

DECISION ANALYSIS

Species of Int Model, Part 2

Terri Donovan

recorded: January, 2010

Welcome back. We've just heard Tony talk about hard and soft solutions for a decision problem like the Species of Int. Earlier we had found the portfolio, that conserved all 14 species with a minimum cost. But now we want to take a few minutes and go through some examples of how you as a modeler can start to add some softness into the modeling program per se.

Let's take a few different case examples here. In the first case, let's just assume there is some political interest in conserving site #8. As the modeler, you'd like to go back the group and say, well you know, we considered this scenario and here are the results. How would you do that?

We can use Solver, once again, and include site #8 as part of the Solver problem. Remember that we said that we wanted to set the target cell D2 to a minimum by changing the choice matrix variables. And we added the constraint that the choice matrix variables are binary. And we also added the constraint, that every single species must occur on at least one site.

How do we take care of the site #8 problem?

Well we just need to say that we have to choose site #1. And so we enter our reference A13 is equal to 1, and then press OK. Now we have three constraints. And we're ready to try to find a solution.

So in this case all 14 sites were conserved. The total cost has gone up a bit. But we have been able to show people what this result would be given that site #8 needed to be conserved.

Let's look at another case. Suppose a bunch of conservationists claimed that conserving a species at one site doesn't necessarily protect the species into perpetuity. And that they suggest that at least two sites are needed for every single species. So you want species 1 to be protected at least two sites, not just one.

How could you use Solver to handle that?

Well, we just go up to our Solver. Let's go ahead and remove the constraint for site #8 so we can just delete that. Our new constraint would be – oops I think I removed the wrong constraint. We'll remove the constraint at site A13 is chosen. And we'll add a constraint that the number of sites that contain each species, now, has to be greater than or equal to 2. And we press Solve. And Solver finds a solution, 14 species are conserved. The total cost has jumped up to 47 units. But we can see these are the sites that were selected, sites 2, 3, 4, 6, 7, and 12. Not #8, because that was not a part of this problem. But that given this matrix of numbers, this vector, we conserved every single species in at least two different locations.

Now let's think about this problem in a slightly different way. Suppose the group comes back says, well this is great but we don't have 47 units to spend, we have only 40 units to spend.

How would you handle that problem?

We can call on Solver once again. This time we can say we want to set our species to a maximum, under the constraint that we have only 40 units to work with. So that's a different kind of question, but also one worth exploring.

So in this case we want to set our target cell to be equal to D1. And we're going to set that to a maximum value. Still by changing the choice matrix. Still subject to the constraint that the choice matrix must be binary. And that we want at least two species at each site. We want to also add another constraint that we have only 40 units to work with. So we'll go ahead and add that. And we'll click on cell D2, and D2 must be less than or equal to 40.

So let's just double-check our boxes here. Set the target cell, D1, to a maximum. So maximize how many species you can conserved, by changing the choice matrix subject to the constraint, that the choice matrix in binary. We want each species to occur on at least two sites. And that we have a budget that is less than 40 units.

Now we press Solve. You see that Solver could not find a feasible solution. And that's OK. This gives you some flexibility to go back to people and give them the results and let them really see how these different scenarios have played out. And that's a way for you to find some acceptable solutions and explore solutions that have other interests besides finding the pure maximum.

So those are all important points to keep in mind, when you as the modeler are performing these kind of analyses.

We've covered a lot of ground in this exercise. And one thing that I think is really important for you to do is to just take your time, check the equations, and really get a feel for how the different equations are working. And also play around with the entries in Solver. Because one thing that you don't want to get in the habit of doing is just running Solver and then blindly recording your results without really going back and reflecting on what those results actually mean.

That's about it for this one and we'll see you next time.

< 00:07:57 END >