OLD TO DO LIST (updated lower):

* Create Homeranges from 2018-2020 birds
* Produce Availability points for RSF for roosts and full tracks
* Create SSF points and randoms using full track, then subset that for the roost locations
  + Want the roost availability based on where they were previous to roosting.
* Prepare Covariates – raster with moving window value?
  + Basal Area
  + Mean Tree Height
  + Percent Sofwood
  + Distance to Edge
  + Wind Chill
  + Weather PCA
  + Developed
  + Agriculture
* Run SSF/RSF based on how roost site/diurnal site selection changes based on dynamic covariates.
* Compare diurnal (behavior) and roost to roost (change habitat) step lengths among birds.

Notes from Kaj’s Thesis:

* GPS transmitter error ~12.7m
* Data collection: Jan 1 through March 15
* Land Cover Metrics:
  + 10m resolution, meaning a moving window analysis was done to 1 pixel out, bringing the total distance considered for each data point to 30m, greater than our GPS error.
  + ~~Average Tree Height~~
  + ~~Basal Area~~
  + ~~Softwood Percentage~~
  + ~~Distance to Forest Edge~~
    - Areas of no data in raster layer were set to 1, all other values set to 0. Then used Euclidean distance tool in ARC
  + Ag and Dev were obtained from maine office of GIS
* Weather Data
  + Combine min temp and mean wind spead into a wind chill metric.
  + Wind Chill = 13.12 + (.6215 x T) - (11.37 x V 0.16) + (.3965 x T x V 0.16)
  + Used previous daytime minimum wind chill as predictor value in roost selection models

Erik discussion

* NAs in height moving window
* 0s in BA moving window
* How do turkeys react to changing weather
* Diurnal selection complicated by not just being in forested landscape
  + Conditioning diurnal step selections to forests?
  + “as a function of changing weather”
  + ~~Focus on forested to follow same framework as roost then do a broader landcover analysis~~
  + Much more a 3rd order process compared to the roost selection (4th)
  + Focus on landcover derived variables for daytime selection, add in density of softwoods
  + May need a more appropriate moving window for that.
  + Skip basal area and tree height
  + Include topography
  + Do moving window for landcover type
* Roosting becomes a finer 4th order decision related to the characteristics of the trees
* Slope/aspect – in relation to wind
  + Circular and need to be dealt with in a particular way
  + Pick an optimal direction and calculate how much it deviates from it. 0 means they are on a slope facing incoming wind
* Have mean daily step length – can look how behavior changes with weather
* For moving window for diurnal, look at average step length, use the 90th quantile of step length
* Distance to Edge = distance to nearest forest edge
  + Need a distance to edge of forest WHEN in nonforest
  + Flip BA = 1 then do same thing as when in forest
  + Anything that is an edge make a 1
* PCA just showed seasonality
  + Just so windchill (metabolic demands for thermoregulation) and snow depth (access to food)
  + Have one model for each
  + Individual intercept helps with different number of samples
* Example Model: USE ~ BA + SNOW + BA\*SNOW + (BA\*IND|IND)
  + Want the random slop to affect just the landcover term
* Use clogit
* Just do step selection function
* Haroldson 1998 – quantify how metabolic demands of turkeys change as function of dropping temperature
* Add home range to Proposal

Updated to do:

* ~~Mean height raster moving window – leave NAs~~
* ~~Confirm BA moving window with 0s included~~
* ~~Distance to edge now needs to be for both within and out of forest~~ 
  + ~~Flip BA = 1 raster then calculate distance to Forest for all non forest~~
* ~~Prepare Weather Covariates = Snow Depth and Wind Chill~~
* ~~Land Cover Characteristics within a buffer = length of 90~~~~th~~ ~~percentile of step length~~
  + ~~Find the 90~~~~th~~ ~~percentile of step length~~
  + ~~Focal statistic in Arcgis at that length for proportion of Ag/Dev, average softwood~~
* ~~Slope/Aspect in relation to wind~~
  + ~~180 = slope opposite wind, 0 = slope facing wind~~
  + ~~Get Aspect in Arcgis~~
  + ~~Extract aspect for each point~~
  + ~~Use weather data to calculate difference in wind direction and aspect for each point on the date it was taken~~
* ~~Separate Roost and Diurnal Selection models~~
  + ~~4~~~~th~~ ~~order = Roost; Forest Structure~~
    - ~~BA~~
    - ~~Mean Ht~~
    - ~~DtFE~~
    - ~~Percent Softwood~~
    - ~~Aspect in relation to wind~~
  + ~~3~~~~rd~~ ~~Order = Diurnal; Landscape characteristics~~
    - ~~Softwood Density (percent wooded)~~
    - ~~DtFE~~
    - ~~Percent Ag~~
    - ~~Percent Dev~~
    - ~~Landcover class at location~~
    - ~~Aspect in relation to weather~~
  + ~~Both include weather~~
  + ~~Need a BirdID column~~
  + ~~Use~ Land + Weather + Land\*Weather + Random Slope|Random intercept~~
    - ~~Separate Model for snow depth (food access) and wind chill (thermoregulation)~~

MODELS

* For all, have a snow depth and a previous days wind chill
* Roost
  + ~~Distance to forest edge~~
  + ~~Basal Area~~
  + ~~Percent Softwood~~
  + ~~Wind Exposure~~
  + ~~Mean Height~~
* Forest Day
  + ~~Distance to forest edge~~
  + ~~Basal Area~~
  + ~~Wind Exposure~~
  + ~~Mean Height~~
  + ~~Percent Softwood~~
  + ~~Prop Ag~~
  + ~~PropDev~~
  + ~~PropSW~~
* All Day
  + ~~Distance to forest edge~~
  + ~~Proportion Softwood~~
  + ~~Wind Exposure~~
  + ~~Prop Ag~~
  + ~~PropDev~~
  + ~~NLCD class~~

POST RESULTS MEETING (10-28)

* Roost results consistent with Kaj
* Not seeing selection for food subsidy in day use
  + Could look at HMM to get behavioral states
    - 3 states (loafing, foraging, and roosting)
* Hook to the paper is thinking about how changing weather modifies resource selection
* Cleaner to create discrete analyses and run them separately
* New subset – foraging and loafing periods analysis
  + Can either do HMM or hour of day
  + If hour of day, look at how does step length change with time of day
* Does changing weather affect behavior state
  + Could add another dimension to paper, not just selection but weather
* Can drop Percent SW (cell specific) in foraging/loafing, for roost use both
* Keep aggregated food subsidy?
  + Random slope deals with difference
  + Keep them separate
* Update buffer for NLCD classifications to 1 cell out (PropAg, PropDev, PropSW)
* Run analysis without behavior specification and then compare to behavior specific
* Graphs – paired color coded graphs 1 with beta coefficients as points/error and then show slopes
  + Focus on interactions
* Incorporate Vital rates – Keep in back pocket
  + Look at individual residuals and see how their selection affects

DO WE USE ORIGIN OR DESTINATION TO DEFINE BEHAVIORAL STATE? – t2

WHAT ARE OUR INPUTS FOR HMM?

* Step Length: R < L < F
* 0 Inflated: R ~= 1
* Turning Angle Concentration: R < L < F
* Transition Probabilities ~ Time Since Midday + 1|ID