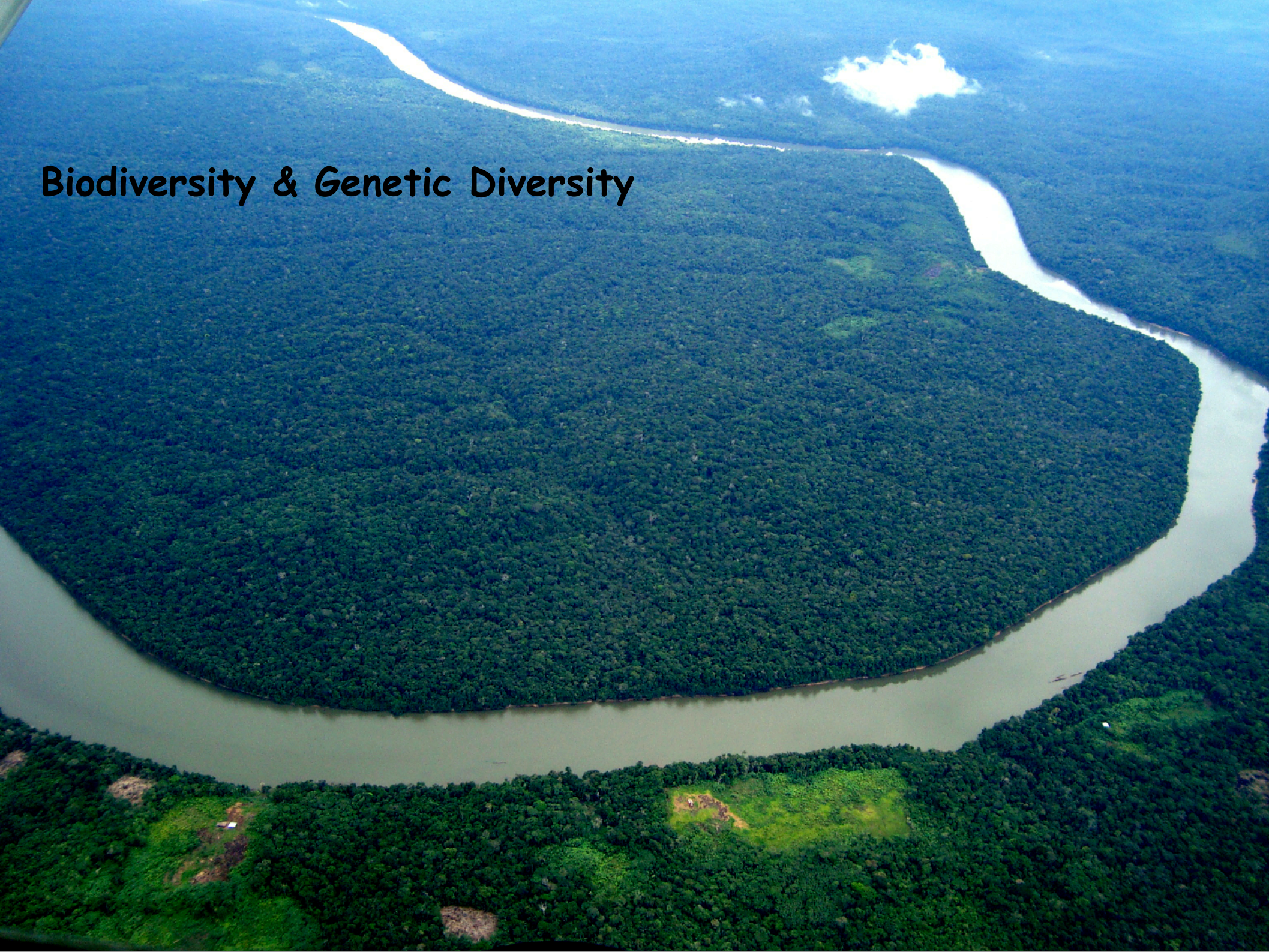


What is eelgrass?

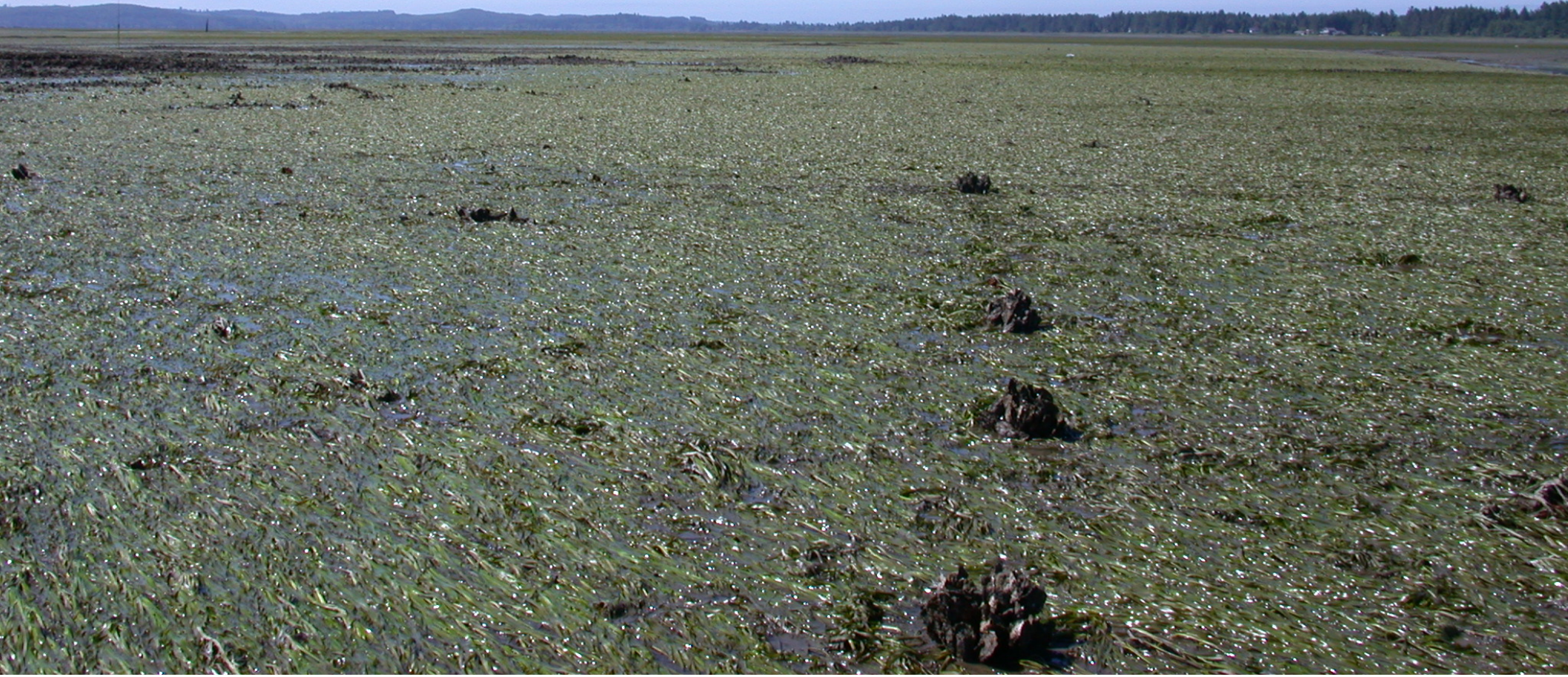


Alan Trimble
University of Washington
December 8, 2014

Biodiversity & Genetic Diversity



Essential Habitat? Noxious Weed?



A photograph of a beach during low tide. The foreground is dominated by wet, rippled sand in shades of grey and blue. Patches of green seaweed are scattered across the sand, some appearing as small clumps and others as thin, elongated strands. The background shows a continuation of the beach with more seaweed and a hint of the ocean's edge. The overall scene is a natural, somewhat desolate coastal landscape.

Sometimes it disappears from where we want it to be.

Sometimes it exists in places we don't want it to be.





But what is it?

Eelgrass species in Washington

Zostera marina - "native eelgrass"

Zostera pacifica - "wide eelgrass" (unverified)

Zostera japonica - "Japanese eelgrass"

Ruppia maritima - "widgeon grass"



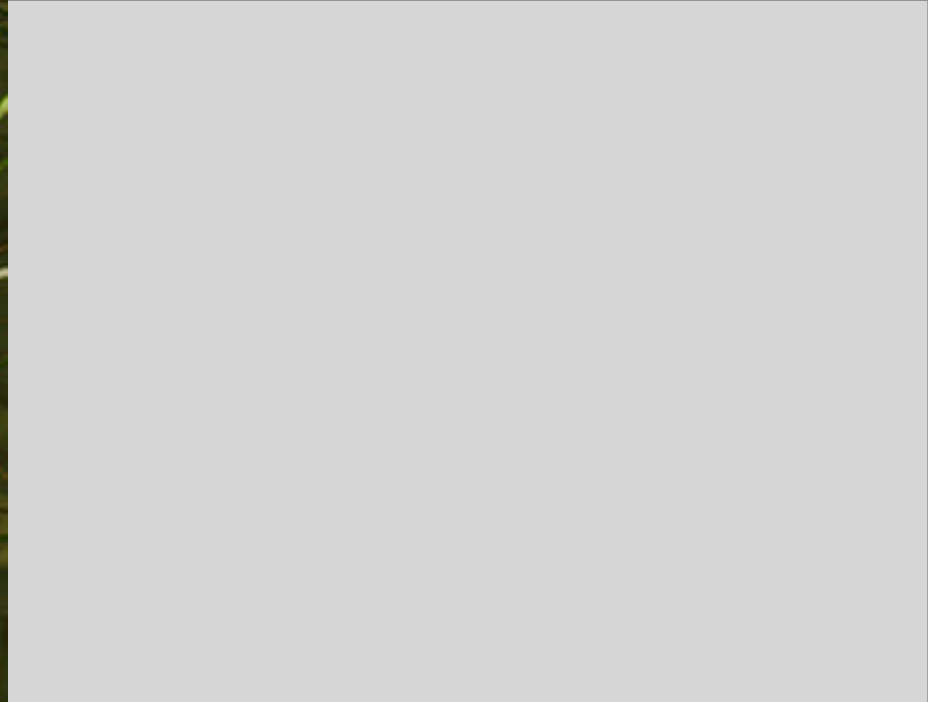
A close-up photograph of a dense field of green seagrass, identified as *Zostera marina*. The seagrass consists of numerous long, narrow, blade-like leaves that are vibrant green and appear wet, with water droplets visible on their surfaces. A vertical, weathered metal pole or stake is positioned in the center of the frame, extending from the top to the bottom. The background is a continuous expanse of the same seagrass, creating a textured, green carpet. The lighting is bright, suggesting a sunny day, and the overall scene is a natural, coastal environment.

Zostera marina



Zostera japonica - "Japanese eelgrass"

Photo: Susannah Anderson



Ruppia maritima
"widgeon grass"

A photograph showing a dense bed of seagrass. The blades are long, narrow, and pointed, with a mix of vibrant green and brownish-yellow colors, indicating varying stages of growth or decay. The seagrass is growing in a shallow, clear water environment, with the sandy or silty bottom visible through the water. The overall appearance is that of a healthy but slightly stressed seagrass meadow.

Zostera marina and Zostera japonica

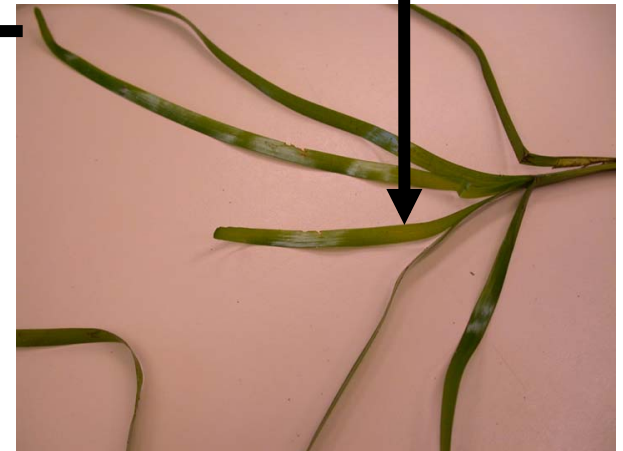
Eelgrass life cycle



Seeds
germinate into
seedlings



New leaves grow from
inside the plant



Each leaf
occurs at an
internode on
the rhizome

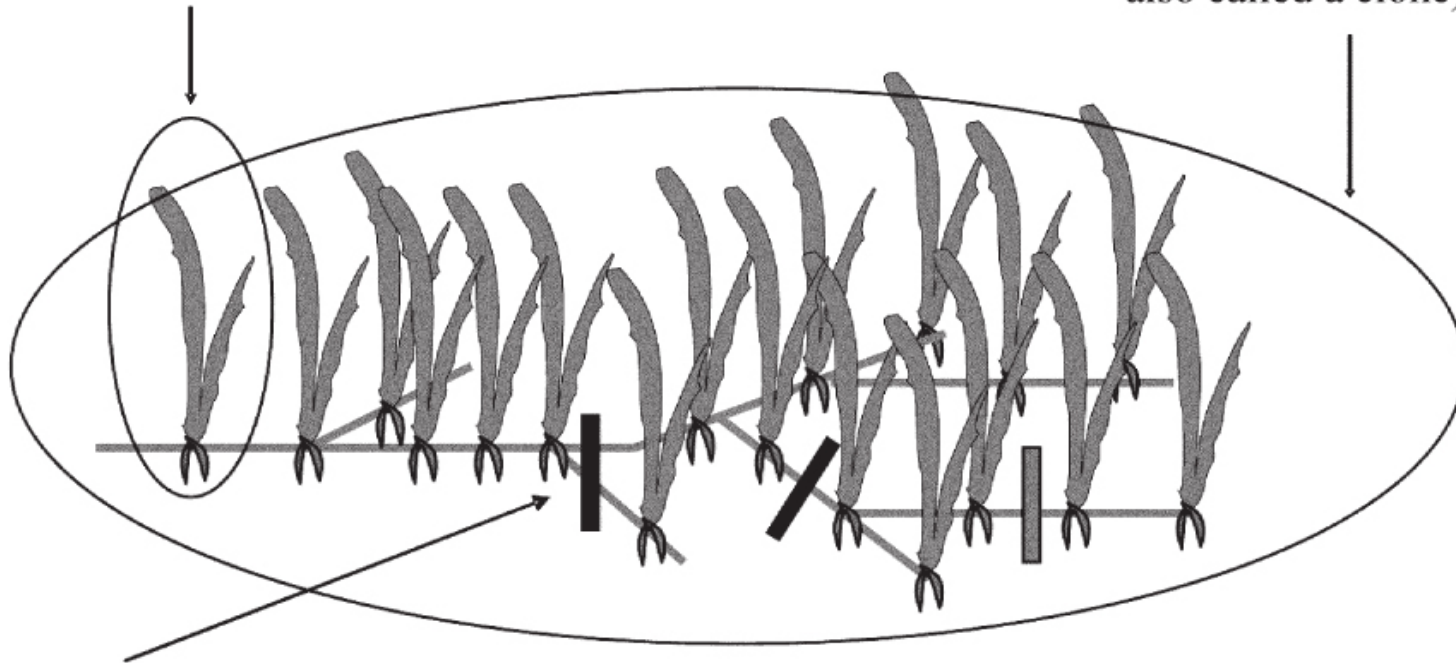


Flowering shoots
make flowers and
pollen.

New shoots
branch at
internodes

Morphological “individual” = ramet
(also called a module)

Genetic “individual” = genet
(which consists of many ramets;
also called a clone)



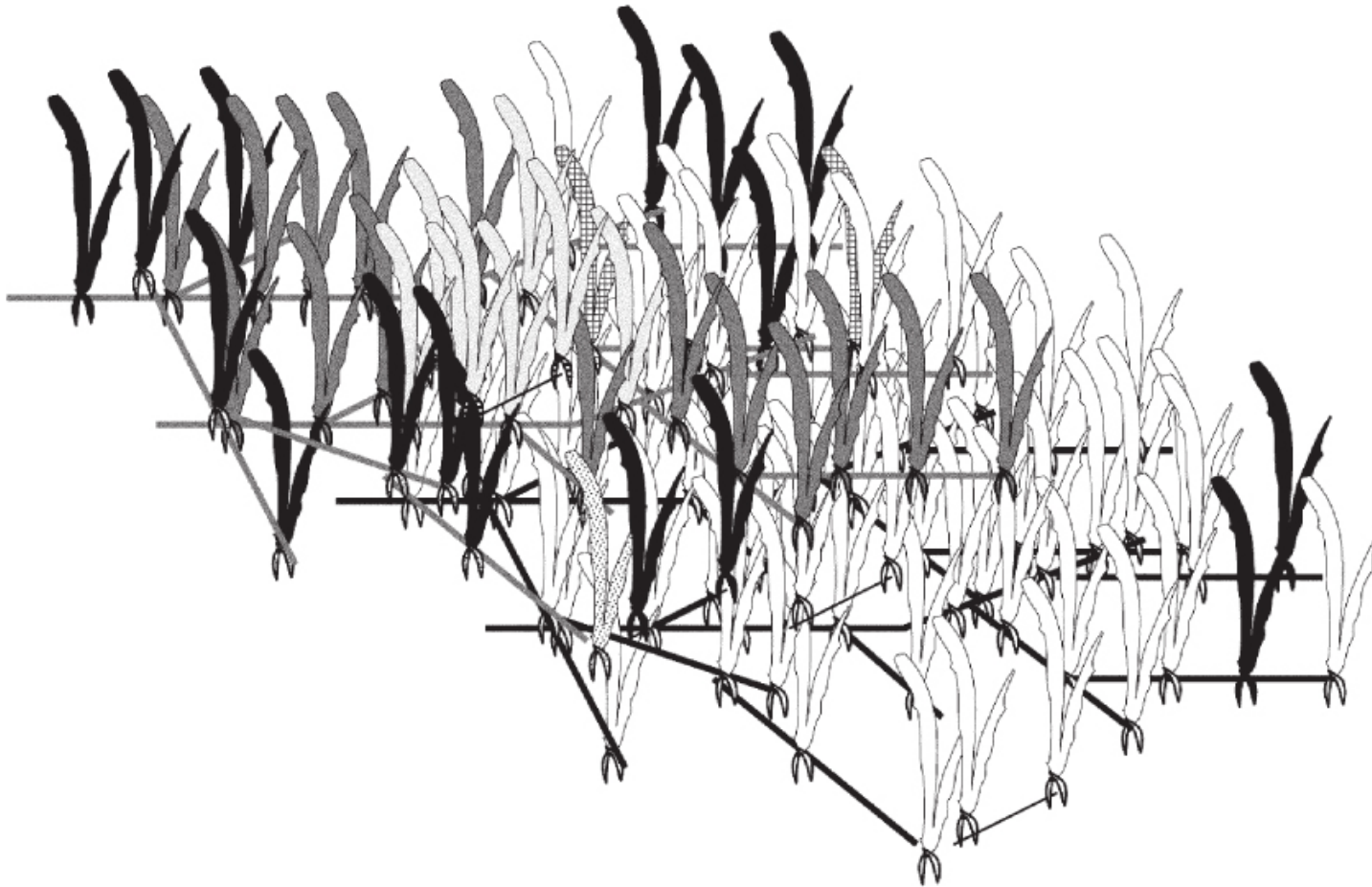
Breaks in the rhizome over time make it impossible to empirically identify a genet. A genet is also referred to as a clone which may continue to grow by vegetative spread over many years. Clonal diversity is thus equal to genotypic diversity, whereas genetic diversity refers to the allelic diversity. In the above example we have one genotype (or one clone).

Two genets of *Z. marina*?





Three more?



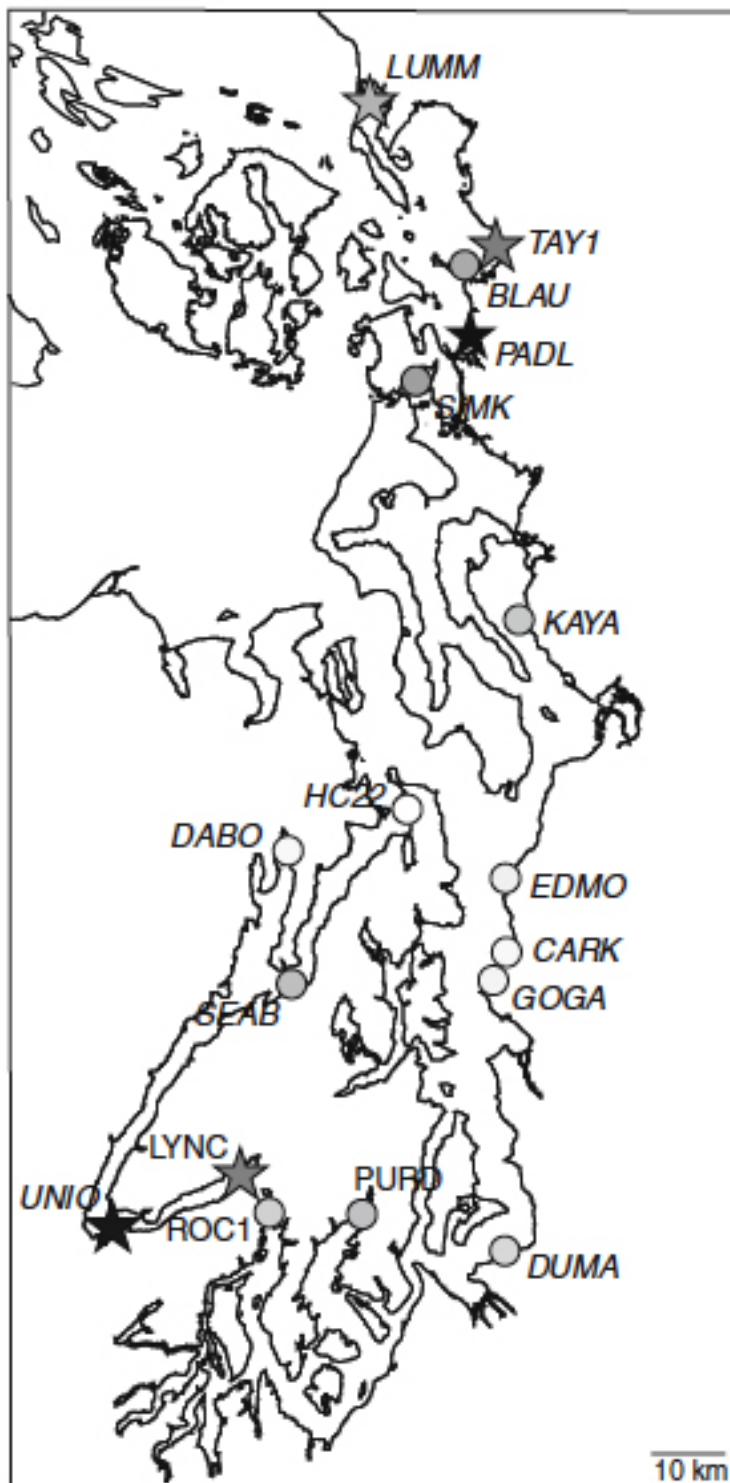
Each pattern represents a different genet. These genotypes or clones can only be identified using highly polymorphic molecular markers (e.g. microsatellite loci). This example shows intermingling of the different clones. Each clone can have a different genetic (allelic) diversity.



How many genets here?



How many are we removing
in each experimental plot?



Yang, S. et al
Estuaries and Coasts (2013)
36:1006–1013

How does “eelgrass” in Washington:

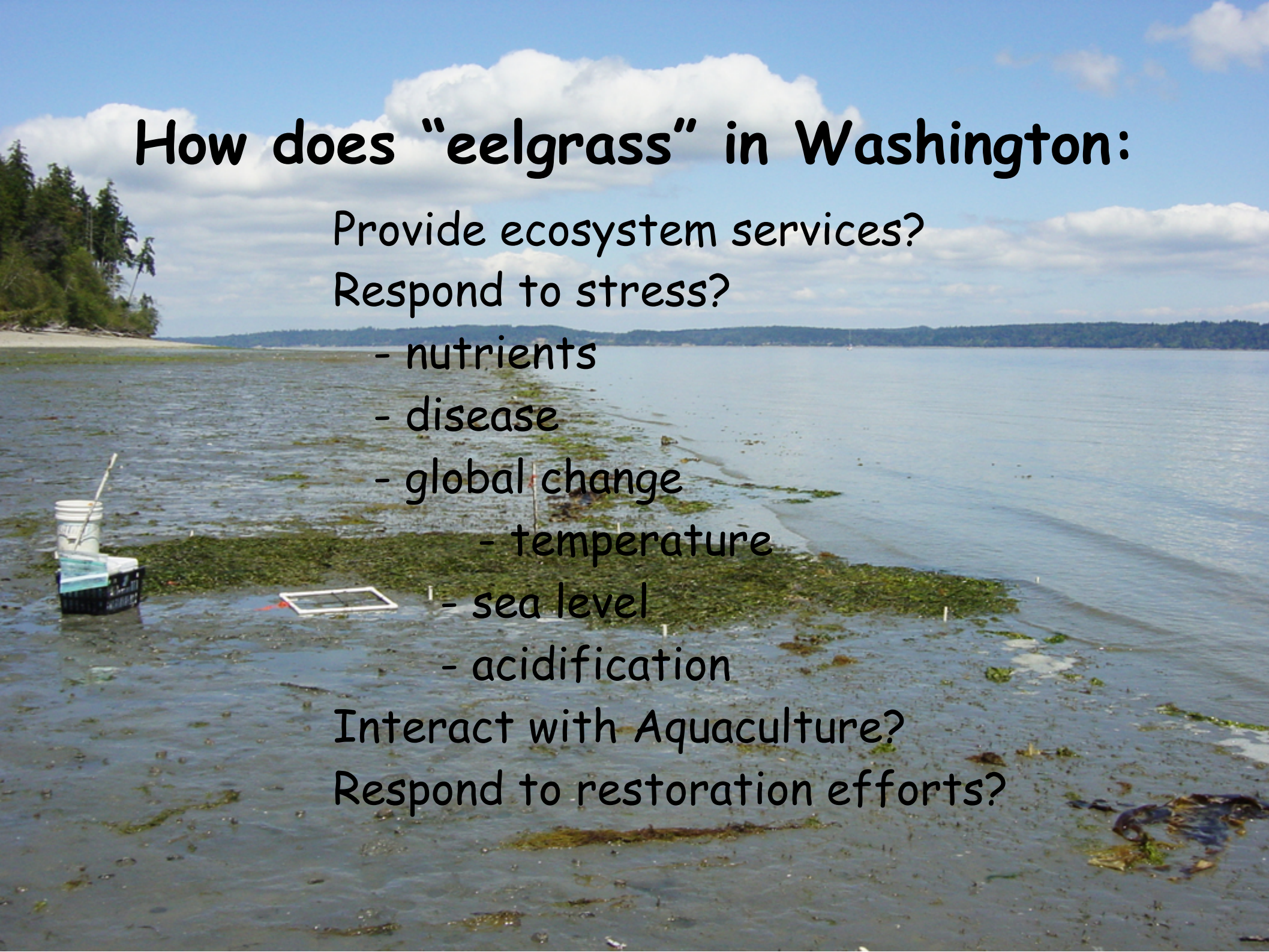
Provide ecosystem services?

Respond to stress?

- nutrients
- disease
- global change
 - temperature
 - sea level
 - acidification

Interact with Aquaculture?

Respond to restoration efforts?





Two possible ways forward:

- Old School: common garden experiments
- New Age: population genetics analysis

Population Structure and Genetic Diversity among Eelgrass (*Zostera marina*) Beds and Depths in San Francisco Bay

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