# Short Term Visitor Meeting

## March 3, 2016

**Possible Questions**

1. Demography type models incorporating seedlings
   1. Are differences in demography due to this expanding front, characterize more of that expansion or contraction?
   2. Spatial demography analysis looking at risk of death
   3. Is it distance to large neighbor or abiotic variables?
2. Potential role of fire / significant disturbances on long term demography?
3. Potential to look at month variation using the rest of the data to truth the model (Step 2)

**Questions for Don (answered by Sarah in red, Don in blue)**

1. Fog Data?
   1. Christopher Still, UCSB
   2. How many years was a fog collector active?
      1. Don has some of the samples still, will check files for data
2. Gopher presence
   1. They’re there but not abundant
   2. More skunks
   3. Not often on the slopes as much as down in the flats
3. Observation variance
4. Understory composition as go down the front
   1. Varies dramatically
   2. Highest elevation: poison oak, coffeeberry, ribaies, coast live oak, bay
   3. Less community diversity as move further down
   4. Quite a bit of grass species, some poison oak which is lost as get to emerging front
   5. There is understory plot data near the plots
   6. MSC = thick, SSC = less, OP=minimal, EF = rare
5. What are you using for measurements for DBH?
   1. Calipers
   2. Tapes?
   3. New germinants up to about 2.5cm basal diameter
   4. Sapling some basal diameter some at breast height
   5. Sapling basal diameter until reach DBH then switch
   6. Once trees larger then 2.5cm using diameter tapes
   7. Almost always tape
      1. Tape ineffective for trees under 4cm (varies)
6. Cone data -> what is a first year cone?
   1. One that is so small hasn’t opened to get fertilized
7. Nodes -> what are these? Why are there two columns?
   1. Assume it corresponds to number of years but maybe it’s something different
   2. Every time the plant branches off to the side, should correspond to the years
   3. Relatively clear to score, when in doubt feel the trunk itself
8. What’s the direction of the transect? Are they N/S or E/W?
   1. What does that mean about the direction from tape?
   2. Why are some N/S when the majority are E/W?
      1. S=E, N=W
   3. Confirm the length of the transects -> do they match Figure 2-1 in Kris’s thesis?
      1. 93m is correct (300 feet)
      2. MSC = 10m wide on one side of the tape, 3m wide man everything collected, 7m everything greater (Kris’s thesis figure is correct)
   4. GPS coordinates for each transect
9. What’s the status of this year’s census?
   1. We did do it and Kevin Hurt, a grad student of Sarah’s has it
      1. he has some questions that need to be worked out before it’s ready for prime time
   2. Should be ready in a week or two
   3. Contact Island Conservation Group for info about Baja weather

**Questions for Sarah**

(see Meeting with Sarah notes for further info)

1. Put out any sensors? iButton? Soil moisture probes? Resin probes?
   1. Soil baggies, gravimetric -> drying oven?

**Potential Small Projects**

1. Count number of gopher mounds
2. Are islands different? Do they de-evolve a relationship with their mycorrhizal fungi?
3. Get two other people to out independently and measure the same 50 trees to get a sense of the individual variation
   1. Send to Sarah and her students

**Demographic models (from Don and Chris):**

* Lots of variance in time since sampling
  + Issue with how do you use the weather data
  + Most of the sampling occurred in the fall -> subset fall sampling and treat weather as annual
* Issues with size measurements
  + Need a way to standardize seedling diameter and DBH
  + Many diameters which are smaller in subsequent years, is that measurement error or can trees shrink?
    - YES! Trees can shrink up to 14% and still be OK until a threshold of moisture final kills the tree
* Assess seedling output by looking at number
* Is there any other place we could get reproductive effort?
  + Maybe from the early Año Nuevo papers?
* Treating basal diameter as DBH
  + DBH1 linearly related to DBH2
  + Gradual increase in DBH with proportion survival

**Meeting with Sarah**

* Exogenous and endogenous drivers of relative growth rate and pulses of mortality and regeneration
  + Two separate models
    - 1) Transect models looking at mortality / regeneration
      * Topographic wetness index: spatial analyst
    - 2) larger climatic variables
      * ClimateWMA -> downscale climatic data over the timeframe of sampling
      * Wants more local data
        + Data from Big Sur really different
        + No local weather station local to Cambria
        + Morro Bay not necessarily ideal
* Process some columns for:
  + Relative growth rate
  + Proportion survival
  + Mortality rates
* Añother student looking at pitch canker at Año Nuevo
  + Mortality and resistance as a function of treatment
* Installed permanent plot network across the distrubtion of Monterey pine
  + Cambria: 26 plots at rancho marino, Fiscinali reserve & covell ranch (higher elevation bands)
  + Swanton
  + Set of nested circular plots
  + More resolution across the landscape
  + Hard to pull real health issues out of current transect dataset
    - Students tracking those at the individual level
  + Fish eye picture and soil moisture index
  + Community composition
  + Status – potential change of mortality moving from green through dieback through gray through snag
  + Crown-class
  + Live crown code: percentage of cAñopy dying back
  + Damage: pitch canker, western gall rust, dwarf mistletoes, bark beetles
    - Presence or absence
    - Severity with pitch canker
    - Mostly secondary bark beetles
  + Height on a subset of trees (one from each cAñopy class)
    - Cores -> establishment dates
  + Light assessment: densitometer, fish eye photos at the plot centers
  + Average litter depth -> coarse woody debris / fuel transects
    - Could be put into a model to talk about what kind of fire you would expect to be there
    - Highly variable
  + Subset of plots with soil moisture sensors
    - In situ brand attached to hobo loggers
  + Don’t have a PAR sensor so can’t get photosynthetic data
  + Average is between 12-20%
* Ibuttons: putting some of those out of interest to her and her students
* Greater resolution between plots
* Second round of data collection starting in April
* Dan describes approach to data modeling we discussed this morning
  + How are you dealing with cones:
    - Few issues, yes semi serontinos so a lot opening with heat and they’re establishing throughout the forest
    - Hard to count cones on large diameter cAñopy trees
    - Probably need a different way to assess this
* Very few standing trees out on the emerging front
* Currently has plots in Bishop pine / coast live oaks
  + Sarah has plots in the PG&E experimental plots with data which could be comparable
  + Growth rates and survivorship of young trees in first few years after the fire
    - Do you see higher density after fire, severe thinning? Density dependence
    - Also has preburn area that show densities
* FOG!
  + Surrogates for fog based on wind speed and humidity
  + Alicia Torregrosa for USGS Menlo Park -> coarse data and decadal data
  + Might be important to instrument these trees if we want accurate assessments of these trees
  + Large differences between WRCC data between Big Sur, Morro Bay, Cambria so likely to be relatively variable too
    - Consider looking at the correlations between Cambria and Channel Islands fog data
* Send Sarah a list of wants

**Do small/young things matter?**

* Motivating and justifications:
  + easier to monitor / manipulate (both individual and the environment) /measure
    - Inoculations
    - Destructive harvests
  + What can you infer about evolution/fitness?
    - Carry over effect
  + Applied questions:
    - Foresters: importance of inoculation for establishing seedling, does that improve success of adult
    - Conservation/restoration: improve establishment of new species but does that translate to older individuals
  + Cohort effects
    - Seabirds: group of birds receive more nutrition early in life do better forever
    - Pre-K
* Frequent assertions that juveniles don’t matter
* Good literature in fish that better relationship between age and size if allow for individual variation
  + Tim Coulson & Jean-Michel Gaillard
* Most people that make the argument that little things don’t matter its only in the context of stable population dynamics
* Questions:
  + Does performance early in its live predict later success?
  + Do aggregate measurements on small individuals tell us anything / population dynamics
  + Is it always true that juvenile population growth doesn’t matter for demography?
    - Individual fitness of parents
* Analyses that may give different answers then the traditional answers:
  + Box showing the generality / limitations given the high profile studies
  + Spatial spread
  + Carryover effects
  + Positive density dependence (magnifying effect)
  + Transient dynamics -> more sensitive what happens to individuals
  + Simple magnitude of variation patterns
    - Huge perturbations to the adult might not matter as much since they’re inherently less plastic

**Afternoon TO-DO**

* Clean datasets for dates
* STAN
  + Uses Hamiltonian instead of a Gibbs samples
* 1st cut growth and survival
* Spatial analysis for recruits
* Determine access to fog data from Still

**Fog**

* Thought to possible use for algorithm to assess fog:
  + Fog forms when the difference between temperature and dew point is generally less than 2.5 °C or 4 F.
  + The difference between Fog & Mist is that Fog reduces visibility to less than 1 km (5/8 statute mile) whereas Mist reduces visibilty to 1km or more.
* Calculation of fog-point via Craddock & Pritchard method (<http://www.skystef.be/calculator-fog.htm>)
  + Tfog = (0.044 \* t) + (0.844 \* td) - 0.55 + a
    - (a = adjustment which depends upon the forecast cloud amount and geostrophic wind speed)
  + Note: to be used for calculation of radiation fog
  + Source: Forecasters' reference book - ISBN 0 86180 306 X
* The Pacific Coastal Fog Project
  + Alicia Torregrosa (suggested by Sarah): [atorregrosa@usgs.gov](mailto:atorregrosa@usgs.gov)

## March 4, 2016

**Morning Discussion**

* Things to do today:
  + Review materials Sarah sent overnight
  + Draft letter of submission to TREE
  + Code
    1. Chris ran model last night and took 20 minutes with a small 100 tree dataset so some work needs to go into reducing this
  + Skype with Don at 4pm
  + Look at National Centers for Environmental Information fog data
* Organization of the final products:
  + TREE review paper concerning do small/young things matter?
  + Dan make sense to have two papers from the data:
    1. A paper looking at the basic population biology of this species in its native range.
       - What limits its ability to expand given that it can survive all lots of different conditions as a timber species?
       - How have these populations persisted?
       - How will climate change impact this species?
    2. Paper integrating the myco stuff from Año Nuevo
    3. Potentially important third paper (from Megan and Jason)
       - Effect of fog on tree growth: survival, relative growth rates, etc
* Fog Data
  + Questions about fog:
    1. Is averaging fog over the whole year a good proxy for the tree or should we be using an alternative method?
       - Monthly averages?
       - Monthly max and min?
       - Yearly average?
       - Yearly max and min? -> also probably just captures seasonality
  + Codes related to Fog:
    1. MANUALLY OBSERVED PRESENT WEATHER CODE TABLE
       - 11: Patches of shallow fog or ice fog at the station, whether on land or sea, not deeper than about 2 meters on land or 10 meters at sea
       - 12: More or less continuous shallow fog or ice fog at the station, whether on land or sea, not deeper than about 2 meters on land or 10 meters at sea
       - 28: Fog or ice fog
       - 40: Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer
       - 41: Fog or ice fog in patches
       - 42: Fog or ice fog, sky visible, has become thinner during the preceding hour
       - 43: Fog or ice fog, sky invisible, has become thinner during the preceding hour
       - 44: Fog or ice fog, sky visible, no appreciable change during the preceding hour
       - 45: Fog or ice fog, sky invisible, no appreciable change during the preceding hour
       - 46: Fog or ice fog, sky invisible, has begun or has become thicker during the preceding hour
       - 47: Fog or ice fog, sky invisible, has begun or has become thicker during the preceding hour
       - 48: Fog, depositing rime, sky visible
       - 49: Fog, depositing rime, sky invisible
    2. AUTO-OBSERVED PRESENT WEATHER CODE TABLE
       - 20: Fog
       - 30: Fog
       - 31: Fog or ice fog in patches
       - 32: Fog or ice fog, has become thinner during the past hour
       - 33: Fog or ice fog, no appreciable change during the last hour
       - 34: Fog or ice fog, has begun or become thicker during the last hour
       - 35: Fog, depositing rime

**Skype with Don**

* No idea what’s going at Swanton Ranch with the drought, Sarah is a better source
* Carmel -> don going to do some researching
* Tried to make notes when took basal DBH compared to DBH at 1st node compared to DBH
  + Diameter taken at green part, then 1st node when it appears, and then DBH when tall enough
  + Is there a correlation?
* If we could see it we would measure it, no minimum

## March 5, 2016

**Morning Discussion**

* What can we do with this data?
  + Project population dynamics?
  + Dan: with different climate projections (ie, drought) can look at population viability and growth
    - Does diversity of habitat promote stability?
    - Community/Habitat structure lead to buffering
    - Important for answering the question, how do these tiny populations survive?
    - Can you say how much of the total montery pine population in cambria is preserved on the rancho marino reserve?
      * Should ask **Sarah** how much of the habitat types are represented by our dataset but exist totally?
      * Portfolio effects: habitat leading to stability
        + Certain habitat types aren’t as effected by climate change

You never do better but you don’t get effected as much

* + - * + One way to tie in habitats and climate (drought) effects
* Can we do anything with fire?
  + Nice to see what’s happening with Sarah’s Bishop pine
  + Can always make up some sort of fire scenarios
    - Carol horovitz and doug similar work with hurricanes
    - Nice to have some sort of real data for growth rates and mortality rates
  + Probably should re-contact Sarah t be more clear as to what’s going on with the northern population and fire
    - Recall saying something about lightening strike fire
    - Know there’s CalFire concern
    - Need to clarify
* Questions:
  + Does variation in habitat variation in demography alter population stability in the face of drought?
    - Relatively straight forward simulation and demographic analyses
  + What role will fire (or lack of) play in structure this population?
* Secondary projects
  + Mycorrhiza relationship
    - Easier to write a story about mycorrhiza once have basic demographic model done
    - Need to think about how to incorporate that

**Questions for Bill Libby**

* Ask about nodes as a reasonable surrogacy for age?
* Ask about fire knowledge
* Megan sent email

**New Questions for Don**

* What does ‘DBH will’ mean in the notes column?
* Confirmation for sure regarding the rule for when to switch from measuring diameter at first node to measuring at actual DBH
  + The data suggest that switch did not happen as soon as trees got taller than DBH but sometime later, when?
  + If there’s no real explicit rule let’s make one for future censuses
* Did the SSC transect change sizes in 2014?
  + Went from 5m on each size of the transect until 2014 when went 10m on either side of the transect
  + West side of MSC beyond 3m, even for large trees (greater than 6cm), we don’t know that he got all of them
    - In recent years he may have gotten more data on large trees on the east side
  + SSC, went out to 20m to get trees greater than 6cm in DBH in 2014

**Issues with Spatial Model**

* Really messy
* May make more sense to use **Sarah**’s which is likely to be cleaner
  + Map cone density to recruit success
  + Ask her about the possibility of using her data in this way
* Because of the issues with the DBH, Jason decided to create a new column with DBH type so it’s easier to suss out what’s true DBH, what’s DBH at first node (DFN) and what’s probably basal DBH.
  + Megan will match some that are hard to determine against copies of the original database to clarify (only 11!)

# Meeting Summary

* Basic demographic model is running in STAN for growth and survival models
  + Small subsets of data based on habitat types
  + Successful runs with precipitation or fog/cloud ceiling interactions
* Spatial analysis for reproduction slightly murky until we have cleaned up DBHs
* Climatic variables (precipitation, fog, and cloud ceiling) cleaned, verified against multiple sources of data, and calculated on annual level

# Tasks to Complete

**NOTE:** many tasks on hold until 2015 data is entered into the database and cleaned DBHs

## Chris Steenbock

* Run STAN models for:
  + Alternative growth
  + Survival
  + Reproduction
* Run actual demographic models!

## Dan Doak

* work on getting estimates for reproduction

## Jason Hoeksema

* finish cleaning DBHs
  + Integrate 2015 data?
* work with Sarah to maintain separate research agendas and fire data

## Megan Rúa

* Look at original datasheets to confirm trees with heights and DBH that don’t appear to match
  + Integrate 2015 data?
* Review fog literature suggestion from Chris Still to confirm our estimates
* Schedule follow up Skype meeting (first week of April)