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Satellite-derived ecosystem indicators: a retrospective analysis of high resolution ocean color and sea surface temperature products in the Salish Sea

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Satellite-Derived Ecosystem Indicators: A Retrospective Analysis of High Resolution Ocean Color Products in the Salish Sea

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INTRODUCTION

A complete set of MERIS CoastColour data products (2002 to 2012) was developed for the greater Salish Sea, including Puget Sound, Strait of Georgia, and the continental shelf/slope off Washington and Vancouver Island, BC. These data were processed by Integral Consulting Inc. for the Salish Sea Marine Survival Project and are being made available to the regional research community for any number of applications. The data set includes both nearshore and offshore processed satellite data products at 300 m resolution over a 10-year period (~3 day revisit) from the MERIS ocean color sensor.

Table 1. Comparison of Select Remote Sensing Satellite Sensors

Agency	Operating Dates	Spatial Resolution (m)	Number of Bands	Spectral Coverage (nm)
Ocean Sensor				
CZCS	NASA 1978-1986	825	6	433-12,500
SeaWiFS	NASA 1997-2010	1,100	8	402-885
MODIS-Terra	NASA 1997-current	250/500/1,000	36	405-14,385
MODIS-Aqua	NASA 2002-current	250/500/1,000	36	405-14,385
MERIS	ESA 2002-2012	300/1,200	15	412-1,050
VIIRS	NASA 2013-current	375/750	16	402-12,488
Sentinel-3A	ESA 2016-current	300/1,200	21	400-1,020
Land Sensor				
Landsat-8	NASA 2013-current	15/30/100	10	435-12,510
Sentinel-2A/B	ESA 2015-current	10/20/60	13	492-2,202

Source: Updated from Jensen (2007)

DATA PRODUCTS WORK FLOW

Data products highlight seasonal water quality trends in the Salish Sea and show how events, such as algal blooms, have wide reaching effects across multiple ecosystems. However, to create meaningful data products, a series of processing steps was necessary.

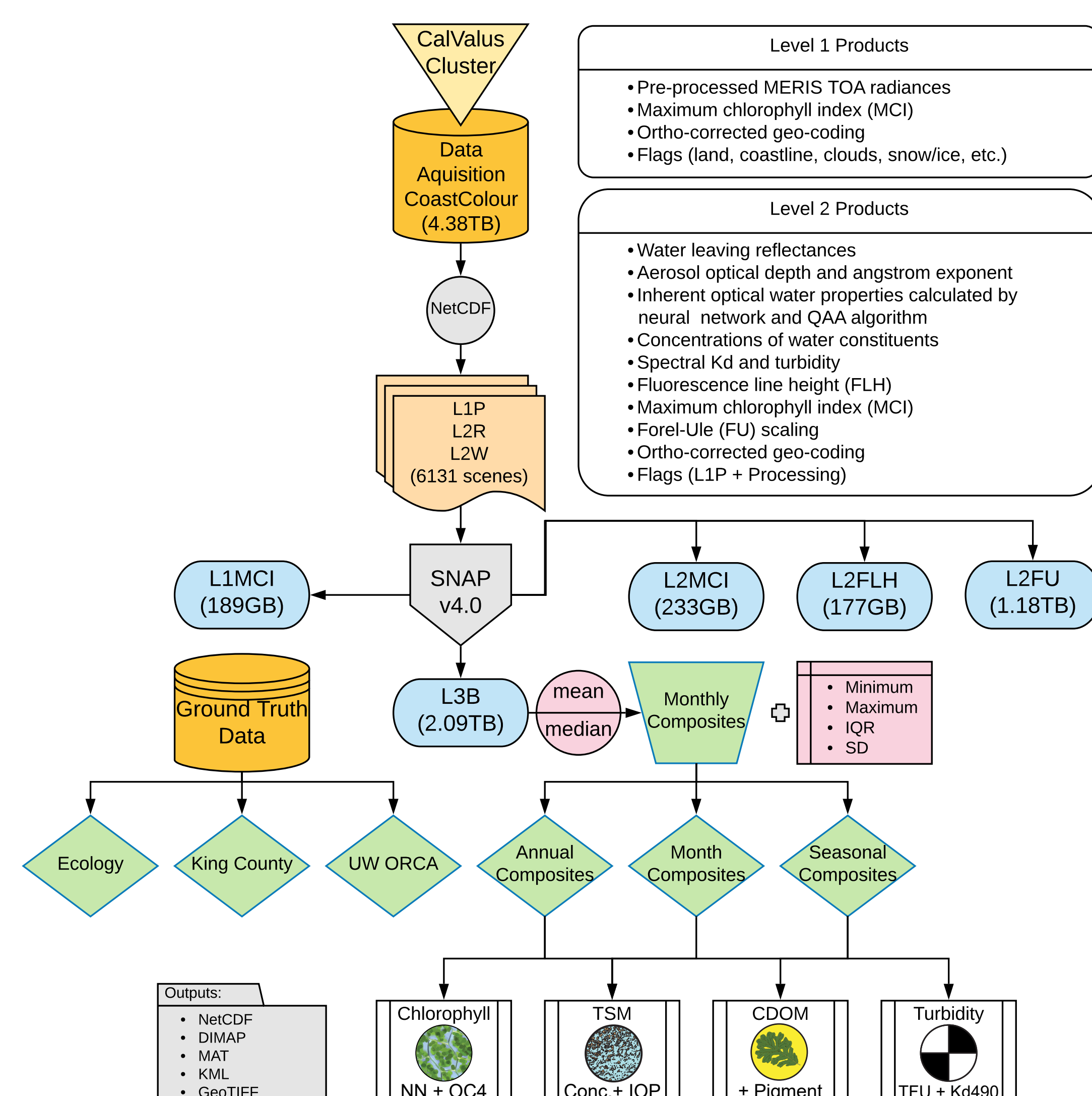


Figure 1. MERIS Data Processing

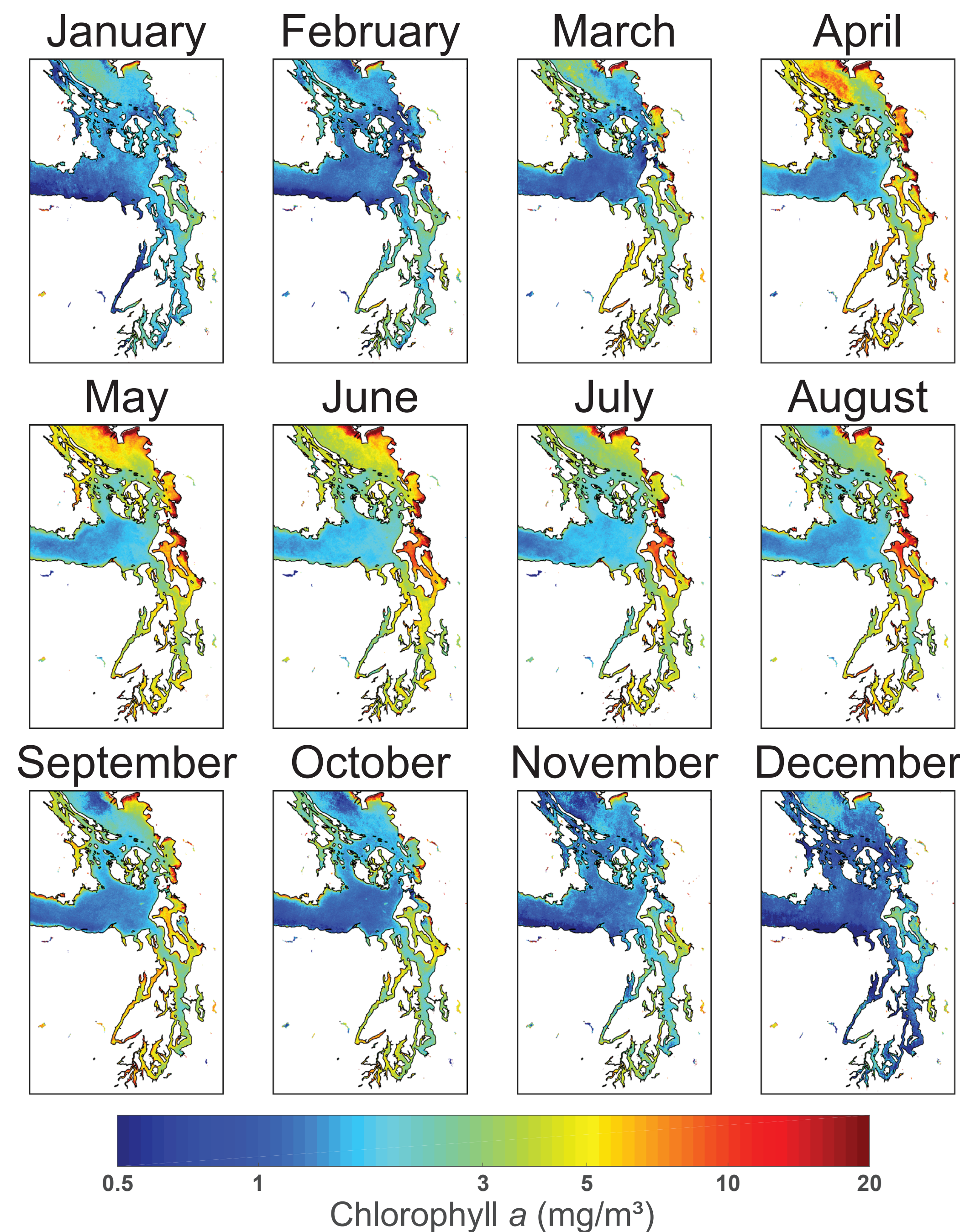


Figure 2. Median Monthly Concentrations of Chlorophyll by Neural Network (2002-2012)

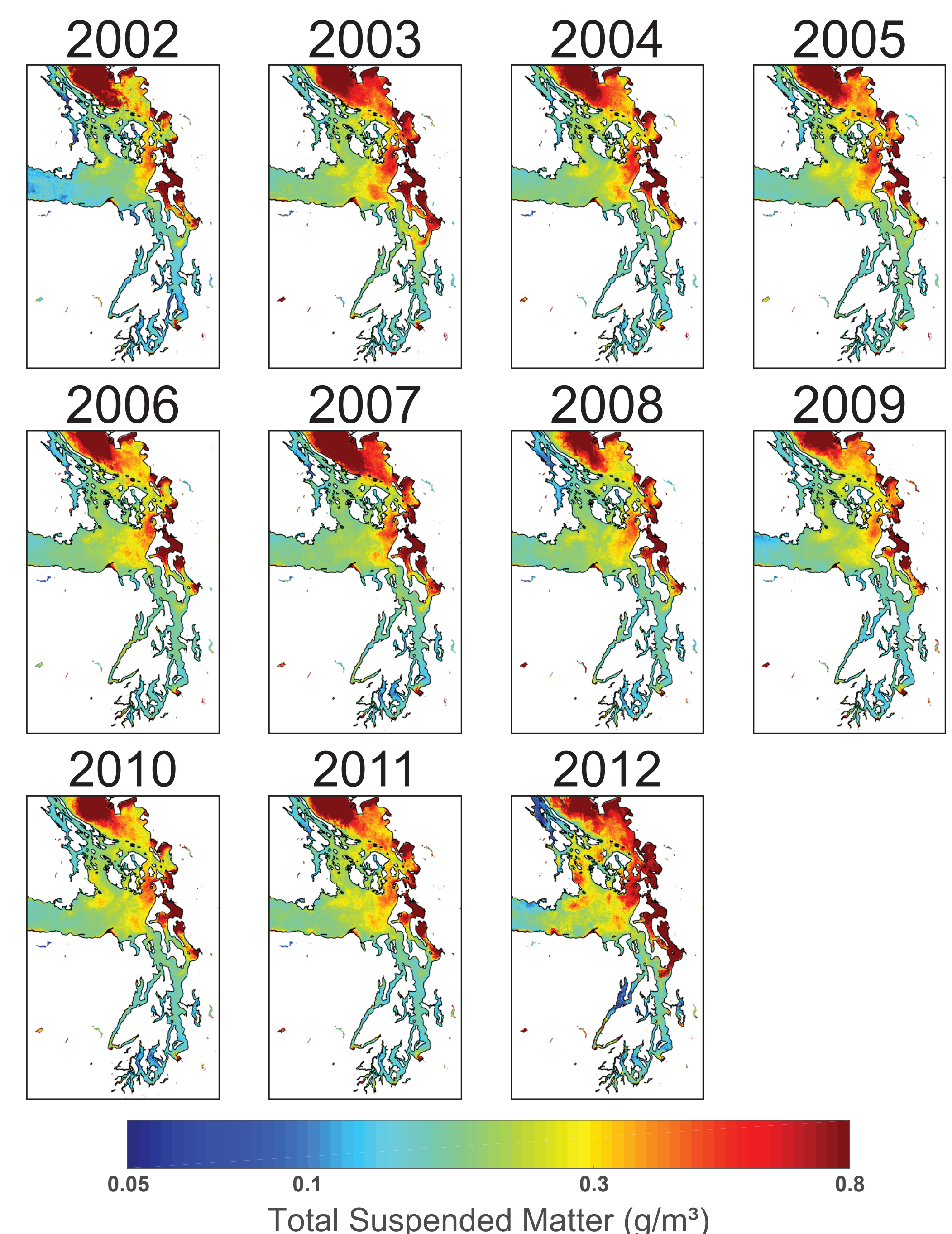


Figure 3. Median Annual Concentrations of Total Suspended Matter

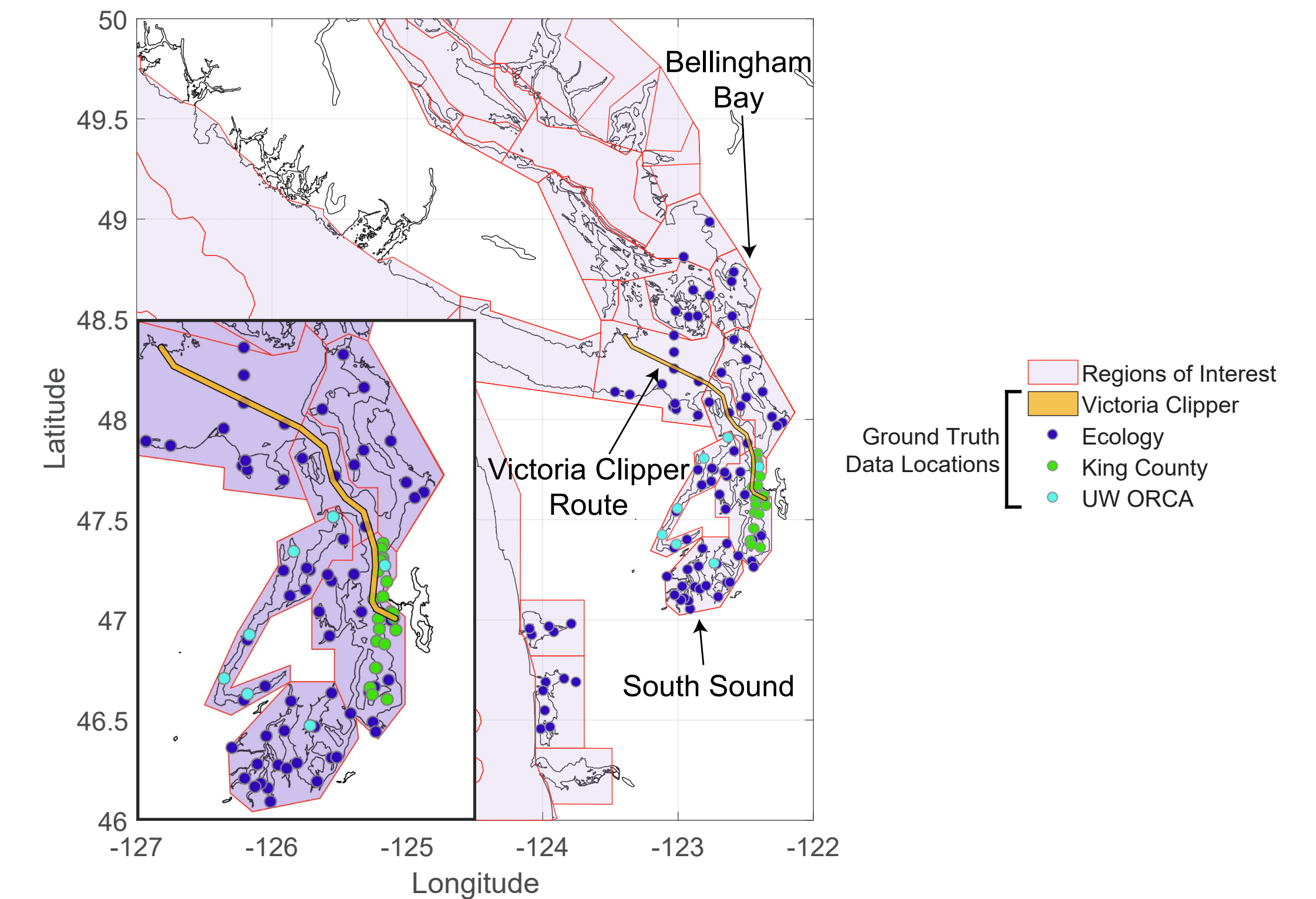
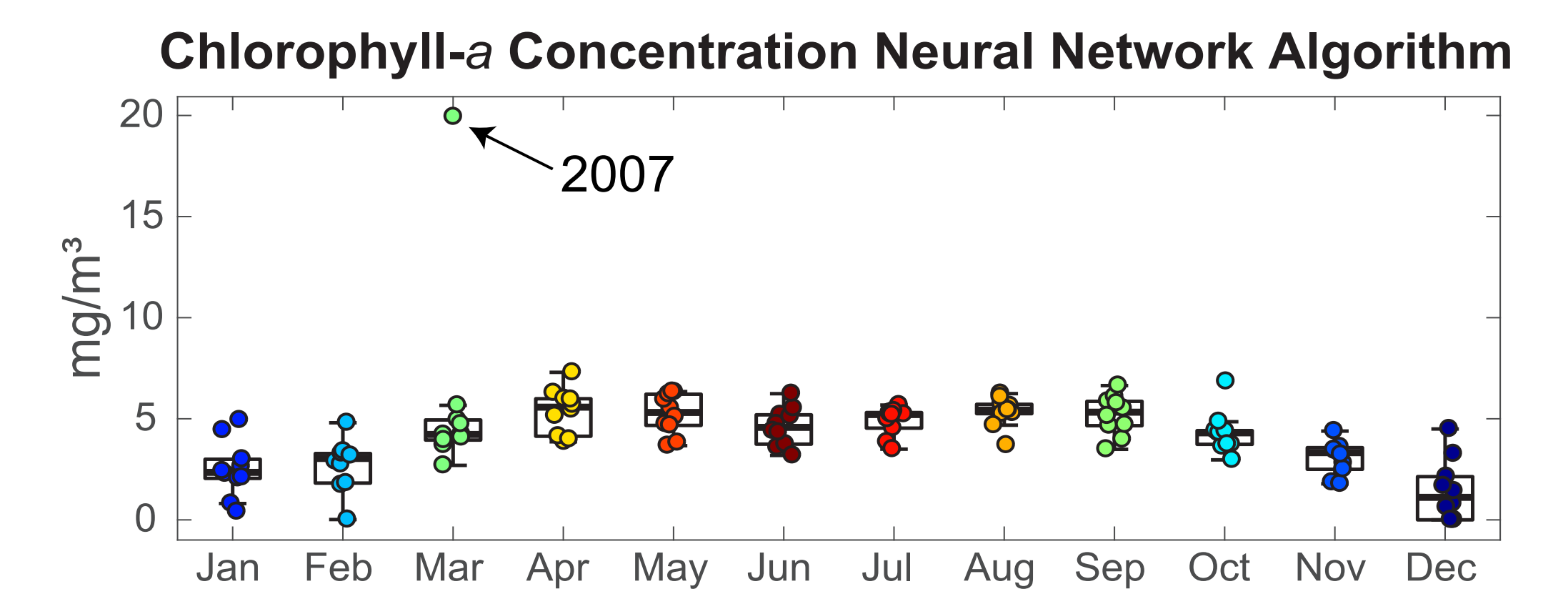
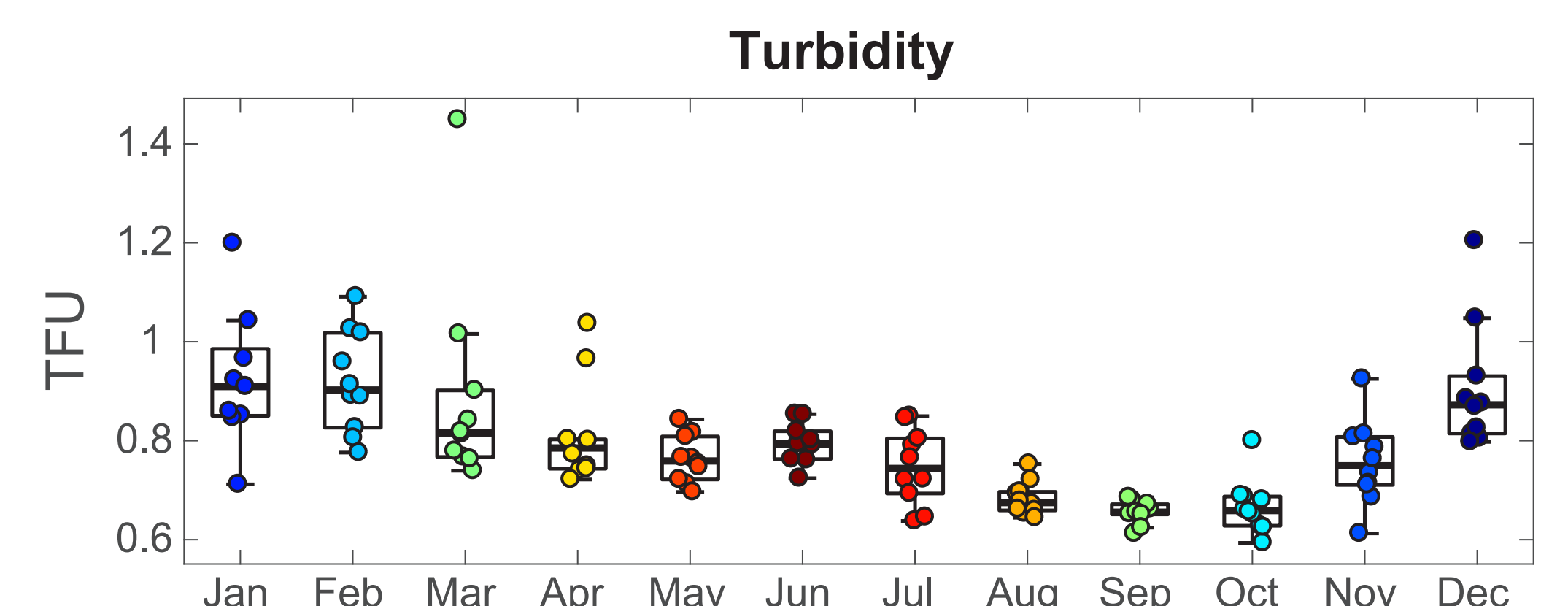


Figure 4. Regions of Interest in the Salish Sea



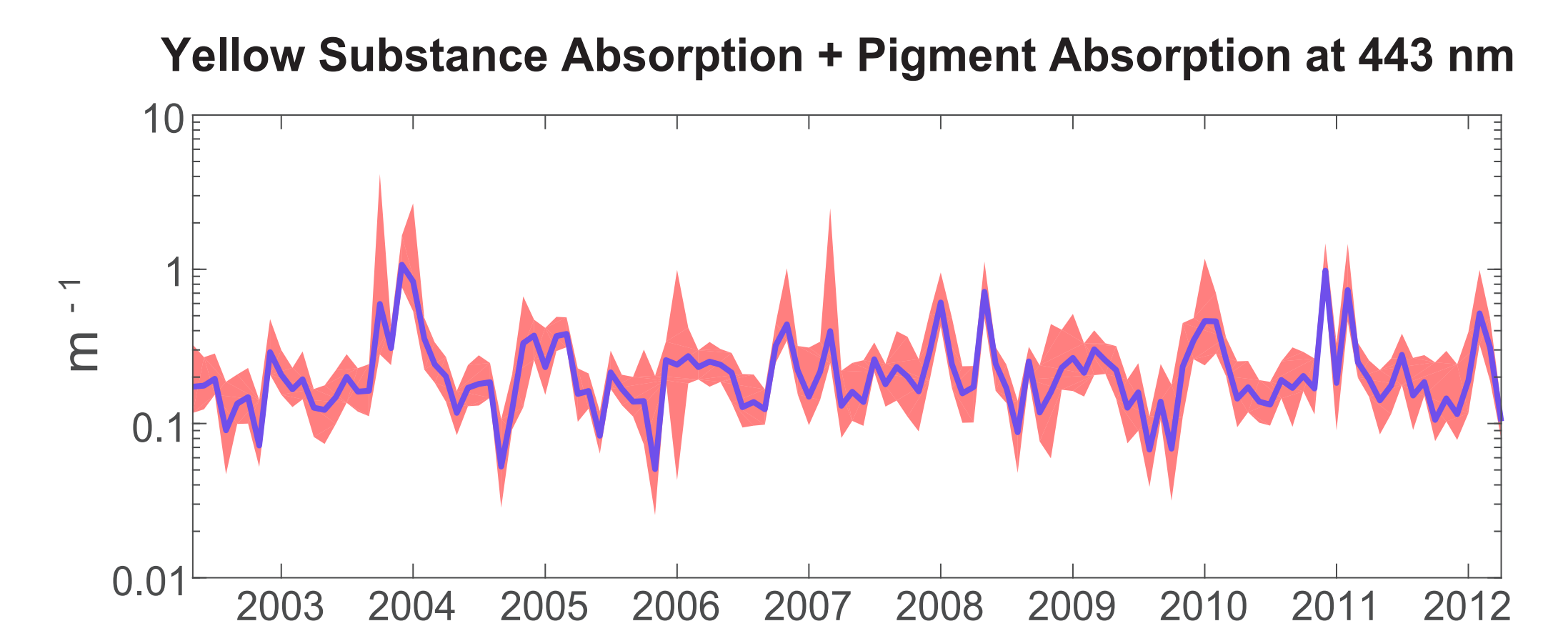
Note: Outliers indicate years with events such as large algal blooms.

Figure 5. Monthly Chlorophyll Concentrations in South Puget Sound



Note: Elevated turbidity from Skagit River runoff into Whidbey and Main Basin.

Figure 6. Monthly Turbidity along Victoria Clipper Route



Note: CDOM shows freshwater discharge from Nooksack River.

Figure 7. Time Series of Colored Dissolved Organic Matter (CDOM) in Bellingham Bay

Reference and data available upon request.

ACKNOWLEDGEMENTS

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