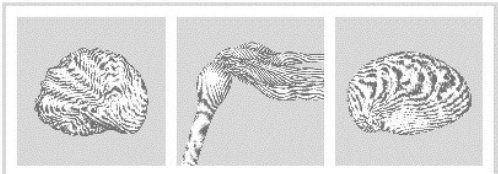


Bull kelp restoration

Hilary Hayford

hilary@restorationfund.org



PUGET SOUND
RESTORATION FUND



Acknowledgement with gratitude of the
Indigenous people who have stewarded these
lands & waters since time immemorial &
continue to do so today.

PSRF bull kelp team



Brian
Allen



Jessi
Florendo



Kari
Inch



Morgan
Arrington



Sofia
O'Connell



Alex
Harnick



Sophie
Schwager



Nereocystis luetkeana – bull kelp

Kelp needs

- Cold water
- High flow
- Nutrients
- Space
- Light

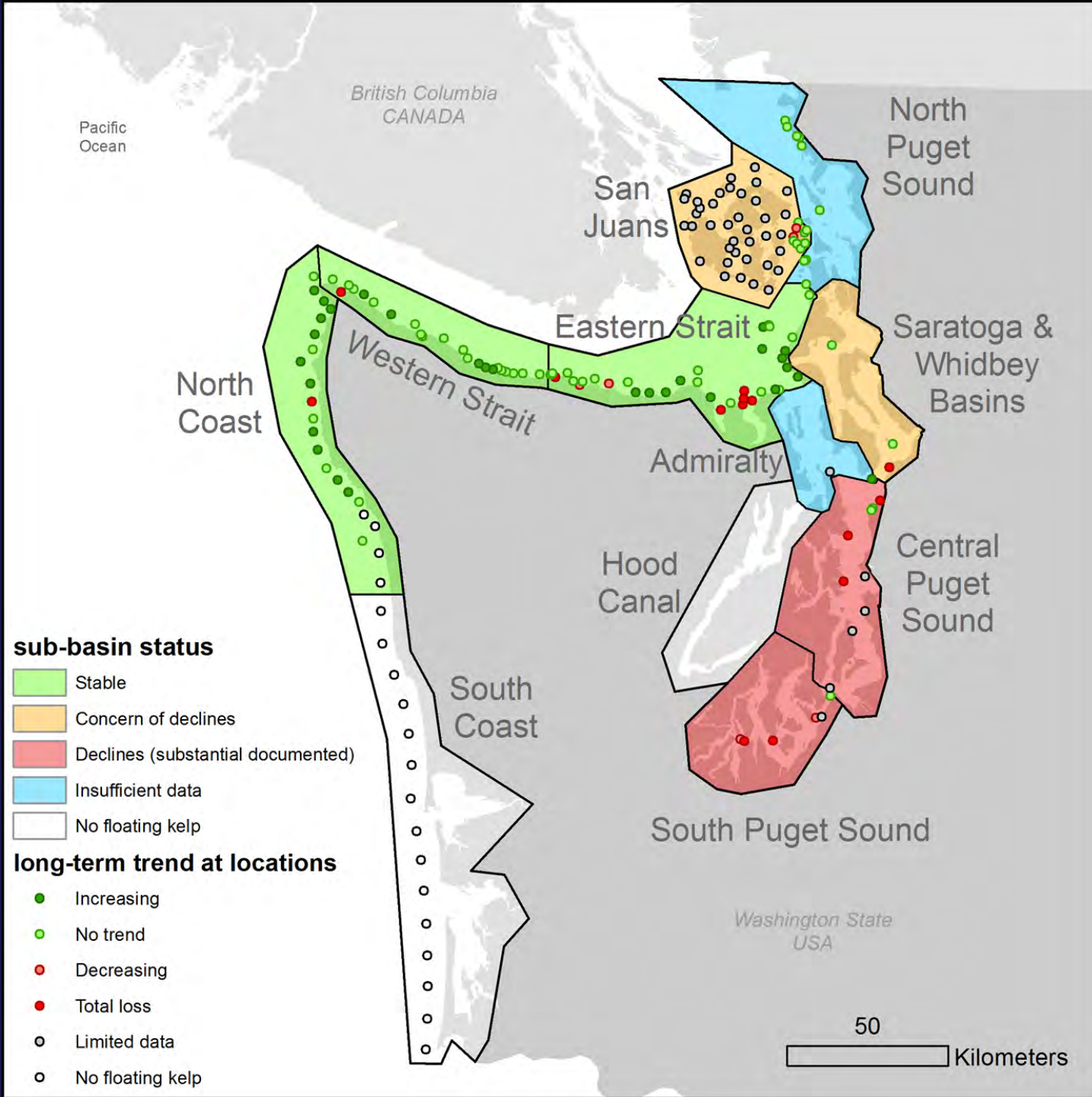


Kelps declining globally



WA canopy kelp decline is patchy

Puget Sound Partnership Vital Sign Indicator,
led by WA DNR & NW Straits Commission

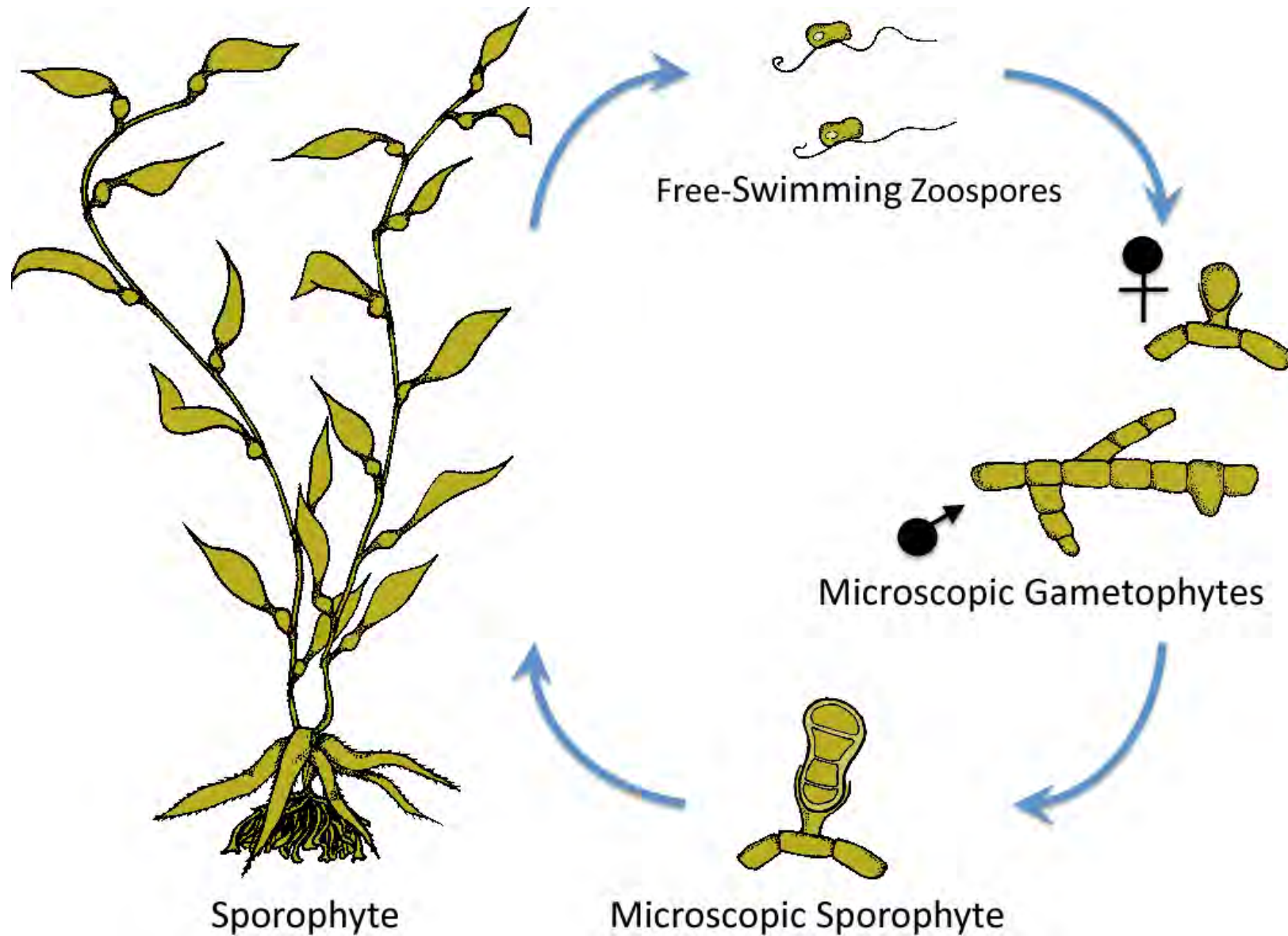


Causes of decline unclear in WA

- Warm waters
- Low nutrient availability
- Trophic imbalance



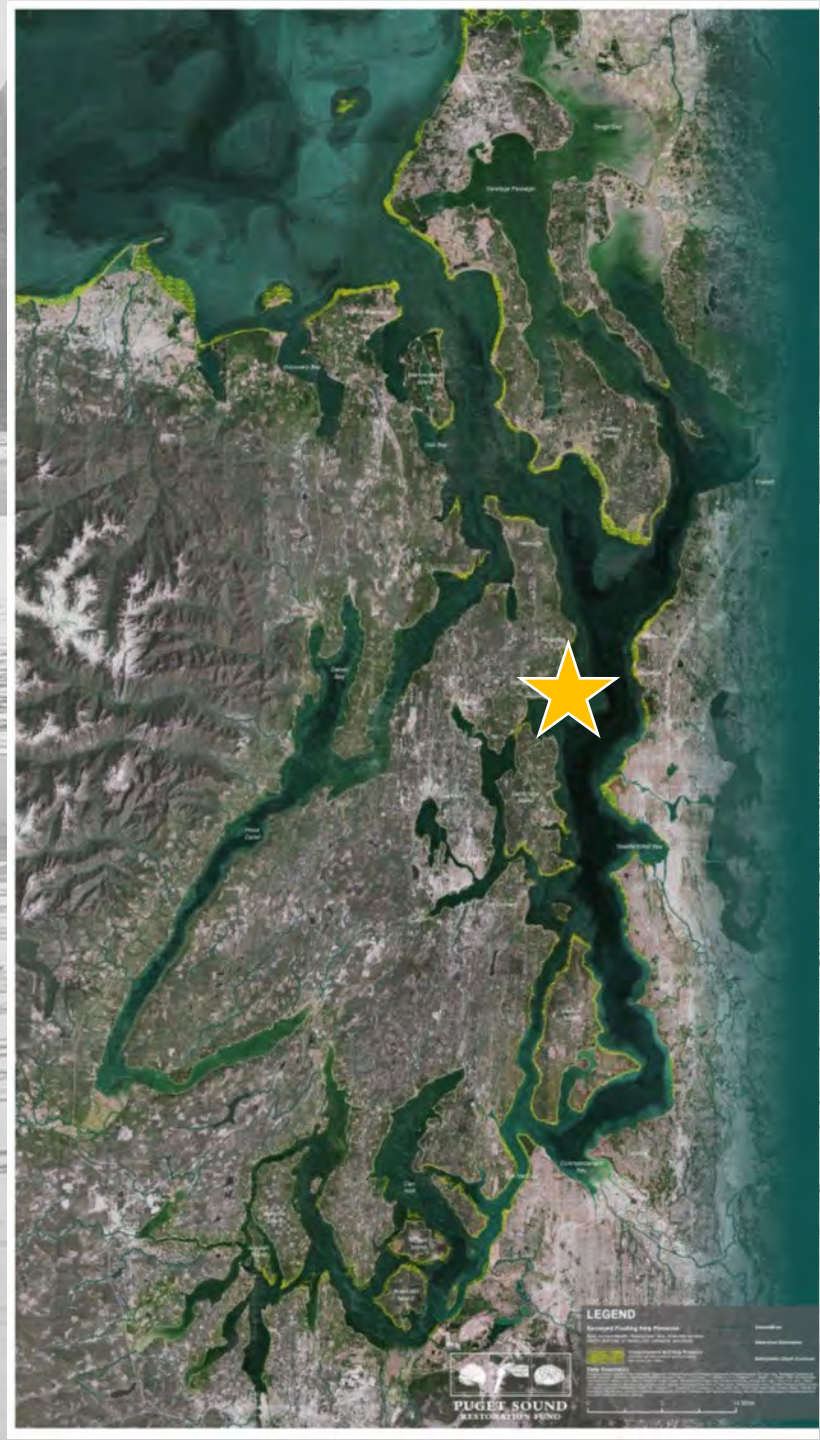
Kelp life cycle



Kelp bed gone missing

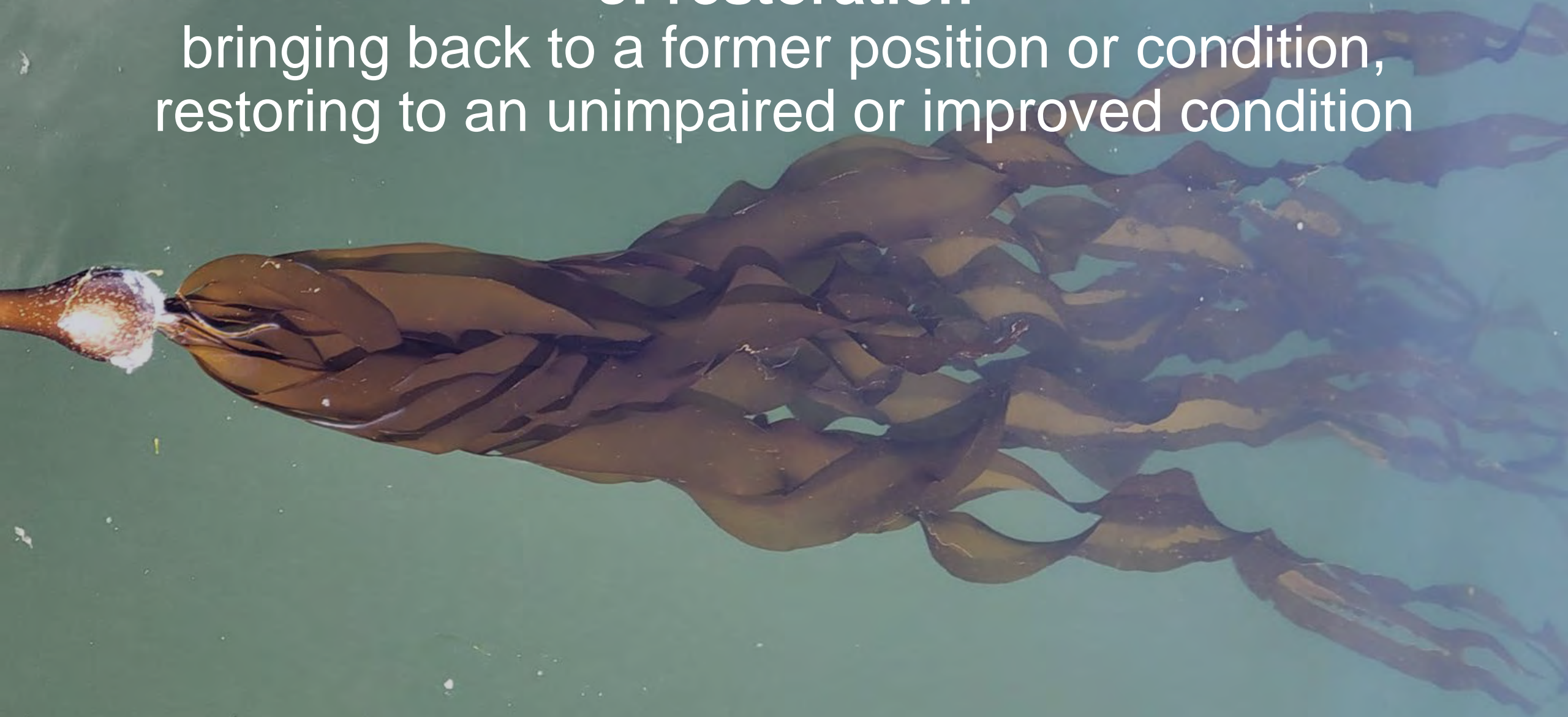


Jefferson Head/dx^wqig^wəc

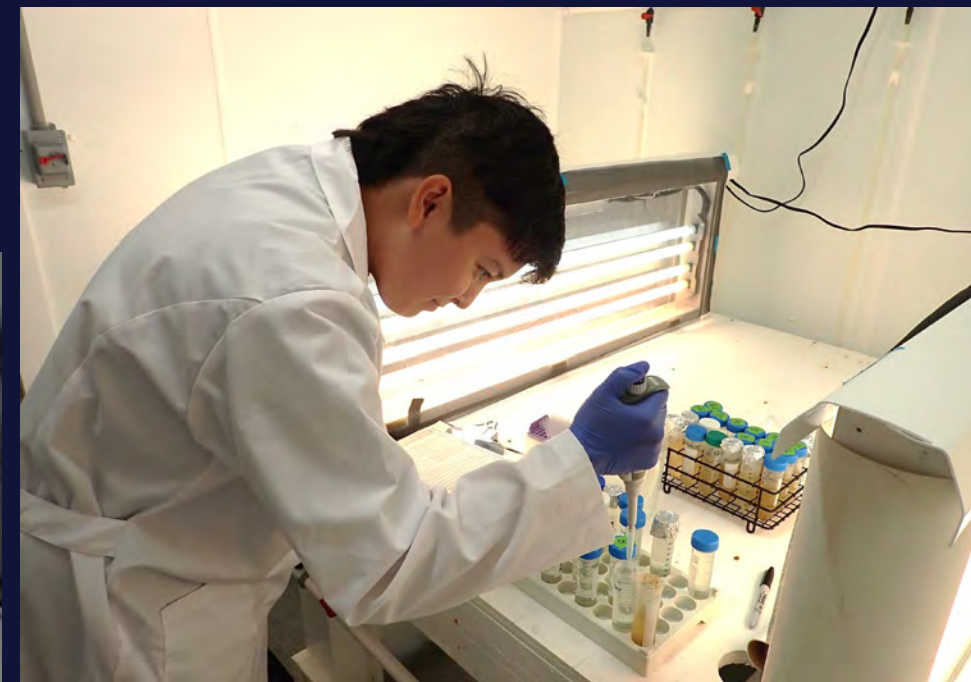


δ: restoration

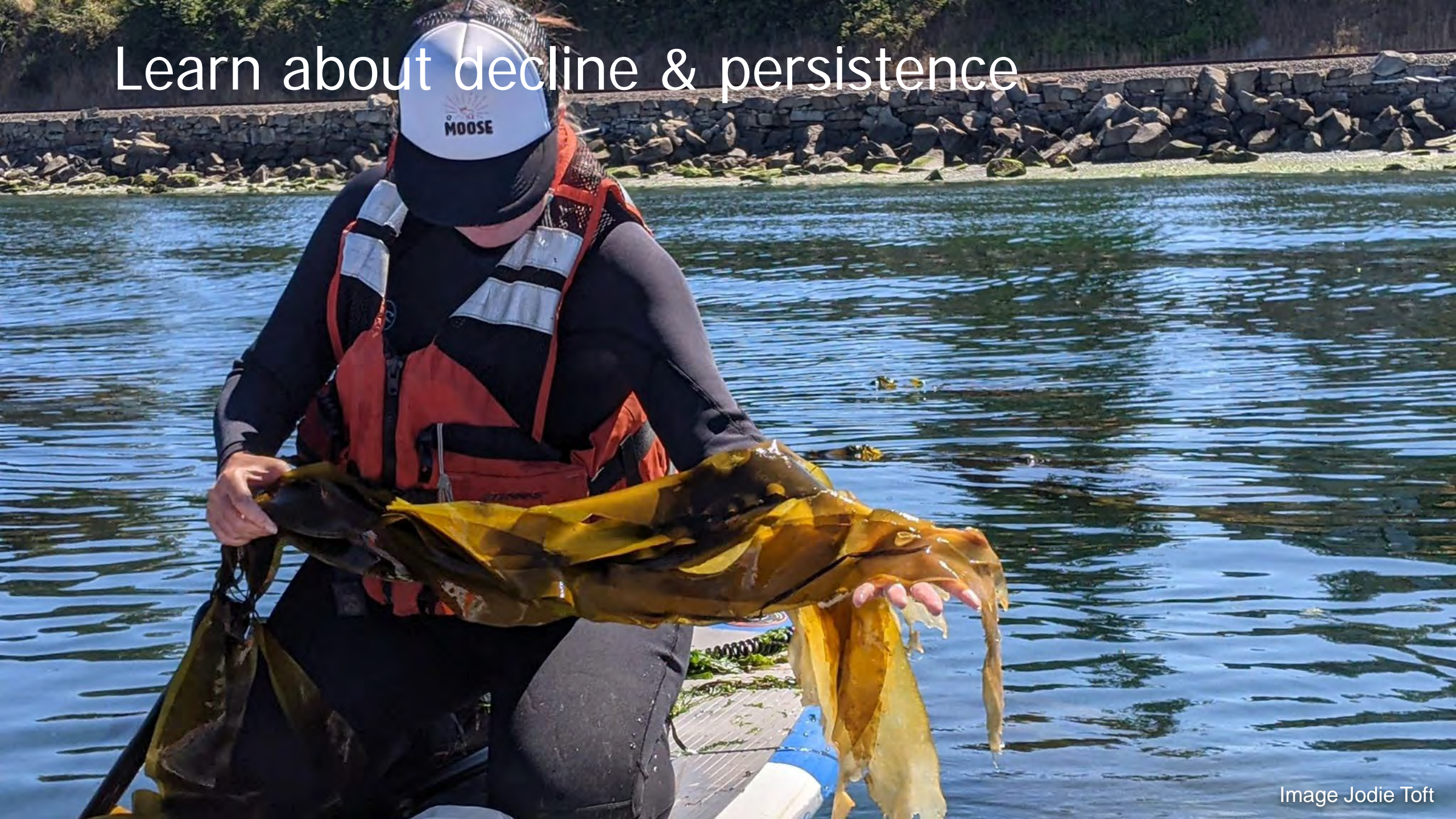
bringing back to a former position or condition,
restoring to an unimpaired or improved condition

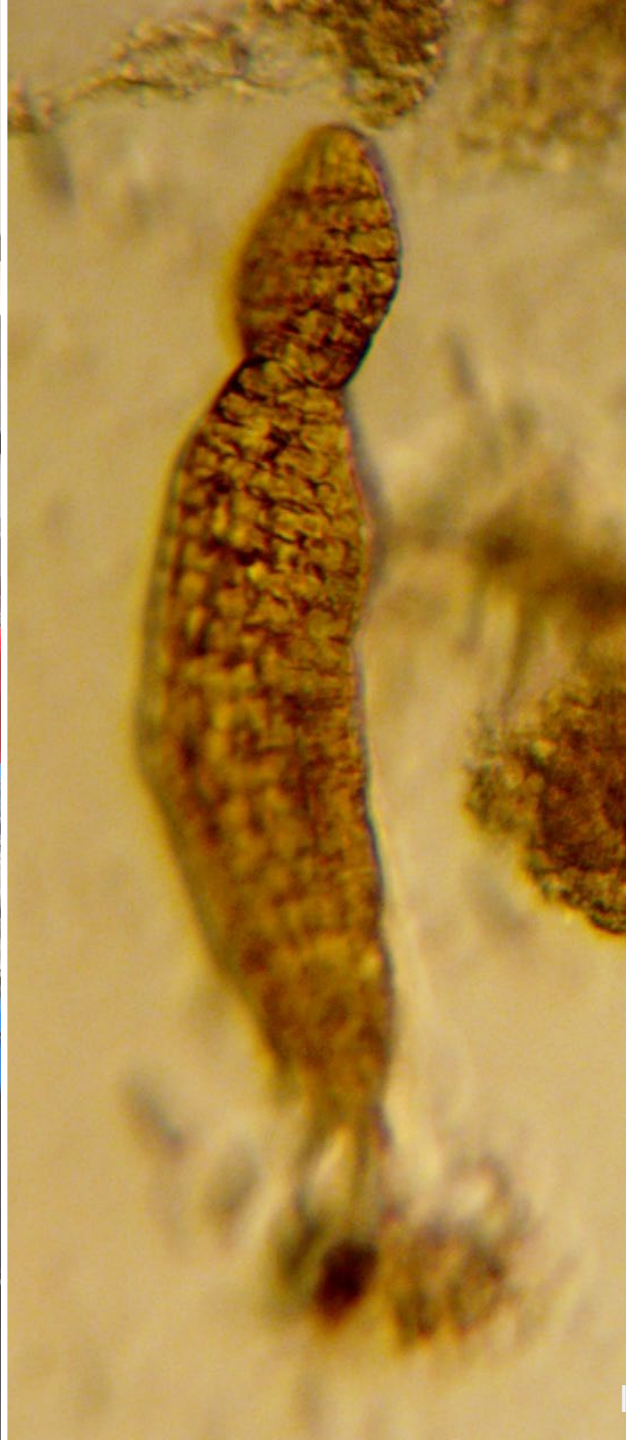


Build capacity



Learn about decline & persistence





Images Brian Allen, Jessi Florendo, Sofia O'Connell



Outplant in winter
Anchor at bottom



Image Gray McKenna



Image Kathy Burnham



Image Kathy Burnham

2020



2021



2022



2023



2024



Kelp will grow in this place



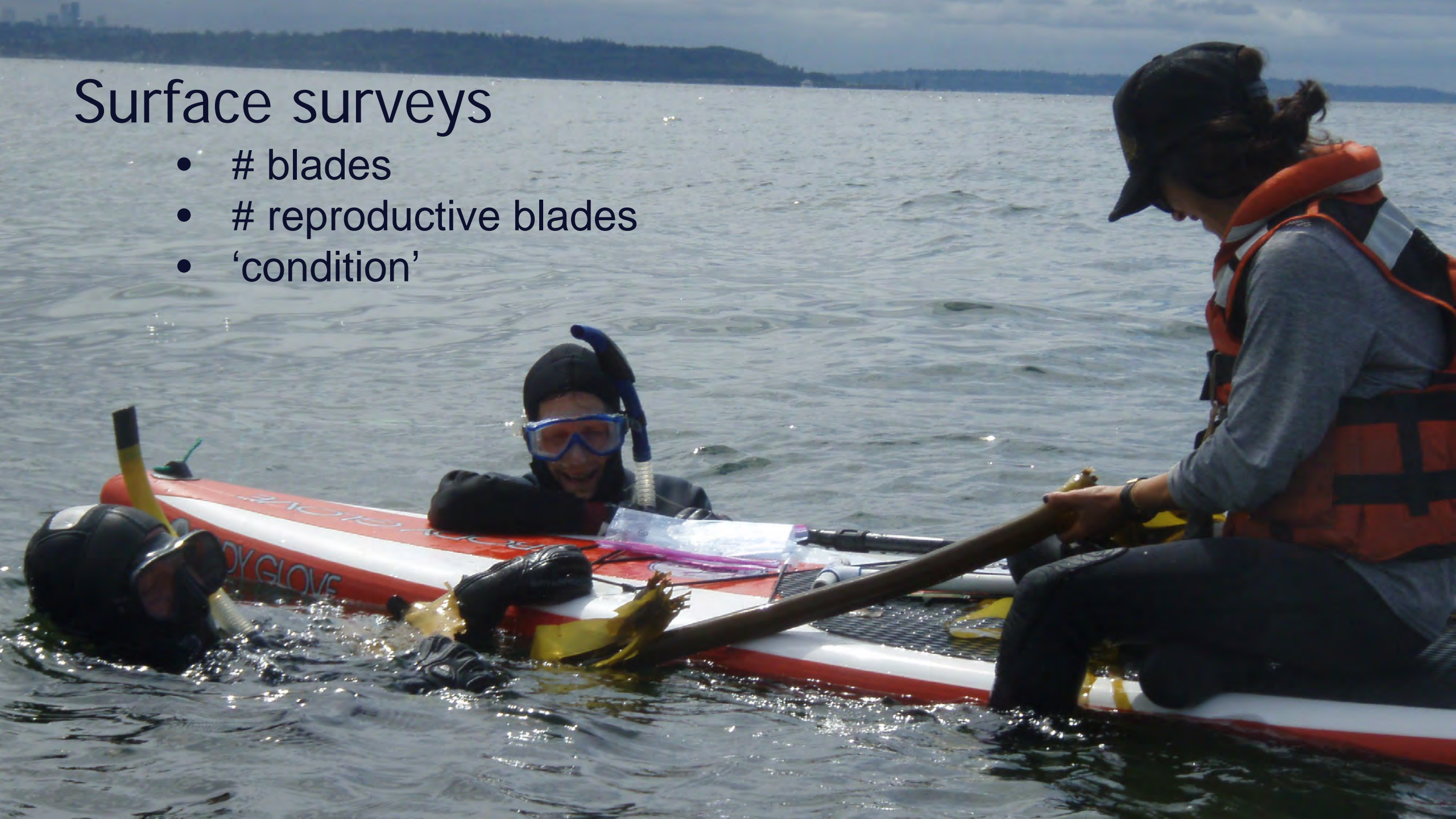
Measures of success

- 1. grow to reproductive maturity**



Surface surveys

- # blades
- # reproductive blades
- 'condition'





Every year adding spores to the sea



Measures of success

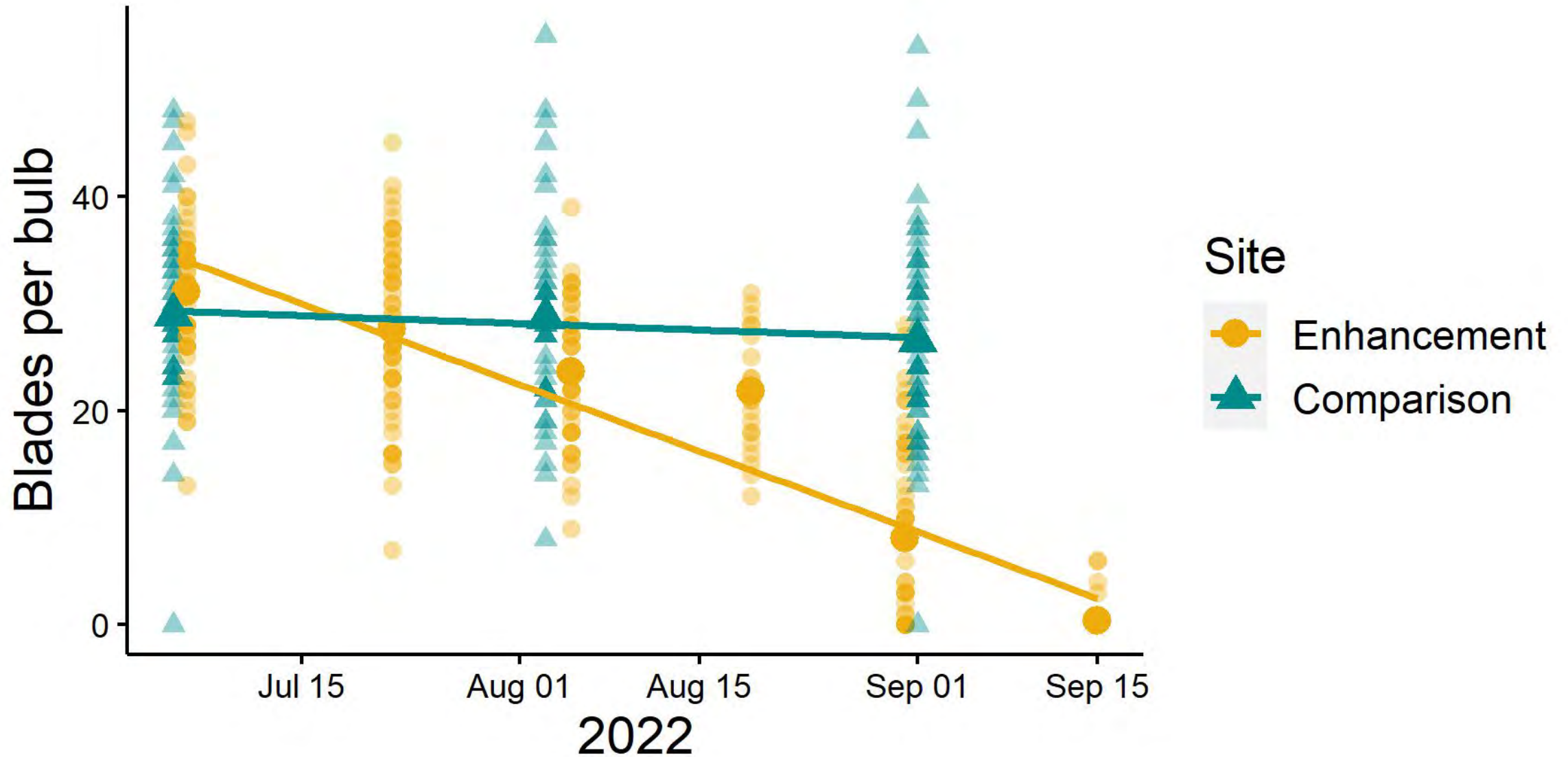
1. grow to reproductive maturity
- 2. mimic a wild bed in seasonality**



Jefferson Head/dx^wqig^wəc



Faster loss of blades



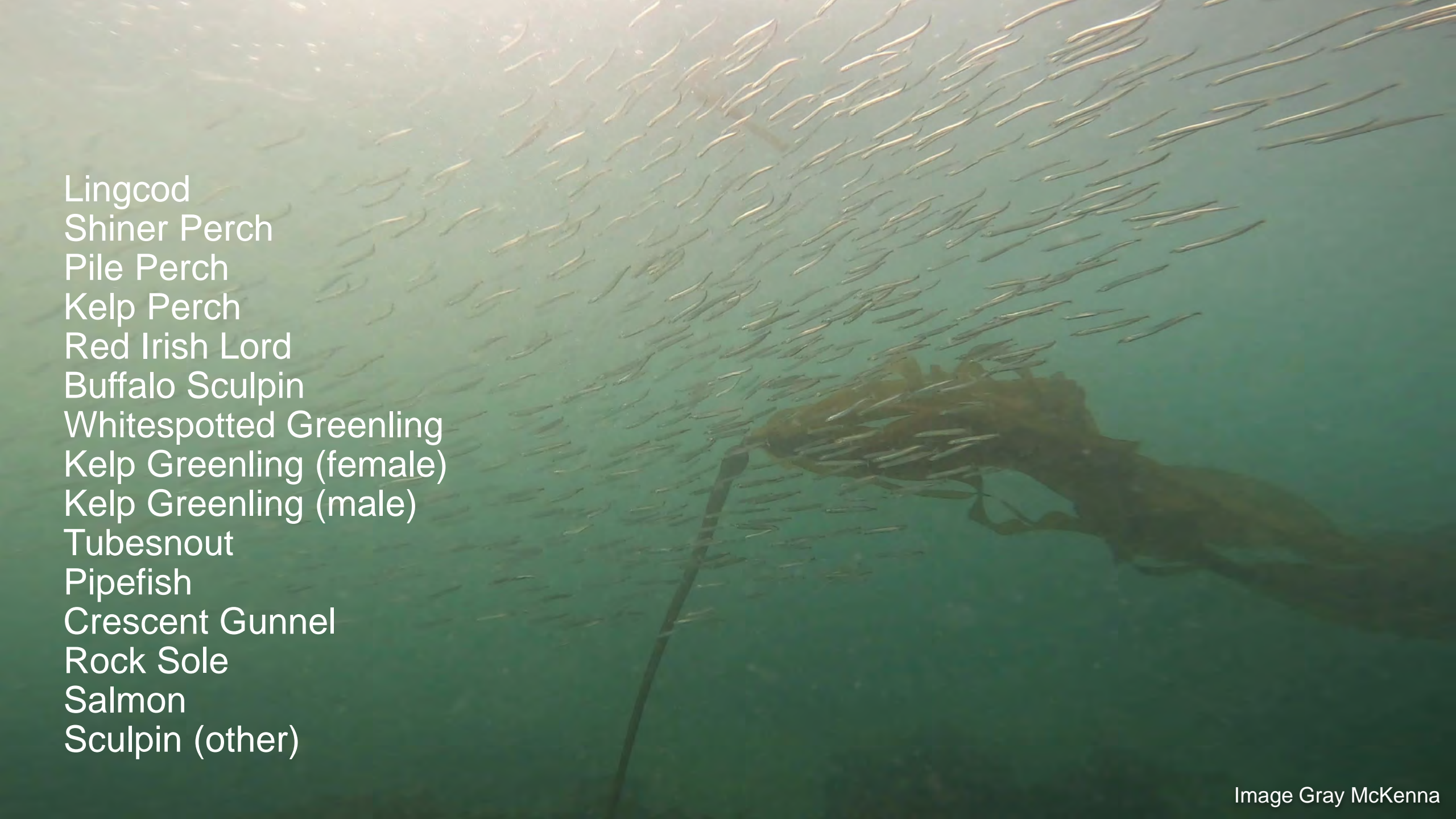
Other comparisons to wild beds



Measures of success

1. grow to reproductive maturity
2. mimic a wild bed in seasonality
- 3. create structure that attracts biological community**



An underwater photograph showing a dense school of small, silvery fish swimming in a greenish, slightly hazy water. In the lower right, a diver's hand is visible, holding a large, dark brown kelp frond. The lighting is soft, coming from above, creating a dappled effect on the water surface.

Lingcod
Shiner Perch
Pile Perch
Kelp Perch
Red Irish Lord
Buffalo Sculpin
Whitespotted Greenling
Kelp Greenling (female)
Kelp Greenling (male)
Tubesnout
Pipefish
Crescent Gunnel
Rock Sole
Salmon
Sculpin (other)



Reef Check

WASHINGTON



Measures of success

1. grow to reproductive maturity
2. mimic a wild bed in seasonality
3. create structure that attracts biological community
4. **outplant yields next-year recruitment**





Kelp volunteers
to 2024
enhancement site

Measures of success

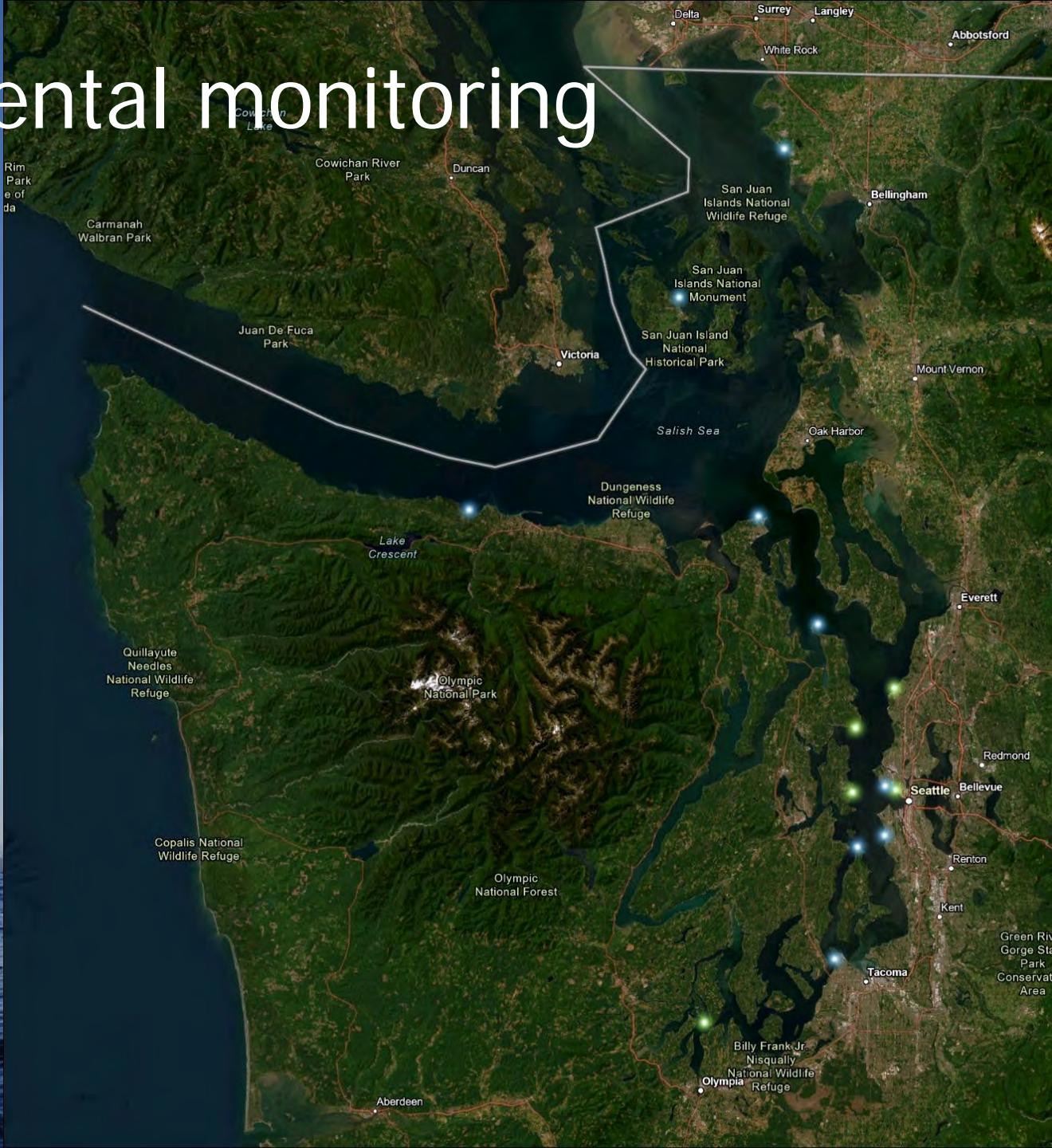
1. grow to reproductive maturity
2. mimic a wild bed in seasonality
3. create structure that attracts biological community
4. outplant yields next-year recruitment
- 5. self-sustaining bed year over year**



Eyes On Kelp: environmental monitoring



Eyes On Kelp: environmental monitoring



Eyes On Kelp: environmental monitoring



Odyssey Xtream
+ Zebratech
Hydrowiper

PAR light



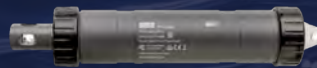
Onset U20L-2

temperature
+ water level



Onset U204-002-C

conductivity
(salinity)



Onset MX2501

pH



Onset U26-001

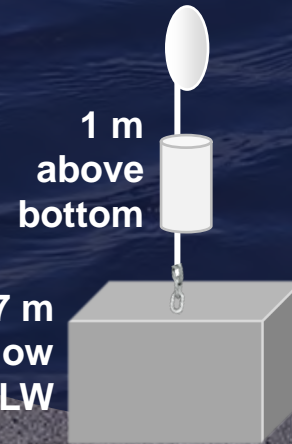
dissolved
oxygen



1 m
below
buoy



extreme
low water

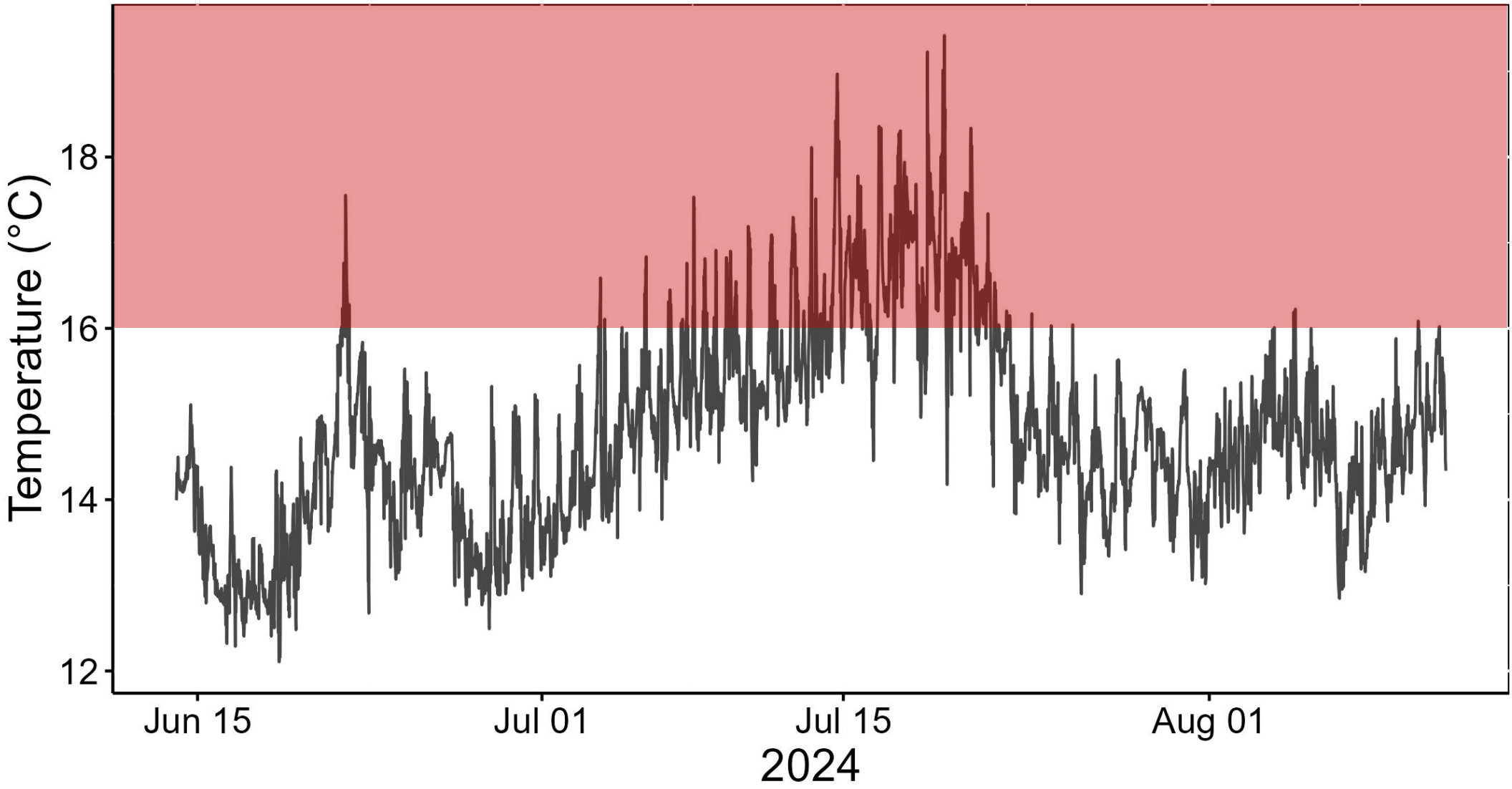


1 m
above
bottom

5-7 m
below
MLLW



July 2024 temperature stress at enhancement



So much progress

- We can grow canopy kelp bed each year *in some places*

So much progress

- We can grow canopy kelp bed each year *in some places*
- Benefits:
 - Spores
 - Fish habitat
 - Water quality

So much progress & so far to go

- We can grow canopy kelp bed each year *in some places*
- Benefits:
 - Spores
 - Fish habitat
 - Water quality
- Needs intervention to persist

So much progress & so far to go

- We can grow canopy kelp bed each year *in some places*
- Benefits:
 - Spores
 - Fish habitat
 - Water quality
- Needs intervention to persist
- Conditions are changing

Partners & supporters



SEATTLE AQUARIUM



BUILDERS INITIATIVE



BENJAMIN & MARGARET
HALL FOUNDATION

Bringing Balance to The Oceans



San Juan County
Marine Resources
Committee

