Simple 0D model that could be used in a spreadsheet to compute carbon credits ($$):

1. $dz/dt = [(k_s B + q)\, m\, D^2/T + k_r B]/(\text{Bulk Density})$
   dz/dt is the change in elevation of the marsh surface (cm/yr).
2. $dD/dt = \Delta\text{sea level} - dz/dt$, units (cm/yr), Δsea level is local apparent rate of sea-level rise (relative to NAVD88)
3. $B = aD + bD^2 + c$, units ($gC\ cm^{-2}\ yr^{-1}$, 42% of biomass dry weight = carbon weight)

Data needed to run the simple 0D model

m: avg suspended sediment conc. (mg/liter)
T: tide range (mhw-mlw) (cm)
mhw (cm rel to NAVD88)
site elevation (cm rel to NAVD88): initial
Rate of sea level rise (cm/yr)
Region
Plant community type
salinity: classification initial, for look up table:

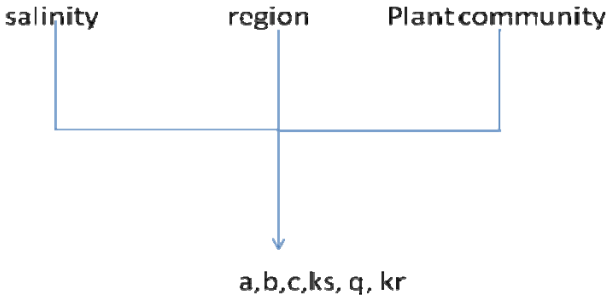

Fig.1: Some data inputs are used in a lookup table to find model parameters

Parameters

k_s and q: (from a fit to regional and wetland class SET data, or possibly to sediment core and paleomarker data{need to think about that}); q is the settling velocity of suspended matter, ks is the trapping efficiency of vegetation, units of both are $time^{-1}$. Theoretically these parameters should be relatively constant provided particle size and velocity are constant.

k_r: from the relationship between refractory carbon content in sediment and standing biomass, kr encompasses the ratio of the refractory part of root production to standing aboveground biomass, assuming that the model is calibrated to standing biomass. Kr could be broken up into separate pieces, or not. Question: does the percent refractory OM relate to lignin content?

r (the decay rate of labile organic matter) from model fits to Craft-type data: r determines the time that a restoration project gets credit for "new" production.

a, b and c: these are the parameters that define the relationship of biomass to depth below mhw ($B= aD + bD^2 + c$).

Verification Data Needs

Initial sequestration rate

Bulk density at depth (below the root zone in a mature marsh) site elevation (rel to NAVD88): at 6 yr intervals

Emissions

Methane:

- Use existing salinity/methane relationships
- Use data to generate thresholds
- Model- jim's model

N_2O: do not include this initially. Probably not important unless NO_3 inputs are significant.

To do list:

Morris – sensitivity analysis of model, compute kr for MA Typha site, convert model to run on a 100 yr time to generate a time series of carbon sequestration and income at $7 per ton of CO_2 or $24.5 per ton of carbon, discount income stream to PV to determine project value.

Chris – kr values from his GA data set

Lisa and John – carbon vs depth → k_r

k_r = carbon density below the rooting zone x accretion rate/B

k_r = (gC cm^{-3} x cm yr^{-1})/B = (gC m^{-2} yr^{-1})/B. B is standing aboveground biomass (gC m^{-2} yr^{-1}). gC = 42% of total biomass. k_r is a unitless ratio.