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2 FEDERAL ENERGY REGULATORY COMMISSION

3 Loup River Public Power District
4 Project No. 1256-029-Nebraska

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10 Loup River
11 Hydroelectric Project
12 (FERC No. 1256-029)
13 Study Results Meeting - Day 1

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24 New World Inn
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P A R T I C I P A N T S

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MS. MELISSA MARINOVICH, HDR ENGINEERING
23 MS. WENDY THOMPSON, HDR ENGINEERING
24
25

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

3 STEPHANIE WHITE: Everybody should have an
4 agenda and you should have a packet of slides, note
5 slides. Real quick I'll just hit a couple of
6 highlights in the agenda.

7 This morning we're going to walk through
8 Study 4 and Study 8, water temperature in the bypass
9 reach and recreation and creel surveys. We'll break
10 for lunch at noon, and depending on if we have
11 people fill in these spaces this morning, I might
12 ask some of you to move forward, or you might just
13 do that on your own whether or not you can hear.

14 This afternoon we'll do Studies 1 and 12.
15 We'll adjourn for the day at 5:00. Tomorrow we'll
16 do Studies 2, 5, and we'll do a little bit of next
17 steps, what happens next, where are we in the
18 process tomorrow afternoon.

19 Ground rules. Essentially, No. 1, is
20 really about utilizing the microphone so the people
21 on the phone can hear you today. I think we have a
22 pretty good system, but I might interrupt you if you
23 start off softly or somebody can't hear you.

24 The second one is really for the phone
25 attendees. If you would, please don't put us on

1 hold. What happens when you do that is we get a
2 nice elevator music that can sometimes go on for 45
3 minutes to an hour. So if you would put us on mute,
4 that's fine, but not on hold.

5 Number 3, for those of you on the phone,
6 we also need an alternative way to get ahold of you.
7 So if somebody in the room has your cell phone
8 numbers. Lee, do you have the first phone numbers?

9 LEE EMERY: I don't have their cell phone
10 numbers.

11 STEPHANIE WHITE: And I know we have John
12 and we've got your cell number.

13 Cell phones --

14 JOHN BENDER: I'll give you my desk phone
15 number.

16 STEPHANIE WHITE: Great. We'll take
17 breaks periodically throughout the day. Also, if
18 you have a hard time hearing anybody, raise your
19 hand, let me know, speak up, and we'll work to
20 adjust.

21 Anything else? Okay. Today -- here we
22 are, the second ISR meeting. The goals are to
23 present the remaining study results and talk about
24 any proposals to modify. I'm going to let Lisa take
25 it from here.

1 LISA RICHARDSON: Thanks, Stephanie. And
2 I apologize, I've got kind of a funky voice thing
3 going on, a cold that's lingering for about three
4 weeks, so -- okay. I just wanted to start off with
5 a little bit of background for everybody.

6 We've been meeting with pretty much all of
7 you for several years now. We started off -- we've
8 had probably close to a dozen meetings, several of
9 them large meetings like this. We talked about the
10 issues that are associated with the project or the
11 concerns that agencies have. We also had several
12 meetings to develop this study plan, which we've now
13 conducted the studies according to the study plan
14 that was developed, so this has been a long process,
15 so there may be some new faces, and if any of the
16 new faces have questions, please ask, but I think
17 some of you this will be -- you know, this is just a
18 continuation of where we've been before.

19 I wanted to just kind of highlight where
20 we are in the process for relicensing.

21 STEPHANIE WHITE: We're on slide six now.

22 LISA RICHARDSON: Thank you. This is a
23 graphic that we've shown at many of our meetings.
24 The relicensing process that the district is using
25 is the integrated licensing process, the ILP. It

1 has a very prescribed process, lots of dates that
2 are set in the regulation. We did some early
3 information gathering and developing the studies and
4 defining the issues. Now we're in the issue -- in
5 the issue study phase. Hopefully we'll be
6 completing that here in the next few months, and
7 then the next step is really applying for the
8 license.

9 The district will be submitting a draft
10 license application to FERC in November, and then
11 the official license application goes in in March of
12 next year. So we're not quite to the end. A new
13 license is not anticipated until 2014. That's when
14 FERC is expected to make their decision on the
15 license, but we are getting closer and closer, and
16 all the hard work that everybody's putting in it I
17 think is paying off.

18 The study plan determination, I just want
19 to briefly go back over that. We submitted the
20 study report -- excuse me, the initial -- the
21 revised study plan. We've had so many reports, I
22 can't keep them straight. The revised study plan.
23 FERC put out their determination on that study plan
24 and made some adjustments and changes to it.

25 There were three studies that were

1 removed, water temperature in the Platte River, fish
2 sampling, and creel survey, which was actually just
3 combined with recreation use. Three studies were
4 approved without modification. That is -- those
5 were fish passage, the land use inventory and
6 Section 106 compliance.

7 And then there were six studies that had
8 some modifications requested by FERC, sedimentation,
9 hydrocycling, water temperature in the Loup River
10 bypass, flow depletion and flow diversion,
11 recreation use, and ice jam flooding on the Loup
12 River. That was FERC's study plan determination
13 from August of 2009. Most of the studies that had
14 modifications are the ones that we're presenting
15 today.

16 As you've all noticed, this is the second
17 initial study results meeting. I've gotten a little
18 bit of flak for that, the second initial, that's
19 kind of odd.

20 We all met back in September, and the
21 studies that were presented then was sedimentation
22 study, the fish passage study, there was an update
23 on recreation use that really focused on the
24 telephone survey portion of the recreation study,
25 the land use inventory, Section 106 compliance, and

1 then wasn't really a full-blown study, but the PCB
2 fish tissue sampling that MDQ did last summer. So
3 those studies are complete with the exception of
4 sedimentation.

5 There were some unged site analyses that
6 needed to be completed. The data wasn't available
7 at the meeting in September, so Pat and the guys
8 have been working on finishing that analysis and is
9 going to be presented today.

10 So after the first study -- first initial
11 study results meeting, there was an opportunity for
12 agencies to comment. The district responded and
13 then FERC made a determination on modification
14 requests for the studies. There were three studies
15 that FERC did not require any modifications. Those
16 studies are considered to be complete and final:
17 Study 7, fish passage, Study 10, land use inventory,
18 and Study 11, Section 106 compliance.

19 There were two studies that FERC requested
20 some additional analyses or work to be done. For
21 those on the phone, I'm now on slide ten. There
22 were two studies that were requested revisions to.
23 The first one was sedimentation. These were in
24 response to some of the comments that were received.
25 Confidence limits for sediment rating curves.

1 Include the aggradation/degradation analysis at
2 Duncan, North Bend and Ashland and Louisville. This
3 was information that was included in the PAD, but
4 will be included in the final sedimentation report.

5 Then perform some aggradation/degradation
6 analysis at Genoa, perform the Kendall Tau, that
7 should be a U, not an N, Kendall Tau test to assess
8 aggradation/degradation trends, and then do some
9 statistical analysis on the tern and plover nesting
10 in relation to the various sediment transport
11 parameters. And then one was to provide some
12 additional reference materials.

13 Under hydrocycling, there was one request
14 made at the last meeting, and that was the sediment
15 transport analysis for hydrocycling be conducted
16 using the HEC-RAS model. Those revisions are
17 currently underway. We will be presenting the
18 results related to those revisions at the updated
19 study results meeting or in the updated study
20 report. That report will be due in August of this
21 year.

22 So what do we have on tap today, as
23 Stephanie mentioned, sedimentation. The focus on
24 the sedimentation study is the results from the
25 ungedged analysis. We're not planning to go back

1 through the original analysis that was presented in
2 September. However, if you have any questions
3 related to that, feel free to ask them.

4 Water temperature in the Loup River bypass
5 reach, flow depletion and flow diversion, recreation
6 use, and then ice jam flooding on the Loup River.

7 That is where we're headed today, and so
8 after today's meeting there are several things that
9 will happen. We've kind of had a dry run on this
10 you might say or a wet run I guess because we
11 already did this once with the initial study results
12 meeting.

13 There is an opportunity -- first the
14 district will submit a summary of the meeting.
15 That's due to FERC March 11th. Then agencies and
16 other stakeholders have an opportunity to comment on
17 the meeting and the report just as you did on the
18 report and meeting from back in September.

19 May 12th -- and that's due by April 11th,
20 excuse me, your comments are due by April 11th,
21 including any request for modification to studies.

22 May 12th, the district will provide
23 responses to any comments that are received relating
24 to how we would try to address those. And then in
25 June we would expect FERC to make a final

1 determination on modifications for the requests that
2 are made in this round of studies.

3 So that's kind of the timeline for the
4 studies we're presenting today. And then as I
5 mentioned a little bit ago, in August we'll be
6 submitting the updated study report. Because of the
7 timing of things, we may -- if there are revisions
8 to these studies, we'll have to see what they might
9 be to see if they can be completed by August. If
10 they can't, we'll end up having to do a second
11 meeting for that as well. Maybe we'll just push
12 everything into one meeting. We'll have to see how
13 that goes.

14 There would be a meeting in September --
15 the report would be due in August, meeting in
16 September, and then, as I mentioned, November the
17 district will be filing their draft license
18 application. And I think that takes care of
19 everything I had. Did anybody have any questions on
20 the upfront stuff. Jeff?

21 JEFF RUNGE: Yeah. This is Jeff Runge
22 from the Fish and Wildlife Service. My question is
23 to FERC about the process. You know, looking at the
24 timelines, the next step is NEPA, and based on what
25 I was told at the last meeting that these studies

1 are to incorporate all of the variability that would
2 be associated with a NEPA analysis. And that there
3 is no means -- after this second round of studies,
4 there is no means of coming back and reanalyzing so
5 that you can learn differences associated with
6 alternatives; is that correct, or is this sort of
7 the last step when it comes to study requests and
8 analysis of the effects?

9 LEE EMERY: It is for study requests.
10 Analysis -- we'll do analysis once the application
11 is filed, you'll have more opportunity to comment
12 then on the analysis.

13 JEFF RUNGE: But as far as analysis of
14 effects, if there is NEPA -- for example, a
15 potential EIS to where there is multiple
16 alternatives that would be evaluated that looked at
17 effects to different resources, I'm wondering here
18 if that -- is that to be addressed in the study
19 results, or is this -- is there a follow-up to that
20 that will fine tune evaluations for NEPA
21 alternatives?

22 LEE EMERY: Once the application is filed,
23 we will prepare a NEPA document. That's where we've
24 analyzed all of the different alternatives.

25 JEFF RUNGE: I guess I'll be a little bit

1 more exact here. Do we need to identify what the
2 effects are to our resources and what the
3 alternatives would be so that this next round of
4 studies will incorporate these protective mitigation
5 enhancement measures into their studies so that they
6 can look at a range of alternatives and what those
7 effects may be to the resources?

8 LEE EMERY: I'm not sure what you mean by
9 the next range of studies.

10 JEFF RUNGE: Well, there is one last step
11 for modification of these studies, and, you know,
12 for us I would think that our last step would be to
13 use this information to feed into an alternatives
14 analysis for NEPA?

15 LEE EMERY: It would. You would make your
16 comments and we would incorporate that analysis in
17 our NEPA document.

18 JEFF RUNGE: So within this next letter,
19 would we have to identify what the effects are to
20 our resources of concern, and would we have to
21 propose protection mitigation enhancement measures
22 at this time so that -- so that you can incorporate
23 that into NEPA.

24 LEE EMERY: You would not have to do that
25 at this stage of the analysis. You would have a

1 chance to write any descriptions and the
2 recommendations later on in the process.

3 JEFF RUNGE: Okay. That's helpful.
4 That's helpful when it comes to --

5 LEE EMERY: Is that right, Nick?

6 NICK JAYJACK: Yes, Lee, that's correct.
7 We're a little bit early for that right at the
8 moment, so the district will prepare a draft license
9 application, and at that point you can review it and
10 make comments as to what environmental measures you
11 would like to see or what environmental alternatives
12 you would have them look at.

13 Of course, once the license application
14 comes here and we review it, and we find that it
15 meets our regs as far as an adequacy review, then we
16 would issue a notice of ready for EA along with an
17 acceptance notice. And then we would at that time
18 ask for your final recommendations, terms and
19 conditions, et cetera.

20 Multiple points at which you can make
21 recommendations for measures and communicate to us
22 and to the district what you would like to see for
23 your resource.

24 JEFF RUNGE: That's good. That's really
25 helpful, because I would hate to get to the point to

1 where we identify these measures only to find out
2 that it's too late to go back and evaluate the
3 effects of those measures, and that there is still
4 an ability to do that in the future.

5 STEPHANIE WHITE: Nick, this is Stephanie.
6 Lee gave us a cue before you spoke and he called you
7 by name, but for those of you on the phone, if you
8 wouldn't mind saying your name at the beginning of
9 your comment, I think it would really help with the
10 court reporter and the record of the meeting.

11 RANDY THORESON: Randy Thoreson, National
12 Park Service. Just go back to the schedule for a
13 minute, if you would, Lisa.

14 LISA RICHARDSON: This part?

15 RANDY THORESON: Yes, please.

16 STEPHANIE WHITE: We're looking at slide
17 12 now.

18 RANDY THORESON: March 11th the district
19 submits meeting summary. After the first initial
20 study report, I submitted a letter summarizing my
21 comments from that meeting. Would I also have an
22 opportunity to do that prior to March 11th in
23 relation to the second --

24 LISA RICHARDSON: Actually your
25 opportunity -- you can submit your comments whenever

1 you'd like. Your deadline is April 11th. We're
2 going to be summarizing -- we're creating a
3 transcript of the meeting, but that's not the
4 meeting summary that we'll be submitting to FERC.
5 Last time we put together, I don't know, six or
6 seven pages worth of notes kind of summarizing the
7 discussion. And then that's available for agencies
8 to review, and if they have comments on that
9 summary, or other comments that they wish to submit,
10 your deadline is April 11th. So, yeah, you can feel
11 free to submit them sooner than that. We would like
12 to have them as soon as we can get them. Yeah, you
13 have plenty of time I think to submit some comments.

14 RANDY THORESON: Thank you.

15 STEPHANIE WHITE: Before we move into the
16 next set, I'm going to turn the lights off up here.
17 I would like to get a sense from the back of the
18 room if that makes it easier to see. I'm going to
19 disappear, I'll be right back.

20 LISA RICHARDSON: Now, I'm going to turn
21 it over to George Hunt to present the results of the
22 water temperature in the bypass reach study.

23 GEORGE HUNT: Thank you. I'm George Hunt
24 with HDR.

25 This is study number -- this is four,

1 study water temperature in the bypass reach.

2 Our goal was to determine if project
3 operations, flow diversion to the Loup Power Canal,
4 materially affect water temperature in the Loup
5 River bypass reach. Particular emphasis on the
6 reach between the diversion weir and the confluence
7 of Beaver Creek with the Loup River or in the Platte
8 River bypass reach.

9 And we set out to do -- to achieve that
10 goal through four objectives. I'm on slide 16.
11 Objective one, to estimate the relationship between
12 flow in the project bypass reach, and ambient
13 temperature, water temperature, relative humidity
14 and solar radiation.

15 The second objective was to describe and
16 quantify the relationship, if any, between diversion
17 of water into the Loup Power Canal and water
18 temperature in the project bypass reach.

19 No. 3 was to determine if a critical reach
20 relative to water temperature excursions exists
21 within the project bypass reach.

22 And No. 4 was to determine if an accurate
23 and reasonable method exists for predicting water
24 temperature excursion events.

25 And we defined excursion events as any

1 time the water temperature got above 90 degrees
2 Fahrenheit, which was the NDEQ standard for the
3 protection of aquatic life.

4 So our study area -- I think you guys have
5 all seen this before, but we have the Loup bypass
6 reach here, we have the Platte bypass reach, the
7 diversion, and the tailrace canal return. And this
8 is the stretch we want to study in here. We had --
9 well, let me move on.

10 Our methodology was to coordinate with the
11 USGS.

12 STEPHANIE WHITE: Stop just one second.
13 We're on slide 18.

14 GEORGE HUNT: Slide 18. Was to coordinate
15 with the USGS so they can put temperature probes in,
16 and I'll show you where in a second. So the USGS
17 was able to collect water temperature and water
18 flow. We were able to collect water temperature as
19 well, and we obtained meteorological data from a
20 site at Monroe from the High Plains Regional Climate
21 Center. Our data analysis for the methodology, we
22 use linear regression, ANOVA tests, logistic
23 regression and exceedance probability.

24 I'm on slide 10 on the map. So what we
25 did was the USGS was able to put a temperature probe

1 upstream on the Loup River at a site called
2 Merchiston, which is a brand new site from USGS.
3 And they started collecting temperature in early
4 May, and went all the way through the end of August
5 and just left it in as long as they could.

6 They put a temperature probe at their
7 existing site at Genoa. So we have flow and
8 temperature there at Genoa. And we were lucky
9 enough the USGS put in a probe at Columbus as well,
10 which we didn't know about originally.

11 We had temperature data loggers. These
12 little tidbits on slide 18, this is what they look
13 like, and it's about their size, and they can
14 collect temperature data for weeks and months.

15 We put -- as a test, we put them in
16 alongside Genoa just to make sure that our
17 installation methodology was as good as the USGS or
18 we got equivalent data out, we got equivalent data.
19 We tested in a week in June, and then we pulled it
20 out, and then in -- at the end of August we put them
21 back in. We put probes, two apiece, two at
22 Columbus, coincident with the USGS location. We
23 also had -- sorry, we also had flow there collected
24 by the Nebraska DNR. We had probes at upstream of
25 the -- on the Platte upstream of the Loup River

1 confluence. And we put probes in the Platte
2 upstream of the tailrace.

3 A lot of dates and stuff. Any questions
4 about that?

5 Okay. Slide 20, objective one, again, is
6 there a relationship between air temperature or flow
7 or water temperature. Is there a relationship for
8 water temperature between air temperature, relative
9 humidity, solar radiation or flow.

10 We found that there is not a statistically
11 significant relationship between water temperature
12 and either flow, radiative flux or relative
13 humidity.

14 We found that there was a statistically
15 significant relationship between water temperature
16 and air temperature and soil temperature.

17 Here I'm on slide 21. We've plotted flow
18 and temperature on the same graph here. You can see
19 the early May the temperature started -- and this
20 graph just happens to plot until near the end of
21 August.

22 We have drawn here the NDEQ standard at
23 90 degrees, and you can see here early June the
24 Genoa USGS probe got washed away, so we had to wait
25 a while until they were able to put the probe back

1 in.

2 You can see here we had some excursions
3 above the standard in August, and you can also see
4 the diurnal variations of the temperature going up
5 and down every day.

6 I'm on slide 22. In the back and forth,
7 you know, and developing the study plans, it was
8 requested of us that we -- in addition to what we
9 propose in terms of regressions, we used the
10 methodology presented by Sinokrot & Gulliver, and
11 it's a water temperature exceedance probability.
12 There is not a lot of data on this graph. There
13 weren't a lot of excursions. We didn't want to draw
14 too many conclusions from this graph, because like I
15 mentioned in the results slide, we did not find a
16 statistically significant relationship between flow
17 and water temperature. And this methodology kind of
18 ignores that and just plots the flow and
19 temperature. But basically what it's saying is for
20 about 200 CSF, there is a 50/50 chance of exceeding
21 the standard.

22 Here we have flow plotted against water
23 temperature. Sorry, I'm on slide 23.

24 And you can see, it really wasn't
25 appropriate to put the linear regression on this

1 plot. They are kind of scattered. Basically
2 because on a day you can have the flow be very even,
3 but the temperature is just going to go up during
4 the day and then down during the night, so you can
5 get the up and down pretty much in the same flow.

6 I'm on slide 24. We also plotted air
7 temperature versus water temperature. We have a
8 very good correlation, slight spread of the data,
9 but the water temperature is statistically related
10 to air temperature.

11 Slide 25, we have soil temperature versus
12 water temperature. We have a much tighter pattern,
13 again, a statistically significant relationship.
14 It's a much tighter pattern. We think it's just
15 based on response time being soil.

16 LEE EMERY: Question, Lee Emery, FERC. On
17 your soil temperature, I guess it was collected at
18 Monroe. I didn't go back to see the original
19 outline of the study. How was that measured?

20 GEORGE HUNT: I don't know. I would have
21 to go through the methodology. I would have to go
22 back through the --

23 LEE EMERY: I didn't see anything in the
24 report saying how it was done. I figured it was
25 probably done -- the original study plan. I was

1 just curious.

2 GEORGE HUNT: I don't know. I would have
3 to go back through the original data you download.

4 LISA RICHARDSON: We didn't do those
5 measurements, it was from the Great Plains --

6 LEE EMERY: Climate control. Just keep a
7 probe in year round and take measurements off of it
8 or something?

9 LISA RICHARDSON: I'm not sure.

10 LEE EMERY: It's in the study plan, the
11 original design of how data would be collected?

12 GEORGE HUNT: I'm sorry, what was your
13 question?

14 LEE EMERY: The methodology for the soil
15 temperature collection was in the original study
16 plan I guess about how --

17 GEORGE HUNT: No. I think we just said we
18 would get it from the agency.

19 LEE EMERY: I'm curious. I've never done
20 that before. I'm curious how they get that. A
21 probe stuck in the ground year round or something?
22 In this case it has quite a influence it seems like
23 on temperature and water in your study.

24 GEORGE HUNT: We came to the conclusion
25 that air temperature is influencing soil

1 temperature, but the water and the soil just have
2 the same -- a similar response time, and so you're
3 going to have a much tighter pattern.

4 Slide 26, we have relative humidity versus
5 water temperature. And, again, we didn't do a
6 regression on this slide. We found no statistic
7 relationship.

8 One thing, if you're using this dataset,
9 you're able to say, well, there weren't any
10 excursions with relative humidity below 50 percent,
11 the excursions all happened above 50 percent.

12 Slide 27, radiation flux. Excursions
13 could happen at the -- during the whole range of
14 measurements, from zero all the way up to 800, and
15 just say, well, it could be hot on a cloudy day as
16 well.

17 On slide 28, we have maximum daily water
18 temperature versus maximum daily air temperature.
19 Again, there is a statistically significant
20 relationship between this. These two datasets
21 slightly higher correlation, but we think that's due
22 to just a lot less data points.

23 Slide 29, we also -- we did two other
24 analyses on two other datasets. We had a dataset
25 where we took just the daily maximum water

1 temperatures and daily maximum air temperatures, and
2 we also had a second dataset where we took all water
3 temperatures above 63 degrees Fahrenheit.

4 We performed two different analyses on
5 these two different datasets, multiple logistic
6 regression modeling, multiple linear regression
7 modeling, and both models on both datasets show the
8 air temperature is the best predictor for water
9 temperature.

10 The logistic modeling was able to show
11 that if you included relative humidity in the
12 predictor model, it improved the results and
13 improved the prediction. And neither one of the
14 models for neither datasets was improved by
15 including flow in the analysis.

16 So to sum up for objective one, there is
17 not a statistically significant relationship between
18 water temperature, flow, relative humidity or
19 radiative flux. And there is a statistically
20 significant relationship between water temperature
21 and air temperature.

22 Slide 31, objective two, to describe and
23 quantify the relationship, if any, between diversion
24 water and Loup Power Canal and water temperature in
25 the bypass reach.

1 So the first step is we analyze
2 Merchiston, the data from the Merchiston site
3 similarly to the data from the Genoa site, and the
4 same relationships were found, you know, related to
5 air temperature and no statistically significant
6 relationship between radiative flux, relative
7 humidity or flow.

8 There is synchronous daily oscillations in
9 water temperature between the two stations, and
10 there is a statistically significant relationship
11 at -- one-to-one relationship between the recorded
12 water temperature at the two stations.

13 This is a similar slide. I'm on slide 32
14 that I showed before for Genoa. Again, same
15 pattern.

16 And, again, I'm on slide 33 with the
17 Sinokrot and Gulliver methodology. This time we
18 have four data points, and here it's showing for
19 about 2500 CFS you have a 50/50 probability of
20 exceedance.

21 Slide 34, Merchiston, showing air
22 temperature versus water temperature. A strong
23 correlation again, statistically significant.

24 And here we've plotted -- just plot the
25 data for Merchiston in blue on slide 35 and Genoa in

1 red. And this is from early May through mid June
2 about, and you can see they are practically right on
3 top of each other.

4 And then moving on to slide 36, we have
5 the other half of the Genoa data from mid July
6 through near the end of August.

7 And here -- we think right here the data
8 is a little -- you know, doesn't follow the same
9 pattern as usual. We believe that the Genoa probe
10 got exposed to the atmosphere a little bit there.

11 And then we plotted one against the other,
12 Merchiston water temperature versus Genoa water
13 temperature, and the standards on each side. You
14 can see there is a very high correlation.

15 I've also plotted the one-to-one line, so
16 if the data were exactly the same, they would all
17 fall along this line, and they follow it almost
18 right on.

19 This -- I'm back on slide 36. We did
20 announce these both with these data points and then
21 without, and the same relationship, it doesn't
22 matter. It's just that this plot looks a lot better
23 with them out.

24 Slide 38, in summary, water temperature at
25 Merchiston, similarly at Genoa, had no statistically

1 significant relationship between flow and relative
2 humidity or radiative flux.

3 Water temperature at Merchiston had a
4 statistically significant relationship to air
5 temperature.

6 We seen synchronous daily oscillations in
7 water temperature between the stations, and a
8 statistically significant relationship exists
9 between the two stations.

10 The third objective was to determine if a
11 critical reach relative to water temperature
12 excursions exists in the bypass reach. And a little
13 history, this came about because we had -- you know,
14 we had planned on just collecting temperature data
15 at Genoa, because Genoa is upstream of where Beaver
16 Creek comes in, and if flow was important, this
17 would be having the least amount of flow.

18 So we also -- that's why we had
19 temperature at Columbus and then upstream and
20 downstream on the Platte of the Loup confluence.

21 We found synchronous daily oscillations in
22 water temperature between Genoa and Columbus.
23 Almost identical to the Merchiston and Genoa.

24 Synchronous daily oscillations in water
25 temperature in the Platte bypass reach. And the

1 Platte River bypass reach temperature was correlated
2 with the temperature in the Platte upstream.
3 Therefore, no critical reach was identified.

4 Here is Genoa versus Loup River. These
5 are all USGS data. On slide 40, this time Genoa is
6 blue and Columbus is red. And both Genoa and
7 Columbus probes are washed out mid June, and then
8 Columbus had a little issue in July with being
9 exposed to atmosphere.

10 Here is -- I'm on slide 41. Here is a
11 week between August 13th and August 23rd about where
12 we are comparing Genoa -- USGS measured Genoa
13 temperature and one of our tidbit probes at
14 Columbus. You can see synchronous daily
15 oscillations right on top of each other.

16 And then again Genoa this time on the X
17 and -- on slide 42 -- Columbus on the Y, and, again,
18 we're showing the one-to-one statistically
19 significant relationship between the two.

20 Slide 43. So during the week that we had
21 our tidbit probes in, what this analysis -- what we
22 did for this analysis, we averaged for every day of
23 the week all the midnight flows, we averaged all the
24 1 a.m. flows and so on. So this is an average of
25 that week.

1 You can see that Genoa and Columbus
2 tracked right on top of each other generally. You
3 have Genoa on top in the morning, but they track
4 together, and then Columbus is on top in the
5 evening, but they all track similarly.

6 Now, if you look at the purple triangles,
7 the tailrace, that's in the Platte bypass reach,
8 it's higher than the flows -- I mean, than the
9 temperatures in Genoa and Columbus. But if you
10 compare it to the temperature in the Platte upstream
11 of the Loup confluence, those two probes match very
12 well also. Purple and the green track during the
13 day, green goes up a little higher than purple, but
14 then purple goes up a little higher. They correlate
15 together the same way that Columbus and Genoa
16 correlate together.

17 Slide 44. So, again, to summarize,
18 synchronous daily oscillations in water temperature
19 seen between Genoa and Columbus. There is a
20 statistically significant relationship between water
21 temperature at Genoa and Columbus, and the
22 temperature in the Platte River, the two temperature
23 probes are correlated together. And, therefore, no
24 critical reach was determined -- was found.

25 Slide 45, objective four, is there an

1 accurate and reasonable method to predict
2 excursions. Well, so if the temperature in the
3 water is a function of air temperature, then we need
4 to look at how do we predict a high air temperature
5 during the day. And if we wanted some warning, we
6 would want to look at it, what is the air
7 temperature -- can we look at the air temperature in
8 the morning and find out if the air temperature in
9 the afternoon, which brings up the water temperature
10 above 90, if that was a good predictor.

11 What we found was that if the -- I'm going
12 to switch to slide 46. If the air temperature hit
13 74 degrees at 8 a.m., you're highly likely to have
14 an excursion that day. If it's a hot morning, it's
15 going to be a hot day, and you're going to have hot
16 water.

17 And that's --

18 STEPHANIE WHITE: Any questions for
19 George?

20 JEFF RUNGE: Yeah. Jeff Runge. Just
21 going through FERC's final study determination, on
22 Page 19 of that they requested that if the Platte
23 River -- the Platte River bypass area, if the water
24 temperature is substantially higher than the Loup
25 River bypass area, then the district shall conduct

1 additional water temperature monitoring and analyze
2 water temperature, ambient weather conditions, and
3 pretty much it's -- if the water temperature in the
4 Platte River is higher than that of the Loup bypass
5 temperature, then you would have to conduct the same
6 analyses as you did for the Loup system. I was
7 wondering is it because of that correlation with the
8 Duncan is why that wasn't done or --

9 GEORGE HUNT: Right. That was before we
10 had decided -- we decided later to put that extra
11 probe in. I think that was written -- if I remember
12 correctly, that was written before we had decided to
13 put a third probe upstream. And by putting that
14 third probe upstream at the same time, we were able
15 to show that the temperature in that section of the
16 Platte is related to temperature upstream of the
17 Platte.

18 JEFF RUNGE: Okay.

19 LISA RICHARDSON: I guess, George -- this
20 is Lisa Richardson. I believe you did the same
21 analyses, you just had a different dataset, a
22 smaller dataset; is that correct?

23 GEORGE HUNT: Did we do the same linear
24 regression showing -- you're asking did we do the
25 same linear regressions?

1 JEFF RUNGE: Same linear regressions,
2 probability of exceedance analyses, all the logistic
3 regressions and those types of similar tests for the
4 Platte system.

5 GEORGE HUNT: We did not perform that
6 analysis. We saw that the temperature in that
7 section of the Platte was driven by the
8 temperature -- you know, I'm going to go back to
9 slide 43. Genoa and Columbus tracked together and
10 the two Platte track together.

11 JEFF RUNGE: And that's under the
12 conditions of last year?

13 GEORGE HUNT: That's correct, yep. That's
14 using this dataset using data collected during this
15 time period.

16 JEFF RUNGE: Thank you.

17 LEE EMERY: Lee Emery from FERC. On a
18 couple of your tables in the report, you have AT
19 which is air temperature, what is RH?

20 GEORGE HUNT: Relative humidity.

21 LEE EMERY: Sorry. I didn't see it any
22 place in the document. You do have a footnote in
23 several of the charts what AT was. Thank you.

24 GEORGE HUNT: Okay.

25 FRANK ALBRECHT: Frank Albrecht, Game and

1 Parks Commission. Will you help me out on
2 explaining something? I don't understand -- if you
3 go to slide 23. I guess I anticipated that there
4 would -- you know, one of your conclusions is there
5 is no statistical difference in the flow versus the
6 water temperature, and I guess that part surprised
7 me. I thought -- I guess what I was anticipating
8 was that's the higher flow of -- you know, the water
9 temp is going to go down somewhat, didn't know how
10 much, but this scale is a little bit -- on the flow
11 on the CFS on the bottom, maybe that's what confuses
12 me I guess, the way it's clustered there. But you
13 still have a temperature difference on the water
14 temp of 48 up to 96 or something like that. I know
15 that probably -- some of that is air temp like
16 you've been describing, but isn't that a pretty
17 significant difference in the water temperature?

18 And I guess where I'm going with that,
19 there is some flow issues on that bypass reach, and
20 we've had some fish killed and so on. It's not the
21 temperature from the -- I'm trying to figure out
22 what's going on there then. So can you help me out
23 on this one on this graph, and then that overall
24 question that I have?

25 JEFF RUNGE: One thing, too, to maybe help

1 with your question there, there is the previous
2 slide. That sort of filters out a lot of the noise
3 in the second graph. Oh, not that one, the next
4 one. That one there. That if you go to the next
5 graph, you see that there is a lot of scatter, a lot
6 of noise as far as when there is a -- an evaluation
7 is done.

8 A lot of the regressions doesn't look
9 at -- correct me if I'm wrong, doesn't look at just
10 flows above 90 and the probability of that, it
11 includes all the temperatures across all the
12 different flow ranges.

13 STEPHANIE WHITE: We're on slide 23.

14 GEORGE HUNT: This graph?

15 JEFF RUNGE: Yeah, or a lot of the
16 regression analyses looks at all of the
17 evaluation -- all of the relationships between water
18 and temperature across all the different water
19 ranges and all the different temperature ranges. It
20 doesn't focus on things like -- you know, like on
21 the very low end and the very high temperature end
22 of things.

23 GEORGE HUNT: Yeah, we did -- I'm looking
24 through the report now. If you look, for example,
25 on pages -- I'm on study four, Page 21. We have --

1 JEFF RUNGE: Before we get to that. Just
2 that previous slide, though, for me it sort of
3 filters out that noise. Knowing that there is a lot
4 of scatter, that there is somewhat of a relationship
5 there. A curve to linear relationship between your
6 main daily discharge and the probability of
7 exceeding that temperature limit. But sorry about
8 that. Sorry for interrupting you, but I thought I
9 would just show that real quick and allow for you to
10 go into the other analyses.

11 GEORGE HUNT: Well, if I understand your
12 question, you're saying it doesn't seem intuitive
13 that flow would not have an effect?

14 JEFF RUNGE: Well, to me it's -- I'm not a
15 statistician, but there is a lot of scatter. I
16 think they term it like heteroscedastic, and it's
17 sometimes like multiple regressions. I'm not
18 familiar with logistic regressions, but maybe like a
19 regression quantile would be able to filter out a
20 relationship within a subset of the data as opposed
21 to a linear relationship, linear regression that
22 sort of looks at all the data. You know, tries to
23 get that medium fit between the relationships.

24 GEORGE HUNT: We did analysis, so I'm
25 going to -- we have two analyses that I think

1 address your question. We have the analyses where
2 we reduced the dataset to flows just below 50 CFS,
3 100 CFS, 200 CFS, and then just -- so we feel like
4 we've addressed that sort of -- you know, let's just
5 look at low flows and what happens, let's just look
6 at high temperatures, what happens.

7 Now, the logistic analysis, what that --
8 in report we describe how we took -- any time the
9 temperature is above 87 or 88 degrees Fahrenheit, we
10 set that as a one, and any time it's below, it's a
11 zero, and that reduced all that scatter. And so you
12 have above and below. And it was able to, you know,
13 use that methodology reducing the scatter,
14 addressing the heteroscedastic; is that right?

15 JEFF RUNGE: Yeah, you know what I'm
16 talking about now.

17 GEORGE HUNT: Yeah. We feel that that
18 analysis addressed that concern and it found the
19 same results.

20 JEFF RUNGE: Yeah, I think you might be
21 right. Like I said, I'm not familiar with logistic
22 regressions, and I think that that does have that
23 capability of sort of model building and looking at
24 that subset, so that's something I'll just have to
25 follow-up on, but I do recall that, and it does --

1 yeah, the information looks good from that
2 perspective.

3 GEORGE HUNT: Did I --

4 FRANK ALBRECHT: It doesn't entirely
5 answer my -- if that scale was different on the X
6 axis, maybe if it was just zero to 2000 CFS, maybe
7 that would help. I guess what I'm still getting at
8 is, A --

9 GEORGE HUNT: Do you have our copy of the
10 report, can you take a look at these --

11 FRANK ALBRECHT: I do, but maybe -- okay.
12 Isn't that a significant amount of change I guess
13 from 48 to 96 under those lower flow conditions on
14 that one, or am I probably missing something?

15 GEORGE HUNT: Forty-eight to --

16 FRANK ALBRECHT: Temperature on the Y axis
17 is 48 up to 94, 95.

18 GEORGE HUNT: Uh-huh.

19 FRANK ALBRECHT: That's a pretty
20 significant jump, especially when the threshold is
21 90. Like I said, I'm probably missing it. But your
22 conclusion is there is no statistical --

23 GEORGE HUNT: So what this is saying for
24 about the same flow rate at Merchiston it says --

25 FRANK ALBRECHT: That's where maybe I'm

1 missing it, because the scale on the other axis it's
2 all clustered there on the lower flow conditions, so
3 maybe if that was spread out I would see it a little
4 easier.

5 GEORGE HUNT: What I'm trying to say is if
6 you look at our report plots, like on Page 21, 22,
7 23, 24, we've plotted this data, the same data, just
8 reducing the dataset down to exactly what I think
9 you're asking for.

10 FRANK ALBRECHT: Okay. So I need to look
11 at that a little bit more then.

12 GEORGE WALDOW: George Waldow, HDR.
13 Correct me, George, because I think I asked the same
14 kind of question earlier on this slide that what
15 we're seeing at the left margin is all of the -- all
16 of the temperature points that were collected during
17 this period of the summer warm season. And your
18 explanation to me was that the temperature varied
19 all over the map under low flow conditions during
20 those -- during that period of record. You're not
21 seeing anything other than the raw plot of
22 temperature occurrences during all of these days,
23 and there are a lot of temperatures at low flows
24 because there were low flow -- many more low flow
25 days than high flow days. It's that simple.

1 STEPHANIE WHITE: Does that help, Frank?

2 FRANK ALBRECHT: Yes. I'm looking at
3 this. This scale, zero to 500 CFS, it does.

4 LISA RICHARDSON: George, maybe go to 35,
5 where you're seeing it's exactly the same.

6 GEORGE HUNT: So on slide 35, this is
7 another way to look at the data. Frank, this is
8 another way to look at the data. Just plot them
9 right on top of each other. And we know that the
10 flow at Merchiston is higher than the flow at Genoa,
11 but the temperature is plotted right on top of each
12 other.

13 FRANK ALBRECHT: Okay. That's one of the
14 later slides, isn't it?

15 GEORGE HUNT: This is slide 35 I'm looking
16 at right now.

17 FRANK ALBRECHT: Okay. Thank you.

18 STEPHANIE WHITE: Any other questions for
19 George? We're doing pretty well on time. If you're
20 open to it, I would like to keep going.

21 Okay. I turned the air off to help with
22 acoustics. I think it's fine, but if we need to
23 take a break and turn it back on, we can. I think I
24 will not have it on during the presentations.

25 I think we might be ready for Study 8.

1 Quinn, come up.

2 QUINN DAMGAARD: My name is Quinn
3 Damgaard. I'm with HDR. I've been working on the
4 recreation study for a while along with Mike Gutzmer
5 is here, he's with New Century Environmental. Mike
6 did a lot of the underground survey work, so he was
7 a very big help.

8 I did work with George a little bit, just
9 a very little bit on the temperature study. I'm
10 certainly glad George was here to go through that
11 with you. I think this will maybe be a step down in
12 technicality. Hopefully we can move right through
13 it.

14 The goals and objectives have really not
15 changed since FERC's study plan determination. They
16 are to determine the public awareness, usage
17 perception and demand of the project's existing
18 facilities, including fisheries and the Loup River
19 bypass reach.

20 The bypass reach was something that was
21 added per the study plan determination as well as
22 the Loup Lands WMA, Wildlife Management Area.
23 That's an area that's owned by the district and
24 managed by the Game and Parks Commission. That was
25 also added for the study plan determination. And to

1 determine if potential improvements are needed, and
2 to ultimately develop a recreation management plan
3 to address existing and future recreation needs.

4 The objectives, I believe there are five
5 or six. To measure recreation use of the project
6 facilities, including the fisheries, the Loup River
7 bypass reach and the wildlife management area, and
8 to document the types of recreation use occurring at
9 the facilities and along the bypass reach, to
10 determine whether recreation facilities meet current
11 demand, and to determine the public perception, the
12 awareness of the facilities, including the
13 fisheries, and identify the impact, if any, of the
14 operation -- project operations on recreation use.

15 And then moving more to the creel aspect
16 of the survey, we look to determine what species
17 anglers are targeting, what they are catching,
18 including their catch rates, and to collect data for
19 use -- ultimately to collect the data used to
20 prepare the recreation management plan.

21 The study area is the Loup Power Canal in
22 its entirety, the 35-mile length, including the
23 developed recreation facilities along its stretch
24 there. They are listed there. Also, as we said,
25 the bypass reach was also looked at.

1 The bullets here, the two public parks,
2 the wildlife management areas and the road bridges
3 were areas that were used. They were publicly
4 accessible areas used to access the bypass reach
5 during our survey.

6 Methodology, very quickly, outreach was
7 performed ahead of the surveys. It consisted of
8 paid newspaper advertisements, press releases, web
9 page announcements, as well as the district actually
10 installed some signs at the entrances and multiple
11 recreation sites just kind of announcing that they
12 would be doing a recreation survey during the 2010
13 recreation season. Just letting people know when
14 Mike and his crew approached them to be cordial
15 hopefully and provide us some information that we
16 needed.

17 A facility inventory was done. That was
18 done along all the developed facilities along the
19 canal. Basically just seeing -- getting a real good
20 handle on what's out there now, getting the kind of
21 baseline condition. It was also performed per the
22 study plan determination along the access locations
23 at the bypass reach. So those wildlife management
24 areas and the public parks were also inventoried for
25 their existing facilities and amenities.

1 And then the real big piece, of course,
2 was the in-person surveys and the user counts.
3 Those started the first of May, they ran through
4 October, they were done on ten days every month at
5 the randomly selected days, four weekend days and
6 six weekdays, again, every month, as well as on the
7 three holiday weekends, so Memorial Day, the 4th and
8 Labor Day we had crews out there. The survey
9 schedule was developed by the Game and Parks. It
10 was done with their -- actually with their creel
11 survey schedule software, and, again, randomly
12 selected.

13 The district also installed three trail
14 counters to get a handle on what's the usage of
15 their trail network. There is three main trails
16 that kind of surround Lake Babcock, Two Lakes Trail,
17 Bob Lake Trail and Robert White Trail. The trail
18 counters were installed right at the very end of
19 April, and they collected data May through October
20 as well.

21 And we did do a telephone survey. A
22 professional market research firm did that, I
23 believe, April and May of last year. The results of
24 that I think were presented last September during
25 the initial study results made.

1 So getting into the results. First we're
2 going to hit the results of the survey that was
3 performed along the canal, specifically along the
4 canal. We'll then look at what we learned along the
5 bypass reach, and then the third phase will be the
6 creel survey results.

7 STEPHANIE WHITE: Is there a question on
8 the phone?

9 ISIS JOHNSON: No, sorry.

10 STEPHANIE WHITE: We're now on slide 55.

11 QUINN DAMGAARD: I've been failing
12 miserably at identifying what slide I'm on.

13 So slide 55, the user demographics
14 collected from the respondents, again, along the
15 canal. The ratio composition was approximately
16 90 percent white, nonHispanic. Pretty much the
17 remainder was Hispanic. There was really no other
18 racial or ethnic groups represented.

19 The most frequently -- the most frequent
20 annual household income was between 26 and 50,000.
21 That was 34 percent of our respondents. And I guess
22 just in generalities, as the income range went up,
23 the frequency decreased. There was kind of an
24 inverse relationship there.

25 The most popular age of user was actually

1 the children, 22 percent were 12 and under, and
2 there was a similar relationship there, as the age
3 went up, the frequency decreased, so -- and the
4 residents of users, 96 percent of our survey
5 respondents reside in Nebraska, more specifically
6 46 percent were from here in Columbus. We actually
7 asked them their zip code, so we were able to
8 extrapolate that, and that's kind of graphically
9 shown here.

10 These numbers are probably hard to see,
11 but basically the darker color the more concentrated
12 the recreation use that we interviewed. But, you
13 know, a fairly good dispersion throughout at least
14 the eastern half of the state.

15 Some general findings from our -- slide
16 57. General findings of our survey along the canal,
17 the size of the party was generally one or two. A
18 lot of folks were either by themselves or just with
19 a single guest. That was over half of the people we
20 surveyed.

21 Miles traveled to access the district
22 facilities, 60 percent traveled less than 25 miles,
23 and 92 percent traveled less than 100 miles.

24 If you look at where Columbus falls in the
25 state, it's almost 100 miles exactly to the nearest

1 state border to the northeast and the west, so most
2 of the people there were in state as you saw by the
3 last figure.

4 If you -- what's interesting about the
5 folks that traveled over 25 miles, we did some cross
6 tabs on what those folks were doing at the
7 district's facilities. Most of the folks that came
8 here from more than 25 miles away were here for the
9 OHV park. Again, the district has an OHV, off
10 highway vehicle, maybe ATV. They have a park
11 associated with Headworks Park that does draw people
12 from quite an area. So most of the people that
13 traveled more than 25 miles were here for that
14 reason.

15 Overnight stays, 35 percent of our survey
16 respondents were staying overnight, and of those,
17 two-thirds were staying in RVs. 39 percent were
18 staying for two nights, that was our most frequent
19 length of stay. One and three night stays were also
20 fairly common, kind of even, but after you get over
21 three nights, it dropped off pretty significantly.

22 We did ask folks if they had any special
23 access needs of our respondents -- which I'm on
24 slide 58 -- of our respondents of which there were I
25 think 1,012. I should have mentioned that up front,

1 we did have 1,012 survey responses along the canal.
2 2 percent cited special access needs. And in
3 following up with those folks, one thing that they
4 mentioned that they might like to see was maybe
5 some -- a little more shore fishing access with some
6 ADA compliant pass. That was something they
7 specifically noted.

8 98 percent said the site adequate, the
9 access was adequate. So the vast majority thought
10 the recreation access was adequate throughout the
11 facilities.

12 And 70 percent of our respondents said
13 that the reason they recreate at the district
14 facilities is because it's close to home. I suppose
15 that makes sense.

16 On top of that, other things that were
17 commonly noted was the shore fishing opportunities,
18 the fishing opportunities as well as the OHV park.
19 Those were the other common draws as to why people
20 were recreating.

21 And the frequency of visitation, the most
22 common frequency, we did give several choices, was
23 two to three visits per year. That's 36 percent of
24 the people, and that does correlate very directly
25 with the NOHVA jamborees. NOHVA is the Nebraska Off

1 Highway Vehicle Association. They generally have a
2 jamboree in -- an ATV/OHV jamboree in the spring and
3 in the fall, so twice a year, so that's -- that does
4 correlate with our findings.

5 Visitation by month, people were asked
6 when are you here. You know, we might have hit them
7 one time, but we did ask them when do you generally
8 visit the facilities. Not surprisingly, they
9 indicated May through August, the summer months were
10 by far the most popular. It trended down a little
11 in the fall. Very, very little use in the winter.
12 Again, not surprisingly. Picked up again in April.

13 We did not survey over the winter, and
14 based on our findings, again, the questions that
15 were built in, there is very, very little use in the
16 winter based on what we found, and the district I
17 guess is of the feeling that winter surveys are
18 probably not necessary going forward.

19 We also asked folks do you use other
20 facilities, nondistrict owned facilities in the
21 area, whether it's a city park or a wildlife
22 management area somewhere in the area. 93 percent
23 said they do not use. They just don't use those
24 facilities.

25 We did ask people, of course, what are you

1 doing, why are you here, what activity are you
2 participating in. These are the top six of 18
3 choices that we had. So the top third, fishing,
4 relaxing, hanging out, for lack of a better term, I
5 guess, camping, again, the off highway vehicles,
6 wildlife viewing and picnicking. Those were the
7 most common activities that our respondents were
8 participating in.

9 We also asked folks what are the most
10 important things for you that you would like the
11 district to provide. The percentages indicated are
12 the percentage of people that said that these
13 activities were either very important -- excuse me,
14 important or very important. So, again, basically
15 the same activities. With the addition of the
16 trails, these are the people -- the things that
17 people feel are important.

18 And, again, these are things to consider,
19 that the district will consider when developing the
20 recreation management plan going forward.

21 People were asked to rate the district
22 facilities and the amenities. The percentages
23 indicated here are the percentage of respondents
24 that said these facilities are either very good or
25 excellent. So people think the trails are obviously

1 very good, again, the OHV park and things going down
2 the list here. These are the top five of ten
3 choices that were given.

4 The facility, the amenities that had the
5 lowest rating was the restroom, restrooms.

6 STEPHANIE WHITE: Slide 63 now.

7 QUINN DAMGAARD: Respondents were also
8 asked if there was anything, any project operation
9 that may have interfered with their recreational
10 enjoyment or activities. 88 percent said, no, the
11 project did in no way interfere with my recreational
12 enjoyment. Those that did cite some type of
13 hindrance or interference mentioned ATV operation at
14 night, bugs and unleashed dogs. Those were the
15 three most commonly cited things.

16 We did ask respondents specifically if
17 there were things that they might like to see at the
18 differing developed recreation sites along the
19 canal.

20 At Headworks Park, the most commonly cited
21 request were more camper hookups and power in the
22 restrooms. The number here in parentheses is the
23 number of respondents that said something to that
24 nature. Maybe not exactly, but in line with that.

25 Shower installs at Babcock. People

1 mentioned just restroom maintenance basically and
2 maybe a shower.

3 At Lake North Park there was little
4 more -- a little more focus on the fishing. People
5 mentioned fish cleaning station would be nice,
6 perhaps some more stocking of Lake North, fish
7 stocking, and maybe some more fish structure, you
8 know, sunk to the bottom of the lake for fish
9 habitat. And also, again, restrooms and showers.
10 That was kind of common.

11 Powerhouse Park, restroom lighting and
12 fish cleaning station was again mentioned there,
13 and, again, several fewer responses. These are the
14 areas -- this area is not as heavily used as some of
15 the others.

16 And Tailrace Park, again, the restroom and
17 a fish cleaning station.

18 The trail counts, again, there were three
19 trail counters installed along each of the main
20 trails. They collected from May through October,
21 the length of the study.

22 And here you can see that trail usage was
23 highest in May. Pretty consistent June through
24 August, and then it fell off in the fall. Blue is
25 Two Lakes Trail. That's the trail that runs along

1 the north side of Lake Babcock. It sees the most
2 traffic by far as you can see.

3 And average daily trail counts, again,
4 through the work week, fairly consistent through the
5 work week. As you would expect, an increase during
6 the weekend. Two Lakes Trail, right around, you
7 know, 60, up around 80 on the weekend, 90, and the
8 other two trails represented there with a little
9 less use.

10 And then we actually plotted it by the
11 time of day as well, when are people out. Again,
12 picks up in the morning as you would assume, getting
13 higher and higher in the afternoon and the evening,
14 and dropping off at about 8:00 through the night.

15 We did look at some use estimates looking
16 at how many people are actually visiting using the
17 facilities, and what we came up with was 82,000
18 recreation user visits on an annual basis, with an
19 average of 720 on the weekend day and 260 on an
20 average weekday, so three times the use on the
21 weekend on average.

22 During the week, Lake North Park saw the
23 most traffic, the most use. Headworks Park was
24 actually the busiest on the weekends. This is again
25 2010. Headworks Park was the busiest on the

1 weekends and the holiday weekends.

2 We then looked at the capacity, capacity
3 at which the current facilities operate. And our
4 findings were generally consistent with kind of the
5 anecdotal information provided in the PAD. And that
6 is that the facilities seem to provide adequate
7 capacity for the demand. There are a few minor
8 exceptions. Of course, that's when holiday weekend
9 when the weather was nice -- this past year that was
10 Memorial Day weekend. 4th of July was raining and
11 we saw use down from probably what was normal. But
12 on Labor Day there was one -- there was one instance
13 where the campers seemed to exceed what was
14 considered the amount of capacity at Lake North.

15 The other exception occurs when the NOHVA
16 jamborees happen at Headworks Park. The district
17 knows that, and NOHVA knows that, that there is more
18 demand there, capacity. NOHVA actually makes
19 accommodations with adjacent landowners to lease
20 additional lands there to accommodate that
21 additional need. And, again, that's pretty
22 isolated. That happens twice a year, once in the
23 spring and once in the fall.

24 STEPHANIE WHITE: Slide 74.

25 QUINN DAMGAARD: So looking at demand and

1 understanding that there is not a real good metric
2 to base area of recreation facilities and lake trail
3 on. The Game and Parks' new score references this
4 NRPA standard, which I believe says that there
5 should be -- let's see, is it -- I want to get this
6 right here. Ten park acres per thousand people, my
7 apologies, and one trail mile per 8,000 people. And
8 this is a metric that's not universally recognized,
9 but it's kind of what's out there. It's something
10 to go by.

11 So when you take the 2009 census estimate
12 for Platte and Nance counties, and you apply it to
13 what -- using NRPA standards are, that would come up
14 with a need of 360 recreational areas to accommodate
15 Platte and Nancy counties in the 2009 estimate, and
16 four and-a-half trail miles.

17 Now, the district alone provides these
18 numbers, you know, far in excess of what this
19 standard would require, and that's not including any
20 city parks or anything else that's available here in
21 Columbus or via the wildlife management areas or
22 anything else. So according to this metric, the
23 district far exceeds what would be required of
24 adequate recreation facilities.

25 And looking ahead, future demand, if you

1 compare the -- you know, the 2000 census to the 2009
2 estimate -- we don't have our hands on the 2010
3 stuff yet, but the populations here in Nance and
4 Platte counties have been essentially static, very
5 little increase.

6 And also the Game and Parks in their
7 latest SCORP, that's a state comprehension outdoor
8 recreations plan, they did a statewide survey with
9 regards to recreation, and what they found was
10 people in Nebraska generally are not recreating
11 outdoors as much as they have in the past, and we
12 all know with technology that that's kind of a hot
13 issue.

14 So basically what that says is it doesn't
15 look like there is a lot of future demand, a lot
16 more future demand than what we're seeing already.

17 So that kind of concludes our results on
18 the canal. Moving to the bypass --

19 LISA RICHARDSON: I was just going to see
20 if there were any questions before we move on to the
21 bypass?

22 JEFF SCHUCKMAN: I've got a question.

23 STEPHANIE WHITE: Jeff.

24 JEFF SCHUCKMAN: That 82,000 annual visits
25 for the Loup Canal, does that include 11,000 some

1 odd fishing trips? Are they included in that 82,000
2 total?

3 QUINN DAMGAARD: They are included, Jeff.
4 That would include, yes, anglers, recreators of any
5 type really.

6 JEFF SCHUCKMAN: Use that 11,000 figure or
7 that other figure that we discussed earlier, or is
8 that my influence, that 82,000?

9 QUINN DAMGAARD: No, I'm sorry. That was
10 not determined based on the creel outputs, Jeff.
11 That was determined based on the number of people we
12 interviewed, and applying a few formulas with
13 regards to the number of people interviewed versus
14 the number of people observed. We started out -- we
15 determined it by how many people per hour visit the
16 sites, and then we ran it down to the day and to the
17 week and all the way to the year.

18 So Jeff and I had some conversation before
19 the meeting started, and you'll see I have a few
20 corrected numbers on the creel side here. Jeff's
21 asking if what we discussed before the meeting would
22 influence these numbers, and the answer is no, Jeff,
23 these were derived in a different way.

24 JEFF SCHUCKMAN: Very good.

25 QUINN DAMGAARD: And actually these were

1 derived in two different ways. We first did it the
2 way that I mentioned there. We did an alternate
3 method where we looked at kind of the turnover
4 method that some of our folks on the West Coast have
5 used in other FERC projects, and we came up with a
6 very similar number.

7 STEPHANIE WHITE: Randy?

8 RANDY THORESON: I think I'll just keep my
9 comments at the end when you get through all your
10 slides.

11 LEE EMERY: I have one quick comment. I
12 haven't talked to Janet Hutzel yet, but your slide
13 65 about structure, we've seen in various projects
14 across the country use Christmas tree bundling,
15 which is very low cost, and various programs,
16 hydropower projects to create fish structure and
17 wildlife. Just a thought.

18 QUINN DAMGAARD: Thank you, Lee. Ron.

19 RON ZIOLA: Ron Ziola, Loup Power
20 District. We do do that in a shallower part of the
21 lake down in the southeast corner, we do do the
22 Christmas bundles. However, in the deeper parts of
23 the lakes we have not done that. So we do have one
24 area pretty much dedicated to fishery, keeping the
25 buoys that direct boating and those kind of things,

1 so we do have a portion of the lake that does have
2 tree bundle structures.

3 STEPHANIE WHITE: It sounds like there may
4 be a question on the phone. Janet, was that you?

5 JANET HUTZEL: No. I was just commenting
6 that I see it more done in the south than the
7 Midwest, but you could do it.

8 STEPHANIE WHITE: Any other questions?

9 QUINN DAMGAARD: All right. So moving on
10 to the bypass reach. And the following results are
11 specific to the folks surveyed along there. We did
12 have -- as opposed to the 1,012 respondents we had
13 along the canal, we had 102 respondents along the
14 bypass reach.

15 And this number here is wrong, this should
16 be 92. Racial composition along the bypass reach
17 was essentially the same, approximately 90 percent
18 white, nonHispanic and 5 percent Hispanic.

19 The household income range was the same,
20 most commonly cited was 26 to \$50,000, and the age
21 of users was the same as well. The kids were the
22 most common, and the frequency decreased as the age
23 went up.

24 Residents of users was again along the
25 same, 95 percent Nebraska and 52 percent Columbus.

1 We did ask for the zip code again, so we were able
2 to derive the specific locale. And, again, a
3 similar figure, the darker the shading, the more
4 concentrated the respondents.

5 The size of party was the same as it was
6 along the canal. Folks either recreating alone or
7 with a single guest. Two-thirds of the respondents
8 were with a party of that size. 70 percent traveled
9 25 miles or less, and 90 percent traveled 100 miles
10 or less.

11 Overnight stays, 22 percent were staying
12 overnight, 63 percent cited RVs. And what was
13 interesting was the people that were staying
14 overnight seemed to stay a little longer, again,
15 along the bypass reach as compared to the canal,
16 with four nights being the most common at
17 31 percent. The one, two and three night stays were
18 pretty evenly distributed, and once you got over
19 four, it dropped off pretty sharp. People on the
20 canal generally stay two nights most commonly,
21 people on the bypass, four nights.

22 People actually visit the bypass reach
23 more frequently than the folks we interviewed along
24 the canal. Almost half of them visit it weekly.
25 Again, that can be skewed a little bit by the NOHVA

1 jamborees and the folks coming a couple times of
2 year for that specifically.

3 And the visitation by month was the same
4 as expected, the summer months of May through
5 August. 60 percent of the visitation happens there.

6 We'll get into a little bit of specifics
7 on the wildlife management area, and you'll see
8 there that folks tend to come to that area in the
9 fall and in the spring coincident with the hunting
10 seasons here in Nebraska as well as the mushroom
11 hunting that happens in the spring.

12 Folks were -- along the bypass reach were
13 asked similar questions with regards to their
14 activity participation. And here are the top five
15 of ten options that were asked. People that cited
16 other were either walking or running, that was not
17 one of our options, OHV riding and mushroom hunting.
18 Those are the three real common things under other.
19 So that did make it quite a ways up the list.

20 And 85 percent of the people we talked to
21 along the bypass reach cited no hindrance to their
22 recreational enjoyment, no interference, nothing of
23 project operation wise was interfering with them.

24 So by far the vast majority -- those that
25 did cite something requested maybe more signage for

1 the trails. Again, keep in mind we're on the bypass
2 reach and these are not district facilities, so they
3 thought it would be nice to have some signage, but
4 the district doesn't own these facilities or operate
5 them.

6 The OHV riders were interfering with their
7 enjoyment. One thing that is pertinent to the
8 district was Headworks Park -- part of that park
9 does abut the bypass reach, so we did survey people
10 there along the bypass reach, and they noted showers
11 would be nice, and that's consistent with what we
12 saw with the folks interviewed along the canal
13 there.

14 Specific to the Loup lands, the wildlife
15 management area, the numbers here, the -- I'm on
16 slide 81, the 77 percent that say they have never
17 visited, this needs to be clarified. 77 percent of
18 the people surveyed along the entire bypass reach,
19 so this is not specific to the Loup lands area. So
20 of the people, the 102 people we talked to, most of
21 them have not visited the Loup lands area. Of those
22 that do, 10 percent say they visit it annually.

23 And here is the interesting shift in when
24 people visit. Again, the fall and the spring to --
25 coincident with the State of Nebraska hunting

1 seasons. Deer and turkey I think are probably the
2 most popular ones. And then the morel mushroom
3 hunting that happens in the spring.

4 Activities that people are performing
5 specific to the Loup lands area, and this area is
6 way on the western side of the project near the
7 Headworks for those of you not familiar.

8 Again, hunting is No. 1, and that's why
9 people are there in the fall and spring, camping,
10 fishing, wildlife viewing and hanging out.

11 So that kind of wraps the bypass reach
12 results. I can take questions on that now too if
13 anyone would like.

14 RANDY THORESON: Randy Thoreson, National
15 Park Service. Lots of information, Quinn, a lot of
16 it, and I've spent quite a bit of time looking
17 through the reports, and I have a few just general
18 comments that I would like to give.

19 As you know, the National Parks Service
20 has been involved in recreation and relating to this
21 relicensing project, and been involved in various
22 stages of it. And the most recent I think written
23 letter was in relation to the additional study
24 report and interim recreation report, and I have
25 comments on that.

1 Mainly the comments related to that was
2 related to this study getting more information for
3 drawing conclusions. This report here gets to that.

4 The three main interests of the National
5 Park Services are the inventory, which you went
6 over, the use and demand, which you have a couple
7 slides on, and also the possible improvements. And
8 I know today -- you know, we're taking this
9 information, talking about it, but all three of
10 those things go through recreation management plan.
11 So I know a lot of those won't be solved or
12 completed today in terms of conclusions and stuff
13 like that, but the report gives a lot of good
14 information. So, thank you, a lot of good
15 information in the report.

16 As well as the Loup River bypass reach,
17 provide a lot of comments with that requesting that
18 bypass reach could be studied and summarize the
19 recreation report.

20 When I look at the conclusions, there is
21 really only a couple small paragraphs that I can see
22 on Page 14 where it summarizes use and demand, and
23 also use and demand and --

24 QUINN DAMGAARD: This is Page 14 of the
25 actual study report?

1 RANDY THORESON: Right. Use and demand
2 capacity, use estimates, those two things of the
3 paragraph. I would like to probably see a little
4 more analysis summarizing that, but we can get into
5 that in the direct management plan summarizing those
6 conclusions.

7 Also, I look -- in terms of the facilities
8 improvements that you went over, tables 5.25 to
9 5.30. I think it provides good information. Rather
10 than just the top three you picked, there is a good
11 history that we can look at recreation management
12 plan. I did not see -- and there is a table in the
13 report, but you don't have in your slide, and it's
14 5.30 which talks about the power canal and
15 improvements that have been reflected in that. I
16 didn't see that in your slide and it's in the report
17 unless I missed it.

18 QUINN DAMGAARD: No, we did not include
19 that here. Just focusing on the developed areas.
20 As Randy has mentioned, there is a lot more
21 information in the report that maybe than we're
22 covering here. He did reference the facility
23 inventory. I really just mentioned that we did
24 that. I didn't cover that here in the slides at
25 all. There is a lot of detail in the report with

1 regards to the baseline condition and what's out
2 there now for amenities, but, yeah, Randy, I just --
3 we left that one out I guess.

4 RANDY THORESON: My comments are that I
5 was looking for this information to obviously move
6 forward with the recreation management plan, and you
7 provided some good information. I still think we
8 need to marry the information with the sites and
9 look at the sites as they are developed, or as they
10 exist, and possible improvements to the sites.

11 QUINN DAMGAARD: I think that's entirely
12 our objective and our intent, and that's why we put
13 together those tables that you referenced. Here are
14 the requested things by site, here's what people
15 want specific to different areas.

16 RANDY THORESON: And I'll be submitting
17 written comments to what I said. What is it,
18 April 11? And obviously I'll be submitting those
19 comments. And I would like the opportunity to
20 provide review and input as you develop the rec
21 management plan, even at the early stages when you
22 develop the outline of the management plan. I
23 obviously would like to be involved in that. You
24 did some good studies.

25 I guess in summary what I would like to

1 say is there is a lot of information here that I've
2 looked at, and I still need to draw some
3 conclusions, but what it boils down to is looking at
4 the rec facilities and see if there is any
5 improvements that can be made to them is where I'm
6 coming from here.

7 QUINN DAMGAARD: Mike and the crew were
8 out a lot this year, 60 some days from May to
9 October, so there was a lot of data gathering,
10 absolutely.

11 RANDY THORESON: I didn't see any real
12 improvements requested for the trails other than
13 trail counts. Did you have any information on
14 requested improvements for the trails?

15 QUINN DAMGAARD: You know, nothing comes
16 to mind, Randy, but really we highlighted the real
17 top things that people requested. I would encourage
18 you to put that in your comment form. I could look
19 back under the very specific requests and see if
20 there was anything referenced to trails.

21 RANDY THORESON: That's basically my
22 comments. Thank you.

23 QUINN DAMGAARD: Move on now to the creel
24 survey.

25 Last September when you all were here for

1 the first study results meeting, I believe that was
2 the first week in September, I was up in Canada
3 fishing and collecting quite a stringer of walleye,
4 so I thought I would make a lot of friends by
5 showing you that. These pictures were actually
6 taken the very day that you guys were here in
7 Columbus. I thought that might be appropriate.

8 And, by the way, that's quite a bit more
9 than a limit. I was with three other guys so we
10 were perfectly legal, Jeff, and everybody else.

11 The study for the creel survey was
12 specific to the canal. It did not include the
13 bypass reach, but it did include the whole 35-mile
14 canal, including Lake Babcock and Lake North. It
15 also included area of the Loup River right at the
16 Headworks. If people were there at the Headworks
17 fishing in the river, we did survey them. Also
18 people at Tailrace Park fishing in the Platte River
19 right there adjacent to the park, we did survey
20 them. So that is the area of the survey.

21 The methodology was produced in
22 cooperation with the Game and Parks. We did have a
23 meeting where we sat down and really hammered out
24 exactly what we needed to do. It resulted in a
25 progressive count bus-route creel survey design.

1 The schedule was coincident with the general use
2 survey along the canal. It was six weekdays and
3 four weekend days per month from May 1st through
4 October. We only surveyed anglers during the
5 daylight hours. We weren't out in the middle of the
6 night collecting data.

7 Ultimately the analysis was input into the
8 Game and Parks creel survey software that they
9 provided us. And then the analysis was run and the
10 outputs run through the software. And actually Jeff
11 ran an error check on our data and our input, so we
12 think we got some pretty good data.

13 Demographics of the creel survey, again,
14 very consistent with the same folks we saw in the
15 canal involved in other recreation. 88 percent
16 white, nonHispanic, 12 percent Hispanic with really
17 no other groups represented.

18 The same annual income that we've seen,
19 and, of course, the folks fishing were 99.6 percent
20 from Nebraska, so almost entirely -- I think there
21 were three -- we surveyed 439 people for the creel
22 survey, and there were three of them that were from
23 out of state. I believe one was from Georgia and
24 two were from Oklahoma, or maybe it was two Oklahoma
25 and one Georgia, but those were the other states

1 represented.

2 The Game and Parks survey form asks what
3 county you reside in, it doesn't ask what zip code,
4 so our data is a little different there. So we know
5 that 59 percent were from Platte County. We don't
6 necessarily get down to Columbus.

7 And then again the miles traveled,
8 two-thirds were within 25 miles and 96 percent were
9 within a hundred miles.

10 Here's the same similar map. Again, this
11 goes to the county level instead of zip code, and
12 the darker colors are more concentrated anglers that
13 we surveyed.

14 So, again, 439 surveys were conducted.
15 This slide is where Jeff has some corrections for me
16 I think. The mean party size was 1.75, how many
17 folks are you fishing with on average, it was just
18 under two people.

19 The mean completed trip length is accurate
20 at 2.9 hours. Generally people are fishing for
21 almost three hours at a trip.

22 This number is wrong. There should be a
23 three in front of here. It's about 32,000 total
24 angler hours. Jeff corrected me on that this
25 morning.

1 And total angler days we're probably going
2 to maybe amend the report to make that total angler
3 trips. So basically we take this 32,000 number and
4 divide it by the mean trip length, and we come up
5 with a number just shy of 11,000. So an estimate of
6 11,000 angler trips is what we'll end up with in the
7 report. And, again, those two bottom numbers are
8 going to be wrong in the report you have now. We'll
9 get those corrected.

10 We asked people what are you fishing for,
11 what are you targeting. Nearly two-thirds are after
12 channel catfish, and that was far and away the most
13 popular species that people were fishing for.

14 The second most popular thing that people
15 said, well, we're just fishing for anything that
16 will bite the line. They weren't targeting anything
17 specific. They were, you know, probably out with
18 their kids trying to get a fish on the end of the
19 line. And then the walleye, sauger, the drum,
20 flathead catfish and crappie kind of rounded out the
21 top six.

22 Fishing pressure, that is derived by
23 angler hours, and here's the number that should be
24 up in the 32,000 -- no, excuse me, this is by month.
25 So September received the most fishing pressure at

1 7,700 hours, fall, and by May, July, June and August
2 and October -- I think we expect to see probably
3 June moved up here ahead of July during a normal
4 year. If you'll recall, and you heard this all
5 before, but June was very wet around here so people
6 probably weren't out as frequently as they would
7 have been in June.

8 95 percent of the effort occurs via shore
9 fishing along the canal. Boat access is pretty
10 limited once you get outside of Lake North, so those
11 numbers are not all that surprising.

12 Catch, release and harvest estimates, I'll
13 define that real quick. A catch is you get a fish
14 on your line and you bring it in and you've got a
15 catch, end of story. A release is you bring the
16 fish in, you take him off and you put him back. And
17 a harvest is you bring the fish in, throw him in
18 your live well and eat him for dinner later on.

19 So the total estimate derived from the
20 Game and Parks output is 20,800 fish along the
21 canal. The release estimate, 11,800, and the
22 harvest estimate, 9,000. So what you can see there
23 people are releasing fish more than they are
24 harvesting fish, so that's a good sign for the
25 viability of the fishery.

1 The greatest catch values were in May.
2 People were having the most success in May, but the
3 most fish were harvested in October. Actually May I
4 think accounted for more than twice the catch than
5 any other month. I think at like 29 percent of the
6 catch happened in May. So that was by far the most
7 productive. But people were -- apparently were the
8 hungriest in October. They saw the days getting
9 shorter and colder so they started keeping more fish
10 in October.

11 So specific to catch estimates, again,
12 just bring the fish in, we said 20,800, and breaking
13 it out by species, channel catfish was almost half
14 of the total catch, so people catch that the most.
15 Drum and crappie were two and three. Flathead
16 catfish and walleye were not necessarily four and
17 five. I think they were a ways down the list, but
18 they are a kind of notable species so I put them up
19 there.

20 Fish release, again, the 11,800 number,
21 most of the fish being released are channel catfish,
22 they are the most being caught and released.
23 Crappie and drum are again two and three, and then,
24 again, the flathead and the walleye/sauger were not
25 necessarily four and five, but, again, notable. And

1 the same numbers for fish harvest, what are people
2 taking home, channel catfish, drum and crappie, one,
3 two and three again.

4 Because people are targeting the channel
5 catfish the most and they are catching that the
6 most, we ran a few analysis specific to that
7 species. Here is the harvest estimate by months
8 specific to channel catfish. In May and June around
9 400 fish were harvested as an estimate. July
10 through September about 700 fish were harvested,
11 channel catfish. And as you can see in October,
12 like I said, people must have been hungry in
13 October, because they took a lot more fish home in
14 October.

15 CPU is the catch per unit effort.
16 Basically how many fish are you catching per your
17 hour of angling effort. The overall rate was
18 three-tenths of a fish per hour. That's the harvest
19 rate, not the catch rate. And the highest catch
20 rates were in May. As we said, people had pretty
21 good success in May at 1.3 fish per angler hour.
22 And October was second at .86 fish per angler hour.

23 The highest estimated harvest rate like we
24 said was in October, and that's when the most fish
25 were taken at about six-tenths of a fish per angler

1 hour.

2 We did ask folks about their satisfaction
3 with the fishing opportunities and the amenities for
4 fishing. It was not specifically asked in
5 coordination with the creel survey, but it was asked
6 in regards to the general use survey that we did
7 along the canal.

8 From that data we were able to
9 extrapolate -- let's only get the dataset from
10 people that were fishing. So from that dataset, 57
11 percent of those folks that were fishing said that
12 the amenities, the opportunities for fishing were
13 above average or excellent. Only 4 percent rated it
14 below average or poor. Those folks that did
15 indicate lower ratings, they mentioned a lot of
16 snags, maybe it's riprap, whatever that is.

17 They talk about steep banks along the
18 canal being hard to access in locations, some
19 overgrown vegetation. So access things along the
20 canal. And some people again requested some more
21 submerged structure in Lake North like we mentioned
22 before.

23 So basically wrapping the results, our
24 steps going forward as Randy kind of mentioned
25 already is development of the recreation management

1 plan, taking this data that we collected, finding
2 out what's important to people, what they would like
3 to see improved and try to get a plan on how the
4 district can accommodate those things going forward.

5 So if there is any more questions, I'll
6 field those.

7 JANET HUTZEL: This is Janet Hutzel from
8 FERC. I do have a couple of questions. One was
9 kind of a clarification.

10 I think like one of -- two of your tables,
11 5.5-7, it says white twice. Was that supposed to be
12 white and Hispanic?

13 QUINN DAMGAARD: 5.5-7?

14 JANET HUTZEL: Table 57. It's in part of
15 your actual recreation report.

16 QUINN DAMGAARD: Table 57?

17 JANET HUTZEL: You have listed percentage
18 of racial composition of survey respondents,
19 90 percent white, second column was 9.5 percent
20 white. I assume that's supposed to be Hispanic?

21 QUINN DAMGAARD: Yeah, the first one is
22 white, nonHispanic, the second line is white,
23 Hispanic. That's consistent with how the census
24 bureau breaks out those ethnic demographics.

25 JANET HUTZEL: And the second question had

1 to do with your capacity. I know in your report in
2 5.62 you gave a general overstatement as to most
3 people were okay with the survey, most people who
4 were surveyed were okay with the future capacity,
5 and you had listed that they have exceeded the
6 capacity. But specifically when FERC sees reports,
7 we like to have a table or some sort of
8 documentation as to each one of your facilities at
9 what capacity they are at. Sort of like what you do
10 for your Form 80s.

11 QUINN DAMGAARD: Okay. Yeah, Janet, and
12 we do have that information. We did run that by
13 site. We can certainly provide that in the rec
14 management plan if you would like to see it there.

15 JANET HUTZEL: Yeah, that's very
16 important, because that helps us determine if an
17 improvement is needed or not.

18 QUINN DAMGAARD: Sure. Absolutely. Yeah.
19 And we do have that data. We can certainly provide
20 that.

21 JANET HUTZEL: That would be very helpful.

22 RANDY THORESON: Randy Thoreson, National
23 Park Service. I agree with that. I think that
24 would be very helpful, like I said, to run analysis
25 on site-by-site basis. Janet brings up a good

1 point.

2 LEE EMERY: I have one question not
3 related directly to this study.

4 How much ice fishing occurs, if any?

5 QUINN DAMGAARD: Ron, can you?

6 RON ZIOLA: What was that question?

7 LEE EMERY: Ice fishing.

8 RON ZIOLA: Ice fishing is totally
9 dependent again around here on the weather in as
10 much as the last couple of winters we've had
11 extended cold spells that allowed a reasonable
12 amount of ice, four to 12, 14 inches. The prior
13 probably eight winters before that we never had cold
14 spells long enough. So the last couple of winters
15 on Lake North, you know, we see a rather nice array
16 of ice fishing. Maybe on a weekend, 15 to 25 or 30
17 people.

18 In some respects we actually -- when I say
19 discourage it only from the fact that we cycle that
20 water underneath the ice, so we don't tell people to
21 get off. We caution them about getting on. And I'm
22 sure there is a lot of long time ice fisherman that
23 are aware of that, and so they kind of limit the
24 amount of ice fishing they do. But one of our
25 biggest concerns is that small lake where the ice

1 fishing occurs, which is Lake North, it's around
2 maybe close to 200 surface acres, and with that
3 water fluctuating upwards of a foot, foot
4 and-a-half, you know, like I say, we don't keep them
5 off, we indicate that there is issues, so it's all a
6 seasonal thing. When the ice is there, it appears
7 we have a fair amount of ice fishing, like I say, 25
8 to 30 people a day on a weekend, but that's kind of
9 the --

10 LEE EMERY: I'm from Michigan originally.
11 Do they do any trapping for muskrats around here as
12 well?

13 RON ZIOLA: Again, because of the -- you
14 know, in all honestly, it's somewhat of a tight
15 system, and with dogs and cats and the amount of
16 people that kind of wander around the trails now and
17 stuff, we do occasionally have some trapping. We
18 limit that to maybe a particular individual that we
19 feel very secure with that he monitors things
20 properly. So I'm not saying it doesn't go on.
21 Those that ask, we are very particular where they do
22 it or how they do it, because of, again, the
23 smallness of the actual project in total acres, and
24 we have to be careful, you know, we don't run into
25 some domestic animal issues.

1 STEPHANIE WHITE: I have a question back
2 here. Would you state your name?

3 JASON BUSS: My name is Jason Buss. I'm
4 the president of Columbus Area Recreational Trails.
5 I just wanted to make a general comment similar to
6 Randy's. We're looking forward to the recreation
7 management plan. We've really enjoyed a great
8 collaborative relationship with Loup, with the trail
9 projects. It's very gratifying to see the
10 appreciation shown in the survey results from the
11 people who are using those trails. They appreciate
12 the quality trail system there, and we look forward
13 to that recreation plan and offer any help we can
14 with that.

15 STEPHANIE WHITE: Other questions or
16 comments?

17 Is there someone -- something on the
18 phone?

19 JANET HUTZEL: This is Janet Hutzel again
20 from FERC. I had one question concerning the
21 showers. Were they requested because of the
22 swimming, or was there a certain reason as to why
23 showers are being requested frequently?

24 QUINN DAMGAARD: Well, I think, Janet, one
25 place that was common was down at the Headworks, and

1 I think that was probably commonly requested by the
2 OHV folks, and they stay for a few days, and that
3 was common there. I don't think it's necessarily
4 for swimming per se. And, you know, camping is
5 pretty open at most of the areas along the canal, so
6 I think it was more general just for people camping
7 and staying overnight. I don't think it was
8 specific to swimming.

9 And also if I could go back to your
10 question about capacity, Janet, I did remember in
11 Section 5.2 where we do the recreation facility
12 inventory, we do list the capacity with regards to
13 campsites, so on and so forth, specific to each
14 recreation site. So there is a little bit of
15 information in there with regards to that.

16 JANET HUTZEL: What section was that?

17 QUINN DAMGAARD: I think it's -- yeah,
18 it's 5.2, the facility inventory. We break out, you
19 know, the camping capacity by site.

20 JANET HUTZEL: Right. I guess what I'm --
21 I see there is like a count table; is that it?

22 LISA RICHARDSON: Yeah.

23 QUINN DAMGAARD: Yes.

24 JANET HUTZEL: I see there is a count.
25 I'm more interested in whether it's a percentage,

1 whether it's 50 percent being used. I notice in
2 your initial study plan you had mentioned certain
3 capacities like 70 percent usage and other
4 percentage usage, and so that's sort of what I'm
5 looking for. I'm looking for percent usage so we
6 can see at capacity, under capacity, above capacity.
7 Just like the Form 80s require 100 percent, or in
8 the case if it's more based on observation or
9 counting or anything of that nature. It would need
10 that for each one of the sites here.

11 QUINN DAMGAARD: Okay. And the only time
12 in 2010 when we did see more use in capacity was on
13 Memorial Day weekend at Lake North, and during the
14 fall, the NOHVA jamboree at the Headworks. Those
15 were the only two occurrences during 2010. And
16 based on the anecdotal things that the district
17 staff provided us, that's generally when it happens.

18 JANET HUTZEL: I mean, yeah, if you don't
19 have -- that's good. I mean, if you don't have the
20 specifics for individuals, you can just put in your
21 Form 80 that you did in 2009. For some reason I
22 can't pull it up on the web. I guess our e-library
23 doesn't have it online yet, but that's the sort of
24 information we're looking for.

25 QUINN DAMGAARD: Okay.

1 STEPHANIE WHITE: Anything else for Quinn?

2 Okay. We're running ahead of schedule,
3 which is a good thing. We have a half an hour at
4 least until lunch is served. I would like to keep
5 moving if everybody is okay with that. All right.
6 Let's go. Let's do the next study. So we're going
7 to jump to the 1:00 item on your agenda. This is
8 methodology discussion. We'll probably just scratch
9 the surface of it, but I think we'll just take
10 advantage of these next 30 minutes.

11 PAT ENGELBERT: I'm guessing since
12 everybody's been sitting in this room for an hour
13 and-a-half or so or two hours that might be a little
14 jittery needing to go to the bathroom, I will try
15 and talk as fast as I can. Feel free to get up and
16 vacate as you need to stretch your legs, use the
17 restroom. Especially when I'm talking you'll find
18 it's better to probably leave the room.

19 Anyway, a couple things that I wanted to
20 cover prior to getting into our actual studies is we
21 had to conduct quite a few analyses that were
22 consistent between the studies. And instead of
23 revisiting them during the actual study portion of
24 the talk, we decided to pull them out front and kind
25 of go through some of the -- what we call the

1 preliminary analysis.

2 And what those -- what those analyses and
3 efforts were was first was a data collection effort
4 that we conducted. We also, per FERC's
5 recommendation, we evaluated some things for wet,
6 dry and normal flow conditions, so I'll describe
7 that analysis.

8 Because we were evaluating things at sites
9 that didn't have gages, we had to develop
10 hydrographs at those, so I'll go through how we
11 develop the synthetic hydrographs at those
12 locations.

13 We also had to develop a hydraulic model
14 at a few sites, and so I'll go through that
15 development. And then we also needed to evaluate
16 some hydrologic statistics for our studies as well
17 as the ice study which Roger Kay from the Corps will
18 be presenting later this afternoon. And so I'll go
19 over very quickly how we developed some of those
20 hydrologic statistics. That being flow duration and
21 flood flow frequency, and the conditions under which
22 we evaluated those.

23 It may be a little bit difficult to see in
24 the back, but I wanted to go over the study sites
25 that are consistent between the studies that we

1 performed, that being hydrocycling, flow depletion
2 and sedimentation.

3 Here's a map of the overall system. Per
4 FERC's study plan determination letter, we needed to
5 develop a analysis at a site upstream of the
6 diversion structure. And so what we did is we met
7 with the US Fish and Wildlife Service, the Nebraska
8 Game and Parks, I believe it was January of last
9 year in Lincoln, and we coordinated with them in
10 identifying where the sites were to be located.

11 So the first site that we chose, which we
12 will effectively call unged site one going from
13 upstream to downstream is located just upstream of
14 the diversion structure.

15 Throughout the course of the presentation,
16 the rest of this presentation this morning as well
17 as this afternoon, tomorrow morning we'll be
18 referring to the sites as sites one, two, three,
19 four and five, and I would like to continue showing
20 where those are.

21 Ungaged site two is located just
22 downstream of the diversion structure. Ungaged site
23 three is located in the area between the Loup Platte
24 confluence and the tailrace return, so it's the
25 location upstream of the tailrace, but downstream of

1 the Loup Platte confluence. That is ungaged site
2 three.

3 Ungaged site four is located just
4 downstream of the tailrace return, and then we had
5 an ungaged site five which is located approximately
6 a mile or a mile and-a-half downstream of the North
7 Bend gage.

8 So, again, sites one through five go from
9 upstream to downstream. Site one is upstream of the
10 diversion, site two is downstream of the diversion
11 on the Loup, site three is on the Platte downstream
12 of the confluence and upstream of the tailrace, site
13 four is downstream of the tailrace on the Platte,
14 and site five is downstream of North Bend.

15 In order to develop some of the hydraulic
16 models, we had to do a data collection effort. It
17 was prescribed to us in the study plan determination
18 when we would do that data collection effort. These
19 were -- data was collected at all five of the
20 ungaged sites. We got bathymetric and water surface
21 elevations there. The dates were to be considered
22 pre and post nesting season, which basically means
23 around the May 1st area for the prenesting season,
24 and mid to late August time frame for the post
25 nesting season.

1 We were unable to get velocity
2 measurements due to the high water that occurred
3 this past year, and we covered that in some length
4 at the September 9th study, so I won't go into that
5 again.

6 Here is a table that shows the dates in
7 which we collected the data at each of the sites,
8 and it's -- I believe it's presented in the report.
9 I think maybe what is a better illustration of when
10 the data was collected are a couple of hydrographs
11 that were developed. As you can see from this
12 graphic, there was a large event that moved through
13 the system from mid June of last year, lasting until
14 approximately the 4th of July weekend. We were
15 fortunate enough to get surveys -- now this is the
16 Loup River. We were able to get surveys at sites
17 one and two prior to the event, and we were able to
18 get surveys at both sites one and two after the
19 event on the Loup River.

20 STEPHANIE WHITE: So Pat is on slide 105.

21 PAT ENGELBERT: This next slide, slide
22 106, shows a hydrograph of the Platte River. Again,
23 you can see the large event that moved through the
24 system in the early June to early July time frame.

25 We were able to get a survey of site

1 three, that's the location just upstream of the
2 tailrace prior to the event moving through, but we
3 were unable to get sites four and five prior to that
4 event moving through.

5 We were able to get a couple of different
6 times at sites four and five after the event moved
7 through, and site three we got -- we were able to
8 get a survey about six weeks after the event moved
9 through, and then at sites three, four and five it
10 was roughly, you know, eight to ten weeks after the
11 event moved through.

12 It's going to be important to remember
13 those dates as I go further into this presentation
14 and describe the relationship between the cross
15 sections relative to the time in which the data were
16 collected. So recall that we weren't able on sites
17 one, two and three to get cross section surveys
18 prior to the event moving through post spring
19 runoff, but prior to this summer storm, and then the
20 remainder of the cross section information was
21 obtained after the event moved through. Some in
22 close proximity to the event, and some, you know,
23 four to six to eight to ten weeks after that large
24 event moved through. I'll go into greater detail as
25 I continue with my presentation.

1 And I know this is again very difficult to
2 see in the back, but we wanted to provide an example
3 of the cross section layout that we incorporated.
4 Again, this was done in coordination with the Fish
5 and Wildlife Service and the Games and Parks last
6 spring.

7 This is an example of the cross section
8 data that was collected at sites three upstream of
9 the tailrace. Here's the tailrace, I'm on slide
10 107. And the data that was collected downstream of
11 the tailrace, which is site four. Just for
12 landmarks, here's the Tailrace Canal, here's the
13 Burlington Northern bridge.

14 The spacing that was used and the
15 locations again were selected in coordination with
16 the service and the Game and Parks. Just to zoom in
17 a little bit, I'm going to look specifically at
18 unengaged site three, which is upstream of the
19 tailrace on slide 108. We spaced our cross section
20 surveys so that they would be within a quarter to a
21 third of the overall channel width. At this
22 particular location I want to say that the channel
23 width is roughly 6 to 800 feet wide, so the spacing
24 of the surveys would be approximately 200 feet
25 between each of the cross sections.

1 We did get an additional cross section
2 approximately one channel width downstream to
3 provide us with some boundary conditions for our
4 hydraulic model development.

5 LEE EMERY: Isn't there one upstream too?
6 I thought the previous picture showed a site
7 upstream.

8 PAT ENGELBERT: I'll go back one slide.
9 This was site three.

10 LEE EMERY: What's that blue line that
11 went across?

12 PAT ENGELBERT: We wanted to get an
13 intermediate cross section between the tailrace
14 return and the Burlington Northern bridge. And we
15 used that -- when we develop a hydraulic model, we
16 actually developed the model so that sites three and
17 four were within the same models so we could
18 evaluate and see if there were any tailwater effects
19 associated with that.

20 Any questions on the locations that were
21 surveyed or data was collected, or the cross
22 sectional spacing, anything like that, the timing
23 that the survey was taken?

24 Okay. Now I'm going to go through the
25 cross sections or representative examples of the

1 cross sections that were taken. I'm on slide 109.
2 This is a photo that was taken at ungaged site one.
3 You can see there is a sandbar feature in the middle
4 of the channel with water flowing on either side.
5 That's represented in the cross section here by this
6 red line. The red line on slide 110 is the survey
7 that was taken in October. You can see there is a
8 large sandbar feature. The red dashed line that
9 moves across was the water surface elevation on the
10 date in which the surveys were obtained.

11 So a couple things to note -- and you'll
12 see that it's pretty consistent within these cross
13 sections that were surveyed. The blue diamonds or
14 squares are the cross section that was taken in
15 June. So at site one it was just prior to the event
16 moving through, post spring runoff after the event
17 moving through. The other cross section was taken
18 in October. You can see that there was -- between
19 those two surveys, there was a redistribution of the
20 sand materials in the system. Low flow channels
21 that existed in June were shifted to other parts of
22 the channel in October. Very characteristic of a
23 braided system. It's not to suggest that some of
24 these sandbar features left the area, they just
25 translate themselves downstream, thus the nature of

1 a braided system.

2 Here's an example of a cross section in
3 site two. This is located just downstream of the
4 diversion structure. The blue line is the survey
5 that was taken in April. Again, that occurred post
6 spring runoff, a little bit higher flows on the
7 hydrograph. The red line was taken in August.
8 These were within, oh, probably two to three weeks
9 of that large event that moved through the system.
10 And the green line was the cross section that was
11 taken in September.

12 Now, it's important to note that the red
13 line and the blue line, those that were taken post
14 spring runoff and post high event have some similar
15 traits. You see a deeper channel forming for those
16 surveys post spring runoff, but then what you see
17 after a sustained period of more normal flows is a
18 redistribution of the sediments in the system and
19 kind of a leveling off of the channel.

20 Similarly, at site three, this is upstream
21 of the tailrace, in May post event, post -- or post
22 spring runoff, prehigh event, we again see kind of a
23 deeper channel that has formed.

24 As we go to August, which is post runoff
25 event, we see that deeper channel has maintained.

1 But as we move to September, going six to eight
2 weeks past that high event where you have more
3 normal flows, we again see kind of the
4 redistribution of the sediments and some smaller low
5 flow channels occurring. As opposed to one
6 consolidated channel, you see several low flow
7 channels as that channel begins to level off.

8 Okay. Similarly at site four. These were
9 surveys that were taken in June is the blue, red is
10 September. I'm on slide 113. We see essentially
11 the same phenomenon occurring, kind of a leveling
12 off of the channel as you get further away from the
13 higher low flow events.

14 And here we are at cross section five.
15 This is down at North Bend. The blue again is in
16 July. This particular one was taken after -- just
17 after the event where we had a deepening of the
18 channel, maybe more concentrated flow in those
19 deeper sections. And then as you move out to
20 September, again, which is four to six, eight weeks
21 after that large event when you've had sustained
22 typical flows, you see kind of a redistribution of
23 the sediments, you know, more fingers developing and
24 a leveling off of the cross section.

25 Okay. Based on all of the cross sections

1 that we took, there were between nine and ten cross
2 sections per study site. We evaluated how the flow
3 area changed per site. And that was done by putting
4 a lid on top of the channel at the high banks. So,
5 for example, here we would have -- back on slide
6 114, we would have put a lid on the channel at the
7 lowest channel station and evaluated the area below
8 that lid and compared them between survey dates.

9 So moving to the table on slide 115 at
10 site one, between June and October, we saw
11 approximately a 4 percent reduction in flow area
12 between June and October. Remember, in June you had
13 kind of that deeper channel, in October you kind of
14 had that leveled off channel. So we saw a reduction
15 between the surveys that were taken in June and
16 October, approximately 140 square feet, which is
17 roughly 4 percent reduction in flow area.

18 At site two it looked between April and
19 September, the first and last surveys that we took,
20 there was essentially no change, three square foot.
21 If any of you have been on the Loup, if you step on
22 it and sink in you probably just displaced about
23 three square foot, but essentially no change.

24 However, if you look at the intermediate
25 surveys between April and August, we saw an increase

1 in flow area of approximately 235 square feet or
2 8 percent of the flow area.

3 Moving between August and September, we
4 saw a reduction in flow area of approximately
5 7 percent. So between April and September we saw
6 essentially no change in flow area. When you break
7 it down between April and August and August to
8 September, you saw a shift. You saw an increase in
9 flow area between April and August, and then it had
10 adjusted itself back between August and September
11 after those long sustained flows.

12 At site three, between May and September,
13 we saw reduction of approximately 6 percent in flow
14 area. And similar to what we saw at site two, from
15 May to August, we had a slight reduction,
16 approximately 1 percent, and between August and
17 September, we had a reduction of approximately just
18 over 4 percent.

19 Moving on to site four, again, we see
20 approximately a 4 percent reduction in flow area
21 between June and September, and at site five we saw
22 a 3 percent reduction in flow area between July and
23 September.

24 Okay. So any questions on that?

25 What's interesting to note is it's fairly

1 consistent regardless of location on the rivers. At
2 site one we saw reduction in flow area upstream of
3 the diversion, at site two just downstream of the
4 diversion it essentially stayed neutral. Upstream
5 of the tailrace return we saw a 6 percent reduction
6 in flow area. Downstream of the tailrace we saw a
7 4 percent reduction in flow area. And down near
8 North Bend, a 3 percent reduction in flow area.

9 Between those two times that were
10 surveyed -- what I would like to note is that
11 although this shows a reduction in flow rate between
12 the two times that are surveyed, if you look at the
13 specific gage reportings that are documented in a
14 USGS report from the late 1800s to approximately
15 1999, it has shown that the gaged locations on both
16 systems is essentially stable. It's neither
17 upgrading nor degrading, it's essentially stable.

18 These are the results at our ungaged sites
19 taken at two points in time, one point in the
20 spring, I guess you could call June spring, maybe
21 early summer, because of the high flows, and another
22 point in September, that fall -- late summer, early
23 fall time frame.

24 So any questions on the data that were
25 collected, the locations of the cross sections, the

1 characteristics that we saw between surveys, the
2 timing of the surveys, and kind of the percent area
3 reduction on average that we saw between the study
4 sites? Any questions? Everybody is really hungry
5 or has to go to the bathroom very badly.

6 LEE EMERY: Paul, are you on line?

7 PAUL MAKOWSKI: I am.

8 LEE EMERY: Okay. Thanks.

9 STEPHANIE WHITE: Pat, I was thinking
10 maybe slide 18 would be a good stopping point; does
11 that feel right to you?

12 LEE EMERY: One eighteen?

13 STEPHANIE WHITE: One eighteen.

14 PAT ENGELBERT: That would be fine.

15 STEPHANIE WHITE: Three more slides.

16 PAT ENGELBERT: The next analysis that we
17 conducted, again, which is consistent between the
18 studies, is to establish a flow classification for
19 the water years -- or the study periods that were
20 evaluated. And it was -- we incorporated
21 methodology that was developed by the US Fish and
22 Wildlife Service to where for whatever study period
23 you're evaluating, you rank the flows -- or the mean
24 annual flow or mean annual volume, or if you're
25 looking at a month, you would just look at the

1 month. But in our particular case we were
2 identifying years, so we looked at the mean annual
3 flow for each year in which we were evaluating, and
4 you rank them from highest to lowest.

5 And so the top third, the top 33 percent
6 of those flows are designated or classified as being
7 a wet flow year. The bottom 25 percent of those
8 flows are classified as a dry year. The middle,
9 what's left, and if anyone can do the arithmetic
10 really quick to tell me the fraction that that is,
11 you get a candy bar after lunch. But that middle
12 portion is considered a normal flow year. Anybody
13 have it except those that worked on the study?

14 NEAL SUESS: It would be 42.

15 PAT ENGELBERT: The fraction, what's the
16 fraction of that?

17 NEAL SUESS: Forty-two divided by a
18 hundred.

19 PAT ENGELBERT: Which is roughly
20 five-twelfths. So --

21 LISA RICHARDSON: No candy bars.

22 PAT ENGELBERT: No candy bars for Neal.

23 We evaluated the flow classifications for
24 the period in which we analyzed them, and we
25 verified that there was a wet year, a dry year and a

1 normal year between years 2003 and 2009.

2 And why that was important is the gage
3 that monitors the return flows from Comos Hydro was
4 installed in 2003. So fortunately for the study we
5 were able to evaluate a wet year, a dry year and a
6 normal year between 2003 and 2009, which allowed us
7 to use that realtime gage data that was available at
8 the 8th Street gage which monitors or gages the
9 return flows.

10 Here's a quick table that shows for both
11 the Loup and the Platte what years were considered
12 wet, dry, normal. I know it's very difficult to
13 see, so we created a summary slide.

14 On the Platte River, 2006 was classified
15 as a dry year, 2008 was classified as a wet year,
16 and 2009 was classified as a normal year.

17 On the Loup, 2005 was classified as a
18 normal year, and consistent with the Platte on 2006
19 and 2008, 2006 was a dry year and 2008 was a wet
20 year.

21 Okay. So when we're talking about wet,
22 dry and normal on those two systems, these are the
23 water years that they are -- or not -- the calendar
24 years that they are tied to.

25 Any questions on that? Any questions?

1 Anybody?

2 That's all that I'm going to present at
3 this point on the upfront analysis. After lunch I
4 will go through our synthetic hydrograph
5 development, our hydraulic model development, and
6 then some of the hydrologic statistics that we
7 evaluated. So any questions? If not, we'll turn
8 folks loose.

9 (11:56 a.m. - 1:00 p.m. lunch recess
10 taken.)

11 STEPHANIE WHITE: We have a full afternoon
12 of material. We have a request for a break this
13 afternoon, so if you're really good, maybe 3:00.
14 You can look for a break at about 3. Everybody's
15 present on the phone. I think we're ready to go.

16 PAT ENGELBERT: Just a quick recap from
17 the preliminary stuff that I did this morning.

18 Again, we collected data at the five
19 ungaged sites, and not to get confusing, we numbered
20 them one through five, upstream to downstream, so
21 we'll be referring to those sites as we go through
22 the analyses this afternoon, so hopefully you
23 remember.

24 Finally, we ended up with the flow
25 classification. And I just wanted to reiterate that

1 on the Platte River, 2006 was classified as a dry
2 year, 2008 a wet year, and 2009 a normal year. On
3 the Loup, 2005 was normal, 2006 and 2008 were dry
4 and wet respectively.

5 Next I would like to talk about our
6 synthetic hydrograph development. We needed to
7 develop hydrographs at the ungaged sites to help us,
8 you know, perform analyses for the current
9 operations, but we also needed to develop
10 hydrographs for the alternative conditions that we
11 evaluated at both the gaged and ungaged sites.

12 We used real time data, real time being,
13 you know, the 15 minute to 30 minute to 60 minute
14 data that is collected by the USGS.

15 Based on the gaged locations that we had,
16 we calculated reach gains and losses, the amount of
17 flow that is lost between the gages, and applied
18 those to our hydrographs. And before we combined
19 them at an ungaged site, we would adjust them for
20 travel time.

21 Just to reiterate a little bit, the two
22 conditions that we did evaluate for alternative
23 conditions was one is a run-of-river condition.
24 Now, that is run-of-river in the power sense,
25 meaning they are not regulating or storing the flow

1 in order to hydrocycle. They are running the flow
2 through the turbines without regulating the water.
3 That's what we call the run-of-river condition.

4 The other condition that we evaluated was
5 the no diversion condition, meaning they didn't
6 divert any water off the Loup up at the diversion
7 structure, it all went down the bypass reach.

8 Here's an example, and I know the graphics
9 are tough to see, and I know they are tough to see
10 in the handouts, but what we plotted here was -- as
11 far as our calibration of the synthetic hydrographs
12 went, we generated synthetic hydrographs to test our
13 approach at the Loup at Columbus and the Platte at
14 North Bend. So we could compare our synthetic
15 hydrographs using our methodology to the actual
16 gaged hydrograph.

17 This particular hydrograph is the Loup
18 River at Columbus, and this is slide 120 for those
19 of you on the phone. The blue line, which is behind
20 the red line and the green line, was the hydrograph
21 that was developed based on our methodology using
22 reach gains and losses and adjusting for travel
23 time. The green line is the flow at Columbus, the
24 Loup River flow at Columbus based on a regression
25 relationship developed by the US Fish and Wildlife

1 Service from flows at Genoa.

2 So the Genoa gage has been in operation
3 since the '40s to present. The Loup at Columbus
4 gage was in operation from the '40s until 1978.
5 However, the DNR just reinstalled it in 2008, but
6 between '78 and 2008, the Fish and Wildlife Service
7 wanted to estimate what the flows would be at
8 Columbus based on a flow at Genoa. So we took that
9 regression equation and ran it for the flows at
10 Columbus.

11 In addition, we evaluated against the
12 actual gaged data at Columbus. And as you can see,
13 visually we had a pretty good fit. The timing looks
14 really good, the peaks, we typically estimated
15 higher peaks than what they were measuring from the
16 DNR gage. You can see that in these locations.

17 We did provide or run a statistical
18 relationship called the Nash-Sutcliffe coefficient,
19 which evaluates measure versus predictive, and we
20 had very favorable results at this location.

21 Here's a shot of the Platte River at North
22 Bend. Again, the blue is our synthetic hydrograph
23 that we developed compared to the red hydrograph
24 which was actually measured at North Bend. And,
25 again, we had a very good fit on both the timing and

1 the magnitude, so we were very comfortable with our
2 approach and felt, you know, through this validation
3 process that we had done a good job of approximating
4 what these synthetic hydrographs would look like.

5 Here's an example of what our synthetic
6 hydrographs look like, and I know you're all looking
7 at a blank screen, but we threw a little animation
8 in on this one because it gets pretty clustered.

9 I'm on slide 122. The -- this dashed --
10 or this dotted line is the minimum flow at site
11 four. This is downstream of the tailrace. This is
12 our synthetic hydrograph of the minimum flow at site
13 four.

14 This solid blue line is the mean discharge
15 at site four, and this dashed blue line that just
16 came in is the maximum.

17 So this is an illustration of the
18 synthetic hydrographs that we developed using the
19 real time data, which gave us the min, the mean and
20 the max for any given day.

21 Similarly, we incorporated the
22 run-of-river synthetic hydrograph right on top of it
23 for comparison purposes. The yellow dotted line is
24 the minimum run-of-river condition, the solid yellow
25 line is the mean flow for the run-of-river

1 condition, and the bigger dashed yellow line is the
2 max flow run-of-river condition.

3 Now, this is an example of the synthetic
4 hydrographs that we developed. This particular one
5 is at site four. I will go into more detail as to
6 some of the characteristics and the trends that we
7 saw comparing current operations to run-of-river.
8 I'll be doing that tomorrow morning during the
9 hydrocycling study. But I just wanted to provide
10 you an example of the types of synthetic hydrographs
11 that we developed to evaluate the different
12 conditions.

13 Any questions on synthetic hydrographs or
14 the synthetic hydrograph development?

15 I'm just going to briefly go through how
16 we developed our HEC-RAS model. HEC-RAS stands for
17 Hydraulic Engineering Center, River Analysis System,
18 which is a model developed by the United States Army
19 Corps of Engineers.

20 We used the steady-state component of
21 that, which provides us with steady-state water
22 surface profiles. Some of the outputs are cross
23 sectionally averaged hydraulic conditions, that
24 being depth, velocity and wetted width.

25 We built the geometry files for this model

1 based on the cross section surveys that we
2 collected. We calibrated the model based on
3 measured water surface elevations that were
4 collected. Remember, they were collected at two
5 different times. One time in the mid summer
6 timeframe to the late summer, early fall timeframe.
7 So we calibrated them for both timeframes. So we
8 had two separate models, one for the first survey
9 date and one for the second survey date. For those
10 areas where we had three surveys, we calibrated it
11 for all three dates.

12 The Corps of Engineers, the Omaha District
13 Corps of Engineers, and Roger Kay will be speaking
14 on this later. They developed a model of the -- a
15 little grosser model of the Loup River bypass reach.
16 Remember, our cross section spacings for our little
17 study sites were about 200 feet apart, and the
18 length of the model was roughly three times the
19 channel width, so maybe 1,500 to 2,000 feet.

20 Roger and his guys pulled together a model
21 of the entire Loup bypass reach, but it was a little
22 grosser scale. They had cross sections roughly
23 every 1,500 feet, something like that, Roger.

24 So what we did for our models is we worked
25 in collaboration with Roger and his guys to make

1 sure that we had consistent end values, consistent
2 slopes, you know, consistent and effective flow
3 areas, that type of thing. So we worked in
4 collaboration with them. And actually we dumped our
5 little smaller site reach right into their model for
6 boundary conditions. So we had very good agreement
7 in the parameters that we had assigned to our model
8 to be consistent with their model.

9 Here is an example of site two as to how
10 we calibrated the model. I know it's difficult to
11 see, I'm on slide 124, but the blue lines are the
12 water surface -- the computed water surface
13 elevations from the model, and they represent the
14 maximum flow for the day in which the survey was
15 taken, the mean flow for the day in which the survey
16 was taken, and the minimum flow for the day in which
17 the survey was taken at each of those cross
18 sections.

19 The red diamonds represent the observed
20 water surface elevations. And the fact that we were
21 able to bracket the observed for the max, min and
22 mean for that particular day told us that we had a
23 good calibrated model. We were matching what the
24 water surface elevation that was observed on that
25 day.

1 Any questions on that? Any questions on
2 how we calibrated it to observe water surface
3 elevations?

4 Okay. I'll go ahead and continue on. One
5 of the things that we noted, and it kind of goes
6 right along with what I described earlier this
7 morning relative to the difference in cross
8 sections. Here's an example of a cross section at
9 site three. This is on slide 125. The difference
10 between the cross section taken in June, which is
11 this magenta color, versus the cross section that
12 was taken in September, which are the dark boxes,
13 just the time in which the survey was taken has a --
14 is directly related to the shape of the channel
15 geometry.

16 Remember, just after the spring runoff or
17 just after that high flow event, we saw little --
18 you know, deeper, little bit more confined channels,
19 to whereas later in the year we saw kind of the
20 redistribution in the leveling off. That also has
21 an effect on the stage that is observed.

22 For this particular cross section, for the
23 exact same discharge, and in this case it was around
24 3,400 CFS, the water surface elevation is
25 approximately a half a foot higher for the September

1 cross sections than for the May cross sections. So
2 just something to note how you have continual change
3 in those channel cross sections. So taking cross
4 sections at two points in time and running the same
5 discharge over shows that there is -- there was a
6 slight increase in the stage.

7 Similarly, at site four we saw a very
8 same -- very same phenomena that had occurred.

9 Any questions on the hydraulic model
10 development parameters that were used, calibration
11 effort that was done?

12 PAUL MAKOWSKI: I'm just looking at slide
13 125. Is the overall width, did that change between
14 the two surveys? Did I interpret that correctly?
15 The water surface, the width a little bit greater in
16 September versus --

17 PAT ENGELBERT: You know, Paul, it looks
18 like we may have shifted that one. It looks like
19 the left bank for May is left of the left bank for
20 September, but similarly it's a similar shift from
21 the right bank. I can check into that. I don't
22 believe there was a shift. I think we may have just
23 plotted it slightly differently.

24 PAUL MAKOWSKI: Well, it looks to me that
25 the later survey is greater both on the left bank

1 and the right bank. It just doesn't look like -- it
2 may be a scaling issue.

3 PAT ENGELBERT: I'm sorry, no, I see what
4 you're saying. The magenta is inside both sides on
5 the black. I apologize. I looked at that
6 different. It looks like it could have shifted a
7 little bit, yes.

8 PAUL MAKOWSKI: Because that's kind of
9 important when you start comparing cross sectional
10 areas below your top.

11 PAT ENGELBERT: Yes. Paul, I don't know
12 if you were in before lunch, but we went through our
13 calculations as to how the flow areas changed
14 between cross sectional surveys.

15 PAUL MAKOWSKI: I was there, but I'm
16 saying if you basically -- if you had it top -- I
17 mean, you're going to gain some area, that's
18 certainly going to have an effect if there is any
19 type of scaling issue or what have you. If this is
20 a true widening, that's fine, but I would be
21 interested if this is an actual widening or not.

22 PAT ENGELBERT: Okay. Any other questions
23 on the model or the model development?

24 Lastly, we evaluated -- we performed some
25 hydrological statistical analysis on both the gaged

1 sites and the ungaged sites. At the gaged sites we
2 used the actual gage data, at the ungaged sites we
3 used synthetic hydrographs. What we wanted to pull
4 out of that were some different statistical
5 parameters. In particular, development of a flow
6 duration curve to get median discharges for
7 different flow years. We also wanted to look at
8 flood flow frequencies, return periods associated
9 with flows.

10 A couple -- one of the packages we used
11 was HEC-SSP, the statistical software package
12 developed by the Corps which runs hydrological
13 statistical analysis. That gave us the flood flow
14 frequency, two year return flow, five year return, a
15 hundred year return.

16 A lot of that data was used by Roger for
17 his ice study, but we had incorporated some of it in
18 our study as well.

19 The median discharge and the 25 percent
20 exceedance discharge and the 75 percent exceedance
21 discharge, we used just a standard spreadsheet for
22 that in order to develop what those discharges are,
23 and I will go over that in -- on this very next
24 slide.

25 One of the things that we wanted to do in

1 evaluating a wet year or dry year and a normal year
2 is we wanted a range of flows within that wet year,
3 within that dry year, within that normal year. So
4 we evaluated -- and I'm on slide 128 now.

5 We evaluated the 50 percent flow, which
6 means you rank all the flows. The 50 percent flow
7 means that 50 percent of the flows are higher than
8 it, 50 percent flows are lower than it. It's also
9 defined as the median discharge.

10 The second flow that we evaluated was the
11 25 percent exceedance discharge. And that means
12 that 25 percent of the flows on average are higher
13 than that discharge, 75 percent of the flows are
14 lower than that discharge.

15 Similarly, we looked at the 75 percent
16 exceedance discharge, which means 75 percent of the
17 flows are higher than that, 25 percent of the flows
18 are lower than that.

19 And what that gave us was, for example,
20 for a normal year, looking at the 25, 50 and
21 75 percent exceedance discharges, we got a wide
22 range of discharges just within that wet year. We
23 evaluated -- and Matt will be going through some of
24 that during his talks.

25 We evaluated, you know, different

1 parameters looking at that wide range of flows. For
2 example, for a normal year, we looked at it from
3 1,100 CFS all the way down to just over a hundred
4 CFS for comparative purposes.

5 For a wet year we looked at a range of
6 flows from roughly 1,500 CFS all the way down to
7 just under 200 CFS. So not only did we look at a
8 wet, dry and normal, we looked at a range of flows
9 within each of those years.

10 Just as an example, this is a cross
11 section from site four. I would like to illustrate
12 how, you know, flow depths and stages can change
13 based on those probability of exceedances.

14 On this particular graphic, this highest
15 stage occurs, as you would expect, at the 25 percent
16 exceedance discharge. Again, it's that discharge on
17 average that is equal or exceeded 25 percent of the
18 time for the study period what you're looking at.

19 The median line, the middle line is the
20 50 percent exceedance discharge, and the blue line
21 is the 75 percent exceedance discharge at this
22 particular cross section.

23 Hopefully that gives you a little bit of
24 background on how we incorporated the 25, 50 and
25 75 percent exceedance discharges into some of the

1 summary calculations that Matt will be going through
2 a little bit later.

3 Any questions at all on the preliminary
4 analyses going back all the way from data collection
5 to wet, dry, normal to synthetic hydrograph
6 development, model development, hydrologic
7 statistics?

8 The thing to remember is we used these
9 analyses through a lot of the studies, in particular
10 the hydrocycling study and the flow depletion study.
11 And then Roger incorporated some of the results into
12 his ice study.

13 So hopefully that provided you a little
14 bit of background when we use those terms later in
15 our presentation. Any questions? Gary?

16 GARY LEWIS: Yeah. This is Gary Lewis
17 with HDR. I was going to comment on the question on
18 the cross sections, because that was I think a
19 valuable question that appeared to show a widening
20 of the channel.

21 If you look at all of the cross sections
22 at the same location at the two different times, you
23 see what you're seeing on this current slide. I
24 guess you backed up there, but on the slide you had
25 a minute ago, these banks, high banks are right on

1 top of each other.

2 I don't believe that those high banks
3 changed in that period of time, because the majority
4 of the drawings that we looked at show them exactly
5 on top of each other.

6 Remember that when they surveyed these,
7 they went out and tried -- they weren't monumented.
8 They went out and tried to locate where they had
9 taken cross section six in site three or
10 whichever -- that's cross section four I guess.
11 Tried to locate where that was and measure the
12 channel across that location.

13 If they crossed on a little bit of a skew
14 or didn't quite start and finish at the same point,
15 it would show -- it would have an appearance of a
16 change in channel width. I just don't believe
17 that's happening for the majority of the slides.

18 We can look at those in more detail, but I
19 don't believe widening or narrowing are part of what
20 we saw during that period of time.

21 PAT ENGELBERT: Anything else? Any other
22 questions or comments? I think we'll move on.

23 And I will be staying right up here
24 talking through sedimentation.

25 So this particular study is an update to

1 our first study which evaluated the sediment
2 transport characterization of the gaged sites. This
3 particular study looks at the sediment transport at
4 the ungaged sites. We evaluated it for current
5 operations in this particular study. We'll get into
6 the sediment transport relative to hydrocycling and
7 flow depletion tomorrow when we cover those studies.
8 The intent of this update is to characterize the
9 sediment transport for current operations at the
10 ungaged locations.

11 Just to reiterate, the goal of the
12 sedimentation study was to determine the effect, if
13 any, that project operations have on stream
14 morphology and sediment transport in the Loup River
15 bypass reach and in the lower Platte River. This is
16 on slide 132.

17 In addition, to compare the availability
18 of sandbar nesting habitat to tern and plover to
19 their respective populations, and to compare the
20 general habitat characteristics of the pallid
21 sturgeon in multiple locations.

22 That second goal we did address in the
23 initial study report. And based on comments that we
24 received from FERC, we're going to look at some
25 additional -- we are currently performing additional

1 statistical analyses, and the results of that will
2 be presented in the August 26th report, the -- is
3 that the second initial study or --

4 LISA RICHARDSON: Updated.

5 PAT ENGELBERT: It's the report that we're
6 going to show in August, for the challenged like
7 myself.

8 The objectives associated with -- you
9 know, in order to help us to meet that goal, were to
10 characterize sediment transport in the Loup River
11 bypass reach and in the lower Platte River through
12 effective discharge and other sediment transport
13 calculations, and to characterize stream morphology
14 in the Loup River bypass reach and in the lower
15 Platte River by reviewing existing data and
16 literature on channel aggradation/degradation and
17 cross sectional changes over time. These are the
18 same objectives that we had back in September for
19 the gaged locations.

20 These grayed out objectives, again, are to
21 the statistical relationships between sediment
22 transport and the nesting that we are currently
23 performing and will be reporting on in August.

24 Okay. Back to objective one. To
25 characterize sediment transport in the Loup River

1 bypass reach and in the lower Platte River through
2 effective discharge and other sediment transport
3 calculations.

4 For this particular study, again, these
5 are at the ungaged locations. The tasks associated
6 with that are to look at the overall sediment
7 budget, the sediment supply that is available, to
8 perform our sediment transport calculations, and
9 from that determine what the effective and dominant
10 discharges are. And then we also evaluated the
11 regime analysis based on those effective and
12 dominant discharges.

13 The first thing we did is we looked at the
14 sediment budget that we presented back in September,
15 and evaluated what the yield or the potential supply
16 is at the ungaged sites.

17 You recall from back in September we
18 adjusted the Missouri River Basin Commission
19 sediment yield table based on the reduction in
20 dredge amounts that the district has seen in their
21 settling basin.

22 Here's a table showing the ungaged sites
23 and the potential supply that is available at those
24 ungaged sites. For site one, the potential supply
25 that is available, and, again, this is upstream of

1 the diversion weir. It's approximately
2 4 million tons of sediment per year. Downstream of
3 the diversion weir, and this is on slide 137, you
4 get approximately 2 million tons of sediment is
5 available.

6 Sites three, four and five you're upwards
7 of 5 million tons per year of sediment is available.

8 Okay. Now that is supply. That is the
9 potential supply that is available to the river at
10 those points in the system.

11 In order to -- and this is a little bit of
12 a summary, and I'm sure everyone pulled out their
13 initial study report and reviewed this before today,
14 but as a refresher, in order to perform our sediment
15 discharge calculations, we had to develop sediment
16 discharge rating curves.

17 Next we did the collective sediment
18 discharge rating curve, and then from that we
19 determined what the total sediment transported was,
20 and then we evaluated what the effective dominant
21 and -- effective and dominant discharges were.

22 The difference with the ungaged sites from
23 the gaged sites is to develop our sediment discharge
24 rating curve, we need a width, a depth and a
25 velocity relationship in the river.

1 At the gaged locations we had the -- we
2 had measured data from the USGS, over 25 plus years
3 at each of the gaged sites, so we were able to
4 develop those relationships for measured data.

5 At the ungaged sites, we used the two
6 survey dates and our hydraulic models, and ran a
7 series of flows through our calibrated hydraulic
8 models to come up with those width, depth and
9 velocity versus discharge relationships that we'll
10 be using here.

11 A slight caution is that at the gaged
12 locations it was based on 25 years of data, at the
13 ungaged sites, you know, we're looking at a couple
14 points in time in one particular year. So just to
15 provide you a little bit of the scope associated
16 with that.

17 Again, here the study states that we
18 evaluated sites -- ungaged sites one, upstream of
19 the diversion structure, two, downstream of the
20 diversion structure, three is upstream of the
21 return, four is downstream of the return, and five
22 is near North Bend.

23 Hopefully tonight when you go home you
24 won't have one, two, three, four, five stuck in your
25 head with all these locations because I've repeated

1 it so many times. My kids know where they are, but,
2 unfortunately, they were born to an engineer.

3 Here's an example of the depth versus
4 discharge relationship that we developed using the
5 calibrated model results. And this is kind of for a
6 lower flow range for discharges a thousand CFS and
7 less.

8 You can see that there is a pretty -- you
9 know, pretty good spread between the depth for a
10 given discharge. And each of these points represent
11 a cross section location in the model.

12 So we provided our best fit line to come
13 up with that -- you know, the best relationship or
14 general relationship between depth and discharge.

15 Here's an example, and this is at site
16 four, depth versus discharge for higher discharges,
17 velocity versus discharge for low discharges, and
18 velocity versus discharges for higher discharges.

19 Again, just want to give you an example of
20 the types of relationships that we developed using
21 our calibrated hydraulic model.

22 Based on that information, we ran our
23 sediment transport calculations using Yang's
24 equation again, which is what we used at the gaged
25 sites and which is consistently used up and down the

1 basin. And we developed a sediment discharge rating
2 curve. This particular example is at North Bend.

3 At the North Bend location, because it was
4 also a gage location, we compared the gaged versus
5 model results sediment transport rating curve, and
6 they were -- they were very close to each other.

7 I'm on slide 144.

8 LEE EMERY: Because these guys watching on
9 the screen without knowing you're flipping through
10 them.

11 PAT ENGELBERT: Sorry about that. I'm on
12 slide 144.

13 So now that we've established -- now I'm
14 on slide 145.

15 Now that we've established what our
16 sediment discharge rating curve was at the ungaged
17 sites, we went ahead and performed our -- continued
18 with our calculations, and we determined the total
19 amount of sediment that was transported assuming it
20 was at capacity for given years.

21 We determined what the effective discharge
22 was based on our sediment transport calculations,
23 and what the dominant discharge was based on those
24 calculations.

25 And as a quick refresher, I would just

1 like to reiterate what the definitions of each of
2 those terms are.

3 I'm now on slide 146. Total sediment
4 transport capacity is the total sediment carried for
5 a period of interest based on the sediment discharge
6 rating curve and the corresponding flow hydrograph.

7 So we take that sediment discharge rating
8 curve that I had, which is sediment versus
9 discharge, and we combine it with discharge, and we
10 get the resultant sediment load that is transported.

11 The effective discharge, by definition, is
12 that discharge that transports the largest fraction
13 of the total sediment load. It results in the
14 average morphologic characteristics of the channel,
15 it's the channel shaping flow. It's used to assess
16 channel characteristics within depth. However, due
17 to subjectivity, it suggests that that's used for
18 long-term analyses for greater than a year.

19 The dominant discharge is that average
20 flow that transports the same amount of sediment as
21 the actual hydrograph for the study period that
22 you're evaluating.

23 It is also used to assess channel
24 characteristics within depth, and it can be used for
25 shorter periods. Typically for those periods a year

1 or less.

2 So if you can picture, you know, the total
3 sediment that is being transported by a hydrograph,
4 let's say is a million tons, if you divide that
5 million by 365 days, you get the average number of
6 tons per day. You go back to your sediment
7 discharge rating curve, and say for that many tons
8 per day, what's the associated discharge. Let's say
9 it's 1,500 CFS.

10 So if 1,500 CFS were flowing down the
11 river every single day for the year, it would convey
12 the same amount of sediment that the natural
13 hydrograph did, so that is the definition of
14 dominant discharge.

15 Here's a summary table showing the results
16 of our sediment transport calculations. I'm now on
17 slide 149.

18 The first site, site one, the effective
19 discharge is approximately 3,000 CFS, the dominant
20 discharge is a hair under 3,000 CFS. And I'll go
21 through these pretty quickly so I'm not boring you
22 even worse.

23 But we saw the same trends we saw at the
24 gaged sites where the dominant effective discharges
25 were increasing as we went through in the downstream

1 direction.

2 What's interesting to note is we also
3 threw up there the mean daily discharge in the third
4 column. And there is pretty good agreement between
5 the mean daily discharge and the dominant discharge.
6 That is just one of the interesting pieces that we
7 noted. That that discharge that, you know, is
8 generally responsible for shaping the river is
9 pretty close to the mean daily discharge.

10 Okay. Next we took those -- the results
11 of those sediment transport calculations, and we
12 compared them to the yield or the sediment supply
13 that is available in each of those locations.

14 As you can see, and consistent with the
15 trends that we saw at the gaged locations, the
16 capacity of the system at site one is about
17 2.9 million tons per year, and the supply that's
18 available at that site is a little over
19 4 million tons per year.

20 Again, we had consistent trending in the
21 downstream direction, and in each case, just as we
22 had found at the gaged sites, the capacity was
23 smaller than yield, which led us to the conclusion
24 that it is not a supply limited system. There is
25 more supply available than what the system has the

1 ability to carry.

2 Here's a quick graphic on slide 151
3 showing kind of our spatial analysis comparing the
4 effective and dominant discharges to flow volumes
5 and total sediment transport.

6 Again, as you work your way from upstream
7 to downstream, it increases as you would expect in
8 this type of system.

9 And then we also showed the capacity
10 versus yield spatial analysis where at each of our
11 gaged and ungaged sites we show the river's ability
12 to convey it, the capacity versus the yield or the
13 supply that's available.

14 Based on those dominant and effective
15 discharges, we plotted those on the regime graphics
16 at the ungaged locations to see if they were
17 trending or were in the same morphology as what we
18 had seen at the gaged locations.

19 On slide 153 you can see that they are all
20 very well clustered up into the braided region of
21 the -- of Chang's regime morphology graphic.

22 Similarly, for Lane's relationship, his
23 regime analysis, we plotted both the gaged and
24 ungaged sites, and they are all very well seated
25 toward the braided -- toward the braided regime.

1 So in summary, both rivers at all
2 locations were clearly not supply limited.

3 The spatial analysis of effective and
4 dominant discharge reveal that they increase in a
5 downstream direction, which is consistent with
6 natural river processes.

7 The effective discharge and associated
8 river morphology has not changed since '28. That's
9 based on the Louisville gage.

10 Sediment transport calculations show that
11 the channel geometries are in regime. Nothing
12 appears to be constraining either the Loup or the
13 Platte from maintaining the hydraulic geometries
14 associated with those dominant and effective
15 discharges.

16 The combinations of slopes, sediment sizes
17 and effective discharges result in all locations
18 being well within that braided regime. Okay. And
19 none are near the threshold of transitioning to
20 another regime.

21 So those are kind of the conclusions of
22 objective one to characterize the ungaged sites and
23 sediment transport associated with those.

24 Any questions on that before I go on just
25 to talk about, you know, comparing it to the

1 literature, which is a pretty quick little piece?

2 Any questions, any comment?

3 Anyone need coffee, Mountain Dew?

4 Yes, Michelle.

5 MICHELLE KOCH: This is Michelle Koch from
6 the Game and Parks Commission. I think I asked this
7 question back in September and I still don't
8 remember the answer. But for the potential supply,
9 what is that based on? Does that include
10 everything, even the sediment and all the sand and
11 stuff that's tied up in permanent, you know,
12 stabilized sandbars, does that include all of that?

13 PAT ENGELBERT: The supply is calculated
14 based on the amount of sediment that is coming off
15 the watershed through, you know, overland flow,
16 getting into the rills, getting into the smaller
17 streams, the bigger streams as well as the material
18 that's available within the channel.

19 MICHELLE KOCH: The movable material
20 that's available in the channel, not the stuff
21 that's stabilized?

22 PAT ENGELBERT: I'm not sure if when the
23 Corps did this they looked at like an island in the
24 channel that has large tree structures, if they
25 accounted for that at all, I don't know for sure.

1 But I would imagine that those are relatively small
2 in proportion to the overall watershed and what it
3 can dump in at that point.

4 Gary, did you want to add anything on
5 that?

6 GARY LEWIS: I wouldn't mind commenting on
7 that. I was at the University of Nebraska when
8 those studies were done. I actually participated in
9 some of the studies. Not in this one. I was
10 involved in hydrology task force on a part of the
11 project that we looked at everything in the entire
12 Platte basin.

13 But I believe the correct answer would be
14 that the -- because of the methods used, the soil
15 loss equations, all of the methods used in
16 developing those yields, that would represent the
17 production of sediment to the river by the
18 watershed. And it doesn't have -- they didn't
19 recount sandbars or had no way of estimating the
20 supply available.

21 However, the supply available for capacity
22 transport is in addition to the load that's carried
23 to the river to any location, and you notice it gets
24 bigger as you go downstream, so they must be
25 accumulating more. And that's probably because the

1 watershed is in between two points is contributing
2 more sediment.

3 So I believe the proper way to interpret
4 the NRDC estimates would be the load that's carried
5 to the river at any point as it accumulates down
6 river. So that would not include the vast amount of
7 sand and material that's sitting in that river
8 either stabilized or not stabilized.

9 But all of the investigators when they are
10 looking at capacity to transport sediment consider
11 the fact that even if the supply of material being
12 brought to the river was less than the capacity,
13 there is still a tremendous amount of sediment out
14 there that could be mobilized, and in that case you
15 might have some concern that maybe that's morphology
16 unchanged. Because if the supply coming to it is
17 less than what -- it's eaten away at the reserve, if
18 you want to think of it that way, and because these
19 quantities represent the amount being carried to the
20 river, and that probably has changed over time in
21 development and everything else. It was reflected
22 in the district's dredging records. We saw
23 something happening. I don't know that we know
24 exactly what did, but there was a reduction. So
25 hopefully we're getting the right answer to you.

1 The NRDC I would say in my opinion of
2 having read that report is the supply that's carried
3 to the stream by the watersheds, but continue to
4 think in terms of capacity to transport. If that
5 capacity transport starts to exceed that number and
6 you're running out of reserve in the river, you're
7 probably going to see some kind of a change
8 occurring.

9 Just a quick comment too, the Corps of
10 Engineers in their cumulative impacts assessment,
11 their conclusion was, because they looked at some of
12 the same material, the capacity that leads to yields
13 that are coming out, and they said probably the best
14 way to interpret this is the yield is equal to the
15 capacity in the Platte River.

16 The capacity to transport is the yield,
17 because it's going to carry that much. You probably
18 don't have many days, although our rating curves
19 show different, that you have it carrying less
20 sediment than it's capable of carrying. And that --
21 there is such an abundance. They say the same thing
22 on sediment there that there is not a cause for
23 concern.

24 All this is saying is that if these
25 supplies of sediment that are coming to the river

1 are properly estimated by NRDC, and they've used the
2 best available technology for doing that, then they
3 are far in excess of the capacity at the river to
4 transport it. So we're not eating into our reserve
5 if that's coming in. In fact, we're getting an
6 oversupply of sediment which defines a braided
7 river.

8 JEFF RUNGE: But wouldn't this oversupply
9 of sediment result in aggradation of the channel?

10 GARY LEWIS: The Platte River has degraded
11 over the years long-term. It's called the backbone
12 of Nebraska, so, yes.

13 JEFF RUNGE: But not within the records
14 then of the USGS when they did the
15 aggradation/degradation studies?

16 GARY LEWIS: They hadn't detected it.
17 We're talking geologic time.

18 JEFF RUNGE: Yeah. But the -- if the
19 supply greatly exceeds what is being transported,
20 though, I mean, it seems like that would be
21 something that would be evident on a scale that's
22 much smaller than on a decadal scale you would see
23 that aggradation, because it seems like there is a
24 lot of sediment being supplied from the basin based
25 on those studies.

1 GARY LEWIS: I can only report what the
2 facts are, not explain it, because, yes, it's
3 intuitive that you think there would be an awful lot
4 more sediment coming than we're transporting, and,
5 gee, why isn't it getting bigger. And it is in the
6 long-term if you look at -- if you studied some of
7 the reports on the paleogeology of the basin, the
8 Platte River has gone all over the page through
9 these erosion, deposition and stable cycles. That
10 whole valley has been 2 or 300 feet deeper than it
11 is now, and it spans 2 or 300 feet higher than it is
12 now in long-term. So, yes, there is a long-term
13 effect of this oversupply of sediment, but we don't
14 see it, and it isn't cause for alarm in the time
15 frame we're talking about here in the project life
16 and some of the other measures of time.

17 PAT ENGELBERT: And the supply versus
18 capacity is one piece of the puzzle. The gages as
19 you mentioned, they are another piece of the puzzle,
20 and they kind of show the same -- although slightly
21 differing, show the same consistent theme that it
22 seems to be a pretty stable system.

23 Anything else on -- anything else on that?

24 Real quickly, we also characterized the
25 stream morphology by reviewing some of the existing

1 data and literature, and, again, it's going back to
2 that USGS stream gage trends as well as evaluating
3 some other periodicals to see if they suggested
4 anything at the ungaged sites. And, again, it's
5 basically all the information at the gaged locations
6 that says that both rivers are in dynamic
7 equilibrium with no indications of aggradation or
8 degradation or channel geometry changes over time.

9 Long-term literature and calculations
10 demonstrate that the Loup River bypass reach and the
11 lower Platte River at both the gaged and ungaged
12 sites are in regime. They are well seated within
13 the regime zones classified as being braided.

14 LEE EMERY: 158.

15 PAT ENGELBERT: Slide 158. Any -- 159,
16 any questions? Any questions about the sediment
17 transport calculations that we developed at the
18 ungaged sites, calculations at the gaged sites, the
19 whole sedimentation study? Jeff.

20 JEFF RUNGE: Yeah, I've got one question
21 here. When it comes to those regime models that
22 were developed, there is a Leopold and Wolman model
23 that was in the initial study report, the first one,
24 and then this one here it wasn't. I didn't know why
25 that was -- why that wasn't in the second updated

1 one.

2 PAT ENGELBERT: Did we plot the Leopold
3 and Wolman; do you remember?

4 GARY LEWIS: Yeah, we said in the initial
5 report that we did include that one and talked about
6 it and pointed out two problems with it. One is
7 that the sediment sizes that were used in that study
8 were of a single value and they weren't
9 representative of the range of values we used here.
10 So you saw in the original report the data points --
11 or sort of curious where the plotting on it as to
12 whether it's braided or meandering, and we just
13 discounted it for the purposes of this second report
14 assuming that our explanation why we discounted in
15 the first report was adequate. So we could repeat
16 that same logic. There was some problems with that
17 study -- I have the original paper -- that do not
18 make it applicable. In fact, I don't think you used
19 any braided streams in that report. There were two
20 problems, and I forgotten which two they were. I
21 would have to go back and look. One was the D50 was
22 not anything close to what we're doing here, and I
23 believe he really didn't have braided streams, look
24 at meandering, and he just tried to find the upper
25 threshold of meandering, so it doesn't do a lot of

1 good for this. We can include that graph and plot
2 the data points on it and it will look just like it
3 did in the other report.

4 TOM ECONOPOULY: This is Tom Econopouly,
5 Fish and Wildlife. You also mentioned in that
6 report that the Corps didn't use it.

7 GARY LEWIS: That's correct, too, in
8 the -- the Corps had applied both of the evident
9 graphs. Thank you.

10 You know, they didn't explain why they
11 didn't -- which ones they didn't use or why, but
12 they did select those two and use the same ones.

13 TOM ECONOPOULY: It would be nice to see
14 them just for consistency.

15 PAT ENGELBERT: We can include that, yeah.

16 JEFF RUNGE: The other question too is
17 when looking at things making comparisons
18 longitudinally there is the Parker regime equation
19 that was computed that looked at your effective flow
20 discharge, your sediment size, slope, and then you
21 came up with numbers like wetted width, mean
22 depth -- or mean common velocity, mean depth. And
23 it didn't seem like that was computed for the -- for
24 any of the ungaged sites. That was done in the
25 initial study for the gaged sites, but that wasn't

1 computed for the ungaged sites?

2 PAT ENGELBERT: Jeff, I don't recall
3 computing the -- using Parker's equation to compute
4 widths and depths. We took the dominant discharge
5 and compared it to the width and depth relationship
6 that was developed from the gaged data, but I don't
7 recall using the Parker's regime equations. I think
8 we mentioned it in the report. I don't know that we
9 actually -- I don't know that we used them. I think
10 we used it as an example.

11 JEFF RUNGE: Yeah. I'll point that out as
12 far as like a lot of that information is provided
13 more in an appendix than it was in the document, but
14 I can point that out.

15 PAT ENGELBERT: If you could, I would
16 appreciate it. One of the things we did do is we
17 calculated what that dominant discharge was, and
18 then we went back into our width and depth versus
19 discharge relationships to come up with what those
20 channel characteristics would be associated with the
21 dominant discharge.

22 GARY LEWIS: If I could comment, the -- we
23 did have a table in there of all of the different
24 variety of methods used to calculate effective and
25 dominant discharge, and we showed that Parker had

1 done some work in the simple Platte as part of the
2 Platte River management project. I was involved at
3 that time.

4 But we didn't run his method on any of
5 these study sites or report any values of Parker's
6 method. He calibrated it to a specific part of the
7 sediment plant area above Grand Island, I believe,
8 and it was one of many methods of trying to look at
9 morphology in the Platte at that time. And recall
10 USGS Harlinger (phonetic) and others used these same
11 methods as well as Parker's method.

12 JEFF RUNGE: Yes, yes. And I guess it's
13 real difficult to discuss this now. I'll just have
14 to go back to the specific appendix and reference
15 that from the original report.

16 GARY LEWIS: If you understood it saying
17 we did -- we used Parkers down in the lower reach,
18 that should have been communicated that we didn't
19 run Parkers down in the lower. It's very difficult
20 to calibrate.

21 JEFF RUNGE: Okay.

22 TOM ECONOPOULY: Tom Econopouly, Fish and
23 Wildlife. I'm also interested, how did you
24 calculate the slope for the cross sections?

25 PAT ENGELBERT: For use in the model?

1 TOM ECONOPOULY: And also within the
2 regime diagrams.

3 PAT ENGELBERT: We looked at USGS topo
4 maps, we looked at the survey information we had,
5 and we looked at literature on the Platte River
6 system. And I know in the initial sediment report
7 we kind of listed the table and what the sources
8 were for coming up with the slope. So we kind of
9 used two or three different sources to develop --

10 TOM ECONOPOULY: The cross sections as
11 well?

12 PAT ENGELBERT: Yeah.

13 GARY LEWIS: Tom, for your information,
14 even though the graphs show bankful discharge, in
15 one case the mean annual discharge, we explained in
16 the original report we used dominant discharge for
17 both sets of graphs. We think that's a better
18 equation.

19 TOM ECONOPOULY: D50 was also -- that was
20 estimated from nearby gages?

21 PAT ENGELBERT: Yeah, from USGS gages.
22 And we compared that to the dredging data that the
23 Loup Power District had, and we had a good
24 agreement.

25 TOM ECONOPOULY: At the cross sections

1 they used the D50 from nearby gages, right?

2 PAT ENGELBERT: At the ungaged locations
3 if there was -- like at Genoa, we would use the
4 Genoa gage. For sites three and four, we
5 interpolated between the gage locations based on
6 river mile.

7 GEORGE HUNT: This table right here, Table
8 4-2, it lists the slopes and the D50s and their
9 sources for every site.

10 PAT ENGELBERT: So in the report, Table
11 4-2 on Page 9 of study 1.0, sedimentation, lists the
12 inputs used for Yang's equation.

13 Any other questions on sedimentation?

14 JEFF RUNGE: Yeah, I've got one more
15 question here. And I'm not sure where -- well, I'll
16 just mention, Page 11 of FERC's final study
17 determination, they requested a longitudinal -- or
18 they put in parentheses spatial comparisons of all
19 sites on the Loup and lower Platte River starting at
20 the most upstream site on each river and progressing
21 downstream.

22 It seems like a lot of the variables that
23 would be collected and analyzed in this comparison
24 would be those similar to the Ginting and Zelt 2008
25 one, but as far as a longitudinal geomorphic

1 comparison, I wasn't quite sure whether this
2 captured that now that the ungaged site information
3 has been collected.

4 PAT ENGELBERT: I guess, Jeff, what we had
5 done is we listed what each of the sediment
6 transport calculations were relative to their gage,
7 and we summarized it in a table and noted what those
8 trends or what the -- what we saw in doing that.

9 JEFF RUNGE: So the longitudinal
10 comparison that was made was just more on transport,
11 the transport at those sites?

12 PAT ENGELBERT: Our sediment transport
13 calculations, yes.

14 JEFF RUNGE: Okay.

15 PAT ENGELBERT: Anything else?

16 I guess with that I'll turn it back over
17 to Stephanie.

18 STEPHANIE WHITE: I think we're probably
19 ready for 12. Let's start that. We'll go until
20 3:00, wherever that takes us.

21 LISA RICHARDSON: I think we'll probably
22 be able to pretty close get through ice in an hour,
23 don't you think, Roger?

24 ROGER KAY: I think so, yeah.

25 My name is Roger Kay. I'm with the US

1 Army Corps of Engineers, Omaha district. I'm the
2 chief of hydraulics section. And part of what we do
3 in hydraulics is look at ice affected flows in
4 rivers. And we were asked to develop scope of study
5 and eventually do the study on ice jam flooding on
6 the Loup River.

7 The primary goals of the study were to
8 evaluate the impact of project operations, if there
9 are any, on ice jam flooding on the Loup and Platte
10 Rivers between Fullerton and North Bend.

11 And also to develop an ice jam and/or
12 predictive -- breakup predictive model limited only
13 to the examination of project effects, as well as
14 identify operational or structural measures to
15 mitigate or minimize project effects on ice jam
16 formation and subsequent flooding, if it is
17 demonstrated that operation of the project
18 materially impacts ice jam formation on the Loup and
19 Platte Rivers.

20 So out of that -- those two goals, we have
21 three objectives associated with our study that we
22 performed. The first objective is to simply
23 evaluate the effect of project operations on
24 hydrology, sediment transport and channel
25 hydraulics, and how that affects the ice processes

1 on the Loup and Platte Rivers.

2 Second objective to develop an ice jam
3 and/or predictive model to evaluate project effects.

4 And the third objective is to identify
5 structural and nonstructural methods for the
6 prevention and mitigation of ice jams, should it be
7 demonstrated that operation of the project
8 materially impacts ice jam formation on the Loup and
9 Platte Rivers.

10 LEE EMERY: One sixty-two.

11 ROGER KAY: As far as our study area, this
12 is a map on slide 163. Basically the study area
13 extends from the Loup River upstream of the canal
14 Headworks, up near Fullerton, Nebraska, down through
15 the Loup River to the Platte confluence, and down
16 the Platte River down to North Bend. It also
17 includes the flows that are bypassed -- or diverted
18 for the power canal. And primarily for most of our
19 modeling purposes, we focused on the Loup River
20 region between the Headworks and the tailrace.

21 Again, to get in a little bit more
22 specifics of what our study results, our first
23 objective, again, was to evaluate the effect of
24 project operations on hydrology, sediment transport
25 and channel hydraulics on the ice processes on the

1 Loup and Platte Rivers.

2 Three main tasks associated with that
3 objective one was to assess a history of ice jams,
4 second was to assess the impacts of -- changes in
5 hydrology and sedimentation characteristics, and,
6 lastly, looking at ice formation and how that may be
7 impacted.

8 The second objective was to develop an ice
9 jam and/or predictive model to evaluate project
10 effects. The tasks associated with that objective
11 are to look at ice transport and the ice affected
12 hydraulics.

13 And the third objective, once again,
14 identifies structural and nonstructural methods for
15 prevention and mitigation of ice jams. The tasks
16 associated with that is identification of methods
17 for prevention and mitigation of ice jams.

18 LEE EMERY: One sixty-six.

19 ROGER KAY: This portion of the study was
20 only to be carried forward if it was demonstrated
21 that the operation of the project materially impacts
22 the formation of ice jams.

23 Now going into objective one,
24 methodologies, we looked at a -- the history of ice
25 jams that have occurred on the Loup River, looked at

1 all available records to determine when significant
2 and minor flood events occur. And for purposes of
3 this discussion, significant flood event would refer
4 to a flood that causes either loss of life,
5 considerable loss of infrastructure or considerable
6 damage to property. And we used newspaper records,
7 we used USGS reports, we used Corps reports and --
8 to develop this history of ice jams.

9 We looked over then the period of record,
10 and analyzed to determine if there was any
11 statistical basis to indicate if district operations
12 have a significant effect on the occurrence and
13 severity of these ice jam events.

14 I'm on slide 168. And this is just a
15 listing of what we found for significant ice jams on
16 the Loup River. And I apologize, the colors don't
17 show very well, but the project went into operation
18 in 1937, so these events March 1936 prior up to 1848
19 or 1849 were preproject. These are post project ice
20 jams cause significant either damages, death.

21 One caveat on the 1960 flood was really
22 more a high water event. There was some ice. There
23 was no indication that ice jams formed on the Loup
24 River, however, there was loss of life in Columbus
25 and considerable damage at that time as well. But

1 that's included in here as -- because it was -- we
2 do know that 1960 there were ice jam floods in other
3 portions of the study area on the Platte River.

4 With that we looked at how many events
5 occurred prior to project event, project operations,
6 post project operations, and we see that there has
7 not been a significant change in the occurrence of
8 ice jam floods. In fact, we show a possible
9 decrease in the occurrence of ice jams since the
10 commencement of operations for the project.

11 I'm on slide 170. We can't say
12 definitively that the decrease can be -- decrease in
13 probability can be credited to district operations,
14 but the decrease in probability does discount the
15 idea that project operations have increased the
16 probability of ice jam occurrence on the Loup River.

17 One thing to note in this review of flood
18 histories, we looked at other floods, ice jams on
19 other large Nebraska rivers, and without exception
20 every year that there was a significant ice jam
21 flood event on the Loup River, there was a
22 significant ice jam flood on one or more large
23 Nebraska rivers as well. Primarily either the
24 Platte or the Elkhorn Rivers.

25 One thing that -- you know, that points

1 out is that it would appear that the occurrence of
2 ice jams on the Loup and the Platte River are driven
3 primarily by climatological conditions rather than
4 operational considerations.

5 One thing that makes the -- muddies the
6 water maybe a little bit is that perceptions of
7 flooding change over time. People may grow
8 lackadaisical over flooding because it occurs
9 frequently, they don't really pay attention to the
10 lowland flooding, and after a period of time they
11 just ignore it, it's just going to happen again.
12 And over time there may become a period where we get
13 less flow and less frequent flooding, and all of a
14 sudden we get back into a period with more frequent
15 flooding, people say, hey, something's happened
16 here. So it really makes it difficult to compare
17 the minor flooding events.

18 But if we look at the ice affected stages
19 at the Genoa gage, we see that in 22 of the last 50
20 years, the peak stage has been ice affected, and
21 that corresponds pretty well with frequency on other
22 natural streams where we see ice jams occurring on
23 average every two to three years. That doesn't mean
24 that we have an ice jam this year and not an ice jam
25 next year, an ice jam this year, but on average

1 long-term we'll see ice jams form every two to three
2 years on most natural streams. And that seems to be
3 the occurrence on the Loup and Platte Rivers.

4 One thing that may contribute to severity
5 of individual ice jams, floodplain development. And
6 for this purposes I just want to point out that we
7 did not evaluate any of these specific items at this
8 site, but I just show this for example purposes.

9 You have elevated roadways that cross the
10 floodplain at right angles to the flow, which can
11 increase flows, you have areas where levies have
12 been constructed further constraining flows, you
13 have areas where residential developments or
14 industrial developments have occurred further
15 blocking the floodplain. All these things may
16 contribute to severity of ice jam flooding. It
17 doesn't necessarily impact the occurrence of the ice
18 jam flooding, it just might make them more severe.

19 And one thing to note with the floodplain
20 development is something that occurs gradually over
21 time. It's not like all of a sudden with -- like
22 the project began operation in 1937. People can
23 point to and say in 1937 Loup Power began diverting
24 flow and it's had this impact. Whereas with
25 floodplain development, all this development occurs

1 over time, people kind of forget that -- you know,
2 well, we raised this road, we built this bridge, we
3 built this levy, and all these things have occurred
4 over a period of time, and when ice jams don't occur
5 all that frequently to begin with, it can lead to a
6 perception that the problem must be somebody else's
7 problem. It's not my problem because I built
8 something out here in the floodplain.

9 Going on to the hydrology and
10 sedimentation portions of the study, these are
11 studies that were done by others, by HDR, and Pat's
12 gone through some of the sedimentation study and
13 also the hydrology. The results of these were used
14 as inputs to various portions of the study, such as
15 we used the flows from the hydrology portion of the
16 study to evaluate the flow regime, if you will, the
17 hydraulic flow regime with -- concerning current
18 project operations, or considering if the project
19 did not divert any water -- or if there was no
20 project to divert any water.

21 We also used sedimentation results to
22 verify if there would be a need to change any of the
23 geometric parameters within our hydraulic model, and
24 I'll get into that a little bit later on as we talk
25 about that portion of the study.

1 As far as results, really we do not see a
2 discernible difference in channel geometry due to
3 differences in sediment transport or flow regime.
4 That's not to say there aren't differences at
5 different discharges, but overall there are not --
6 there is not a measurable difference between the
7 project and no project conditions that we modeled.

8 On slide 174, the last portion of
9 objective one, last task I should say was looking at
10 ice formation. And this looked at looking at some
11 hydrometeorological data to determine ice
12 production. So we looked at flow data, we looked at
13 air data, air temperature data, precipitation data.
14 We used that to determine if there were any trends
15 that could be discerned due to project operation.

16 We estimated ice cover thickness growth
17 and how that may be impacted by changes in the flow
18 regime. And then if there are any differences in
19 the ice regime that were attributable to differences
20 in discharge in our hydraulic model studies, then we
21 would look at two different ice regimes.

22 Looking at the results, I just want to --
23 this is on slide 175. Just talk about one term that
24 I'll be talking about quite a bit here for the next
25 several slides, and that's accumulated freezing

1 degree days or AFDD.

2 When we look at ice production, in general
3 it correlates very well with temperature data. In
4 other words, how much the daily temperature deviates
5 from freezing, the daily mean temperature deviates
6 from freezing. That's what we designate as freezing
7 degree days.

8 So, for instance, if yesterday the average
9 air temperature was 28 degrees, we would have had
10 four freeze degree days for yesterday.

11 If we look at that over the whole winter
12 period, we accumulate those individual freezing
13 degree days from the beginning of the onset of cold
14 weather up through the melt out and beyond. We term
15 that the accumulated freezing degree days or the
16 AFDD. And that kind of gives us an indication of
17 the severity of the coldness of the winter, and it
18 helps us to determine what kind of ice thicknesses
19 we might expect to be associated with that climate
20 data.

21 If we look at then the flow data as well
22 as the air temperature data, we find that based on
23 project operations after we accumulate 11 freezing
24 degree days on average, we begin to see the project
25 divert flow down through the bypass reach, not take

1 flow into the canal any more. And that condition
2 continues until about an average of 108 freezing
3 degree days are accumulated. And at that point
4 there is a stable ice cover that's formed upstream,
5 there is no longer a significant flow of frazil ice
6 coming down the river into the study area. The
7 project is then able to resume normal wintertime
8 operations.

9 This value here, that's the average value.
10 The median value is actually 101, which corresponds
11 very well to just as a general rule of thumb, we on
12 average see a natural stream form a stabilized cover
13 when accumulated freezing degree days hits 100.

14 So in terms of that we don't see any
15 difference in how ice is forming on the Loup River
16 as opposed to rivers all across the country.

17 When we look at the annual maximum
18 freezing degree day accumulations, we see that
19 60 percent of our ice jams occur in years where we
20 have freezing degree day accumulation greater than
21 1000. And this value is about one standard
22 deviation above the average. And if you look in the
23 report, I don't remember the exact page, but this
24 number is shown as 70 percent. There are a couple
25 of typos in our report, and I believe they will

1 be -- an errata being published showing those
2 corrections. But those corrections don't have an
3 impact on what our conclusions are here.

4 We look at 60 percent of the ice jams
5 occurring in years where the freezing degree day
6 accumulation is greater than a thousand, but just
7 because we hit a thousand freezing degree days in
8 any year doesn't guarantee that an ice jam will
9 occur. There is only about a 20 percent chance that
10 an ice jam actually occurs in years where we hit
11 that. That points out there is a lot of variability
12 in both temperature data and the snowfall data and
13 precipitation data. All these factors go into how
14 likely we are to have an ice jam. And I believe on
15 the next slide -- or next couple slides we'll see
16 that in a little more detail.

17 One thing that was kind of interesting to
18 note, and this may also lead to some of the
19 perceptions that have occurred over time as to what
20 are the impacts of causing -- or what are the
21 impacts causing flooding to occur on the Loup River.

22 We see that if we look at the annual peak
23 freezing degree day accumulation, that these are
24 varying on about 25- to 35-year cycle. In other
25 words, we see about a 25- to 35-year period where

1 the annual maximum is averaging substantially below
2 normal. We move into a period 25, 35 years where
3 the freezing degree day accumulations are
4 substantially above normal.

5 And in this chart on slide 177 shows that
6 a little bit more clearly as opposed to the table.
7 You can see that -- you can see a fairly sinusoidal
8 shape to the -- both the five year running average,
9 ten year running average and 30 year running average
10 looking at freezing degree days over these various
11 periods.

12 And if we look at these high periods of
13 freezing degree day accumulations as opposed to
14 these low accumulation freezing degree day periods,
15 we have about 30 percent probability in any year in
16 the high freezing degree day periods of exceeding
17 1000 freezing degree days, but in these low freezing
18 degree day periods we only have about 10 percent
19 probability.

20 And as I said before, it appears that
21 climatological conditions are a primary driver in
22 the occurrence of ice jams. So you can see that
23 based strictly on just the temperature data, there
24 is a substantial difference in what we would expect
25 as far as the occurrence of ice jams within these

1 high and low freezing degree day periods.

2 Another thing that's kind of interesting
3 about freezing degree days is that in these high
4 freezing degree day periods, about 65 percent of the
5 years are above the long-term average, but in the
6 low freezing degree day periods, only about
7 35 percent of the years are greater than average.

8 So it indicates that not only are we
9 seeing the long-term average, but within that period
10 there is a certain band, if you will, that the
11 freezing degree days do not extend beyond, so we see
12 a lot -- see a substantial difference in the
13 variability of these, whether it's a high freezing
14 degree day period or a low freezing degree day
15 period.

16 If we look at just strictly if ice jams
17 are more likely to form in years where our AFDD is
18 greater than a thousand, and we look -- we would
19 expect to see about three times more likely to have
20 an ice jam flood in periods of high freezing degree
21 day periods, in other words, cold weather, colder
22 weather periods as opposed to the warmer weather
23 periods. That's not quite how the statistics work
24 out. It's a little bit more about two times more
25 likely, but there is more than just freezing degree

1 days in effect here.

2 One thing to note if we go back to the
3 slide here, project operations started in the late
4 '30s. You can see we're kind of in the trough of
5 that freezing degree day period.

6 We've gone through now one complete cycle
7 and we're heading into what's most likely going to
8 be colder weather than what would be experienced, so
9 be sure to buy your stock and winter coat companies
10 here in the next ten years.

11 The one thing to note is that we weren't
12 as likely to have ice jam floods when the project
13 began operations. After the project had been in
14 operation for, you know, 10, 15, 20 years, we see
15 that the climate gradually was becoming colder on
16 average, and that we were more likely to have ice
17 jams. And that may have led to a perception that
18 project operations were a factor in increased ice
19 jam formations when really all it is is just the
20 variability in climatic conditions.

21 RANDY THORESON: Can you tell me what
22 happened in 1920, go back to your chart, that little
23 blue?

24 ROGER KAY: This is a five-year average,
25 so it's just looking at the past five years. I

1 don't have the individual years here in front of me,
2 but there would have been a period of five years
3 where we had -- you know, I think there was four out
4 of five that were really high, really cold winters
5 there. And interestingly enough there were no ice
6 jams that occurred in that five-year period, except
7 possibly the first year. I don't remember if this
8 included the 1912 to 1917, or if this would have
9 been 1913 through 1918, I don't recall.

10 TOM ECONOPOULY: Tom Econopouly again, US
11 Fish and Wildlife Service. Even though there may
12 have been an ice jam, a low probability of an ice
13 jam in the years when there was low period AFDD,
14 that doesn't necessarily translate into damages
15 incurred, does it?

16 ROGER KAY: No.

17 TOM ECONOPOULY: So you can have more
18 severe damage during a low AFDD year?

19 ROGER KAY: It's possible, yeah. As my
20 next bullet points out, there was only one year
21 where we had below normal freezing degree day
22 accumulations that caused a significant flooding
23 event, and that was because there was a rainfall
24 event on top of the snowmelt event. And that's
25 something that I'll talk a little bit more here in a

1 another slide about, but it is possible.

2 One thing that I point out that I
3 indicated earlier that freezing degree day
4 accumulations greater than a thousand indicates
5 about 20 percent chance of an ice jam forming. But
6 if we couple that with the period preceding the peak
7 accumulation and freezing degree days as being
8 colder than normal, and we follow that with above
9 normal temperatures as temperatures warm up, then we
10 see about a 50 percent chance of ice jams forming.
11 And that same thing holds true to some extent in
12 years where we have lower freezing degree day
13 accumulations. It's largely driven by how warm it
14 gets, how rapidly it gets following that, and
15 sometimes in years where we have really significant
16 snowfall events, it just can't warm up fast enough
17 to melt all the snow.

18 And, conversely, where we might have
19 relatively low snowpack year, it could warm up very
20 substantially, very rapidly, and even though you
21 don't have a lot of volume, you can get a very rapid
22 rise into the stream and cause large increases in
23 stage and generate an ice jam. But generally there
24 is just not enough volume in that to generate
25 significant flooding. The event just doesn't last

1 long enough for water to build up before the stages
2 drop again.

3 Going a little bit more with snow
4 accumulation, generally speaking, years with snow
5 accumulations correlate very well with high
6 discharges. Just because you have a high discharge
7 doesn't mean you're going to have an ice jam.

8 One thing that kind of seems
9 counter-intuitive at first is that 80 percent of the
10 ice jams that occurred, occurred in years where we
11 had above normal snowfall. And 60 percent of those
12 ice jams occurred in years with snowfall in the 20th
13 percentile or higher. In other words, we are one
14 standard deviation above normal for snowfall events.

15 And one reason that this is, that we can
16 get a lot of runoff, like I said, the amount of snow
17 that's out there to melt, just because of the way
18 that nature works, we just can't generate enough
19 warm air fast enough to melt that snow rapidly
20 enough to lead to real sharp increases in discharge.
21 That's what seems to be more driving us rather than
22 the high discharges.

23 Lastly, I just point out that rainfall --
24 this seems very intuitive. Rainfall during the
25 snowmelt event seems to increase the probability of

1 ice jam formation. However, there just haven't been
2 enough precipitation driven events where ice jams
3 formed to really conclusively state how significant
4 precipitation is. In other words, does it take
5 quarter inch precipitation over a large area, does
6 it take an inch of precipitation over a large area
7 to drive this rapid rise in stage.

8 There are several -- a few other things we
9 looked at. One thing that we looked at when we
10 looked at the maximum annual accumulation of
11 freezing degree days is that there appears to be a
12 downward trend. However, it's not statistically
13 significant just because there is so much scatter in
14 the annual freezing degree day accumulation.

15 As you can see, there is a cyclical
16 pattern of 25- to 35-year periods of high and low
17 periods. What we don't have is there a larger trend
18 where we're seeing up and down, are we on the down
19 side of a longer period trend, or are we in a
20 long-term trend. We really don't have enough data
21 to say one way or the other what's going on there.

22 We also looked at the monthly accumulation
23 of freezing degree days. Some months show slight
24 upward trend, some months show a slight downward
25 trend. Again, there is nothing that is

1 statistically significant with that.

2 If we look at when that peak freezing
3 degree day value occurs, the date that that occurs
4 on, we can see that the trend is the same as that of
5 the annual freezing degree days. In other words,
6 we're seeing a trend towards earlier accumulations
7 of freezing degree days and thus earlier breakups of
8 ice. However, there is just so much variability
9 again in the natural climatic conditions from year
10 to year that that trend is not statistically
11 significant.

12 One thing to note, though, that's
13 interesting, and I just put this up here because it
14 is interesting. Even -- whether we have a period of
15 high freezing degree day periods or low freezing
16 degree day periods, the variability of that date has
17 remained fairly constant until the last 20 years.
18 And why that is, I don't know, but we -- one thing
19 we do know is the project is not that powerful that
20 they can influence the weather to cause that much
21 variability, so I think we can ignore that for
22 impacts to the ice jam formation.

23 The last task associated with the
24 objective one is looking at ice formation. Again,
25 we use hydroclimatic data to estimate ice cover

1 thickness.

2 We also add measurements of ice thickness
3 for -- within various years going back to the 1940s
4 on the Loup River. And there is an equation, we
5 call it the modified Stefan equation. It's really a
6 differential equation that's been simplified due to
7 various assumptions, so you get rid of all the
8 differential equations which makes life a lot easier
9 for us. But basically the thickness of ice is
10 related to the square root of the accumulated
11 freezing degree days.

12 If we go -- and there is a coefficient
13 here that can vary from river to river, and there is
14 a number of reasons why the coefficient value can
15 vary.

16 On an average river -- and these values
17 are developed more for eastern rivers as opposed to
18 plains rivers. The standard values that are
19 expected on average river are .4 to .5, on slightly
20 larger rivers, like on the Loup and on the Platte
21 and Elkhorn, we would expect to see values to be .4
22 to .6, and maybe .65. And those values depending on
23 where you're at and how the river is oriented to
24 prevailing winds, you can even see those values go a
25 little bit higher. And that's really what we saw.

1 When we looked at the measured -- ice
2 thickness measurements over the last 50, 60 some
3 years, we see that our C value comes out to an
4 average .56. The value in ranges generally range
5 from .4 to .7, which falls very favorably within
6 other streams within the State of Nebraska and also
7 other northern plain states.

8 This range in -- we then took this average
9 .56 value and looked at estimating what the average
10 ice thickness would have been for some of the
11 historical ice jam periods. And the values that we
12 computed for ice thicknesses seems pretty consistent
13 with available anecdotal evidence. We don't really
14 have ice measurement thickness measurements prior to
15 USGS beginning in gage operations in the late '30s
16 on the Loup River. However, we do have photographs
17 of some of these ice jam events that occurred in the
18 early portion of the 20th century, and just, you
19 know, eyeballing what the ice thickness is, appear
20 to be based on scaling the ice to other objects in
21 the picture, the thicknesses that we derive match
22 very well with what we compute using this .56
23 coefficient.

24 So based on all that, really can conclude
25 then that there is really no measurable difference

1 in ice regimes that are attributable to project
2 operations.

3 Are there any questions before I move on
4 to the second objective?

5 All right. The second objective was to
6 look at an ice jam breakup predictive model.
7 Essentially we looked at two tasks. The first is
8 ice transport, and that's to assess 2-D modeling of
9 select reaches of interest may demonstrate
10 differences in the formation of ice under with and
11 without power canal conditions. In other words, no
12 flow being diverted into the canal versus current --
13 how operations currently exist.

14 And the second task with that is looking
15 at ice affected hydraulics using a one dimensional
16 model to assess differences in flow and channel
17 regimes between the with and without flow diversions
18 may lead to differences in water surface profiles in
19 the study reach. And also to assess if the flow and
20 channel regime differences lead to differences in
21 ice cover and ice formation, as those may lead to
22 additional differences in water surface profiles
23 increasing flooding risk.

24 For the first task, ice transport, we
25 contracted with the Cold Regions Research and

1 Engineering Lab. It's a lab that's operated by the
2 US Army Corps of Engineers in Hanover, New
3 Hampshire. They've had considerable experience with
4 two-dimensional model that's averaged -- the two
5 dimensions are in the horizontal direction. They've
6 used it to simulate ice transport through various
7 channels as well as structures and looking also at
8 the formation of ice jams during freeze up periods.

9 If you look at our study scope, the
10 DynaRICE model was only going to be conducted if we
11 demonstrated that there were differences between the
12 sedimentation characteristics of the project or the
13 reach with and without power canal operations, and
14 if we could demonstrate that there was a difference
15 in the ice regimes.

16 However, we got to a point in the study
17 where we didn't have those answers, and in order
18 to -- if we did determine that there were ice
19 differences, we needed to get started on the
20 DynaRICE modeling. So they began some modeling for
21 us. They looked at two areas. The first area was
22 upstream and downstream of the power canal Headworks
23 on the Loup, and then they also looked at the
24 section of the Loup River that passes through
25 Columbus.

1 Of interest to note, and this kind of
2 verifies with what we see in the field as well as
3 the one dimensional modeling is that we show a
4 freeze up jam occurring in the band just downstream
5 of the Genoa gage with a thin ice cover, then
6 quickly proceeding upstream to the Headworks for
7 both high and moderate flows.

8 Jams are likely to occur under the no
9 diversion condition. In other words, all the flows
10 going down the bypass reach, and that any diversion
11 of flow into the canal reduces the amount of ice
12 that's available in the bypass reach for ice jam
13 formation.

14 And one difficulty that the model ran into
15 it was unstable at low flows, in other words, very
16 little flow going down the bypass reach, and this is
17 really due to the coarseness of the bathymetry that
18 we had available.

19 If you're familiar with two dimensional
20 models, they really require a fairly dense grid of
21 points, and with our cross section spaced about
22 1,500 feet apart, there just wasn't enough detail to
23 generate a detailed representation of the channel
24 between those cross sections. It tends to just
25 generate a flat channel between those, so that

1 really becomes a problem with two dimensional flows.

2 One thing that was encouraging, though,
3 was that -- as I'll point out here, the DynaRICE
4 model showed jam formations in close proximity to
5 where we were showing jam formation occurring with
6 our one dimensional HEC-RAS model for these moderate
7 and high flows.

8 The first location in our HEC-RAS model,
9 this is on slide 187, and I'm not sure how well this
10 is showing up at the back of the room, but this
11 accumulation of ice corresponds pretty well with
12 where they are showing some thickening of ice cover.
13 This is the bend just downstream of the Genoa gage.
14 You can see here, here's Genoa, this is the
15 Highway 37 south of Genoa. This corresponds with
16 the location of ice thickening right here.

17 And then there is another location our
18 HEC-RAS model shows that's between the Genoa gage
19 and the Headworks just downstream of this large
20 bend, and, again, in the DynaRICE model we're seeing
21 the same location for freeze up jams forming.

22 So our feeling is that for low flows this
23 same duplication of sites would be replicated with
24 DynaRICE if there were available bathymetry that --
25 if we had enough bathymetry to generate a stable

1 model at extremely low flows.

2 Moving downstream to Columbus, we looked
3 at breakup conditions, because that's typically been
4 the concern at Columbus. The DynaRICE model
5 demonstrates that whether flow is being diverted
6 into the power canal or not, there is definitely a
7 potential for significant ice to build up during
8 breakup conditions in the Columbus area downstream
9 of the Highway 81 bridge right out here.

10 One thing that the model does indicate is
11 that diversion of flows into the canal reduces the
12 size of a jam at Columbus, and it also thus then
13 reduces the resulting water surface elevations and
14 potential for flooding.

15 There was a third domain that was proposed
16 for DynaRICE modeling. This was looking at the
17 reach from upstream of the tailrace to downstream of
18 the Burlington Northern bridge on the Platte River,
19 however, there was not enough bathymetry available
20 at the time to construct such a model, and per our
21 study scope, by this time we had demonstrated there
22 was no measurable difference in ice regime with or
23 without project, and we didn't continue down this
24 path because there was no need to per the study
25 scope that was agreed upon.

1 One thing to note is that in terms of the
2 DynaRICE modeling, additional bathymetry may improve
3 model stability in both reaches that were modeled,
4 however, it's not really -- it can't really be
5 demonstrated that DynaRICE would indicate any
6 difference in ice cover formation, ice jam formation
7 given that the -- given the similarity and results
8 between the DynaRICE modeling and the HEC-RAS
9 modeling. And the HEC-RAS modeling was able to
10 model these much lower flows and generated basically
11 the same jam formation locations.

12 Before I go on to the ice effect and
13 hydraulics, are there any questions regarding --

14 LEE EMERY: Lee Emery from FERC. Wasn't
15 there an ice jam in recent years near the Genoa Loup
16 canal?

17 ROGER KAY: There was an ice jam last year
18 near Genoa, however, it's just -- it's just causing
19 lowland flooding.

20 LEE EMERY: I just wondered how it figured
21 into your calculations.

22 ROGER KAY: I think the two that -- well,
23 we look at the years where an ice jam produced a
24 peak stage at the Genoa gage, and based on that, you
25 know -- the occurrence of that doesn't really differ

1 from a natural stream in other areas where we expect
2 to see ice jams every two to three years.

3 If there are no other questions, I'll move
4 on to the second task associated with objective two,
5 ice affected hydraulics. For this we used a one
6 dimensional model, HEC-RAS, we used a georeferenced
7 model. The model initially extended from just
8 downstream of the power canal Headworks to just
9 upstream of the Union Pacific bridge. Those were
10 based on 2010 channel surveys. We didn't really see
11 a difference in that way.

12 Profiles with previous studies, we
13 incorporated HEC-2 model that covered from
14 downstream of the Platte-Loup confluence to upstream
15 of the Burlington Northern bridge, and incorporated
16 that into the HEC-RAS model as well.

17 LEE EMERY: One eighty-nine.

18 ROGER KAY: We then took the -- overlaid
19 these channel survey cross sections and overlaid it
20 over a 10-meter DEM to extend our overbank geometry
21 so that when we modeled the larger flows, we would
22 be able to represent the conveyance that occurs
23 outside of the natural channel.

24 Just going through the methodology. As
25 Pat explained, the model is calibrated to both the

1 Genoa rating curve and also calibrated against major
2 water surface elevations during the -- that were
3 taken during the channel surveys.

4 The calibrated model was then used to
5 verify the parameters from the sediment study for
6 the open water conditions. We looked at both the
7 effective and dominant discharge, ran those through
8 the HEC-RAS model, and looked at both the current
9 operating condition and the no flow -- no diversion
10 flow condition.

11 And even though the values may not match
12 exactly as far as top width or depth or velocity,
13 the relative difference from the HEC-RAS model to
14 what the effective and dominant discharge
15 calculations are computing are consistent.

16 In other words, if our top width from the
17 hydraulic model that we took a cross section,
18 compared it to what Pat and his group came up with
19 for effective and dominant discharge, top widths if
20 no diversion scenario showed 15 percent difference
21 in what his calculations showed versus a specific
22 cross section in the HEC-RAS model. If we looked at
23 the with project conditions, the difference between
24 predicted and -- from the sediment calculations and
25 in the hydraulic model were the same, 15 percent.

1 So that indicated to us that there was
2 essentially no difference between with and without
3 project geometry, and, therefore, there was no need
4 to modify the model for project operations to look
5 at two different channel geometry regimes. There is
6 just one valid channel regime that was used.

7 We then took the HEC -- the HEC-RAS model.
8 We modeled ice formation flows with 10, 25, 50,
9 75 percent flows by duration for the months
10 November, December, January, since these are the
11 months we typically see the river freeze up.

12 And we also then modeled a freeze-up jam
13 with 10 percent flow by duration from December to
14 look at both the amount of ice that's produced in
15 the river at these various discharges under the two
16 scenarios, current operation and no diversion, and
17 looked at what that also has in terms of the impacts
18 for freeze-up jams.

19 We'll get to the results here. For
20 breakup period ice jams, we came up with the amount
21 of ice that was available to be in a breakup jam by
22 looking at our pre-breakup flows that would
23 typically be in the month of February. We looked at
24 the 10, 25, 50, 75 and 90 percent flows by duration
25 to come up with a range of potential ice volumes

1 that were available.

2 We also looked at ice thicknesses that
3 were based on the average freezing degree day, and
4 one standard deviation above freezing degree days,
5 and that came out to about 13 inches and 19 inches.

6 We used those volumes of ice then within
7 each reach to come up with how much ice would be
8 available if an ice jam should occur.

9 We then modeled breakup jams with the two,
10 five, ten, 20 and 50 year discharges, and we took
11 the amount of ice we computed and reduced that by
12 half.

13 The reason we do that is because during
14 the course of ice breaking up, and as it's
15 transported downstream, even though the water is
16 still very cold, there is still enough heat in the
17 water to begin melting the ice as it's being
18 transported downstream. As the ice tumbles against
19 one another, it breaks up into smaller pieces, and
20 those smaller pieces can melt away a lot more
21 quickly. We also see some ice getting shoved up as
22 we get these ice runs. We see the ice getting
23 shoved up on sandbars, up onto the high banks, and
24 we lose quite a bit of volume of ice in those. Not
25 every river is exactly the same, but on average

1 50 percent loss is kind of what we tend to see on
2 nearly every river that we've modeled.

3 If we look at results from our freeze-up
4 period, we see the HEC-RAS predicts nine locations
5 that are most likely to freeze up, to form or freeze
6 up jam. And I'm not sure how well these show up,
7 but this is the first location, second location,
8 third, fourth, fifth, sixth, seventh, eighth and
9 ninth.

10 These locations varied very little based
11 upon discharge. Depending on the specific discharge
12 modeled, the location of the ice jam, freeze up ice
13 jam might move upstream or downstream, one in cross
14 section, however, there is really no trend to
15 correlate where that ice jam may move to upstream or
16 downstream of these locations based on discharge.
17 Kind of just is a function of the discharge and how
18 that -- how all the hydraulic characteristics of
19 each cross section interplay with one another at
20 various discharges.

21 The one thing that is consistent, though,
22 is that the no diversion scenario, in other words,
23 no water being taken into the power canal produces
24 higher stages because we have a greater amount of
25 flow going down the bypass reach, have a greater

1 volume of ice.

2 But in all the formation of the ice cover,
3 formation of freeze-up ice jams, and the areas where
4 we see open water, or potential for open water are
5 all very similar regardless of the flow in the
6 channel.

7 The only thing that we can really
8 correlate with flow is the volume of ice that can be
9 produced out on the river, and that's just strictly
10 a function as we have more flow in the river, the
11 river just gradually gets wider and wider, and you
12 can get more and more ice produced just because of
13 that greater top width.

14 This is just showing where we have the
15 reaches -- or the areas where we would most likely
16 see the river remain open if there was not upstream
17 ice being transported down against a stabilized
18 cover and then progressing upstream.

19 These locations stayed the same regardless
20 of discharge, and the implication there is that, you
21 know, if there is not sufficient volume of upstream
22 ice available to be transported down and cover
23 this -- these areas up, that these areas would be
24 open regardless of project operation, and that they
25 would be producing significant volumes of frazil ice

1 that could cause problems downstream. That's
2 regardless of whether the project is in operation or
3 not.

4 When we look at the breakup jams, we see
5 fairly similar jam locations that we see with the
6 freeze-up jams. Again, these locations move around
7 just slightly with discharge, but they tend not to
8 move more than one cross section upstream or
9 downstream.

10 One thing I have up here is that HEC-RAS
11 does not self-predict a jam below the Highway 81
12 bridge. It does show a thickening of the ice cover
13 in that reach where we historically have seen ice
14 jams on the Loup River out here. However, those
15 thickening accumulations only occur when there is
16 thickening of ice downstream.

17 And we did model this reach with the
18 DynaRICE model and matched -- observed high water
19 marks from 1993 to 1969 very well. We've also
20 modeled this reach previously with HEC-2 and
21 HEC-RAS, and we produced the ice jam floods that
22 occurred in 1969 and 1993, so we didn't feel we
23 could really add anything by modeling it again.

24 The one thing again as same as with the
25 freeze-up period, the -- when there is no flow being

1 diverted into the canal, you get higher stages
2 because you've got more flow coming down the river
3 and you have slightly greater volume of ice.

4 And before going to the last objective,
5 are there any questions about the HEC-RAS modeling?

6 All right. The last objective was to
7 identify methods for prevention and mitigation of
8 ice jams. However, since we didn't identify any
9 measurable impacts due to project operation, there
10 was no need to identify any measures for mitigating
11 or preventing ice jams.

12 On slide 196, then in summary of what our
13 results and conclusions are, a review of the flood
14 history of the Loup River indicates that ice jam
15 frequency has not increased since the project began
16 operations in 1937.

17 Review of the climatological data and flow
18 data, and the use of our hydraulic models does not
19 show a difference in occurrence of minor ice jam
20 flooding occurring.

21 The third point, climatic variability and
22 floodplain development may lead to an increase in
23 flood risk with time.

24 And, lastly, we concluded the project
25 operations have not measurably changed the Loup

1 River ice regime, nor increased the risk of
2 significant ice jam flooding.

3 Does anybody have any questions?

4 STEPHANIE WHITE: Thanks. I think it's a
5 good time for a break. Let's come back at a quarter
6 after. It's a little bit more than a 15-minute
7 break.

8 (2:55 p.m. - Recess taken.)

9 PAT ENGELBERT: Thank you, Stephanie.
10 Hopefully the temperature has cooled down a little
11 bit for folks. If you start getting warm or want us
12 to crank it back on, just let us know, I can always
13 talk louder.

14 As Stephanie said, we're ahead on schedule
15 a little bit, so we're going to go ahead and dive
16 into hydrocycling.

17 Just as a review, the goal of the
18 hydrocycling study was to determine if project
19 hydrocycling operations benefit or adversely affect
20 the habitat used by interior least terns, piping
21 plover and pallid sturgeon in the lower Platte
22 River.

23 The objectives that we came up with, you
24 know, 18 months ago or whenever we first met were --
25 slide 200.

1 So the objectives to compare the sub-daily
2 project hydrocycling operation values, the maximum
3 and minimum flow and stage, to daily values, mean
4 flow and stage. In addition to same-day
5 comparisons, we'll look at periods of weeks, months
6 and specific seasons of interest to protected
7 species will be evaluated to characterize the
8 relative degrees of variance between hydrocycling,
9 current operations and run-of-river operations in
10 the study area.

11 The second objective is to determine the
12 potential for nest inundation due to both
13 hydrocycling, current operations, and run-of-river
14 operations.

15 I would just like to note at this time the
16 only alternative condition that has been identified
17 is that run-of-river operation. And to review the
18 definition from this morning, run-of-river is in the
19 power sense in that we're not regulating the water
20 to hydrocycling, it's going through the turbines as
21 fast as it's diverted.

22 The third objective is to assess the
23 effects, if any, of hydrocycling on sediment
24 transport parameters, and to identify any material
25 differences in potential effects on habitat of the

1 tern, plover and pallid sturgeon.

2 Again, a quick review of the study area
3 for the hydrocycling study. It's that area on slide
4 202. It's those areas that are located in the
5 vicinity of the canal return and then going all the
6 way down to Louisville.

7 So we'll be looking at the ungaged site
8 three, which is just upstream of the return for
9 comparison purposes, that was per the -- FERC's
10 determination letter, ungaged site four, which is
11 just downstream of the tailrace return, ungaged site
12 five, and then we'll talk a little bit about the
13 gaged sites further downstream.

14 Moving on to slide 203. The associated
15 tasks that we have with meeting objective one were
16 to develop the hydrographs of current operations and
17 compare them to the run-of-river condition.

18 The methodology that we used, we
19 incorporated the synthetic hydrographs, and that's
20 what we discussed this morning, we plotted those for
21 both current operations and the run-of-river
22 operations, and then we looked at the maximum,
23 minimum and mean flows for a wet year, a dry year
24 and a normal year. We did that at both the gaged
25 locations and the ungaged locations, and we looked

1 at them annually and seasonally.

2 For the purposes of this presentation,
3 I'll be showing representative slides of the normal
4 year. The dry and wet year information is in the
5 report, but for the sake of time, we'll be showing
6 just the normal year information here today.

7 This is slide 205. This is the synthetic
8 hydrograph that was developed at site three, which
9 is upstream of the tailrace.

10 I'm going to go on to the next slide which
11 shows it seasonally because it provides a little bit
12 of clarity for the folks in the audience. I'm off
13 to slide 206 now.

14 A couple interesting things to point out,
15 there is some, you know, flow variability from
16 May 1st through August 14th, 2009. You see some --
17 you know, some decreasing flows as you come off the
18 typical spring high flows that occur. Here's the
19 storm event that occurred in 2009, and then you see,
20 you know, again some daily variation in the flows,
21 and this is at the -- again, the gaged site that is
22 upstream of the tailrace.

23 So you do see some natural flow
24 variability that occurs, the decreasing trend in
25 flows as you come off the spring, high flows going

1 into the summer. This is a local storm event, and
2 then, you know, flows transitioning toward the end
3 of the summer to the end of the nesting season.

4 So that is the synthetic hydrograph that
5 we developed for 2009 which was classified as a
6 normal flow year for the site just upstream of the
7 tailrace.

8 Going into the hydrograph -- and one thing
9 to point out, back a slide, this is again at slide
10 206, the current operations and the run-of-river are
11 the same thing. The site is unaffected by the
12 project's operation. So the blue lines and the
13 yellow lines are right on top of each other.

14 Here going down to site four, this is the
15 ungaged site located just downstream of the
16 tailrace. This is the annual synthetic hydrograph
17 that was developed for 2009, and, again, we have
18 quite a bit of information on here. The blue lines
19 are the daily flow fluctuations as a result of
20 project operations, and the yellow lines are the
21 run-of-river operating condition.

22 I'm going to focus on the next slide, 208,
23 which is the seasonal 2009 showing both current
24 operations and the run-of-river. And similar to
25 what we had done this morning, I'm going to slowly

1 transition what each thing means so it doesn't look
2 as cluttered as it will at the end.

3 The first dotted blue line that comes in,
4 that is the daily minimum that occurs under current
5 operations. This next line, the solid blue line is
6 the daily mean flow rate that occurs under project
7 operations, and the dashed blue line is the daily
8 maximum that occurs under current operations.

9 Okay. So a couple things to note on this
10 particular graphic -- again, we're on slide 208. As
11 you can see, you have about a -- roughly a 3,000 CFS
12 fluctuation, daily fluctuation between the maximum
13 and minimum. That occurs under project operations.

14 Once you get into the storm events, you
15 know, these are flows that are as a result of a
16 storm event, you see a greater max and min
17 fluctuation, the rising and falling of the
18 particular storm event. And then near the end of
19 this particular season as we get into more daily
20 flows outside of the storm event or the kind of a
21 dry weather condition, if you will, you see roughly
22 a 2,500 CFS daily fluctuation that occurs as a
23 result of project operations. Okay.

24 So is everyone kind of clear what we're
25 demonstrating here? It's the maximum, min and mean

1 discharges that we see on a daily basis as a result
2 of project operations for that season between
3 May 1st and August 15th, and this is for a normal
4 flow year, that being 2009.

5 Okay. Next I'm going to cascade in the
6 run-of-river synthetic hydrographs that were
7 developed.

8 The first one is the dashed -- or the
9 dotted yellow line, which is the minimum flow that
10 would occur if they didn't regulate the flows, they
11 just ran them through the turbines as fast as they
12 could pull them off the river, or close to that.

13 The second line, which is pretty close to
14 the minimum, the solid yellow line is the mean daily
15 flow that would occur on project operations.

16 And this last line is the maximum flow
17 that would occur under a run-of-river condition.

18 A couple things to point out here, again,
19 you see kind of some natural flow variability that
20 does occur under the run-of-river scenario. The
21 peaks that would occur during the storm events are
22 slightly lower than what is occurring under project
23 operations. However, the minimums, the difference
24 between max and min during the storm event are
25 similar to the max and min we see under project

1 operations.

2 Okay. Another thing that we noted or
3 another trend that we noted is although daily we see
4 approximately a 3,000 CFS fluctuation, under a
5 run-of-river scenario, that 3,000 CFS fluctuation
6 would occur, however, over the course of
7 approximately three weeks.

8 For example, from May 1st at around 6,000
9 down to May 22nd around, oh, 2,500 CFS you have
10 that -- the same decrease -- or the same flow change
11 over a three-week period that you see daily under
12 project operations.

13 So just to reiterate, daily we're seeing
14 about a 3,000 CFS difference between max and min,
15 under a run-of-river operation you would see that
16 3,000 CFS change, but it would occur over
17 approximately a two- to three-week period.

18 A couple other things to note is at the
19 tail end of this particular year, 2009, we see some
20 daily fluctuations for the project operation
21 scenario. Those are a result of project management
22 activities that are going on in the Platte River
23 upstream of Duncan, so I just wanted to note some of
24 the variability that does occur in the hydrograph
25 that are not related to the project.

1 Kind of blow up this area, on the left
2 there on slide 209, this is just a blowup of what I
3 just described where daily we're seeing about a
4 3,000 CFS differential between the maximum, minimum
5 daily flow, and we see about a 3,000 CFS change in
6 flow over a three-week period. So just kind of
7 wanted to bring that to folks' attention.

8 Here is the synthetic hydrograph that we
9 developed down at Louisville. This is the seasonal
10 hydrograph, and the point of these graphics are to
11 show kind of the dampening effect as we moved
12 downstream. The further downstream you get from the
13 project, the lower magnitude change you see in that
14 daily flow.

15 Again, we're on slide 210. Down at
16 Louisville the difference between the maximum and
17 minimum gets reduced around 2,500 CFS as opposed to
18 the roughly 3,000 CFS we saw upstream at site four.
19 But, again, you see similar trending over a
20 three-week period that we saw daily under project
21 operation. So, again, we see a difference of around
22 2,500 CFS that occurs daily under project operations
23 versus a 2,500 CFS change in flow over approximately
24 a three-week period.

25 I'm on slide 211 now. Similar to what we

1 had done with the flow, we took the synthetic
2 hydrograph and we put it into our steady state model
3 that we calibrated to get an idea of how the stage
4 changes over time, so we developed a synthetic stage
5 hydrograph.

6 So we looked at the maximum, minimum and
7 mean stage for a wet, dry and a normal year. We did
8 it at both the gaged and the ungaged locations, and
9 we did it annually and seasonally.

10 I will again -- this shows site three,
11 which is upstream of the tailrace, and you can see
12 the daily stage fluctuations that occur at site
13 three, again, which is upstream of the tailrace, so
14 it would be unaffected by the project. You see kind
15 of a slight stage fluctuation due to natural river
16 conditions.

17 This is the seasonal graphic at site
18 three. By season that was defined, you know, in
19 previous correspondence as being from May 1st until
20 August 15th. You see a slowly declining trend in
21 the stage, because we have a declining trend in the
22 flow from the flow hydrographs. You see an increase
23 in the stage that is occurring -- again, I'm on
24 slide 213. Each one of the horizontal lines
25 represent a foot in stage. So over the course of,

1 oh, about a month, we saw decrease in stage of
2 approximately a foot. At the tail end in the July
3 time frame, we see kind of a daily stage
4 fluctuation. Again, those are from activities that
5 occurred upstream of Duncan.

6 Here we are again at site four, and this
7 is the annual stage hydrograph that was developed.
8 And I'm going to go by this one pretty quickly, go
9 straight to slide 215, which is the seasonal stage
10 variation. I'm going to build it up again similar
11 to what I had done with the hydrographs.

12 This is the -- under current operations,
13 this blue dotted line represents the minimum daily
14 stage. The blue solid line comes in clear in the
15 upper left-hand corner for some odd reason, as does
16 the dash line. Son of a gun. Is there any way we
17 can fix that on the fly? It didn't do that at home.

18 GARY LEWIS: Try it again.

19 PAT ENGELBERT: Well, imagine that
20 superimposed on top of that.

21 LISA RICHARDSON: Do you want to take a
22 couple minutes, Pat, and see if George or Wendy
23 could fix it?

24 PAT ENGELBERT: That's a bad deal. I wish
25 I was John Madden and could just circle it and slide

1 it down.

2 George, do you want to grab the computer
3 quick and see if you can fix it?

4 Now would be a good time to visit our
5 concession stand.

6 I think what you'll see is the -- a little
7 precursor, you'll see that as the flows decrease,
8 the difference in stage increases, which represents
9 a trend that as flows get lower, the magnitude of
10 the stage differential gets greater.

11 GEORGE HUNT: I think it's working.

12 PAT ENGELBERT: We're back on now.

13 LEE EMERY: How far is Louisville
14 downstream from site four?

15 PAT ENGELBERT: It's probably -- North
16 Bend is probably 30 miles downstream, Louisville
17 would be another probably -- it's probably 60,
18 70 miles downstream. I've got the exact river miles
19 in my book I can get you when I'm done.

20 LEE EMERY: That's fine.

21 RICHARD HOLLAND: Louisville is river mile
22 17, North Bend is like 57, and the power canal is
23 about 101.

24 PAT ENGELBERT: Louisville is the last
25 gage on the Platte before the confluence with the

1 Missouri.

2 We're fixed. George waved his magic wand
3 and we're back.

4 Here is the stage differential, the mean
5 daily stage that has occurred is a solid blue line,
6 and then the dashed blue line is the maximum daily
7 stage based on our synthetic hydrographs and our
8 calibrated model.

9 Now I'm going to dump hopefully right on
10 top -- okay, the yellow dotted line is the
11 run-of-river minimum daily stage, solid line is mean
12 daily stage, and a dash line is maximum daily stage.

13 A couple things again to note what I was
14 describing earlier is that the daily change in stage
15 is approximately one foot what we've modeled.

16 What's interesting is that one foot gets
17 closer to a little over a foot and-a-half as
18 flows -- as flows decrease from roughly 5 and 6,000
19 CFS down to that 2, 3,000 CFS, you see a greater
20 difference in the maximum and minimum stage. So as
21 flows go down, you see a greater differential in
22 stage.

23 You know, you're kind of -- as flows go
24 up, you're kind of submerging some of the sandbar
25 features and other things which is what explains

1 that.

2 Again, naturally you see about a one foot
3 decrease in stage over that, well, approximately
4 three-week period what you're seeing daily under
5 current operations. So that's what that particular
6 slide shows.

7 Here we are down at Louisville. Again,
8 you see kind of a dampening effect. We're showing
9 slightly less than a foot in stage differential,
10 where before we were showing a little over a foot,
11 but it stays pretty consistent. It doesn't seem to
12 be as affected by the dryer -- you know, the lower
13 flows, because you've got the influences of the
14 Elkhorn River and Salt Creek down at Louisville, so,
15 again, you have some dampening effect as you work
16 downstream.

17 Here we wanted to include this in the
18 report. This is a flow hydrograph of the North Bend
19 gage between Thanksgiving of this past year and
20 December 11th of this past year. Just wanted to
21 note the natural flow variability that is occurring.
22 This is a time when the project was not in
23 operation. They had -- they shut the diversion
24 gates due to the presence of frazil ice.

25 GEORGE WALDOW: Slide 217.

1 PAT ENGELBERT: We just wanted to note
2 that there is some daily flow variability when the
3 project -- you know, even without the project, so --
4 Here's kind of a summary of the statistics
5 of those previous slides. This is based on the
6 annual 2009, the normal year, the annual hydrograph.
7 The difference in flow between maximum and minimum
8 upstream of the tailrace return, so this is the
9 average difference between the daily max and min
10 over the course of the year is approximately 840
11 CFS. Downstream that is increased to approximately
12 3,700 CFS. So that's the average difference between
13 the daily max and min over the course of the year.

14 This would include -- you know, we saw
15 early on under the dry weather condition, the
16 nonstorm condition, that difference was around
17 3,000. That gets much larger as you go through the
18 storm event, and then back down to what I would
19 consider the dry weather.

20 For run-of-river operations, the 840 stays
21 the same. Again, it's unaffected. But that
22 difference under a run-of-river scenario, the
23 maximum and minimum difference is around 1,000 CFS.

24 Going to the stage or the water surface
25 elevation difference, the average difference between

1 the maximum and the minimum stage upstream of the
2 tailrace return is around four-tenths of a foot.
3 Downstream it's about 1.3 feet.

4 Under run-of-river operations, the
5 four-tenths is essentially the same, but the
6 difference downstream of the tailrace is around -- a
7 little under -- a little over a quarter of a foot.

8 Another interesting thing to note, as we
9 look at current operations, maximum minus a
10 run-of-river max. This gives us an idea of what the
11 average difference would be for the maximum stages
12 that would occur under the two scenarios is about
13 three-tenths of a foot downstream of the tailrace
14 return. So those are some statistics we pulled
15 together based on the study that we did on an annual
16 basis.

17 Going into a seasonal basis, those numbers
18 are a little bit lower when we're looking just
19 between May 1st and August 15th. The difference in
20 flow upstream is around 890 CFS, downstream of the
21 tailrace the difference between max and min on
22 average over that season is around 3,600 CFS.

23 The stage difference under for current
24 operations, upstream and downstream, four-tenths of
25 a foot upstream of the tailrace, downstream about

1 1.4 feet is the mean daily difference between max
2 and min.

3 For run-of-river, the discharge goes
4 from -- stays around 900 CFS upstream, but it's
5 around just under 1,100 CFS downstream of the
6 tailrace.

7 The stage for run-of-river operations is
8 between four-tenths and three-tenths upstream to
9 downstream.

10 Again, wanted to note that the maximum
11 stage for current ops compared to the maximum stage
12 for run-of-river seasonally is approximately
13 three-tenths of a foot on average over the course of
14 that season.

15 Okay. Any questions on the current
16 operations hydrographs versus the run-of-river
17 hydrographs, or the current operation stage
18 hydrographs versus the run-of-river hydrographs, and
19 the associated differences, does anyone have any
20 questions over that?

21 Again, we summarized them just for the
22 normal year for the purposes of this presentation.
23 The remaining information is in there for wet and
24 dry, for the wet years and dry years.

25 So I'll just kind of summarize the results

1 similar to what I had talked about. We're on slide
2 220.

3 The difference between maximum and
4 minimum, daily water surface elevation is larger
5 under current operations than under a run-of-river
6 condition.

7 Similar differences for the run-of-river
8 condition are seen except over a, you know, two- to
9 three-week period as opposed to daily.

10 The largest differences do occur in a dry
11 year under those low flow conditions.

12 Downstream differences are less. Those
13 gages that are downstream have less variability than
14 do -- in the near vicinity due to that dampening
15 effect that we discussed.

16 And the average annual difference in water
17 surface elevation is typically less than a foot.
18 That's looking at wet, dry and normal. So when you
19 look at all three of those, it's around
20 approximately one foot.

21 That's all that I have for our hydrograph
22 comparison due to hydrocycling. I'm going to turn
23 it over now to Matt Pillard unless you guys have
24 more questions, or any questions. I'll turn it over
25 to Matt Pillard who will talk about the nest

1 inundation analysis that we performed.

2 MATT PILLARD: Objective two of this study
3 was to determine the potential for nest inundation
4 due to both hydrocycling, current operations, and
5 run-of-river operations. A task here that we looked
6 at was looking at nesting season sandbar inundation
7 heights.

8 And so I won't go through all the methods
9 here. We really built on everything that Pat had
10 developed relative to synthetic hydrographs and
11 those types of things to utilize for this particular
12 study. So we used the same synthetic hydrograph
13 that Pat developed for years 2003 through 2009.

14 We looked at just site four for this
15 particular study downstream of the tailrace. I
16 believe in your -- in CD that's attached to the
17 study plan -- or the study results, we do have some
18 site five results in there as well. They were
19 nearly identical, so for the purposes of analyzing
20 just go to site four. And we did that for both
21 again current operations and a run-of-river
22 condition.

23 So what we did here is we established a
24 benchmark flow, and how we did that, we did that for
25 the pre-nesting season for both species. And so we

1 looked at -- for that the highest daily flow prior
2 to birds arriving. So we went from February 1st to
3 April 25th for plovers, and then May 15th --
4 February 1st to May 15th then for terns. And so we
5 used that highest daily flow as a benchmark as a
6 pre-nesting season surrogate for potential nesting
7 elevation.

8 And as you can see here, it's kind of an
9 example then. Here for this particular -- this is
10 site four, I'm on slide -- I can't see what slide
11 number I'm on.

12 LISA RICHARDSON: Two, twenty-four.

13 MATT PILLARD: Two, twenty-four. This is
14 site four downstream of the tailrace in 2005. And
15 so the highest daily flow prior to April 25th was
16 for a -- current conditions was on February 5th, and
17 again for the run-of-river condition it was on
18 February 5th as well, so those would be for this
19 particular example the two benchmarks that were
20 established. And then we build on that for the next
21 missions of the study.

22 So what we did then we used that benchmark
23 flow compared to subsequent sub-daily flows during
24 the nesting season. So then we looked, you know,
25 for each year then from April 25th through July 31st

1 for piping plovers, and May 15th then through
2 August 15th for least terns.

3 And what we then did was try to determine
4 how many times for both operation conditions, you
5 know, did that -- was that benchmark exceeded.

6 We also then -- you know, as we started
7 looking at the data, realized that one event might
8 have a series of exceedance of a benchmark. You
9 know, a storm event comes, it exceeds that benchmark
10 for three or four days, and then again you go below
11 the benchmark. So we also then looked at how many
12 events might have occurred during the nesting season
13 just for comparative purposes.

14 And obviously those events would be the
15 same for both conditions, it's just another way to
16 kind of look at those exceedance events.

17 So, again, here is an example then using
18 that same site four in 2005. You know, here would
19 be an occurrence of an event of which we had four
20 separate days that exceeded this benchmark for both
21 current operations and run-of-river. And, again,
22 another event that had three exceedances. Again,
23 the benchmarks were exceeded for both current
24 operations and run-of-river respectively. Third
25 event and a fourth event. So that's kind of how we

1 looked at the data for each year for each species.

2 And then a couple of assumptions here.

3 Kind of things that this study -- you know, the
4 benchmarks isn't really related to any particular
5 elevation. We could have derived a stage from that,
6 but we chose just to look at these flows from a
7 benchmark perspective.

8 Habitat may be available out there above
9 that particular benchmark. Again, we didn't look
10 at -- compare the benchmark to any of the cross
11 sections that we had done. This is purely looking
12 at flows.

13 We understand that birds can and do nest
14 above the highest -- you know, above that benchmark
15 flow, and they might choose a nest below that
16 benchmark flow. Really we just wanted to use that
17 as a baseline to compare how often might that
18 particular benchmark get exceeded throughout the
19 course of a nesting season.

20 And then, you know, we also -- you know,
21 we also assume that there would be a 60-day period
22 that would be required for successful nesting
23 attempt. We use that to -- as we looked at when
24 subsequent benchmarks exceeded, you know, might
25 there be the potential for renesting.

1 And so results here -- now, generally as
2 you remember back in the graphs, I have to go
3 backwards for this -- I went backwards to slide 226
4 briefly.

5 Generally you can see, and not surprising
6 per Pat's discussion of the hydrographs, that
7 current operations obviously has a higher benchmark,
8 you know, than the run-of-river condition. And
9 really all subsequent daily flows are going to be
10 typically higher than the run-of-river condition.

11 There were a few cases, you know, most
12 likely due to a daily change in operation where a
13 run-of-river flow might have been higher than a
14 current operation flow, but fairly consistently
15 current operations had, you know, higher flows than
16 did run-of-river. Not surprising. Pat kind of
17 already covered that piece.

18 What's kind of interesting to us anyway is
19 that there were a number of years in which the
20 benchmark that occurred during that pre-nesting
21 season was never exceeded during the nesting season,
22 and that occurred more often than we would have
23 expected. And, again, that's for both conditions.

24 So for 2003 to 2006, that benchmark was
25 not exceeded for least terns, and in years 2004 and

1 2006, that benchmark was not exceeded for the piping
2 plover.

3 The other thing that we found is that
4 there were a number of years in which the number of
5 exceedances of that benchmark for each operation
6 were identical. So, you know, 2007 through 2009,
7 the number of exceedances for least terns for
8 current operations was the same number of exceedance
9 that we had for run-of-river conditions. And for
10 piping plovers the identical exceedances occurred in
11 2005 and 2007 through 2009. So that really left us
12 with -- I guess here is an example I guess we
13 showed. Site four, you know, same number of
14 exceedances in this particular year.

15 I think what we, you know, really ended up
16 then one year where we had somewhat of a difference
17 between the two operations, and that happened to be
18 in year 2003 for piping plovers in which in that
19 particular year there were 12 exceedances of the
20 run-of-river benchmark, and four exceedances for the
21 current operations. And I think we have that
22 example here.

23 So this is site four, 2003. The benchmark
24 was established on March 8th, and it was roughly
25 7,800 CFS. And the benchmark happened to be just

1 much lower for the run-of-river condition in a
2 pre-nesting situation.

3 So as we went through the nesting season,
4 you can see that there were a number of occurrences
5 here where the run-of-river condition exceeded, and
6 actually in this particular block the current
7 operations was less than run-of-river. Again, that
8 might have been due to closing their gates due to
9 high flow when they have large storm events.

10 So this -- the one example where the
11 run-of-river condition happened to have more
12 exceedances in this year than would have the current
13 operations condition.

14 So really, you know, kind of to summarize,
15 there were -- in this particular -- in -- the
16 benchmark that we used, there were no instances
17 where current operation exceedance could have been
18 avoided on a run-of-river. So actually what we then
19 did is we looked at -- you know, after the
20 pre-nesting season benchmark, might have there been
21 a potential to avoid that exceedance if a
22 run-of-river operation were then performed after the
23 birds arrived. And from the years we selected and
24 the benchmark that we used, we didn't find any.

25 You know, normal season flow events during

1 the nesting season, you know, really they create
2 potential for nest inundation throughout the whole
3 nesting season. We also kind of looked at when did
4 these events occur. When you look at all the
5 different years there is, you know, exceedance
6 events in May and June and even in July. So those
7 exceedance events can occur for both operations
8 really throughout the majority of the nesting
9 season.

10 And, you know, getting kind of back to the
11 first one, we didn't have any -- we didn't find any
12 times in project operations cause an exceedance of a
13 benchmark flow that could have been avoided on a
14 run-of-river condition.

15 So I guess before I go forward, are there
16 any questions?

17 So this is objective three. And this is
18 to assess the effects, if any, of hydrocycling,
19 current operations, on sediment transport
20 parameters. And there were some associated tasks
21 here that we looked at. Pat is going to cover these
22 for us.

23 PAT ENGELBERT: As Matt said, objective
24 three is to assess the effects, if any, that
25 hydrocycling has on sediment transport parameters.

1 What we did is we looked at our synthetic
2 hydrographs for current operations and run-of-river,
3 and we evaluated -- we performed our sediment
4 transport calculations taking our sediment discharge
5 rating curves and marrying with the hydrographs to
6 see what our resultant sediment transport
7 calculations are.

8 The tasks associated with that again is we
9 calculated what the sediment transport is, we
10 evaluated the indicators, total sediment transport
11 dominant, effective discharge. We looked to see how
12 the channel characteristics associated with those
13 indicators, how those changed between current ops
14 and run-of-river, and we compared the regime
15 analysis for current ops and run-of-river.

16 I'm now on slide 234, and this is a
17 summary table showing the sediment transport
18 calculations at the ungaged sites, sites three,
19 sites four and sites five.

20 One of the things that we wanted to note
21 is there is a difference in the sediment transport
22 calculations between using daily data and the
23 sub-daily data. So we just wanted to note that in
24 general you get slightly -- it looks like -- in
25 general you get slightly higher values of sediment

1 transport using the sub-daily data than using the
2 daily data. Okay. It looks to be slightly higher
3 data.

4 These are the values for I believe 2009.
5 The first table shows the values for just using the
6 2009 hydrographs for current operations and
7 run-of-river. And we'll focus on the sub-daily data
8 that was necessary to use in order to evaluate the
9 effects of hydrocycling.

10 But looking at site three, upstream of the
11 tailrace, we have effective and dominant discharge
12 in the range around 2,500 CFS. And the total
13 sediment transported is around 1.1 million tons.

14 Going downstream of the tailrace return,
15 that dominant and effective discharge goes to
16 approximately 4,700 CFS for the dominant discharge,
17 and 5,600 CFS.

18 The total sediment transport capacity at
19 site four under current operations is around
20 3 million tons per year.

21 Okay. Looking at the same parameters for
22 the run-of-river condition, the dominant and
23 effective discharge is approximately 4,600 CFS and
24 4,800 CFS, with capacity at site four downstream of
25 the tailrace return of around 2.8 million tons per

1 year.

2 Okay. Similar trends we see at the site
3 five near North Bend, the dominant discharge and the
4 effective discharge were around 42 and 4,500 CFS,
5 and the total sediment transport capacity is around
6 2.3 million tons for current operations, and it's
7 very similar results for the run-of-river
8 operations.

9 That is for just evaluating the 2009
10 hydrograph.

11 Next we look at 2003 to 2009 to get a
12 longer term feel for how this would respond. Here
13 are the sediment transport indicators, that being
14 total sediment transport effective and dominant
15 discharge for current ops and run-of-river.

16 At site three, again, just focusing on the
17 sub-daily data, we're about 2,400 CFS for the
18 effective and dominant discharge, with a total
19 sediment capacity of around a million tons.

20 Looking at site four, the dominant and
21 effective discharge is roughly around 4,000 CFS for
22 current operations -- that is -- for run-of-river
23 it's slightly lower, 3,900 and 3,400. And the total
24 sediment transport capacity is also slightly lower
25 at about 2.4 million tons. That's the average

1 annual sediment transport capacity. And, again,
2 those values are similar to what we would see at the
3 North Bend gage.

4 Okay. We plotted those -- kind of plotted
5 those spacially on the map so you can see the
6 trending from upstream to downstream.

7 LEE EMERY: Figure 236.

8 PAT ENGELBERT: I'm going to focus on the
9 '03 to '09 stuff so we get kind of a longer term
10 feel for it.

11 At site three the sediment transport
12 capacity is around a million tons. Downstream of
13 the tailrace it's about 2.5 million tons. And then
14 again working our way downstream. That was for
15 current ops. For the run-of-river condition, we've
16 got at site three still about a million tons, but
17 the downstream of the tailrace it's about
18 2.4 million tons under run-of-river condition as
19 opposed to going back to slide 236,
20 2.53 million tons. So you have a slight decrease in
21 the total sediment that is being transported on an
22 annual basis. And, again, working our way
23 downstream.

24 So in summary, in summarizing those
25 results, the sub-daily values, the sub-daily

1 hydrograph values that we used result in slightly --
2 they have slightly higher sediment transport results
3 than do the daily values.

4 A couple things, the short-term values
5 differ from long-term values by up to 40 percent.
6 So if you're looking at just a year versus that
7 six-year trend, that's why we -- you know, we tend
8 to focus on sediment transport calculations looking
9 at a long-term trend as opposed to an annual basis.

10 And then last the total sediment transport
11 capacity is slightly higher for current operations
12 than what we see on a run-of-river condition.

13 So any questions on just the sediment
14 transport calculations that were performed comparing
15 current operations to run-of-river?

16 Next I'm going to go into kind of the
17 channel characteristics and how those differ between
18 current ops and run-of-river for the dominant
19 discharge, so --

20 LEE EMERY: Paul, any questions?

21 PAUL MAKOWSKI: As you move downstream, I
22 notice that the capacity does not necessarily
23 increase, and that the biggest deficit or the
24 largest capacity -- I really haven't had time to
25 think about it. Is there a quick explanation?

1 PAT ENGELBERT: Well, there is a couple
2 things that -- you know, at site four, and we kind
3 of alluded to it a little bit earlier. Developing
4 the sediment discharge rating curves for the sites
5 was based on the one survey. When you look at the
6 other parameters, one of the more important ones,
7 that being the D-50, that was based on linear
8 interpolation, so I'm assuming the combination of
9 those two are what's slightly skewing those
10 transport capacities at site four.

11 PAUL MAKOWSKI: So should the comparisons
12 be between the run-of-river and the current
13 operations versus spatially?

14 PAT ENGELBERT: That comparison would -- I
15 think would be a relative comparison, but if we're
16 comparing site three to four to five to six
17 spatially, that gets a little trickier just because
18 we use the one single year survey values.

19 But the comparison that we showed in the
20 table did show site four run-of-river versus current
21 operations, which is probably, you know, a
22 reasonable comparison between those two conditions.

23 PAUL MAKOWSKI: I'll have to continue to
24 think about it.

25 PAT ENGELBERT: Okay. Any other comments,

1 questions, Lee, anybody? I know it's exciting.

2 GEORGE WALDOW: I'll give you one. George
3 Waldow, HDR. Your third bullet point there, there
4 is a reason for that; would you share that? Would
5 you share the reason for the third point conclusion?

6 PAT ENGELBERT: The third point is the
7 total sediment transport capacity is slightly higher
8 for current operations than it is for run-of-river.
9 And the reason for that is the sediment transport
10 relationship is a nonlinear relationship. The highs
11 aren't offset by the lows when you're looking at a
12 daily hydrocycling thing, so the mean does not give
13 you the average between the high and the low,
14 because the high is a little bit higher than the low
15 is lower, if that makes any sense at all.

16 So basically because the high point
17 transports more, and it's not offset by the low
18 point, the mean daily does not give you the average
19 of those two. So during the hydrocycling, the
20 higher transports more than what is offset by the
21 low, so it's slightly higher than the mean -- what
22 the mean discharge would give you.

23 Any questions on that, more confusion?

24 Okay. With that I'm going to move on.

25 What we did next is we took the -- similar

1 to what we had done in the past, we took the
2 dominant discharges and we compared them to the
3 widths and depths associated with those dominant
4 discharges, and we compared them for current
5 operations and a run-of-river condition.

6 Okay. This is for 2009.

7 LEE EMERY: Slide 239.

8 PAT ENGELBERT: The effect -- the
9 effective and dominant discharge, you can see that
10 for current operations because the -- you know, the
11 discharge is slightly higher. You have slightly
12 greater wetted widths under current operations than
13 you do under the run-of-river condition.

14 JEFF RUNGE: Sorry, Pat. Question here.
15 Did you take the effective and dominant discharges
16 and run that through the HEC-RAS model as far as
17 like to get those numbers?

18 PAT ENGELBERT: We generated these numbers
19 from the RAS model using those relationships that I
20 showed this morning. So it would be an average of
21 all the cross sections for a range of flows. But
22 it's a good question, because we did take a look at
23 for that dominant discharge what would the width and
24 depth be, and it fell right on where we expected
25 because we used the model to generate those

1 relationships. We used the model to prove the
2 model. Unfortunately it wasn't really a validation.

3 We used the model to generate the
4 relationships, so in going back and running that
5 discharge in there we would expect it to prove out
6 what the relationship showed.

7 JEFF RUNGE: The values that you used to
8 prove those would be the -- you ran the effective
9 discharge for all the multiple -- well, in this case
10 just for 2009, a single flow value, the effective
11 discharge to come up with those numbers, and then
12 the dominant discharge a single value for both
13 operations, and that came up with those values?

14 PAT ENGELBERT: Right. And it was based
15 on that relationship -- using the best fit
16 relationship between that range of depths and
17 velocities and widths that we had gotten from the
18 model.

19 JEFF RUNGE: Okay.

20 PAT ENGELBERT: So from this graphic you
21 see the width is slightly smaller for a run-of-river
22 condition than it would be for current operations.

23 Similarly, the depth is slightly greater.
24 Again, this is looking at 2009. Slide 240, the
25 depth is slightly greater for current operations

1 than a run-of-river condition.

2 Here is a graphic showing the 2003 through
3 2009 hydrographs looking at the widths and depths.
4 The bars go from left to right sites three, four and
5 five for effective discharge, and then sites three,
6 four and five for the dominant discharge.

7 Similar to what we saw in 2009, the widths
8 are slightly smaller under current ops than
9 run-of-river as are the depths.

10 So in summary, for looking at the channel
11 characteristics versus the sediment transport
12 calculations, the channel widths and depths are
13 slightly smaller for a run-of-river operation than
14 for current operations. Again, that goes back to we
15 have slightly greater sediment transport under
16 current ops than we do under the run-of-river.

17 The last thing that we did is we compared
18 the current operations' dominant discharges to
19 run-of-river operations' dominant discharges, and we
20 plugged those in our regime graphics to see if that
21 would cause a transition from one regime to another.

22 So looking at a regime analysis -- again,
23 this is Chang's graphic.

24 LEE EMERY: Figure 244.

25 PAT ENGELBERT: We plotted the current ops

1 and run-of-river dominant discharges on the regime
2 graphics, and it showed that it's still within --
3 clearly within that braided regime.

4 Similarly, to Lane's relationship, our
5 graphic shows that for both current ops and
6 run-of-river from a sediment transport perspective,
7 it's still well within the braided regime.

8 So in summary, the regime analysis,
9 current operations and run-of-river operations are
10 both well within the braided river morphology, with
11 neither transitioning from one regime to another, to
12 another morphology.

13 So just to summarize the results from
14 objective three, the run-of-river operation would
15 carry less sediment than current operations, and the
16 channel would likely be slightly smaller in a
17 run-of-river operation as compared to a current
18 operation.

19 LISA RICHARDSON: Can you give us just an
20 idea of how much smaller the width would be and how
21 much smaller the depth? Is it -- I was looking at
22 your slides, it's pretty minor.

23 PAT ENGELBERT: The depths would be, you
24 know, in the order of tenth of a foot maybe over
25 this long-term average, you know, and the widths

1 would maybe be in the order of 30 to -- 20 to
2 30 feet, something like that. We've got the numbers
3 in the tables in the report, but we thought it would
4 be easier to see in a presentation graphically using
5 bar charts. So probably in the order of, you know,
6 20 to 30 feet, something like that.

7 Any questions on the sediment transport
8 calculations that were performed comparing the
9 current operations to a run-of-river operation?

10 GARY LEWIS: Pat, a comment on those
11 widths. Bear in mind that's the wetted width. It
12 may or may not have anything to do with examining
13 widening. It's the wetted width for that discharge.
14 The discharge is lower, it has a less wetted width
15 than the higher discharge, so these are the wetted
16 widths, not the channel widths. I think it's
17 important to distinguish those two.

18 PAT ENGELBERT: Any questions on that?

19 JEFF RUNGE: That's a difference between
20 the two, but as far as applying an effective or
21 dominant discharge, which is a channel forming
22 discharge, I guess I don't see -- you know, I guess
23 why did you select the effective or dominant
24 discharge as the measure to compare between the two,
25 run-of-river and --

1 PAT ENGELBERT: You know, it goes back to
2 the original definitions that it is those
3 discharges, the effective and the dominant that are
4 ultimately resulting in the shape of the river, so
5 in evaluating what their widths and depths would be,
6 what the river is pushing it toward, what it's
7 trending toward, we used those values to see what
8 the width and depth relationships were -- or what
9 the width and depth values were relative to that
10 particular discharge.

11 JEFF RUNGE: Yes, except you mentioned
12 that those are channel forming discharges, but this
13 is a fixed bed. I mean, there is no channel
14 evolution that's predicted as a result of that.
15 It's just -- you know, it's static, it's just
16 changing wetted width, it's not predicting how that
17 results in the change or evolution of the channel
18 itself.

19 PAT ENGELBERT: That's a good point.
20 These models are a fixed bed, rigid bed model.
21 However, the relationships, for example, at the
22 gaged sites, the relationships are based on, you
23 know, general trends of the width and depth
24 relationship over a wide variety of discharges.
25 Similarly with this model -- we did look at two

1 points in time, it was the best information that we
2 had, and that's our best estimation of what that
3 width and depth would be looking at two points in
4 time.

5 I mean, you see differences in widths and
6 depths just between the June and September surveys,
7 so it's the best estimate that we have based on the
8 data we had available.

9 It's a good point. Clearly it's a
10 limitation that's noted in the report.

11 Anything else, any other questions,
12 comments, observations?

13 With that I'm going to turn it back over
14 to Matt Pillard who's going to talk about objective
15 four.

16 LEE EMERY: Slide 248.

17 MATT PILLARD: Okay. Objective four was
18 to identify the material differences in potential
19 effects on habitat of the interior least tern,
20 piping plover, and pallid sturgeon.

21 The task associated with this objective
22 were to look at the effects of hydrocycling on
23 interior least tern, piping plover, pallid sturgeon,
24 and isolation of backwaters and side channels.

25 The methods that were done to perform this

1 were a literature review and a comparison to other
2 river systems. We looked at the Peters and Parham's
3 discharge versus habitat relationship. We evaluated
4 the lower Platte River stage change study. We did a
5 comparison of the cross sections that were performed
6 in the early summer and late summer. And we looked
7 at habitat evaluation using the HEC-RAS model that
8 was developed.

9 So to begin with the methodology for the
10 comparison to other rivers, we looked for rivers
11 that were within the range-wide survey population
12 counts, rivers that had some flow alterations and
13 structures on them, and the rivers within the
14 interior of the country, meaning we weren't looking
15 at coastal areas.

16 We compared the habitat characteristics of
17 these systems. We looked at the flow operations of
18 those systems compared to project operations, and we
19 looked at the population counts from those
20 range-wide surveys downstream of the structures on
21 these other rivers.

22 The rivers that were chosen to look at for
23 interior least terns were the Red River below the
24 Denison Dam, the Arkansas River below the Keystone
25 Dam, Missouri River below Fort Randall Dam, and

1 Missouri River below Gavin's Point.

2 For piping plover we looked at Missouri
3 River below Fort Randall and Missouri River below
4 Gavin's Point.

5 And for pallid sturgeon, the other rivers
6 that were looked at were the Yellowstone River below
7 the intake, the Missouri River below Fort Randall
8 Dam, and again Missouri River below Gavin's Point.
9 And this is just a graphic, slide 252, kind of shows
10 geographically where these locations are.

11 Again, for terns and plovers we already
12 went over the four rivers we're going to look at.
13 This table here kind of shows -- the next two slides
14 actually, 254, 255, which show kind of summary
15 differences between these systems.

16 I guess the main things to point out are
17 the Platte River below the Loup tailrace is a
18 braided system. Most of the other systems are
19 meandering below the structure. The Red River had
20 some braided system above the dam, but it moves to
21 meandering downstream.

22 Another kind of point to point out is the
23 flows here on the Platte River were very similar to
24 the Red River. The other dams, Missouri River
25 and -- you know, obviously had much higher flows

1 somewhat close to the Arkansas River.

2 And then population counts. You know,
3 we're seeing lots more birds using the Red River and
4 the Missouri River below Gavin's Point than the
5 other three rivers, just for points of reference.

6 And then I guess finally here it's the --
7 here's kind of a look at the systems that are in
8 place, and, you know, just -- you know, the Loup
9 project is smaller in general than any other
10 projects in terms of the amount that they put
11 through the system.

12 So given all that, that makes it --
13 obviously because these systems are all different,
14 and we have different things going on, it makes it
15 really difficult to compare what projects are --
16 project operations and their effects here versus
17 what's happening on these other rivers with larger
18 dams and larger flows.

19 Some of the things that we did find out
20 through discussions with folks on these systems and
21 review of literature associated with these other
22 rivers, particularly here on Fort Randall, their
23 operations have shown that flow releases at higher
24 rates during early nesting has encouraged birds to
25 nest higher. That was through personal

1 communication with -- oh, shoot, I have it here.
2 Greg Pavelka.

3 Some of the literature reviews that we
4 looked at, Leslie, a study in 2000 on the Arkansas,
5 I believe, show that daily hydropower operations,
6 you know, were not found to be affecting birds,
7 whereas some periodic high flows was found to be
8 beneficial for nesting.

9 Again, hard to compare these systems.
10 These were just the results of what these other
11 studies were. And here because our project -- the
12 Loup project doesn't really have an effect on large
13 flows like some of these other systems. They don't
14 control larger flood events. The project's effects
15 from daily hydrocycling on sandbar formation are,
16 you know, different compared to what these other
17 systems do just because of the way the systems
18 operate.

19 Now we get into some issues on pallid
20 sturgeon, and, Scott, it's time to wake up in the
21 back corner.

22 If there are any questions on the lit
23 review piece on the birds, we can handle these kind
24 of at the end. Scott is going to go over a few
25 number of things associated with the pallid for us.

1 SCOTT STUEWE: Well, as Matt stated
2 earlier, we looked at the intake dam on the
3 Yellowstone River, the area below Fort Randall Dam
4 on the Missouri River, and Gavin's Point Dam below
5 it as well.

6 The thing we needed to look at -- or we
7 were directed to look at, of course, was the
8 substrates, the flows, temperatures, turbidities,
9 and we tried to put them in a table here for your
10 review as well.

11 We saw everything from zero NTUs up to
12 6,400 NTUs. And I don't know, I looked at the
13 Platte over lunch, it looks like it's like 6,400
14 today.

15 But as you can see, there is a very wide
16 range in flows that we needed to look at, so it made
17 a comparison rather difficult at best.

18 Describe a little bit of what the dams are
19 doing presently, hydropower facility at Gavin's
20 Point. Primarily at Gavin's Point they use it for
21 flow control and water level fluctuations on the
22 Missouri.

23 Again, it's a large reservoir, so you have
24 hypolimnetic releases, which is not what happens
25 with the Loup.

1 The same thing kind of like at Fort
2 Randall. Daily releases for power generation, which
3 I guess you would equate back to what the Loup does.
4 Again, it's in a large reservoir, again hypolimnetic
5 releases.

6 The intake dam on the Yellowstone is
7 different. It's kind of like the diversion that we
8 have on the Loup as it -- water is diverted through
9 an irrigation canal. It was noted that this does
10 cause some entrainment of fish, and once they get in
11 there they can't get out.

12 As for the Loup, very little entrainment.
13 They are coming up through the system since we were
14 talking about the pallid.

15 LEE EMERY: Slide 261.

16 SCOTT STUEWE: A very wide range of
17 habitat is utilized by the pallid sturgeon. Not
18 necessarily because it's the best, but it's what's
19 available. So we've seen the collections are -- for
20 pallids have been deep water, shallow water, gravel,
21 cobble, sand. They evidently can be collected
22 anywhere. And as the studies go further with USGS
23 and through the University of Nebraska-Lincoln, they
24 are going to narrow those down even further.

25 They seem to prefer sand and fines

1 particularly as young, but they have been collected
2 over the gravel and cobble areas. They think that
3 this may be some response to spawning. In personal
4 communication and with some reports from DeLonay
5 with USGS, they have been -- seem to be gravitating
6 towards the revetment areas on the outside corners
7 of the Missouri River.

8 Stream bottom velocities have been highly
9 variable, anywhere from zero to 4.2 meters per
10 second, which, you know, you can say that's twelve
11 foot per second, just round it off. Normally what
12 we've seen in the Platte is around two foot per
13 second.

14 Depths have ranged from approximately two
15 foot in depth to 45 feet, and they are collecting
16 these fish particularly in the Missouri River behind
17 entrainment structures.

18 Again, water temperature, they are highly
19 variable. They can be found in anywhere from 32 to
20 86 degree Fahrenheit water. They don't particularly
21 like the 90 degree water.

22 Turbidity ranges anywhere from 12 to 6,400
23 NTUs.

24 Slide 262. There has been recent spawning
25 detected by DeLonay on the Missouri River. There

1 has been tracking that has occurred over the last
2 two years. They are getting a better handle on
3 where this may be occurring, though they have not
4 been able to catch the fish in the act.

5 Pallid sturgeon has not been observed
6 spawning in the Platte River, though there has been
7 Scaphirhynchus species larvae that have been
8 collected. Naturally the shovelnose and the pallid
9 intermingle.

10 Other evidence of spawning has been
11 observed along the revetments below the Gavin's
12 Point area. They had hoped that they could detect
13 them up in the cobble area, but at this point they
14 haven't been able to do that.

15 We'll go into a little bit what we think
16 may be happening. It's all hypothesis. But pallid
17 captures have been on the rise in the rivers. It
18 seems to be indicative of the increased stocking
19 efforts that have occurred since 2000. These fish
20 have been tracked particularly with University of
21 Nebraska's studies. They have shown with these
22 fish, they are marked fish and they can track them
23 back to those hatchery sites where they were
24 produced.

25 They are essentially being captured on

1 sandbars and sandy substrate within the Platte River
2 area. Naturally there is not a whole lot of cobble
3 and gravel in this area.

4 There is no direct evidence providing a
5 link between hydrocycling and the reproductive
6 behavior of pallid sturgeon. It's been theorized
7 that with the releases, particularly from these
8 hypolimnetic releases from the deeper lakes, such as
9 Gavin's Point and Fort Randall, is that the
10 temperatures are colder than what those fish can
11 respond to.

12 DeLonay theorizes a combination of a rise
13 in temperature and a rise in flow induces spawning
14 activity.

15 LEE EMERY: Have any of the pallid
16 sturgeon stocking occurred in the Platte River in
17 the vicinity of the project?

18 SCOTT STUEWE: No, they haven't stocked in
19 the Platte, but what they are seeing are the
20 stockings from the Missouri.

21 RICHARD HOLLAND: There have been
22 stockings in the Platte River.

23 SCOTT STUEWE: When did those occur?

24 RICHARD HOLLAND: 1996, -4, somewhere in
25 there. There was a small group of fish stocked at

1 Two Rivers. That's about river mile 42. There was
2 another stocking that was done at this part of
3 telemetry study. There was another stocking
4 associated with the University telemetry study I
5 believe in around 2000.

6 LEE EMERY: Could you provide that
7 information for the record?

8 RICHARD HOLLAND: I can see about getting
9 it.

10 LEE EMERY: That would be great. Stocking
11 with what size?

12 RICHARD HOLLAND: These were -- I would
13 have to check.

14 LEE EMERY: It would be interesting to
15 know that information.

16 JOHN SHADLE: Large enough to track.

17 SCOTT STUEWE: Thanks. I've been told we
18 probably ought to just close from here and start up
19 again tomorrow morning on this.

20 STEPHANIE WHITE: We're ahead of schedule
21 and we're early on time. I think if you've got some
22 pressing questions that you would like to ask, we
23 certainly can do that.

24 Is there anything you would like to ask
25 Matt or even Scott? Otherwise I think we can

1 continue this conversation in the morning at 8:00
2 sharp.

3 (4:33 p.m. - Adjournment.)

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.	140 [1] 94/16	2003 [9] 99/1 99/4 99/6 196/13 200/24 201/18 201/23 206/11 213/2
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.65 [1] 162/22	14th [1] 181/16	2008 [8] 99/15 99/19 99/19 101/2 101/3 103/5 103/6 140/24
.7 [1] 163/5	15 [3] 78/16 101/13 156/14	2009 [29]
.86 [1] 74/22	15 percent [2] 171/20 171/25	2010 [6] 43/12 53/25 56/2 82/12 82/15 170/10
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1 percent [1] 95/16	159 [1] 134/15	205 [1] 181/7
1,000 [1] 192/23	15th [7] 184/3 187/20 193/19 197/3 197/4 198/1 198/2	206 [2] 181/13 182/10
1,012 [3] 47/25 48/1 59/12	16 [1] 17/10	208 [2] 182/22 183/10
1,100 [2] 113/3 194/5	163 [1] 143/12	209 [1] 186/2
1,500 [4] 106/19 113/6 124/9 124/10	168 [1] 145/14	20th [2] 159/12 163/18
1,500 feet [2] 106/23 166/22	17 [1] 189/22	21 [3] 20/17 35/25 39/6
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1.1 million tons [1] 205/13	174 [1] 150/8	211 [1] 186/25
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1.3 feet [1] 193/3	177 [1] 154/5	215 [1] 188/9
1.4 feet [1] 194/1	18 [6] 18/13 18/14 19/12 50/2 97/10 178/24	217 [1] 191/25
1.75 [1] 70/16	1800s [1] 96/14	22 [3] 21/6 39/6 147/19
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10 percent [3] 62/22 154/18 172/13	1849 [1] 145/19	220 [1] 195/2
10-meter [1] 170/20	187 [1] 167/9	226 [1] 200/3
100 [3] 37/3 46/23 152/13	19 [1] 31/22	228 [1] 229/10
100 miles [2] 46/25 60/9	19 inches [1] 173/5	22nd [1] 185/9
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1000 [2] 152/21 154/17	1913 [1] 157/9	234 [1] 204/16
101 [2] 152/10 189/23	1917 [1] 157/8	235 [1] 95/1
102 [2] 59/13 62/20	1918 [1] 157/9	236 [2] 207/7 207/19
105 [1] 87/20	1920 [1] 156/22	239 [1] 211/7
106 [4] 7/6 7/25 8/18 87/22	1936 [1] 145/18	24 [2] 22/6 39/7
107 [1] 89/10	1937 [4] 145/18 148/22 148/23 177/16	240 [1] 212/24
108 [2] 89/19 152/2	1940s [1] 162/3	244 [1] 213/24
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11 [4] 8/18 66/18 140/16 151/23	1960 [2] 145/21 146/2	25 [14]
11,000 [4] 56/25 57/6 71/5 71/6	1969 [2] 176/19 176/22	25 miles [5] 46/22 47/8 47/13 60/9 70/8
11,800 [2] 72/21 73/20	1978 [1] 103/4	25 percent [7] 98/7 111/19 112/11 112/12 112/17 113/15 113/17
110 [1] 91/6	1993 [2] 176/19 176/22	2500 [1] 26/19
113 [1] 93/10	1996 [1] 226/24	252 [1] 219/9
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