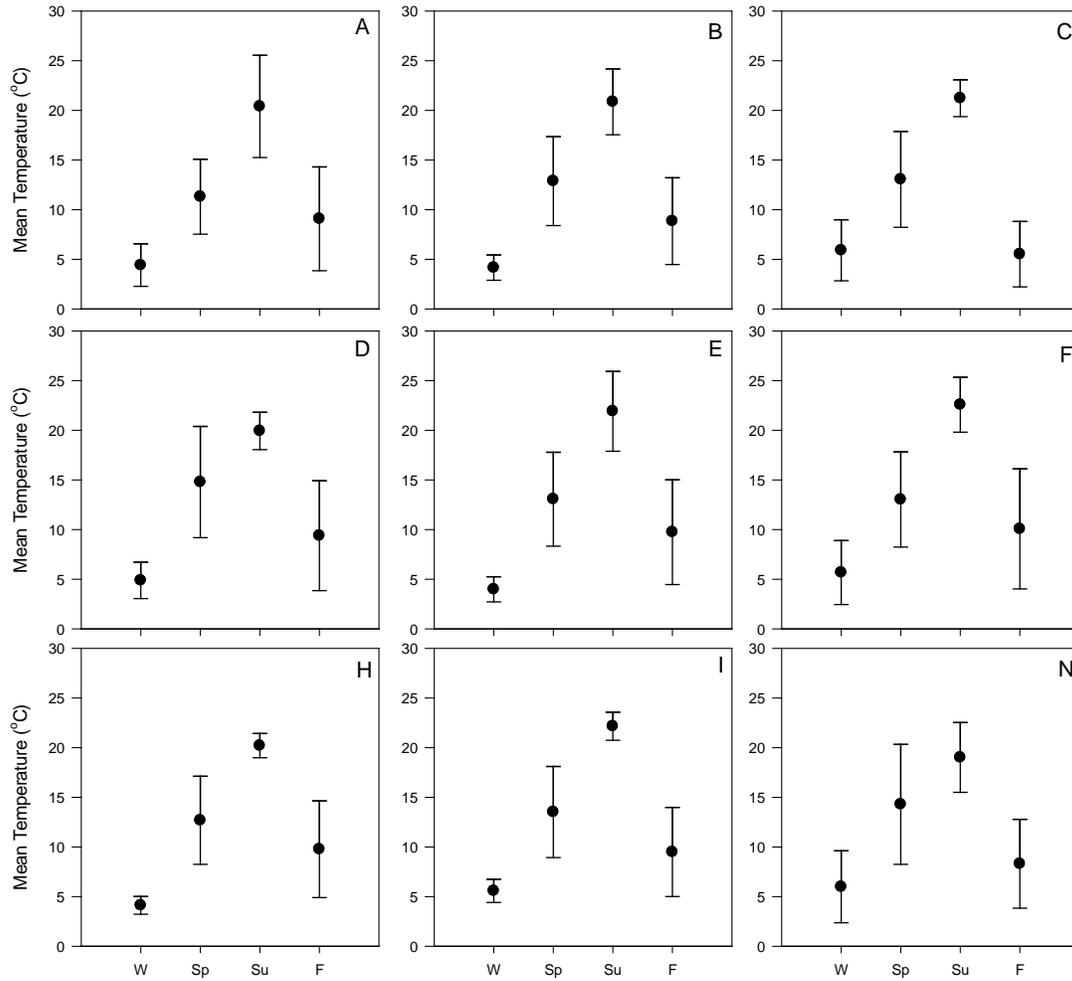
## Analysis Questions

This appendix demonstrates example outcomes from data analysis, after data are uploaded to *Oncor*, to answer analysis questions with specific temporal or spatial parameters (e.g., seasonal temperatures and fish densities), and how monitored indicators from different data categories can be combined to answer analysis questions (e.g., topography and plant species presence).

### A.1 Fish Analysis Questions

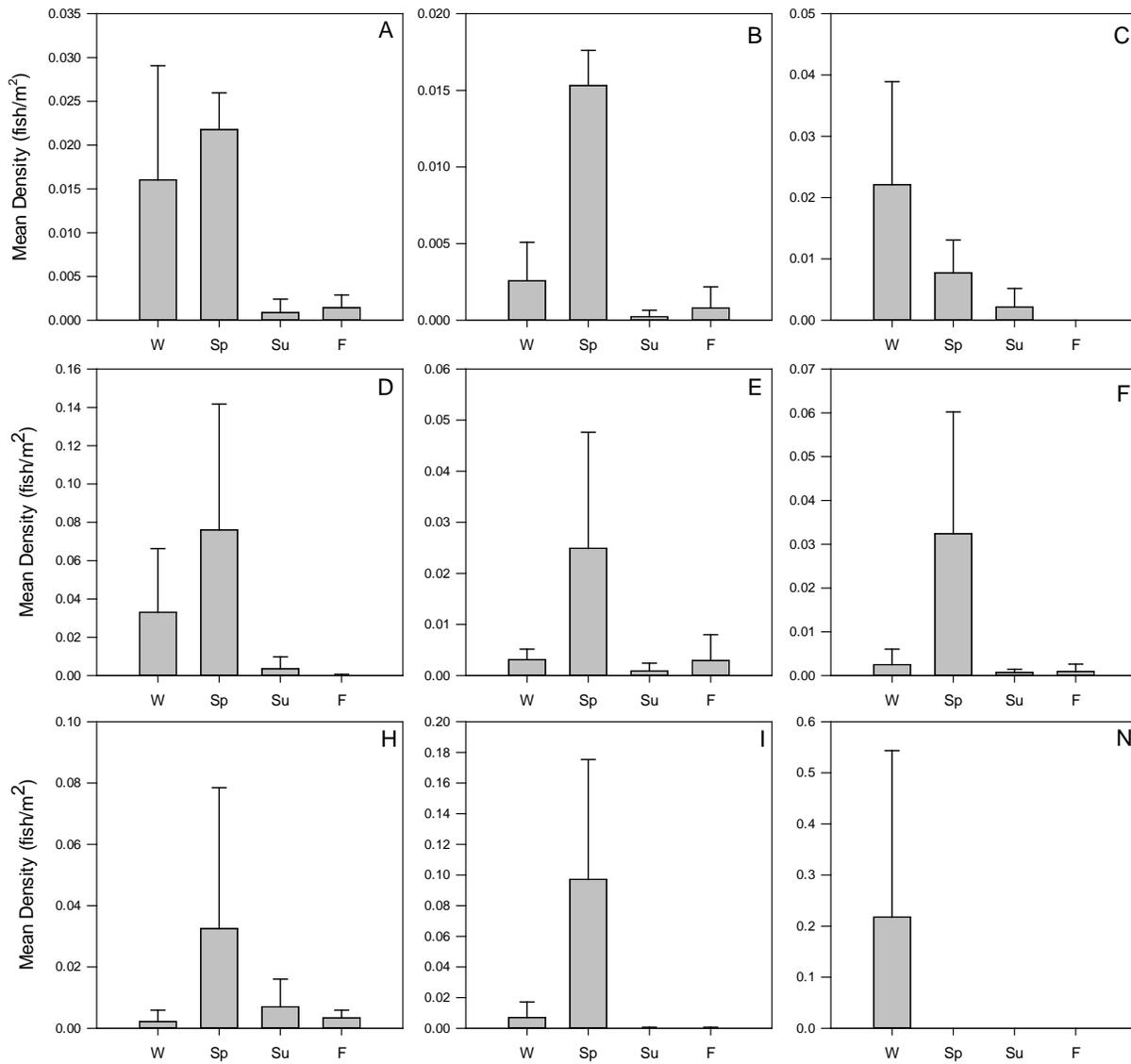
The following questions and subsequent figures provide examples of queries that managers and data generators may wish to perform with *Oncor*. The examples below are from data collected during 2009 near the Sandy River delta study area (river kilometer [rkm] 188–205) and the Lower River Reach (LRR) study area in the lower Columbia River and estuary. Fish were sampled monthly from nine sites using beach seines. Water temperature data were collected in conjunction with beach seine activities. For additional information about sampling methods, see the report by Sather et al. (2011).

**What was the seasonal, site-specific water temperature in a given study area?**



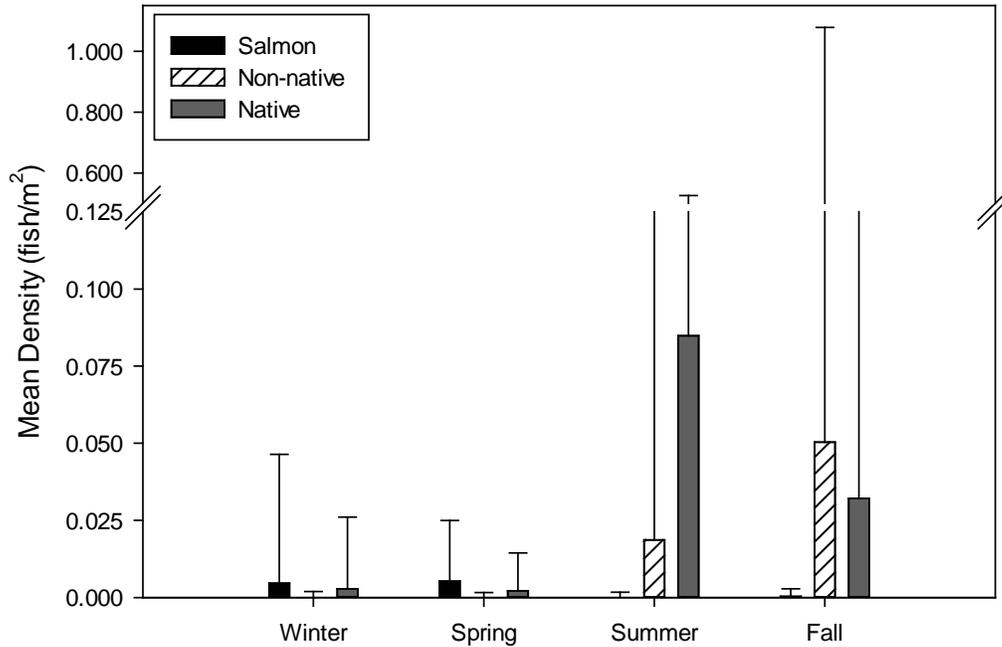
**Figure D.1.** Mean seasonal temperature collected from nine sites in the Sandy River delta study area. Site names correspond to the letter code in the upper right corner of each panel. Data were collected during 2009 as point measurements (from a YSI instrument) and taken in conjunction with fish seine hauls.

**What were the site-specific mean densities of selected fish species over a given year, month, and/or season?**



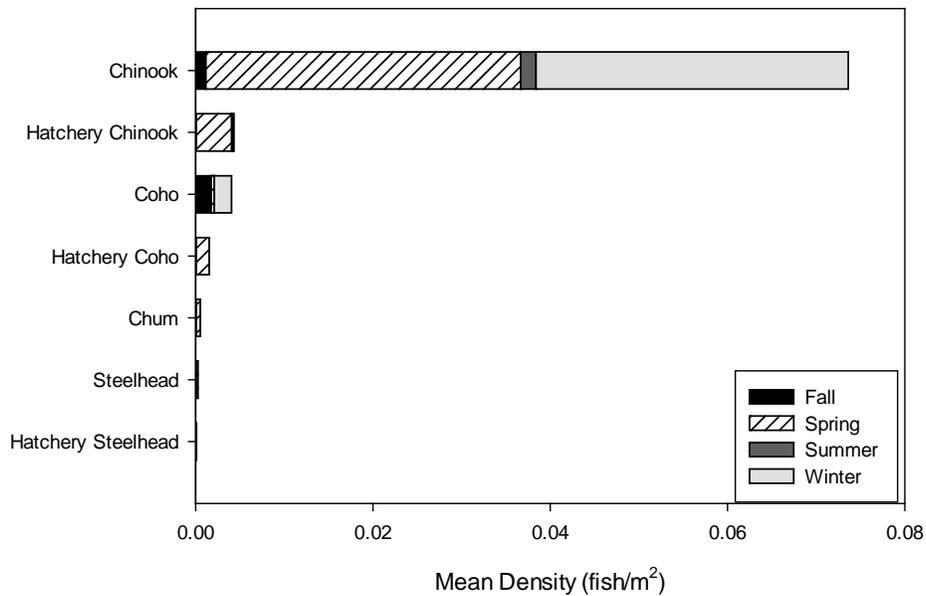
**Figure D.2.** Mean seasonal densities of unmarked Chinook salmon estimated from nine sites in the Sandy River delta study area during 2009. Site names correspond to the letter code in the upper right corner of each panel. Error bars are one standard deviation.

**What were the seasonal mean densities for salmon, non-native, and other native (excluding salmon) taxa in a given study area over a given time period? What is the standard deviation?**



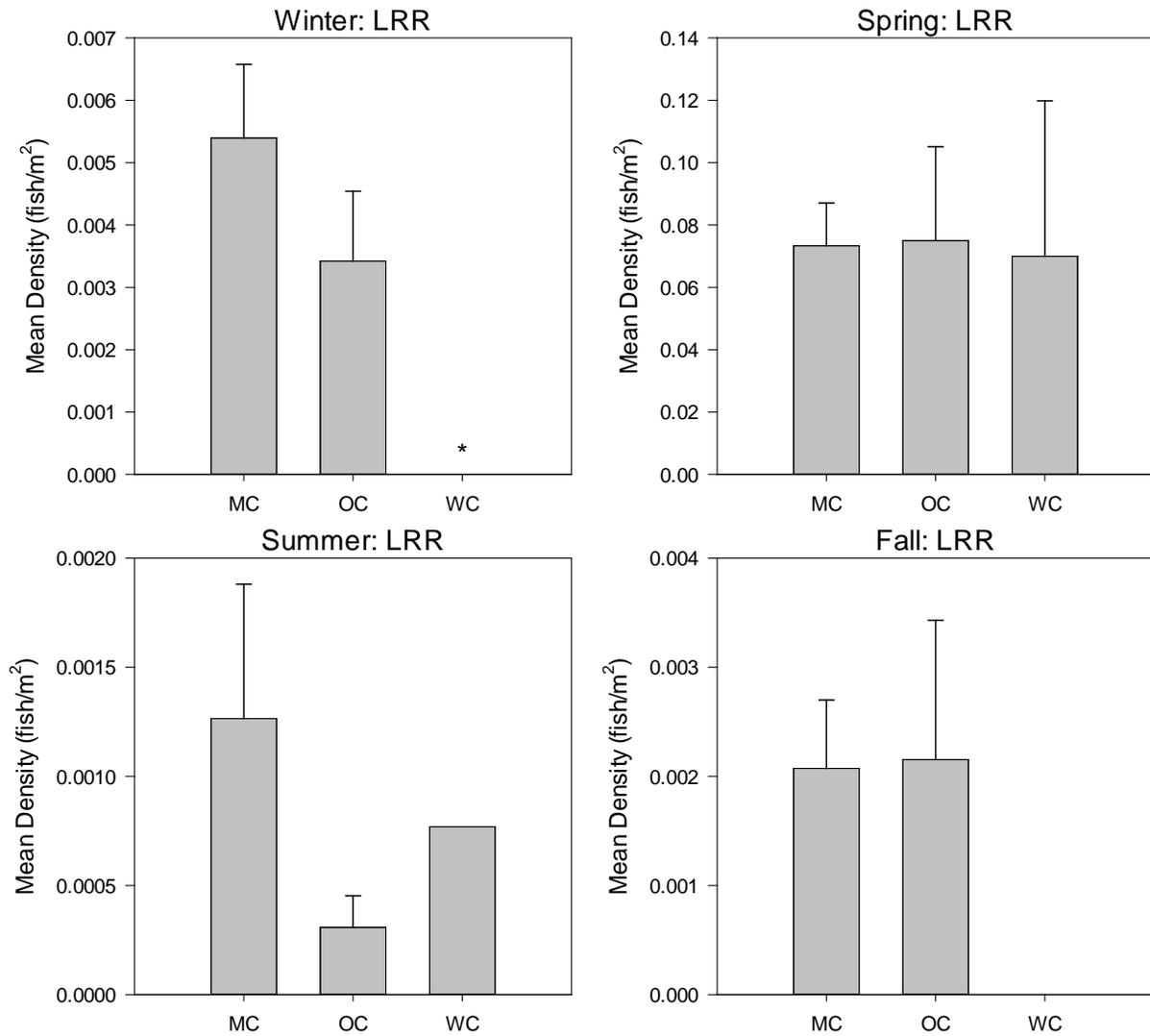
**Figure D.3.** Mean seasonal densities for different groups of fish sampled at the Sandy River delta study area during 2009. Fish groups include native and non-native status, and salmon have been extracted from the native group to be represented as their own category. Error bars are one standard deviation.

**What are the seasonal mean densities for selected salmon species in a given study area?**



**Figure D.4.** Mean densities of individual salmon species seasons. Data were collected from the Sandy River delta study area during 2009.

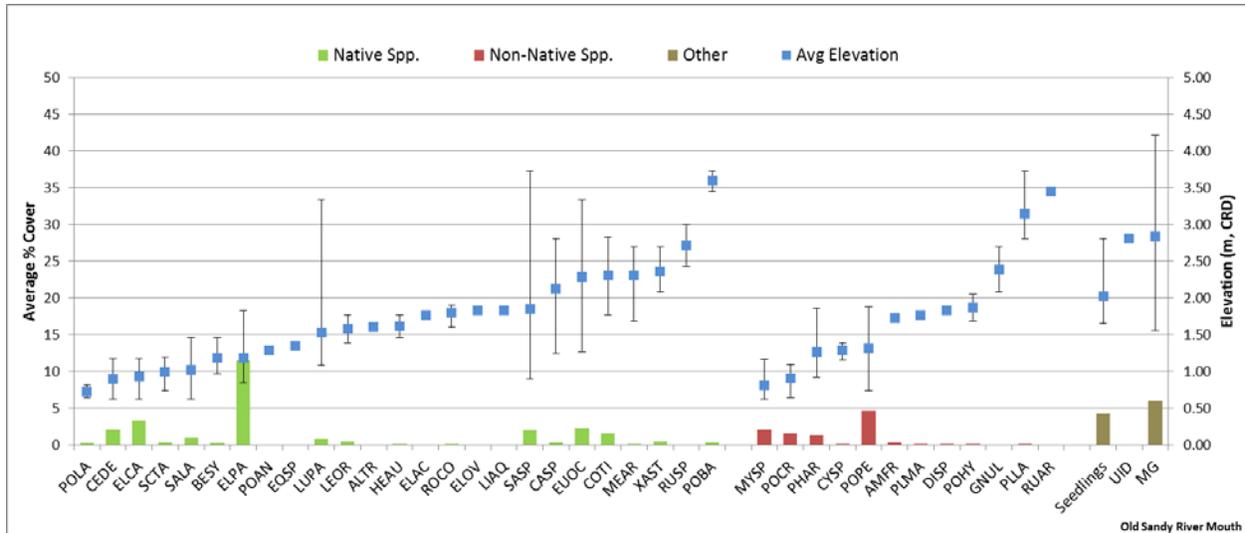
**What are the seasonal densities of a given species within a particular habitat type?**



**Figure D.5.** Mean density of unmarked Chinook salmon in different habitat types: MC (main channel), OC (off channel), WC (wetland channel). Fish were sampled in the Lower River Reach (LRR) study area (rkm 110-141) during 2009. The asterisk denotes the wetland stratum was not sampled.

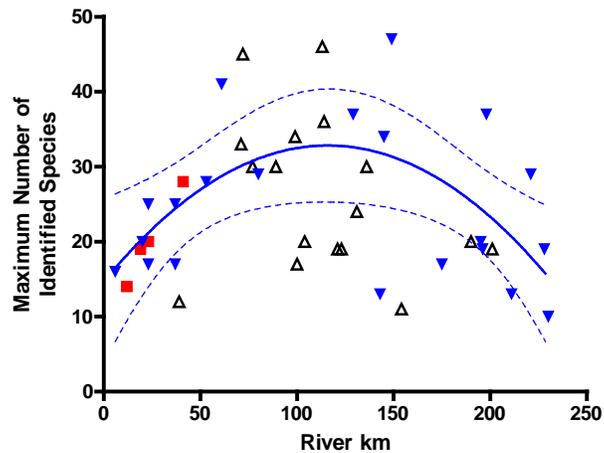
## A.2 Habitat Analysis Questions

What are the average percent cover and minimum and maximum elevations at which species *s* occurs at site *n*?



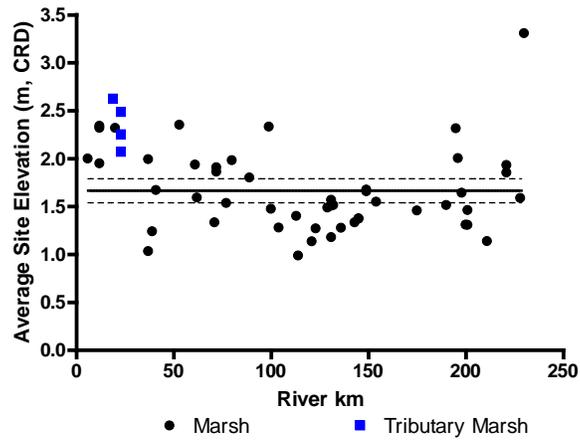
**Figure D.6.** Average percent cover of the vegetation species (bars) and the average elevation of the species (points) within the sample area of a study site. The minimum and maximum elevations are depicted by the error bars on the points.

How many plant species have been observed by river kilometer?



**Figure D.7.** Maximum number of species observed at reference marsh sites versus the distance of the sites from the river mouth. The mid-river section, associated with the peak of the quadratic curves, had significantly more identified species than the lower and upper portions of the river (Kruskal–Wallis;  $p = 0.008$ ). The fitted curves and the confidence intervals were based on the least-disturbed marsh sites only (the blue triangles). Red squares represent previously diked sites and open triangles represent sites affected by dredge material placement.

What is the average elevation of the vegetation survey areas relative to river kilometer?



**Figure D.8.** Average site elevation (meters Columbia River Datum) of the vegetated sample area for emergent marshes along the estuarine gradient. The fitted linear regression and its 95% confidence interval are shown in black.