



Apr 30th, 3:30 PM - 5:00 PM

Is Nitrogen a Major Stressor of Eelgrass (*Zostera marina*) in Puget Sound?

Fred Short

Washington (State). Department of Natural Resources, fredtshort@gmail.com

Pete Dowty

Washington (State). Department of Natural Resources

Helen Berry

Washington (State). Department of Natural Resources

Lisa Ferrier

Washington (State). Department of Natural Resources

Jeffrey Gaeckle

Washington (State). Department of Natural Resources

Follow this and additional works at: <https://cedar.wwu.edu/ssec>



Part of the [Terrestrial and Aquatic Ecology Commons](#)

Short, Fred; Dowty, Pete; Berry, Helen; Ferrier, Lisa; and Gaeckle, Jeffrey, "Is Nitrogen a Major Stressor of Eelgrass (*Zostera marina*) in Puget Sound?" (2014). *Salish Sea Ecosystem Conference*. 57.
<https://cedar.wwu.edu/ssec/2014ssec/Day1/57>

This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Salish Sea Ecosystem Conference by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.

Is Nitrogen a Major Stressor of Eelgrass (*Zostera marina*) in Puget Sound ?

Fred Short, Pete Dowty,
Lisa Ferrier, Jeff Gaeckle

Nearshore Habitat Program
Aquatic Resources Division
Department of Natural Resources

WA





Eelgrass

Zostera marina L.

A seagrass:

- vascular plant
- flowering
- root system

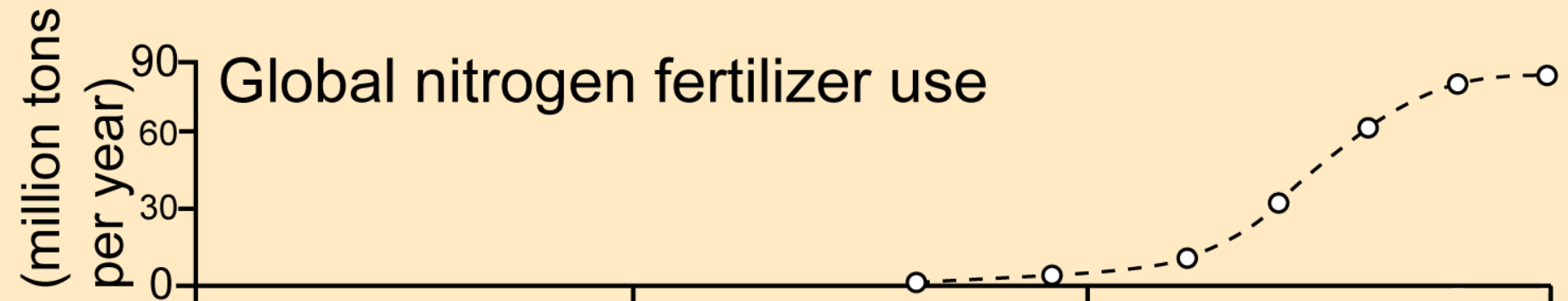
Causes of Current Eelgrass Decline

- **Reduced water clarity**
 - **Nutrient loading**
 - Sediment loading
 - Sediment resuspension
- **Physical damage**
 - Fishing
 - Aquaculture
 - Dredge and fill

Increased Nitrogen Input (fertilizer and sewage)

First nitrogen
fertilizer plant

1850 1900 1950 2000



Fertilizer applied in agriculture

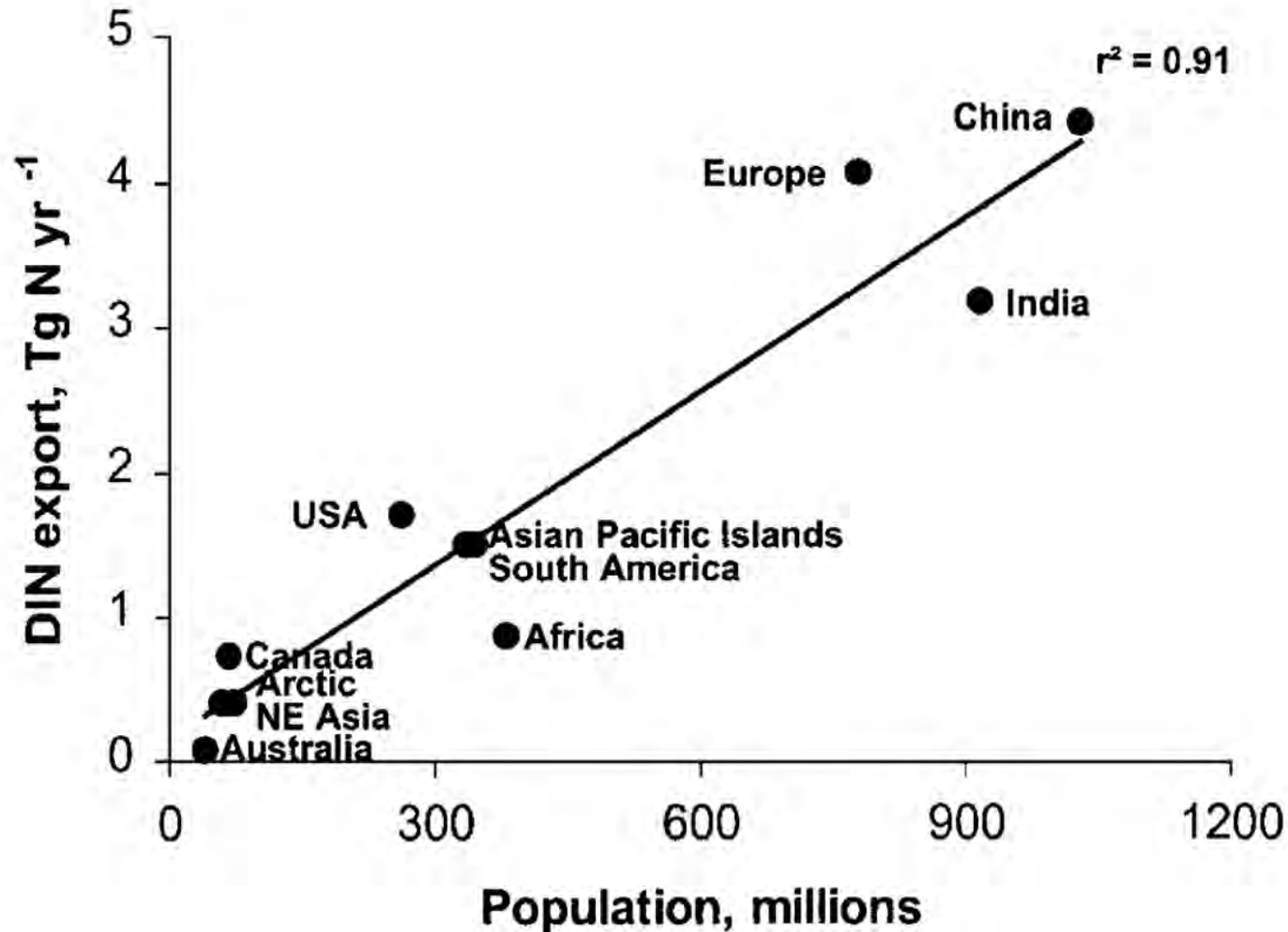


Wastewater Treatment Plant



Fertilizer applied to lawns





The connection between human population and nitrogen loading. Dissolved inorganic nitrogen (DIN) export from land (i.e., nitrogen loading to coastal waters) in 1990 versus human population for major world regions (from Seitzinger et al. 2002).





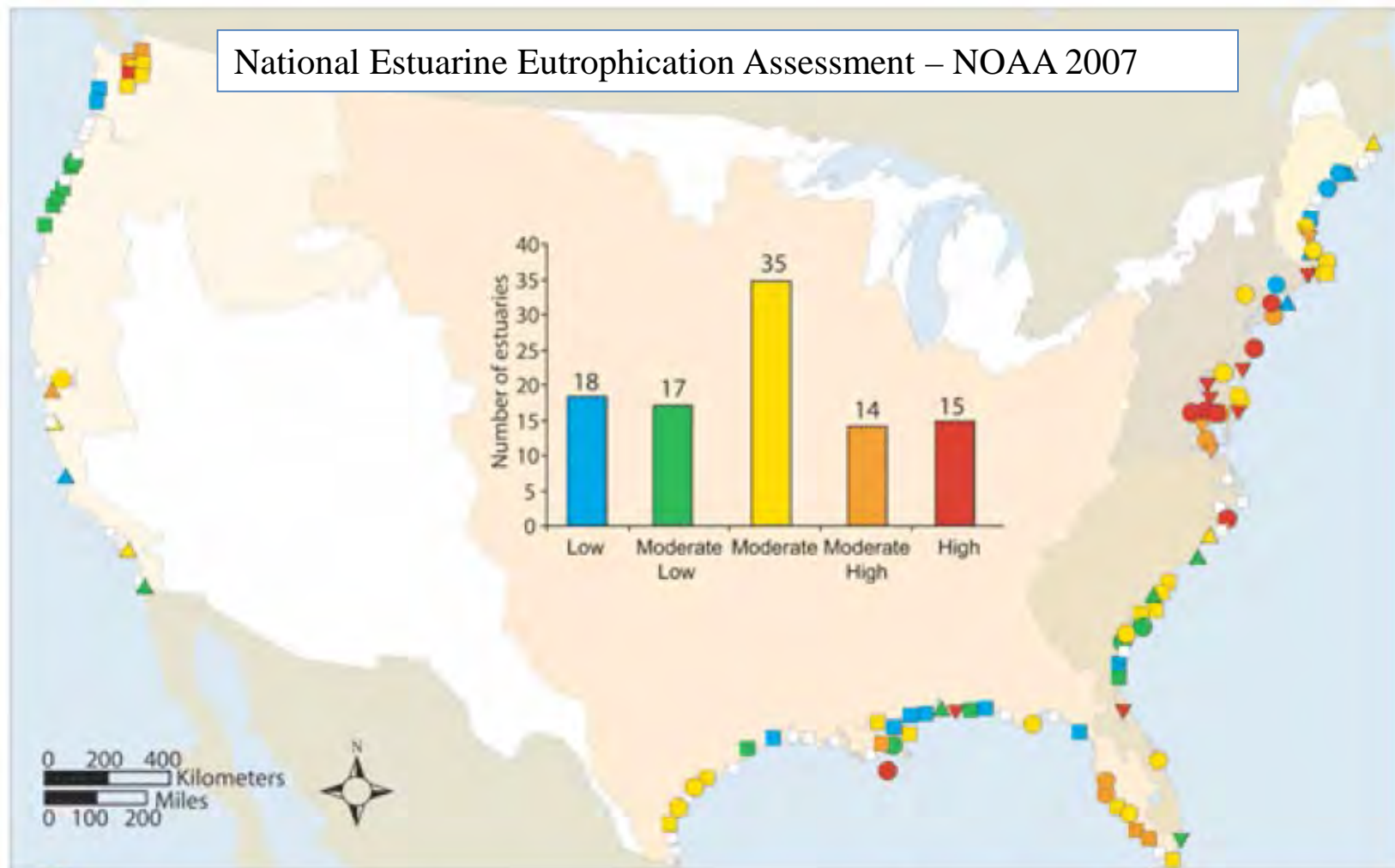
Nutrient Enrichment > Excess Algae



Excess Algae < Eelgrass

Burkholder et al. 2007

National Estuarine Eutrophication Assessment – NOAA 2007



Overall Eutrophic Condition (OEC)

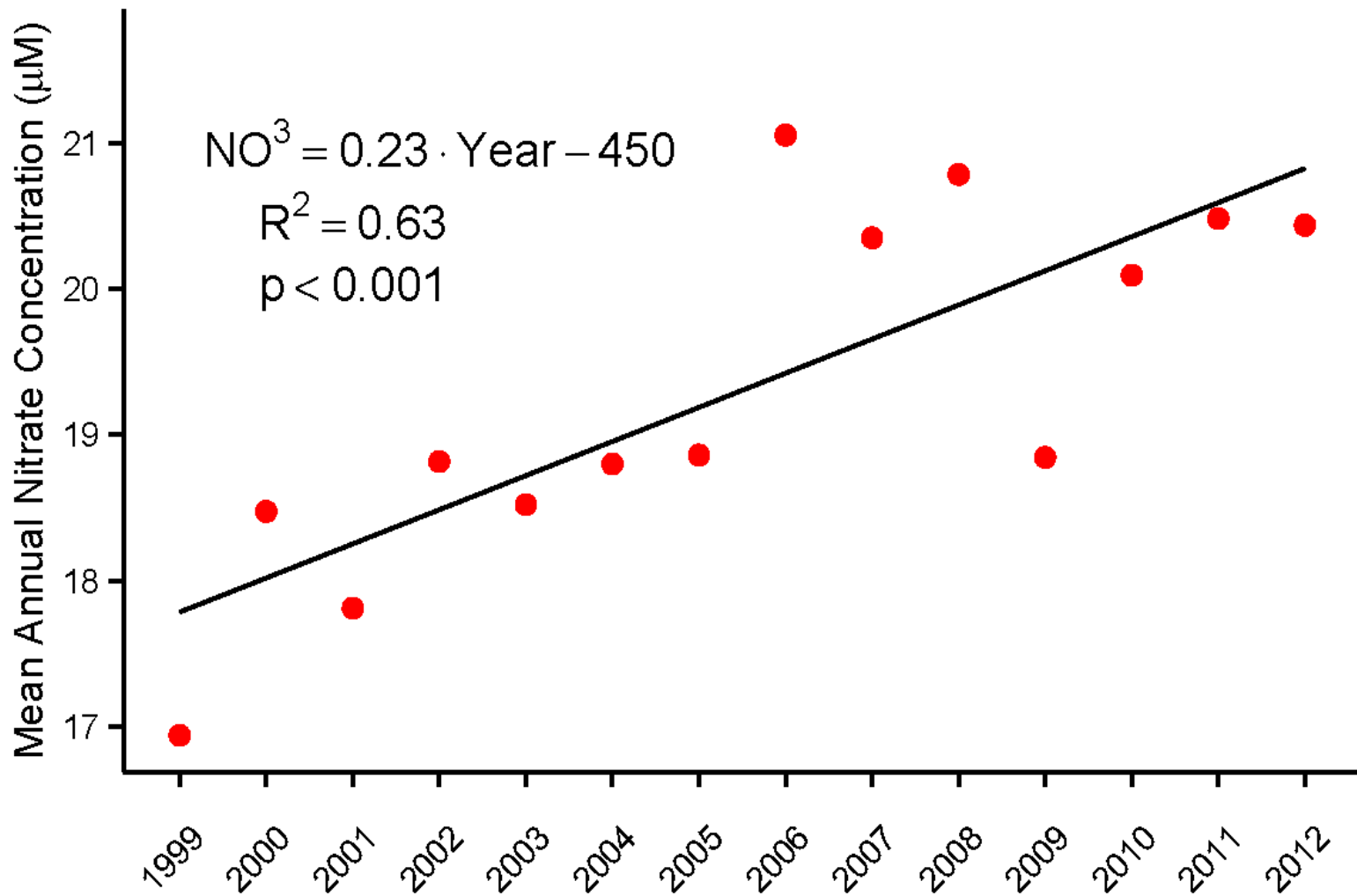
- High: symptoms periodic or persistent and/or over large areas
- Moderate high: symptoms less regular and/or over medium to extensive areas
- Moderate: symptoms less regular and/or over medium areas
- Moderate low: symptoms episodic and/or over small to medium areas
- Low: few symptoms occur at more than minimal levels
- Unknown: insufficient data for analysis

Change in eutrophic condition since 1999

- △ Symptoms improved since 1999 assessment.
- No change in symptoms since 1999 assessment.
- ▽ Symptoms worsened since 1999 assessment.
- Insufficient data to show trend.

Map showing the overall eutrophic condition of the nation's estuaries and whether they have improved or worsened since 1999.

Nitrogen Trend in Puget Sound

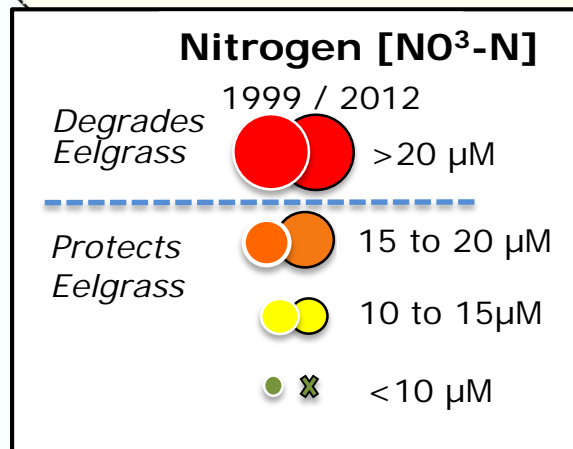



data from Dr. Christopher Krembs, WA Department of Ecology

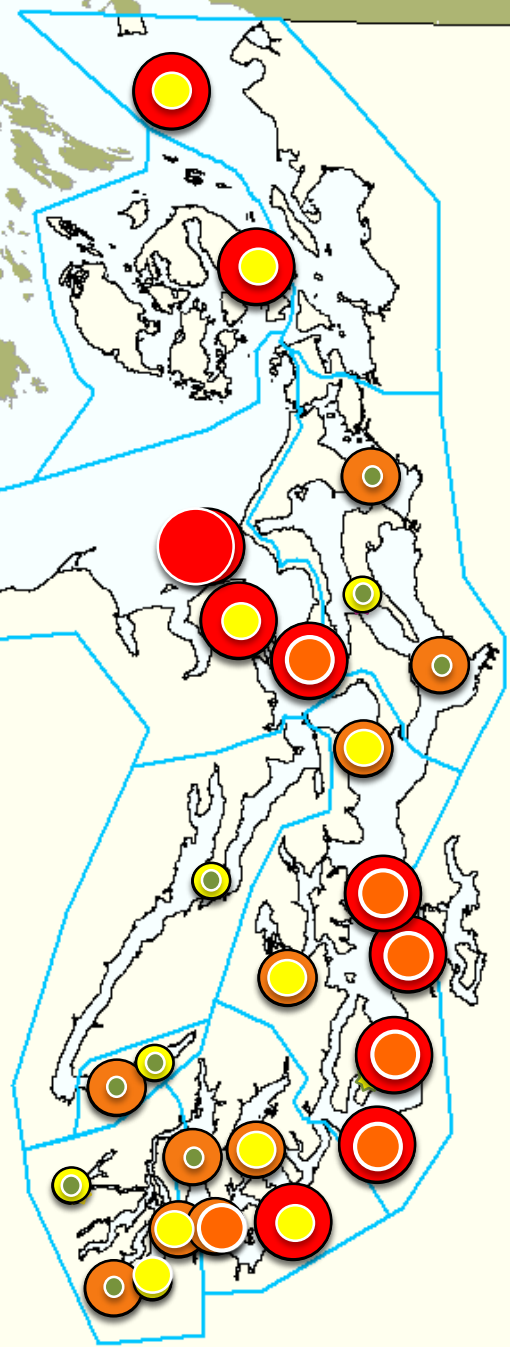


WASHINGTON STATE DEPARTMENT OF
Natural Resources
www.dnr.wa.gov

1999
2012



 Sub-region Boundaries



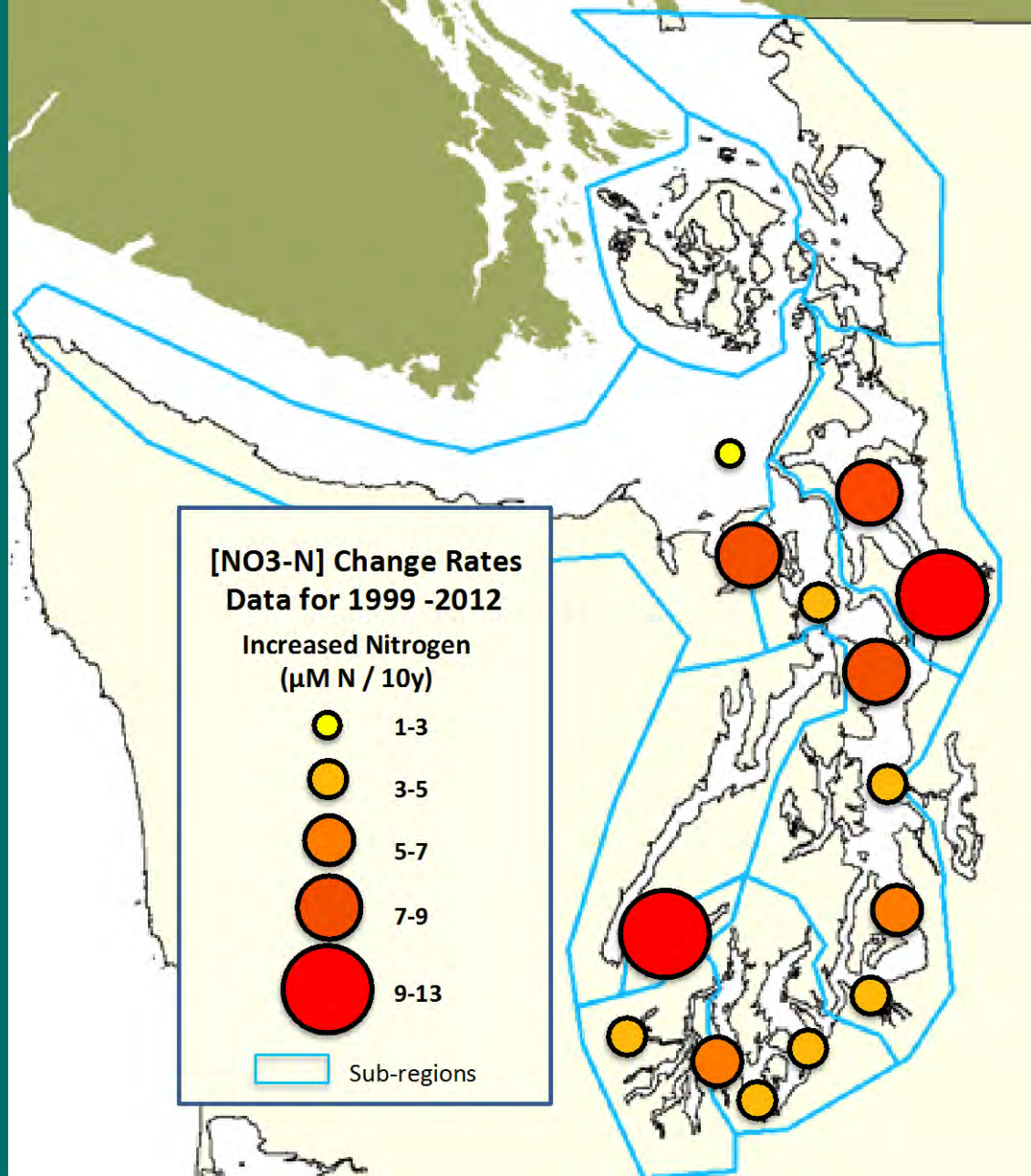
Data from:

Dr. Christopher
Krembs,

Washington
Dept. of Ecology



Nitrogen Increases in Puget Sound Waters





Early near-surface spring plankton bloom. Location: Hood Canal, 2:42 PM



Large and intense red-orange-brown plankton bloom. Location: Hood Canal, 3:35 PM

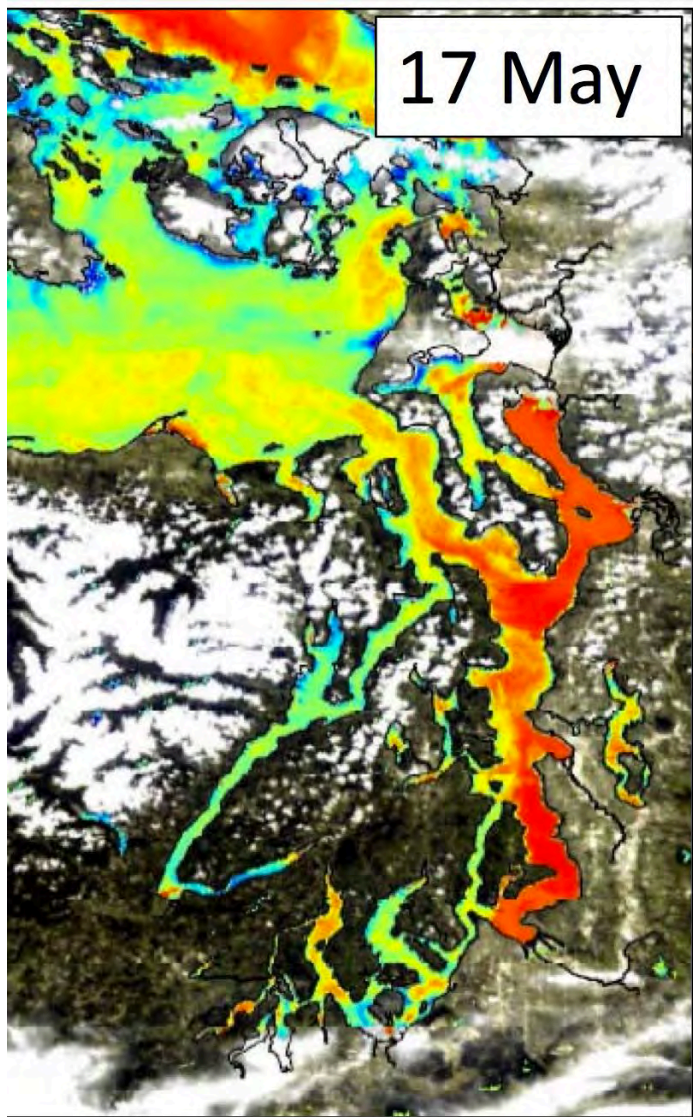


Large and intense red-orange-brown plankton bloom. Location: Hood Canal, 3:35 PM

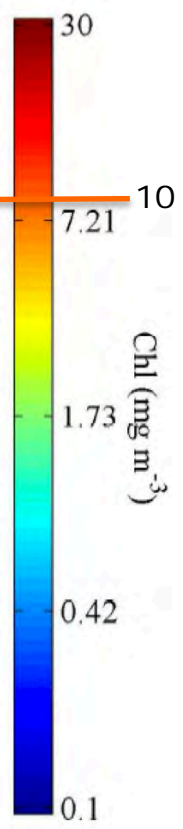


Noctiluca bloom accumulating in long band along a convergence. Location: Near Twanoh State Park (Southern Hood Canal), 10:00 AM

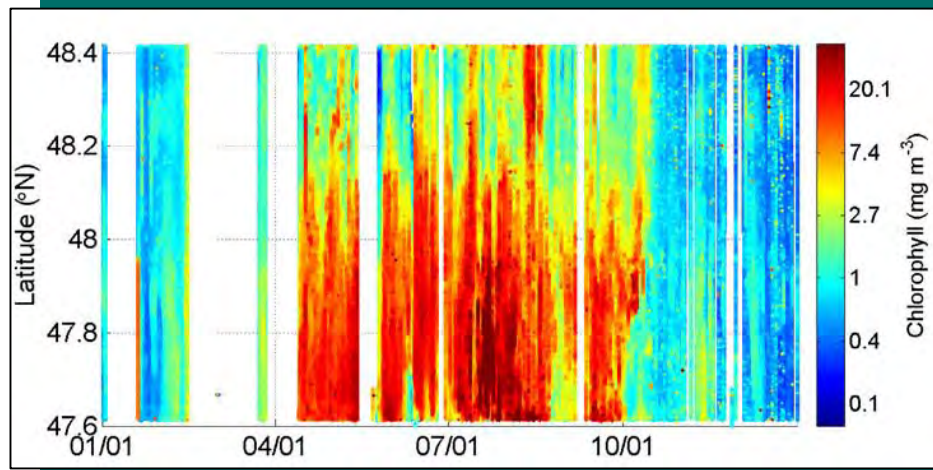
Phytoplankton from Satellite Imagery



17 May



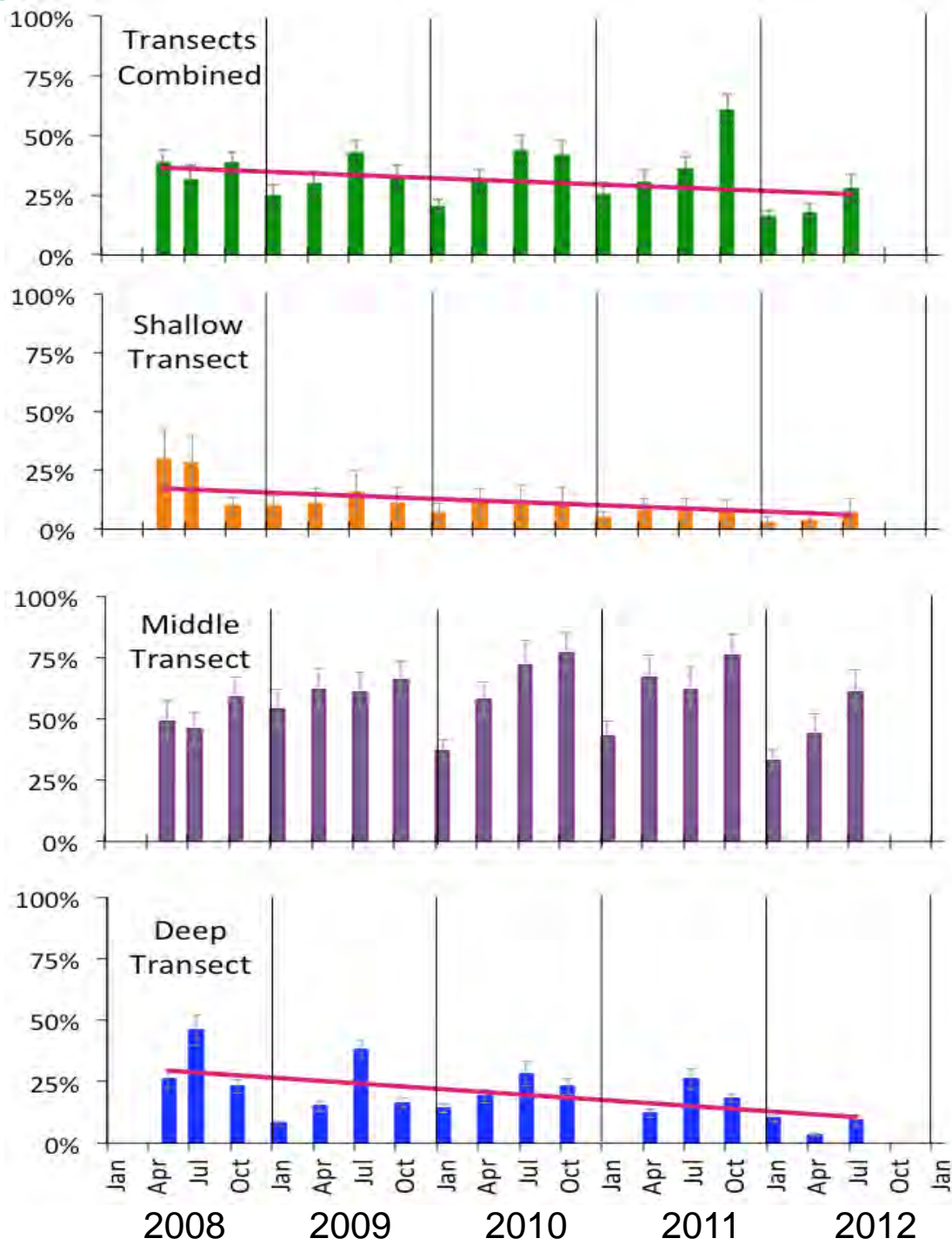
Victoria Clipper
daily water quality monitoring



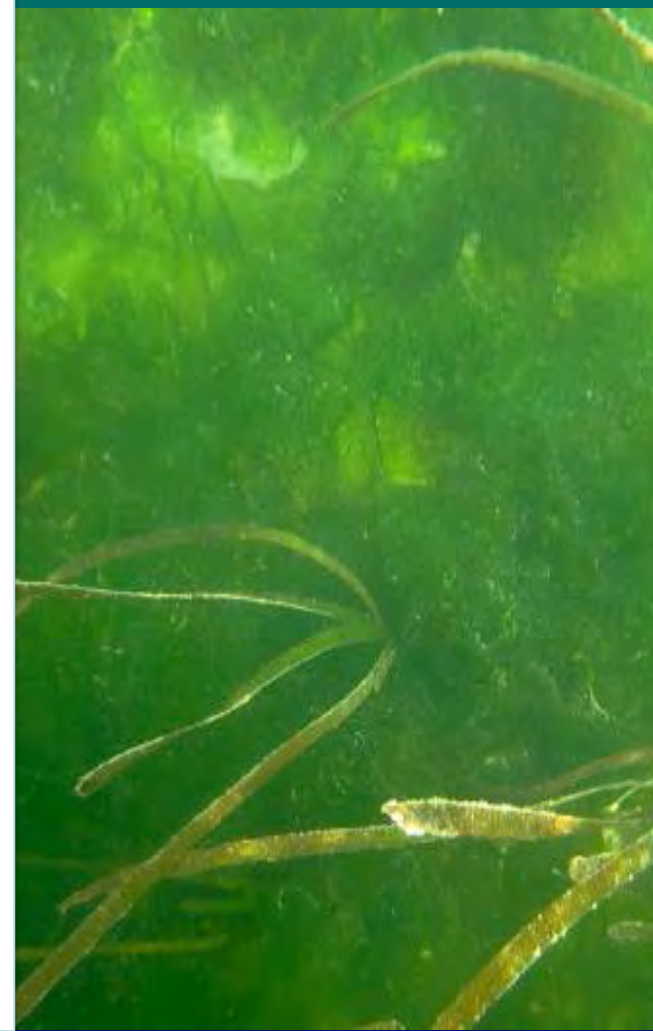
An underwater photograph showing a dense field of green grasses. The water is a murky, greenish-yellow color, indicating low visibility. The grass blades are long and thin, some in sharp focus in the foreground and others blurred in the background. The overall scene conveys a sense of poor water clarity.

Poor Water Clarity

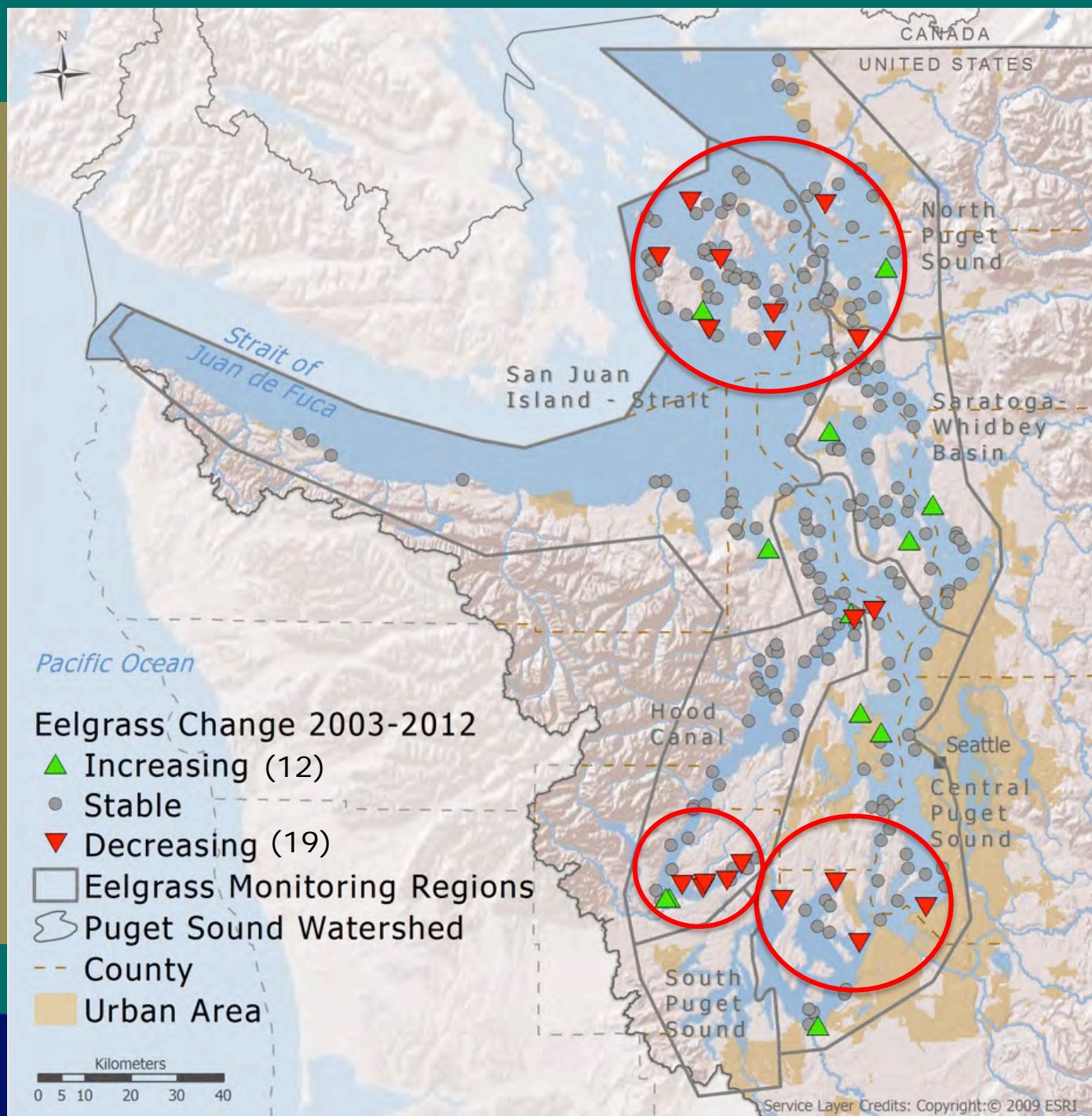
Percent Eelgrass Cover



SeagrassNet at Dumas Bay, WA



SVMP Monitoring Sites with Declining and Increasing Eelgrass



Cass Inlet, South Puget Sound

- Eelgrass loss at the deep edge -

- Water clarity problem -



Water clarity problems currently limited to inlet areas



WASHINGTON STATE DEPARTMENT OF
Natural Resources

www.dnr.wa.gov

Environmental Solutions

1. Improve waste treatment
2. Reduce runoff
3. Restore watershed filters

Political Solutions

Implement and support the
Washington State "Eelgrass Strategy"



QUESTIONS?



http://www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/aqr_nrsh_publications.aspx



WASHINGTON STATE DEPARTMENT OF
Natural Resources
www.dnr.wa.gov

