



# Does Size Matter?

## An investigation of suspended sediment particle size distribution in the San Francisco Estuary



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### INTRODUCTION

Particle size distribution (PSD) is defined as the amount, by mass, of particles within a given size class. Particle size distribution can influence:

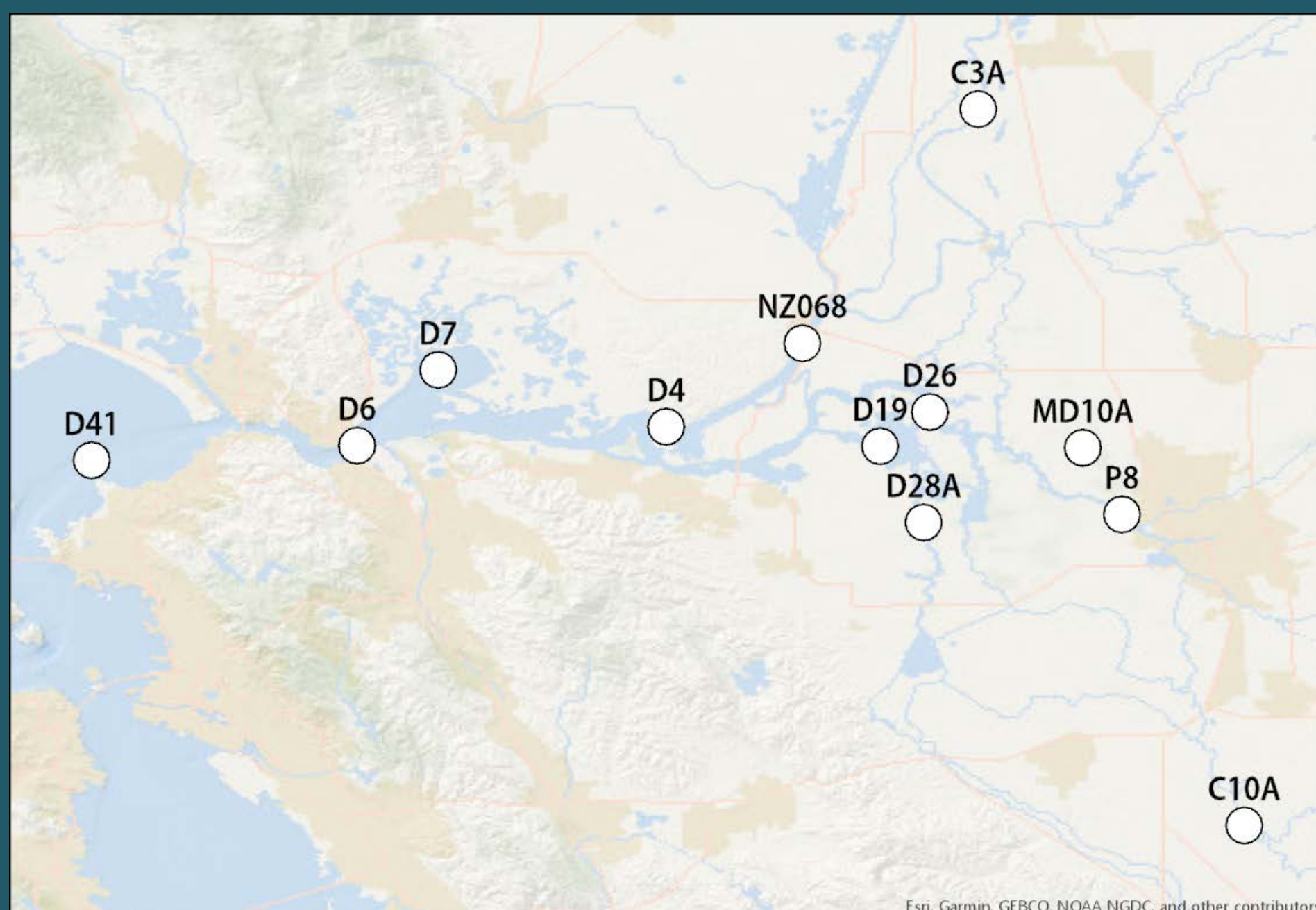
1. Settling rates and light attenuation
2. Bio-availability and toxicity of contaminants
3. Feeding habits of aquatic organisms

### METHODS

Twelve stations were sampled monthly starting in March 2018 and ending in June 2019. One-gallon water samples were collected from the twelve stations in Figure 1 each month. For shore-based stations, water was collected with a Van Dorn water sampler while stations accessed by vessel were sampled via a flow-through system.

The samples collected were analyzed using the ASTM D4464M method. This method uses light diffraction of a laser beam to determine particle size distribution of fine grain sediments (<2mm).

### STATIONS



Stations for this study were chosen to cover a wide geographic range across the San Francisco Estuary and to encompass stations with varying physical characteristics, like depth and water body type.

Figure 1. Map of the twelve stations sampled

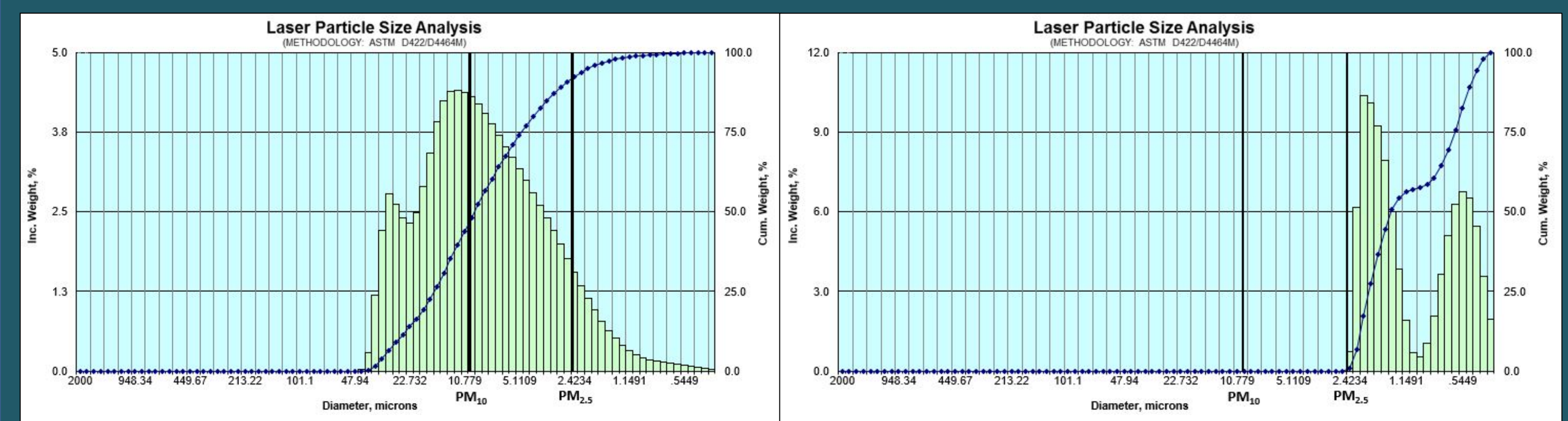


Figure 2. PSD results for station D28A in April 2018 (left) and April 2019 (right), showing the variation over time from a unimodal to a bimodal distribution. Bars represent incremental weight % for each size bin; the line shows the cumulative weight %.

### RESULTS

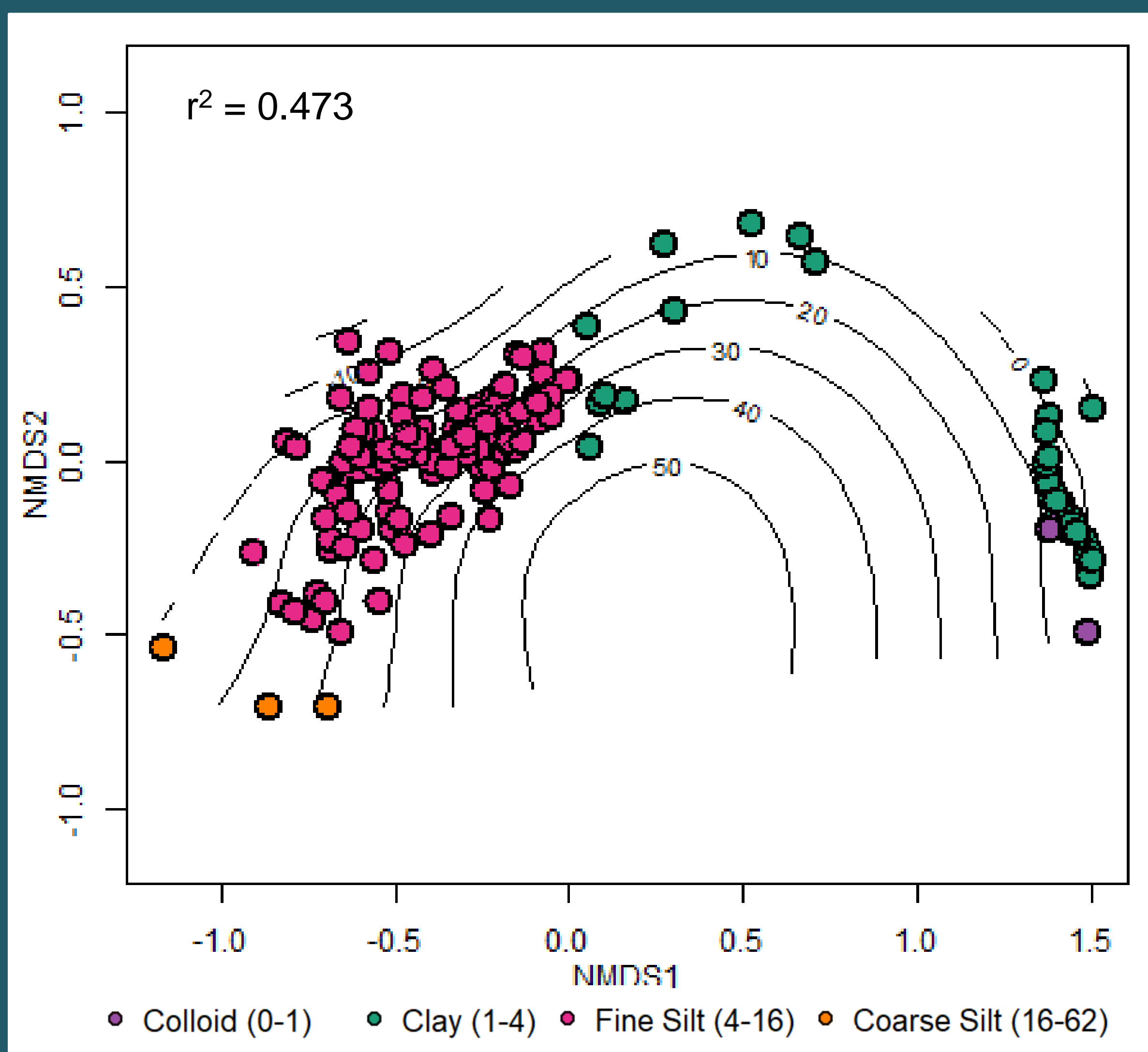


Figure 3. NMDS analysis for PSD. PSDs are grouped by their median particle size. Contours represent the fitted smooth surface for turbidity.  $r^2$  value is the proportion of variance in PSDs predicted by the turbidity GAM.

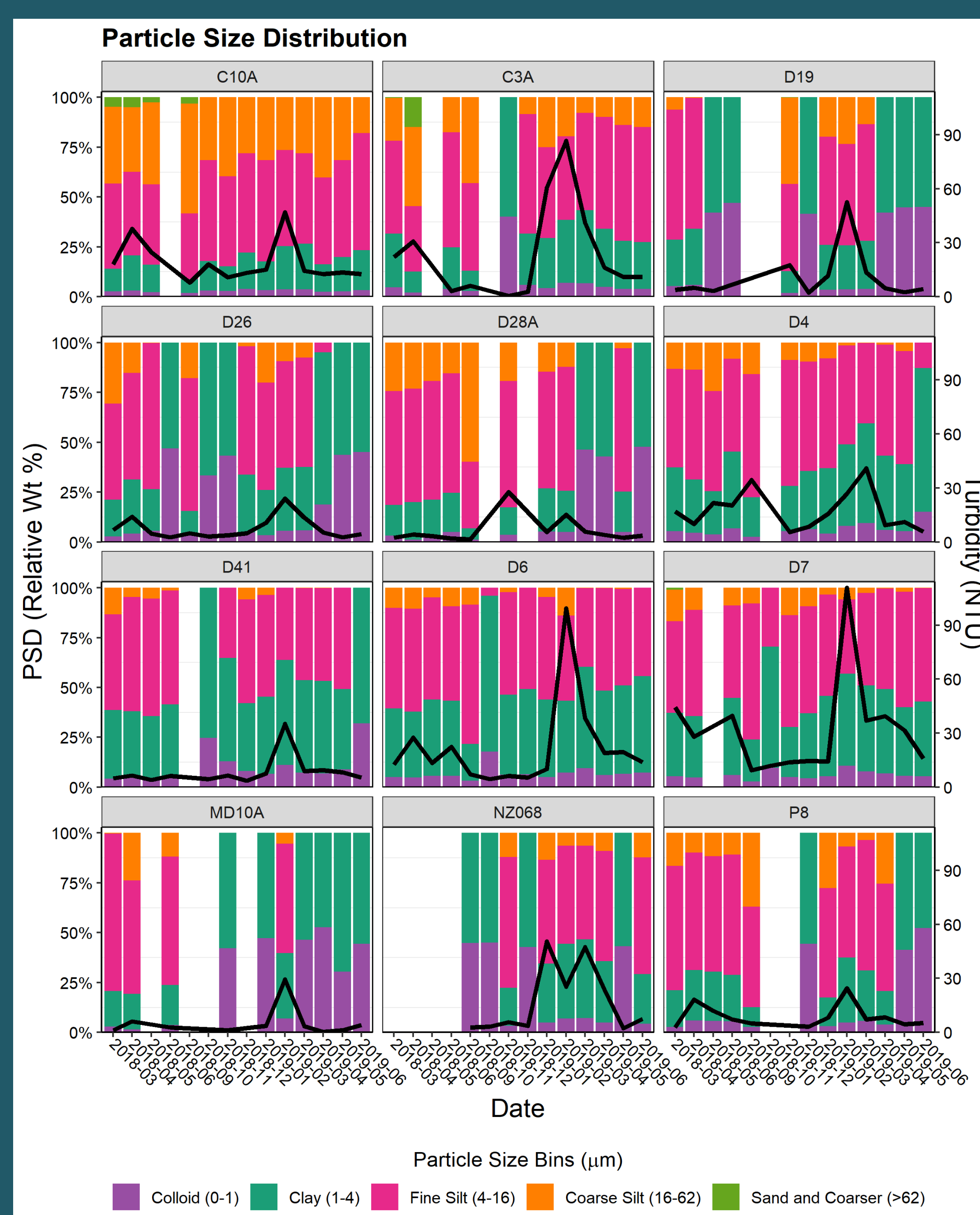


Figure 4. (Bar graph) Relative weight % for each size bin for a given PSD at each station. (Line graph) Corresponding turbidity measurements for a given station.

Preliminary conclusions were made regarding the spatial variation between stations, temporal variation at a single station, and the influence of environmental variables on particle size composition.

It was observed that the PSD results fell into two main populations, as shown by Figure 3:

- A smaller one consisting of bimodal distributions with small median particle sizes
- A larger, more varied one, generally consisting of unimodal distributions, with a wide range of median grain sizes

### CONCLUSIONS

#### Variance in Particle Size Distribution

- The particle size distribution varied between stations over the course of this study
- The particle size distribution at each station varied over time for the duration of this study, some to a larger degree than others

#### Influence of Environmental Variables

- Turbidity and variables related to it (secchi depth, total suspended solids) explained the most variance in PSD
- The degree to which these variables influence PSD is unknown, but is suggested to be fairly significant