Nathan Schumaker <[redacted]>

HexSim Final Steps

Anthony, Robert G - FW <robert.anthony@oregonstate.edu> **Fri, Aug 6, 2010 at 11:18 AM**
To: Nathan Schumaker <[redacted]>, Brendan White <Brendan_White@fws.gov>, Brian Woodbridge <Brian_Woodbridge@fws.gov>, Bruce Marcot <brucem@spiritone.com>, Craig Ducey <Craig_Ducey@or.blm.gov>, Dave LaPlante <dave@nrg-gis.com>, Eric Greenquist <Eric_Greenquist@blm.gov>, Jeffrey Dunk <Jeffrey.Dunk@humboldt.edu>, Jim Thrailkill <Jim_Thrailkill@fws.gov>, Katie Dugger <katie.dugger@orst.edu>, Marty Raphael <mraphael@fs.fed.us>, Ray Davis <rjdavis@fs.fed.us>

Nathan:

Thanks for all of your hard and dedicated work on the HexSim modeling and most of all great responses to all of our picky reviews of the results. I have a few minor comments in italics on each of the issues you raise below. I have also read Jeff's comments and for the most part agree with them and the approach he has suggested. Overall, I think you are getting close to the kind of scaling among zones that will result in more realistic results compared to the most recent demographic analyses but we may have to do it zone by zone which could be a little messy. We will look forward to reviewing the next set of results whenever it is convenient for you to produce them and send it out. Thanks again for all of your hard work on the HesSim modeling! See below:

Regards,

Bob

From: Nathan Schumaker [mailto:[redacted]]
Sent: Thursday, August 05, 2010 10:35 AM
To: Anthony, Robert G - FW; Brendan White; Brian Woodbridge; Bruce Marcot; Craig Ducey; Dave LaPlante; Eric Greenquist; Jeffrey Dunk; Jim Thrailkill; Katie Dugger; Marty Raphael; Nathan Schumaker; Ray Davis
Subject: HexSim Final Steps

I've been working closely with Bob and Jeff this week to try and finish the HexSim fine tuning. I'm not quite there yet. I'm just trying to find the right per-province resource targets to use, that's all. These should correlate with the resource quality, or density, in each province.

I'll separate my comments into issues below, but they are all related:

ISSUE 1

Most recently, I've used the following table of relative values to scale each province's resource target:

WA Olympic 3.5

WA Cascades 1.5

OR Cascades 1.167

OR Coast Range 1.33

OR Klamath 0.83

CA Klamath 1

CA Redwood 0.5

These values equal the minimum home size / CA Klamath min home range size.

I've then multiplied each value by 500, 550, 600, 650, 700 to obtain 5 different HexSim scenarios.

I've attached a plot of the population sizes that result from these 5 scenarios. See "PopSize.pdf".

Bob looked carefully at the per-Modeling-Region population sizes for the scenario called "Baseline J", which uses the coefficient 500. He felt that the regional population sizes and trends were not accurate yet.

This argues for modifying the table above. But I need help doing this in a defensible way. Based on Bob's comments, I think we may want scaling values more like:

WA Olympic 2.5

WA Cascades 2.0

OR Cascades 1.5

OR Coast Range 1.25

OR Klamath 1.5

CA Klamath 1.5

CA Redwood 1.0

I have just made these numbers up -- they are only intended to get you thinking about this relative resource value issue on a per-province basis.

Alternatively, we could set the resource target scaling values on a per-Modeling-Region basis. That would permit even more fine-tuning. But its more work, and may be harder to justify. I have attached the modeling region-specific weights corresponding to the top table, and the range of resource coefficients [500, 550, 600, 650, 700]. See "Resource Targets.pdf". You have probably all seen this before.

I think the scaling values in the second table will provide results that are more in line with the recent demographic results, so I look forward to seeing those results. I believe it change the relative differences between the WA Olympic and WA Cascades that were a bit extreme, and it will likely provide a more realistic comparison between the CA and OR Klamath versus the Redwood zone.

ISSUE 2

What I've been doing thus far is to set these per-province scaling values based on observed home range sizes, and then multiply each by a coefficient. The file "Resource Targets.pdf" illustrates this for 5 different coefficients. We don't have to do it this way. A resource target could be selected directly for each province or modeling region. The higher the target, the lower the population will be in that region. As a refresher, each owl will attempt to acquire resources equal to its resource target. If it gets 1/3 or less, its placed in a low resource class. If it gets 2/3 or more its placed in a high resource class. The rest go in a moderate resource class. Survival varies with resource class.

It would be ideal to simply arrive at absolute resource values on a per-region basis. That would amount to adding a new column to the "Resource Targets.pdf" file -- one that had values you thought made the most sense. But the approach outlined under issue 1, above, is certainly adequate too.

Bob pointed out that the populations on OLY, TYE, and COA seemed to be disappearing, while populations on RAI, Warm Springs, and WEN were not. This did not mesh with the observations that TYE, KLA, SCA, and HOOPA appear to be the most stable sub-populations.

Modifying the resource targets on a per-modeling-region basis may be the only way to fix this. We are already modifying the home range size and likelihood of barred owl encounters per-modeling-region (Bob, all of that work you and Katie did is definitely folded in to all of these scenarios -- thanks!).

Let's see what the results from the second scaling table above look like before we think about doing the resource allocation on a zone by zone basis. We do have to consider the future relative

performance of populations in each of the DSAs and make sure they are not very different from the most recent demographic results; otherwise, the results will be criticized as not being comparable to recent results and unrealistic.

ISSUE 3

Jeff and I came up with a possible approach to selecting one set of resource targets from a group. We did this using the scenarios corresponding to the data in the "Resource Targets.pdf" file.

The idea is predicated on two statements:

1. Today's population size is likely between 3000 and 3500 female owls.
2. At present, the population is declining range-wide at about 3% per year.

What I did was to make plots of instantaneous lambda vs population size for each of the 5 simulations corresponding to the resource target groups in "Resource Targets.pdf". Scenarios J and K (coefficients 500 and 550) didn't have any points that fell in the region corresponding to the 2 criteria above. But if I ran multiple replicates, I may see some appear. However, scenarios L, M, N all did. See the attached file "Lambda.pdf".

I'm computing Instantaneous Lambda as N(t+1) / N(t), where N is the population size. But also, this value is high in even years and low in odd years, so the data I'm using here is an average of each paired even and odd year.

My question is, do you think this sort of analysis will be useful in the fine-tuning process?

A decline of ~3% per year for the rangewide population is very close to the value in the latest demographic analysis (good!), but it is not clear how the two of you estimated the population at 3000-3500 females. The latter range will eventually need some support or justification. Yes, I think computation of an instantaneous lambda will be useful for the rangewide population and for the different zones. However, we need to understand that these lambdas will not be directly comparable to the lamdas in the most recent demographic analysis because (1) HexSim model includes floaters as well as territorial females and (2) the recent demographic analysis includes both territorial males and females. We and others just need to be careful not to make that direct comparison for whatever purpose.

ISSUE 4

Bob also had some other concerns. One concerned year to year variability in survival.

I recently sent a plot of survival rates through time. Survival in these simulations is a function of stage class (4 levels), resource class (3 levels), and barred owl presence / absence. That gives a total of 24 different survival values. For simplicity, I just displayed the grand mean. It wasn't very informative, but Bob pointed out that there was a lot of year-to-year variability in those survival values.

I made a few more specific plots of survival rate in time. For example adult / high resource / barred owl absent. In a quick scan, I found that there was still a fair bit of year to year variability in survival. I suspect this is because, even in this more specific case, we are still averaging across the entire range, including floaters and territorial birds.

But we may want to look at this further.

I was looking at the recent model results compared to what we see with territorial adults in the DSAs from the recent demographic analysis. In general, we see high variability in fecundity on an annual basis but relatively less annual variability in survival rates, referred to as a "bet-hedging" strategy. Since HexSim modeling includes floaters as well as territorial owls, my comparison may not have been totally valid---much like the lambda issue above. If HexSim can produce annual survival rates of territorial owls, then those rates would be more comparable to those in the recent demographic analyses. What you would expect to see is declining survival rates when populations are declining because the dynamics of owl populations are most sensitive to changes in adult survival rates.

ISSUE 5

Bob also indicated some concern because I sent around a plot that seemed to show spotted owl / barred owl interactions decreasing with time -- opposite of what we actually observe. This was just a consequence of my being in a hurry and not doing a very good job of developing plots. If you take the same data and remove the population trend, then the interaction frequencies tend to be roughly constant once the model reaches steady state. This is what you'd expect, given that we are modeling a constant regional probability of encounters.

We can easily make the encounter rate dynamic. But that's up to you.

Let's look at the results from the next run and see what the encounter rate looks like under a stable or declining population. I suspect that most of the field biologists and DSA crew leaders would argue that barred owl numbers are increasing on most of the DSAs, and it would be more realistic to model a small yearly increase in encounter rates but we can think about that for future runs once we have some results with the new scaling of resources.

SUMMARY

Given everything discussed above, I think all we really need now is to settle of a set of resource targets. It takes about 2 hours to run a simulation, and I can run several simultaneously. So I can experiment and then send back plots of population size (overall, by region, and by DSA).

I'm sorry this email message is so long... It just seemed like an important time to summarize where we are at.

Nathan