Scenarios for 10 queries:

**Coastal marine primary production**

Q4a: Net C uptake by the {phyto}plankton in seawater} (Net Phytoplankton primary production)

- protocol: oxygen evolution in a chamber (water-filled)

Q4b: Gross C uptake by the phytyplanton in seawater (Gross Phytoplankton primary production)

* protocol: C14 incubation

Q4c: Primary Production of a plant in a “forest” (e.g., net kelp primary production, gross kelp primary production, “forest” defined mainly in terms of size of individuals)

- protocol: non-destructuve allometric

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Q4d – primary production of grasses in a salt marsh

- protocol: TBD

query contexts: plant, macroscopic algae, kelp, phytoplankton, marsh grasses

related concepts: benthos algae, oceanographic (or aquatic, if defined., = any water body?),: growth rate, carbon content, dry weight, loss rate,

freshwater – overlaps, similar protocols used.

**Ocean acidification**

Q6a: in situ measurements of ocean pH

- dimensionless.

- scale: [total, free, seawater, NBS]

- protocol: seafet sensor

- context: ocean, seawater

- related concepts: carbonate system , alkalinity, CO2 concentration

Q6b: measurements of ocean pH, adjusted to in situ

- dimensionless.

- scale: [total, free, seawater, NBS]

- protocol: laboratory sensor, followed by adjustment based on spec'd conditions

- context: ocean, seawater

- related concepts: carbonate system , alkalinity, CO2 concentration,

Q10: rate of Air-Sea CO2 flux (TODO: move to Q5. confirm that this is gas exchange.

http://www.pmel.noaa.gov/co2/story/Ocean+Carbon+Uptake )

- dimensions: [moles or mass] carbon per area per time

- protocol: CO2calc algorithms (TODO: confirm Dickson? or other. TODO: confirm that this meas is exchange based on carbonate chem)

- context: air, ocean surface

- related concepts: carbonate system

**Processes contributing tof NEE in a forest**

Q4c: Primary Production of a plant in a forest (e.g., net and gross primary production)

- protocol: non-destructuve allometric

- related terms: growth rate, carbon content, dry weight, loss rate, litterfall

- context: plant, tree, shrub

Q2: heterotrophic soil respiration at the ecosystem level

- protocol: TO DO (tracer? O2 consumption?)

-context: soil, terrestrial,

- related concepts: bacteria

Q3: soil microbe carbon pools

- mass of carbon {in soil bacteria} per {area or volume}

Q7: rate of release of carbon dioxide from soil

- {mass or moles} per {area or volume} per time

- carbon dioxide is the entity

- context

Q9: methane release from soil

**Calculate Annual above-ground NPP in grasslands.**

Q1: above ground net primary production in a grassland (lter:AGNPP, lter:BGNPP

Q8: carbon dioxide experimentally added to a grassland