<u>June 6 Webinar: Kelp Monitoring Methods and Technologies</u>
10:00 am - 12:30 pm

WEBINAR OBJECTIVES
- Learn from guest speakers: the various efforts to survey kelp beds using different methods and technologies, the challenges of remote sensing and aerial mapping, and ways to address challenges
- Discuss implications for our region; what technologies seem most promising and effective? What could be applied in our region to better understand changes to kelp forests?
- Begin crafting monitoring recommendations based on what was learned - take detailed notes to revisit at 2nd working group meeting

AGENDA

Time	Title	Presenter
10:00 - 10:10	Introduction CDFW Update	Rietta Hohman, GFNMS Cynthia Catton, CDFW & KWRG Co-Chair
10:10 - 10:25	California Department of Fish and Wildlife Aerial Kelp Surveys	Rebecca Flores-Miller, CDFW
10:25 - 10:50	Remote Estimation of Kelp Canopy Density along the California Coast	Tom Bell, UCSB
10:50 - 11:10	Re-thinking our approach to observation and monitoring of Bull kelp after large scale ecological and environmental perturbations on the North Coast	Meredith McPherson, UCSC
11:10 - 11:20	BREAK	
11:20 - 11:40	Detection of Bull Kelp (Nereocystis luetkeana) in the Salish sea Using High Resolution Satellite Imagery	Maycira Costa, Univ of Victoria
11:40 - 12:00	An Overview of Floating Kelp Trends and Issues in Washington State	Helen Berry, WA DNR
12:00 - 12:30	Group Discussion/Q&A	Francesca Koe, KRWG Co-Chair

SPEAKER INFORMATION

Rebecca Flores Miller is an Environmental Scientist with the California Department of Fish and Wildlife (CDFW). Rebecca is the CDFW lead for marine algae management, including: managing the statewide aerial kelp surveys, tracking commercial kelp and other marine algae harvesting, reviewing and providing guidance on marine algae related permit requests, and providing recommendations to the Fish and Game Commission (Commission) on kelp harvest plans, kelp bed lease requests, and potential regulation changes. Rebecca is the lead on the three-phase process to review and amend the commercial kelp and other marine algae harvest regulations. She has overseen the completion of Phase One, focusing on the kelp regulations which included updating Administrative Kelp Bed boundary descriptions and kelp harvest plan requirements. Rebecca is currently working on the Phase Two review, focusing on marine algae management policies including harvest methods.

Presentation title: California Department of Fish and Wildlife Aerial Kelp Surveys

Rebecca will be presenting information on the California Department of Fish and Wildlife's aerial kelp surveys. The presentation will include the survey background, how to access the data, uses of the dataset, an overview of the north coast kelp surveys, and the value and limitations of the surveys.

Tom Bell is a postdoctoral researcher with the University of California Los Angeles and the University of Alaska SE. He completed his Ph.D. in Marine Science from UC Santa Barbara in 2016 under the guidance of Dr. David Siegel. Tom has been working on the remote estimation of giant kelp biomass and physiological conditions since 2011 and has published many papers on the topic with several additional manuscripts in preparation and in various states of review.

Presentation title: Remote Estimation of Kelp Canopy Density along the California Coast

Presentation summary: Tom will present an overview of the methods to estimate kelp canopy density from multispectral satellite imagery, such as the Landsat sensors. This process can be summarized as two main steps: the identification of kelp containing pixels using supervised classification techniques and the estimation of the kelp canopy density within a pixel using multiple endmember spectral mixture analysis. Successful implementation of this method can be used to produce a 30+ year time series of kelp canopy dynamics for most areas of the globe. Tom will also present recent results using these data linking giant kelp dynamics to various environmental drivers and the application of this method to bull kelp canopies in the NE Pacific.

Meredith McPherson is a third year Ocean Sciences PhD student in the Kudela Lab at UC Santa Cruz. Meredith studies kelp in northern California using a variety of remote sensing technologies, and is interested in understanding the effects of oceanographic, ecological, and biogeochemical processes on radical changes in kelp biomass in Sonoma and Mendocino counties over the past decade. Previously, she completed her BS and MS in Ocean, Earth, and Atmospheric Sciences at Old Dominion University (ODU). Her research at ODU focused on studying the effects of in situ water column optical properties on seagrasses in Florida Bay as

an undergrad and developing a mechanistic model to predict the impact of environmental conditions on carbon uptake and isotope discrimination in Eelgrass (Zostera marina) as a masters student, both under Dr. Richard Zimmerman.

Presentation title: Re-thinking our approach to observation and monitoring of Bull kelp after large scale ecological and environmental perturbations on the North Coast

Presentation summary: The CDFW has historically monitored kelp canopy area using aerial surveys, but temporal and spatial coverage is intermittent in northern California across the bull kelp die-off. Landsat imagery has proved to be a fantastic tool for detecting relatively large giant kelp beds in southern California, however it is unclear whether Landsat can accurately estimate bull kelp after the die-off in northern California, which reduced canopy diameters to <10 m. Relatively high spatial resolution sensors may be necessary to accurately capture Bull kelp. I will discuss the suite of sensors we are exploring to understand the spatial requirements of Bull kelp using remote sensing, and some challenges we've encountered in utilizing commercial satellite imagery with higher spatial resolution than Landsat. Furthermore, I will present upcoming field work to quantify bull kelp biomass and kelp health (expanding on research published by Tom Bell), which is important for linking remotely sensed data to bull kelp physiological conditions through space and time.

Maycira Costa is a professor at the University of Victoria, Canada and she is the coordinator of the Remote Sensing Laboratory in the Department of Geography. Her expertise is in oceanography and ocean remote sensing.

Presentation title: Detection of Bull Kelp (Nereocystis luetkeana) in the Salish sea Using High Resolution Satellite Imagery.

Presentation summary: Bull kelp (Nereocystis luetkeana) is an important feature of the nearshore environment, forming structural habitat for marine species, protection from wave energy and nutrient entrainment. In the Salish Sea, reports that kelp beds are in decline due to factors such as warming sea temperatures and deterioration of ocean conditions have raised concern amongst the scientific community. This talk will present some of the benefits and challenges of using long-term data set of satellite imagery to detect kelp and understand how its distribution may be changing over time. A framework for using high-resolution satellite imagery acquired by SPOT and WorldView will be demonstrated.

Helen Berry is a marine ecologist who maps and monitors nearshore habitat for the Washington State Department of Natural Resources, the state steward of intertidal and subtidal aquatic lands. Helen's current projects include long-term monitoring of kelp, seagrasses and intertidal biotic communities. Findings from these projects are used to track habitat condition for DNR, the Puget Sound Partnership and other organizations. Helen has an MS in Oceanography from Oregon State University.

<u>Presentation title</u>: An Overview of Floating Kelp Trends and Issues in Washington State.

<u>Presentation summary</u>: Helen will discuss what is known about long-term trends in floating kelp in Washington and patterns in kelp canopy area since 2013, which encompasses the time-period of extreme changes in Northern California. She will also discuss the progress of the Washington Kelp Recovery Plan, which is currently under development.