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Participants in the broadcast held in April of 2006 were given a homework assignment. Module 8 includes the assignment and resulting discussion of the work submitted. The instructors are Mike Pelland, Jeff Herrick, Pat Shaver and Dave Pike.

The exercise had two options, option one was to develop a reference sheet for an area with which students were familiar, students were to complete the reference sheet for indicator 12 functional and structural groups, indicator 15 expected annual production, indicator 4 bare ground and indicator 2 presence of water flow patterns. Option two was to critique these same 4 indicators for an existing reference sheet. The homework was faxed to the National Training Center after the first days broadcast ended. The instructors presenting this material are Pat Shaver, Jeff Herrick, Dave Pike and Mike Pellant.

Want to start this review by going through some specific examples that we found and if we could go to the overhead we'll start just by going through a few of these examples and then we will talk about some general things that we found. All of these are going to be setup the same way. We'll start with indicator #2 which is presence of water flow patterns and then go to 4 and 12 and 15. This particular example was one that was sent in as a critique, what's on the screen now is what was written in the reference sheet that is being critiqued and you can read that and while you're looking at that I want to make some notes about some of the critique that was sent in with that water flow pattern indicator. It says it seemed

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as if we considered the discussion that took place about state and transition models, a good description of what could be expected in a specific event and you'll notice there that it says that following a heavy thunderstorm short sinuous discontinuous flow patterns would be apparent, more information and site documentation on what might be expected from moderate and extreme or extreme to total would be beneficial, remember that comment as we go through the rest of this section and the next section that we're going to talk about the evaluation Matrix. Indicator four bare ground, the critique says, this is a fairly straight forward and easily applied during field assessments and as we said yesterday when we went through the process of reference sheet development there is a reason we generally go to bare ground after we do the functional / structural group and that's because it generally is pretty fairly straight forward and easy to come up with some numbers. Indicator 12 is the functional / structural groups, this is the one that I started with and it says, it seems that if we considered the discussion that took place about state and transition models that this indicator could also include a nonnative group as to the perennial, the native perennial and annual forbs, and if you look at what's on the screen and the way that's written, it says, cool season, mid height native perennial bunchgrass, greater than mid and short height native perennial bunchgrass and the comment needs to be brought up here that as we mentioned yesterday origin is not a reason to develop a functional and structural group, the functional and structural groups are based on structure, height, rooting depth, above ground structure and then functional things that include photosynthetic pathways, timing of growth

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within that season, reproductive mode, those sorts of things and native or introduced has nothing to do with that function. In the reference sheet, while origin has nothing to do with function, in the reference sheet there should be no mention of origin and then the list of species that are included in that group there should also not be any exotic species listed in that group for the reference sheet as in the reference state all the plants that should be in that reference state or in the normal range of that variability should be native vegetation and not introduced, but, the group is not just a native functional group. When. Go ahead Jeff.

I was just going to ask Pat, does that mean that a nonnative species could in fact be part of a functional group in the reference state?

Yes, in the reference state it certainly might be, certainly we'll have nonnative plants that will occur within reference state. What we need to be very careful to do as we develop these reference groups or the functional and structural groups and the reference sheet is to deal with that natural range of variability that occurs, take the time to look at the state and transition model, discuss those dynamics that occur in that reference state and which of those are truly in that natural range of variability, which of those can we expect to be able to say this is what occurs on this site, this is what characterizes this site and this is how this site functions in its natural range of variability.

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So, what we're saying then is that, that in this particular indicator we're really just trying to capture those functional / structural groups and we deal with natives, non-natives, exotics and so forth in the invasive indicator?

Certainly, in the invasive plant indicator is where many of those exotic plants will be dealt with, particularly, those that are invasive, not all exotic introduced plants are invasive, but, those that are that's where they would be dealt with. The next example that I want to go over is one that started with a new reference sheet, or developed a new reference sheet I should say and here are some of the, if we'll go back to the overhead, here are some of the information that was provided on this development of this new reference sheet. Water flow patterns would be evident after high intensity storms, due to slope and soil structure very little water movement would occur, there is a little bit of dichotomy there, it says water flow patterns would be evident after high intensity storms and then it says due to slope and soil structure very little water movement would occur, there rarely needs to be usable by someone other than the author, there needs to be some transition here and a little greater explanation, it's a good example of dealing with some temporal variability, but, there needs to be some additional information in there on transition or to tie it together and not one statement contradict the other one. It talks about bare ground, says bare ground may range between 40 and 70% depending on available moisture and species composition and if a statement like that is going to be used, then, there needs to be further explanation on what affect species composition has on bare ground, what are

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they talking about here and to be sure that what they're talking about is still within that natural range of variability as expressed in the state and transition model. Functional / structural groups, this example listed species, dominant, alkali, sacaton, saltbush, subdominant, black Grama, javelina bush and then others listed bush muhly, plains bristle grass and ephedra. That really doesn't help at all when you go make an assessment assuming that those are the dominant and subdominant in the site description and that does reflect that species composition and dynamic, when you go make the assessment, how do you assess the functional and structural groups if those species aren't present, you need to not use species names, but, rather use functional and structural groups, put those species into a group that reflect how they react to capturing sunlight energy, how they react to moisture, how they react to other stressors and what their structure is, that way regardless of what the name of the species is when you go do the assessment you have a place to put it or you know that it's in fact is a new functional group to the site.

Thanks Dave. Do you have a question?

Yes, Pat.

I think one of the things we can remind people is that we can actually use that supplemental worksheet that we have for the structural and functional groups and people can turn to that particular portion of the appendix and actually fill out

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the list of species that goes along with that structural and functional group, so, we allow that to take place in that supplemental worksheet that is associated with structural and functional groups and that would be the place to put the list of species that goes along with them and then reminding them that when they're actually putting together the reference sheet that reference sheet should in fact talk about just the structural and functional groups.

Yes, this is something that we haven't looked at before, it's on page 79 and I'm going to zoom in on it now and just take a look at the different components. On the left side, we actually have the list of the functional / structural group names, for example, warm season brush grasses, we have no mistakes in the manual, but, occasionally come across one, warm season stoloniferous grasses, warm season narrow leaf bunchgrasses, Yucca was actually listed here as a functional / structural group. Okay, why did we do that? Well, in this case that was literally the only one in that system, however, it still would've been better to have given that a functional / structural group name since we don't know what other species might come into this system in the future. We then defined the potential and the actual, whether it's a dominant, subdominant or a minor component, the M or a trace species and again that corresponds fairly closely with our classes on the reference sheet and then there is a space to provide a species list for these functional / structural groups and that's where you can include that list of names and this just helps organize that information when you're going through an evaluation or helping to develop a reference sheet. Mike.

Yes, thanks, I think that's an important forum and one I would really encourage you to take a look at and use as you go through the five step process.

Thanks Jeff, Pat, do you want to continue?

Sure, and again, as Jeff pointed out with that worksheet there is the place to write those species names down and put those species into functional and structural groups, so, that on your reference sheet what is listed are the structural and functional groups. I'd like to remind everyone that we do want this to be interactive, so, please don't be shy about coming in with your push to talk or calling or faxing in some questions or comments. We really would.

This is Mike Bolts at Boiser. I'm not sure if you've already addressed this because we're having some technical difficulties, but, for instance, you were talking about functional and structural equivalence. We however know crested wheatgrass replaces the natives on a number of sites and here in Idaho have a separate standard for that. I'm wondering how you would include that or not include that in these functional and structural groups?

You want to.

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Yes, let me turn this back to you Mike. What do you think a structural, what functional and structural group do you think that particular plant fulfill within that system?

It tends to act like a "decreaser".

Well, that's not a functional / structural group; the functional / structural groups would be more along the lines of the photosynthetic pathways and length of the growing season and that kind of thing.

It's a, it's a robust cool season grass C3, so, it would be in the same group as for instance bluebunch and so on.

Right, right and exactly where we would place it would be within that particular group and it would be that cool season bunchgrass form, the issue would be then that particular structural / functional group then ends up being part of the system

So, I guess my question is that would be another stable state for these sites?

It could be in many of those systems, it sort of depends on where you are and in the area where that particular plant grows I know that there are some areas within the great basin where you can get mixtures of crested wheatgrass with other species, there are other locations where it tends to dominate that system

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and you have very few others, so, it sort of depends on the area that you're located at.

Yes, if I might interject some other comments in here and go back to the overhead and look at the form again, the functional / structural group's form, I think Jeff has it cued up on the overhead again. Remember that in those places where we have a solid stand of something like crested wheatgrass that's been seeded into that and that's all that's there or that certainly is the dominant plant that's there that certainly or surely is another state in the state and transition model, we don't write a reference sheet for that state, the reference sheet is developed for the reference state which would not include a plant community that is dominantly crested wheatgrass, the crested wheatgrass then would not occur in the functional / structural group as a species for the reference state, when you went and did the evaluation it would go into the same, you would place that species into the same functional and structural group as the cool season bunchgrass. If we could go to the overhead and look at the way that form is put together I think you can see at the top of the form, again, you have the name of the functional / structural group, instead of saying warm season bunchgrass there it might say cool season bunchgrass and it, on the potential and then the actual is what, where that functional / structural group is when you do the evaluation and if you'll slide the page over a little bit, plant names, those plant names are the plant names that are in the reference functional / structural group and then on your evaluation sheet you could write down the, in the comment

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section on your evaluation sheet you would write down the plants that you put in those functional groups that were on the site, particularly those that were not in the reference state like crested wheatgrass. Did that help?

Well, you said nonnative plants could be part of the reference state and I just wondered how far you were going with that and I wanted to know if it was considered to be across a transition or not.

Well, I think that you need to keep your, first of all the reference sheet is built on the reference state, there can be minor amounts of exotic plants in the reference state in those dynamics, but you want to be sure that they're not controlling the dynamics, that they're not the plants that are causing the dynamics or, or the plants that are becoming dominant within the dynamics of that state. At that point you've crossed the threshold and are into another state. So, there can be minor amounts of nonnative plants in the reference state, be careful how you look at them when you develop the reference sheet.

Yes, Jeff, comment?

Another way to look at that is, if you can get back from that plant community that has these exotic invasive species in it to these other native plant communities without significant input, then, you have the potential to remain in the reference state, but, in this case, my understanding is once you got crest and wheatgrass

in there, it's very difficult to get back to the native plant community, is that right Mike?

Well, I think it comes back to Dave's point, that depends on how well that crested wheatgrass is established, is it a dominant or not and then a lot of times what kind of grazing management, a certain amount of grazing management may encourage sagebrush encroachment back into these seedings and in reality 20-30 years later sometimes you're hard-pressed to even say that the area was seeded because kind of a natural dynamic has come back, so, I think it's important to kind of keep this temporal aspect again in mind when we, we talk about this and again, I just tend to look at that reference state as, of the plant communities how they function, you know, before a lot of the disturbances that maybe we brought in with some of our activity, so, yes, there was always fire, there was always drought, but, you know, there wasn't always cheatgrass, so, you know, kind of keeping it in that perspective not going back 200 years ago necessarily because that's kind of a dynamic target as well, but, I know this is a good discussion and I think Mike as we go through some more of these reference sheets and discussions maybe we can kind of build upon or reinforce some of the things we've said here and if it's still not clear at the end we certainly have time to kind of take any of these unanswered questions as well.

We do have one question that has just come in from Pat in Dillon, Montana and this relates to trying to, asking us to explain how the indicators of rangeland help

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relates to the determination of upland health. I think what we'll do with this question, we have a component, a section here on applications we'll do a little later and we'll address this question when we get in there, but, I just want to let Pat know that we're, we're not skipping by it, we're just going to address it a little bit later in this morning presentation.