

Connecticut River Pilot Core Team Meeting Notes

October 31, 2014

INTRO (Nancy Mcgarigal) I want to remind you that our November and December meeting dates are moved up to avoid the holidays. In November it will be Friday, November 21st, and in December it will be Friday, December 19th. Andrew will say a few words about the Large Landscape Conference that many in the LCC attended last week, and anything relevant from the Steering Committee Meeting

Andrew Milliken: The Large Landscapes Conference was attended by 600-700 people. If you didn't think there was momentum for landscape conservation design, being at the conference highlighted the consensus that it does, including at the very top. Sally Jewel gave a strong keynote on the importance of large landscape conservation and LCCs. Maritza put a [poster](#) together that got a lot of attention. At a session on Landscape Conservation Design, I did a presentation on conservation design at multiple scales that included a piece on the CT River Pilot. We also had some good discussions about moving across network of LCCs in conservation design, and specifically in linking up the designs from different LCCs. There were a lot of good questions and feedback about our process, how we deal with uncertainty, etc. Scott also gave a presentation on science products and science delivery, including the Pilot. Bill Labich presented on the "Wildlands and Woodlands" conservation design that Highstead is working on. There was a lot of attention paid to what's going on in the North Atlantic LCC. Chad Rittenhouse from UConn did a really nice presentation on looking across 4 conservation designs along the eastern portion of the country and has done a lot of thinking about how to tie these designs together.

Earlier this week we had a Steering Committee meeting. To summarize briefly, we still have strong support for continuing in conservation design, learning from the CT River, thinking about how we can apply that in other watersheds and across the region, as well as how we can deliver science to our partners.

BJ Richardson: I was involved with 2 presentations, mostly centered on Data Basin and data management, and used the Pilot as a project to highlight during those presentations, and there was a lot of interest.

Ken Elowe: You know I can't give up the opportunity to say a few words. One of the things I love about Andrew is that he's so steady and understated. But I want you to know that there are a ton of people watching what's happening in the CT River, and waiting for it to come together, and who are really excited about it. There isn't anyone else doing conservation design at the level of complexity and collaboration of your group. In fact, on a national call yesterday with my counterparts around the country, people were chomping at the bit to see what we come up with. The energy at the conference was amazing. Five years ago, you couldn't have that conference. But there were over 600 people there, and many rooms were standing-room only, including during Andrew and Scott's presentations on the North Atlantic LCC and the CT River Pilot.

Nancy McGarigal: We're going to adjust the agenda a bit and stay together instead of doing the afternoon breakout, for a couple of reasons. I've discussed this with the subteam leaders and this fits our agenda for today best. We'll still be taking a break around noon. So, subteam updates are next.

TERRESTRIAL SUBTEAM UPDATE (Randy Dettmers)

We had a conference call this past Monday and we are still wrestling with the question of how to scale core areas on the terrestrial side. We spent a good amount of time reviewing our options and really trying to figure out what is our best option to have well-distributed cores and maintain a good representation of those ecosystems that we wanted to up-weight and ensure are within core areas. What we're finding is that there is a lot of overlap amongst all of them, which is good, but we're trying to think about the distinctions between them and find the right balance. We're hoping to come to a final decision later today. We're circling around towards 3 options, although that may be adjusted by what Jeff is going to describe based on a conversation with had yesterday with State folks about rare communities. In general, we've focused on HUC8 scaled option, which gives us the best distribution. But, it messes with some of the weights that we set. So we're also looking at the hybrid option, which is roughly an average between the full watershed scaling and the HUC8 scaling. The last option represents an adjustment to the weighting in which we add weight to Central Oak-Pine forest. We did a straw poll of those on the call and there wasn't a clear winner. There was some level of preference for the last scenario described, a fair amount of support for the hybrid, and the least support for the HUC8 scale.

Jeff Horan – Update on Rare/Natural Communities

Some of the scaling related issues really come down to a couple of other decisions that we have to make. As some of you remember, there was a lack of connectivity across the watershed, particularly around aquatic areas. We had a meeting to look at floodplains. To oversimplify a bit, the areas along the CT are highly developed, so they were essentially masked from become core areas. We found a spatial data layer that correlates closely with a 100-year floodplain. The group strongly recommended that we incorporate that map in the core selection index.

Ken Elowe: Is that dataset available regionwide or just in the CT watershed?

Jeff Horan: I think it is only available in the CT, but I think the approach can be reproduced. Ground-truthing was involved in creating this dataset. It does include developed and agricultural land, which is masked out by the other analysis.

Kim Lutz: I can clarify that a bit. Our technique was developed by Mark Anderson and has been applied for the whole region. The ground-truthing is only complete in the CT.

Ken Elowe: The context of my question is whether we can use this approach at a regional scale.

Bill Labich: Just very quickly, to make an analogy to zoning, there is system-level zoning and spot zoning. I wonder if there are other situations where we take an ecosystem favored by a particular partner, that we then recognize is important, and include that in the core. And could that be part of the model?

Jeff Horan: I think we are. That provides a nice segue into our conservation from yesterday about rare communities. We have this data from all 13 states, and it's similar, but it's not exactly the same. And there are different restrictions in each state on how that data is used.

Ken Elowe: I don't want to imply that we shouldn't use the best available information. It's just a question of the separation of how to provide that data. Should we keep the design general, and add in specific local data layers later? I don't want to hinder our ability to use the modeling foundation at the regional scale.

Jeff Horan: As much as we try to make all of these datasets consistent, local concerns sometimes trump what seems best for the region. We try to be flexible in those cases and allow for some local modification, and remedy changes that we can. We had the same conversation on natural communities yesterday. Jenny, Emily, Eric, Dave, Randy, Scott, Nancy, Lori, and myself were all there. We were trying to understand the implications of including the rare communities in the core selection index vs. having it as an ad-hoc layer. Our last decision was to do the former. But the result of that was that the rare community areas showed up as very obvious polygons on the map. Showing this would violate our agreements with some states not to disclose the location of rare areas. As a result, we've decided to include the rare species data in the selection index in order to hide them somewhat within core areas. The upshot of this is to add in more core areas. We've gone from 577 to 800 core areas. We tried increasing the minimum core area size, but it didn't greatly decrease the total number of cores.

AQUATICS SUBTEAM UPDATE (Andrew Maclachlan)

Our subteam has made most of the decisions we need to make for this phase of the design. We decided to scale our selection index by the watershed in order to maintain the regional context of this conservation design. A lot of our partners already have a local conservation plan, so by using this scale we focus on what we believe is a new approach, this larger landscape approach. We didn't see any negatives from using this approach. We're also using the 25% of area in cores. We've been working on the species-based approach. We don't really have any modeling materials for this, unlike the terrestrial team. We've put together some expert opinion on anadromous fishes. Including this leads to a nice connectivity corridor up the main stem of the CT and upstream into some tributaries. We've also been working with Brook Trout, using the data from Ben Letcher and his group. There are some things we're doing in the aquatic realm that are new. Initially they were struggles, but we see them more importantly as opportunities.

Dave Perkins: I want to thank Andrew for keeping this team moving forward and making decisions. One thing I wanted to touch on was setting species population objectives. It's interesting to look at the iconic, keystone species of brook trout. It's not simple or easy or straightforward to set these objectives. If you ask the states how many brook trout populations they have, they'll give you an answer, but they all have different perspectives on what exactly is a population. The Joint Venture is classifying them in 4 ways: destination fisheries, local populations, ecological populations (little connection to the public), and winkers (population on the verge, that come and go). On top of all that you have the complexity of stocked vs. unstocked populations, which challenges our assumptions about which areas would

maintain populations in the absence of stocking, and may be affected genetically by the stocking. The final variable is that the conservation measures that Connecticut may take don't necessarily affect the populations in Vermont, so it's different from managing migratory birds, for example. So we instead focused on habitat, suitability, resilience, looking for "the best of the best," etc.

Ken Elowe: It sounds like your objective is distribution. No? Then how do you know where you want to maintain brook trout?

Dave Perkins: What we've tried to do is identify the best of the best habitat. So we've identified the best 25% of brook trout habitat potential that's there. Brook trout have lost 90% of their historical habitat. So folks in VT preserve all habitats with current brook trout.

Ken Elowe: But you've described an objective as not to lose brook trout where they are now. And I think it's important to describe it that way. I think it's critical to articulate the outcome that way: "No loss of brook trout where they are right now." If you state it that way it can help describe what you're trying to achieve to others.

Dave Perkins: I think we thought it would be valuable to help managers identify the best areas on a habitat/watershed scale. It doesn't mean that other areas aren't valuable. There is still a lot of work being done to identify the status, history, and other information about different brook trout populations across the watershed, especially as part of the Joint Venture.

Bill Labich: If only 10% of the habitat is left, are you looking at other representative species that will still be using aquatic habitat if the brook trout disappears from other streams?

Dave Perkins: We've thought about that and talked about it, but we didn't come up with a better solution than what we're doing now.

John Warner: The way we looked at it was that without any data for any other species, we could use them as representative species. To get at that part of it, we're relying on the ecosystem-based approach. In the future, if there are more habitat models and assessments developed for aquatic species, we could incorporate it.

Ken Elowe: Just to wrap up. It seems to me that you're dancing around an objective that you have not explicitly stated. When I talk to Bill Hyatt, he says he doesn't want to lose any brook trout. And people in VT say the same thing. Wherever our brook trout models indicate we can continue to support them, then you can prioritize among those areas. I think what you're saying is that we don't want to lose any brook trout, but we're going to prioritize their habitat.

Dave Perkins: Yes, that's close, but we haven't yet got the data that would allow us to do the prioritization the way you're describing it.

CONSERVATION DESIGN SCENARIOS (Kevin McGarigal)

The first part of the presentation focuses on the package associated with the species-based approach. After that, we'll compare the species- and ecosystem-based approaches look like. Please keep in mind what we want to use for our final design. We can distribute and describe just one package, or a couple of the options that exist separately, and we could make 2 or 3 options available.

Slide 4 Review of what kinds of information are incorporated into the core area selection index

Part One: Terrestrial Cores (Species-Based Approach)

Slide 5 Review of key decisions for the terrestrial cores

Slide 6 Optimization involves progressively creating core areas in the CT river watershed. Described more extensively in the [September meeting](#). The graph on the left shows our progression towards meeting the target of landscape capability units for each species. Recall that each species was weighted and the design involves assigning a target that reflects what portion of the total landscape capability available in the watershed for a given species. The vertical dashed bar represents the solution at which 25% of the landscape is in core areas.

Patrick Comins: Isn't there a bit of a northern bias in the species we've chosen? The only one I see is Louisiana Waterthrush, which is tied to streams. But several of the others, such as black bear, moose, etc. have a northern bias.

Kevin McGarigal: You are right, I think, that there is a bias in the representative species toward northern distributions. Also, we're using the CT River scaling. We haven't imposed a distribution like the HUC8 scaling. Here we took the place that was going to meet all the species' targets the best first. The cores are concentrated and larger in the north because the land up there meets more species' needs. We do see well-distributed cores in this approach, but they are small.

Patrick Comins: I just wonder how different it would look if there were additional representative species.

Kevin McGarigal: This is the issue with representative species. We're only using 14, which clearly do not capture all of the species of interest. If we used 30 species, perhaps we'd get better distribution.

Ken Elowe: Just to clarify, when you say target, what do you mean?

Kevin McGarigal: Each species has a total landscape potential, which we calculate by summing landscape capability across the watershed. The initial target for each representative species was 50% of that potential. Then a weighting system was applied to bring that percentage up or down. The ranges go from 40-85%. This 40-85% of landscape capability is the target to which we're referring.

Ken Elowe: We need to keep being clear about articulating the difference between what we need to meet our goals vs. how we're going to be strategic about it. It's a critical piece for discussions with the public.

Slide 6 (animation, continued) Shows top 20%, 20-40%, etc. The graph at left has the same curves, but the vertical line moves.

Slide 7 100% of the targets. This occupies 48% of the landscape.

Slide 8 If you study this slide, you see that the species approach often overlays areas with high IEI, but in some cases, such as the smaller core in the center, the species approach is capturing habitat of some species that would not have been highlighted with the IEI.

Slide 9 We've tried to show here a prioritization of cores based on the order in which they were created during the optimization. It's not a true gradient since it's categorical, but it represents a sort of tiering system.

Slide 10-13 Illustrates how small cores are created to pick up good habitat for particular species. I see these as some of the most important products to come out of this process – the cores overlaid on the continuous and seamless gradient maps.

Slide 14-15 Vulnerability to development. This map highlights areas with high conductivity (modeled ecological flow) *and* a high probability of future development.

Bill Labich: In terms of the large core in the center, can we assume that because that core is there that the roads aren't developed nearby, or that the development is unlikely?

Kevin McGarigal: Already-developed areas are transparent on this map. These are areas that our model indicates are likely to be developed.

Slide 16 In this map, core areas are displayed as nodes. We also looked at the links among them, and created a network. We then calculated the importance of each core area based on the relative importance of each core area. This was based on removing nodes one by one to see how much their disappearance affected the connectivity of the entire network. This takes into account actual size, IEI values in the core, proximity to other nodes, and connectivity between nodes.

Patrick Comins: Does this take into account protected areas? It looks like a lot of the blue cores are on protected land.

Kevin McGarigal: In the early stages of this project we decided not to include information about secured lands. We're only using it after the analysis as an overlay.

Patrick Comins: I'm concerned that someone could look at this and say "our job is done," and redirect focus to other parts of the country.

Kevin McGarigal: It would be interesting to take these cores and adjust their importance index based on whether they are already secured. That's a slightly different question; this is focused on the importance of the nodes ecologically, rather than the vulnerability of the nodes. We'll give some thought to that; it's an interesting point.

Catherine Doyle-Capitman: How is high probability of development determined?

Kevin McGarigal: It's based on a very complicated urban growth model that has been in development for a couple of years. That model is based on statistical amounts of historic growth and patterns projected into the future based on county-wide growth. I think if I go into more detail I might confuse more than clarify.

Slide 17 This is another potential product as part of the packaged design.

Slide 18 We can also describe core area composition. We could do this on a core-by-core basis. Later I'll show you the composition of the full network. The box in the lower left describes Core 72, the large one in the center, and the importance of that core area in terms of macrogroups. It's not showing the proportion of land in the macrogroup within the core, but rather how important that core is.

There was some confusion about this slide. **Scott Schwenk** summarized it by saying: Just to clarify, one simple alternative would be to say that this core area is 5% Northern Peatland and Fens, but that's *not* what you've done here.

Kevin McGarigal: Yes, this is actually an importance index, which is very different from the percent breaking out by macrogroup. We can provide that, and talk about other ways to create an importance index, if people are interested.

Georgia Basso: Two questions. Would it be worthwhile to look at the distribution of the representative species to see if we are skewed, and to consider adding a southern-skewed species? Especially if we're already skewed towards the north for other reasons, like intactness.

Kevin McGarigal: You've hit on a real issue of choosing a limited set of species. There's no way to choose a completely unbiased set of species. These representative species were chosen to represent the range of habitats, as well as those species for which the CT has a high responsibility for. There's also the practical issue of limited time and money. I don't think this is an issue that is part of the scope of this project to tackle.

Georgia Basso: The second part is about use. Looking at the connectivity model, do we have a local connectivity model? How do managers at the local level apply this tool if there aren't opportunities for connections?

Kevin McGarigal: The short answer is yes, there is both local and regional connectivity. It is an independent, standalone product that you can use to make decisions. The regional connectivity is the one based on the core area network.

Ken Elowe: We talked a lot about this topic at the Steering Committee meeting. They really wanted to make sure that we define things at the scale at which money is spent.

Kevin McGarigal: Yes, we plan to provide a suite of products that will allow managers at varying scales to make decisions that are informed by the context of other scales.

Bill Labich: My comment is that more information is better. So all the products that you've showed so far look fantastic. I'm thinking about implementation at the local scale, and thinking about our experience incorporating the TNC resiliency data into a biodiversity conservation planning process. There was hesitancy about whether to incorporate data, but in the end they wanted to include information about the importance of a given area to the region or ecoregion as a whole. So my question is whether the selection index is scaled to the watershed? If Core 72 is representing 22% of that macrogroup, if we change the scaling then does that mess up our numbers?

Kevin McGarigal: It doesn't mess it up; it just changes it, and will certainly change those numbers.

Bill Labich: So then this is important, because what you're showing now is pretty straightforward. But under a hybrid scaling approach, or something more complicated than that, then using this figure, and explaining what that percentage means, will be difficult. I'm afraid I'm going to lose people if a figure like the one on the slide is any more complicated to explain than it already is.

Jeff Horan: When you laid out what the scenario was, you indicated that no rare species were included. But the terrestrial team agreed to include a few rare species; we just don't have the data for it yet. There are a lot of priority New England cottontail areas in the southern half of the watershed. That is one species that will be captured - that is a different approach in the species approach. If we included that in the core selection index, it would create some more cores in areas that Patrick and Georgia are thinking about.

Kevin McGarigal: In this iteration of the approach, the rare species, including cottontail, are being treated as overlays. They are not used to generate cores.

Slide 19 Shows an importance index for several species of that same core. It's big, heterogeneous, and has a lot of good habitat for a lot of species.

Slide 20-21 Showing the species habitat capability maps in the same area. Note the species targeted by each core area differs spatially.

Slide 22-24 Top chart is for Core 388; bottom chart is for Core 400. I'll also point out that these cores are fragmented, on purpose, because of roads that are present. But they are very close to one another, and you could think of these as one larger core.

PART TWO: AQUATIC CORES

Slide 25 Review of decisions made

Slide 26 Brook trout probability of occurrence model based on current conditions and at the catchment scale (larger than terrestrial 30mx30m scale). Rivers include distribution of these species (not preference). Conveniently, brook trout are pretty well distributed north-south.

Slide 27 We provide ecological integrity gradients for aquatics too – this slide is specific to brook trout.

Jeff Horan: So are you saying that instream habitat has been evaluated?

Kevin McGarigal: No. What's depicted here for streams is IEI and the stream temperature sensitivity – they are not combined.

Slide 28 This shows the same IEI, but for anadromous fish instead of brook trout. This is another way of providing a gradient of information for the cores.

Ken Elowe: The Millers river shows up here as darker than the mainstem. Is that a function of it being free-flowing instead of impounded.

Kevin McGarigal: I can't say for sure, but that makes perfect sense.

Slide 29-30 The aquatics cores are buffered, but the buffer is a zone of influence, rather than a buffer that could be considered part of the core. The zone of influence is the terrestrial area around the cores, graded from 0 to 1. What this slide shows is that a huge proportion of the CT watershed is covered by the zone of influence around our cores that represent 25% of the aquascape.

Andrew Maclachlan: I want to address Georgia's question about decision points. I think this is one of those sets of products. The zone of influence map shows where your terrestrial decisions have the most influence on important streams. Where do we impact streams the most?

Slide 31 We still need to decide how to describe the composition and importance of the cores.

Ken Elowe: Is the question you're posing modified by the buffer and its role as an influence on these areas? I'm trying to think about how you would use this information on the ground.

PART THREE: CONNECTORS

Slide 32 overview slide – for more details on how all these maps are created, you can view the webinar on connectivity from September, or read the notes and look at the presentation PDF. [All are available on the LCC Website.](#)

Slide 33 You have higher conductance when you're near a large, good node (nodes in blue). We are still focused on the species scenarios. The gaps you see are the reality of having core areas in a highly resistant (developed, fragmented) landscape.

Slide 34 We need to consider how best to present this. Right now we're looking at the raw result, but we could smooth it.

Bill Labich: It's about presentation *and* interpretation. I'm looking at the far right corner and all the red between those cores. I wonder if I were to work with a land trust there, how would we interpret what would be important to do. Looking at the red, in my mind I want to know how much of the connectivity we need to conserve. Do I have to protect all the red, or is there a way to display importance?

Kevin McGarigal: That's a great question without an easy answer. I can clarify one thing, which is that this product shows you where the flow is occurring, and how much. What it doesn't show you is how critical is any one place in that corridor – vulnerability. In theory we could calculate what happens if you

develop a given area, but it's a huge computational challenge. We've done it before – we've done it for Massachusetts – but it's outside the scope of the current project. If we decide that it's very important, we could do that in a future face. But on that note...

Slide 35-36 ...irreplaceability gets at part of this. Where you have broad swaths connecting things, you get less irreplaceability. But I think what you really want is critical linkages. This disregards where you are likely to go. But it says, if you could go anywhere, where would you go, even if it's really far away and the conductance probability is 0.

Bill Labich: We've talked about an implementation phase. If there is a future phase, maybe we should include that.

Scott Schwenk: To clarify, even with the species core areas, the conductance is not referring to them, but rather to the ecosystem core areas.

Kevin McGarigal: Yes. If we agree that the habitats represent what the species need, it should be fine. If we were to do this the best way, we would want to do conductance for each species, and build unique connectivity models. If we did that, we'd get 14 connectivity results, which we would then have to figure out how to combine them. I think we should do this down the road, but we're not doing it in this phase of the work.

Eric Sorenson: What does land-based connectivity mean when the species are mostly birds?

Kevin McGarigal: This conductance isn't pertaining to birds per se. It's referring to the ecological similarity between the cores in the biological settings variables that define the environment. I'm not arguing that birds are equally sensitive the landscape resistance, but they *are* sensitive to some degree.

Bill Labich: I know we're talking about birds, but they are representative species for animals from other taxa. So this isn't saying that this only relates to birds, it's the ecosystems that birds and a lot of other animals use, and the connectivity between those ecosystems.

Slide 37-38 Vulnerability. This integrates how likely it is that I can get to a place, if it's the only place I can go, and whether it's likely to be developed in the future. We're also showing local vulnerability within the cores. Places that are red have high flow, but also a higher probability of development.

Slides 39-40 Here we've prioritized the links similarly to how we prioritized the nodes (core areas). These maps don't show all the links, just the most important ones, which are then ranked within themselves. This is another dataset that we can decide to include as part of the package or not.

Emily Preston: So these are based on a least-cost pathway?

Kevin McGarigal: They're based on random low-cost paths. It picks one single route.

Emily Preston: But it's weighted toward shortest distance?

Kevin McGarigal: Conductance is, but irreplaceability is not. There's also a threshold distance.

PART FOUR: RESTORATION AND MANAGEMENT

Slide 41 – overview of what is in the current, funded scope of work

Slide 42 Measuring change in aquatic connectivity, which is a metric developed by UMass. This is one of the metrics that goes into IEI. We look at the change in aquatic connectedness associated with removing a dam (which has a passability score). Also incorporates where the surrounding area in the aquatic environment has high ecological integrity. We theorize that if an area has poor integrity anyway, then removing a dam won't help that much. The intent of this map is not to be the only source for deciding where to remove dams.

Scott Schwenk: TNC has also done some dam removal prioritization. I think the approach they've taken is an anadromous fish perspective, so you might start lower in a stream system, rather than starting near headwaters. Could this take more of an anadromous fish perspective, or do you have any thoughts on this?

Kevin McGarigal: Yes, it could, and it currently does not. I think this algorithm would have to be modified substantially in order to do this, because it's based on local connectivity rather than anadromous (ocean-freshwater) connectivity.

Dave Perkins: I think that's what's really cool about it. We feel confident about our knowledge of anadromous fish needs, but this could bring attention elsewhere.

Bill Labich: Do you have a way to identify the use of the dam? Such as whether it's a drinking water supply reservoir?

Kevin McGarigal: That's be great. This is not our datasource. I think it originates from our TNC dam database. I don't think we did any attribution work – just spatial work to attach the dams to actual streams.

Kim Lutz: I was going to comment that those attributes do exist, so if we wanted to provide that information then it is in the TNC layer.

Kevin McGarigal: Great. It does sound like more of a post-hoc thing. It wouldn't affect the results, but it would affect how we interpreted or used them. Maybe we don't want to show it as a target if it's a public water supply.

Slide 43 Culvert upgrades – 27000+! We used the field-based data when we had it. Currently that data exists for 10% of the dataset, and we'll continue to update these as culvert survey work continues. The rest are modeled.

Dave Perkins: Do we have a sense of how accurate or how good the modeling is at predicting the bridges?

Ethan Plunkett: I think the bridges are usually classified correctly – around 80%. It's really beyond that where it really deteriorates. The R^2 on the model as a whole was 0.3, but this was predicting terrestrial passability, aquatic passability, and whether or not it was a bridge. So the noise isn't due to bridges.

Slide 44 Terrestrial analogue to culvert improvement. No one has pointed it out yet, but there are limitations to this. We can only point out the difference in terms of removing one barrier at a time. Optimizing clusters of actions is extremely computationally challenging.

Slide 45 We don't plan on developing an algorithm to optimize this during the current phase of work. But, we can use the existing products to think about management. For example, we know that Central Oak-Pine and Prairie warbler habitat evolved with fire, and we can point to this to recommend certain core have, for example, prescribed fire actions. But it's not a model-based approach. It's using the compositional analysis and then logically determining what management should be done.

PART FIVE: CONSERVATION OVERLAYS

Slide 46 Overview slide.

Slide 47 One option. If it's an overlay, you have time to think about it. If it's going to be incorporated, then we need to know now.

Bill Labich: What are the downsides of including it as overlay? Jeff was talking about natural heritage areas. (rare ecosystems) For proponents of these rare species, what are the negatives of the overlay approach?

Kevin McGarigal: The implication is that if it's an overlay, then it is what it is. It doesn't interact with the other layers. If it's incorporated into the core-building process, then it will gain cores. Sometimes they'll grow only to that edge boundary, and sometimes it will encompass other types.

Bill Labich: If it's detachable, is that a place where people could lose funding?

Emily Preston: The issue we've had with overlays is that they may depict locations on the ground of rare species in a way that in New Hampshire – we have really tight regulations – we have to find a way to disguise these sites. This is both to protect the plants and animals that might be targeted for harvest, and to appease landowners who do not like having information on a map that relates to their land. So we need to fuzz out the data, to say this is an important natural area, and not say that it's great habitat for species X or Y.

Kevin McGarigal. If it doesn't need to be represented in the core, then an overlay is simple and straightforward. Then the question is how much do we need to smooth it? We could use our core area algorithm to disguise these area. I don't see that as a problem.

Emily Preston: The advantage to the overlay is that we do discover new information from it. And we could update it later. We just have to make sure our state is okay with the decision that is made.

Dave Perkins: I'm not a cottontail guy, but wouldn't the cottontail people want to know all the same questions and answers for the cottontail algorithm.

Kevin McGarigal: If I were really interested in cottontail, then I would build a landscape capability model and then treat it like the other species.

Chad Rittenhouse: The cottontail is tricky because it has a lot of what I would call intrinsic habitat elements. The main one I would say is somewhat easy to map is the early seral. We've done that for CT. But that's the trick – with respect to forest, it's forest that is <20 years of age, and that requires active management. I see challenges in trying to do the New England cottontail. There are also wetland edges, fields transitioning into forest, or certain invasive species. If anyone has those data it would be helpful to creating a landscape capability model.

Jeff Horan: The terrestrial team chose representative species and natural communities purposefully. The thought was that these areas were underrepresented, even based on the representative species we had at that time. These are different and we're treating them differently, but I would prefer that they be treated more similarly, and I would prefer that they be integrated into the IEI. We want connections across the landscape for them. And we're not going to develop models for any of these. The other implication is that we get 245 more cores if we incorporate the natural communities. So there are definitely implications.

Kevin McGarigal: Just to remind you all, the species-based approach and ecosystem-based approaches are very different. The species approach gets weird when we put a bunch of "1s" and a binary system into the mix.

Mitch Hartley: These are the only 3 rare species we're going to integrate? Do we know what % of the landscape is made up of this?

Kevin McGarigal: Less than 2%, maybe only 1%.

Mitch Hartley: I don't see why we would try to integrate, both for the structural and mechanical reasons you describe, and because it won't have a huge impact on the landscape. We're incorporating it for the people who care about every little pixel on the landscape.

Georgia Basso: Weren't there a bunch of rare plant communities we decided to integrate?

Kevin McGarigal: They are integrated in the ecosystem-based approach.

Georgia Basso: Why don't we just mitigate the risk of harm to rare communities by not giving out the data at a scale where people can use it to harm the rare communities? We could hold the rest back and only allowing certain people to see where the rare communities actually are.

Kevin McGarigal: That works for any maps that are distributed, but not necessarily for GIS layers.

Emily Preston: By the terms of our data sharing agreement, we just can't display that data at all.

Slides 48-70 were focused on a comparison of the ecosystem- and species-based approaches. We did not have time to discuss these slides, and instead focused the remainder of the meeting on a small terrestrial subgroup meeting focused on what to do about rare natural communities and the scaling question.

RARE COMMUNITIES DECISION/DISCUSSION

As we've discussed, including rare communities moves us in a more/smaller cores direction, although we would maintain a minimum size restriction on core areas of 10 acres. But our challenge is that we can't display the rare communities in an identifiable way per certain data sharing agreements.

Bill Labich: When we do that do we see a greater extension of cores to the central and southern part of the watershed?

Mitch Hartley: What percent of the landscape is in rare communities?

Kevin McGarigal: 2%. Actually less, since that includes floodplains.

Jenny Dickson: One quick comment. Looking at the increase in the number of core areas and then what we'd have to do in terms of changing the minimum size areas might negate what we'd get from incorporating the rare areas in the first place. Coming from a highly urbanized state, that's a huge part of the core areas. So I think it'd be better to do it as overlays.

Nancy McGarigal: I'm looking at Kevin. Emily said by putting them in the core they'd be masked, but you have a way to mask them as well.

Kevin McGarigal: If they're in a core, you wouldn't "know" it was a rare community. But it'll be obvious in about half the cases anyway, even with a buffer of a core area. We would still have to decide how much you want to mask, because a lot of times the barrier is highly developed.

Scott Schwenk: Just to clarify, we can keep a smaller size threshold, but then we have a couple hundred more cores. So it's a tradeoff.

Eric Sorenson: The other thought is that it's easier to work with a fewer/larger core based design, but there is definitely a trade-off in not including small cores that might have greater species diversity.

Kim Lutz: I thought that floodplains were being treated separate from rare communities, but now I'm not clear.

Randy Dettmers: Floodplains will be incorporated into core selection regardless.

BJ Richardson: What is the goal for incorporating the rare natural communities?

Eric Sorenson: My view is that if you don't incorporate them then they're not part of the connectivity design, and then they're an add-on, and easier to leave out of the bigger picture.

Randy Dettmers: Are they core areas by definition? If they don't show up in the cores based on our definition and the algorithm used, then are they cores?

Eric Sorenson: We're deciding on that. Core areas can be big or small, but they should include areas of high biodiversity.

Randy Dettmers: Is it diversity or integrity?

Eric Sorenson: Diversity. Many areas with low ecological integrity have high diversity, and we're including them. At this point, Ken brought up the issue of data consistency for the northeast scale. Kim said the floodplain data is available, but it hasn't been verified. But the natural heritage data exists throughout the 14 states.

Jeff Horan: I want to remind folks. We decided to look at macrogroups, but that caused us to lose sight of the rare natural communities, which is why we decided to add it back in. So it was objective-based.

Kevin McGarigal: I'm trying to understand whether the main concern is whether we will have too many cores. I wonder if we can't agree to get over that and be okay with having additional small cores. If we did that, those who feel including them is important will be okay. There's nothing inherently wrong with more cores. And we can define cores as areas of high integrity and biodiversity, if that's what the group thinks is important.

Randy Dettmers: In order to be in compliance with our legal restrictions, incorporating the rare communities into core areas may be our best option at this point.

Ethan Plunkett: If we wanted to include all the rare species, we could do what we did for the combined run, and basically underlie it. So we could lock it in as our target. So we would have consistency still between ecosystems and species.

Jenny Dickson: My lingering issue is the unresolved nature of what a core area is. If we change the definitions, then we lose some of what we decided we were interested in. And while we're on the subject, I'd be hesitant to include rare species information because it changes so frequently. I think you'd be very challenged to maintain currency on the mapping, and people would complain that the map is inaccurate. I'm worried that we'll have too many areas so we'll lose the perspective. The little cores might not be bad at a local level, but it doesn't seem helpful at the regional or landscape context. Does that noise impact what you're ultimately trying to do with a higher level conservation planning exercise?

Rachel Cliche: I agree.

Emily Preston: This is an important point. We keep going back and forth. I almost want to disregard the 3 species we were thinking about. And maybe we should increase the minimum size.

Dave Perkins: I think with more small cores then you are better able to address opportunity.

Mitch Hartley: I think Jenny clearly articulated an issue with this, which is that core areas become some hybrid of ecological integrity OR rare/natural communities. If you take that to the "so what?" question – why are we doing large landscape conservation? Maybe it's cynical, but who's trying to protect integrity

right now? Protecting rare species is messier, but I think it's worthwhile. I think it will be more likely to be more practically conservation based.

Kevin McGarigal: I have another perspective to offer. I am calling it the "M&M Cookie" approach. Regardless of what we do, we're making a fragmented set of cores. You have to have and think about the matrix between them. So you get stuff like the very last slide. The reality of working with high resolution data is that we're going to get a fragmented network. Maybe one way to resolve the idea of thinking about large areas is to think about core areas as M&Ms in a cookie. It's the whole cookie that matters. What we could do is take this core area solution and the connectivity solution, and somehow delineate these cookies. They could be bounded by highways, or not. But if we wanted to think about an area that's really important to lots of different colored M&Ms (ecosystems, species), maybe we need to bound these macro-assemblages. The core areas are not reserves; they're pieces of a broader picture.

Rachel Cliche: I agree with Jenny, but I think what Kevin just explained, it works for me now. It makes me feel better. I worry that we're losing the integrity of the cores, but this other approach sounds good.

Bill Labich: I would say that additional smaller cores are fine. I'm looking at this last slide, and I think this is exactly what the people in the field want. They want to see these small cores, and use that to represent a particular parcel and describe its importance in a larger context. So I think this is great.

Nancy McGarigal: Jenny, you said that the species may change very quickly. Do ecosystems have a similar issue?

Jenny Dickson: No, we can do that. My concern is changing what a core area signifies. But if we step further back, to the ecosystem objectives, it seems that the M&M cookie approach meets all those objectives. We perhaps need to go back to the overarching objectives instead of the interim objectives.

Randy Dettmers: I'm beginning to hear some consensus around incorporating rare communities into the selection.

Patrick Comins: I would just hate to see forests be broken down into such small areas that they are not useful for forest species and communities.

Randy Dettmers: I do think adding the Oak-Pine forest weighting will help with that, and so will the M&M cookie approach.

Kevin McGarigal: Remember, we decided that developed areas and major roads are barriers to cores. As long as that is true, then the southern cores will be smaller. So the M&M cookie approach should show you larger areas of forest.

Patrick Comins: I wonder if forest cover at the landscape scale, say 1-km, may be worth looking at. Instead of looking at pure blocks, look at what percentage of the landscape at the 1-km scale is forested. That can give an idea of the degree of fragmentation. Is it forest laced with fragmenting features like roads, or is it fragmented by large development.

Kevin McGarigal: Those are all incorporated into the metric that goes into IEI, which creates cores in the ecosystem based approach. Given that integrity index, which accounts for those things, we're still not spreading across secondary roads. As long as that is a rule, you're not going to get big cores. There are just too many roads. Even when you force the distribution down there, such as with the HUC8 approach, you get more small cores in the southern section, not larger ones.

Eric Sorenson: I just wanted to thank Kevin for making cookies last night and coming up with this analysis. I think that cookie analogy helps get to the other thing that FWS is working on, which is identifying RCOAs.

Randy Dettmers: I think we can keep the rare species in on the ecosystem side, and out on the species side. So let's move on to scaling. Given those decisions, are people comfortable with maintaining a CT River scaling approach.

Emily Preston: This is Emily, I have to leave but I don't have strong feelings about this.

Patrick Comins: Should everyone see what the differences look like on the ground?

Kevin McGarigal: I just want to show people a couple more maps. One is the scale we mentioned before, and one is new – the TNC ecoregions, which Christian brought up. The ecoregions kind of gets the north-south and the east-west that Christian commented on in his email. The other one is HUC6, which the aquatics team considered. Sections were also suggested, but it also gives you a north-south and east-west set of breakpoints. Not to throw more confusion into the mix! To fill some of you in, Christian made some good points about the underlying geologic features that are present north-south and east-west in the CT river watershed.

Bill Labich: If we were to use the TNC ecoregions...before seeing the site I was thinking scenario 10 scaled to the watershed and increasing weight on the oak-pine – maybe that would increase cores in the south. If we scaled it by ecoregion, would that create a more equitable distribution of cores between the north and the south? How many other regions will be as linear and north-south as ours, though? And going to Kevin's question about how it might fit with others and why the sections may work or not work...maybe it doesn't matter. Maybe it just matters what the large landscape is that people are working at. If there's an inherent separation between ecosystems on one side of the line versus the other, and not taking into consideration that inherent difference, it's going to feel like something's not quite right to the people who will be implementing it, and working with the data.

Randy Dettmers: There are a couple ways of getting at that. Doing some stratification by ecoregion is one way. Using the TNC ecoregions will ensure a north-south distribution, but how many cores show up at the southernmost section is dependent on integrity, and it will probably be low. So we've also put weight on ecosystems that are most important. I do think that is an approach that's transferable elsewhere in the region.

Mitch Hartley: I've missed some of these meetings. I'm uncomfortable with us making decisions based on what we want to see. If we don't like that integrity is lower in the south, then we should scale things by HUC8.

Scott Schwenk: I'm not sure it's quite that dramatic a difference. Early on we decided that Alpine areas were important, so we upweighted them. Later on we realized we missed some southern forest types, so we're upweighting them. I think there is a biological basis for upweighting Central Oak-Pine.

Jeff Horan: I thought it was Mitch who said at one point that Boreal forests are common, but they're vulnerable, so let's upweight them. If we're trying to distribute cores through the watershed, then it makes some sense to include macrogroups in the southern forest that are habitat for species down there.

Randy Dettmers: It is true that the weighting process is more subjective than using an ecoregion approach, I guess. But to the extent that we've used weights, we've outlined the criteria that we used to justify weights. So the question comes back to should we use full watershed scaling with weights that include oak-pine forest, or do we want to use some other means of subdividing the watershed.

Patrick Comins: Has everyone seen those scenarios? 1, 3, and 10.

Randy Dettmers: I think so, because they're all available on Data Basin and we discussed them on Monday. Everyone has had the opportunity to.

Kevin McGarigal: I can offer a comment on the scales we originally offered. We know that distribution is an ecological consideration, not just a political consideration. So we had a goal of distribution. This is also to protect against our uncertainty in future change and condition. The ecoregions display hard lines that don't exist in reality. Also, by scaling by macrogroups you're implicitly scaling by ecoregion. So we came up with HUC8s in an attempt to choose something that we liked the size of, that were distributed north-south-east-west. It did what Ethan wanted to do with square moving windows, but in more of an intuitive way.

Patrick Comins: My concern is not political, but rather that the differing bird regions here should be represented because they represent different ecologies.

Kevin McGarigal: Good distribution is just as important as the best within the CT River given future uncertainty.

Scott Schwenk; I think everyone has agreed that there should be some consideration of scaling. So the CT River is a HUC4. You could use a finer scale like HUC6, HUC8, or the section. My concern with HUC8 is that it seems too small, in that you tend to force everything from low to high integrity and it goes against some of the other goals we have.

Kevin McGarigal: There is also the HUC6.

Scott Schwenk: There is also the matter of consistency with the aquatic approach and with the species approach. We don't *have* to be consistent, but it has merits.

Bill Labich: I feel like we're scaling to the whole watershed in order to translate this to other areas. If we have to use the whole watershed scale and then use something else to take care of the weighting issue...I think that's sketchier than scaling it to HUC6.

Patrick Comins: Unless there is a good reason for upweighting an ecosystem.

Bill Labich: Are we just saying: here's the model. Pick your region, and depending on the outcomes, you might consider upweighting a particular ecosystem that you don't feel like is well-represented.

Randy Dettmers: I'm getting the sense that some sort of intermediate approach between the full watershed and the HUC8 is needed. Either TNC ecoregions or HUC6 would be an intermediate approach.

Patrick Comins: Or BCRs if you were looking at a larger ecoregion.

Kim Lutz: I wish I had Christian's email in front of me. I'm thinking of a point Kevin made about the TNC ecoregions, which are based on Bailey's, but I think they're consistent across the whole US. They play out in terms of ecological communities. HUCs are crossed all the time, but the ecoregions are different plant communities. So I'll vote for Christian's suggestion.

Kevin McGarigal: The reality is that there will be lines on the map regardless of what we choose. And in some of the products, you will start to see those lines. You can't avoid it, which is why Ethan wanted to do the moving window, but it's not worth trying to explain it. SO you have to choose a boundary that achieves your distribution goal, along with other things, and you have to choose it and then live with the results. HUC6 distribution will bias against the lower part.

Patrick Comins: Either the HUC6 or the ecoregion would be better in my view.

Kevin McGarigal: But remember that ecoregions are implicitly included in the IEI. So what's left is to achieve a spatial distribution. So the HUCs, because they are smaller, are all about geographic distribution. The ecoregions stuff will still play out because the systems are mapped by ecoregion and you're getting representatives from each ecosystem.

Jenny Dickson: I vote HUCs. I don't care if it's 6 or 8.

Bill Labich: I vote HUCs. I'd rather have 8, but I'll take 6.

Pete Murdoch: I don't have a strong opinion. Having a CT scale makes sense to me, but I would be inclined in using multiple maps in my interpretation at different scales. Each option is one representation. My biggest concern on all of this is that the model is a terrific tool, but it's highly complex and I do not see this being used effectively by people who are not highly skilled in the use of the model. I think we'll have to have the ecologists and modelers sitting down with resource managers to help them make decisions. I fear dumbing it down because there's just too much depth to it. But that's a separate issue. I think the user interface is 2 people: one resource manager and one modeler.

Kim Lutz: Christian and I vote ecoregions, but we won't fall on our sword about this.

Patrick Comins: I don't think it makes much difference in this case, but thinking of expanding to the region, I think ecoregion makes the most sense.

Rachel Cliche: Ecoregions makes sense to me thinking beyond the CT watershed, but I can go either way.

Ethan Plunkett: I would like to personally say I like HUC6s. If we apply ecoregions somewhere else, there's a possibility that we won't have a nice division by ecoregion within the next planning area.

Bill Labich: One question I keep thinking about is what are the other pilot scales going to be. If we're just going to work our way through different watersheds, then I think we should stay in a HUC framework.

Kevin: What if you would apply it to the full northeast region?

Scott Schwenk: We've talked about that as a demonstration.

Bill Labich: In that case I would do it by ecoregion. And we do know that's coming, and we don't know what the other smaller landscape will be.

Nancy McGarigal: I don't know that future landscape will always be watershed-based.

Scott Schwenk: I think HUC6 would ensure a better distribution.

Jeff Horan: Are we talking about the ecosystem-based approach, or for ecosystem and species?

Kevin McGarigal: You tell me – we can do it for both.

Jeff Horan: I prefer species at the full watershed scale. If we get away from that, HUC8 is too homogeneous. I like ecoregions but I don't think they're as transferable to other areas, so at the moment I like HUC6.

Maritza Mallek: I'm pretty torn, because it seems like at the regional scale people feel ecoregions are the most appropriate, but once we're looking at a smaller landscape, most folks prefer the HUC6. And I don't know how to reconcile that issue.

Randy Dettmers: Maybe there isn't one answer for all the scales.

Pete Murdoch: That's what I was trying to say less clearly. It depends on the question we're asking. And I guarantee you that whatever we pick that a question will arise in the next couple of years that will demand that we do a different model.

Randy Dettmers: I'm hearing us gravitating toward HUC6 at this point.

[DECISIONS](#)

- Core area selection index for ecosystems will include tier 1 floodplains and rare/natural communities.
- Species includes rare species as an overlay.
- Tentative agreement that scaling for terrestrial species would also be at the HUC 6 level. Review of the product will determine whether we will stick with that.
- Kevin will talk to the aquatics subteam leaders to see if scaling at the HUC 6 level could work. All present felt that if we could be consistent in scaling that would be advantageous and most simplistic for roll-out and explaining.