Meeting Summary/Notes
Connecticut River Pilot Core Team Meeting in
Hadley, Massachusetts
March 27th, 2015, 10:00 a.m. to 2:00 p.m.

Attendees by Phone: Bill Jenkins, Emily Preston, Mike Marchand, Mike Slattery, Pete Murdoch, Rachel Cliche, Tim Wildman, Anne Kuhn

Attendees in Person: Andrew Milliken, Andy French, Bill Labich, BJ Richardson, Catherine Doyle-Capitman, Chad Rittenhouse, Dave Eisenhauer, Ethan Plunkett, Eric Sorensen, Georgia Basso, Jeff Horan, John Warner, Ken Elowe, Ken Sprankle, Kevin McGarigal, Nancy McGarigal, Kim Lutz, Maritza Mallek, Marvin Moriarty, Mitch Hartley, Patrick Comins, Renee Farnsworth, Scott Schwenk, Tanya Lama, Deb Rocque, JoAnna Grande, Megan Tyrrell

Introduction – Nancy McGarigal
[0:00]

We tried to create an agenda reflecting your feedback from the last couple of meetings. I want to thank Kevin McGarigal and the whole team at UMass for working hard amidst a lot of computer problems to get the design and its many associated products together for this meeting. Also thanks to Scott Schwenk and Maritza Mallek for working to synthesize and summarize a lot of the information from the DSL team. Finally, thank you to BJ and Renee for all their work getting layers up on Data Basin.

We have some new results for you all to review today. We still hope to have a single final core-connector network design, but we want to have a good discussion about the latest network and hopefully reach consensus about what to use.

We've set some time aside to talk about the review period, and plan a celebration meeting for May 1. Then at 2:30 Kevin will review the climate stressor metrics that you haven't yet seen in detail. At the end of the day BJ and Renee will run through how to use Data Basin for anyone interested in staying for that. If you feel comfortable with Data Basin you don't need to stay for this part.

Update from the Communications Subteam – Dave Eisenhauer
[5:50]

For the last month about 10 of us have been developing an outreach plan. Our thinking right now is that our primary objective is to ensure that the identified target audiences know about the design and use the tools associated with it to plan conservation efforts. We take the overarching goals and objectives identified by the core team as the core of the message to be delivered. A lot of our focus has been on how we message this effort. I'll review some of our themes identified so far. First is a focus on the value of the resource and collaboratively defining the future of the watershed, rather than having it defined for us. We also focus on how conservation work enhances the overall health and well-being of people.

We want people to understand the value of lands within the watershed with respect to ecological function. In addition, the tool is helpful not just to conservation practitioners, but also to those whose actions are likely to impact natural systems in the watershed. We are planning to have a phased approach to the rollout, focusing first on existing partners, who can become early adopters and help in future communications efforts.

Decision Summary Document – Scott Schwenk
[9:25]

Maritza and I have been working to update this document, which attempts to capture the major decisions that we've made. It had been about 5 months since we did a thorough revision. A major addition is the incorporation of more details about the aquatic subteam's decisions. We've also added information about decisions from the last few months. We also reworked the document, which before was more of a meeting by meeting summary, into more of a synthesis of the decisions that we made.

LCD product review period – Nancy McGarigal
[11:05]

We're hoping for you to take the results back to your home agencies and organizations and determine whether the folks that you're working with believe that this tool adds value and complements existing assessment tools used to prioritize conservation activities within the watershed. We're not looking for a full formal endorsement, but we want agreement that the design adds new and useful information that you plan to use, that we can acknowledge your involvement, participation, and support, and that you would encourage its use. We hope that you will agree that the design not only enhances existing tools, but also offers something new that will be valuable in prioritizing conservation actions within your organization. We also want to know that you will continue to use and test the tools that are part of the design. We hope that you will be able to come back and tell us that the larger LCC community and the FWS will be able to acknowledge your involvement, that you were part of the partnership, and that you encourage others to use this tool. If during the course of your discussions your organization identifies particular products that you expect to be particularly useful, please share that feedback with us as well.

Given that, we're asking you to do this over the next month. We'd also like to schedule a meeting on May 1st (a Friday) and have us get back together and debrief on how the reviews went. We'd also like to have a little celebration, which will also mark the closure of this first major phase. We'd like to include a discussion of how it went, lessons learned, etc. This has been a great team and we want to recognize everyone for their hard work.

Climate change metrics and their influence on the core-connector network – Kevin McGarigal
[18:15]

There are several places where climate change comes into the assessment and affects the design: sea level rise metric, climate stressor metric, recalculating resiliency metrics with future climate data.

The biggest impact of these changes is the climate stressor metric. We developed a climate niche model for each ecological system, similarly to what was done for species. Then we developed a logistic regression model that produces the probability of climate being suitable. Instead of predicted occurrence (like in species), we're predicting suitability. So think of it as an index of climate suitability for each system. Because the models were done separately for each system, the results need to be viewed on a system-by-system basis. The slides show Appalachian (Hemlock)-Northern Hardwood Forest. The impact of the climate stressor is that lower elevations and southerly latitudes become less suitable in 2080. The output metric is based on the change in suitability between 2010 and 2080. This slide demonstrates the shift in suitability over time that we predict. If no loss in suitability occurs, the value is 0 (likely to persist) and if suitability completely disappears, the value is 1. This stressor metric is used as an input to IEI. It is weighted, as are all the inputs to IEI, by expert opinion.

What's tricky about this, which requires a deep understanding of how the model works and how quantile scaling works, is that as some pixels associated with a given ecological system decrease in value, that loss is compensated for by the fact that other pixels associated with that same ecological system will increase in value. So what happens here is that even though the highest elevations are being stressed and their absolute value is going down, they are less stressed than other areas, and so the highest elevations become relatively more important. Thus, there is a reorganization of relative values for each system, in which mostly the higher elevations increase in value.

The next slide shows the 19 metrics that go into IEI. All metric weights are applied equally for each macrogroup. We ended up basically having 4 weights. Some systems had a weight of 0 (basically ignoring climate). For example, all the aquatic systems received a weight of 0. In addition, for systems whose distribution is mostly south of the northeast region, we could not develop a meaningful climate niche model, so we set the climate stressor metric to 0. This did not actually affect any of the systems present in the Connecticut River Watershed.

For ecological systems that are not thought to be especially vulnerable to climate change, a weight of 5 was input. For high elevation, northern systems, which are thought to be highly sensitive, a weight of 15 was input. These weights are based on a relative impression of importance.

Bill Labich: For the climate stressor metric, of all the variables associated with that, are there any in particular that would drive distribution of ecosystems?

Kevin McGarigal: Yes. Each system has a model derived using model selection methods to choose the model that was best suited to the data. Each system thus has a slightly different model, including between 2 and 6 climate variables. So for each system, you can determine that stress is based on a set of input variables, but we have not done analysis to separate out the exact effect size.

Ethan Plunkett: We incorporated growing degree days, precipitation, growing season precipitation, min temp, max temp, heat stress index.

Kevin McGarigal: So it's mostly temperature and precipitation, which mostly deal with extremes.

Andrew Milliken: These climate niche models are developed for the full range of these systems, correct? So the relative values are pertinent to the full range of the region, not just the watershed?
Kevin McGarigal: Correct.

Emily Preston: Going back to the weighting slide. It seems to me that the choices that you made for climate are in all cases very high compared to all these other metrics. It seems like you are giving climate a very large weight relative to all of the other metrics. Can you explain what the thinking was there?

Kevin McGarigal: One thing to clarify is that only 3 systems have a weight higher than 5. Two boreal systems get a weight of 15, and one gets a weight of 25. It's basically equivalent to the combined weight of all the other metrics. We justify the high weights based on the growing concern about the sensitivity of these macrogroups to climate change. The weights are not empirically based; they are expert opinion, so you could argue that they are too high, or not high enough. For the systems with a weight of 15, the other metrics together do exceed that value. Sea level rise is very high, because we think if there is a coastal system, sea level rise trumps everything. For systems that aren't coastal, that weight is not relevant.

Emily Preston: That helps. We talk about alpine a lot. There has been some recent research that suggests that our alpine forests are actually above the planetary boundary layer, and so may not be as sensitive as we thought before. Because we have these isolated mountains, like Mount Washington, they may not experience as big an impact.

Kevin McGarigal: We're not wed to these weights, although we probably don't want to mess around with weights too much. But I would not be too concerned that alpine won't be represented in the network.

Eric Sorenson: If a system is mapped throughout the region, the climate stressor metric only identifies where it will be most suitable in 2080, but doesn't predict where it will be, correct?
Kevin McGarigal: Correct

Kevin McGarigal: If you look at the selection index, the impact of climate in IEI is somewhat muted, because we are adding in the floodplains, rare natural communities, and TNC resiliency layer. For species, we take the average of predicted occurrence in 2010 and 2080. Next slide shows the difference between the network shown in January and the network incorporated climate change.

Pete Murdoch: I understand the logic about 50% weight, but I don't understand why there wasn't a distinction made between systems that will definitely experience SLR and those that won't. Also, why not set SLR to 0 for noncoastal habitats?

Kevin McGarigal: The reason we left it in is that for some systems in the region, the system extends all the way to the ocean. But it's being multiplied by 0, so it generally doesn't matter. If it would make people more comfortable, we could formally take out the weights, but it wouldn't affect the outcome.

Andrew Milliken: Is the aquatic connectivity weight 0 for headwater creeks so that it doesn't conflict with Ben Letcher's layer?

Ethan Plunkett: The systems were actually mapped based on temperature, so to compare temperature stress in systems that are mapped by temperature is not helpful. Essentially, they didn't want to double-count temperature, so to speak.

Discussion and comparison of core-connector networks with and without climate – Scott Schwenk *[55:50]*

We wanted to have some more discussion about the climate metrics. Incorporating climate is one of the unique and valuable aspects of the design. Although the differences between previous designs and this one look subtle on the map, there are some important differences that we noticed, and want to show you. At the same time, we thought it would be appropriate to have a short discussion about how climate change should be incorporated and what we want to see, in an effort to make our decision based on what we think adding climate stressor should do, and not simply base our decision on what the map looks like. After that we will go through the more detailed comparison of the two designs.

First, I have a few slides about how we're addressing climate in this design.

- In the short-term (one year to a few decades), our climate strategy is to include the highest quality current ecological systems and species habitat in core areas. So the "current" design essentially incorporates climate out to about 2030.
- In the medium-term (few to multiple decades), our strategy is the core-connector network and stream resiliency. The new addition is to focus on climate-persistent locations (refugia) for ecosystems and species). This time scale is out to about 2080.
- In the long-term (many decades to centuries), we expect there to be significant range shifts, alterations to community types, and novel climate conditions. The strategy to adapt to this is based on incorporation of the terrestrial resiliency into core areas, and the inclusion of a core-connector network that includes south-north connections.

Bill Labich: On your previous slide you show ways of addressing things in the CTR. I wonder if the scale of the watershed spatially is appropriate for short and medium term, but maybe not for long-term. For south-north connectedness, I think you'd want to consider areas outside of the watershed.

Scott Schwenk: Yes, I think that broader spatial scales are certainly relevant. To some extent we are incorporating that because many of the individual products are being developed for the full region and just rescaled to the watershed for the network we're designing.

Kevin McGarigal: The next phase of this work, where we extend some of the design components to the entire region, will surely build connections between the cores in the CTR and cores outside of it.

Marvin Moriarty: As you're going through the time scales, it occurs to me that climate change isn't beginning now; we're already in the long-term of climate change.

Scott Schwenk: I guess I've imposed a strict boundary that doesn't exist. So some species are moving and phenologies are changing.

Marvin Moriarty: I'm just saying this works day 1 if we start thinking about distributions now.

Scott Schwenk: Next I want to acknowledge the tradeoffs explicitly. This is review for most of you. One of our big challenges is balancing our desire to conserve sites of highest current integrity (a short-term measure) and our desire to have a well-distributed, interconnected network (a long-term need). So we addressed this by including IEI and TNC resiliency into the network, and we created the network by HUC6s. The new information includes a medium-term measure, that of climate persistent sites.

Randy Dettmers: So what we wanted to do next is essentially a pulse-check before diving into the nitty gritty details. Thinking about this context, and given the modeling framework we're working with, in a timeframe out to 2080, and the fact that people are pretty comfortable with the design from January, if we're now going to incorporate these climate change metrics, it's going to change things and we have to accept that there will be some differences. I'd like to get a sense from folks, if we're going to incorporate climate change, what do you expect that to do to the network?

Andy French: I actually think all three time scales are important. Obviously we're looking at what's here. What comes in down the road may not necessarily be that bad. What's in lower latitudes is generally coming our way. But if you get your core areas and connectivity right, we'll be in the best position we can be in. Obviously I have a particular interest in this, and the Conte laid out conservation focus areas 2-3 years ago that focused on these principles of cores and connectivity. We looked at the new network in comparison to that, which was a relief and also somewhat of a validation of the process we're going through today. The challenge with climate is that we don't know when changes will occur, where they will happen.

Ken Elowe: I'm glad Andy went first, because I'd like to reframe the question. What is the appropriate conservation response to climate change and adaptation? What are our responsibilities to look at persistent areas, and also to look at a connected network?

Randy Dettmers: I think we were in agreement that people wanted to focus on places with climate persistence in terms of our landscape design.

Ken Elowe: So I think our discussion should be on that.

Marvin Moriarty: I was intrigued by the way you answered the question, as if we're debating the political dimension. I liked the way Andy answered; I think we have to incorporate future climate.

Eric Sorenson: One of the main reasons for doing this – the whole core and connectivity design – is to come up with a network that will allow for persistence. For me the thing that gets complicated is that, first, I don't think we know what exactly is going to happen. We know it's going to get warmer and that sea levels will rise. But we don't exactly what will happen to individual species. The network is important because we are choosing the sites where adaptation and movement can proceed. I think when we get down to predicting things for particular systems or species, and then we're favoring what we know now. There are lots of changes that have happened and will happen within, say, the northern hardwood

forests. I think the current systems are a surrogate for future systems, but I'm not sure I'm comfortable with choosing which parts of the northern hardwood forests will be good for systems in the future.

Randy Dettmers: If I can paraphrase, it sounds like you are probably on the side of not placing much weight on what future climate suitability would say and that we should not incorporate it….okay, Eric says he would like to see more first.

Jeff Horan: We all sat down and worked through this whole series of objectives, which did create tradeoffs. Eric mentioned the ecological system groups, which are mapped as they are. That's a surrogate, as Eric said. We also said we wanted a well-distributed network. That's going to compromise certain other objectives. I think the climate change component affects that. And we'll have to consider which objectives are the most important.

Georgia Basso: In addition to what Eric said, what if we have a high value marsh but it's vulnerable to inundation so it takes the core away, but at the same time we have Sandy restoration that might change the picture for that marsh, but can't be incorporated into the model. I wouldn't want to see the ecological value of that marsh not appear in a tool like this.

Mitch Hartley: I think I'm on the same page as Eric, which is that to me the whole process thus far has been undertaken with an eye toward the future and climate change resiliency. I'm not sure the way we incorporate climate is to add another parameter on top of 19 to IEI. To me the more important tool is the climate niche data layers for each system, which indicate long-term refugia or the degree of degradation, and what's in between. To me those layers really inform that, and anyone interested in climate will be able to look at that in a separate way. To me we started with a network of cores and connectors that is our best hybrid approach of looking at threats other than climate as well, like roads and development, to come up with a design that is resilient. The other thing is that since we've not chosen to change habitat types over time, is that looking at the climate impacts that Kevin was showing us earlier, and then scaling them 0-1 is an issue because I don't want to know what is the overall best northern hardwood site 80 years from now due to climate. I want to know across systems and see which are hit the hardest. One system might get hit 3 times harder than another. Some area is still going to be the best of that system, and that will show up, but not the first thing.

Ken Elowe: I think what I'm hearing is a lot of support for all these things. I think there is a strong need for knowing where those climate persistent areas are. We have responsibilities to the public to figure out trajectories for resources we're entrusted with protecting. A large part of this is figuring out the probability of being able to sustain different resources in different geographies. Part of this is coming up with an adaptive network that will ensure movement of organisms over time. But also being able to figure out what we think we'll be able to sustain in certain timeframes to be able to meet our public responsibilities is a very important part of this design too, and I don't want to lose that.

BJ Richardson: What I'm thinking now is that if we acknowledge there is uncertainty in the climate models, then what we're asking if it's worth it to introduce that uncertainty. Maybe it has enough value to us that we accept the uncertainty. And maybe in that case what's important isn't as much the hard

boundaries, but the overall surface. The uncertainty is more important if we have a hard in-or-out boundary.

Bill Labich: It seems like this is the end, the last meeting. It sounds like you're talking about the cherry on top of the sundae, but now I'm getting nervous that you're softening us up for a big change. I thought we'd been thinking about climate change the whole way. Like the species weightings, for examples. So I want to see the changes you're about to show.

Randy Dettmers: That's exactly it. There are changes and we just don't know if reactions will be "Oh, that's pretty subtle, and I'm good with this" or "Oh wow, that's a big change." And we're hoping to make the decision scientifically, based on what we feel is important, and not just on map images, since we don't have time to do a close look during the meeting today. So just to review, the new revisions are based on adjustments made on a system-by-system basis that alter their resiliency and measure stress based on implied sensitivity.

Marvin Moriarty: Earlier we had climate persistence built into the models. This is climate stressors. The question is to include or not include the climate stressor.
Scott Schwenk: This is the first time we've seen both, but Kevin can discuss it more.
Kevin McGarigal: By climate persistence formally being in the model, I believe you're referring to the species models, where we had a climate persistence index for each of the representative species. We had that, but did not incorporate it into the January design. The January design was based on conditions in the year 2010, but we showed you the climate persistence for the species in order to show what we would be using for the future climate change scenario. The climate stressor metric and adjustments to IEI are new.

[1:32:25]

Scott Schwenk: So with that backdrop I'll work through the results we've seen. Slides are available online. In general, the results make sense. Core areas are based on where ecosystems and species currently exist. Notable differences from the January design are that there is a shift from southern and low latitudes to northern and higher latitudes. In addition, connectivity has been reduced in several parts of the watershed, as a consequence of movement of core areas. We also see some changes in species representation. As a reminder, the potential for species and communities to move northward (changes to system locations) was *not* modeled.

The next slides provide a conceptual overview of the changes.

On to comparing the two designs. There is about an 85% overlap in the core areas [correction from recording, in which it was stated that there was an 85% overlap in the design]. I've included a comparison among all the HUC8s, which is not to advocate a return to that scaling, but just to summarize changes at a smaller scale. We also evaluated the most abundant systems and how they changed after the climate stressor metric was added. The modeling was not designed to cause changes in this, but because the specific location of the seeds and the integrity of the area around them changes,

the ultimate composition of the final cores changes. When we look at species, there is also a bias for northerly species and against southerly species, which makes sense.

Emily Preston: I think it would be interesting to look at the comparison of system types. The ones that lost out were early successional shrubland and grassland species, and the interior forest stuff was the winners here, and that reflects a couple things we should be aware of.

Patrick Comins: To a degree this is somewhat counterintuitive, because the species that are moving out of NE are being tagged as more persistent, and the species moving into NE are being tagged as least persistent.

Kevin McGarigal: Keep in mind that this is not a measure of climate vulnerability.

Patrick Comins: But I don't think some of these species will persist within the watershed. It feels like we're emphasizing species habitat that isn't likely to be here in 80 years.

Kevin McGarigal: This is mostly reflecting an emphasis on those northern types, so along with that you're getting species like blackpoll. If we wanted to put more emphasis on climate vulnerable systems, this is a consequence of putting their habitat into the core areas. We'll have more habitat for blackpoll warbler because we're putting more alpine areas into cores.

Ken Sprankle: You had an earlier slide that speaks to this discussion. We've chosen the CT River scale. It kind of struck me that as we expand this to other areas, species that don't seem important here will be important in the future [within Connecticut]. Some of this is just a consequence of our scale, and it's something we've been aware of this during the whole Pilot process. With this approach, and an expansion to include areas outside the watershed, values may be incorporated that aren't shown right now. I don't have an answer; it just struck me that this is a function of how we set everything up.

Kevin McGarigal: What I was just thinking about is that the LC refers to how much of a species LC is captured by the design. We find that in the future more LC is captured with fewer acres.

Georgia Basso: At this point I have a question about whether the tool would be used to highlight the best areas for future conservation areas or if we would shift it to increase urgency for resiliency planning in certain areas. I'm thinking about other values. If this focus would shift our focus away from coastal areas…I guess my question is how this would be used, and how we feel about a shift away from coastal areas.

Scott Schwenk: That's a question we have to answer. I'll remind everyone that all these products will be available individually.

Dave Perkins: I think maybe Kevin got at most of it. Since we're looking at percentages here, it might be hard to think about what is actually changing in terms of actual area being selected for cores. I wasn't sure if the percentages were showing the whole picture, or if there were counterintuitive results in here.

Pete Murdoch: It seems like we need to look at the inverse of how this is being presented. But these species in red are going to move north, and we're not including migration in this analysis.
Scott Schwenk: Right, that's not being modeled.
Pete Murdoch: But if we did include migration, then the habitat for, say, prairie warbler might actually expand. And habitat for blackpoll warbler would decrease.

Ethan Plunkett: Just to clarify, I think 3 people had a hand in making this table. The climate 2080 LC represents the percentage of the climate persistence (2080 LC) that was captured by the March cores. The Current LC represents the percentage of the current LC.

Kevin McGarigal: So the issue is that there are different reference points.

Pete Murdoch: My point is that we'll have migrations, so the prairie warblers will still be in the watershed, but the blackpoll moves out.

Kevin McGarigal: In reality? You're talking about in reality.

Pete Murdoch: Yes, and reality matters if we're going to use this for management.

Kevin McGarigal: Keep in mind that this is not a prediction about what will happen to the species. These values just refer to what is being captured in the cores.

Ken Elowe: I think we're confusing several points. The point of this is that we're trying to build a strategy to support these species at a certain amounts. We have built cores to try and meet the species targets. What this shows is that it takes different amounts of area to support these species in the future. And the table shows the amount of LC captured in the cores. And this is why we're asking the question: what is our strategy for conservation? So we want to look at the species results to see if the core areas are a satisfactory strategy. We've talked a little about species migrations, but we unfortunately can't include that now. So does what's on the table work for us?

Pete Murdoch: So that 60% for blackpoll warbler, that table is saying to increase the emphasis on blackpoll warbler by 15%?

Kevin McGarigal: No, those numbers don't reflect emphasis on species when we built the cores. They are a consequence of the creation of the core areas. Some species do well because the system selection overlaps well with a species' niche.

Pete Murdoch: In a sense this looks like we're putting more resources into species that are not going to be present in the future. The species benefiting from the network are species that are likely to migrate out of the region. I'm also curious about whether core areas are now in more protected locations, and whether there is a consequence of de-emphasizing core areas that are still in need of protection in the southern part of the watershed.

Kevin McGarigal: Two things to understand. First, none of our species models predict total movement of some species out of the watershed by 2080. Of course, our models could be wrong. But also to the issue

of bias away from coasts, is that IEI is system-based. So the systems themselves are not systematically biased. Each system's best areas are represented. It gets a little complicated because IEI gets averaged in with Resiliency. So the water gets muddy in terms of ensuring that all systems are equally well represented. The other thing to keep in mind is that the core area solution is driven mostly (20%) by the systems, and only 5% of the cores are driven entirely by the species.

Eric Sorenson: Scott, can you put up the slide of ecosystem changes? I think this one is really important and emphasizes why this decision is about scale and shows how the southern systems lose out, and those to the north are well represented in terms of percentage. And I think that's largely a consequence of using the watershed. If you took a larger area, which I think we have to when we're thinking about core design, we have to think about immigration and emigration, for both species and systems. If you get rid of or reduce the core size of places in CT and MA because there are better places elsewhere, we're going to miss out on the ability of other species or systems to redevelop in those places. What we should be doing is keeping a representation of the percentage now of those systems as a way of establishing how much of each we need. Not really favoring the ones that will be more vulnerable.

Chad Rittenhouse: When you have the alternatives up there, I'm wondering if we are compelled to pick one. I wonder if these are more strategies. One strategy is to look at current conditions, and another is to focus on the future. I think there are some parts of the watershed in which an explicit incorporation of climate change might turn people off of the design, but in other parts people will want that.

Kevin McGarigal: Just so everyone is clear, these three scenarios are not categorically different. They are variations on a theme. Major components of these are the same in all three scenarios. TNC Resiliency and land use are constant. The difference is only in how we incorporate climate persistence.

Andy French: There are 3 alternatives up there, and to me they are all important. I don't see why having a tiered approach isn't in the cards as well, as opposed to picking a single approach. I think where we are now is important. I think knowing what's coming is important. I don't see why we have to pick just one.

Scott Schwenk: One thing is that these are not 3 different timeframes. They all incorporate the short and long term. We also think that one network is easiest to explain and distribute. So if we pick more than one, we're taking on additional challenges with respect to explaining the overall project.

BREAK

Continued discussion and comparison of core-connector networks with and without climate – Scott Schwenk
[2:25:50]

Nancy McGarigal: I hope that people have some flexibility on timing, because it looks like we will probably be here until 3 today in order to finish discussion of the three alternatives, and allow time for Kevin to go over the products. We'll be using Data Basin to review the alternatives. For the new combo design, we got it yesterday and do not yet have calculations like what we showed you earlier.

Scott used Data Basin to look at the three alternatives across different parts of the network.

Note, technical difficulties from 2:34:45 – 2:42:45 dealing with symbology on Data Basin (skip through this on the recording)

Kevin McGarigal: January Design has 1202 cores. March Design has 1026 cores. The difference is 175 cores. Combined approach has 938 cores. The scenarios with fewer cores have larger cores.

Nancy McGarigal: That's it in a nutshell. Andrew just asked for Scott to show the new combination, which only shows the core areas. So right now we want a gut check to see what people are thinking, with the ultimate goal that we have had, which is to agree and have consensus on one design to present. The other layers may be available as a product, but we want to go forth with a single primary product that is one design. Earlier we heard a great presentation by Kevin on what the climate metrics were supposed to be doing. So you need to decide if you think those are value-added, and if so then we accept the results. We don't want to go back and forth massaging the results. So if we accept how climate was used, then the results are what they are.

Kevin McGarigal: I see all three scenarios as very acceptable. I think they all meet the overarching goals. They just do it in subtly different ways. One thing that makes a big difference is that the difference between the current and weighted future solutions is a 15% difference in core area. So the question is whether you want to give a little more emphasis to climate persistence and a shift of a few percent in some systems.

[*Ed. Note:* As shown on the slides, while most systems change by only a few percent, changes of 5-15% were also observed for several systems in the watershed. These changes reflected a systematic upper and northerly shift.]

Randy Dettmers: When we discussed the species results and differences, it was apparent that the differences are not exactly as implied. I think we should be much more tempered about what those differences really are. As Kevin was saying, the relative difference between those scenarios is small. I also wanted to point out that the shifts of tens of thousands of hectares occurred in the most widely distributed systems, so it's important to look at percentages as well as absolute change.

[2:50:50] Kevin presented an updated species values comparison.

Andy French: How does the amount of land in the connectors change?

Kevin McGarigal: The current scenario has 22% of the land area in connectors, while the future scenario has 19% of the land in connectors.

Jeff Horan: We talked about being able to look at the continuous surface and ranking it. Which of these scenarios work for that? Or do some have more problems than others?

Kevin McGarigal: A further comment about connectors. Having fewer cores leads to having fewer connectors. I suspect the combined scenario will have even less land in connectors. Regarding continuous surfaces, I see the selection indices as the simplest underlay for that purpose. The same is true for the species products – they are all continuous surfaces with a reasonable interpretation. Either

IEI, future IEI, or the max value of current and future IEI would be available for this as well. TNC Resiliency is also available as a continuous surface.

Ken Elowe: I appreciate the table you put up, because it clarifies a bunch of things. I think it also indicates that we need to consider the future. I'd like to throw out that we move forward with the combined approach.

Emily Preston: I think it's a lot to try to follow remotely. On some level, they're all fine. There are subtle differences, and there are issues that pop up depending on where you look. I'm also thinking about buy-in, and it's very hard to consider which alternative will have the most success in that realm.

Patrick Comins: I also have some concerns with having fewer core areas, because federal prioritization and funding does matter and we can't ignore that.
Nancy McGarigal: So are you thinking of going with the 2010?
Patrick Comins: Yes.
Kevin McGarigal: Is your concern about the amount of areas in cores, rather than about how to best incorporate climate change?
Patrick Comins: My concern is mostly in the outcome.

Andy French: I have also expressed concern over relevancy in different parts of the watershed. I think the climate scenario is important to look at, but if the outcome is shifting everything up in elevation and latitude, then to me we're completely overlooking what may be coming north, or however you want to phrase it. If we shift our emphasis north based on what we have today only, I'm concerned about the outcomes, specifically in Connecticut [the state], where those areas could be very important to whatever is coming north. Those upper elevations/latitudes were well represented beforehand.

Kevin McGarigal: But we should keep in perspective that we're not completely shifting the distribution of the network. There's a shift but it's not a total shift.

Andy French: There are already a lot of acres identified in the upper latitudes and upper elevations in the January design. When you're incorporating climate further, maybe the new design helps you distinguish the most important cores. But I'm concerned about migrating north and in elevation at the expense of what we might do at lower latitudes and lower elevations and what's coming from the south. It's not an either-or, but it's a trend, and it's thousands of acres.

Kevin McGarigal: This result is a function or the result of several key decisions that we made along the way. In particular, we made decisions about how to control the distribution in the final solution. If you recall, we spent a lot of time going down the HUC8 road, which we decided was best for getting distribution across the watershed. If we had gone with HUC8, you would still see a shift up in latitude and elevation. I'm not advocating for a HUC change right now, but rather pointing out that we have to distinguish between trying to affect distribution from trying to account for climate change. They interact, but they are two separate things, and we should consider them as such.

Mitch Hartley: One of my concerns about the overall design and the utility of it is the ability for people to understand it in a coherent way and not see it as a black box. Given that all three of these are driven by the same set of IEI metrics, and some of those had climate resiliency built in before, in my mind it's best to focus on a core design network that is simple, rather than an amalgam of things. This is an alternative that shows persistent areas can always be highlighted and indicated as a supplement to the core-connector network. To me it's actually easier to incorporate climate when they are separate, rather than combined. Second, this has always been viewed as a combination of layers that allow us to do conservation with the threats we're facing, which are short and long-term threats. The idea of having cores and connectors – a major rationale for that approach is to have climate resiliency. I don't know if the benefits to ecosystems and species are as clear if we're not thinking of the future. And this is what we'll use for the next 5 or 10 years. . Also, one way we deal with long-term things is that we iterate over time. I'm sure 10 years from now, the network that we design will change somewhat.
Nancy McGarigal: So you are advocating for 2010?
Mitch Hartley: Yes.

Kevin McGarigal: What you described is very consistent with what we laid out in the beginning.

Eric Sorenson: The idea that we have more cores in the north than the south implies that the south is less climate-adaptive. So it's counter-intuitive to the idea that the whole system is supposed to be adaptable. We're forcing the places to the north to be more adaptable, if the southern part has fewer cores and less connectivity. This ignores systems, because they will change.

Maritza Mallek: What were the ramifications of weighting certain systems earlier in the process, like alpine, and then weighting them again with the climate stressor?

Kevin McGarigal: Yes, some systems were upweighted in IEI, so some were deemed vulnerable based on that. So there was already a bias due to their climate vulnerability. The addition of the climate stressor metric means that for the emphasis that we place on that system, it affects where the cores go to capture that system. So it's not itself capturing more area in high elevations because of the weighting twice.

Maritza Mallek: Did you consider incorporating climate such that the systems south of the watershed were not zero, but rather weighted in such a way that climate benefited them?

Kevin McGarigal: Systems that extend beyond the boundaries of the northeast region did not have climate niche models, so they could not be evaluated based on climate. Otherwise, all systems were weighted by the climate stressor metric, which had a negative effect on all systems.

BJ Richardson: I think having the additional data layers available is a difficult proposition at best. I think it's difficult for the average user to take growing degree days and overlay that and interpret it meaningfully.

Mitch Hartley: I was under the understanding that there was a model of persistent cores, or maps of systems that changed the most. I was thinking about the summary products, not the components like growing degree days, which I would not suggest to the average user.

Andrew Milliken: I have struggled a lot with this and it does get back to the tradeoffs between climate resiliency and distribution. In the end, all three are reasonable alternatives. I can deal with that by thinking of the current core-connector design as being the best baseline for dealing with short and long term climate resiliency, and somehow using the additional climate information for an additional prioritization, but not building it into the core area network because of my concerns about our inability to incorporate things that are moving in, and the boundary effects. So I'm leaning in that direction, for some of the reasons that Eric talked about. I hope we can continue to talk about how we can use that valuable climate data. I truly am agonizing over this and don't think this is the perfect solution, but it's the one I keep coming back to.
Marvin Moriarty: How would you use the 2010 as advised by the climate stressor information?
Andrew Milliken: I think the core-connector network is the network we present, but as part of the package we present additional climate information for systems and for species. It's not a perfect solution.
Marvin: Is that doable from Kevin's standpoint?
Kevin McGarigal: Yes

Pete Murdoch: I have to leave, but I concur with Andrew's suggestion.

Georgia Basso: I don't have a scientific basis for this, but it seems like CT is a big loser, and I'm concerned about big losers. 25% less area in CT gives people in CT less flexibility and movement to work with what is there. It is also home to some ecosystems that are only present in CT. Also just the whole tool again is shifted to the north anyway because of the representative species we chose and the ecological system weightings we selected. The whole design is already weighted toward the north.

Bill Labich: How does the persistence information compare with the TNC resiliency data? That layer seems powerful from the standpoint as being places that are likely to have high biodiversity in the future.

Kevin McGarigal: We have not done a formal comparison between our stressor metric and the TNC resiliency. They are dealing with climate stress in completely different ways. We look at each system on its own – which is related to its geophysical setting – and examine projected future climate conditions related to temperature and precipitation in order to develop our layer. The TNC resiliency layer does not incorporate systems and does not explicitly incorporate climate changes.

I think the issue with extra layers, is the question of what will actually get used. Setting climate aside and requiring an extra step to consider it, might mean that a lot of users would not look at it. Some may just take the network and not look at any of the side layers.

Joanna Grand: If people are concerned about lay users not looking at the climate info, one solution would be to incorporate a climate vulnerability index into the attribute table for the cores.

Andrew for Chad: He wanted to make sure somehow that the climate was taken into account in the design, and that of the three alternatives, he would vote for the combo approach.

<u>Decision</u>: A vote was taken and about three-quarters of the votes were for the January 2015 (also referred to as the " 2010" or "current setting") design approach, and the remainder of participants voted for the combo approach. No one voted for the new climate design approach. Those that did not vote for the 2010, current design approach were asked if they could "live with" a decision to go with it. They all said "Yes."

Thus, the collective decision was made to adopt the 2010, current setting core-connector design approach as our CT River pilot product.

Discussion of when to do the products discussion *[3:43:35]*

The team decided to postpone the discussion of products until the following Thursday, April 2, in order to allow time for a full explanation by Kevin of them.