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Loup River
Hydroelectric Project
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Study Results Meeting - Day 2

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P A R T I C I P A N T S

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(Whereupon, the following proceedings were had, to-wit:)

STEPHANIE WHITE: We're going to get started this morning. We're a couple minutes late, but I think that's probably to our benefit.

I'm going to let Matt Pillard walk through the results slides for hydrocycling. We're going to overlap a little bit with the data, the information we presented yesterday. We have some new folks in the room, and I think we'll probably have a little bit of discussion before we move into objective two. So with that, Matt.

MATT PILLARD: Thanks, Stephanie. I'm going to cover the results from the hydrocycling study that we got to yesterday, and so the first slide here is slide 220. And this is the results for objective one, and I'll just read these, and if there is some more discussion, Pat will have to help us out because these are his slides. He didn't want to stand up and sit down.

Objective one, the difference between the maximum and minimum daily water surface elevation is larger under current operations than under the run-of-river condition.

Similar differences for the run-of-river condition over several weeks. Largest difference occurs for a dry year. And downstream differences less than in the project vicinity, and the average annual difference in water surface elevation is typically less than one foot.

Those were the results from objective one. I have to find the results for objective two.

This is the -- objective two is the nest inundation study. Slide 232. And these are the results for the entire objective.

So in review of all years for both species, there were no instances where current operations exceedance could have been avoided under a run-of-river operation.

Normal seasonal flow events during the nesting season, you know, we're creating the potential for nest inundation. And project operations did not cause any exceedance of a benchmark flow. So those were the results from objective two.

Are there any questions on either the first or second objective?

JOEL JORGENSEN: I have some questions about objective two. I guess I would like to -- yeah.

MATT PILLARD: If you want to go back to some slides, I sure can, just let me know.

JOEL JORGENSEN: How about 226.

STEPHANIE WHITE: For those of you on the phone, we've moved back to slide 226.

JOEL JORGENSEN: So in the analysis I understand that the benchmark flow was derived prior to the April 27 period, and that's pretty rigid, so -- but -- so like in this slide I understand the benchmark is that one peak way over there, but in reality, is it more likely that the bigger flow to the right there, the biggest one is more likely to create habitat that's going to be used by the birds?

MATT PILLARD: That's a good question.

JOEL JORGENSEN: Does the bigger flow create bigger sandbars? That's apparently the assumption of your analysis, you just have a limited time frame.

MATT PILLARD: The analysis wasn't predicting whether this flow was creating a bar that high.

JOEL JORGENSEN: I understand that. But I think conceptually we can all understand that a bigger flow is probably going to create bigger sandbars, right? I think that's a fair statement.

Another thing that I wonder about this analysis too, I wonder about the 25 April date which was sort of set in stone. I think that's a reasonable date to sort of use as the beginning of piping plover nesting, but we don't go to bed on the 25th of April, wake up the next morning and have a piping plover nesting. And that's the reason --

MATT PILLARD: Sure, they don't have boarding passes.

JOEL JORGENSEN: I think that's a sensible thing to use as a start date. However, the analysis seems to overall be plover centric, because you do mention accordingly that interior least terns begin nesting later on in season, but both species -- if habitat is not present in the system, they don't necessarily have to begin nest initiation early. So if you don't have habitat in the system when birds are arriving, they may delay initiating nests. Particularly for interior least terns. And so you have a habitat forming flow event in May before terns show up, that's very important, because that's likely to create the habitat that those birds are going to use. So on this slide in particular that big peak there probably going to create the habitat --

MATT PILLARD: This one?

JOEL JORGENSEN: Yeah. -- that terns are going to use. But the analysis sort of fails to avoid -- you know, recognize that.

MATT PILLARD: We did look at -- we did consider looking at, you know, picking a second peak after the birds arrive. I mean, there are different ways to look at it. This now becomes your peak for the rest of the nesting season. So, yeah, there are other ways to look at later flows that would set a new benchmark.

JOEL JORGENSEN: Right, but you didn't do that. Even though you could say that, but if you have a subsequent peak flow after that 25 April date, there would likely reset the system and create bigger sandbars and the birds would more likely use after that flow event occurs. That was not considered in the analysis, right?

MATT PILLARD: No, but that is something you could do. Obviously in this year that peak would not been exceeded for rest of the season, you could then assume if this created habitat that was -- and the birds nested at that -- at an elevation associated with that flow, the rest of that season that flow wasn't exceeded and you could assume if birds were smart and nested high enough, there wasn't enough event for the rest of the season that they would have --

LISA RICHARDSON: Well, and I guess, Joel, and, Matt, correct me if I'm wrong, but I think that the slides are showing piping plovers, but we did the analysis separately for terns and used a different date.

JOEL JORGENSEN: You used a different date for the analysis, but not necessarily when the initial part -- the input, the -- for the benchmark flow.

LISA RICHARDSON: Well, the benchmark flow was the highest flow that occurred between February 1st and whatever the date was for the species.

JOEL JORGENSEN: Right, for the analysis, but in reality for a bird, if the benchmark flow occurs on the 27th of April, and it's 2 million CFS, the birds are going to use the habitat created by that flow, not the 11,000 CFS that happened in March.

LISA RICHARDSON: Right, that's true, but I think the end result is that the analysis regardless of when you set your benchmark, the analysis is still the same, that the current ops don't exceed any more than run-of-river exceeds.

JOEL JORGENSEN: Well, I would argue that if you -- if your benchmark flow is set lower, you're more likely to have that result. If you consider a higher benchmark flow, that's less likely to be the case, particularly when I talk about maybe another thing I want to talk about here just a moment.

MATT PILLARD: Joel, one thing to consider, when we look at -- I have to go back to -- let's see what slide. Not methodology, but, you know, there were a number of years where that pre-nesting season was never -- was not exceeded during the nesting season, so we did have to pick a date, and we completely understand that in nesting -- nesting season flows might affect chances for renesting and new habitats.

What we're simply showing here is the benchmark that we picked is these years show that the benchmark that was established prior to nest inundation was not exceeded for these three years and those two years, so in some years it didn't make a difference.

JOEL JORGENSEN: I understand that.

STEPHANIE WHITE: I want to make sure for those on the phone that we're on slide 228. George, I want to give you a chance to speak and then we'll come back to you, Joel, and then I'm going to jump over there.

GEORGE WALDOW: George Waldow, HDR. What I sense here is we're getting away from the results and we're talking about the study plan. And I think it's important that we go back and remember that the study plan was agreed to. The nesting dates were provided to us, correct me if I'm wrong, Matt, but it was in coordination with Fish and Wildlife, Game and Parks.

MATT PILLARD: George, I think the point is the dates that we use --

GEORGE WALDOW: Let me finish, please. And I wasn't intimately involved in it, but I'm just stating that fact that we're here to discuss the results, not the approach, because what -- I think it's important to state that what we're looking for and what we were looking for in developing the approach is a tool to look at the incremental effect that hydrocycling may have on nesting and nest inundation. And there was a lot of time and discussion that went into that. And when you --

Joel, when you talk about but in reality this might happen or that might happen, we don't dispute that at all, but there was -- collectively we could not come up with a better -- a better approach to address this question, and I think we have addressed it. The results may be worthy of discussion certainly. We aren't able to go back at this point and change the entire study, so that's --

JOEL JORGENSEN: Well, I think when you're talking about study methods, I mean, some things may sound good, but once you actually do it and sort of compare what was actually done with something, and it may not make sense, so I don't know how you discuss results without the potential considering the methodology that went into it.

So I recognize what you're saying, George, but, you know, again, once maybe this model has been completed and we sort of look at what actually occurs in reality, it may be useful to go back and look at some of the methodologies, maybe some more corrected measures can be taken.

I'm going to sort of try to touch upon a couple other things.

JEFF RUNGE: Joel, before you do that, I would like to ask what extent can there be modifications to the study, since we're on that topic?

LEE EMERY: Typically we do not -- you know, we get the results and then we go from there. If something weather wise or beyond nature's control made the data bad, then you might -- in fact, we had to delay the first time because of rainfall, but otherwise I think we just go forward with what we've got, make the interpretations from that.

JEFF RUNGE: So as far as a major restructuring of these methods, that's going to be limited?

LEE EMERY: Yeah.

JEFF RUNGE: I'm sorry, Joel.

JOEL JORGENSEN: I guess in the report where it talks about the assumptions, the following assumptions were used for this analysis. Essentially a key assumption of this analysis is that you're considering nest distribution is a uniform distribution. There is a single volume where nests are distributed both to the sandbars, but also where the nests are located in regards to elevation.

But in reality, the distribution of nests -- and you sort of admit this in this assumption, that nests can occur below and above that. So in reality you don't have a singular body, you'll have a distribution. Probably a normal distribution depending on some spread. We really don't have that information. So if you have -- you go back to this one slide that --

MATT PILLARD: Two twenty-six?

JOEL JORGENSEN: That one, yeah. So if you have a peak flow regardless of what the magnitude is, somewhere below that peak you're going to have a distribution of nests. We don't really know what that distribution is. So it's really not an all or nothing game.

You have a distribution, and so the subsequent high flow events are going to sort of come up on that distribution somewhere, and this happened in 2008 and 2009. In 2008 -- you know, another key point here is the birds didn't initiate their nests right away. Our first nest in 2008 wasn't initiated until the 16th of June. So, again, a high flow event occurred early in the season, and most high flow events do occur in May or June. Birds did not initiate nests until June, and they use that habitat that was created, and then there was a subsequent high flow event in July, out of about 75 nests, one nest was inundated. So it caught the very -- that subsequent peak caught the outlier of that distribution.

In 2008 or 2009, the high flow event that occurred in 2008, that was the dominant habitat form. The same sandbars that were created in 2008 were used in 2009. We had about 311 nests on the system in that year. We had a high flow event, which you guys I'm sure are -- know very much about these high flow events that occurred in 2009 in about mid June. We had about 60 nests that were inundated. So, again, that flow event worked up on that distribution, you know, that distribution on your Y axis there of being something you can place right on there. So it wasn't an all or nothing game such as this analysis shows. So I guess I see those subsequent peak flow events. If current operations are higher than the run-of-river, then hydropeaking does have an effect on inundation. We don't need to run a separate analysis, that shows it right there that hydropeaking will have an effect on inundation.

MATT PILLARD: Yeah, there is no dispute that the current ops has a higher peak than run-of-river.

JOEL JORGENSEN: Right. And so the

probability of inundation is greater.

MATT PILLARD: It's picking that range. Obviously we say we know it's not an all or nothing, it's not black and white where the birds might nest. You know, that is what the study looked at is it picked a date and analyzed subsequent events compared to that flow.

You know, so if the question is, you know, could we look at putting a larger distribution or a buffer on these flows to see what might have happened, you know, plus or minus a certain percentage of a flow to see how subsequent peaks would affect that, yeah, that's something that could be looked at.

JOEL JORGENSEN: Well, I think we can just look at 2009 at that peak flow event that occurred in mid June of 2009, and we have data that says inundation occurred. And if that peak flow event was greater for whichever one, you know, then we would have an effect. I think the question is just how does that translate into an average probability. That concludes my comments. I want to thank you for the audience and facilitating me to say a few things. I'm all glad you guys were able to do it. Again, I think we can provide some additional feedback about this analysis, and, yeah, we'll be able to do that.

MATT PILLARD: That would be great, Joel. Thanks. Good comments, really.

I'm going to skip ahead to results from -- let me get the objective up here. Pat went through these pieces yesterday too. So, you know, objective three --

STEPHANIE WHITE: We're on slide 233.

MATT PILLARD: Objective three was to assess effects, if any, of hydrocycling on current operations on sediment transport parameters.

So yesterday Pat went through a number of tasks associated with sediment transport relative to hydrocycling. And those tasks were sediment transport calculations, sediment transport indicators, channel characteristics and a regime analysis.

And I'm going to skip to the results of that, and, Pat, if I really stumble here, you're going to have to save me, or you can choose not to.

LISA RICHARDSON: That's it right there.

MATT PILLARD: Slide 247.

So summary results for objective three, run-of-river operation would carry less sediment than current operations, and channel area would be -- would likely be smaller under run-of-river operations.

Pat, are there any other results you would like to summarize on that?

PAT ENGELBERT: No.

JEFF RUNGE: One comment here. This is Jeff Runge. Run-of-river operations would carry less sediment than current operations, but, again, too, since this is -- this is coming out of the tailrace, this is sediment free water so it's at higher capacity, but that capacity -- that higher capacity is not being fed by sediment.

And I know, too, I know the past discussion about the supply that's already in place, but it sort of feeds that deficit. The current operations sort of feeds that deficit. But admittedly a very small amount, though, proportionately.

MATT PILLARD: We just started to get -- getting into objective four yesterday. We stopped halfway through, but we did get through one of the tasks anyway, and that had to deal with the literature review for terns and plovers.

Objective four was to identify material

differences in potential effects on habitat of the interior least tern, piping plover and pallid sturgeon.

And one of the first methods that was looked at was the literature review in comparison to other rivers.

LEE EMERY: Two forty-nine.

MATT PILLARD: And slide 256, the results of the literature review in comparison to other rivers for terns and plovers, what we really found is it's really difficult to compare this system to other systems, because there is so many differences between, you know, the operations and the size and the magnitude of the river systems.

Changes in -- we did find that changes in Fort Randall operations had shown that some flow releases at higher rates during early nesting had encouraged the birds to nest higher.

Other portions of the literature review showed from Leslie, et al. 2000, daily hydropower operations were not found to be affecting the birds --

LEE EMERY: Two fifty-seven.

MATT PILLARD: -- whereas subjecting habitat to periodic high flows prior to nesting was beneficial.

And I guess the final conclusion is project operations -- this project does not have the ability to control large flood flows. Project's effects from daily hydrocycling on sandbar formation are small, minor compared to effects from large flood flows.

Were there any -- yes.

RICHARD HOLLAND: Your results from Leslie, et al., what beneficial results did you get subjecting habitat to periodic high flow?

MATT PILLARD: I'm going to ask Melissa to answer that. She helped me a lot more with the literature review portion, so, Melissa, can you help answer that?

MELISSA MARINOVICH: I'm Melissa Marinovich with HDR. The Leslie, et al. what they actually found was that it regenerated the habitat basically. The same thing that Joel was saying that that large flood flow was actually forming more habitat for the species. And the year following that large flood flow actually created more habitat and had a greater number of birds nesting.

RICHARD HOLLAND: You're not talking about the daily hydropower operation?

MELISSA MARINOVICH: No. They looked at that in the study, and they found that that actually was not having an effect on bird populations, and what was, was this dam was releasing large flood flows, and that was actually having a greater effect on species, and it was proving to be beneficial. That's what that study found.

MATT PILLARD: So I think that moves us into -- Scott, how far -- do we have some result summaries for pallid that we got to before Peters and Parham?

LISA RICHARDSON: Yes. The slide right before that.

MATT PILLARD: We'll do the slide right before you'll start. These two slides maybe would be your results slides.

LEE EMERY: Slide 261.

SCOTT STUEWE: In the determination or once we looked at the information that was available, we looked at -- the results showed that pallids are collected in all channel types. However, they do seem to prefer sand and fines, particularly within the Platte, but have been collected over gravel and cobble areas, which seems to be more indicative during their spawning response times. And they seem to target revetment areas as well as studies with USGS have shown.

Stream bottom velocities have ranged anywhere from zero to 4.25 feet per second, with an average of 2 foot per second. Again, the Platte falls within that regime from .6 to 1.9 is what Peters and Parham is showing.

Depths ranged from 1.9 to 45 feet where they were collected. Again, the 45-foot depths and so on are indicative of the Missouri system.

They also have a wide range of temperature tolerances, anywhere from 32 to 86 degrees. They tend to move out of those systems when it gets higher than that.

Turbidity that they were collected in ranged anywhere from 12 to 64 NTUs.

Again, we looked at the different dams and their effects. Quickly again, Gavin's Point and Fort Randall are hydropower facilities, also ones used for -- oh, wrong one, my apologies.

Slide 262. Okay. Recent spawning has been recorded, however -- and that is on the Missouri system. However, on the Platte there is no concrete evidence of spawning, however, they did collect Scaphirhynchus species, and it's hard to find if they are either pallids or shovelnose. And other evidence of spawning has been observed along the revetments below the Gavin's Point Dam on the Missouri.

Pallid captures have been on the rise on all the rivers. However, increases also coincide with hatchery supplemental stockings. And as we found out yesterday, the Platte has been stocked at different times.

The pallid sturgeon often are captured in areas with sandbars or sandy substrates, along with the shovelnose sturgeon. And there is no direct evidence providing a link between hydrocycling and reproductive behavior in pallid sturgeon.

Many theorize that the indirect effects of altered flow do induce spawning behavior, however, from the hypolimnetic releases, there is a decrease in temperature.

DeLonay theorizes that with a rise in temperature and a rise in flow, this induces spawning response.

Okay. Slide 264 we're going to go in the methodology. We worked with Peters and Parham methodology as the study plan determination said we should. The equation, once we got into looking at the study, unfortunately was not correct. Once the district looked at and tried to run the equation, the equation itself was right, but the coefficients were wrong. Contact was made with Dr. Parham, and he made some adjustments to those coefficients, which then he agreed that there was mistakes within the report, but it came back, and the -- with those adjustments, our numbers coincide with his numbers.

Also, the -- on the shovelnose, though, there was -- we never could get the numbers to work out exactly right. There was a zero to 2 percent difference, correct, Lisa?

LISA RICHARDSON: Right.

SCOTT STUEWE: And -- close, but just not exactly right.

LISA RICHARDSON: So we didn't include any analysis of shovelnose in this -- in the report, because we couldn't replicate the numbers from Peters and Parham, but we did include the pallid results.

SCOTT STUEWE: Now, however we can say that the numbers didn't really jive, but in actuality the results basically follow what -- you know, what would be expected as you go down the river.

So what we did is we looked at the analyzed daily percent suitable habitat for pallid sturgeon based on the minimum, maximum and average discharges.

We evaluated for current and run-of-river operations. And in the evaluation, we looked at wet year, 2008; a dry year, 2006, and a normal year of 2009.

These are the sites that were looked at.

LEE EMERY: Slide 266.

SCOTT STUEWE: The results of the study showed that during current -- with current operations, there are higher max flows, which Pat showed yesterday, and also lower minimum flows. And this was exacerbated in the dry years.

March and June -- or March through June showed that there was the highest percentage of habitat that was available. July through October, which you would -- you know, you would probably guess is when the lowest habitat percentages because you don't have the flows that are available earlier in the year.

Habitat increased as you moved downstream, as you would expect, because of the increased in flows from other tributaries into the Platte, and this would -- and this would also increase for the wet, dry and normal years across the board.

This is -- I'm going to show some of the -- some graphic, and this is 268. And we look at -- as we go down the river from the gages, as you can see, this is based on a dry year percent suitable pallid sturgeon habitat. Blue is maximum flow. So here as you go down the river, you can see the habitat becomes -- increases. Now, that's -- you know, as you get an influx, of course, you get a rise, and this happens daily.

Again, the minimum shows lower, but the average still comes out approximately the same as you would see with run-of-river. And yet you still have the increases with maximum flow and with minimum flows across the board. Very similar.

This is based on a wet year. Again, you see we have the increased levels of the percentages are, you know, 20 to 27 percent. Again, your minimums and your average. Pretty much coincides with run-of-river.

On a normal year, pretty much mirrors what we saw even with the wet year, and follows what we've been saying from the beginning. Run-of-river less change, but the same amount of habitat is still available.

On this slide what we want to show, and Pat kind of had this the other day too, it shows that we have the lower -- the lower levels for the minimums, this is with current operation minimums. This is run-of-river minimum, and, of course, you can see there is less between this, and there is more from the minimum to the maximum with current operations. However, the median still pretty darn close. But as you go down the river from the gage, you can see those -- that change is less farther down the river than up in the stream itself.

This is another one. This is for wet year.

LEE EMERY: Slide 272.

SCOTT STUEWE: Kind of interesting how you go here and there is such a large change here, however, the mean is still about the same.

And then in August in a dry year, very little habitat availability even with the changes that we have with run-of-river and with current operations.

And then during a wet year, August, again we see that we have, you know, the wide fluctuation with operations closer to the tailrace area, but the problem we have here is that even during what we would call a wet year, your habitat percentage is still about the same, but it's still less than what you would expect with higher flows. But then being August, the flows that occur in August are less than what you would see in the spring or late in the fall.

So the results, current operations exhibit higher percent habitat during maximum flows and lower percent habitat during minimum flows. That was indicative of those last graphs that we had shown.

Under both run-of-river and current conditions, the habitat above Ashland is considered marginal anyway.

Effect of hydrocycling appears to diminish as you move downstream as we showed on the graphs. The area between the maximum and minimum became less overall.

Also even with large fluctuations of discharge, there are deeper plunge pools that can be available, are utilized for short terms for refuge. We have cross sections, we'll look at those in a little bit.

During drier months, pallid sturgeon

naturally move out of the warmer, oxygen depleted tributaries.

Richardson and Cross stated that the lower part, the lower 30 kilometers of tributaries are available for habitat. This is reflected as well within the Platte itself.

When flows are available and conditions are conducive, pallid sturgeon will access the available habitat. This was quite indicative of what happened this last year with the higher flows where, you know, pallids actually -- you know, pallids collected up above the Elkhorn confluence.

Even with run-of-river or with current operations, habitat is limited above the Elkhorn confluence and above the Ashland gage.

LEE EMERY: Slide 277.

SCOTT STUEWE: This is a slide of the cross section again. What we're going to show was even with the median flows and water surface, you have deep water areas which pallid sturgeon will access when available. So you have, you know, about three foot of depth available here, and over here we have, oh, approximately four foot of depth.

And this shows -- you know, this correlates to those collection sites that Peters and

Parham had where they were collecting fish anywhere from 2 feet to 5.9 foot in depth.

Here's another example of cross section three further down. Again, we have water depths of 5 foot and of approximately 6 feet.

Most habitat is found below the Elkhorn confluence, and this is what has been collected and studied in the past as well. The greatest habitat, of course, occurs in the spring with rain -- with increased rainfall and melt.

University of Nebraska-Lincoln, their research provides evidence that pallid sturgeon prefer the lower reaches. They have split up their study into two sections. In 2009 they had a little -- they couldn't get in in the spring because of water flow -- of increased flows, so the collection that they had was basically in the fall. But the one thing they did do was they weighted their collections in 2009, where they do 20 sites on the lower versus ten sites on the upper section, which is basically was split at the Elkhorn confluence.

In 2010, they went in. They decided not to weight it, so they would have ten selection sites or ten above and ten selection sites below, or 20 or -- I can't remember exactly what it was. However, they ran into collection problems again because of high flows, but the numbers do reveal that in segment one, which is the area below the Elkhorn, there are more collections for both years.

Again, here for segment one in 2009 was eight and segment two was one. They used different collection methods using both trammel and trotline. Primarily what this shows is right now if they can get back in and look again this next year, this was the main thing they were wondering is primary spring utilization with some fall utilization.

So as you see here, even though they couldn't get in and get the collection like they wanted, segment one still had eight fish in the spring. This kind of goes against the grain, because they collected ten fish or 16 fish in the summer, which doesn't equate real well with what happened in 2010, but then again they couldn't access the river like they wanted to. So it's an ongoing study, but they are showing that other fish that they are collecting, the majority of those fish are fish that have come from stockings, however, there are still some wild fish out there that they've been able -- haven't been able to identify as to any other source. So it's easy to say that even though we can't detect exactly what these fish are doing within the system, they are utilizing the Platte. And as long as we can keep minimum habitat for those fish to continue to use, they will continue to be around and use this system as they would require.

We then looked at the evaluation for -- you know, we evaluated PRRIP for water management activities. Basically what the conclusions for that came from were percent habitat has a relatively high rate of change for flows ranging between 4,000 to 6,000 CFS.

Changes in habitat areas as a result of 100 or 500 CFS releases have negligible influences on the lower Platte River.

Pat, do you have anything you want to add to this?

PAT ENGELBERT: This study was done for the Platte River program to evaluate central Platte water management practices on the -- relative to the effects of the habitat in the lower Platte. And just what the slide says, discharges coming out of the central Platte, any modification to those would have a negligible result on the habitat in the lower

Platte.

It was a project that was done -- the project team consisted of HDR and the Platte water group, Musser Engineering and Dr. Mark Pag (phonetic) who's doing a lot of research for the pallid sturgeon. So it is available I think as one -- is it one of the attachments or just referenced?

LISA RICHARDSON: It's just referenced.

PAT ENGELBERT: It is referenced. So if anyone would like a copy of the report, it's probably out on the website, or we can get it.

LISA RICHARDSON: Yeah, we can.

PAT ENGELBERT: It's on the Platte River program's website as well.

SCOTT STUEWE: Further, increases in discharge, they don't move the conductivity, turbidity, temperature or dissolved oxygen outside the typical range that a pallid sturgeon would be trying to access.

And large changes in discharge may have the most effect on pallid sturgeon when flows are around 4,000 to 6,000 CFS.

LEE EMERY: Slide 282.

SCOTT STUEWE: Two eighty-two, I'll let

Matt Pillard take over.

JEFF RUNGE: I've got a question, if you could back up to 281, please. The analysis that was conducted looked at percent change in habitat, but the relative high rates of change in flows are between -- that metric is in CFS. How does the change in habitat relate to 4,000 -- or how does 4,000 to 6,000 in that change in CFS relate to change in habitat? It didn't look as if the report addressed that.

SCOTT STUEWE: At 2,000 CFS there is -- we know that habitat is negligible for pallid sturgeon. So any increase from 2000 on, you see an increase in habitat availability for sturgeon, okay.

Now, as we go into the cross sections, would have to verify that as we go along, the increases from 4,000 to 6,000 allow more habitat, and I'm not sure exactly what the percentage is right now, but it kind of relates back to what Peters and Parham had recognized in their study as well.

JEFF RUNGE: But the stage change study too, could that be used to report? It may be difficult to pull that out of Peters and Parham, but can the stage change study also show percent habitat at 4,000 CFS versus percent habitat at 6,000 CFS?

PAT ENGELBERT: One thing when we're talking about habitat, that particular report identified different habitat types, and those habitat types were based on hydraulic parameters. Runs and ripples and pools and plunge areas, and they were all tied to a depth and a velocity value that was, you know, determined with -- in consultation with Dr. Mark Pag who's doing a lot of research for the Games and Parks as you know.

We also applied some sensitivity analysis to create, you know, ranges of flows or ranges of how that percent habitat types could change over with the change in discharge. So unfortunately I don't have those memorized, or if I did, they are long gone, but they are in the report if you wanted to take a peek at them.

JEFF RUNGE: Okay.

RICHARD HOLLAND: Isn't the takehome message in stage change the project essentially that due to the constraints of the central Platte delivery system, they cannot put enough water into the system to make a significant impact on the flows and they enhanced the habitat? They can't put enough water in with the restrictions of the choke points and the canal systems that they have -- the way they are operating to put significant amounts of water into the lower Platte.

PAT ENGELBERT: And I think it works the other way as well. When a large flood event moves through, they don't have the intake structure capability to peel enough off that hydrograph that it would make an impact further down the stream. They can only pull so much in during a larger event. Same thing, they can't put enough into the system, nor pull them up off of the system.

RICHARD HOLLAND: I'm not asking to pull them off the system.

PAT ENGELBERT: That was the basis of the study was if they pull waters into their system for recharge and other things, would that have an effect as it worked its way down.

RICHARD HOLLAND: They don't have the storage capability. I understand that.

LISA RICHARDSON: Jeff, related to your question about the flows and the percents, yeah, you're right, the body of the report only talks about the percentages related to the results of the analysis from Peters and Parham. In the attachment in the back of the hydrocycling -- well, on the CD or I guess you don't have a hard copy, you asked for the attachments there.

In the attachment to the hydrocycling study is all of the data for every single day, the highs, the lows, and so you can see the flow versus the percentage.

JEFF RUNGE: It seemed like when looking at the appendices it seemed like the percent changes, those tables and the appendices weren't tied to a flow, but --

LISA RICHARDSON: Do you have them on your computer?

JEFF RUNGE: I don't. If it's possible, just plotting those in there I think would be a benefit.

LISA RICHARDSON: Let me take a look when we have a break and I'm sure that information is in there.

JEFF RUNGE: Okay.

SCOTT STUEWE: Matt.

MATT PILLARD: Slide 282. And this is a methodology that we looked at cross sections. Again, same crossings that were taken as part of the data collection effort that Pat went through yesterday. And the purpose of this cross section comparison was just to see from early summer to late summer what can be gained from looking at how those cross sections changed just within the season.

You know, we can then kind of compare, make some assumptions as to how might this affect tern and plover habitat as well as pallid sturgeon habitat.

Scott kind of covered those cross sections in his portion, so this discussion really just kind of focus on what can we gain from early summer, late summer comparison of cross sections.

So, again, the cross sections were taken pre-nesting season, post-nesting season. Again, it kind of varied June, September kind of time frame.

We reviewed those cross sections to see what changes were there. Pat went through this yesterday where they looked at what's the channel capacity for each of the cross sections. And this portion of the method just kind of reiterates that.

And then look at differences affected -- sites by affected by and unaffected by the site. So really we looked at site three upstream of the tailrace, and then site four, downstream of the tailrace.

And, Joel, I don't know if -- I don't know who's new today other than Joel, but are you familiar with the site numbers, site one, two, three, four, five, because we're going to refer to those a lot here in the next --

JOEL JORGENSEN: I think so. I'll pretend I do.

MATT PILLARD: Site three is just upstream of the tailrace, site four is just downstream of the tailrace, and site five is near North Bend.

JOEL JORGENSEN: Got it here. Thank you.

MATT PILLARD: So what this is, slide 283, and this is at site four, cross section nine. And really what this shows again as Pat alluded to yesterday is over time. And here's -- the blue line is the June cross section, and the yellow line is the September cross section.

And really to reiterate again what Pat described yesterday, the lows filled in between June and September, some of the high forms really matched quite well, you know, between the two cross sections. Some of the highs from June were knocked down to a low by September.

So when you looked through each -- there is about nine cross sections for each study site, and so when you look at each cross section, it varies depending on what changes and doesn't change between each cross section.

I think my next slide here is kind of a reiteration of what Pat went through yesterday. There is one mistake on this slide, and it's at site three I believe should be 1 percent. What I did when I pulled this slide together originally is there were three time frames for -- yeah, there were three time frames for site three. There was --

PAT ENGELBERT: That's right, Matt.

MATT PILLARD: This is correct. Okay. I must still not understand the graph from the report, but I thought the May to September was 1 percent.

PAT ENGELBERT: No, the May to August was minus 1 percent. May to September was minus 6 percent.

MATT PILLARD: I didn't -- so the 6 percent decrease at site three, 4 percent decrease -- this is again in channel area, at site four, and 3 percent decrease in site five.

So we're just showing over time there is less channel capacity when you averaged all the cross sections for the sites together. There is less capacity there from June to September, thereby a same flow would result in a slightly higher stage, a slightly higher water elevation.

Another thing that we notice is some of the larger higher formations that were present in the June cross section were still evident in the September cross section. Again, kind of going back to this slide, we know that some of the areas have diminished over time, other areas increased over time, but for the most part some of the really higher areas were available in both times. And I believe that these weren't large, vegetated islands, those weren't really surveyed. Pat, you might have to help me out with when they got to a large macroform if they skipped around those.

PAT ENGELBERT: There was one particular location down by North Bend that had a very old established island, big huge tree growth. They kind of went up as high as they could with their survey equipment on the island and they went around the other side. I think that was the only occasion.

MATT PILLARD: So these aren't large vegetated islands, just higher macroforms that might have been present in June. For the most part, we found that those still were there in some capacity in September.

We then used -- slide 286. We then used

the HEC-RAS model that we developed to try to garnish what can we gain from the HEC-RAS model relative to tern and plover -- nesting tern and plover habitat.

I won't go through all the methods but the one you modeled, because I couldn't pretend to understand everything there, but steady-state 1-D model was developed. Really what we could garnish from that model is how through different flows does the stage change based on the cross sections that were taken in both June and September.

So, again, you know, we looked at -- we looked at a number of different variables then to look at how different changes in flow affect, you know, the elevation relative to those cross sections. And so we looked at the wet, dry, normal years that we described yesterday. We looked at a range of flows within each year, so we looked at a 25 percent exceedance flow, as I like to call it, a high flow, a 50 percent exceedance flow, which is a normal flow, and a 75 percent exceedance flow, which I've kind of coined a lower flow.

If there is any questions on that we can address that before we move forward, but it's kind of just a range of flows everything each precipitation year.

We then -- for each of those flows then we were able to calculate between the high bank and the high bank the percent of exposed channel that was above a water surface elevation. So for the purpose of the rest of this analysis, percent of exposed channel width, and how much is above the water line for each of these flows. And then we looked at that for both current operations and a run-of-river operation.

And this is --

LEE EMERY: Slide 287.

MATT PILLARD: This is purely an example of what a different water surface elevation look like on a particular cross section. So this is at site four during current operations in the, you know, pre-nesting season or early summer analysis where the bottom line here is a lower flow, 75 percent exceedance flow, the middle blue line is the 50 percent exceedance flow, or the kind of a normal -- a medium flow, and then the higher line obviously is 25 percent exceedance flow or a higher flow.

So, again, we looked at this for a couple different ways. We kind of compared between sites three and sites four. It was kind of the first thing that we did.

Site three, upstream of the tailrace, the percent of exposed channel width was generally decreases as flow increases. Not surprising, but as flow gets lower, more sand gets exposed, and we have some graphics here I can cover.

We also found that from early summer to late summer, the percent of exposed channel width increased at site three. However, during that same time period, site four, percent of exposed channel decreased. So kind of a little -- different things are happening obviously above and below, below the tailrace from that perspective.

From a current operation standpoint, site three had a higher percent of exposed channel width than site four during a wet year. However, again, opposite is true during normal and dry years. So there is kind of a difference in those flows between site three and site four, effective percentage shows channel width differently.

Some of these reasons could include we know that above the tailrace the channel width is less than below the tailrace. Site three the channel width is approximately a 1,000 feet below the tailrace, channel width is approximately 1,700 feet. Percent of exposed channel width is obviously a function of the width of the channel, so some things -- you know, some things can be tried just by that channel width that's available.

You know, under higher flows at site three -- I believe -- here is site three, I went to slide 290. This helps explain this point.

You can see that for the most part we have deeper channels above the tailrace than below, and so a change in water surface elevation has less of an effect on percent of exposed channel width at site three than comparatively to site four where a change in water surface elevation has a more dramatic effect on what's exposed from a channel width perspective.

We also compared current operations to run-of-river operations at site four. So here we're just looking at site four, but how the different operations compared against each other. And for the purpose of this analysis we're just looking at the normal year, but there is more detailed results of wet and dry years comparatively in the report.

Early summer between -- again, current ops to run-of-river operations at site four, early summer had a greater percentage of exposed channel width than did late summer.

Current operations had a lower percentage of exposed channel width than run-of-river. However, we found that at the normal flow that was opposite.

There was little difference between operations in late summer conditions for medium and high flows. And, again, this is taking all the cross sections for a site and averaging, you know, that percent of exposed channel width for each cross section.

We also do the same kind of comparison at site five, the site near North Bend. And here we found fairly similar results, but current operations had greater percentage of exposed channel width at the medium and higher flows -- I'm sorry, the medium and lower flows, than did run-of-river in both early and late summer. However, at the lower flows, the opposite is true. So kind of an inverse relationship between, you know, a lower flow and medium and higher flows on what's available.

At the normal flows showed -- the normal flows showed the greatest difference between early and summer cross sections. So when we just looked at the magnitude of difference in what's available between early summer and late summer, that normal flow showed the greatest magnitude of difference.

And here in comparing current ops and run-of-river for sites three and four kind of all flows -- you know, this is looking at a bigger picture.

Late summer had a larger difference between operations and early summer did not show much difference. So basically we're saying that later in the year as the conditions get drier, you see a greater magnitude between the two operations.

Site three had a greater percentage -- here's kind of a summary slide. I believe this is one of the last ones I have.

Site three had a greater percent exposed channel width than site four during a wet year, but not during a normal and dry year, the opposite was true.

Current operations had lower percent exposed channel width than run-of-river.

Early summer had a greater percentage of exposed channel width than late summer.

And site four had a greater percentage of exposed channel width than did site five.

I think that's the end of the hydrocycling portion of the presentation. We'll take questions on the percent of exposed channel width or channel cross sections that were looked at at this time.

LEE EMERY: FERC, do you have any questions?

ISIS JOHNSON: I have a quick question. This is Isis. I wanted to -- I mean, it's not a specific question about hydrocycling specifically, but I was wondering if you -- comparing how the results of hydrocycling study and the results of the sedimentation study have impacted the sandbar plain -- the sandbar riff rather?

MATT PILLARD: Isis, we've tried to think of ways to combine -- you know, Pat went over how sedimentation changes are looked at, how sediment is affected by hydrocycling, you know, trying to tie that in to the peaks, the peaks from hydrocycling versus run-of-river. I think the main problem we're running into is we have a hard time showing how the sandbars might move or change as a result of hydrocycling. I mean, everything that's done here is an analysis of how elevations affect a cross section that was taken at a single point in time. And we know that over time, you know, that cross section is going to look differently two days after they were there.

So the question that you're asking is a hard one to get to if the thought is how do bars change and move, that's a -- that's one that I don't think we have the answer to relative to the model that we've developed and the analysis that we have. I know that probably doesn't answer your question.

ISIS JOHNSON: I absolutely understand that. The issue is that we're going to have to take all the impact and be able to come to some decision about the ways in which the -- you know, each particular operating regime impacts the potential nesting habitat for the terns and plovers, so it's not -- I guess that's fair that we're asking for specifics about how they move or change, but really we're just sort of looking for what could reasonably happen, what are the reasonable effects that could occur based on what would happen -- based on the results of the hydrocycling and based on the results of the sedimentation. So there has to be some sort of discussion of the way that those two systems, because they are so interrelated, would impact nesting habitat. And so I completely understand that it's a difficult sort of issue to address, but it has to be in some -- given that kind of attention one way or another.

MATT PILLARD: We understand.

RICHARD HOLLAND: I think your data shows a little bit of what may be happening with this. When you show early season cross section with a lot of deep troughs and high points in the form of a channel, and then late season where that kind of shallows out, you're having deposition in the deep -- some of the deep areas.

A portion of that deposition is coming from erosion on the margins of the sandbars. As the water goes by, you see it peeling off of the margins of the sandbars. It's a very regular feature of the river. And so you see that and it isolates some of those big landforms that are still there. They still have the main height, but they may be encroaching in terms of the margins. I think that's where a portion, probably not all of the fill in for the deep areas is coming from.

Another comment I have on the comparison between the current operations and run-of-river, I think one of the most significant -- biologically significant findings that you have is the run-of-river decreases the variance of the stage relative to current operations.

What that means is you're going to have a lot of habitat that remains covered by water for longer periods of time, and allowing primary and secondary productivity to increase in those habitats. We've done some studies back in the '80s and '90s on colonization by invertebrates on structures that were in that fluctuation zone. We seen a traumatic difference in colonization rates and impacts on areas that are inundated and then not inundated. And so I think the biologically significant impact of changing to a run of the river would have an impact on that primary and secondary productivity. Whether it affects overall -- how great a percentage of habitat it affects may not be as important as the effect on the productivity in the system.

MATT PILLARD: Okay.

MICHELLE KOCH: This is Michelle Koch from Game and Parks. My question kind of little bit relates to Rick's comments about, you know, when you're looking -- this is backtracking a little bit, I apologize for that, but when you're looking at slides like 271 to 274, you know, when you have those -- the results on 275 state current operations exhibit higher percentage habitat during maximum flows and lower percent habitat during minimum flows, but what is the duration of those high and low flows, because you could have a high flow that's very short that doesn't really provide, you know, much habitat, because the water isn't there for a very long time, and you can have low flows that last a really long time, and, you know, the fish wouldn't use those areas, so how is that duration of those flows taken into consideration?

MATT PILLARD: Is this the slide you're referring to?

MICHELLE KOCH: That whole series of slides.

MATT PILLARD: So is this more a question on pallid?

MICHELLE KOCH: Yeah, it would be for pallid.

SCOTT STUEWE: Well, we know that even during the times of -- you know, of the inundation due to hydrocycling effect, those fish may actually go out on that new inundated ground, and they may actively pursue, you know, macro vertebras or whatever. I don't know -- has there ever been a documentation of stranding of sturgeon due to the cycling? If there is, I'm not aware of it. So if they can actually go up and they can actually access and utilize those areas, when the water starts going down, they will go back into the deeper water areas for refuge. So even though it is less, you know, less water there, there should be -- you know, there is habitat for those fish to be able to utilize at those times during the low flows. If it's not -- for the most part, most fish end up going downstream with the flow as they can sense the constriction taking place. So that's a roundabout way. I can't really answer that completely for you.

Rick.

RICHARD HOLLAND: In terms of documentation, strict documentation from a scientific standpoint, the only -- I'd say, no, we've never quantified that phenomenon you're talking about.

From empirical observations, though, we have observed isolation of various fish species, and I can't say that I've ever seen an isolated sturgeon before, but, again, years I was out there we were in somewhat of a drought situation. I doubt there was that many sturgeon in certain areas, but it was not uncommon to see fish isolated in pockets that were developed as the hydropeaking was on the downswing. That's a normal phenomenon in that period. Whether it's a significant proportion of the population, I can't say. I don't think it probably is. I think some of the larger species have a much better ability to adjust their position if the hydropeaking isn't on and off just like that.

We do know that under drought circumstances fish will get isolated in pools and get cut off, and if those pools stay cut off for a long period of time, they will die because of temperature and oxygen stress.

Again, quantifying those in terms of population level phenomenon, that's never been done, at least not that I know of. I don't know if anyone else has seen any evidence to suggest it's been done. It's been observed several times.

SCOTT STUEWE: We know it occurs in flood situations fish will get stranded. I'm sure, you know, just as you say empirically it's happening, but to what extent, it's just hard to enumerate.

JEFF RUNGE: Jeff Runge here. Just a question about the hydrocycle and from peak to trough, what's the time duration for that approximately?

SCOTT STUEWE: Pat, can you answer that?

PAT ENGELBERT: I think scientifically 12 to 14 hours, somewhere in there.

RON ZIOLA: Yeah. From the time it starts from peak to trough would be 12 hours. It's almost a 24 hour -- it would be approximately from peak to trough would be 12 hours. I think, Rick, what you observed probably when you're in that part of the river.

STEPHANIE WHITE: Any other questions or comments? It's a great natural time for a break. I know there are a couple of things we'd probably like to dig into the reports and look for. It might be a good use of this time. Let's reconvene at a half an hour, so at 9:30.

LISA RICHARDSON: No, I don't need that much time.

STEPHANIE WHITE: Ten minute break.

(9:19 a.m. - Recess taken.)

PAT ENGELBERT: We'll start out on 297 for those of you on the phone. Flow depletion and flow diversion study. We'll be looking at the amount of flows that get diverted into the canal system, how much get bypassed down the loop bypass reach.

Moving on to slide 298, the goals of the flow depletion and flow diversion study were to determine if project operations result in a flow depletion on the lower Platte River, and to what extent the magnitude, frequency, duration, and timing of flows affect the Loup River bypass reach.

The other goal was to determine if project operations relative to flow depletion and flow diversion adversely affect the habitat used by interior least tern and piping plover populations, the fisheries, and the riverine habitat in the Loup River bypass reach and the lower Platte River compared to the no diversion condition.

Going on to slide 299, the objectives associated with that goal, one were to determine the net consumptive losses associated with project operations compared to the no diversion condition.

Two, to use current and historic USGS gage rating curves to evaluate the change in stage in the Loup River bypass reach during project operations and compare against the no diversion hydrograph.

Three, to evaluate historic flow trends on the Loup and Platte Rivers since project inception.

And, four, to determine the extent of interior least tern and piping plover nesting on the Loup River above and below the diversion weir.

Objective five, to determine project effects, if any, of consumptive use on fisheries and habitat on the lower Platte River downstream of the Tailrace Canal.

Six, to determine the relative significance of the Loup River bypass reach to the overall fishery habitat for the Loup River.

And, seven, to determine the availability of potential whooping crane roosting habitat above and below the diversion weir under project operations compared to the no diversion condition.

Moving on to slide 301, here is the study area. We'll be looking at the Loup River bypass reach, which is that portion of the Loup from the diversion structure down to the confluence with the Platte River. The ungaged sites that are associated with this are sites one, two and three.

Moving on to slide 302, again, objective one, to determine the net consumptive losses associated with project operations compared to the no diversion condition.

What we did for this, the associated activities were to determine the surface area that is exposed or contributes to evaporation for the project and the bypass reach, and we evaluated it for both current operations and the no diversion condition.

We applied evaporation and ET rates based on the US Fish and Wildlife Service methodology to those contributing surface areas. We also evaluated it for a wet year, a dry year and a normal year. Okay.

In addition, per the study plan determination letter, we evaluated the consumptive use of the irrigation water that is withdrawn from the canal. And we also evaluated the consumptive use of Lost Creek flows. Again, that was per the study plan determination letter.

Moving on to slide 304, we'll go into a little bit of the methodology as to how we evaluated the consumptive use of both the project as well as the bypass reach.

In order to get the surface area that contributes to the evaporation for the project, for current operations we based the water surface elevation on the design drawings and the normal operating conditions. So the maximum stage in the canal, and we know the geometry of the canal, so we can then get the top width of the water, and then take it times the length of the canal and get a surface area for normal operating conditions.

In addition, we got the O and M manuals for the regulating reservoirs, Lake North and Lake Babcock, which will give us the surface area under normal operating conditions.

For the no diversion alternative for the project, we assume that although we're not diverting any water, there still would be some water standing in the canal, you know, likely due to ground water recharge back into the canal roughly, you know, approximately a foot, so we just use the -- basically the bottom width of the canal. And we did evaluate the no diversion alternative assuming that the reservoirs were full of water, or that the regulating reservoirs had no water, and I'll show those results here in just a second.

The area that contributes to evaporation for the bypass reach was calculated based on the hydraulic model that the Army Corps of Engineers developed for the bypass reach. So we looked at the hydraulic model results every single day, and we evaluated what the surface area was for every single day for a wet year, dry year and a normal year.

Okay. The area that contributes to evapotranspiration for both the project and the bypass reach was the area of riparian vegetation within 100 feet of the source. This is consistent with the methodologies that were laid out by the US Fish and Wildlife Service in coordination with some of the water users, central Platte NRD, NPPD, the DNR, CNPPID.

Here's an example of how -- slide 306, this is an example of how we computed the contributing area to evapotranspiration. Again, we looked at areas -- we took a 100 foot strip to riparian vegetation adjacent to both the project, the canal and the bypass reach. So assuming you got 100 foot of width, then we took it times the length from aerial photos to get our contributing surface area for evapotranspiration.

Okay. Again, the 100 foot width was based on the literature, the US Fish and Wildlife Service methodology in coordination with others. We just applied that same methodology.

Okay. Slide 307, here is a summary table of the surface areas that were calculated. For a -- and, again, similar to yesterday, we'll kind of focus on the normal year as -- in an effort to save some time.

So for current operations in 2005, that

being the normal year, the canal has approximately 470 acres of surface area. The reservoirs are approximately 960 acres of surface area, for a total of 1,430 acres of surface area. The bypass reach for 2005 has approximately 2,050 acres of surface area. That is for the current operations.

Under the no diversion scenario, the project canal -- again, we're just looking at assuming the bottom width of the canal has approximately a foot of water in it. Has approximately 230 acres of surface area. The reservoirs, again, assuming they are full, have 960 acres of surface area for a total of just under 1,200 acres. If we don't include the reservoirs, we've got just the canal bottom width, which is 230 acres.

The bypass reach for that no diversion scenario, we're diverting all the water down the bypass reach, it now has approximately 3,400 acres of surface area.

Evapotranspiration areas, those areas that are contributing to evapotranspiration, for the project canal we've got approximately 300 acres of area contributing to ET. Around the reservoirs we've got approximately -- just under 50 acres, so a total of just under 350 acres of surface area contributing to ET versus the bypass reach which has approximately 820 acres of surface area contributing to evapotranspiration.

Any questions on how we calculated the surface areas or the methodologies, assumptions that were made relative to the surface areas that contribute to both evaporation and evapotranspiration?

RICHARD HOLLAND: I'm just not sure why you're including under the no diversion the canal water. I mean, why wouldn't the canals be dry?

PAT ENGELBERT: Assuming there is a ground water mound adjacent to the canals, you would probably see some weeping of water back into the system very likely for probably quite a few years. We didn't test it. We just made an assumption on that. You could clearly evaluate it either way just by taking that area out as well as in the results. Just thinking that if there was no water running through the canal, you probably would still have some shallow water, you know, french drain type being pulled into the canal system, so you would have some water exposed to the atmosphere.

Any other questions on that on the

assumptions or methodologies?

The next step in order to evaluate the evaporation and the evapotranspiration was to apply an evaporation rate to those surface areas.

For the project canal and regulating reservoirs, we used National Weather Service daily pan evaporation rates to the canal in Lake North because of their depth, you know, in excess of 20 feet. We applied the lake coefficient of 0.7 to the pan -- the daily pan evaporation rate. Again, consistent with the methodologies we saw in the literature.

However, to Lake Babcock, because it's much shallower, we applied a lake coefficient of 0.9 to the pan evaporation rate.

For the bypass reach, again, use the National Weather Service daily pan evaporation rates, but due to its being relatively shallow, we applied the lake coefficient of .9 to the bypass reach as well.

The ET rate was a function of the pan evaporation rates consistent with the service methodology, but it had a coefficient that was contingent upon the growing season, whether it's the winter season or the growing season. So we took the pan evaporation rate times .7, and then you multiplied it by either .5 for the winter season or .8 by the growing season.

So we had daily pan evaporation rates, multiplied it by the coefficients that we applied, and applied those to the daily surface areas for the bypass reach, and then there were no daily fluctuations in the project operations, we assumed it was always operating at its maximum level.

Here is a summary of our results on slide 309. For the power canal, under current operations, the total open water evaporation is approximately 6,000 acre feet, evapotranspiration is roughly 870 acre feet, for a total consumptive use of the project of 6,900 acre feet.

In the bypass reach, we had an evaporation consumptive use of just over 9,000 acre feet, mean ET is approximately 2,000 acre feet. So the subtotal for the bypass reach is just a hair over 11,000 acre feet.

So looking at the consumptive use, combining both the project and the bypass reach, we get just a hair over 18,000 acre feet per year, and, again, this is for a normal year. We're looking here at 2005.

Under the no diversion condition, again, assuming, you know, minimal flow in the canal, we had 5,400 acre feet of consumptive use, 870 for ET, for a total -- subtotal consumptive use value of just under 6,300 acre feet.

Looking at the bypass reach for the no diversion condition, we're diverting all the water downstream, we get a total evaporation of 16,150 acre feet, ET stays the same at 2,110 acre feet. The subtotal of the bypass reach is 18,260 acre feet. So the total for the no diversion condition is 24,530 acre feet. When you combine both the project and the bypass reach for the no diversion condition, you have 24,530 acre feet.

George brought up a great point here. This evaporation of the canal assumes that the reservoirs are full. They've diverted water and have filled both reservoirs. That being Lake North and Lake Babcock.

Okay. This table on slide 310 is the analysis assuming under the no diversion condition we have -- the reservoirs are bone dry, there is no water in the reservoirs, however, we did allow for the one foot of -- approximately one foot of depth covering the bottom width of the canal.

You can see that the no diversion condition for the Loup Power Canal has approximately just under 1,100 acre feet of evaporation as compared to the 5,000 if we add the regulating reservoirs in there. ET stays the same, but now the consumptive use for the canal goes to just a hair under 2,000 acre feet. The bypass reach numbers stayed the same as we had shown on the previous slide. So the total without the regulating reservoirs for the no diversion condition is approximately 20,200 acre feet of consumptive use. That's evaporation and evapotranspiration. Any questions or comments on those results?

PAUL MAKOWSKI: My question to you is the water that's in the power canal is not really coming -- I guess it must be a gating section, so it's not really coming from the Loup River. And basically you have water in there, but it's not really coming from the Loup River, so would it -- I mean, unless you thought it would be going -- if it doesn't go to the canal, it will go to the Loup River, because it's counterintuitive that, you know, you have two bodies of water, when you go to one, it actually has less consumptive use.

PAT ENGELBERT: I guess our assumption

there, Paul, was that with it being, you know, ground water fed back into the system, that it would eventually make its way to the Loup River.

And could you -- the reporter would like you to speak up if you have a comment. She was having trouble hearing you.

GEORGE WALDOW: This is George Waldow, Paul, and I'm going to ask Pat to confirm what I'm about to say, but I seem to recall when we were structuring this analysis that we have the irrigators that currently take their water out of the power canal along its length, and I think we assumed that we would -- that there would be a necessity to maintain some flow in that canal to provide the water for those irrigators, and I would refer to Pat now to see if that was part of the final consideration.

PAT ENGELBERT: Here very shortly we will go over the irrigation consumptive use. Per the study determination letter, the -- under the no -- they didn't consider the -- you know, taking the project totally out of commission as a viable alternative, however, they wanted to evaluate the consumptive use from the irrigation, so I'll be going through those numbers. But just recognize that, you know, FERC in their study plan determination letter has stated that decommissioning the project is not a viable alternative, so there would, in effect, be water available for the irrigators.

However, for the purposes of this analysis, the no diversion, we just made an assumption as to a level or an amount of water that would get into the canal system under that no diversion alternative.

PAUL MAKOWSKI: You're putting one foot of water in so the irrigators can use?

PAT ENGELBERT: Not necessarily, Paul. Again, I guess the -- it's kind of two different things. One, the reality is that the alternative is not going to be evaluated of decommissioning the project or having no project there. Therefore, the irrigation consumptive uses will be the same whether the project is diverting or not diverting. But for purposes of just trying to get a number or a handle on the consumptive use, you know, in the event that the gates were closed at the diversion and they spilled all the water out, that you would still have water seeping into the system, thus being exposed to evaporation.

LISA RICHARDSON: This is Lisa Richardson. I just wanted to remind everybody that this was related to depletions on the Platte, not the Loup. So because it's all part of the Platte River basin, water that seeps into the canal under a no diversion scenario would be considered a potential depletion to the Platte River; is that right, Pat?

PAT ENGELBERT: Yeah, we're evaluating flow depletion to the Platte River as a result of project diversions. That's the overall purpose of the goal of this particular study. Ron.

RON ZIOLA: Ron Ziola, Loup Power District. And, again, it was in some of our early documentation we did show where drainage is allowed into the canal. So even under some normal rain events and those kind of things, there are several -- Pat, the number was someplace in the order of eight to ten locations where water would come out of the hillsides. Through -- under normal without the project being there, normal flows would take it to the Loup and ultimately to the Platte. Where under some normal rain events we're going to see a few culverts that are going to allow drainage into the canal, and, therefore, it will be in the canal and have difficulty then getting out of the system to get back to the Platte. So a little bit of water in the bottom of the canal under no diversion is still, as you've indicated, is going to occur, whether it be seepage or whether it be surface water runoff.

PAT ENGELBERT: There are locations along the canal where there are culverts that discharge storm runoff into there.

We thought about this a little bit as to how we should evaluate the evaporation under the no diversion condition. We thought maybe they would fill the canal in and then they would plant corn so there would be more irrigation, or maybe the vegetation would take over the canal and then you would have greater ET. And we thought maybe the simplest way to do it is just to think about how the system would operate if the canal stayed in place under no diversion, and we thought it seemed fairly logical that you would have some ground water seeping back into the canal which would be exposed to the evaporation that occurs. So it's -- yes, Michelle.

MICHELLE KOCH: Michelle Koch from Game and Parks. Did you use the same coefficient for the bypass reach for both the no diversion and diversion scenarios, use the same coefficients?

PAT ENGELBERT: Yes, yes.

GARY LEWIS: Gary Lewis, HDR. This was certainly a point of discussion, and I personally believe because of my understanding of ground and surface water connections in the state that there would be continued depletions to the Platte River from the canal sitting out there with seepage into it and the drainage that Ron mentions, but this table, if you did discount all the calculations of losses during -- or with the no diversion option, then the balance becomes 18,260 versus 18,080. So if you want those numbers, they are there.

We will hold our position that there would be continued depletions just from the operators and from our knowledge of how things are connected surface and groundwater out there. There would be continued depletions under the no diversion option, but the numbers are there. If you have an interest in them, we're -- they do show up on the chart.

RICHARD HOLLAND: You have -- in your no diversion scenario, you have a reduction in total acres about 50 percent roughly in the canal, and yet your evapotranspiration loss goes maybe 10 percent.

PAT ENGELBERT: Let me go back to the

surface area table. This is on slide 307; is that what you're referring to?

RICHARD HOLLAND: That's correct.

PAT ENGELBERT: So under current operations, we have approximately 470 acres of surface area contributing to ET. Under no diversion that goes to 232, so it's roughly half. However, we did keep the project reservoirs in there, so the total 1,430 and 1,192 would be the two surface area values that we would apply the evaporation rates to. So that looks like a reduction from 1,400 down to 1,200, which is about that 10 to 15 percent roughly the reduction in the evaporation rate that we saw with the regulating reservoirs.

RICHARD HOLLAND: When you go down to the 309, the table 309, slide 309, you have open water evapotranspiration, that's the reservoirs?

PAT ENGELBERT: This top line here?

RICHARD HOLLAND: Yeah, the top line.

PAT ENGELBERT: That includes the regulating reservoirs, yes.

RICHARD HOLLAND: What's the second one?

PAT ENGELBERT: That is the evapotranspiration, the riparian vegetation adjacent to the canals in the reservoirs, and that would be unchanged.

RICHARD HOLLAND: Thank you.

PAT ENGELBERT: I'm moving on to -- I'm still at slide 310. Again, any questions on the calculations of the surface area or the rates that were applied for both evaporation and evapotranspiration? Any questions or comments?

Okay. I'll go ahead and move on to slide 311, which kind of is a summary of the results of that particular portion of this.

That flow depletions under current operations are less than what would occur under the no diversion alternative. So we showed less consumptive losses under the current operations, which, again, is a combination of both the project and the bypass reach were less than what we would see under the no diversion alternative, again, which looks at still both the project and the bypass reach.

Next we'll go into the irrigation consumptive use. Again, per FERC's study plan determination recognizing that the irrigation will go on -- there was no alternative that would be evaluated assuming decommissioning, so the irrigation would continue.

RICHARD HOLLAND: A thought just occurred to me. I'm sorry to take us back one step. If we're including the reservoirs, how are we refilling the reservoirs every year, just through precipitation directly into the reservoir?

PAT ENGELBERT: Again, the assumption we made is that if -- that's why we looked at it both ways, with and without the reservoirs. Don't know how logical it would be to fill --

RICHARD HOLLAND: If you include the reservoirs, they have to be refilled every year to whatever level you're using to make your estimates.

PAT ENGELBERT: Yeah.

RICHARD HOLLAND: If the analysis was done over time, I would expect that the reservoir volumes would decrease over time, and, hence, the loss of depletion through evapotranspiration from the reservoirs would decline over time. That's the statement I made.

LISA RICHARDSON: That's what the analysis that Pat did shows. I mean, he did the analysis twice, once with the regulating reservoirs and once without, so those are for a single year. So over the course of time the amount of depletion would transition from the highest number down to the lowest number.

RICHARD HOLLAND: Understood.

GEORGE WALDOW: George Waldow, HDR. I don't want us to get into nit-picking here. I think what we -- we made some gross assumptions, which I think are probably pretty realistic if you do look at the long term. No. 1, our recreational analysis shows that this is a huge recreation resource for the region, and say the power plants went away, there would be a lot of public pressure to maintain not only the reservoirs, but the fish populations in them. And so somehow there would have to be a mechanism to feed whatever water was necessary to offset the evaporation to maintain those resources. So we had to -- we had to bracket all these possibilities, and that's basically what we've done with the approach we took. It wasn't to try and dig down into all the details of how this project may function absent the power generation part, so that's --

RANDY THORESON: Randy Thoreson, National Parks Service. You know, I'm not a part of the technical part of this, as you know, but very simply if I was going to summarize this, what you're saying is the current operations do not contribute significantly to the canal bypass consumptive use, right, is that what you're saying?

PAT ENGELBERT: Can you repeat that?

RANDY THORESON: The current operations do not contribute significantly to the canal bypass consumptive use; am I off on that?

PAT ENGELBERT: I think what we're saying is that under current operations you have less consumptive use than if you diverted all the water down the bypass reach, but both entities still contribute to that consumptive use. The canal and the bypass reach contribute under both scenarios to that.

Any other questions or comments?

So, again, moving back to the irrigation consumptive use, and recognizing that this would be on slide 312, this would be the same consumptive use whether the project was in operation or not in operation. So we just evaluated it for what it is. It would be applied to both sides of the equation, current ops and no diversion.

It was done by a sub to us on this project, the Platte Water Group, and they incorporated methodologies that are used by the Department of Natural Resources in their annual hydrologic evaluation to determine the crop irrigation requirement based on crop types, demand curves and precipitation. And then you evaluate what the consumptive use of the crop is based on a couple things, net irrigation requirement, gross irrigation requirement and applied irrigation.

And then based on the irrigation records, the amount of flow that was applied -- or amount of water that was applied to the system, how much would be lost to consumptive use, how much would contribute to the yield of the particular crop versus how much would run off. And it's not just, you know, the amount of water that runs off, because some of it goes into the root zone and can still be sucked up by the plant, but some of it goes into deep percolation that gets beyond the root zone and is essentially lost to the system.

I think I'll just stop right there. The results are -- and they looked at a longer period of time. I want to say from 1984 to 2009 to try to get a wide range of precipitation or climatic conditions. And what they found was on average approximately 71 percent of the applied irrigation water is lost to the system in the form of consumptive use. And, again, just wanted to reiterate that for both conditions, both operations and no diversion scenario, this would be the amount of irrigation water on average over the 25 or 26 year period that they evaluated. On average, 71 percent of the irrigation water that is applied would be lost to the system in the form of consumptive use.

Any comment or question on that?

JEFF SCHUCKMAN: Jeff Schuckman, Game and Parks. How many acre feet a year is that then? How much comes out through irrigation?

PAT ENGELBERT: Jeff, I want to say it's about 2,000 acre feet per year on average from the district's metering records that they pull out of the canal. About 2,000 acre feet, so this would be roughly on average 1,400.

JEFF SCHUCKMAN: And you're assuming that will be lost under both scenarios, that same 2,000 acre feet is lost?

PAT ENGELBERT: Yes.

JEFF SCHUCKMAN: Even though there is no water in the canal, or do you have to provide that irrigation water? Do they have senior water rights that you have to provide that irrigation water?

PAT ENGELBERT: I guess we didn't look at it under the logistics of how the water would get there. The study plan determination letter that said the decommissioning the project -- the reason we looked at the no diversion was to book end different -- instead of looking at over periods of weeks or months and not diverting, let's just not divert for the entire year, what would those values be. And assuming that, you know, that's not a condition that they would actually evaluate, because decommissioning the project is not a reasonably foreseeable alternative that they are going to be evaluating. But they wanted to book at the far end, so realistically they wouldn't do that, so there would be irrigation water provided to these folks whether they are not diverting for potentially short period of time or the project is operating as it is. So those consumptive losses would be the same under any of the alternative conditions that could be evaluated.

I hope I didn't jumble that too bad. It made sense in my head. All the voices in my head thought it made sense.

Any other questions on the irrigation calculations that were made, comments? Okay.

The next value that we determined was the

Lost Creek consumptive use. I just want to provide a little bit of background as to how Lost Creek interacts with the project from the time the project was built, and then other projects being constructed, you know, since the project was built.

The Lost Creek siphon was constructed with the project to convey Lost Creek flood flows. So I'm going to move ahead to slide 315 just for a second. It's kind of difficult to see with the arrangement of the room, but when the project was built, this magenta line is the irrigation canal. The Lost Creek basin covers -- it conveys flow from the northwest to the southeast through the town of Columbus, and then the natural pathway for the -- for Lost Creek goes under the canal probably a mile or a mile and-a-half upstream of where the tailrace discharges back into the Platte.

So historically, any presip that resulted in runoffs took the flow down Lost Creek through the city of Columbus, went through the siphon and then was conveyed, oh, approximately another 16 or 18 miles downstream through the Schuyler Golf Course and then into the Platte River.

So before the project was built, all the water flowed to Schuyler, after the project was built, the flows were conveyed through the siphon, went to the Schuyler Golf Course and then into the Platte River, probably with a couple of Neal's golf balls.

NEAL SUESS: More than likely.

PAT ENGELBERT: Again, after the project was built, they put that siphon in.

Going back to slide 314, during those times when there wasn't any flow in Lost Creek, they needed a way to discharge water from the canal into the siphon to keep it clean of debris. So they installed a gate that they operate periodically to flush flows through the siphon.

In the 1980s the Corps of Engineers constructed the Lost Creek flood control project. And going back to slide 315 now, the Corps constructed this Lost Creek flood control channel to pick up all -- a large portion of the Lost Creek basin would be captured in this Lost Creek flood control channel to prevent those flood flows from going through the town of Columbus. And those flows are collected and discharged into the Tailrace Canal just downstream of the Columbus powerhouse.

So prior to construction of this, you had Lost Creek flows being conveyed all the way down to the siphon and then into Schuyler. As it stands today since the 1980s, those Lost Creek flows are collected into the Lost Creek flood control channel and are now discharged into the Tailrace Canal.

Okay. So they are capturing Lost Creek flood flows, putting them in the canal, running them downstream, and going into the Platte River at the tailrace as opposed to in Schuyler, the portion of the basin that exists upstream of the channel.

LEE EMERY: Lee Emery from FERC. Is there still some water that enters that Lost Creek, the old entry there on the lower part?

PAT ENGELBERT: Yes, there are still flows that do go through the city of Columbus and are still being conveyed through the siphon at the Lost Creek siphon.

NEAL SUESS: If I can, Lee, the city has built some additional structure to basically force -- especially in the lower southeast corner of Columbus, and I think you probably saw it last night when you drove out there. They built some additional structure to kind of take that and make it very clear as to where the Lost Creek is at to put that flow back in there, and then they also have an additional runoff structure that goes down to the

Platte River now. But, yeah, there is some flow that comes -- basically as Pat said. The flow that comes through the city of Columbus is then directed into that structure that the city built. That's supposed to follow the natural flow of Lost Creek to take that back into Lost Creek as it is.

LEE EMERY: Thank you.

PAT ENGELBERT: Any other questions on that?

So the methodology that we evaluated is look at the consumptive use of the Lost Creek flows, is we evaluated the amount of runoff that comes from Lost Creek that is discharged into the canal versus the amount of water that is taken out of canal at the siphon.

Okay. So Lost Creek flows coming into the canal, we quantified what that is on an average annual basis, and we compared that to the average annual amount that they are discharging out of the canal through the siphon.

All right. And that was done -- in order to evaluate how much flow was coming into the canal, we looked at -- again, here's the Lost Creek flood control channel coming into the canal. We had to make some assumptions based on watermarks shown on the energy dissipater at the downstream end of the channel just prior to it going into the Tailrace Canal.

Here's a photo of the small notch at the upstream end of that energy dissipator. And we looked at these water stain markings which gave us an indication of what the typical or the daily levels are based on those markings. So we made an assumption as to what the mean daily height of that is, applied it to a weir equation, and then came up with what kind of the base flow coming off the Lost Creek channel is into the Tailrace Canal.

Let's see. I'm going back now to slide 316. So we had an idea what the base flows were coming into the canal, and then we also evaluated what the average annual runoff was based on some runoff curves that were developed by the -- I think the ARCS, Gary, is that right?

GARY LEWIS: Yes.

PAT ENGELBERT: So we also looked at average annual runoff, that being average annual storm events that were factored in to create these curves.

To determine the average annual amount of flow that is discharged from the Tailrace Canal, we looked at the district's gate opening records from the pipe that conveys flows from the canal into the Lost Creek siphon. And we evaluated using a software package called HY-8 which evaluates culvert hydraulics to give us an indication of what the average annual flows being discharged out of the canal are.

Here I'm going on to slide 321, which is the design drawing from the district which gave us our parameters to evaluate the culvert losses.

Here's a picture of the gated structure. This is the canal -- I'm on slide 322. So this is the gate structure on the canal side of the berm that exists. They open and close that gate periodically, and it conveys flows into a pipe -- now I'm on slide 323 -- conveys flows into a pipe that are then discharged into the canal. This is a picture of the head wall on the upstream side of the siphon. The pipe that runs from the gate is actually under the berm there, so you can't see the pipe that actually goes into the siphon. But that's just to give you an idea of what that particular structure looks like.

So what we found is that the average annual Lost Creek flows that are entering the canal on average is approximately 14 CFS, and the amount of flow that's being discharged from the Tailrace Canal through the siphon is approximately 12 CFS. We base the gate openings to be consistent with other studies from 2003 to 2009. We used the district's gate opening records from 2003 to 2009.

If you go back further, I think they started keeping them in 1994. It's actually slightly lower number, it's maybe around ten CFS or something like that, but to be consistent with the '03 to '09 time period, that's what the 12 CFS represents.

So any questions on how we calculated the Lost Creek flows, the amount coming in versus the amount being discharged out, any questions or comments on that?

GEORGE WALDOW: Just to clarify if anybody's wondering how this thing works. It's an inverted siphon, and because an inverted siphon goes down and under and back out above, it tends to collect debris down in the area that's not accessible, and that's the purpose for the flushing flows was to clean out the sediment that would accumulate in that -- the bottom of that U-shaped structure.

PAT ENGELBERT: So I guess in summary of the consumptive use analysis that we performed, the flow depletions under current operations are less than would occur under the no diversion alternative. That's that ET portion.

On average, 71 percent of the applied irrigation water is lost to consumptive use.

The average annual Lost Creek flow entering the Tailrace Canal is approximately 14 CFS. And the average annual flow being discharged from the Tailrace Canal through Lost Creek, the Lost Creek siphon which then is conveyed down to Schuyler is approximately 12 CFS.

Any questions on the summary results, any component of it, the consumptive use, evapo ET, areas, rates, irrigation consumptive use or the Lost Creek analysis that was performed? Any questions on that before we move on to some stage calculations? Michelle.

MICHELLE KOCH: This is Michelle Koch from Game and Parks. You may have explained this before, but other than just the evaporative loss and ET when you're calculating depletions, was there any consideration as far as how much water is held back in those reservoirs that doesn't ever reach the rest of the -- where it joins back in there down by below the tailrace? I mean, other than evaporative loss to a river system, if you're taking all that water out, whether or not it's evaporating or sitting in a reservoir just sitting there, was that taken into consideration?

PAT ENGELBERT: No, it was not. That portion of water volume was not taken into consideration. Ron.

RON ZIOLA: Ron Ziola, Loup Power District. Again, you know, our reservoirs are not what you construe as a dam. Power retention as you see through the cycling at the North Bend gage, the water is impounded for less than 12 to 24 hours. There is a dead pool in Lake North. We can't totally drain Lake Babcock through a process, but there is a small dead pool in Lake North, but it's, you know, very, very small, probably less than a few hundred acre feet. But in the idea of Lake McConaughy which might impound some water for upwards of a year, we do not have that capability. The water comes in, the most it would stay there is about a day, and then the water has to be released back to the system. It's just a natural operation of the system.

MICHELLE KOCH: So essentially, and this is for my understanding because I don't know. Everything that's diverted ends up back into the river except for whatever is taken out for irrigation from the canal?

RON ZIOLA: Sure. And then there is a small dead pool in the bottom of Lake North that can't -- if we were to drain the system dry, there would still be a small dead pool, maybe less than a hundred acre -- or probably more in the order of 50 acres and less than four, five foot deep. So there is a small amount of water that no matter what we did we could never get out of Lake North.

MICHELLE KOCH: Thank you for that clarification.

TOM ECONOPOULY: Tom Econopouly, Fish and Wildlife Service. Is there any seepage from the reservoir that's contributed to groundwater --

PAT ENGELBERT: One of the underlying assumptions of the consumptive use analysis was to evaluate the -- we looked at the Department of Natural Resources' hydrologically connected lines, and the project fell within that, so any loss of seepage would eventually get to the system through groundwater.

TOM ECONOPOULY: And also ET for the winter and the summer, where do you come up with those coefficients from?

PAT ENGELBERT: It came out of the literature from that service document, and I believe it's referenced in the report. We've got the electronic copies if you would like copies of that.

I think it was agreed upon, if I remember the reference correctly, Tom, it was a consortium of folks that were evaluating flows that I think on behalf of the central Platte. They looked at it all the way down to Louisville. It was the service and the DNR and I believe NPPD, I think CNPPID. A lot of folks were involved in developing those.

Any other questions before I go on to the next objective?

Okay. On to slide 326, the next objective was to use the current and historic USGS rating curves to evaluate the change in stage of the Loup River bypass reach during project operations and compare those to -- against alternative hydrographs, in this case, being the no diversion condition.

We did evaluate the stages again using the 25, 50 and 75 percent exceedance discharges based on the flow duration curves. And then we evaluated it for a wet year, dry year and a normal year. Again, for the two operating conditions, the current ops and the no diversion condition.

Again, the 25 percent exceedance discharge is -- that discharge for a given year, that discharge is equal or exceeded 25 percent of the time. So 25 percent of the flows are greater than that, 75 percent of the flows are lower than that. So it kind of gave you a little higher discharge for that particular year. 50 percent is the median discharge, it's that discharge which is right in the middle. 50 percent of the flows are greater than it, 50 percent of the flows are less than it.

And then the 75 percent exceedance discharge is kind of on the lower end. Seventy-five percent of the flows are greater than that and 25 percent of the flows are less than that.

Moving to slide 327, here is a summary of the results. And, again, we're looking at 2005, which is a normal flow classification year.

Under current operations for the 50 percent exceedance discharge, that flow is around 570 CFS. You would get a water surface elevation of approximately 1546.2. So keep that in your head just for a second. Under the no diversion condition, that 50 percent exceedance discharge gets increased from 570 up to just under 2,300 CFS. And the stage associated with that is 1547.4. So for a normal year, the median discharge you would have a stage increase of approximately 1.2 feet.

Okay. I don't think that's a stretch to say that if you have more water going down the river you're going to have higher stages.

Any comment or question on that?

That was for the Loup at Genoa. The Loup at Columbus, again, looking at a similar situation -- what we see, though, is the difference in water surface elevation on slide 328, the last column. The water surface elevation is a hair under 1,433, and under the no diversion condition, it's a hair under 1,434. So, again, as you work your way downstream, you see kind of a dampening effect of that no diversion condition, so it's right at approximately a foot of stage increase between the current operations and the no diversion condition.

Any questions on that, any questions on that?

Okay. So in summary, there is an increase in stage under the no diversion alternative.

The magnitude of the stage does decrease with increasing discharge. And although I didn't show the dry conditions, but as we had discussed yesterday under those lower flow or those drier conditions, you do see the greatest differential in stage between current ops and no diversion.

Any questions on that stage evaluation that was performed?

We'll go ahead and move on to objective three, slide 330. And this was to evaluate the historic flow trends on both the Loup River and the Platte River since project inception.

We evaluated USGS gages as well as some USGS publications which are listed here on slide 330.

Moving on to slide 331, this is a graphic of the annual mean flow for the Platte River at North Bend. I'll show the Platte River at North Bend, and then I believe at the Loup at Genoa just to show the historic flow trends.

You see we do have an increasing flow trends from 1950 to present. Similarly, at the Loup at Genoa gage we also see an increasing flow trend from 1944 to approximately 2008.

These are the same trends that we saw at Duncan, however, I failed to get that graphic in this presentation, but I believe it's either in the report or it's in the reference.

So the results of the historic flow trend evaluation show that there was a long-term positive flow trend that has occurred since the gages were put in place. The same trend -- the same trends that are seen at the downstream gages are also seen at Duncan. So it goes without saying it doesn't appear there is a project impact on the long-term historic trends.

GARY LEWIS: Yeah, this is kind of an afterthought. When you look at these flow trends that were done, the studies done by the survey, they exist all the way up and down the Platte River, but that may explain part of why if we're getting such high sediment supply to the stream, why we're not seeing in that 50 year, even 100 year period -- one of those studies went back to the turn of the century -- why we're not seeing the aggradation that would be intuitively correct.

So there is -- we didn't scientifically look at this, but this is one fact that one might look at as an explanation of how if there is that much sediment being produced by the watershed, why the river is not degrading. As I said, geologic time river has been all over the page vertically, but none of the investigations have detected either aggradation or degradation, and they profile the stream throughout the entire river as well as on both sides of the tailrace return. It just isn't -- the data doesn't support that, even though there is some logic to think that it should be changing down there.

So these increasing flow rates may explain it's able to maintain itself in its equilibrium even though we're getting a supply of sediment that exceeds the capacity to transport it. It's not proven, just a afterthought here.

PAT ENGELBERT: And I think Gary's point is that, again, another piece of the puzzle. We evaluated a lot of little pieces, and it's taking us down a path to the conclusions that we've reached.

So if there aren't any questions on those first three objectives, that being the consumptive use and the trends, then I'll turn it over to Matt Pillard who I think is going to talk about some habitat stuff. Any questions? I will be back up in a little bit on sediment transport, which I can see everyone is very excited about, but I'll turn it over to Matt.

RICHARD HOLLAND: Your long-term positive flow trends start at the 50s. There is evidence that you're decreasing flow from the central Platte prior to that period of time. I mean, the Duncan gage obviously shows a decline in flows out of the central Platte. In fact, the purpose of the three state agreement, but -- so, I mean, you have to temper with the fact that you're starting at a low point, and then we're increasing from that, so it's -- don't -- part of your explanation from historical geological time is there used to be more flow coming from the central Platte system into the lower Platte system.

PAT ENGELBERT: Anything else?

LEE EMERY: Any questions from FERC on the phone?

PAUL MAKOWSKI: Paul is here.

ISIS JOHNSON: Isis is here.

LEE EMERY: Any questions?

PAUL MAKOWSKI: Not now.

ISIS JOHNSON: No.

MATT PILLARD: We'll move on to objective four. And this objective was to determine the extent of interior least tern and piping plover nesting on the Loup River above and below the diversion weir.

So we would look at interior least tern and piping plover nesting on the Loup River bypass reach, and then we also looked at sedimentation analysis as it may affect tern and plovers on the Loup above and below the diversion weir.

Slide 335 now. Methodology, the first part of what we did to analyze this was to do a nest count comparison. So we looked at nest counts above and below the diversion weir to see if there could be any differences or similarities in nesting above and below the diversion weir.

We had about ten years of available data to do this from. There weren't a lot of -- wasn't a lot of nesting, the numbers were small in some years, in other years there may not have been surveys performed, so per the study plan determination, if significant differences could be determined, then we would move forward and do an analysis of habitat above and below the weir.

Because we didn't really feel like we could make that determination with the numbers that we had, we went ahead and moved forward and did the analysis, even though it was really inconclusive due to the sample size, you know, whether or not there was a little difference in nesting above and below the weir.

There are differences in nesting numbers to what we have. Nesting numbers do show that there has been more nesting above the weir than below from the data that we have, but it was -- we couldn't distinguish or draw any conclusions from the sample size. So we went ahead and did the analysis of comparing habitats above and below the diversion weir.

In order to do this, we looked at observed habitat parameters that have been identified in other studies. Most of you are familiar to the references to the right-hand side of the column.

So habitat parameters that we would be interested in would be things like channel width, dry sand area, vegetation cover, average location of sandbars, point bars or mid-channel bars, and then we also did look at valley width.

So this is the list of parameters that we looked at. I won't go through this whole list, but this kind of then reflects the types of parameters that we would try to pull from an aerial imagery analysis.

So in order to determine what to analyze, we looked at -- we wanted to really have an equal number of river miles above and below the diversion weir to be analyzed, and so we looked at five separate river miles above the diversion weir and five separate miles below the diversion weir.

We wanted to have one location in close proximity to the diversion weir, so one of the miles we really wanted to locate within the first five miles above and below the weir. The next -- I guess the four other miles for both above and below were then selected randomly based on the number of miles we had to evaluate from.

This image is probably hard to see from the back of the room. It's hard to see from the front of the room. But this is below the diversion weir, so starting at mile zero, I guess downstream at the confluence with the Platte River, there is roughly 37 miles from below the diversion weir that we had to pick from. And keep in mind that we did want one river mile within the first 5 miles, so you can see that we randomly then selected the first river mile was selected at mile 33 to 32, and then randomly selected from the next grouping of river miles available, and so we had river miles 27 to 26, 14 to 13, eight to seven and six to five. Those were the river miles that were randomly selected to do an aerial imagery analysis on below the diversion weir.

The next slide is the graphic above the diversion weir. Again, working again down -- working down from upstream in this case. Within the first five miles we selected one mile, and that ended up being river mile 38 to 39. And then we randomly selected four other river miles up to river mile 69, so that we ended up looking at then randomly selected miles from 49 to 50, 54 to 55, 60 to 61, and 65 to 66.

So on slide 341, we looked at -- the range of the years that we looked at were from 2003 through 2009. We used -- we wanted to have an equal number of wet, dry or normal years in our analysis. We based this off the 1985 Food Security Act methods for aerial color interpretation of wetlands. It was a method that we could make sure that we looked at equal number of precipitation type years in the analysis. So wet years available were 2007, -8 and -9. So we randomly selected 2009.

For dry years, at Genoa, by itself, there was no dry year, however, years 2003 and -6 were very close to being a dry year, and so we selected the 2003 as it was two positions away on the -- was it US Fish and Wildlife Service for selecting those years?

LISA RICHARDSON: The ranking.

MATT PILLARD: It was two positions away. So that was as close as we could get to a dry year for this scenario. And then the normal years available were 2004, -5 and -6. So in this scenario we would have one wet, one dry year and three normal years to use.

We performed a site visit in 2010, early 2010 to try to get a handle on the imagery that we're seeing in 2009 so that we could -- as we begin these photo interpretation using an unsupervised method, be able to ground truth and field verify some of the images that we would be evaluating on the aerials to what happened out there in the field.

I kind of alluded to it. We attempted to use an unsupervised method of evaluation, letting our GIS systems pick and select classifications of different types of habitat using pixel values. We also, as we'll get into here a little bit, also how to use some visual interpretation methods where the unsupervised model wasn't successful.

Again, ERDAS Imagine software was used for the unsupervised method. It's based on the pixel value, so the software would identify pixel values, you know, group those in classifications so that we could assign a habitat type or land use type associated with those pixels.

The results of the analysis were somewhat mixed. Flat and smooth features, the software was very successful we felt in identifying bare sand, wet sand and shallow water. We found a very good correlation between what we saw in the field, what we're looking on the aerials, and what the software was evaluating.

Rough features, such as vegetation and choppy water, we were having mixed results. Things were kind of not making sense, were out of place, couldn't refine the model -- the software any more just based on the resolution of the pixel values.

I kind of wanted to point out that wet sand and shallow water using the unsupervised method, it was hard to separate those from a pixel valuation, so the purpose -- for the purposes of this analysis, wet sand and shallow water were grouped in the same classification. We couldn't separate those with any degree of certainty of what was just wet sand versus very shallow water, you know, from very small amounts of water. Deep water, however, we could begin to see a darker pixel value, so we could then establish how the deeper water areas based on a darker pixel value, the lighter pixel values were established as shallow water or wet sand.

This is kind of one example. These figures are in the attachments associated with the report. This is slide 344. It's river mile 13 through 14. And this is just kind of a result of -- one example the result of the analysis of the areas that were identified as dry sand, areas that were identified as emergent, vegetation force in vegetation, water in the darker blue, and kind of shallow water, wet sand in the lighter blue. So, again, there is an image of this for every year that was analyzed in the attachments.

From a visual interpretation perspective, you know, we had a GIS technician, environmental scientist look at the imagery, classify the areas that were emergent, scrub-shrub and forested vegetation strata, as well as some of the water features. And I think -- I think the -- let me go back to this slide here.

One of the challenges that we had was

grouping what a sandbar was or what a sandbar wasn't, or where those parameters began and end. As often you would have, you know, smaller areas that might be in between two bars, and, you know, there had to be -- there was some user inferences that had to be made where a bar stops and where a new bar begins. So we kind of tried to group areas of sand even though there might have been a small separation of water between bars, you know, somewhere we had to draw the lines on where does the bar begin, where does the bar end. And that's because to determine the number of bars in that river mile, the size of that bar, that's where that piece of information becomes important.

From a parameter classification standpoint, slide 346, we used the usable substrate from habitat standpoint, bare sand versus vegetation bars is what we tried to look for.

From a macroform determination, from a sandbar perspective again, you know, the size, the area, the number of the position of those bars within each river mile, you know, where they -- you hear again this kind of gets back to the point I just made from a mid-channel bar perspective, you know, greater than 75 percent of the exposed sand was surrounded by water we classified as a mid-channel bar versus a point bar.

Again, there was really no attempt made to define was that bar a good habitat or bad habitat, just was it bare sand, was there vegetation on it, what were the percents of those is what was analyzed.

And then again channel width, channel width is fairly consistent, at least from below the weir and above the weir from site to site. And, again, channel width we analyzed that based on the typical high bank to high bank or the edges of the vegetation that could be seen on the aerials.

I think I've kind of hit some of these points, but kind of wanted to make some notes on the methods that we recognize, and I'm sure folks that are familiar with this kind of technique also recognize that the unsupervised portion of the model is repeatable. You know, anyone can use the same software and hopefully derive the same results that we could.

The visual inspection, just like anything, it's open to some human influence and human interpretation. We try to limit that by having the same individual do the -- do all the analysis, you know, that's reviewed by other scientists. Again, that's one area where one scientist might view, you know, a habitat type differently than another. That's just one of the inherent flaws of photo interpretation.

Another thing I would like to point out obviously is the years that were selected were wet, dry and normal. I think it was probably pointed out during the study plan meetings that the flow and the dates is also very important in this analysis, and each of the figures has the flow on the date of the aerial. Even though it might have been a wet year, that particular day that the photo was taken might have been a very low flow day. That has some effects on what we might see in the river that day.

Other things may not have as much influence on such as vegetated bars and those type of things might have been established earlier in the year, you know, based on the weather conditions.

We had some issue with some of the aerials. Some of the aerials we had some issues with relative to the quality of those, something we had to work around. We shifted one river mile slightly to avoid -- where two aerials didn't seem to match. We shifted it a couple hundred feet so that we had one clear image. And then, again, I already kind of addressed the sandbar grouping and how to determine where sandbar starts or stops.

From the methods from the valley width perspective, we built upon the study that was done by Elliott in 2009. We used the USGS shapefiles that they used to look at valley width for that study. It -- that study went from the Loup River to the confluence with the Platte to the diversion weir. They grouped that Loup River valley as all part of the Platte River valley. And we extended the Platte River -- extended that to Platte River mile 187.

Basically we took their analysis and extended it upstream to include the valley width for the Platte River valley, still encompassed the Loup valley through the portions of our study area.

We established transects based on those valley widths here, and this is slide 349. Based on that valley width to determine what the valley width was we then just did a transect every quarter mile to get that average valley width that then would bisect our study area sites so we could get an idea for our study area what are the valley widths.

Slide 350, we're on results of the aerial imagery. We found obviously differences above and below the diversion weir, and I'll kind of go through those.

There were a greater number of sandbars per river mile above the diversion weir. Approximately 41 sandbars per river mile versus 24 sandbars per river mile below the diversion weir.

Above the diversion, sandbars were typically smaller. Four acres in size versus 10 acres in size for below the diversion weir.

From a channel width perspective, again, fairly consistent above and below, but the differences are the channel is approximately 400 feet wider above the diversion weir than below.

There was a lower percentage of vegetation on sandbars above the diversion weir.

There was, interesting enough, a lower percentage of bare sand on the sandbars above the diversion weir as well.

Location of sandbars, more point bars below the diversion weir, more mid-channel bars above.

From a valley width perspective because we were in the Platte River valley it was fairly consistent for both above and below the diversion weir.

The distances in valley ranged from 15.2 miles to 24.3 miles of valley width.

I guess I'll stop here and see if there are any questions on the aerial photo interpretation before we move on to how to use the HEC-RAS model. Again, very similar to yesterday in hydrocycling, how we use the HEC-RAS model to evaluate percent of exposed channel width on the Loup River.

ISIS JOHNSON: I have a quick question. This is Isis Johnson from FERC.

I wanted to know, you said that you got a lower percentage of vegetation on the sandbar above the diversion weir, but there was also a lower percentage of bare sand, so I guess I was wondering if you could explain that.

MATT PILLARD: It's because the sandbars are smaller above the diversion weir, it's how the percentages play out based on the size of those sandbars.

ISIS JOHNSON: Intuitively when I looked at them I thought, hmm, okay, there is a lower percentage of vegetation, but there is also a lower percentage of -- I guess, are you talking about just overall surface area, is that what's playing into the lower -- because if you just sort of look it in passing, you would think, well, there is lower percentage of vegetation, then you think there would be more bare sand.

MATT PILLARD: It's based on the surface area available.

ISIS JOHNSON: Okay.

MATT PILLARD: Joel.

JOEL JORGENSEN: Joel Jorgensen, Game and Parks. So the photos that were used, were they photos taken in late July, August time period for crops?

MATT PILLARD: Yes.

JOEL JORGENSEN: I guess I'm curious if you were to change your macroform depth determination from greater than 75 percent of the exposed sands surrounded by water to 100 percent surrounded by water, would the results change?

MATT PILLARD: I'm sure they would change.

JOEL JORGENSEN: Would the conclusions change dramatically?

MATT PILLARD: It would be the number of point bars for mid-channel bars would change. I mean, most likely the number of mid-channel bars above might go down to more point bars; does that make sense?

JOEL JORGENSEN: Okay.

MATT PILLARD: If we increase that percentage to 100, there might be fewer mid-channel bars upstream of the diversion weir than are currently being shown if that number were 100 percent needing to be surrounded. So I guess we gave the benefit of the doubt to the day that we have the aerial, if there was a small little portion that might have been connected through a few little small pieces of sandbar, that if the flow were to go up a little bit then it would be surrounded. That's why we didn't go with a rigid 100 percent and assuming there might be some times there is limited areas where that could be totally surrounded.

JOEL JORGENSEN: So I guess how did you define whether it was disconnected or not? I understand how challenging that can be looking at aerial photographs, but from a bird's standpoint, a little bit of water is probably the same as being bone dry given the access to predators and those sorts of things. So a little bit of -- yeah, what was the -- how did you sort of define that portion of it?

MATT PILLARD: In terms of disconnected

from the bank?

JOEL JORGENSEN: Right, 75 percent, 100 percent determination.

MATT PILLARD: Melissa might be able to help me out.

MELISSA MARINOVICH: We went with the -- as we said in the study plan, we were going with Kirch's (phonetic) methodology. And Kirch defined a mid-channel bar as anything that was surrounded by 75 percent or more water. So we went with what she went with for that, for the mid-channel versus point bar determination.

MATT PILLARD: It doesn't help maybe answer the question how we did it.

JOEL JORGENSEN: Well, again, I still think more to the point is whether if you changed the parameters would the results change.

So moving on --

JEFF RUNGE: I guess before you go to the next topic, that's why us as a official wildlife service requested that the one dimensional modeling come in place as well, because it's difficult to pick out isolation connection based on aerial photography, but then if we supplement that with information on the ground to see if these bars are connected or not.

JOEL JORGENSEN: Right. Particularly when aerial photographs -- using aerial photographs that are taken in below, you obviously have much less water which would change the way the features look, because it's being diverted, right?

JEFF RUNGE: It does, except with the one dimensional modeling, assuming that there is no significant change within your bed, that you can project if there is a certain point they become disconnected.

JOEL JORGENSEN: I agree, yeah. That would be definitely helpful in supplementing that.

JEFF RUNGE: Yeah.

JOEL JORGENSEN: Regarding the number of sandbars, I'm less familiar with this part of the report. Is there a summary, sort of a statistical summary of the size and that sort of information in the report? I don't need to see it right now.

MATT PILLARD: There is a table. I can get it for you later. Melissa might have the page. Not really statistical analysis, just comparative -- we didn't statistically compare the difference.

JOEL JORGENSEN: It shows the means potentially?

MATT PILLARD: Yes.

JOEL JORGENSEN: And with channel width, I guess here's a situation where means -- really the average is really maybe don't matter a whole lot as much to the birds as potentially the extremes. If it's on the lower Platte River, 50 percent of our nesting occurs in the widest 2 percent of the channel. So I'm curious maybe how much of the extremes. You said the channel was relatively uniform above and below, so there isn't a great deal of variation in the channel width and maybe those extremes.

Again, I think what the birds are probably going to respond to the 1,065 sort of range, and I guess I'm curious on whether that top -- the near of channel widths, how much different those are rather than merely the --

MATT PILLARD: So from an average I guess for each -- you know, within each mile more the range of channel widths would be as much interest as just averaging what we had, because we did tran sex just to get the average. You can also know the max and min for every --

JOEL JORGENSEN: I guess focusing more on the top 10 percent of those channel widths may be more to the point regarding what the birds are using, because, again, probably at the top -- the lower 50 percent of channel width really may not -- I mean, it's important to birds to have channel -- you know, certain things in broader habitat context, but specifically looking at where the birds will be selected for nesting, it's really the wider portions that are really most important.

MATT PILLARD: Okay.

JOEL JORGENSEN: And that's about all I have.

I guess one other point I think there was a quote in there in the report from Brown and Jorgenson regarding -- it talks about habitat uses and habitats not used. It's a direct quotation and it's factually correct. We made the observation on the lower Platte River that sandbars where there were no colonies were larger in size than those unused. However, the direct quote in the report leaves out -- it's not actually a direct quote. It omits the parenthetical statistical information which shows it wasn't a statistical test. It shows there is a great deal of overlap between those two values. And essentially even though we're sort of summarizing the average of what we observed, it really isn't making a conclusion in a statistical sense that there is a difference there.

So I think either incorporating that parenthetical data back into those quotations is very important, because I think after that quotation is mentioned, the argument or the narrative builds upon that point, so I would ask that that be rectified.

MATT PILLARD: Sure. Thanks, Joel.

JEFF RUNGE: Yeah. When looking at the average valley widths, 15.2 miles to 24.3 miles, those are pretty wide valley widths I guess. Would it be safe to assume that the valley at any point does not constrict the channel width, or is there -- or have you seen cases or instances where there is a constriction in the valley width that would result in a restriction in your channel width?

MATT PILLARD: The narrowest is 15.2 miles, so we didn't necessarily analyze in that location is the valley width having an effect on the Loup River channel width. We were looking at valley width as relationship to terns and plover nesting, not to channel width formation.

JEFF RUNGE: Okay. But I guess I would assume that these are wide valleys that wouldn't constrain the active channel.

MATT PILLARD: It's probably a little different situation maybe on the lower Platte where you have some very narrow valley widths, you know, that might have been shown to maybe have some relationship versus here the wide valley widths may not be -- valley width may not be a player on the Loup River in the area we looked at in terms of how it may or may not affect habitat production.

JEFF RUNGE: Yeah, that seemed pretty obvious to me too, but I thought -- I wasn't quite sure. You did all the work so I wanted you to verify that. Thanks.

MATT PILLARD: Yeah. So we'll move -- I think we'll move on. I'm on slide 352, and I'll go through this methods of the HEC-RAS analysis to identify percent exposed channel relatively quickly. It's the same methodology that we did for the hydrocycling analysis on the Platte River, just obviously different locations. We used obviously different sites. Sites one -- site one was above the diversion weir, site two was below the diversion weir. We used the model to evaluate for the different scenarios of flow, what would be exposed from a channel width perspective on average at each site.

So I'm just going to kind of blow through this page. It's kind of the same kind of things that we used for the hydrocycling. Different flows, pre-nesting, post nesting surveys were used, study sites one and two for both current operations and no diversion.

Again, another example, this is at -- I'm not sure what site this one is at. We can assume this is at site one. I think for purposes of the graphic is to show the same things we showed earlier that a change in stage results in a change in what's exposed from a channel width perspective.

Again, maybe didn't make this point yesterday. This only evaluates what's exposed from a percent channel width perspective, it doesn't really make any indication of whether or not that -- what was exposed was suitable habitat for nesting or not. Just whether or not it was above or below the elevation line.

So I'll go through the results of what we found similar to how we addressed before. Here we'll compare between sites one and two. Under both operation scenarios, percent exposed channel width decreased as flow or wetter conditions increased.

At site two, current operations had a greater percent of exposed channel width than under the no diversion condition. It's less flow, you know, under a current operations scenario.

Site one had a similar percent exposed channel width as site two under the no diversion condition. Maybe that's self intuitive. If the flow is going down the bypass reach, you have similar flows above and below. Even though we have some differences in channel widths, the amount of percent exposed channel widths were relatively close.

This is just kind of a summary graphic. I'm on slide 358. It shows site one, the channel width differences, and then, you know, looking at the different years. Site one, 20 percent exposed channel width, current operations, site two, and that dry year was 63 percent. Under a no diversion condition in a dry year was 14 percent, so a little bit less under the no diversion condition downstream than upstream under the same flow scenarios. All typically higher from percent of exposed channel width at site two under the current operations condition.

That's -- I can take questions on the

percent of exposed channel width portion. Pat's going to help describe how the sediment transport parameters worked into the flow depletion flow diversion portion.

JEFF RUNGE: Not really a question, but a statement here is the exposed channel width is very helpful, but I don't think -- getting back to the reference here with Joel is that this is -- the one dimensional model is to help verify a lot of the information that was done at the two dimensional photography analysis. A lot of the different evaluations, such as you've got the exposed -- percent of exposed sand, but it doesn't say whether these are attached or whether these are connected to the bank or disconnected at these different flows, and that's one important component.

I think other important variables that are missing that would help to improve this analysis is wetted width and mean depth as well. I think those are also -- may not be direct selected for variables, but they may imply things like land predator access and those types of variables. So I believe that the analysis is really good, but I think it could be improved with the addition of those variables, which shouldn't take that much extra work, because you do have the model grounds, you do have the output, it's just reporting those.

MATT PILLARD: Thanks, Jeff.

PAT ENGELBERT: Any other questions for Matt before he sits down, or even after?

Just really quickly, we'll go through -- we performed the sediment transport calculations as we had done previously for the hydrocycling stuff. We did it for the no diversion alternative.

Again, after we evaluated the sediment transport under the current ops versus the no diversion hydrograph, we determined what the dominant and effective discharges were as well as the total sediment transport. And we also put those results into our regime analysis, and I think I'll just go right into the summary of results.

Slide 360, site -- up here we've got sites one, site two and site three. Under current operations, the dominant discharged at site one is approximately 2,300 CFS, and the total sediment transport at capacity is around 2,200 tons -- is that tons per day, George?

GEORGE HUNT: That's tons per year.

PAT ENGELBERT: Tons per year. Sorry about that. 2.2 million tons per year.

So looking at site two, under current operations, the dominant discharge is around 1000 CFS, and that dominant discharge gets increased to approximately 2,400 CFS under the no diversion alternative. More water, more sediment being transported.

And then that sediment capacity goes from 890,000 tons per year up to approximately 2.4 million tons per year.

As we get down into site three, the dominant discharge for current operations is around 1,200 CFS, and the dominant discharge under the no diversion condition is approximately 3,400 CFS.

And the sediment capacity increases from 950,000 tons per year to approximately 1.8 million tons per year.

So any questions on that? Basically you have more flow, more sediment being transported, higher dominant discharge. Any questions on that? And that was for 2005, which is a normal flow classification year.

We also evaluated it looking at the hydrographs from 2003 through 2009 and averaged the results to get the average annual.

The dominant discharge for current

operations gets slightly increased from just looking at 2005 up to 2,500 CFS which is the sediment transport capacity of around 2.6 million tons per year.

Site two, the dominant discharge under current operations is 1,100 CFS. Under the no diversion condition it's 2,600 CFS.

Capacity increases from just under a million tons per year to 2.57 millions tons per year.

Downstream at the tailrace, the dominant discharge for current ops is 2,400 CFS, and that increases to 3,900 CFS under the no diversion condition.

The total sediment transported increases from a million tons per year under current ops to approximately 2.1 million tons per year under the no diversion condition.

Okay. So kind of the -- a summary of those results, the total sediment transport, effective and dominant discharges are higher for the no diversion condition than the current operations condition.

Any questions on that? Any questions on the values?

Moving on, I'll go to slide 363. We then compared the change in dominant discharge between current operations and the no diversion alternative to their respective channel widths and depths.

For 2005, which is a normal year, I'm going to focus on the dominant discharge side of things. At sites two and three, you do see an increase in that width from between current operations and no diversion. Again, seems pretty logical, you have more sediment transport, you would have greater wetted width.

Similarly to the depth on the slide 364, on the dominant discharge half of that graphic, looking at sites two and three, you have an increase in the hydraulic depth for the respective dominant discharges between current operations and the run-of-river condition.

Again, we looked not only at just a normal year 2005 or a wet year, a dry year, we also looked at a full hydrograph between 2003 and 2009. And we see similar trends on slide 365. You have an increase in width and an increase in hydraulic depth under the no diversion condition than you did under the current operations condition.

So in summary, the channel widths and

depths are greater for the no diversion condition than under the current operations condition.

Anyone have any questions or observations on that? Joel.

JOEL JORGENSEN: Can I go back -- based on the sediment and the dominant discharge information, is it safe then to conclude that the no diversion alternative then in that scenario you have sandbars of a higher elevation than you do with the diversion; is that safe to say? There is more sediment and there is a greater dominant discharge?

PAT ENGELBERT: I think -- would it have more exposed sandbars.

JOEL JORGENSEN: No, would the sandbars in the system be greater elevation or not?

PAT ENGELBERT: That's a good question. Let me think about that while Matt responds.

MATT PILLARD: Just one quick thought on that, and maybe Ron or Neal might be able to help me out more. When they have those large flood events, it's somewhat routine to close the gates so that you don't get debris into the canal. This is more of a question, Neal, I guess.

NEAL SUESS: Yeah, to a great degree. Yeah, depending on the size of the event.

MATT PILLARD: So in some events there may not be much difference, because if they close the gates to let those go downstream, you know, maybe a large event -- if that's forming the higher bars, the larger events are forming the larger bars, some situations that's happening. Others, you know, medium events they may not close their gates so it's getting less water under some storm events. Maybe doesn't totally answer your question, but that's one observation I made.

JOEL JORGENSEN: From a generic sense, a greater dominant discharge, more sediment in the system, and some of those other variables, generically speaking, they should create sandbars of a higher elevation, right? I mean, a million CFS and 18 billion tons of sediment are likely to produce higher sandbars than 10,000 CFS and whatever. You know, I'm just speaking for --

PAT ENGELBERT: I'm trying to wrap it around the true definition of the dominant and the hydraulic characteristics of the channel itself, you know, the -- it would convey more sediment. Would they be higher or would there be more, I don't know that I could say definitively that you would have one that's higher as opposed to two or three that are there as opposed to one or two with more sediment being transported. I'm not quite sure you can say they would all be higher.

JOEL JORGENSEN: I'm not saying all. I'm saying maybe average, you know, on an average maybe the extremes. I'm just saying from a principle standpoint, the greater dominant discharge more sediment -- does it produce sandbars of higher elevation than a system with less -- with those decreases? You're telling me you don't know, right?

PAT ENGELBERT: I'm saying I don't know that we can make that leap in that you've got a channel that is so wide, its banks are so wide, and there is a theory out there that says, you know, that sandbar will reach a height that is just below the water surface elevation. So if your channel banks are so high, that height would potentially be limited by the channel banks, you know. So if you increase the dominant discharge and you still have those fixed channel banks, you're not going to get a sandbar that's essentially that much higher. Once it gets out of banks, it spreads out over very long distance, and so that's why I'm a little hesitant to say that greater dominant discharge means higher bank. Now, I don't know, Gary, would you like to take a shot at that?

GARY LEWIS: Yeah. The literature on dominant discharge, there is none to my knowledge, and I've probably read most all of it, that link the height of the sandbars to changes in the dominant discharge. What creates the higher sandbars is higher flows. It's hydrograph related, not dominant discharge related.

So as was pointed out by Matt, during high flow conditions, so if you're looking at the -- these two alternatives, during high flow conditions, the district diverts the water through the river, so there probably are occasions where the flows being discharged in the middle range maybe would be higher without the diversion than with it, and those, you know, mediate level sandbars would presumably be higher, but I think where we're both struggling is there is no effort -- or no literature or no use of the method as we've applied it that relates it to the height of the sandbars. It can be related to the width and depth, but it can't -- it hasn't been related in my knowledge to height of the sandbars.

PAT ENGELBERT: Now we did state there would be greater depth, so maybe from the distance from thalweg up to top, you know, potentially could increase.

JOEL JORGENSEN: Is there also an inverse relationship there too if you have deeper channels -- again, I'm speaking out of boundaries of knowledge, but if you have greater depth, isn't the height of the sandbar merely an inverse of that?

PAT ENGELBERT: Meaning greater depth also higher sandbar?

JOEL JORGENSEN: Right.

PAT ENGELBERT: From that context that's -- probably could make that leap. Gary, is that --

GARY LEWIS: It would be a taller sandbar.

JOEL JORGENSEN: Higher elevation.

GARY LEWIS: Just taller.

PAT ENGELBERT: Same elevation. Are you talking standing in the thalweg looking up? So from thalweg up to top could be a bigger number than --

GARY LEWIS: Look at the cross sections that we have before and after a fairly high flow event. There is numerous ones of those, and Matt and both Pat pointed out, if you look at the tops of those sandbars, in both cases they are at the same level. So we had this high event, and the peak -- or the top level of those sandbars didn't change even though the channel deepens. So the height of the sandbar gets taller, divert the dimension between the thalweg and the top of the sandbar, but the sandbars didn't go up.

PAT ENGELBERT: So we're saying height and tall in the same context, then I think you could make that.

RICHARD HOLLAND: I have a question. As long as the flows stay within the banks of the river, can you have -- if you increase discharge flow, can dominant discharge increase without an increase in flow? Let me put it another way. Can flow increase without an increase in dominant discharge? That's what I meant.

PAT ENGELBERT: I don't -- the more flow you have, the higher that dominant discharge would be. The more flow, the more total sediment being transported, the higher the average of that -- the dominant discharge would go up.

RICHARD HOLLAND: So you're going to have -- dominant discharge has to increase if flow increases?

PAT ENGELBERT: Yes.

RICHARD HOLLAND: As long as we're within the banks?

PAT ENGELBERT: Yes.

JEFF RUNGE: Since your higher flows transport a higher proportionate amount of sediment, you can have a change in flows, and like the average, but still have the same effective discharge. It's just your organization of how those flows are represented proportionately you could have different hydrographs and still have the same effective discharge with the same mean flow.

PAT ENGELBERT: Now, effective and dominant are two different things. If you're talking dominant, that would be more of a reflection of the total volume. You could have higher flows, but if the lower flows offset the highers between two years -- if the volume is essentially the same, the dominant would be the same.

Effective is a little different. That's subjective and it's -- we've got quite a few examples in the initial set of report. I don't want to bore everybody to tears with that again, but from a dominant -- if the period you're analyzing you have more flow volume between two years, you'll have an increase in the volume of discharge. The flow volume is essentially the same. We wouldn't expect that great of a -- you know, much difference between them all.

JEFF RUNGE: Yes, that's a good difference between the two. Were you finished, Rick, or --

PAT ENGELBERT: Did that make sense, the tall height thing? Maybe we can flip through some stuff on the previous slides to -- off to the side and just kind of make sure you're square with that.

JOEL JORGENSEN: Let me digest. If I have any questions, I'll have a chance to follow-up.

PAT ENGELBERT: Absolutely.

JEFF RUNGE: I've got a few questions here. Just sort of going off of what was said earlier is that this is sort of a fixed bed analysis to where those sites downstream there is no channel adjustments. There is a change in effective or dominant discharge, but there is no respective change or adjustment in your channel geometries, so this is -- again, this is a fixed bed analysis.

PAT ENGELBERT: The one D model assumes fixed bed hydraulics. Again -- and we fully understand that's a limitation of the system. One of the ways in which we tried to make it a little more university applicable is to evaluate the hydraulics between the two points in time in which they were taken. We had June and we had September.

Some deeper, some more leveled off, and we combined the two to come up with our width and depth relationships. So in some respect we kind of averaged the difference between the two to come up with our approximation for a discharge with the width and depth, but you're right.

JEFF RUNGE: And so -- thanks, Pat. And to build upon that too, the slopes are very similar upstream and downstream. It seems like based on your report, the grain sizes are similar, and in the no bypass alternative or no bypass option, it's roughly the same amount of flow going through. And so when thinking in terms of channel geometry -- and I guess the other assumption too is that there is no odd things going on with the valley that would constrain your channel plan form. And so with that, unless I'm wrong here, thinking about geometry wise, no diversion alternative geometry wise downstream would look very similar to that of site one.

PAT ENGELBERT: Yeah, I think that would be fair to say. Gary?

GARY LEWIS: Yeah.

PAT ENGELBERT: Over the long haul it would trend back toward that.

JEFF RUNGE: So I guess to help Joel with that question. What would you see in terms of bar height and bar size and position and stuff, for the no diversion alternative, it would be similar to what you see in site one.

PAT ENGELBERT: Any other questions on that?

We did then went ahead and plotted the dominant discharges on our regime graphics, and the -- again, most of -- or all of the either current ops or no diversion are still well within the braided.

What you see on the lighter colors, the no diversion, it looks like it shifted even farther into the braided portion. See very similar situation with the Lane's graphic on slide 369. Go ahead, Jeff.

JEFF RUNGE: Question on the previous slide, 368. I'm having a little bit of trouble with the definitions. There is a braided point bar and wide bend point bar stream and a straight braided stream, and -- or, excuse me, the steep braided stream versus the braided point bar and wide bend point bar stream. Given the different geometries, you've got a straighter wider mid-channel bar geometry upstream versus it seems like a narrower, more sinuous point bar system downstream. I wonder how those two different geometries relate to those definitions.

PAT ENGELBERT: Gary, do you want to take a crack at that?

GARY LEWIS: Yeah. Probably the best answer is to refer you to Chang's paper. You'll get a paragraph type description of each of those categories as opposed to the brief statements at the bottom that we can't read from here.

Our point I think in doing this is you're a long way in any of these comparisons from a morphological change. And the line that Chang and others have drawn between straight braided and some of the other terms that are at the bottom of the page is pretty narrow. And I think if you look at his data, you'll see points straight braided down closer to one of the other definitions and points that are close to the lines that we drew through there. It's probably better to understand this graph if you just look at it as a division of two categories. Above is braided, and we're firmly up above that threshold between braided and meandering. If we were moving vertically down, you would have to have the bankful discharge changing, and the slope -- I'm sorry, the slope changing and the bankful discharge being constant. Or to move sideways, you would have to have the bankful discharge or dominant discharge change for the same slope. And those in real systems kind of move together, so it's a generic method of looking at the regime the river would be in that has been adopted and applied universally in the literature, including by the Corps of Engineers.

JEFF RUNGE: And given what you seen through a lot of the results as far as these two, you know, it seems like there is some difference in geometries, but they are both considered braided.

GARY LEWIS: Correct.

JEFF RUNGE: Okay.

PAT ENGELBERT: Joel.

JOEL JORGENSEN: Another question.

PAT ENGELBERT: And talk real loud.

JOEL JORGENSEN: I guess what Gary just said is that, you know, there hasn't -- you haven't seen a change in the regime above and below; is that correct? But is it fair to say -- I'm speaking out of sorts here a bit. When you have a system like a river, you can have numerous changes to the system, but for a braided river system to go to a meandering river system, it's not going to be a gradual change in what I understand. Those changes are more or less episodic; is that correct?

PAT ENGELBERT: I would think so speaking more in geologic time frames again. Gary, is that correct?

GARY LEWIS: I've published papers on the Platte, not on the Loup, that really support the idea that the Platte is not episodic in the geomorphologist's definition of episodic.

The changes we see on the Platte River are not driven by the high floods events. That's an episodic extreme. The Cimarron River in Kansas is episodic. It's a braided stream.

JOEL JORGENSEN: On the central Platte you have had a regime shift -- I'm using the term regime in the generic sense, not specific to geomorphology.

So like on the central Platte where you had a number of variables acting on the system year over year, you've had diminution of those variables over time, and then at some point more or less the overall system went from a braided river system now to more of a meandering system. Is that -- so you can have numerous changes to the system without an episodic change I guess is the point I'm trying to make, or asking about.

GARY LEWIS: If I can comment on that, the system -- the change went from braided to anabranched. And I don't know of anybody who's calling the central Platte River meandering. So anabranch --

JOEL JORGENSEN: That was a recent paper in 2007 by -- I can't remember the person that was using the term meandering, but from a bird's perspective, meandering and anabranch are probably the same thing.

JEFF RUNGE: To me, I guess, in summary is you've seen some differences upstream and downstream, but the whole definition of end regime and graded is such a broad inclusive that it includes both the upstream conditions and the downstream.

PAT ENGELBERT: Yeah.

GARY LEWIS: I might point out in the first paper on sedimentation, if you look at the year-by-year dominant discharge and plot those on this graph, you'll see the same slope. So just moving horizontally. That it will move left and then move right, left and right. And that's really the basis of our dynamic equilibrium conclusion that we make. It's not heading in any particular direction and sustaining that direction. So we did this on a year-by-year basis from '85 to 2009. And if you look at the plot of that data, and if you look at just the graph of the downward discharge, it's cyclic. So it will move left and then right and left and right on this graph within certain limits. All of those limits are well within Chang and Lane's classification of braided rivers. So none of the data support the idea that it's even becoming anabranched in this reach. It all supports the idea that it's braided and not moving outside to any proximity of either an anabranched, which is one of Chang's classifications. If you look at the paragraph definitions of these classifications, it's not even getting close to the anabranch condition.

JOEL JORGENSEN: I guess I'm not challenging that. I'm saying that you can have changes to the character of the system and still maintain what you're saying. I mean, channel width is one, I guess above and below. If you look at those figures, it's almost twice as much wider above than below. And, I mean, that's a character that I guess I'm looking at and saying there is a difference here. And I don't know if it's statistical or not. Again, I know this is different, but from my standpoint I'm not understanding geomorphology. You can have changes to the system and still maintain the same regime.

GARY LEWIS: Correct.

PAT ENGELBERT: Yes.

JOEL JORGENSEN: I'll sit with that. Thank you. I appreciate this.

PAT ENGELBERT: Any other questions on the regime stuff?

So, again, just to resummarize, the current operations of the no diversion condition again are well seated within that braided morphology with neither transitioning toward another morphology. That's on slide 370. With that, no more discussion on sedimentation. Last chance. We're going to turn it back over to Matt on objective five.

LISA RICHARDSON: Scott.

MATT PILLARD: And I'll turn it over to Scott.

SCOTT STUEWE: We are on slide 370.

LISA RICHARDSON: Should be 371. I don't know why it doesn't have a number on it. No number.

SCOTT STUEWE: The objective is to

determine project effects, if any, of consumptive use on fisheries and habitat on the lower Platte River downstream of the Tailrace Canal. Associated tasks are consumptive use analysis for objective one. And the results are no measurable depletions to the lower Platte River. Therefore, fisheries and habitat are not adversely impacted to a greater extent under current operations than it would be under a no diversion condition.

Next objective is to determine the relative significance of the Loup River bypass reach to the overall fishery habitat for the Loup River.

Associated tasks are the fishery populations above and below the diversion weir were measured and evaluated, and to include the Montana method in determining habitat.

Slide 373, methodology for population above and below the diversion was determined from Nebraska Game and Parks' fish data surveys done in 1996 and 1997. Many reaches on the Loup were evaluated, but we used two reaches above and two reaches below for this study.

The Game and Parks' study was used to help determine effects of the diversion on the fisheries in the Loup.

These are the sites that we looked at or that determined we worked with. Below Genoa and Columbus and above Fullerton and Palmer.

Results of the fishery population above for 1996 -- whoops, Palmer area, when you look at '96 versus '97, it's fairly similar. Fullerton, this is again above the diversion weir, very similar in number. Again, in '96 and '97, number is very similar. We did have a jump here in the Columbus collection area.

Part of the -- part of the collection, you can correct me if I'm wrong, Rick, the collection was conducted in four different time periods, spring, early summer, late summer and autumn.

And there were times when they could not access and do the collection I believe at one -- at several times because of water, high water events. But as you can see, it's very similar across the board anyway.

When you look at the percentages of the most common fish, a lot of them are in the middle family. And you can see it's fairly similar when you look at '96, 55 percent of Red Shiner, 75 percent at Fullerton for Red Shiner, and these are the top fish in the collections both above and below.

Then you go down through here. Everything pretty much mirrors so that there is -- you know, there is not a separation except for the Western Silvery Minnow. Now, it doesn't state why there is a difference for that. Maybe the habitat is not there above the diversion that -- you know, that they are conducive to, but they do show up at the Fullerton area anyway in the next year. Again, it doesn't look like there is any impact due to the diversion as far as population comparisons.

Slide 377 is one of showing the sport fisheries. Channel Catfish are well represented. Same way with Largemouth Bass both above and below. There is a little bit of fluctuation among the sites for Bluegill. Otherwise everything else pretty much masks as you go down above and below the diversion.

Because of this, the results have been determined the diversion is not negatively affecting the fisheries. The populations and habitat collected in the study indicate that typical rivers -- you know, at mass the typical rivers for this region.

Again, results in the populations above and below sport fisheries are similar in both reaches. The power canal and Lake Babcock, as stated within the study, are preferred by fishermen, so there has been a fishery created by development of the Loup Power Canal.

Next thing to look at was fish passage to try and determine if the diversion has created a problem for fish passage up and down through the system.

When the sluice gates are open, the velocities through, according to the model, are prohibitive to fish passage. But as we know, there are situations when fish are able to go through the -- either over the diversion, through the gates, or whatever, and there are several reasons that this may happen. There is opportunity for the fish to rest in what we call the hydraulic shadows, and that can be the bowworks or the headworks, they can hide in there. They can stay in that area until they've rested up enough, and then they can work their way down through the corner interstitial areas, reduced velocities there, and then use their burst speeds to get through, or they can hide behind debris or ice buildup within the gate and structure areas. And, again, there is a potential, though it's less than 1 percent where the fish might actually be able to make it over to the diversion weir during flood situations.

We were required by FERC to look at the Montana method. The Montana method uses flow data to determine habitat condition. Through this, several -- you know, we looked at several different sites. On the Loup River we looked at the ungaged site above the diversion weir, and the Genoa gage below the diversion weir. And we also looked at two sites on the Platte, the Duncan gage, which is above the Loup River confluence, and the ungaged site three below the Loup River confluence.

The Montana method is recognized throughout the country for quick assessment. It's easy to use. You can desktop it. It doesn't require extensive field work. It's easy to apply to nearly any situation and system, and it's been commonly adopted, as I say, through the country.

However, there are disadvantages. It only looks at one criterion, which causes some -- you know, depending on what kind of a system you may actually be looking at. It doesn't incorporate intra-month variation. You're looking at an average. And it does -- does not model the true complexity of the system, whether it be plunge pool or whatever if you're looking at flows.

Study sites, again, this just points out where we looked at them. Above and below the diversion and then on the Platte.

Slide 384. One thing that we tried to do to make it easier to visualize was we took -- we decided to go ahead and group optimum, outstanding, excellent and good into what we call our satisfactory category.

So anything -- if we have 40 percent of annual mean flow and above, we put it in the satisfactory category from April to September. And if we're 20 percent of annual mean in October to March, that puts it in the satisfactory category.

When we looked at the different sites, we went down through there, and these are the average annual flows as indicated in previous slides. Satisfactory, 40 percent of flow, of course, 952 CFS. And you can see the numbers as we go across here.

This is an example of how we determine the occurrences of satisfactory, poor or degraded. Black is degraded or poor, and green, of course, is satisfactory and above. And that's how we determine when we came in to develop these graphs.

On this graph, this is the average number of years each site met each strained condition category. At ungaged site one, we show -- this is on the Loup again. We had two to three years of fair and approximately five years of poor condition, but we had better than 51 years of satisfactory or better.

Down at Genoa below the diversion, we do -- there is a drop in satisfactory. Very similar for fair, and we had a little increase in the poor, and we had a definite increase in degraded.

You go back to the October and March time frame, you see we have -- there are no poor or degraded time periods. You go down to Genoa and you have very few as well.

And to break it down further on the Loup, habitat assessment by month, again, site one, satisfactory. Majority of the time from April to June very -- you know, little area for fair. However, everything has stayed either satisfactory or no worse than poor.

When you go over to look at the time period from October through March, all flows remain satisfactory or better.

When you go down to Genoa below the

diversion, still we have a majority of satisfactory time periods for April, May and June. Then we start seeing due to flow depletions or whatever that occurs naturally, that then drops the satisfactory levels to less than 20 years.

The degraded periods do show up a little bit more, however, when we go over here for the time periods of October through March, those begin to pick up again, and we're back in the satisfactory categories.

Even though the Montana method shows that there are some variations in the habitat availability, the Game and Parks studies reveal that the fish communities above and below the diversion are similar and appear to be healthy.

The Montana method may not take into consideration the intra-month variation that may help maintain deeper channels and pools due to the difference in flow.

Also, the power canal, we want to emphasize this, provides habitat and public access opportunity that the Loup River diversion may not provide.

On the Platte, as you can see, there are periods even on this -- on the river system.

Satisfactory -- there are some areas of satisfactory or better, but there are still times and periods of degraded habitat correlations.

Also, same thing is over here for October through March. You still have some degraded time periods. This is probably a direct result of effects that are occurring farther up the river system itself.

Again, as we take a closer look by month, the Duncan gage, which is above the confluence, you know, there are satisfactory time periods for flow, but then as the summer progresses, you get degraded conditions as well.

You get into October through March, again, it improves, increased rainfall, decreased irrigation impacts. Same way down here on the ungaged site below the confluence, everything -- you know, there is a lot of satisfactory times, fewer degraded times, and, again, go back into the improved satisfactory conditions.

So summary results of this are Game and Parks study show fish used the lower reaches as much as they do the upper reaches suggesting that habitat is not limiting.

The sport fisheries are similar upstream and downstream, which would indicate that the diversion is not totally effectively cutting off passage.

The Montana method analysis suggests degraded flows for the Loup, but the fisheries studies also show that there are fisheries populations in there, and we know that it is also being accessed for sport fishery activity.

And the power canal is an important sport fishery resource for this region.

Further results, Platte River exhibits degraded flow upstream and downstream of the confluence.

Rick, did you have something?

RICHARD HOLLAND: Yeah. Just -- I hate to interrupt your flow. Your statement and conclusions concerning the fish studies I think is unfounded, and I'm just going to say that the sampling that went on in the fish studies for those two years was sampling with -- for relative abundance presence and absence kind of sampling. We did no population estimates, we have no data on trends for population numbers up or down, so I'm not going to comment one way or the other which way they are, because I have no data to make that statement. It's a relative abundance kind of approach.

So saying the habitat is not limiting, we have no information to suggest there is any -- there is or is not any density dependent habitat related functions going on in the river segment there, so I don't think you can make that statement that habitat is not limiting. I'm not saying it is, I'm not saying it isn't. I'm saying the data doesn't support such analysis or conclusion, so I think you need to take that out of there.

The fact that these studies were done post project says that what we're doing is simply finding out the relative abundance of these various species and their presence or absence in those various locations. This was a resource inventory study, and it wasn't designed as a population dynamics kind of project. So just want to clarify what that study was designed for.

SCOTT STUEWE: And I understand, though, the fish that are there, they are generalists, and pretty much mimic what are in other river systems here in the central part, correct?

RICHARD HOLLAND: Yes.

SCOTT STUEWE: I believe I read that too, so I just wanted to make sure. We will address that.

Fisheries habitat in the Platte River is not affected by the Loup River diversion. If you recall, there were degraded conditions above the confluence and slightly modified below the confluence.

With that, are there any other questions or comments?

JEFF RUNGE: Could you back up to the previous slide?

Was there -- there wasn't exhibits degraded -- suggest that fisheries habitat in the Platte River not affected by Loup River diversion. That's implying that the Montana method is an indices of physical habitat.

SCOTT STUEWE: Okay.

JEFF RUNGE: That's correct?

SCOTT STUEWE: Yes.

JEFF RUNGE: And so was there a with diversion and without diversion assessment so that you can compare conditions with the diversion and without the diversion?

SCOTT STUEWE: No, because we looked at -- we looked at the conditions above the confluence and below the confluence. We didn't look at what happens if the diversion and no diversion.

JEFF RUNGE: Okay.

LISA RICHARDSON: You have to just -- if you want to try to think what a no diversion alternative would be, you would make the assumption that it would be similar to what you see upstream, but it would -- we talked about that at length. It would be improper application of the Montana method to compare the monthly flows or the daily flows at Genoa to the average mean flow above, because that's not the habitat. You need to compare the flows that routinely are seen in that stretch.

JEFF RUNGE: Well, for the short term, but if there is any long-term changes in flow, there would be some channel adjustment to that change in flow. So I would agree I would think short term, yes, but long term you would -- your channel would adjust to those conditions of the changed flow regime.

SCOTT STUEWE: So what you're suggesting, though, is then, you know -- let me go back.

JEFF RUNGE: I guess what I'm suggesting is there is no diversion versus no diversion alternative comparison, and I'm not sure quite how to do that, but, you know, I guess that's something

I'll have to sit down and think about.

GEORGE WALDOW: I think your -- I think you're asking the question that was not intended to be answered here. And if I remember right, the Montana method is an indicator of habitat suitability, does that ring a bell?

SCOTT STUEWE: Yes.

GEORGE WALDOW: And I'm not a fisheries guy obviously, but I think what we're trying to show here is like a snapshot. The Montana method relies simply on the flow duration curve, and you apply it on a seasonal basis and it's a snapshot. To ask it to indicate long-term versus short-term habitat elements to me is something it can't do and can't be expected to do. I don't know how to answer your question relative to the Montana.

JEFF RUNGE: That just shows the -- like with all models, all evaluations there is always some sideboards, some restrictions with what you can do, and that's -- it's clear to me now that those are some of the limitations of the analysis.

LISA RICHARDSON: I think that if you -- and Pat's said this in the other portion of the studies, if there were no diversion -- if no diversion were to occur, the downstream section would over time become pretty similar, maybe identical to the upstream reach, right, Pat?

PAT ENGELBERT: Seems logical, yeah.

LISA RICHARDSON: And so I guess when we did the analysis separately for upstream and downstream, we're really using that same premise in that you can only compare the downstream monthly flows to the downstream average over the period of record, because the channel has changed slightly.

JEFF RUNGE: That's good. That's a good explanation and this is very helpful.

SCOTT STUEWE: Is there anything else? Okay. Matt.

MATT PILLARD: I know it's noon and we're hungry. I have 14 slides to get through. It's on the whooping crane.

Objective seven is to determine the availability of potential whooping crane roosting habitat above and below the diversion weir under project operations compared to the no diversion condition.

So we're using tools here for this objective that we've already established in other studies, and so we'll be able to kind of fly through the methods.

We use the aerial imagery review that we did on objective four, and then we also used the HEC-RAS model to help analyze roosting habitat.

Slide 395. So these are the methods that -- I'm sorry, these are the observed measurements for whooping crane roosting habitat. We looked at channel width, channel inundated, unobstructed channel width and depth of water for roosting. And we'll get into those as we address the results.

Again, we use the aerial imagery review to perform channel width area -- average area of shallow water, wet sand per river mile, percentage of water and wet sand areas and unobstructed width.

What we found -- I'm on 397. What we found is that the -- again, consistent with the results for the terns and plovers that from a channel width perspective above the diversion is wider than below the diversion. Again, that's an average.

Just as a note here that from the habitat parameters, the observed habitat parameters, the range for Nebraska is roughly 764 plus or minus 275 odd feet for whooping cranes.

From using the aerials to review the

shallow water, wet sand component, we observed that on average for all the river miles looked at, upstream roughly 11 to 12 percent of the river miles had shallow water, wet sand, and downstream that range was 10 to 16 percent.

LEE EMERY: You mean 24 percent or 12 percent?

MATT PILLARD: Eleven to 24 percent upstream, 10 to 16 percent downstream.

MELISSA MARINOVICH: Matt, just a clarification. I think what you meant to say was that 11 to 24 percent of the channel width was the correct -- was the actual shallow water resting. That it was not 11 to 24 percent of the entire river mile was the shallow water resting.

MATT PILLARD: Eleven to 24 percent of the channel width was shallow water or wet sand.

MELISSA MARINOVICH: Yes.

MATT PILLARD: That's correct.

From an unobstructed width perspective, in this particular -- in these -- for the reaches that we looked at, the river miles that we looked at, the unobstructed width was equal to the active channel due to the forest station that was observed on each bank.

In addition, there are locations both upstream and downstream where, you know, the banks are tall, you know, higher than 3 feet, which would also serve as an obstruction.

The average channel width is consistently wider above the diversion weir again then below.

We then used the HEC-RAS model that was developed to look at the whooping crane parameter of water depths. We tried to focus on water depths obviously per the observed parameters, that was .8 feet or less that would exist within each of those river miles.

Again, we used the same years, same flows, and we looked at study sites one and two for both current operations and no diversion. For whooping crane, though, we only looked at the early summer cross section for this analysis.

Slide 401. Upstream of the diversion weir we found generally as the flows increased, the percentage of channel width with water depths of .8 feet or less decreased.

And on average there was little difference between the dry, normal and wet years of those water depths.

Downstream of the diversion weir, for

current operations, generally as flows increased, again, the percentage of channel width water depths of 20 feet or less increased. And, again, similar to upstream on average, there is very little difference between the dry, normal or wet years.

And then downstream the diversion weir under a no diversion condition, generally as flows increased, the percentage of channel width with water depths of .8 feet or less decreased under a no diversion condition.

Then kind of comparing here upstream versus downstream, site one versus site two. For current operations, really the differences between -- the difference between site one and two, the amount of percent exposed sand between those two sites diminish as flow increase. So the first bullet really talks about the difference between what's available between sites one and two.

And at higher flows, high flow for normal and wet years, at downstream, site two had a higher percentage of channel width with water depths of .8 feet or less than upstream.

And here upstream versus downstream for the no diversion condition, so, again, site one versus side two looking at a no diversion condition.

There was a small percentage of channel widths with water depths of .8 feet or less downstream than there was for upstream for all flows.

The difference between those two conditions of site one or two increase as the flow increased.

This is just looking at site two specifically for current operations versus the no diversion condition. Current operations there is a smaller percentage of channel widths with water depths of .8 feet or less during all low and medium flows.

During current operations there is a greater percentage of channel widths with water depths of .8 feet or less during all higher flow conditions. And the percentage of difference are greater -- is greatest during lower flow conditions.

So summarize here objective seven, unobstructed widths above and below the diversion weir were outside of the whooping crane parameters for what's required for an unobstructed width.

The channel widths above and below the diversion weir are within the whooping crane roosting parameters.

There is -- from area -- the area of

shallow water, wet sand it is greater upstream than downstream.

For current operations, there is a smaller percentage of channel widths with water depths of .8 feet or less during low to medium flow, and there is a greater percentage for higher flow conditions.

So I kind of went through that kind of fast. Hopefully you got the gist of what those -- I'll take some questions on that.

JEFF RUNGE: I'll make this quick so we can get to lunch here.

Slide No. 395, similar to the tern and plover one, you did great work here, just one small suggestion here to improve the analysis. Channel inundated percent, that greater than 80 percent, this is oftentimes interpreted as wetted width, and it seemed like a lot of the analysis was done looking at wetted width of a proportion that's shallow. But it would also be good to separate wetted width from that wetted width shallow. And that's it. That's the only comment I had for that.

MATT PILLARD: Joel.

JOEL JORGENSEN: On slide 397. This is kind of an example, maybe a general theme. The area of shallow water, wet sand upstream from -- there is very -- because you have a wider channel width, you probably have more area. So in terms of absolute area, there is probably a substantial difference there between upstream and downstream, and that's probably be carried out in a number of calculations. The absolute area is probably quite a bit larger upstream than downstream I would presume, because again channel --

MATT PILLARD: The channel is wider.

JOEL JORGENSEN: Fifty to 100 percent wider upstream.

And I guess just maybe another -- this is just kind of a general comment maybe about whooping cranes. You know, applying sort of observational information from throughout the state, and, again, it's not really a criticism, but maybe a perspective. But the way whooping cranes migrate, they are not power fliers where they have the opportunity to go around and selecting or choosing where they are going to spend the night when they are migrating. They are essentially kites up in the sky, and when it gets late in the day, they look for a place to sit down. And sometimes, you know, they don't have many options.

So if a bird was hanging over -- you know, if a group of birds are coming in over the Loup diversion, they would be making a decision within that finite area. They really don't have the option of saying, well, this doesn't look good, we're going to travel down the road and see if we can find a better place. They are going to make a decision based on that small area. So bigger, wider is probably going to be what the birds would prefer.

But with that said, sort of -- again, it's relative to the habitat that's available to the end of the day, and that's why sometimes, you know, once whooping cranes are outside of the main corridor away from areas with really good habitat, why they sometimes end up in really some untypical whooping crane areas, small farm ponds or something. Just a point about whooping crane migration. Again, they don't have the ability to say we're not going to stop here tonight. They are doing down and that's it. Just a point.

MATT PILLARD: Thanks, Joel.

LISA RICHARDSON: Well, I'm a little surprised that we ended up so far right on schedule when we were so far ahead yesterday, but I guess that means we kind of had a good estimate of what this was going to take, we just didn't split it right between the days on the agenda.

Does anybody have any additional questions on any of the studies that we've presented, because I'm just going to go through a couple slides on next steps and then we'll be ready for lunch. But there is no lunch. You can have lunch wherever you want. There is a couple of donuts back there.

No questions on any other studies. Randy.

RANDY THORESON: Very, very quickly. Randy Thoreson, National Park Service. Maybe you're going to tie this into the schedule. As I said yesterday, there is a lot of good information on recreation report, and I look forward to the recreation management plan, be involved early in the process of that. I know Quinn isn't here today, but I hope that be conveyed to me when that is going to start that process to form that together for the rec management plan. I just say that again.

LISA RICHARDSON: Yep. I have one thing to add. Before the break this morning Jeff was asking about kind of the relationship between the percent suitable habitat under Peters and Parham and the actual flows, because there was the stage change study that talked about 4,000 to 6,000. Attachment J in the back of the hydrocycling study does have the -- every day the min and max flow based on a 15 minute or 30 minute hydrograph. It does have those in there, and then also the percent suitable habitat, so you can just kind of work your way down through the table and see, oh, there is 3,500 CFS, that's about 10 percent suitable habitat, and what did we see about 23 percent suitable habitat by the time you got up to 6,000 CFS. So you can see those comparisons in the attachment.

So if there are no more questions -- as I said at the beginning of the meeting yesterday, March 11th, that is a Friday, I believe, the district will be submitting the mean summary from today's meeting. Similar to what we did last time where it's just kind of an overall summary.

Then the agencies will have 30 days till April 11th to submit your comments. I believe April 11th may be a Monday. And to submit your comments, any recommendation for modifications you may have, concerns about any study results presented so far. That's the time frame.

The district will then have 30 days to prepare responses to that to provide any additional information that we may not have included directly in the study report or anything else we have.

And then in June, FERC would be making a determination about what additional study modifications may be needed or whatever needs to be done, if we've addressed the comments appropriately or if some more analysis needs to be done.

Lee, do you have anything to add to that time frame?

LEE EMERY: Nothing to the time frame, but you have to follow the regs of the reasoning behind why you may want to modify a project, some of the reasoning. There is about six steps you answer in terms of asking why you want those modifications or need something else. Same as the first go around, same kind of thing as the first go around.

LISA RICHARDSON: Any questions?

All right. The next slide, these are just those other dates that I talked about at the beginning of the meeting. August 26th would be the updated -- I guess I shouldn't say updated initial. It should say updated study report to FERC on August 26th.

And then September 9th there would be a meeting for that report, and then November 18th is the date that the district will be filing a draft license application. There will be a comment period on that, and then the actual final license application will be submitted in April of 2012. And that's it. So I'm only -- we're only 15 minutes over on a ten-hour meeting. That's pretty doggone good.

(Conclusion - 12:15 p.m.)

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C E R T I F I C A T E

STATE OF NEBRASKA)
) ss.
COUNTY OF DOUGLAS)

I, Mary Lou Dubbelde, RPR, CRR, CSR(IA), CCR, General Notary Public within and for the State of Nebraska, do hereby certify that the foregoing was taken by me in shorthand and thereafter reduced to typewriting by use of Computer-Aided Transcription, and the foregoing one hundred and sixty-six (166) pages contain a full, true and correct transcription, to the best of my ability;

That I am not a kin or in any way associated with any of the parties to said cause of action, or their counsel, and that I am not interested in the event thereof.

IN WITNESS WHEREOF, I hereunto affix my signature and seal the 7th day of March, 2011.

____
MARY LOU DUBBELDE, RPR, CRR
GENERAL NOTARY PUBLIC

My commission expires: