TASK FORCE MEETING ON REDWOOD NATIONAL PARK

Held at Library, U.S. Geodetic Survey

Menlo Park, California

Monday, June 12, 1972
8:30 o'clock a.m.

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

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| ASSISTANT SECRETARY REED'S OFFICE: | DR. RICHARD CURRY<br>Science Advisor |
| UNIVERSITY OF CALIFORNIA --<br>EARTH SATELLITE CORP.: | DR. EDWARD STONE<br>MR. PHILLIP LANGLEY |
| NATIONAL PARK SERVICE: | MR. JOE RUMBURG<br>Washington, D. C. |
| | MR. ROBERT J. SMITH<br>San Francisco, California |
| REDWOOD NATIONAL PARK: | MR. JACK DAVIS<br>MR. TED HATZIMANOLIS |
| U.S.G.S. -- MENLO PARK: | DR. EDWARD HELLEY<br>DR. RICHARD JANDA<br>MR. WILLIAM BROWN III<br>MR. LIONEL JACKSON |

Reported by:

PAUL SCHILLER, C.S.R.

DR. JANDA: In March, Ed Helley, Dick Curry, Ed Stone, Bill Brown, myself, Ted Hatzimanolis and Jack Davis, among others, held some discussions in an area adjacent to the Park concerning buffer requirements for protecting just the Redwood Creek Corridor of the Park.

After spending several days in the field, we finally got to trying to bring a lot of isolated observations together by constructing a series of buffer input matrices, actually we only constructed one in the field, where along the ordinate we put a series of potential deleterious inputs to this corridor, and along the abscissa we put a series of potential buffers, and then within the body of the matrix we tried to evaluate what the relative effectiveness of each potential buffer would be in terms of stopping a particular input.

That initial matrix was made from the point of view of protecting the redwood eco system along the alluvial slopes of that corridor.

When we came back, Ed, Bill, Bob Averett, who was also part of our original team, and Walt Heim and myself sat down and constructed another matrix from the point of view of the aquatic eco system in this area.

I then went up to Berkeley and sat down with Bob Twist and Jens Sorensen to find out how we could go about constructing a similar matrix or matrices in conjunction with the aesthetic values that are present in this.

We have these matrices in fairly firm form right now. On this chart (indicating), at any rate, we tried to show graphically what the different buffers are in terms of area, where they are, et cetera.

Some of the potential buffering procedures that we talked about and tried to put on the matrix were, one, what kind of management practices could you do within the existing Park to protect it?

The other was, what could you do in terms of obtaining management easements on the area upslope from this corridor, which was the proposal which was contained in your recommendations of November, I think, of last year.

What could we do by simply obtaining an 800-foot wide buffer all around to corridor, and we evaluated the effectiveness of that buffer. That was managed in two ways: one, if you left it alone, and one, if you used it as an active management area.

We then talked about the possibilities of obtaining or actual outright purchase of landslides of various degrees of activity. The most active portions of the landslide are shown in, I think, the crayon said vermilion, and the older, less active portions of the landslides we show in pink.

We talked about obtaining as another kind of buffer, either management easement or outright purchase, of strips along here (indicating), and at that time we said major tributaries, maybe to be precise we should say second order and higher tributaries.

We talked about the outright purchase of selected tributaries, and then in terms of areas that are involved we talked about what could be accomplished, and this is an obscure thing, by total basin management.

DR. STONE: How far do those landslides go? How far did you go back into the watershed?

DR. JANDA: Okay, for this map we were concerned solely with the area from Copper Creek on downstream. This is Copper Creek here (indicating), which is the key on the Elam Creek Peak quadrangle, and the landslide interpretation goes on down to the edge of that quadrangle.

Let's back up, one of the things that I think the whole study team agreed to when we were in the field was that perhaps the most imminent threat to the old growth forest that has been set aside in this corridor is associated with channel aggradation and channel deflection along the main channel of Redwood Creek. Aggradation leading to burial of the old trees in the flats, causing channel migration laterally, undercutting the banks, initiating landslides and opening a whole can of worms that would have very complicated feedback mechanisms that would tend to accelerate on themselves.

I think two comments are germane here: One is that the area downstream from the self-boundary of the Park comprises only about 10 percent of the total drainage area of Redwood Creek, and so we had some discussion in the field, can you really do anything

significant in this small proportion of the drainage area, when you have all this activity going on upslope?

Volumetrically most of your material is going to be derived well upstream from the Park.

Okay, volumetrically, I think, that argument is valid, but there is another aspect of the argument, things which are going on likely in the side-stream tributaries will affect the ability of Redwood Creek, whatever is put in at the south park boundary through that region, the natural channel may be able to take through the Park what is introduced at the upstream limit, but if we allow it to have side-stream deltas going on, a number of log jam channels, et cetera, we may reduce the ability of the channel.

DR. HELLEY: This phenomenon that Dick is describing has been well documented in other streams in Northern California, the Trinity is one, which is losing its natural steelhead fishery and portions of the Eel River are doing this, where the tributaries contribute so much more to the flow, the stream is changing rapidly.

DR. STONE: You're thinking of the sand accumulation and this type of thing as the result of the dam?

DR. HELLEY: No, not as a result of the dam. A good example from the Trinity River, there is a volume release flow, that does not take care of the side-stream tributaries, so that is an analogous situation.

DR. STONE: That is actually where you have a restricted

flow. How would that be analogous to this one?

DR. HELLEY: Actually, there is an enormous load, the deltas --

DR. STONE: In one thing you are cutting down the floor.

DR. HELLEY: We have increased the load.

DR. JANDA: We have more than increased the load, we are making local sediment traps, there is more debris, so it is no longer smooth travel bed, at least it was not when I walked up it a couple of weeks back. There are all sorts of debris jams and most of those debris jams are comprised of sawed logs, or the vast majority of the logs in the water.

Let's make some comment on the 800-foot wide buffer, which their interim recommendations suggested the outright purchase of. It is the dark shaded area. If other people want copies of it, there is a row of them up here that we can distribute

DR. HELLEY: The name of the 800-foot wide buffer effectively is the Stone Zone.

DR. STONE: Thank you, that is stones.

DR. JANDA: The reason that we proposed this buffer is that it seems like a very effective way of protecting the old growth within the Park from wind flow, from fire, from slopewash from upslope, from "Cat"-moved dirt, primarily these things.

That does nothing or essentially nothing to protect the trees from this channel instability problem with which we are so concerned, and therefore we feel that something in addition to

that buffer is required.

DR. CURRY: Does that handle have tributaries here on the map? These little fingerlings that come down and are running through the zone, does it handle it? Does the buffer principle that you were talking about, one of the real problems of the mainstream channel is what is flowing down through here, will this 800-foot-wide buffer on the little tributaries alleviate the formation of the delta?

DR. JANDA: No, it will have a minimal effect.

In fact, just this last week I walked -- there are two unnamed tributaries, we have several unnamed tributaries, and it gets awkward to say "the unnamed tributary north of this," or let's get some nomenclature.

This big creek here (indicating) which we talk about in our interim recommendation is the unnamed tributary, this is Harry Weir Creek (indicating), and the other two streams to the north, which we will talk about, these are on the Arcata cut, let's call it Arcata north and Arcata south.

Last week I walked around in Harry Weir Creek, Arcata north and Arcata south. Harry Weir Creek we're going to talk a lot about, I hope, in the next couple of hours. It contains, for one thing, the largest extent of uncut old growth adjacent to the present Park boundaries.

At any rate, in terms of Dick's question, I walked around Arcata north and Arcata south, walked down the creek and

the channel aggradation, the undercutting and so forth that we observed up in the logged areas extends right down through the proposed buffer and through the Park into the channel of Redwood Creek.

It diminishes in a downstream direction, but there is a recent cut, so there is a chance this damage is working its way downstream, which I think is probably the case.

One of the other things I realized but last week when I was walking around in these areas is that many of the most spectacular trees in the Park and in the proposed 800-foot buffer are immediately adjacent to or in some instances in the tributaries, so when you start cutting sides, you are going to cut some of the neatest trees. These are some of the trees that are most visible to the Park visitors, because their access would be most visible all along the stream, rather than going up the slopes.

DR. STONE: Essentially, you see through the buffer up these creeks?

DR. JANDA: Yes.

DR. STONE: Essentially you can see right out of the Park through those creeks?

DR. JANDA: Right.

DR. STONE: And in the aesthetic sense that is going to be a problem, but this was not a part of the initial setup, so there was no provision in the buffers for anything aesthetic. Is that still the case, Dick, are we to divorce ourselves completely from

aesthetics? To me it seems that is maybe what the Park is all about.

DR. CURRY: I don't think we need to divorce ourselves. Ed was pointing out in terms of the original mandate.

DR. STONE: I think it would be well to keep it separate.

DR. CURRY: Because that is certainly going to be a separate issue that we have to deal with Congress. I don't think we have a direct authority to deal with aesthetics in this instance, but we may find ourselves, after this review, that we will want to have this kind of information to get into an oversight hearing so we can put it into the record and put Congress on notice.

MR. RUMBURG: I don't think we can ignore it. I have one problem, so I am on the same base as everyone else: What is your color code, Dick?

DR. JANDA: You mean the greens? I colored them so they would stand out separately, each separate basin. There are so many lines on the map.

MR. RUMBURG: But you are identifying small watershed drainages, drainage areas?

DR. JANDA: Yes, and then the acreages are given, to just sort of help your eyes follow this, because it was an incredible mess of lines.

DR. CURRY: Maybe again, before we take off for NASA, we want to look at the shapes.

The ones you showed us, the trip in June, that was really a pregnant discussion, because you get into aesthetics there, too.

DR. JANDA: Those slides are still not put together in any sort of systematic way. Before we show you the slides, then, let me say why I made this last couple of days' trip through the Park. There are some thing I was very much concerned about. One was this creek, Harry Weir Creek.

And also I was concerned about the fact that our south Park boundary gauge last winter there was 19 feet of gravel deposit in two separate events, a total of 19 feet, so one of the things I wanted to do was to see what the longitudinal channel distribution of that gravel was.

So I walked from Coyote Creek to the south Park boundary along the channel of Redwood Creek, and interestingly enough, the aggradation set in essentially at the mouth of Copper Creek.

The gravel which was aggraded in the channel of Redwood Creek was a different geology than the gravel coming out of Copper Creek, so I am not suggesting that all this aggradation was sluiced out of Copper Creek, but this was the first aggradation that jarred me in terms of thinking maybe the materials coming out of the side-stream tributaries are affecting the ability of the mainstream to transport the stuff which is introduced from up above.

The other thing I was concerned about was Harry Weir Creek. Harry Weir Creek has a drainage area which is somewhat

larger than Copper Creek. Here is Copper Creek, here is Harry Weir Creek (indicating).

The channel slope is somewhat less steep than Copper Creek. There are fewer landslides in Harry Weir Creek than in Copper Creek. Copper Creek is essentially one giant landslide, it was an incredibly dumb place to do the kinds of things that they did.

In terms of thicknesses of the soil, looking at the soil vegetation maps and my own observations in the field, the soil cover in this basin is relatively thin. You could easily create with not too terrible much erosion a lot of rock monuments, especially on some of the steeper slopes. There are some places with slopes of 80 or 90 percent.

The forest which is in there is a magnificent forest. When we were up there in March, we were talking that this is one remaining uncut basin remaining next to the Park. I drove to Harry Weir Creek on forest roads, and the whole forest was concentrated there, and the two hours I was in there, I was tabulating in my book when trucks were coming and going, and it seems they were coming and going at a frequency of about one every 20 minutes. I don't know what that means in terms of acreage, but they're cutting vigorously in there right now.

I am concerned that if they cut this basin the way Copper Creek was cut, that a slug of alluvium and debris could come out of this basin, get into Redwood Creek. Immediately downstream

from there is an area of potential landsliding, some of which is quite active. It is conceivable that we could accentuate the movement on that landslide, and all of a sudden we are at the Tall Trees Grove, which is, I suppose, your showpiece.

In other words, I think you're going to have to be extremely careful about what happens in Harry Weir Creek in terms of protecting the Tall Trees Grove.

Okay, the other thing I was concerned about, I had never walked the channel of Redwood Creek. I never walked up the road to the Tall Trees and had seen them, so I did that. One of two things struck me there: One of the real problems you have in the Park is that trail has its high points, but much of that trail is just like walking along any other logging road in second growth throughout the Northwest, in that you're walking in alder thickets for long distances. There are culvert failures, places where the road slid out and left ugly scars.

We are getting involved not just with aesthetics, because some of the slope failures we're talking about are sending sand right into Redwood Creek right next to the Tall Trees Grove.

DR. CURRY: What is the growth line?

MR. HATZIMANOLIS: The M line.

MR. DAVIS: We are maintaining it as a trail only.

DR. STONE: Georgia Pacific has taken a position that happened after they turned it over to the Park, I don't know whether that is so or not.

DR. JANDA: There are some real problems associated with that trail. In fact, that is a good example of the kinds of problems we were talking about happening on some of the cutover land above the Park, if the roads are not maintained. Once these culvert failures start getting gullies, the thing can feed on itself, accelerate and trigger landslides.

What I'm saying, this is an example of some of the kinds of things that may have to be done in terms of management in the Park to protect the Park.

The other thing that was striking to me, this was in the middle of the week in early June, school was still in session, and there is a lot of use on this trail, and in a skinny little corridor like that, it seems like some of the foot traffic problems that some of the redwoods experience around the Bay Area could very quickly develop up here.

Just to throw out a wild sort of suggestion, here is Harry Weir Creek. It is a creek you are very much concerned about. It is probably not my prerogative to suggest this, but you do have acreage, I think there is much to be said for acquiring Harry Weir Creek, and you can make a loop trail to go to the Tall Trees Grove, work its way to Harry Weir Creek, and come back to Bald Hills Road. That would give you a stretch of forest, and you would possibly be taking some of the pressure off from people in terms of the corridor, and you would be doing a lot to buffer the channel of Redwood Creek.

DR. STONE: You have not talked about Bridge Creek. Bridge Creek has probably a bigger stand in terms of volume per acre, considerably more probably than Harry Weir.

DR. JANDA: One of the things we have going for us on Bridge Creek is that the lower gradient of Bridge Creek is so much less than the streams coming in from the east side of the creek, that probably an awful lot of debris and stuff that is related to operations in Bridge Creek will get hung up within Bridge Creek itself.

I do agree, Bridge Creek is a matter of much concern. In fact, you people can tell me that, as I was driving back on Bald Hills Road and looked across the valley, there is a gigantic new landing on the left bank of Bridge Creek which was not there in March.

MR. HATZIMANOLIS: As you're looking up the creek?

DR. JANDA: On the north bank of the creek.

MR. HATZIMANOLIS: It is not a landing, if you and I are thinking of the same place, it is where they are making a log reload area for reloading their logs, a distribution point.

DR. JANDA: That must be close to the proposed 800-foot buffer.

MR. HATZIMANOLIS: The one I'm thinking of is not. It is about half a mile, better than half a mile, unless you want to go that close, it is at the junction of the C and G line.

DR. JANDA: We are not talking about the same thing. We

better not talk in such fuzzy terms.

Anyway, big changes have taken place since this team was there in March.

DR. CURRY: Would the NASA photos show that?

DR. JANDA: They were taken about the time we were up there or shortly thereafter.

MR. LANGLEY: Bob Smith, Joe Rumburg, and Lionel Jackson.

DR. CURRY: May I suggest that you take the fellows for a walk down Redwood Creek now.

(Showing of Slides)

MR. BROWN: The slides which we're going to see were taken by Janda only last week, so you will see some of the things we did not see when we went there as a team in March.

It is essentially a walk up Redwood Creek. There is a parking lot near the mouth of Redwood Creek, it is upstream of the Fearley (Prairie) Creek confluence, you walk up a little walkway from the fence and Dick took pictures of Redwood Creek, taking a look at some of the log streams and the aggradation occurring with the debris.

This is the delta at the mouth of Tom McDonald tributary coming into the stream.

There will be some scenic shots to try to emphasize the aesthetic value or beauty in the Park. It is a magnificent old growth.

This is what Dick was talking about by seeing a lot of

people on the trail. I think the point here, Bill, is the fact that this tree was in a landslide. The tree is tilted from the vertical, this is a landslide area, and one tree has fallen in a natural slide.

The stem of the tree was bent also, indicating that the tree was growing and the slide was still moving. This is right at the mouth of Tom McDonald Creek.

(Showing Slides)

Here is another good example of regeneration.

This is just downstream to the Tall Trees on the cutover area.

MR. HATZIMANOLIS: Part in the Park and part on Arcata redwood.

MR. BROWN: But the point is in the Park there is tremendous change.

Again, you are walking on a road, or it was a road. Here it is again. This is the M-line road. Many places the alders have covered the road completely, so you walk through a thicket of alders.

This is the Gloquet cut, and you can tell more about this particular slip out in the road.

MR. HATZIMANOLIS: That is a culvert failure, again.

MR. BROWN: Again more slope failure on the road. You said "culvert failure," I don't have to say any more (indicating). You're looking right straight at the Tall Trees. This is the

delta, and you can see the brown cut bank.

The grooves in the foreground are tributaries of the deltaic system of Tom McDonald Creek. It comes right out at the Tall Trees.

The more important point was that you could see debris and drift back into the Tall Trees Grove. I believe, Ed, you have seen deposition on this particular flat before.

DR. STONE: As to the heavily silted, you can probably find by looking in some of the old trunks, you can get six or seven feet of silt.

DR. JANDA: Last winter there was a foot of silt deposited on the average.

DR. STONE: Did you say that tree, where there is actually basically way below the surrounding deposits or not?

DR. JANDA: Ed, I went up and back very quickly.

DR. STONE: There is one tree that has been protected from deposition inside the tree itself. On the outside you have this big deposit, and it must be at least six feet.

DR. JANDA: I estimated walking around there that last winter's storms were approximately a foot.

Do we have any idea of the maximum amount of aggradation Sequoia can take?

DR. STONE: In the Rockefeller Grove we had a 3-foot deposit in '55 and a 4-foot deposit in '64 over that period of time.

DR. JANDA: You're talking about fine sand and silt, not gravel?

DR. STONE: This had a little bit of both. As long as you have finer mixed up with the gravel, as long as you don't have organic matter incorporated with it, there is no problem. If it is all gravel, the redwood has difficulty to put the roots through the gravel. You will find in the lenses of fine materials, the roots will come up through the lenses. This one here, one problem would be if you had a lot of silting and you had all this organic matter on the ground, this would give you some difficulty, but this could be controlled by keeping the organic matter down, as long as you don't have a lot of gravel you could keep the organic matter down.

Basically, aren't you getting the heavy deposits here?

DR. JANDA: Everything that I saw was undoubtedly carried in suspension. The reason I took this photo is that the geologist may not see anything very significant in this, but if this delta of Tom McDonald Creek accumulated slowly, there would have been bedding or stratification. It would have been a deposit and various kinds of internal structures. This is completely structureless, essentially debris flows came out, mud flows came out of the side-stream tributary and deposited in this delta very, very quickly, and I think the significance of this is that this is probably happening during the rising stage, it is deposited very quickly, and these deltas are able to deflect the rising of

the creek very quickly. There is no slow build-up or question of an equilibrium situation. There is a sudden evulsion of material which instantly affects the channel of the creek.

MR. HATZIMANOLIS: What is the scale of that?

DR. JANDA: I am sorry, I did not have a scale. My guess would be this is about 4 1/2 to 5 feet.

(Showing Slide)

Pardon the aesthetics, this was Harry Weir Creek and I just had to take a couple of pictures. It is almost embarrassing when you try to grow rhododendrons down here and go to the Redwood Park and see them 20 feet high.

This is something else I'm worried about, and that is the way they're going about doing the roads. We have carefully studied the effect of logging and landslide, showing that roads are the culprits. This road was constructed immediately prior to our visit in March or since our visit in March. Notice, one, that the culvert they put in this stream is, for one thing, quite small, about 24-inch culvert in a drainage area of almost a half a mile. It is not at the base of the fill, it is within the fill. They put fill on top of it, and even before the culvert carries water, it is already halfway plugged.

Let's look at the upstream side of it. This culvert is not draining water, it is about the gradient of the creek, and there is a lake which is formed behind the fill, saturating the fill before the culvert starts to operate, and its effect is to

saturate the fill, and I wouldn't be surprised if the whole fill fell as a landslide before the culvert even carried water.

This is on the northern drainage divide of Harry Weir Creek, looking across the basin. The fog was coming in pretty quickly, but you can see the basin is essentially uncut. Their logging operations were going on in this area (indicating).

Now, when you turn and look at the other side of the ridge, turn around 180 degrees, and this is the drainage that goes into what I called Arcata south on the map.

This road was put in in 1971. This gully formed last winter. I went through some computations on this, I don't know why, but the depth varies from 6 to 10 feet. A lot of material has been introduced into Arcata north from just that one gully alone.

This is their main haul road. We have all seen this ugly stuff before, a gully, a landslide, this is the creek that I walked down, and this crud.

DR. CURRY: Arcata north or south?

DR. JANDA: This is a tributary to Arcata south, and I followed it on down.

The next pictures will take us down the creek.

DR. STONE: This is where we stopped and walked on down, I think it is.

DR. JANDA: Today this is slightly to the north where we stopped and walked down, it is pretty close. This is how the

sidecast, the dirt is working its way into the woods, we took the road up here, which is a major fork, and we took the lower fork and then walked down. It is about a half mile further to the south.

This is why I said we can flip through this, if you have seen one mess you have seen them all.

DR. CURRY: In terms of that sidecast, how far did we figure that stuff moved down?

DR. JANDA: On the Bridge Creek side I did not find any mud flows that came off the sidecast dirt that traveled more than 300 feet, and that was only one. Most of them stopped within 150 feet of the road.

On the Arcata side I found mud flows that went through. not in channels but through the forest floor flow, and one went 400 feet, and most of them went as much as 200 feet. These are pictures I took of side-stream deltas, two toppled trees by bank erosion.

This is the channel of Redwood Creek.

This is one of the road failures in the Park. This is a slide coming down directly above the Tall Trees. That would be about 1500 cubic yards in this one slide. This is crud which has accumulated behind the bridge at Tom McDonald Creek.

This is the road going into Harry Weir Creek.

The reason I took this one was to illustrate the thin soil mantle on top of the bedrock.

These seemed to be pretty typical. There is about that much soil and just bedrock underneath.

This is where we walked down into the woods when you were with us. This is in Arcata south. I had no idea I was going to show you these.

Here is Harry Weir Creek along the lower road. This is walking down now, it was difficult to photograph, because it was quite dark, but this is in terms of pacing the creek about 600 to 700 feet below the log border, and there is this jam that accumulated in the creek, and all the crud behind it.

We were walking down the slope, and now we are probably another 200 feet, and this is working its way down the tributary.

This is now within the Park and everything is so grown over it is hard to get good pictures.

This is in the Park, and here you can see that this tree has been undercut just recently, and a big splay of gravel deposited up on this right bank, which completely buried some rhododendrons, orchids and ferns. The whole understore of vegetation.

This is another one of the culverts which came out in the air in the midst of a fill, which I don't think is a very good way to build a road.

We should wait about five minutes before we leave for NASA.

We have talked about some purchases and I have introduced

some ideas here. Let me relay a little vignette and read you two pages of material that I put together here.

I got nailed while I was up in Eureka by the State Attorney General, Evelle Younger, and some of his staff, who were up touring the North Coast area, and Younger said, "Isn't it true that a State Logging Practices Code would do more to protect the Park than any land purchases the Park could enter into?"

I said, "maybe." I said, "What are the chances of such a logging practices code to be passed in time to do the Park any good?" And he said, "not very good." And he said, "Besides, the cost is a very controversial thing."

He said, "As a geologist and a man concerned with soil erosion and so forth, if you were king" -- which is an interesting way of looking at things, not having to be concerned with economics and political pressures and so forth -- "what sort of restrictions would you like to see placed on logging in the redwood region?" So I sat down and I scratched my head, and I found it an interesting exercise.

I would like to read these now in terms of some of the items that you people included in your list of things that you would want to see in any management easement that you obtain from companies.

You originally had four items listed. I have taken the liberty of rearranging those in the order that I think is most significant, and then adding an additional seven items, and let me

read this list, and you can throw rocks at me for the rest of the day, I am (modest.?)

1. Retention of the land perpetually in commercial forest production.

I make a comment, state this item first, because it is really the "guts" of the whole issue. If the soil and plant nutrient losses can be held at a level that will allow perpetual commercial forest production, it is likely that such activities will have a minimal aesthetic and physical impact upon the Park.

2. Employ cable yarding rather than tractor yarding.

I make the comment this is probably true considering most of the terrain surrounding Redwood National Park; however, on gentle slopes tractor logging may be more versatile in terms of size and nature of cuts, and there is an article I read by Hollin in 1968, who made a plea for using tractors in some areas in Douglas fir country.

3. My third item was alternate patch cutting in units not to exceed 12 acres.

My comment there is that the size of cuts should be related to local conditions, especially exposure. Avoid strips located and oriented northeast-southwest. Note that Pacific Lumber Company of Humboldt County has found that 60 to 70 percent of a stand is left after economic selection logging, wind throw is not accentuated relative to that in uncut forests. Also, note that on south and southwest explosures in southwestern Oregon

soil temperatures and evapotranspiration rates are beyond the tolerances of Douglas fir seedlings. What are the tolerances of redwood seedlings? In other words, on south and southwest basin slopes.

4. Your item was conversion of old growth redwood to second growth over a 20-year period.

My comment there was that the 20-year figure is probably unrealistic in that the conversion is already nearly complete, as the NASA photos have shown. Moreover, easements should extend beyond the initial cutting cycle.

The four are all mentioned in the National Park Service recommendations of November 1971. These items have been arranged according to my assessment of their significance.

Additional specific items that should be included in management easements are presented below:

5. Construct and maintain all roads so as to minimize erosion; avoid all mid-slope roads or provide written justification of the need for mid-slope roads where they may be needed.

6. Keep cutting at least 75 feet away from all second or higher order tributaries. That is to say, maintain an uncut strip at least 150 feet wide along all second or higher order tributaries

7. Aid regeneration of cutover land by planting rather than aerial seeding.

8. Do not construct roads or cuts in active or dormant landslides.

9. Do not burn slash unless it is essential to alleviate extreme fire hazard.

10. Obtain the prerogative to enter into contracts to stabilize all gullies and landslides that pose a serious threat to the Park.

11. Allow no winter (wet season) cutting.

12. -- this is really sort of the other end of the spectrum, which is the guts of the matter. Obtain the needed monitoring and enforcement procedures to make these things meaningful.

Okay, throw rocks at me.

DR. CURRY: Ed will cast the first stone.

DR. STONE: I think one of the things that we're going to have to do today is state very clearly what the objectives are in every case, because I keep getting kind of fouled up between what we're trying to do when you talk about, say, a south slope and you got Douglas fir seedlings that don't come in. What we ought to say is, "Can we with the various cutting systems maintain a cover?" And we recommend no cutting, say, for a strip of 175 feet.

DR. JANDA: I said 75 feet.

DR. STONE: Again, you should stay right with the objective. What are you trying to do, achieve an aesthetic relationship here, or are you really concerned with the amount of actual erosion that would occur from that cutting?

DR. JANDA: I could justify all these items, and the

reason I was concerned with these was because of Younger's charge, if as a geologist, geomorphologist, concerned with erosional problems -- and these items maybe do not have an initial effect on erosion per se, but they can set in motion the processes that would affect the erosional stability of the soil.

DR. STONE: I have been involved in the new Forest Practices Act, and we have got it to the point moving through the legislature, but there is another bill coming in to circumvent it, called the Collier Bill. We have the Z'Berg Bill moving through. And again the question comes up, why do you recommend a water course protection strip? One time the suggestion was we not cut at all on a water course protection strip, but when we began to look at this, we found in some cases cutting would be reasonable.

For example, if you have an area in which, by cutting on the watershed itself, you raise the water table, then you're going to kill all your trees anyway along the lower part of your water course, and then it would be reasonable to take those trees out. I think what you are saying --

DR. JANDA: That is not true here.

DR. STONE: What you're saying here, you have to say whether you're going to cut down erosion with that operation, or whether you're trying to maintain aesthetics.

In some of those areas we could just reach in and skid out by cable some of these trees with very little, really essentially very little movement of the soil in the process, so aesthetics,

it might not look very good if we end up with a whole bunch of tan oak in this thing, but in terms of slope stabilization it would not be bad.

DR. JANDA: If you look at quantitative studies, the Andrews and ~~L. C.~~ Alsea studies, when they logged down to the creeks, on this grass, the L. C. Basin Study, I sort of summarized it in basic form. There were three basins. For seven years stream flow and biological data were collected in those basins. They then left one creek as a control. They went into one creek, patch cut it, left the slash unburned, created a minimum of roads, and went into another basin, completely clear cut it and burned the slash.

What I have done on the chart is to plot the ratio of the sediment discharge from the patch-cut areas to the control, and the clear-cut areas to the control, and the logging and road construction to place here, in the patch-cut area. When they left strips along the streams, the ratio never got more than about somewhat less than three.

In the clear-cut area, where they did not protect the streams, the sediment discharge went up to about something like 8 1/2 times that of the control, and the work which has been done in a similar study in Oregon in the H. J. Andrews experimental forest shows the same thing, that the impact of logging is much greater in terms of sediment production if you go down to the streams.

DR. STONE: The thing that bothers me, I have been up on that Andrews forest, and one of the major problems is roads. I don't think there is any question but when they come to a draw or intermittent stream, they have the fill from the road extend way into it, and every time the thing goes out it would cut away to the base. If they kept it on the solid slope and bridged it, they wouldn't have had the major problems they had.

DR. JANDA: The same problem is true in the L. C. basin.

DR. STONE: I am merely saying I think you ought to state what your objective is for the non-cut strip.

MR. BROWN: One of the other objectives of having a buffer strip around the tributaries is to maintain water temperature, so they are not lethal.

DR. STONE: This is what your objective is, but if you go back to the other one, the water temperatures dropped to the same value within two or three years. It did not require in that case a Douglas fir cover, the alders were sufficient to handle it.

I am not objecting, I'm merely saying in every case you must state specifically the objectives, otherwise when you come up to Court, somebody will say, "What is your objective? What are you trying to achieve?"

DR. JANDA: I think I could justify all these items, I really do, in terms of protecting the redwood eco system within the Park, or the aquatic eco system, or both.

DR. STONE: If I were running Arcata, doing the logging

job over there, there are so many things we could do that would prevent what you're talking about. That keeps bothering me. There is just an awful lot of things they could do that this would not have happened, and I don't think in every case you have to in terms of controlling erosion have this 75-foot strip on each side of the stream. I don't think you would have to from the point of total non-logging, I think you can put the strip in and go in there and reach in and pick out logs without doing any damage to the stream.

DR. JANDA: There is another thing I am concerned about, Ed, in this area up here and in the H. J. Andrews, if you make a similar plot of flood peaks, the flood peaks are not very much changed by the logging operations, because the soils are so extremely porous.

Jerry LaRue has some data from the North Coast area that shows once you start logging the flood peaks are accentuated, the time of concentration is shortened, the unit hydrograph is increased, et cetera.

So in this area you're going to get flashier runoffs in the stream, if you start logging in the drainage basin, leaving the vegetation in the stream channels it is going to do a lot to keep the banks from erosion.

DR. STONE: One is if you take the redwood out, you can still leave the vegetation more or less intact. I am saying you would have the stream protection strip, but it does not guarantee

at all or even suggest necessarily that you leave the redwood in. If you're thinking of the aesthetics --

DR. JANDA: I am not following you. You mean you would leave all the vegetation in except for the redwood?

DR. STONE: Drop the redwood uphill and pull her out, in this you have to spell out what you're trying to achieve, and it would not give you the redwood problem in many cases.

MR. HATZIMANOLIS: There is a problem regardless of the approaches, this philosophy of eliminating the mid-level roads is admirable, but it is technically not feasible to apply on the ground.

The objective is great, there is no question there, but if I were going to go that route, I would rather go to balloon logging and eliminate my road system completely.

DR. JANDA: Look at mining situations, if there is some sort of a seismic problem or fault casting that makes it difficult to operate your mine, you can't go in there. In fact, a lot of mines were never opened because of safety violations and safety hazards. You apply a restriction, and doggone, in search of the almighty buck, the technology develops in a hurry, and you go in there. They have all sorts of ways of meeting regulations that they never did, so I think you should be concerned, and that is what I was worried about being king, I was not concerned about economics, the present state of the art, I was worried about preventing empirically what I see when there are mid-slope roads.

MR. HATZIMANOLIS: I think we can with a little bit more of work modify the balloon logging system. Unfortunately, the total volume in our particular situation in Redwood Creek, the part that is pertinent to the Park directly, is not sufficient. We are only talking about Harry Weir Creek and another little area.

When we get into the area of capital investment to achieve our end, economics certainly does rear its head.

DR. JANDA: Those are things you have to work out among yourselves. I am a geologist concerned with the landscape erosional processes. You people are concerned with economics.

MR. HATZIMANOLIS: No, my concern --

DR. JANDA: I cannot comment on what you're saying.

MR. HATZIMANOLIS: My concern is to marry the desirable and attainable, otherwise I'm not doing my job, I don't believe.

DR. JANDA: I suggest that you ought to say besides what is desirable, then look at it and decide what is attainable, and not approach it from a negative attitude. What is the most desirable thing you want to do to protect this Park? If that is unfeasible, start backing down from that, but don't start negative, and you will never get anything, you will lose your Park and well you might, anyway.

We ought to look at the photos from NASA's massive log.

MR. BROWN: I wonder if there is anything left to cut.

DR. STONE: You mean initially or subsequently?

MR. BROWN: Are people going to sit around for 40 years?

DR. JANDA: Let's not get emotional.

DR. STONE: If you went to Georgia Pacific's land and look at the total amount of area involved, they are in excellent shape to continue forestry operations indefinitely. They do have the distribution, so don't blanket everything this way.

I think there is plenty to find objection to, without actually saying there won't be any possibility of cutting on the North Coast.

There is lots to cut on the North Coast, lots of second growth coming along.

DR. JANDA: I think there has been a problem with communications, the biggest environmental impact is undoubtedly from the old growth, clear cutting of old growth.

DR. STONE: Conversion.

DR. JANDA: Associated with conversion.

DR. STONE: Right.

DR. JANDA: So right now we're concerned about protecting the Park.

I am concerned about the conversion of Harry Weir Creek, which is going to threaten that grove of trees right there.

I am concerned about what is going to happen now that this landslide area has been completely clear cut. What that is going to do to the Park.

I am concerned about what is going to happen to Bridge Creek. We are talking about very specific things.

We are not talking about cutting of any bitsy patches of timber in specific spots.

DR. STONE: All of a sudden we got to the North Coast. We don't want to do that and nail it on this area.

MR. BROWN: A lot of decisions that we make will affect all of this.

DR. STONE: I don't think so. I am involved with the Forest Practices Act and I am just speaking to that, so I don't think any decision we come to here will have any impact on the rest of it.

I think you should view it from the point of view, how do you protect the Park?

DR. JANDA: You have not reacted to something else that we said. Do you feel that it is essential or at least desirable, and that it would be meaningful to take actions other than this strip?

DR. STONE: We don't have enough time for me to really answer that.

DR. CURRY: We will get into that later.

(Whereupon the group visited the NASA Photographic Laboratory)

(Discussion at NASA-Ames Photo Lab)

DR. JANDA: Look at the size of the Arcata cut. Try to transfer that into the Bridge Creek basin.

DR. STONE: I don't know what your point is.

DR. JANDA: At a cutting rate such as characterized at the Arcata cut, if Georgia Pacific were to go to that rate, you could cut all the old growth that is in Bridge Creek over the next five or six years.

DR. CURRY: Can you run the bias again?

DR. STONE: I think you can find out actually what is the rate of cut and the total acreage from Arcata, and it is a very rapid one, and you can find out the rate of cut of Georgia Pacific, and this could be obtained from them, and they are both committed to various rates of cut.

Georgia Pacific, this is an integrated program they plan to go in and use second growth. Arcata are going to come in, cut and get out. I still don't know what your point is.

DR. JANDA: The point I want to make, you look in here, we can see rapidly, without going to records, a spot, here is a spot with which they must be concerned.

DR. CURRY: Which spot is that?

DR. JANDA: I was talking in terms of generalities. Here is the Harry Weir Creek we were talking about earlier, so on the whole east side of the creek, characterized by the steep slopes, there are numerous landslides, etc. This is what you have to be concerned about, and in this part of your Arcata cut, except for the little bit of this drainage, which is the Arcata south drainage we're talking about, they have essentially cut right down, so the only option open to them is to go farther down.

The other thing which is striking to me is that the area where they already cut, where the conversion has already taken place, has been up on the lower gradient bridge tops, most of the conversion that they're going to be involved in the next decade is going to be on steep terrain, closer to the tributaries, and the potential for there being a larger and more direct impact on the corridor is certainly much greater than anything that has been preceding their operations.

DR. STONE: They are getting closer all the time to the buffer area. They have only hit the buffer area in one spot, you say. They are still some distance away from it.

As time progresses they will get closer and closer and closer. I don't want to sound dense, but I don't know what we're getting at.

DR. JANDA: It is clearly documented in all sorts of studies we talked about earlier today, during the conversion process there is a certain trauma to the streams.

DR. STONE: The worst is yet to come.

DR. JANDA: Yes. These things, although we say an 800-foot buffer will not protect the stream, we did mention that the damage is somewhat attenuated. In the headwaters of these tributaries the impact on Redwood Creek is attenuated in that the debris passes down the channel.

MR. BROWN: You are converting not just the vegetable system but the geomorphic system, and the land form in a few

hundred years will be an entirely different type of land form, because of what is happening now.

The land form itself is being changed.

DR. JANDA: One thing we also could do here, which was interesting to me, is notice the sediment problem at the mouth of Redwood Creek, and now notice the sediment problem at the mouth of the Klamath. There is a good-sized sediment problem at the mouth of the Klamath. This film was flown on April 14th.

The plume at the mouth of Redwood Creek and the plume at the mouth of the Klamath and the plume at the mouth of the Eel were striking.

Here is the Smith River, it goes through some pretty steep landslide terrain, has a larger drainage area than the Redwood Creek, and its mouth is almost not there. If you look at the mouth of the Chetko River, there is a clear water plume going into turbid ocean water. We cannot say for sure that the sites of the sediment discharge are tied to land use practices, but it is certainly convincing.

DR. STONE: What disturbs me again, what was the situation in the past? Did we have a similar sediment plume going back over the last 100,000 years? If you look at the deposits in the lower part of Redwood Creek, obviously you have this kind of problem going on for a long, long, long time.

DR. JANDA: There has been high erosion area, but it is being accelerated.

DR. STONE: The real question is, how much are you adding to it?

DR. JANDA: This is awfully difficult to do, unless you have a control study, the pieces of evidence we have geologically, reconstructing land forms we can date, back of Crescent City you have one -- there it would suggest that the long-term average rate of removal of material, a sediment load, would be on the order of certainly no more than 1500 tons per square mile per year, and at Redwood Creek at the present time our data is not complete, but Bill estimated it is on the order of probably between 5 and 10,000 tons per square mile.

So, say, you have a fivefold increase.

DR. STONE: How confident do you feel with that, when you get in court and testify to that? Is somebody going to cross-examine when you come up with the 5,000 figure?

DR. JANDA: The sediment load figure we can say is certainly more than 5,000 tons per square mile.

DR. STONE: However, you extrapolate from Crescent City to land forms down here.

DR. JANDA: We have done this regionally, you can use the Olsen land area, a whole series of geological things, the off-shore basic studies. The erosion of land forms all suggest the figure, and I would say on figures like this we would probably have to say plus or minus 100 percent, but clearly there has been an increase, that is irrefutable.

DR. STONE: In other words, you can stand up and say, "Yes, there has been an increase"?

DR. JANDA: I used an argument for this in a land damage suit in Hawaii, and it is still up in court.

DR. STONE: But you don't know how much, however, you can say there has been an increase.

DR. JANDA: We can put limits on it.

DR. STONE: If somebody asked you, how about doing the same things from the deposits down in the lower part of Redwood Creek, how about analyzing those deposits and tying them back to the rate?

DR. JANDA: What those deposits tell us about is the nature of events. They don't tell us the total volumes in the tributaries.

DR. STONE: How do you determine the total volume now?

DR. JANDA: By actually measuring the stream, the load the stream is transporting.

MR. BROWN: Daily over a period of several years, we have got records in the Eel back to 1957, we have been measuring daily.

DR. STONE: How about Redwood Creek itself?

MR. BROWN: Since November 1970.

DR. STONE: Since 1970 you do have a measurement of what is happening in Redwood Creek?

MR. BROWN: Yes.

DR. STONE: How does it compare to the time when the big

deposit was laid down toward the mountain, there are some big beds, I can't remember exactly where they are located, but very large alluvial deposits. When they were laid down and the silting took place at the Big Creek road, I just want a comparison what you can say about it.

MR. BROWN: You take extrapolation from other places, anything since 1957, direct measurement is not enough to give us what we want to know about the complete geological scale.

DR. STONE: If somebody starts to cross-questioning you about this, what could you come up with?

DR. JANDA: The thing I was impressed with, looking at these photos, we were all very much concerned standing up in Bridge Creek, looking across at the landslide, and it is history, and what its impact was on the sediment load of Bridge Creek, etc.

We were down at the creek bottom, I can remember people saying, "Well, the impact of that slide certainly had to have been much greater on the sediment load on this creek than any logging activity going on."

I really wonder, look at that slide in this photo, which shows up very well, and then see the size of the cutover area. You can see the size of the cut. We have asked the NASA people to fly this basin when the weather gets right for us. We have photos that will specifically portray the area around the Park. Right now the data we have is all sort of a bonus, in that they are missions flown for other purposes, but it is my opinion that

a couple of photos like this would be a very graphic portrayal, with the color which really accentuates the difference between the old growth, the cutover land, and the natural prairies.

The different vegetation things really stand out. You could portray very graphically any presentation you make in terms of any buffering requirements.

MR. DAVIS: What is the date of these photographs?

DR. JANDA: March 17. Today this road here now extends into there (indicating), and it cut out to that prairie, so this much more of Harry Weir Creek is being cut out, and the roads that we were on, that we walked down, when you point it out on the map it is right at the foot of the proposed 800-foot buffer, the Arcata cut is right at it.

MR. DAVIS: Right in the low point here (indicating).

DR. STONE: Dick, are you looking at this from a point of view of what the situation is on the ground, if you had this all blown up, you could direct people to this point or that point?

DR. JANDA: Right. I'm looking at this as a very valuable way of communicating to other people.

DR. STONE: Can you blow this up maybe ten times?

MR. KROECK (NASA): That would be a precision color job to do that. A lot of labor would not be able to handle it but it could be done.

DR. JANDA: The film on the experimental mission when we went up the coast, is that around here? This is something I would

like you to see, this is Bridge Creek.

This was an experiment with high resolution color film, this was a test for the colors, which are poor but there is some information here.

This is the west fork of Blue Creek (indicating), this is an area where we have a lot of information on the history of past flooding and aggradation events from the study of the trees and films, we have a lot of history of what happened in here in 1964, when the big flood came in, and we have been monitoring the stream in terms of the stability of the stream bed the last couple of years, this west fork of the Blue Creek, and this last winter --

MR. KROECK (NASA): When you cut frames you might be able to do it, you can.

DR. JANDA: From downstream from the west fork this stream has suffered, it is obvious.

But we are talking about a large area, and here we can identify lots of landslides. You can look at the channel and you can say, "Oh, yes, there has been a lot of setup and moving around," but the impact of what went on in this area, how far it was carried down the stream is germane to what happened, if Harry Weir Creek was cut over and material was introduced into Redwood Creek, and the damage that would be sustained by Redwood Creek.

Here is perhaps a better view of the west fork of the area which was logged over. Simpson, Herbert Petersen, said that they lost, I forget, several miles of roads in here, which he was very

upset about.

Let's look at some of these others. Here is an interesting photo, the north fork of the Mad River. They completely clear cut, they left one tree standing in the middle of the basin, which has been photographed many, many times.

This gives you some idea of the detail we will be able to get when they fly the mission for us. Here is the slide in Bridge Creek working its way down the slope as well as up the slope.

Here is the basin of Copper Creek. We crossed the road here (indicating), and this landslide here, active landslide within the main of the large landslide area is the one we saw them doing the stabilization work on. You may recall the drain pipes, etc., they stuck into it, and it is unfortunate, because of the shadows you cannot see very well where the aggradation of the creek took place.

Actually, the creek was pretty full when this photo was taken, but I walked the channel from the mouth of this creek going down, and if anything it looks like last winter's events were erosional events, and from Copper Creek down to the Park we started getting lots of channel aggradation. The only place we have a measure of it is our gauging station at the south Park boundary at the edge of this photo.

There was 19 feet of aggradation, and to put that into perspective, at the present stage of Redwood Creek and what the

stage was last week, when I hand leveled the bank from the present channel up to the flat, where the tall trees sit, it is between 11 and 13 feet high above the present stage.

So it wouldn't take very much aggradation, it wouldn't take 19 feet of aggradation to seriously threaten that road.

We're talking about aggradation of coarse gravel and debris and logs.

DR. STONE: How do you put this in perspective with the events that have taken place in the past? How do you stand up and say, "This is something going on right now that did not go on"?

On the other hand, you can fly down this area, you can look down, but where actually the vegetation changed, so you have Douglas fir and maple.

DR. JANDA: We cannot document it that well right now. We have precious little data, and one of the things we should talk about is what data we need to document things, but one way you could get that, this year there were old trees which were buried by gravel here (indicating), old trees that were taken out. You put limits on the recurrence by looking at the ages of those trees.

DR. STONE: You mean if there are buried trees in there in regard to age, most of the stuff you saw was actually cut?

DR. JANDA: It was cut upslope from Copper Creek. It was aggradation downslope.

DR. STONE: The trees you are talking about, those were buried?

DR. JANDA: By aggradation last year.

DR. STONE: Weren't they log cuts?

DR. JANDA: No, living trees.

DR. STONE: That have slid in from the side?

DR. JANDA: Which were damaged by this last storm, rolling down there, and you can look at the pattern of the ring to see if there is a previous damage event.

DR. STONE: Chances are you won't pick it up with the ring width. Where you are boring, the chances of that are kind of remote.

I think you can use the flare of your butt, then I think you can actually get some idea if there is covering or uncovering, and you can even go down to find that.

DR. JANDA: Right.

DR. STONE: The thing is, when we looked at this, and this was not with this recent problem, with the recent flood, but it looked to us actually like it had come up and gone down, it looked like certainly the level of water was way above where it was, whether that was due to the filling of the channel and the erosion out of the channel I don't know.

DR. JANDA: That happened here, the whole channel of Redwood Creek is not 19 feet high. The only reason we know it was 19 feet aggradation is that the stream cut down through it.

DR. STONE: How rapid would it move down through?

DR. JANDA: We don't know, and what will happen to it when it gets there we don't know, but I think it is something to be concerned about and not just say, "Oh, fellows, this is gravel." I have heard that gravel washes down the river ever since genesis.

DR. STONE: You don't have to go all the way back to genesis, just a little ways, had this situation been occurring regularly in the past? Here I am getting up and somebody is going to ask me this, and how do you answer it?

DR. JANDA: We can do it best by studying. The only record we would have would be the hope of getting figures for the past, talking to some people in Oregon and so forth, talking not just along Redwood Creek but other areas.

It seems a pretty common occurrence, and you can go back and get old photos that show rock pools in the channel, etc., historical photographs that show that rock pools have been filled in with gravel, say the last decade or so, or the last couple of decades.

That the channels have shifted from narrow, rather deep channels to wider, more abraded channels. Your cross section has been changing from a relatively deep and narrow one to a relatively wide and shallow one, which is usually brought about by the input of large quantities of rock, so the land forms have experienced a change in the last couple of decades and climatic records don't seem to suggest any dramatic happening.

The most dramatic thing you see happening to the landscape is the timbering practices.

DR. STONE: How about the '64 flood? That was supposed to be a hundred year event, something of that magnitude. The channel actually built up, throughout the whole area.

You are now looking at Copper Creek and its possibility of affecting the Park. How about the side streams? How would they affect it?

We know in the past and in the last two decades there has been the major change in regard to the bed, as you explain it. How are we going to evaluate the impact of the lateral streams?

DR. JANDA: You introduce the effect of the '64 flood. We should talk about 1955 and some of the other large floods.

DR. STONE: Right.

DR. JANDA: You have to get your photos, we have not done this, but talking to people in the field and trying to sort things out, it has been my impression that this chain of events was set in motion prior to the big floods of 1955.

DR. STONE: How do you document that?

DR. JANDA: You have to go back and look for photos.

Has everyone seen the photos that they would like to see and get from them what they want? Here is the last item, Bridge Creek. There is the Copper Creek Basin, Bald Hills Road. This is the creek bottom (indicating). This is the road we were on looking across Bridge Creek at that spot.

With this resolution, when the color works out, I have been impressed with what one could do in terms of monitoring what was going on in a basin in terms of where some of your old roads are going, where you are developing new problems, what other people are doing.

This is sort of a monitoring tool.

I also again think that this is a pretty effective display. We can take a lot of photos of the mess in Copper Creek and take a picture of that slide and take a picture of the pretty trees through here, but given a study and good photography, you can really see quite clearly the relative percentage of the area that is involved.

MR. RUMBURG: How consistently can you monitor by photography in that area?

MR. KROECK (NASA): You would have to talk to the NASA people if you wanted to go over a specific time, there might be a situation where you do this. Right now this material is flown on what is called a contingency basis, that is after our standard flights are completed, contingent on getting that done first, but that is not impossible, it would involve sitting down with NASA and establishing some kind of priorities.

DR. JANDA: These things are going to be duplicated and I will be sending you whatever copies of photos you want. First of all, do you think they are useful?

MR. RUMBURG: They are for specific things now, but the

great value to me would be if you had them over a period of time to do this.

DR. JANDA: I am thinking in terms of our immediate needs of a buffer study.

I think some of this material would be useful, but one of the reasons I want to talk to you people, I am not precisely sure what your needs are and what you want to do. When this gets complicated it will help us in distributing materials to you -- I did not like this stuff, the color bounds were wrong, I did like the obliques, I like the small-scale stuff more, or you tell me what you would like, so we can get it to you.

MR. DAVIS: The value of the photography, if it is done on a recurring basis, is to show us the progress of it, but the other value is in your professional interpretation of it, and we are not in a position to say what we need and what we don't need. It is you people that are the professionals on this who are going to decide what you need in support of your findings or in developing them.

DR. JANDA: Ed and I were standing here talking. We do not have a hundred years of stream flow records and sediment records at carefully selected basins throughout the Park, so we cannot get out carefully computed data and so forth.

Looking at these photos and extrapolating what we know from other areas, there is reason to be concerned about the phenomenon in areas A, B, and C. It might be with carefuly study,

and when I say "carefuly study" I mean one involving several man-years, that we could further document the history of the stability of Redwood Creek, but you are talking about a major research project, a major, time-consuming research project, and your decision is going to have to be made before that thing could ever be completed, unless you opt for declaring a moratorium while the study is going on.

DR. CURRY: How long would a study take, really, an all-out study that you're talking about?

DR. JANDA: The trouble is, we can probably give it to you in terms of man-years or something like that, but in terms of actual time there is all sorts of staffing limitations, funding limitations, manpower, etc.

I think you could come up with it.

DR. CURRY: Let's say we ask for a budget supplemental to do that sort of thing.

DR. JANDA: We have been lining up some graduate students to look into various aspects of the problem. There is going to be a guy working with me doing a thesis study on landslides in Redwood Creek.

Now, putting together a pool of people like that, and getting a supplemental appropriation and giving time for writing a meaningful report, you can probably do it in two years, but three years would be a much more realistic figure.

DR. STONE: Dick, one of the questions that you brought

up is the movement of this gravel through the Park. The fact is that these side streams like Harry Weir Creek, Bridge Creek, McDonald Creek, these might slow down the movement through the Park.

How do you tie this into the periodic heavy flow, such as the one we now had? In a three-year period, obviously you cannot put this in, and one of the major questions comes up, will this be cleaned out with the next major flood?

DR. JANDA: I think what we can do, and that is what we have to do, anyway, we would establish a project which would not do the typical sort of stream gauging, where you concentrate on daily samples of that. We would concentrate on event samples.

We would try to get the storms, we would try to generate, and in fact we always have, plots of discharge versus sediment load, discharge versus velocity, and there are usually pretty clearly defined trends.

Then we would extrapolate. We have long periods of flow records, like Redwood Creek in Oregon. We would try to correlate our short-term records with the long-term record, which is standard, its accuracy may not go very good, but it is a hydrologically accepted thing, which would stand up in court, which I think is what you're worried about.

It may be pretty far divorced from reality, but realistically it would be a perfectly acceptable piece of evidence.

MR. DAVIS: Are you saying event samples through aerial

photography?

DR. JANDA: No, no, there would be physical monitoring.

The aerial photography would be instrumental in selecting our study sites.

DR. CURRY: Can you tell by certain color resolutions what is happening to, say, one of the visible concerns is the Great Trees. Can you tell what is the effect of sedimentation, when you say we can see this occurring, can you see what is happening to the mature forest?

MR. KROECK (NASA): In difference in color, you can tell the difference in health and vigor.

MR. DAVIS: This has never been proven that statistically it shows it. The reason is there is so much variability within the species it is hard to tell the difference.

DR. STONE: After the tree is actually dead, then you can tell it is dead. This is with insect attack, we hear this, don't we?

MR. LANGLEY: You can pick out one picture and look at a population of redwood trees and that spot of land you find the variation within the species in that spot is going to be as big as the vigor differences. It is hard to tie down.

MR. KROECK (NASA): Although it shows something in vegetation, it does not show the cause, you got a series of dead trees, the photographs don't say what produced the dead trees.

DR. CURRY: What are the projection capabilities of this

picture? I guess you cannot do it in a single picture, but a series, what can we expect to be able to project of events? Because I think that is basically the problem we are faced with, we can project that such an event will probably occur as a result of this or that practice.

DR. JANDA: One of the things we talked a little bit about trying to do would be to obviously find part of the trauma associated with the logging, which is caused by the amount of bare soil that is available for surface runoff of the flow, etc.

You could in terms of our monitoring program try to generate other circulations, the amount of bare soil versus the sediment loads associated with a given discharge for given drainage basins, then you can use the photos for looking around and saying, "We will give you a tool for extrapolating. We are not able to put gauging stations in all the tributaries, but using the photos in conjunction with some of our gauging stations, we might be able to put limits on sediment yields."

DR. STONE: You wouldn't feel too badly if I disagreed. Our problem is that most of our stuff comes down actually out of our roads, don't you think so?

DR. JANDA: Yes. But we could look at the road failures.

DR. STONE: If you look at the road situation, but the bare soil per se is not going to give it to you. What we're looking at, our major erosion problems come from the roads.

DR. JANDA: I agree. I picked a bad example, but we could

look at the photos of miles of roads in the area.

DR. STONE: Detailed cuts, the number of times a road cuts a draw or something of this sort.

DR. JANDA: But the photos would help us extrapolate.

MR. LANGLEY: You develop a set of statistics from which you select a sample. The one thing you might do in looking at these trees, Dick, on points of land, you say looking at the changes in vigor, if you have sharp photography on a point of particular interest and you were to catalogue the response of all the trees in the area very accurately, and look at all the trees in a situation over time, you might be able to pick differences in a few of the trees. As far as I know, that has not been done.

DR. CURRY: By the time it shows up it is too late.

MR. DAVIS: That is our problem, we need answers right now.

There is one thing that has been on my mind, and I don't know if there is any validity or not, but we know there is a large percentage of Redwood Creek that has been harvested, and that stream has absorbed the soil erosion that was associated with it, and we have a small percentage, actually, of the total watershed yet to be harvested.

Now, is the harvest of that and the soil problems that we can expect from them going to make any basic change in what we have in the Park now?

DR. JANDA: I say "yes," and the reason for that is the

logging which is going on now.

First of all, there is the business that any impact will be attenuated as it goes downstream. Logging in the past, which that portion of the creek absorbed in the Park, was done many miles upstream from the Park, for the most part.

Now we're talking about logging which is being done immediately adjacent to the Park, and in some cases immediately adjacent to the channel. There is not the distances involved to attenuate those impacts.

MR. DAVIS: Okay, this is true, particularly on the Arcata side, but a sizable portion of the Georgia-Pacific side, which is involved, has been cut over, and I don't know the percentage.

DR. JANDA: But if you look at the stream profiles, they are much gentler profiles than on the Arcata side, and if you walk up Tom McDonald Creek, and Sam McDowell Creek, there is an awful lot of debris which has been stored in the lower gradient portions of those streams that never did get flushed out into the channel of Redwood Creek.

There is no place on the streams that came down on the Arcata side -- when it goes out of the basin it will go directly into the channel of Redwood Creek.

DR. STONE: But the one place where we have the big delta build-up is actually McDonald Creek, and that one has been logged. I don't remember the total amount of that, but most of that whole

creek, except way up on the top, I guess all of it.

MR. HATZIMANOLIS: Most of McDonald Creek has been logged, not in the headwaters, it is on the north bank.

DR. JANDA: There is an example of there being an impact.

MR. DAVIS: McDonald and Forty-Four Creek.

DR. JANDA: Okay. Now, Gene Hofstetd told me when we were up there in March that on an annual basis, when Arcata owned the Tall Trees Grove, they would remove gravel from the delta, McDonald Creek, to protect the trees.

DR. STONE: Georgia-Pacific was using that gravel for their road base and this is one of the things they're going to charge the Park Service for, because they are no longer able to use it, so for years they have been moving large quantities out and Libby someplace along the line became disturbed and came in with a dozer and he changed the shape of that. I got one picture from Gene and one from Al.

DR. JANDA: At any rate, there was a stream, even though it has a lower grade than the streams on the Arcata side, historically it is known to have pushed a lot of gravel out into the channel of Redwood Creek and posed some threat to the Grove.

DR. STONE: The question keeps coming up, is there a natural process that will be carried out repeatedly?

DR. CURRY: What impact did this virtual tide record of rainfall that flowed through there this year have, how did it do in terms of cleaning out the river, or didn't it?

DR. JANDA: I don't think it did. What typically happens is the big storms don't flush out, they wash in. If you look at the gauging station's records for '55 and '64, this last year's events throughout the North Coast area, the big events, are associated with aggradation, not degradation of the channel.

Material was washed in from the slopes and then slowly it takes it out. Some places like Redwood Creek we don't have the data, but places on the Eel River historically the channel has not been cleaning out, it is just filling.

MR. HATZIMANOLIS: What percentage of what is going on is part of the normal aging process of these streams, what would you guess? Earlier you stated that the correction, the Arcata side had sharp defiles and they're tending to get a little bit flatter on the bottoms. Is this not part of the normal aging process?

DR. JANDA: You're talking about things which were going on over millennia.

MR. BROWN: They're aging very rapidly in that right from a semi-stable bedrock channel to an unstable moving channel, that generally takes millennia, but it has been accelerated to a short period of time.

DR. JANDA: This has always been very active country, we could go back and check.

DR. CURRY: You can graphically see what is Park and what is not Park.

(Luncheon Recess)

AFTERNOON SESSION

DR. JANDA: This matrix, the one entitled "Buffer Input Matrix in Relationship to the Redwood Eco System" is essentially the one we completed in the Ramada Inn.

There are some internal inconsistencies in that, the way we filled that out, and so we moved those, we were covering ground pretty quickly.

DR. CURRY: The dartboard.

DR. JANDA: And the other one we prepared for evaluating the inputs on the Aquatic Eco System.

Some comments on the way, my secretary was supposed to be typing up a modified version of these today, unfortunately, she phoned in sick. The matrix is being expanded.

A very good comment was made by Bob Twist in Berkeley, to keep the numbers out of the matrix and put letters in there, the reason being that you don't want someone to think because the number changes from 2 to 3 that you are only gaining that much more effectiveness. It might be that the difference between 2 and 3 -- I forget what our symbology is, 3 is complete control, whereas 2 is just minimal control, so there is really a big jump between 2 and 3, so keep numbers out of the matrix and put some letters or symbols in there, and we are redoing the matrix on that format.

We're also making the channel instability a more specific item, in that we are splitting it up into deflection of the

channel of the creek by log jams and side-stream alluvial, channel aggradation, increase of deposition of flood point sediments, channel aggradation attendant with channel evulsion and incision and/or widening of tributaries downstream from logging areas.

In other words, that is such a big can of worms, it is really not very specific, and different ones of these buffers will be more effective in controlling different parts of that problem.

After talking with some other people, in terms of inputs, it was suggested that it might be worthwhile, and Ed, I would like to get your comments on this in particular, that we add introduced plant species as a deleterious input, thinking in terms of the overall problems in the Park.

Things like the introduction of Himalayan blackberry thickets, gorse, increased frequency of Douglas fir hardwoods.

DR. STONE: In what sense?

DR. JANDA: Deleterious input to the redwood eco system. The eco system was to be a preserved, pristine example of an eco system, and these would be inputs which would be unnatural.

DR. STONE: You mean actually how much will they be overcome by?

DR. JANDA: You are changing the eco system, you want to preserve the eco system as it was.

DR. STONE: Gorse will drop out very quickly as the redwood comes in.

DR. JANDA: The gorse may not drop out, it is killing Douglas fir in Oregon.

DR. STONE: Not in the Park.

DR. JANDA: It is a potential threat, isn't it?

DR. STONE: Actually, what Arcata has done, if you want to look at exotics, they have brought in hundreds of thousands of exotics and spread them all over the Park.

They brought seed from Oregon, that is actually Oregon Douglas fir and not California Douglas fir, and they brought in citcus* trees, and cedar. Do you remember the Park Service going in there and weeding out all the Douglas fir?

DR. CURRY: On this land?

DR. STONE: Park land, if you look at it now, you got a de facto contamination.

DR. JANDA: Don't you agree that is undesirable for the idea of preserving an example of Northern California redwood-Douglas fir forest?

DR. STONE: I don't think it is harmful if you're looking at viewscapes.

If you're concerned with the germ plasm and this is what you're preserving, then it is harmful. That is the real problem, you have to state clearly the objective of the Park is to preserve a piece of primeval redwood forest.

DR. JANDA: There is one other thing similar to this, the introduction of plant diseases. One of the things, Gene

*Not sure of name

Hofstet again said to me he thought the Park posed a threat to some of the Arcata trees in that the port area cedar was able to do well in the Redwood Creek area, but in the port or ford area, brookings area, where they have the root fungus, he is afraid with Park visitors who have been to Oregon coming into the area and introducing the disease, it will attack his trees.

DR. STONE: Sounds like Gene.

DR. JANDA: That is a concern. Could that happen? It does not strike me really as being all that far out.

DR. STONE: You have very little port or ford cedar in Redwood Creek.

DR. JANDA: But some other disease could do something similar.

DR. STONE: That you could buffer against or could not buffer against, I don't think having the whole watershed or having the buffer is very much related to any of this actually plant input, it could jump over the buffer or watershed, all you have to do is bring it into an area where you can grow it.

I don't think you could put it in there very well, Dick.

DR. CURRY: How would a buffer respond to that type of problem?

DR. STONE: I don't think it would have any effect.

DR. JANDA: As a matter of fact, we have zeros going all the way across, or ones.

Then, in terms of actual buffers, there is the idea of

what can you do to protect the Park with management decisions within the existing Park, and also some discussion which we never really did do of your proposed management buffers. We just kissed it off completely and said, "It will never work."

Our history of cooperation with these people has been so poor that we just sort of dismissed it.

Some of us here sat together and tried to complete this matrix for that buffer, under the assumption that indeed you could get the cooperation that was needed, and is this a way of protecting the Park.

Okay, then we went on for the Aquatic Eco System, and the thing that is immediately apparent is that it takes a lot more buffering to protect the Aquatic Eco System than it does to protect the Redwood Eco System.

DR. STONE: One question I think you have to respond to or will in the future would be, essentially on this Aquatic Eco System, the Park picked it up at a particular point in time. Now, there wasn't any attention apparently to roll this back in time. This was not spelled out. You see, it was to preserve the primeval redwood and I guess the associated streams.

Would you visualize trying to roll these back to a primeval condition?

DR. JANDA: Then you get involved with certain specific streams, so that is what we have to talk about. Bob Averett does have some bioassay data of a couple of years back, when certain

tributaries of the Redwood Creek -- what you're getting at, this is a dynamic thing and it is changing.

DR. STONE: Would you use primeval redwood base, that is back, say, 1750?

DR. JANDA: That is for someone else to decide.

DR. STONE: The only base you would have at the time it became a Park.

DR. JANDA: That is primarily a legal question, isn't it? We don't want the Aquatic Eco System to degenerate any more. This is based largely on that assumption, if you want to rehabilitate the stream, you can't buffer them, you have to go in and do remedial measures. We are not talking about that, removing log jams so you can get upstream, fish access again, or removing all the fins that have hydrocarbons clinging to them.

We are trying to prevent the eco, the Aquatic Eco System, from further deteriorating. That is the only thing you can do with buffers.

DR. STONE: I wanted to make a point, where we are starting with this one, in terms of the terrestrial eco system, that is the redwood, we can have a good idea what it looked like in the primeval state, and then we can come through and say, "This is what we want to maintain." That is fairly easily characterized, so I was really asking in terms of your Aquatic Eco System, saying, "We know what it used to look like, and this is what we're going to maintain," or are you going to say, "We are not letting

it be any further downgraded"?

DR. JANDA: Bob is not here, he should be responding.

DR. HELLEY: We have data on a hydrologic bench mark station that is pristine, Elder Creek. If you want to hold that up as a standard.

DR. STONE: That is a very small one.

DR. HELLEY: There are differences.

DR. JANDA: Part of the uniqueness is this is where the trout go to spawn, they're not spawning in the main channel of Redwood Creek. They are spawning in the side streams, cutthroat trouts, many of the desirable things are in the side stream tributaries.

At any rate, to get effective control of protecting both the Redwood Eco System and the Aquatic Eco System, it seems to me using this sort of an analysis that the buffer strip is great for protecting the Redwood Eco System from the things that show up, obviously, winds, "Cat"-moved dirt, fires, slopewash, energy inputs -- we are talking about microclimatic changes.

MR. RUMBURG: One thing we ought to dwell a little bit more on is the thinning Ed brought up a minute ago, probably where we ought to be at this point in time is attempting to assure no further degradation of streams, but long range we ought to be planning on restoration to have them more nearly approach what they were originally.

DR. JANDA: I think in terms of our present discussion we

should recommend a course of action that would prevent us from doing that.

MR. RUMBURG: It should be recognized in our management of this area that we should be attempting over a long period of time to restore those streams.

DR. JANDA: Sure, okay. As I say, I think you have to go beyond that. The landslides we talked about attaining are a big question mark. We really don't know how they are likely to behave. There are a lot of studies, for instance Yreka, the Klamath Forest, they have good photographic documentation.

Some places in Jackson Hole, and there may be something to be said for, in fact, I think there probably is, but being very careful in terms of what land use practices are used on the landslides -- but that is only one input, and unless the landslides are going directly into Redwood Creek, they're going to have to go into some of these tributaries, most of those we are concerned about do go directly into the creek, and the area that is of most concern in terms of landslides is the southernmost end of it. Is that what they call the Emerald Mile?

MR. DAVIS: It is three miles long but called the Emerald Mile.

DR. JANDA: A couple of points, there are very active landslides on both parts of the canyon. There could be damage and channel restrictions.

DR. STONE: Most of this is on grassland, if you recall.

DR. JANDA: It is not on grassland, a good part of it.

DR. STONE: Do you have the vegetation on it? That and the young Douglas fir, if you remember, as you go out of the grassland you move downstream into Douglas fir.

DR. JANDA: This basin here, in fact, I had a picture of that earlier, this first downstream is Copper Creek, and here is the good-sized basin (indicating), a drainage area of about 781 acres. It was completely clear cut by Simpson, and this landslide, and they cut right up to the edge of the Council Prairie, which is the natural grass.

It is not a forest now but it was a forest, and one of the things I am concerned with, of course, sometimes the landsliding is activated not immediately following the logging, but some years afterward.

DR. STONE: Right there, just as you cross the boundary, there is a great, big gash.

DR. JANDA: That is ~~Council~~ Count's Hill Prairie, the red area.

DR. STONE: There is a big one that is grass in there, but this side of it.

DR. JANDA: It is a potential slide area.

DR. STONE: We are okay. It is just as you look at that part that comes into the Park, there is very little at that end of the Park. You are the one that made most of the landslide, there is a lot of the area that was forested.

DR. JANDA: Yes.

DR. STONE: What kind of soil?

MR. JACKSON: This is less active appearing or older landslides, but they definitely have all the morphological features of landslides.

DR. JANDA: They go beyond the boundary of Atwell soils, for instance.

DR. HELLEY: That is for sure.

Why don't you have read into the record what you found out last week, that the loggers are aware of the landslides but they have to cut them or they would be taxed for inventory.

DR. JANDA: Then, besides the landslides, we talked about possibilities of buying up or obtaining easements on strips along these tributaries, and then the possibility of buying up certain selected tributaries that might be particularly critical to the well-being of the corridor.

The only two areas which contain significant old growth are Weir Creek, which has 1,971 acres, roughly. About 1800 of that is outside of the proposed buffer.

And Bridge Creek, which is a big drainage area of 7,622 acres. I did not compute of that, which is outside of the Park, and the proposed buffer.

In terms of acreages, the 800-foot-wide buffer strip around the Park -- and these are very rough figures -- was 1,648 acres, I'm sorry, that is the acreage I got for upslope when you talk about your management buffer.

The strip around the Park is 9,775 acres.

This was reversed, we thought this corrected to 9,775 acres, which is the upslope buffer, 1,648 acres is the Stone zone. Where the 47,000-acre figure comes in I don't know.

MR. DAVIS: That goes to the Bald Hills Road on the east side, the hydrological divide on the west side, and south on Redwood Creek to Deer Creek, way beyond the end of the worm.

DR. JANDA: Devil's Creek.

MR. DAVIS: Devil's Creek, not Deer Creek.

DR. JANDA: I know the creek, it is a steep one that comes in from the west bank. This short jog in the creek is where Devil's Creek comes in. That will make you a big Park, and in the proposals that you talk about, Skunk Cabbage Creek, I presume the acreage is only 1,334, but the figures you give is larger, you talk about the unnamed drainage between --

MR. DAVIS: We are filling in the land, 2400 acres, roughly.

I have already opted for getting some sort of control along all these tributaries. I think it would be desirable to obtain, if you could purchase all of this basin, of the Harry Weir basin, to at least obtain very stringent management easements for the entire basin.

DR. CURRY: Dick, on the Stone zone, the 800-foot margin around here, if you had outright acquisition and then put in check dams or whatever kinds of manipulation you had to do in

there, would that not suffice for the upslope?

DR. JANDA: I think you might be inviting disaster. You could put in a check dam and it might fail.

MR. BROWN: If you wanted to use check dams, you have to use them all along the edge of the creek, not for an 800-foot strip.

MR. HATZIMANOLIS: You have to have anchor points.

DR. JANDA: Anchor points are the guts of the matter. They're very notched canyons, the chances of having the whole thing fail are pretty good. Engineering-wise it would be very difficult.

DR. HELLEY: And expensive.

DR. JANDA: Plus you have to have some sort of access to the dams to periodically pull the debris out of them, because they would fill up pretty quickly, undoubtedly, so that means you have to put a "Cat" road down all the creeks, which is what you're trying to avoid.

I have to admit one of the big disadvantages in acquiring Harry Weir Creek is that part of it would be yet another appendage, but on the other hand, as I said, it does present certain options to you that you could have a loop trail coming up the creek, and Harry Weir Creek to the Park, and along the public road, Bald Hills Road, and since so much of the Arcata land is already cut over, maybe you could pick it up pretty cheaply right now and save the whole strip on the east side of the creek from ~~Dalson~~ Dolason

Hill Prairie up to the present Park boundary.

That would probably be the only way that you would have over the next several decades, maybe even centuries, to revitalize the Aquatic Eco System of Arcata north and Arcata south. Those streams are in pretty bad shape.

Again, I keep talking, because no one else is saying anything, it might be that you could accomplish as much by protecting the Park by entering and obtaining really strict, rough management easements for this upslope as you could by outright acquisition, but Ted tells me that is going to be just as expensive as buying the land, which is not what it says in the initial recommendations that you have.

But again, I don't understand where money comes in -- shall I write a check, go out and buy it? No one else tells me "no."

MR. DAVIS: I ran a quick figure on Harry Weir, and it is around 39 to 40 million dollars what we're talking about. That is a real wild guess.

DR. JANDA: On a cost per acreage of old growth?

MR. DAVIS: Yes.

DR. JANDA: Ed, here is something this fellow Bob Anderson told me. He was worried about Harry Weir Creek in particular, and there is a lot of hardwood, tan oak and madrone, very open forest, and I said, "This is a pretty southerly exposure; do you think you're going to have problems with regeneration here?" He

says, "Yes, we certainly have, we are really worried about it. We may go in and actually have to replant this area because of the exposure."

So there is something else to be concerned with, if they try to experiment with aerial seeding and the seeding does not work out, it is on a southern exposure, and this thing could remain an open scar for a long period of time.

DR. STONE: What is their contract under the alternate plan, those are all out?

DR. JANDA: I don't know.

DR. STONE: They probably filed an alternate plan, saying they would have regeneration back by a specified time. This is all out, since the Forest Practices Act has been ruled unconstitutional. Under the new Forest Practices Act I don't know, it depends what Act they come out with.

DR. HELLEY: What would the Harry Weir watershed cost if it was logged, clear cut, to buy the land without the trees on it?

MR. DAVIS: An awful lot less.

DR. JANDA: What was the original figure in its present state?

DR. HELLEY: Thirty-nine million.

MR. DAVIS: $591,000, $600,000.

DR. HELLEY: What would it cost for us to replant it?

MR. HATZIMANOLIS: One hundred twenty-five an acre.

DR. JANDA: There is a figure I have in the Forest Service

report.

MR. HATZIMANOLIS: Planting has a lot going for it, however, when you were talking about the changes --

DR. JANDA: Skunk Cabbage Creek would cost about the same.

MR. DAVIS: Under $20 million, there is more cutover land in there.

DR. HELLEY: I can't believe they are only operating on three to four percent profit margin.

MR. HATZIMANOLIS: When you're talking about the tan oak Arcata is working with, regeneration process, that need not be as sizable a problem as it probably will be if they cut smaller units, because the microclimate would have lesser adverse impact upon it. That is one of the factors in small patch cuts.

DR. JANDA: The land is such that you could lay your cuts out in such a way that they would be shaded, if you could lay it out northwest-southwest cuts.

DR. STONE: I'm sorry, I don't see what the problem is. Are we concerned with actually whether Arcata will be able to regenerate this or not?

DR. JANDA: If it does not regenerate, it is going to erode at a high rate.

DR. STONE: The regeneration has nothing to do with the erosion.

DR. JANDA: Maybe we are using regeneration differently.

DR. STONE: It is already in tan oak, and it sprouts back

almost immediately, and if you take out the few large redwoods scattered in the area, go in with a Cat and drag the stuff out, you're going to have a lot of brush coming in immediately, and brush is a good soil stabilizer. In terms of stability it won't make a bit of difference, as far as I can see, not a bit.

DR. JANDA: The sediment yields from the brushy, oak-covered areas in Northern California are much higher than from the forest.

DR. STONE: I don't think you can extrapolate from this one.

DR. JANDA: What can I say to a God-like statement like that?

DR. STONE: The thing is where you have actually oak, and here we're not talking about oak, but tan oak, and a redwood type, what comes up almost immediately following the logging, we have to look at it, and if the soil has the root system all through the upper inches of soil, then I don't see that we're going to get any major accelerated erosion.

On a skid trail, unless it is ditched, then you can concentrate water and run down in the road. I have to really quite frankly look at what is on the ground right now to predict what kind of cover you would have immediately following, but I think if you planted it at 600 trees, and you probably wouldn't need that many, 400 trees per acre, that is not going to give you a great deal of stability. It is not going to reduce actually

surface water flow. If you want to reduce surface water flow and pick the trees out -- there is a conflict between trying to get good regeneration and erosion, and this is one of the things that you continually face.

If you want to get good regeneration, Douglas fir or redwood, you want to get as much bare mineral soil as possible.

DR. JANDA: Looking on this cutover area, where a lot of the stuff that came back in has been alders, the stream bed seems to be well stabilized by the alder roots, but there is a lot of bare ground even in the alder thickets. You don't have good forest humus layer, it does not look like it is going to develop for a long time, and there is a fair amount of bare ground, and on the Hurok* Experimental Station, there had been a lot of the initial forest ground cover there. I just bet, I don't have the data, that the sediment yield per ton on a square mile basis is much lower on a basis like that.

DR. STONE: If you go back up to McDonald Creek, coming upstream, and there is the massive cutover that they have, it goes to Forty-Four and over to Bridge Creek, if you go in there and look at it, it has a fairly good cover of sprouting redwood on, second growth redwood, and a lot of brush.

In some areas the redwood is underneath the brush, and if you put out erosion stakes, you would find they are very low. You have to really measure.

Frankly, I don't think we're talking about a real problem

*Not sure of name

here, I think you have to be real careful when you talk about covering the area with trees to stop erosion, versus covering it with natural vegetation which consists of sprouting.

DR. JANDA: I can't agree with everything you said, but I don't think either of us have the data.

Let me introduce one other thing, and that is aesthetics. The slope would have a different appearance.

DR. STONE: The whole worm looks like hell, it is a God-awful looking mess.

DR. JANDA: There are some nice vistas and views.

DR. STONE: I don't know what to address myself to, what question we are really facing.

DR. HELLEY: How do you best preserve the eco system?

DR. JANDA: You think my concerns for this creek are blown out of all proportions?

DR. STONE: I have no data at all what will be the impact on the mainstream of the effluent coming out of these lateral creeks, and that is one of the things we are talking about, one of these lateral creeks, it is going to affect the movement of the gravels through the Park.

MR. BROWN: Specifically the Tall Trees, because it is close to that.

DR. JANDA: It can set in motion a whole can of worms.

Let's start at a clear cut, maybe in the easternmost portion of the basin. It might cause some aggradation problems

along here, which may activate the slide. You get a feedback mechanism and it comes into the creek, causes some problems in Redwood Creek, further activates this slide area, the whole thing feeding on itself, and all of a sudden not just the Tall Trees Grove but the grove on the next bend upstream is also pretty nice, I don't know if it has a name or not.

MR. DAVIS: I know what you mean.

DR. JANDA: The people all walk up to here and think of this as a unit, and that is what you're really threatening.

DR. STONE: I view the whole upper watershed of Redwood Creek as a threat. This is feeding the stuff in. You said, for example, when we have a big storm the gravels actually move in. They don't normally move out, those are the ones that are moving in, this massive gravel, and the question is, how much do the lateral streams contribute to holding those in check; is this what you're saying?

DR. JANDA: But there is something else, too, you are arguing more or less on the point of view of volumes. Okay, let's put some crude numbers on the board. Let's say the drainage area that comes in here is 10 percent of the total drainage base of Redwood Creek. Most of the logged-over areas in the headwaters of the basin were logged over sometime ago and are regenerating.

Looking at the NASA photos, there is not much active logging going on at the present time, but not a lot of active logging. The active logging in the Redwood Creek basin is

concentrated immediately on the borders of the Park.

Simpson and all their holdings seem to be operating in the Mad River basin rather than the other side dividing Redwood Creek. So the load from the upper side of the basin is probably past this peak and going down. Extrapolating from the L. C. experience, and it may be okay that the sedimentation loads are twice normal for the rest of the basin, so 90 percent of the basin the loads are two times normal.

We have this steep area here in the L. C. basin study, the clear-cut prairie was increased by eight times, the partial-cut area by two and a half times. In the Andrews experimental forest the figures were that in the more carefully logged area the increase was a factor of 4, I think, something like that, and the increase in the poorly logged area was 109 times.

So let's take all those things and say in this area we are increasing the sedimentation load by five times, just roughly, over the normal rate.

DR. HELLEY: I think that is very conservative.

DR. JANDA: Probably I could push it to 10, so let's say 5 to 10 times. I think you can see that a significant amount of the total gets delivered from Orick, I don't know what the percentage would be, it is probably coming at the present time from immediately the lower part of the basin, and that is only the magnitude part of the problem.

I'm still concerned, as we said before, it may be that if

this was in a completely pristine state, with a nice, smooth gravel reach going through, with no debris dams, sidestream deltas, that the gravel that came here, no matter how much you put into it, would go through or would be deposited in the estuary, which is probably what would happen, and Orick itself would be subjected to more floods, and you would have to raise the dikes -- that would be Orick's problem.

But I'm worried about the Park's problem, if we diminish the capacity of Redwood Creek to handle the stuff, we will trap more of it.

DR. HELLEY: When you did the study on the Eel, where did you say the big influx of tons per square mile annually was?

DR. JANDA: Upstream between Scotia and the Middle Fork.

DR. HELLEY: Is there any relationship where they are logging today and that, or where road building is on?

MR. BROWN: A good relation to the railroad's building along the slide areas there. The railroad undermined massive landslides along one side of the canyon and cut away from the land road to allow the materials to fall from the slide next to the tracks on one side.

DR. HELLEY: That is some support for your argument, where we have activity, it does not have to be in the headwaters or along the whole length of the basin, it could be localized.

MR. DAVIS: I have a question, based on personal observation, and I would like to see what you think of the validity of it.

We have flown the Redwood Creek area after every storm and at all conceivable times during the year, and never from just visual observation have the tributary streams to Redwood Creek been darker in color than Redwood Creek itself.

The tributary streams have always appeared to be much clearer, including all those within the Park, than Redwood Creek itself.

Now this is no measure, but it is an observation.

DR. HELLEY: A measure of the suspension.

DR. JANDA: I have seen the same thing on streams in Southern Oregon.

MR. BROWN: The same thing happens in the Santa Cruz mountains also.

DR. JANDA: The way I explain this, a large amount of the sediment in the creek bottoms is derived from cannibalization of preexisting valley bottom deposits eating into landslides. previously deposited alluvial zones, etc.

The sediment system is just like the hills of Nebraska, once a particle is set in motion, it goes through the whole motion out into the Mississippi delta into the ocean, but here particles which moved in a landslide several thousand years ago to the bottom of the canyon, while they sit there, and it takes many millennia to carry them out.

MR. DAVIS: You are saying, then, that Redwood Creek is carrying out sediments that have been left there for over a long,

long period of time, whereas the sidestreams are just bringing the new material, is that right?

DR. JANDA: Yes.

MR. BROWN: There would not be much new material.

MR. DAVIS: Some of these are pretty well cut over, Forty-Four Creek, McDonald Creek, McArthur Creek, all those drainages.

DR. JANDA: This last week when I was up, I was surprised, I think it was McArthur Creek, it was actually more turbid than the mainstream.

MR. DAVIS: That is an iron microbe.

DR. HELLEY: I don't think the present Park is defensible the way things are going on right now. We have to start from there. What do you do to protect that eco system?

DR. CURRY: And the great threat is not upslope but upstream.

DR. HELLEY: Immediately the greatest threat right now is upslope, not upstream. Considered in the context of the whole, it is upstream, because we have greater natural problems.

DR. JANDA: But that is what I'm getting at.

MR. HATZIMANOLIS: That is not what he said.

DR. HELLEY: The land upslope from the worm.

DR. JANDA: The volumes are dropping up here, but what is going on here is going to tell you what the disposition of the volumes is.

DR. HELLEY: It is not going to go through, it is like a log jam.

DR. CURRY: So the mission, if I can step back now and try to put it back together again, the real problem, the real threat to the Park value is what is coming down through these various tributaries that are upslope of the existing Park from the southern boundary up to Orick, in the worm portion, and that problem is that these tributaries bring down sediments and are depositing them in these stands, which is reducing the capacity of the river to carry this heavy load on through the Park.

DR. JANDA: It is not just sidestreams, but these big dog-gone log jams, which are sedimented, and then persist for long periods of time.

DR. STONE: On the log jams, how do you know where the logs came from?

DR. JANDA: Okay, sawed logs.

DR. STONE: They can come from way upstream.

MR. HATZIMANOLIS: Precisely.

DR. STONE: I think the log jam is one thing that comes in from a variety of places along the slope. You have logs being fed all up and down the river, so I don't see that being fed in in any great extent.

DR. JANDA: But there is one thing --

DR. STONE: That is one thing in terms of management, at least on some of these you can get the logs dragged out of.

DR. JANDA: I think it is in your report, Phil, but one of the things that I was struck, flying over Redwood Creek in a commercial airplane a couple of weeks back, looking over topo maps, we saw lots of log jams in the area of Redwood Valley, but immediately downslope Redwood Creek paces into a very tight, tortuous canyon, and I wouldn't be at all surprised that the log jams are getting hung up in the canyon and not being swept through and most of the logs that we see from Devil's Creek on down to Orick are derived from the lower end of the basin.

DR. HELLEY: Regardless where they come from, you have high sediment coming on these logs, changes in geometry. Who cares where they come from?

DR. STONE: I was concerned with again trying to put this in perspective, the amount from the lateral streams versus the big flow.

DR. HELLEY: In a practical sense, even if all the problems are upstream, we have not a ghost going from there on.

DR. STONE: I'm not sure we have a ghost the other way, either. What we're really looking at is trying to define where the problem is. Whether we can solve it or not is another question.

Again, I cannot talk to many data in regard to McDonald Creek or McArthur Creek, but they run clean very shortly after heavy rains.

DR. HELLEY: We talked about this on the phone, the big

slug of it.

DR. STONE: You are essentially washing out or cleaning out the channel of these lateral streams, every once in a while they clean out, and as they get into the main bed of Redwood Creek, this is causing you lots of difficulty, and this would be largely the Big Tree Grove.

DR. HELLEY: That is the main attraction of the whole Park.

DR. JANDA: I should have pointed out one thing earlier, about the present jams accumulating debris and stuff coming out, this area from the south Park boundary here and on downstream is pretty doggone vulnerable right in that area the grading of the main channel of Redwood Creek decreases by about a factor of two, it really levels out, so you are really entering in from a zone where you are becoming more likely into a zone of deposition.

DR. HELLEY: It goes through the big loops in here. In terms of alleviating an immediate threat, I think it is right there.

DR. CURRY: To be specific, what happens on the fan? I take it McDonald Creek is right opposite the entrance of the Big Trees section, that deposits a fan there. Does that push the channel over into the Big Tree area and cause bank undercutting on that side?

DR. HELLEY: It seems to be overflow.

DR. CURRY: It is not cutting?

DR. STONE: Not yet.

DR. JANDA: The geometry at the present time is something like that, you can see the current at low stage. There is a raw bank exposed in that area, and the bank upstream and downstream is completely vegetated, this may be 500 feet.

MR. DAVIS: Try 500.

DR. JANDA: And this bulge is less than a hundred feet, but there is a clear deflection. One of the things that Phil's photos show very nicely, at high water, they rephotographed it when they were flying over, and the delta was much less prominent in the high water stage. Jerry LaRue, who flew the area immediately after the flood, said the delta was most prominent immediately after the flood when they got into it. The side-stream tributaries peak faster, and they dump their delta, they are really dumping. It does not get built up slowly, it gets dumped at once, so the rising waters of the flood stage are deflected, and as the flood continues to rise during the waning stages, the main creek eats the delta away.

So to really comment intelligently on the magnitude of these deltas, you would have to be out there making your observations during the rising stage of a big storm.

This is something we can't do after the storm is over, we have just observations to say that is the case.

MR. DAVIS: What I was thinking, the profile on the delta that is coming out from McDonald Creek is low enough now that you would assume with the normal rise in high water in the winter that

that water would cover it, and it may have some influence on the base currents, but basically the high water would be going over the top.

DR. JANDA: Suppose we have another big storm next year. Suppose next Christmas. Most of our big floods seem to come at Christmas time, and you have this base already built up to receive more sediment. What is going to happen? We don't know what is going to happen, but it seems there is a likelihood that this is really not a fairy tale, a complete fairy tale, science fiction, maybe.

DR. CURRY: What would happen if the delta were not there in terms of the dynamics of the water; would it just have that channel down?

DR. JANDA: I think the tendency would be to cut in this way (indicating).

DR. HELLEY: And put a deposition on the next curve.

DR. JANDA: We should look at an actual map.

MR. HATZIMANOLIS: Have you been down to look at Bull Creek, where at Coyote Creek it would have a sluicing effect, it set a major delta in Bull Creek, and that was a real big one, and I did not notice any cutting action on the far shore, the right bank of Bull Creek as you're heading downstream at the confluence there.

If it did not do it there, why should we expect it to do?

DR. HELLEY: It may be an equilibrium situation or

something that takes time to develop. I have a funny feeling that eventually changes like that happen in one good blast, and who is going to say when, you may not get another December 1964, we were talking about that, when December 1955 came around and nine years later we had it again in spades.

DR. JANDA: I can tell you examples of things that went on in the Southern Oregon river coast ranges which are the exact opposites of what you are saying.

MR. HATZIMANOLIS: I was on the Klamath River at Orleans during the 1955 floods when the Klamath River was plugged by a major slide. It blocked that river.

DR. HELLEY: At Bluff Creek, in one event, it started the mechanism, and it did cutting through a serpentine bedrock and cut 10 feet deep, most of it went on in one event, it was just incredible, and the course of the Klamath has changed.

There is a beautiful delta, the trees on the left bank are trimmed off, it looks as if someone took a lawn mower and trimmed it off. That is one event that can happen in that country.

DR. JANDA: Where do you want to go from here?

DR. CURRY: What are the options that we have? Let's say even though there is some debate about the impact of these deltas forming, but let's just assume that is a defensible position. What can we do, then, here? Ed and I were talking, you got Forty-Four Creek, McDonald that is cut, and Forty-Four is cut, Bridge Creek has a fair amount of cutting, what do you do on these areas?

DR. JANDA: Their impact is likely to be decreasing, whereas the impact of the streams on the other side is likely to be increasing, the east side.

DR. CURRY: What you're saying, then, basically is, don't worry about the McDonald fan or the Forty-Four Creek fan, because it has made its big pitch right now?

DR. JANDA: It would be nice to go in there and do things, but compared to the threat posed on the other side, repair ruptured culverts. At Bond Creek, just computing the material that got sluiced out from the road and went a short distance down to the creek, it was a couple of thousand cubic yards, and if you go up into those basins and look for culvert failures, places where the channel is out of its old course, because of a misplaced fill, you could do an awful lot to further diminish the amount of material coming out of these creeks.

DR. HELLEY: What you're getting at, after they are logged they do not maintain most of the roads, is that true?

DR. STONE: Georgia-Pacific has maintained most of them. The one you're talking about has been turned over to the Park Service.

DR. JANDA: I was up here in a hurry, but I did walk around in Forty-Four Creek on the logging roads, and I saw numerous culvert failures.

DR. STONE: I am kind of surprised, I have not been all over the area since the storm. They work their culverts, Georgia-

Pacific, their whole orientation is actually to maintain their road system and not have any plugged culverts.

DR. JANDA: What along the buffer road, there were places where the streams were running along the uphill side and flow across the road.

DR. STONE: They actually put big culverts on each end, and they did pretty well, when you think about it.

DR. JANDA: But we got a run.

DR. STONE: You remember coming down the slope, where they drug their logs down, there were skid trails, a deep erosion, and it ran across the road and even on the other side.

I am going back, I am really saying the orientation of Georgia-Pacific is to maintain their roads and culverts, the orientation of Arcata will not be that.

DR. JANDA: I hate to be like being an antagonist --

DR. STONE: You may not like me but I think you are terrific, so we are not.

DR. JANDA: Going down Bridge Creek we had all the side-cast dirt which went into the creek, and the landslides, it was like a festering sore.

DR. STONE: What you saw, the thing that impressed me is that the road did not go out and they engineered to keep the road in.

DR. JANDA: They had done an awful lot of repair work.

DR. STONE: That was quite amazing that they kept the

road in across that stretch, with the amount of actual soil movement across the surface on down into the buffer, there was a lot of that.

DR. JANDA: I guess what I'm saying is, I really cannot admire their efforts. One of their efforts is good enough as to the sediment production.

DR. STONE: That did not move down into the buffer.

DR. CURRY: As a layman standing up here, it seems to me from the recent conversation that from this point up, around here (indicating) we might as well forget the buffer zone. You can't do it, we should not acquire it, because you can't do anything with it, or can we?

DR. JANDA: If you think beyond the first cycle of cutting, or the conversion from old growth to second growth, you probably would want some sort of a buffer there to protect the Park from any impacts associated with the second and third and fourth cycle of cutting.

DR. STONE: By that time we may have good forest practice, but at this time it may be reasonable not to buy the buffer.

DR. CURRY: With the dollars that we would save here you can put another cooperative agreement in this area with the companies, demanding a higher level or an X level of maintenance on those roads in that area, if that is the prime factor, or insist on certain planting practices or reforestation practices.

DR. JANDA: I think that is a valid point, a good point.

DR. CURRY: So that part of the problem really is the roads there.

MR. RUMBURG: Why should we be forced to maintain roads in areas that we don't propose to have any additional logging? What are the alternatives in the way of preserving the lands other than maintaining roads that we don't want to continue to use?

If road maintenance and the drainage is a problem, what are the alternatives to this without maintaining the road, because our job should not be maintaining the roads.

DR. JANDA: Take the culverts out and the fills out.

DR. CURRY: Excavate the fill.

MR. DAVIS: We have done some of that, but not as much as we should.

DR. CURRY: The cooperative agreements on the other log roads.

MR. RUMBURG: Which will have to be continued to be used.

DR. CURRY: If they don't maintain them, they ought to do the same thing we do, that is pull the culvert and fill out.

DR. JANDA: You really would set an example for your neighbors, shining example.

DR. CURRY: Perhaps we can develop a standard on the M-line road, practice it, and insist, and perhaps on the basis of experiment along that, engineering experiments along that, insist that the same standards be applied in that area by cooperative agreement.

DR. JANDA: Sounds good in theory, there are other people here having practiced that.

MR. DAVIS: I am having a lot of troubles of stabilizing the old road to the degree that we're talking about.

DR. CURRY: What are your troubles, philosophical or money?

MR. DAVIS: This sloughing we're getting along the road shoulders, I don't know how we're going to stop that, that is a result of the fact that the road was there, period.

Now where these drainages come through, we can clean them out and provide for free passage of water. Most of them have been pretty well cleaned out already, and then we won't be maintaining that as a road by way of example as to what we're asking the company to do, anyway.

DR. CURRY: Okay, you have a good point.

MR. DAVIS: Ted, you correct me on that, they don't really maintain all of their logging roads, just the main haul roads.

MR. HATZIMANOLIS: The practice is industry-wide to maintain those roads which are actually being used at the time and those others which time and circumstances permit, but basically it is just to keep the logs moving to the mill, that is the road that gets the number one attention in almost any company.

DR. STONE: But Georgia-Pacific, they are concerned with keeping their culverts unplugged, because what happens if they

don't and they want to come back in and use their road later, their road is gone, and they have to haul all this stuff back in again, so they are very much concerned seeing that all their culverts are maintained.

I think this is true, Ted, on Georgia-Pacific.

MR. HATZIMANOLIS: It might be a goal, but I don't think that any one company works particularly hard at achieving that goal, with all the friends that I got in the industry I can say that.

MR. DAVIS: This past year we saw an unusually heavy storm, their first priority is naturally to get those roads open that they're going to be hauling over the logging season, the others come along secondarily.

DR. JANDA: The industry people said to us repeatedly when we were up in March, "Don't forget, you are looking at a special circumstance, this is a big storm," and I say right back, "This country is characterized by big storms, and we ought to be concerned with what goes on in big storms and not in terms of 'normal years'," because there are not very many normal years in that part of the world.

DR. CURRY: That is why you have a Redwood Park.

MR. HATZIMANOLIS: Getting back to maintenance on the matter of haul road, most companies take the position, "We will wait until the storm is over, then we will get up and do something about it. We can't do anything while it is pouring rain

and while there is no access to the other road."

The problems become major problems and from a small area to a larger area, so there is a geometric progression, but it is not because of lack of desire of the companies to do something, it is mostly a matter of circumstances, it is storming so hard that it is not physically possible.

I saw a G.P. crew trying to install a culvert, there was a torrent of water coming at the fellows, they couldn't stand up in it. They had no alternative but to wait until the storm passes, yet their inability to get past that one point, all the maintenance work beyond that, which is about 85 percent of the road, could not be taken care of.

DR. HELLEY: What we're saying, it is not feasible to maintain their roads, then you replant them.

DR. STONE: I think that what we're really talking about, if you wanted to let a road system go, would be to clean out the channels and that would be it, you would not be able to get in in case of fire.

There are places on the southern tip of that appendix there, if you recall where Simpson had a logging road, that went up and almost met the boundary on the right side, and that one has been taken out, and they did not bother. The culvert went out and they did not bother to do anything, and that stream has cut a tremendous gash, and had they actually taken that water and brought it back in the normal channel, it would not have occurred.

But at the time they thought they were going to maintain the road, it went out and they decided they wouldn't do it.

So our recommendation was that where a road was not to be maintained, the water was put back in its normal channel, and if you try to work out something with them on the Harry Weir Creek, you might be able to examine this with them in regard to their maintenance road system and say, "How much of this are you going to leave in? Or how much are you putting back in the normal channel?" If you can get a cooperative arrangement with them, how they will put this area to bed.

DR. JANDA: You got to do it quickly, I showed you in the two photos the way they put in their culverts and fills.

DR. STONE: If you're looking at this from the point of view, let's assume we have this effluent problem coming in and stopping up Redwood Creek, what can you do about it? One would have to say, "Okay, we won't log it at all." That would really be quite a selling job to get Congress to put that kind of money up.

What would be another possibility, and this would cost some money, but it would be to get some cooperation by putting this area to bed following logging, and I think this would give you a lot of things that you now want.

In other words, to be sure that there is not a bunch of logs in that drainage. To try if there are places that actually the culverts should be pulled, pull them, try and restore the

normal water flow.

I guess that would probably be the best you could get out of this.

MR. HATZIMANOLIS: There are practices they could be doing, three of them, and I have seen more than one absent.

First of all, use more culverts on the roads. I am appalled when I travel some roads and I see so few drainage structures over such a great distance.

Secondly, is the capacity to design for the average rainfall of the area but not for the intensity of the storms we get. A tremendous amount of water comes down in a minimal period of time, if it comes down through 24 hours it would fit through the pipe, but in 15 minutes it won't.

And the third thing I have not seen enough of is the lack of trash racks. The trash racks would work beautifully, and they are not too expensive to install. If they put lots of them in in the proper direction, so the time periods when crews cannot get on the ground, the trash racks will let the water go through and catch a lot of junk, and those are the three things.

DR. JANDA: A fourth one would be to put the culverts in in something that approximates the natural stream.

MR. HATZIMANOLIS: That is a requirement of the Fish and Game now.

DR. STONE: Supposing you want to go to court and get a stop order on Arcata in that particular drainage. Now to go to

court and get it, what are you going to tell them and what kind of evidence are you going to develop? That is essentially what we are facing.

DR. JANDA: I think you could go in and take a series of pictures in the two streams to the north of that creek, and show exactly what their impact has been on the Park.

DR. STONE: What impact will you show?

DR. JANDA: The destruction of the under-store vegetation, the threatening of the tall trees that grow along the banks of the streams, and with a winter's records we can get some sediment load figures.

DR. STONE: Can we measure the amount of erosion that has taken place along the trees, along the stream? You have Arcata north and the lower part of that stream, that whole water is one great mass of slides, three slides, one on top of the other. It does not show there as slides but it is.

DR. JANDA: I know what you mean.

DR. STONE: And those trees are leaning this way and that way, and they're all gone. Put a little more water on them and the whole thing goes out, but that was a condition at the time this was set up as a Park. Now if you don't put any more water into it, what is it all about.

DR. JANDA: I don't think those creeks have felt the full impact of what is going on in the headwaters yet. A lot of debris is hung up on logjams and they will have to slowly fail, but when

it does that, the lower portion of the creek will become aggraded and the water will come up.

DR. STONE: If I am trying to get a court order, I have to say, "This is the situation that exists. What they're going to do upstream is going to give me difficulty, and this is why," and I would have to point out various logjams and say, "Okay, now, Arcata has to take this stuff out." I can point to the fact where a road crossed this creek, and there is a lot of fill there and the culvert is not big enough, and I have to document it all the way with a kind of corrective action Arcata would have to take.

I don't see how I can say "stop," I would have to develop a logical picture why they would have to correct what they're doing.

DR. JANDA: What you're saying is very reasonable and it is feasible, it could be done.

DR. STONE: That is what we have to look at and try to do.

MR. DAVIS: I got the impression this morning that you were talking about the sidecasts coming in the drainage, running 400 feet beyond the gust zone.

DR. JANDA: But there is also stuff coming down the tributaries into the Park.

MR. DAVIS: Down the tributaries, I thought you were speaking of it penetrating about 4 or perhaps 500 feet?

DR. JANDA: No, the sidecast only travels a couple of hundred feet, but in the tributaries it penetrates right through

the buffer to the main channel.

MR. DAVIS: It goes all the way through the Redwood Creek.

DR. STONE: Again, you would have to show that this stuff is moving. You have to develop to show conclusively that that stuff is feeding through the tributaries and into the Park.

I have not walked one of these with this idea in mind. If we got up on the upper stretches, would we really find a serious situation in terms of logjams? I don't know.

DR. CURRY: You followed with the slide presentation, you started at the top. Which one was it?

DR. JANDA: Arcata south.

DR. CURRY: And it began to taper off, there were tremendous jams. What is the impact of cutting the jams out, you cut a bigger V.

DR. JANDA: There are all sorts of feedback mechanisms.

DR. HELLEY: We don't know.

DR. JANDA: Let's look at an example at what could happen: I am going to go to Georgia-Pacific, because that is the best example that I have, that one culvert failed up in the tributary to Bridge Creek.

DR. STONE: We remember that one.

DR. JANDA: And it caused a new channel, a lot of sediment came into the channel of that tributary. The density and viscosity of the medium flowing in that channel was increased, so it was able to start eroding its banks and its beds, and this, in

turn, caused aggradation down further, widening the channel and undercutting the bank, plugging of additional culverts further downstream, so the whole thing fed on itself as it proceeded down the soil, so that removal of one of these logjams -- I don't know, you have to do it slowly.

DR. STONE: The logjams you saw, were they all cutting logjams, logs cut?

DR. JANDA: Yes, cut and slashed.

DR. STONE: You could go to court and say, "This has been dumped on our property." It has not yet, it is still in the buffer.

DR. JANDA: I don't think I actually saw jams in the Park.

DR. STONE: You would say, "This offers a threat to our stream down below," and document the threat, and say, "This is a specific action to be taken, because if we get control of it, this is the action we will take," so what you have to do is come up with a clear-cut proposal of what you want Arcata to do.

DR. JANDA: I don't like that word choice, "clear-cut proposal."

MR. HATZIMANOLIS: I walked from the bridge in Bridge Creek down to Redwood Creek itself. There was no jams, I got wet up to the belt but no obstructions whatsoever.

DR. JANDA: Isn't that because much of the debris had hung up on the crossing?

MR. HATZIMANOLIS: There is not anything down there now.

DR. CURRY: That was backed up behind the bridge.

MR. HATZIMANOLIS: The bridge is still there.

MR. DAVIS: On Bridge Creek downstream from the road crossing, G.P. cut looks like a lot of logjams this past fall, so that they would go out and apparently they did do some --

MR. HATZIMANOLIS: Everything went out but it was replaced by new material, but no jams.

DR. JANDA: But the potential is there for jams.

I have a question for you, in some of those photos we took from the air, it looks like some of the old trees, there was a lot of burial of trees downstream from where we visited the locality.

MR. HATZIMANOLIS: Burial of trees?

DR. JANDA: Yes.

MR. HATZIMANOLIS: No, not since last October, actually July, you might say, when I walked it almost daily. No trees buried in the creek, trees that have come down from some places.

DR. JANDA: No sediment deposited?

MR. HATZIMANOLIS: They were not buried, but deposits.

DR. JANDA: How thick were the deposits from last winter's storm, a couple of feet or a couple of inches?

MR. HATZIMANOLIS: There may have been a couple of feet, I don't think there was that much there, one of the trees was seven feet in diameter.

DR. JANDA: I had the feeling there was sediment deposited

around the bases of these trees. How thick was this layer?

MR. HATZIMANOLIS: The sediment was cut away and removed, because I took some pictures of it.

DR. JANDA: So there was not any deposition?

MR. HATZIMANOLIS: No, it was removed and cut that whole gravel deposit had been lowered. This is a mile below the bridge crossing on the alluvial flats.

DR. CURRY: You started talking about going to court. Let's assume again that this area, the Weir Creek area, is our major remedial area. It is largely uncut. One option is to ask the Secretary of the Interior to enjoin logging operations by Arcata redwood until certain conditions were met, and Ed was trying to say, what conditions would you impose on there with respect to roads? Because that is one of the critical things.

How close they would cut to the ravines, you mentioned 75 feet on either side.

DR. JANDA: There is nothing magical there.

DR. CURRY: Okay. I think we can learn, we ought to apply the same thing here, this is already cut over, this is the avenue and we know there is certain road maintenance, etc., and some aspects that are immediately transferable, and say, "go ahead and cut," but we already know and can demonstrate from this area on this side of the river which is flatter, and actually probably the damage would not be as great as we anticipate it to be in here, that there are certain conditions, if you want to cut

this land -- fine, but on the best evidence we can garner to date we feel that -- A, B and C will happen, with possibly these results.

So what we're really doing is not trying to get outright purchase, it may be one of the functions but our attorneys have to answer that, if we issue a cease and desist order, pending certain operations whether that amounts to a taking -- let's not worry about that at this point.

What kind of things would we put in there, and how can we verify them?

DR. STONE: That is the $64 question.

DR. CURRY: We have more than anybody else does, than the company attorney knows, although he's going to be asking, he is going to be probing, as you have been probing this morning, and this has been a great help.

How can we prepare our case? What kind of a case do we have?

MR. LANGLEY: There is still a two-mile stream hazard between those spots below this whole side hill.

DR. JANDA: Jerry LaRue was told one of their targets for activity this summer is right there, a quarter section.

DR. CURRY: What area are you talking about?

MR. LANGLEY: The south end of the Park, on the west side.

DR. STONE: I think I would be willing to accept, if you have control of the buffer strip, that is the physical 800-foot

buffer, you can protect your terrestrial eco system. I would stipulate this, you have to control it.

What we are talking about right now is actually the tributaries and the protection of the tributaries. That is all we're talking about.

If we go upstream from Bridge Creek, how many tributaries do we have?

MR. LANGLEY: He was talking not acquiring the buffer and spending the money --

DR. STONE: No, we would acquire the buffer from Bridge Creek upstream. In fact, I don't see any real need, once the area is logged I don't see the need for acquiring the buffer. We are really talking about the buffer during the conversion process, so from Bridge Creek to the upper limit of the Park, that would be a buffer.

But what Dick has brought up, and the question we should address ourselves to, if we do file this suit, we have to have justification on each one of these streams that we're complaining about. We are saying, "Okay, in Arcata north, whatever that stream is called, these are the things that you must do and not do. On Arcata south these are the things you must do or must not do.

"On the Harry Weir Creek area, these are the things you must or must not do," and you have to make it stand up.

Do we want them to take out the logging jams? Do we want

them to channel all the water? Do we want a monitoring station and say, "By God, you cannot put any more silt into this."

These are the things we have to talk about.

DR. CURRY: Our basic objectives, to restate this again, is to protect this resource, and if it means acquisition here, we really don't from a policy standpoint want to, and I don't think it makes any sense to buy any more mature redwood area. Any time we are buying a tract of mature redwood stand in this Park vicinity, it is strictly because we feel it is the only way to protect the existing resource. It is not to add to the Park, and I am touching a sentimental spot in your heart about this magnificent area, unless Congress totally changes its mind that we ought to only deal with this area strictly from a protection point of view.

Unless we can demonstrate outright acquisition of the whole area, we ought to scratch that.

Now, if it is vital -- fine. I don't know if that threw us off the track. So in protection, then, of this side, for the protection of this side and the bank up into here (indicating), the buffer is not needed, but what is needed is a management agreement with Uncle Sam. It does not cost money but we will have to pay to put the old roads up to equal priority with active logging roads, but that is basically what we need to do here.

Now in the future, are there any stipulations that we ought to make in that agreement, too, for cutting zones?

DR. JANDA: There are patches of old growth tucked away in parts of these basins, and right along the creeks themselves, and those I think you would want some stipulation as to the techniques that they got them. They won't go in with a Cat road in the creek channel.

DR. CURRY: Is there any merit or do we have any documentation of just not cutting to the stream bank?

MR. LANGLEY: There is lots of literature on the subject.

DR. CURRY: Should we talk that under no circumstances should we cut within 50 feet?

DR. STONE: There are a lot of people who talked this way only because it is oversimplification.

MR. LANGLEY: You can find it documented in the Management Plan.

DR. STONE: I can show you the National Forest, where it does not work.

DR. JANDA: You are objecting to saying "no" to logging?

DR. STONE: I object to the fact that these big, old trees that we leave here either below or down here (indicating), I would prefer to get them out at the same time, but I don't want any big, heavy equipment in there tearing up the soil.

MR. HATZIMANOLIS: There is no prohibition in the National Forest of removal of coniferous stands along the bank, it is just a mythology.

DR. CURRY: A vegetative restriction, our agreement would

say, "I don't care how you do it, if you let it stand or take it out by balloon, you need a surface soil retention strip along these tributaries up there, and you could cut right up to the stream bank with a certain technique and maybe not destroy that."

DR. JANDA: You have to maintain some vegetation.

DR. CURRY: If you are preparing a pillow to drop the tree, you don't pull that in on the vegetation strip, nothing is bulldozed on top of the strip, and if there is a stump you want to go after in the vegetation strip, you can go after it, if you can demonstrate you can drop it outside of the strip and remove it without gouging.

DR. HELLEY: Those are some of the steepest creeks.

DR. JANDA: Yes, pretty steep headwaters.

DR. STONE: What you're saying, in part, if you are the guy who has to make the decision, you're saying what you want on those is some kind of a cable to pull them out of the creek.

DR. JANDA: Harry Weir would lend itself to cable logging, too, looking at the terrain.

DR. STONE: My own feeling would be the whole area, to say, "take it out with a cable." You say it costs $375,000? What you're saying is --

MR. LANGLEY: That is a special kind of cable logging, a slack line.

DR. CURRY: A slack line is 375,000 that Miller Lumber was using on the purchase unit.

DR. STONE: You don't have to have what we're talking about here, you could use almost a big, tall A frame.

DR. CURRY: Don't they use the tree?

MR. HATZIMANOLIS: The A frame with the tree is not in the books in today's technology. It is a steel spar that is used, and as Phil said, it is another form of cable system, but the advantage of the slack line is it can lift the log completely off the ground. I would have brought down a book that shows all these systems.

DR. STONE: The real issue, what you're talking about is you're going to go and tell Arcata you're going to put somebody in there to tell them how to do it, and the reason for it is because otherwise you're going to be damaged.

That is our court case.

DR. CURRY: We are saying that our other alternative of an 800-foot strip will not prevent that anticipated damage.

DR. STONE: Not for that stream course, that is right. I think they have demonstrated that you need control of the 800-foot buffer. They have already demonstrated by their logging and the effluent that has been coming in from their logging operation that you need control.

DR. CURRY: This is a research of still to be determined validity in this sense: At the outset, it is better than nothing. It may be extremely good, but at this point we're not confident that it is adequate enough to do the job, so we are going to

insist on road maintenace and specific cutting practices ahead of them.

You should keep it focused on the tributary streams you are talking about, and not the terrestrial eco system, because that is not a brand-new idea, that is the redwood one.

DR. JANDA: Some of the most magnificent and biggest trees are growing immediately adjacent to those tributaries, and if a visitor is in the Park, the trees that he will most see, outside of those in the immediate vicinity, right adjacent to Redwood Creek it is going to be adjacent to the streams.

DR. CURRY: He is out of the Park, then.

DR. STONE: We can't talk about that.

DR. JANDA: But what about the trees within the Park, away from Redwood Creek that are growing along that, the most valuable trees that you have in the Park are the trees immediately adjacent to the bank of Redwood Creek; and the second most valuable trees that you have are the trees growing along the banks of those tributaries, because those are the avenues of access.

MR. HATZIMANOLIS: Not tributaries, if your profiles of streams are correct, they are much too steep for the average citizen to wander up and down.

DR. STONE: I am sorry, I am lost.

DR. CURRY: What Dick is saying, if I am correct, in terms of Park values that we're trying to preserve, here is number one, the Tall Trees.

Number two on the scale might be -- I am arbitrarily picking -- along this tributary coming in here, or perhaps what we might call, for example, Arcata south. In this portion of the Park, it is still within the Park, although only a quarter of a mile of either side of that one. It is still within the Park.

Now the buffer will possibly add some aesthetic value to it, but again we are buying the buffer not, and this is my understanding and I hope to convince Congress of it, so we don't lose this acreage, as part of the Park, but it is a management zone. The visitor may wander in there, but we don't intend to treat this 800-foot strip like we are this quarter mile strip at all. It is strictly for management purposes, not for the Park.

Now there may be some aesthetic values we would like to preserve up here, but I guess I would have to say that is beyond our purview at this point.

MR. BROWN: Why is that? Stone's 800-foot buffer was a logging consideration and the buffer is such, as set forth by Congress, it is just a buffer per se. So it seems to me --

MR. HATZIMANOLIS: That is correct.

DR. CURRY: It can be a scenic buffer as well as a protective buffer.

MR. RUMBURG: He says the buffer at this point in time has no specified width or shape. We have taken the 800 feet that Ed proposed, but we can come up with a buffer now which would include the tributary streams. Your buffering could go up the tributary

streams and take in whatever you wanted to on each side of a tributary stream, and it would be a part of your buffer.

MR. BROWN: The concern of Congress was protection of the timber and the soil and the streams, and if this means going beyond with the information we now have, the 800 foot of the buffer, then I say let us go.

MR. RUMBURG: We are not locked into the 800 feet.

DR. CURRY: That is right, I was not trying to convey that impression, but for resource protection I don't know if we can justify going beyond the 800 feet.

MR. RUMBURG: On the basis of what Dick and his fellows are saying we can. There may be some disagreement here but on the basis of protecting the resource itself on the tributary streams, they seem to feel that it is necessary to include a certain amount of each of the tributary streams beyond the 800 feet in buffer.

DR. CURRY: Something like 150 feet.

DR. HELLEY: And up to second order streams.

DR. JANDA: We have to work out the details, but I think you have to get something on the sidestreams.

As Younger said, the tax laws are such it is going to be awfully difficult to say, "Be good guys and don't cut in there."

MR. RUMBURG: We have to recognize Ed's point. He believes also there is some protection that needs to be afforded this, but not to the exclusion of all of the redwoods that you

actually would selectively remove some of the major trees in those tributary streams and still not affect it, and I think Dick agrees.

DR. CURRY: What you would have is a buffer zone, whereas in here it would be an acquired pre-acquisition buffer, this could be a scenic preservation or a vegetation protection buffer.

MR. RUMBURG: It could be within your buffer zone, but you could have a different management practice applied to that.

DR. CURRY: They could cut selectively or high cable.

MR. DAVIS: How much of it could they cut?

DR. STONE: We are back to the same thing as the buffer. I still felt if they would log that buffer properly, say on the Arcata side, it could be done without actually any detriment.

DR. HELLEY: Over what period of time?

DR. STONE: We were talking about 12-acre clear-cut type of thing. If that were the case, what the buffer would do, we have control how they would log it, and what we're talking about now along on the tributary streams is having control on how they will be logged.

DR. CURRY: There may be some mild disagreement here, but basically, haven't we reached another plateau where we say even if these were totally managed, our first response and your reaction after we were up there on the field trip, I think you said specifically the way they log, I wouldn't trust them?

DR. STONE: I agree.

DR. CURRY: But the evidence now is saying that really we have to go beyond the 800-foot buffer on the tributaries so we may be talking about an 800-foot buffer running around here, and in addition to that meet these fingerling types of buffers. This will be under fee acquisition, Park Service management, title will remain in the hands of the timber companies with Park Service specifications on how this will be harvested.

The roads in this area will be maintained according to said standards.

DR. HELLEY: Why not ask for cable or high lead logging for all places up from the worm?

DR. CURRY: Do we need it?

DR. HELLEY: I think you just asked for it.

DR. JANDA: When they get the second growth, they may have more versatility if they lose tractor logging.

MR. HATZIMANOLIS: The time they get the second growth, it will be helicoptering. That is one of the big reasons why they are anxious to convert to second growth.

DR. JANDA: Let's not specify cable systems in that there may be a better system to do it.

DR. HELLEY: Say cable until a better system comes.

DR. STONE: If you can work out some kind of agreement where you have some say how that area will be logged, you will then have the problem of actually saying of how shall it be logged, so we can protect the value on these tributary streams,

and you have to say, is it the types of roads constructed, is it actually a vegetation protection strip. Do we want the logjams pulled out, etc.

Once you say this and you get this right, whatever it costs you, you have to go in there with a solid management plan, and without looking at the area directly myself, I couldn't pull one out, but I think they may come back and say, "Why do you have to have it? What is it that we're doing wrong? If you file for it, what is it that we're doing wrong?"

I can tell them what they're doing wrong in terms of the 800-foot buffer, it is obvious, anyone can go along and see the amount of effluent that is coming into it.

On your tributary streams this is a little more difficult, I think.

DR. CURRY: Isn't it really the same kind of issue here, because on the tributaries, let's take this segment of the 800-foot buffer: We feel that they can clear cut right up to this line, because right here the surface wash across and debris and everything will be collected in the 800-foot buffer.

The same practice here in the tributaries, secondary or primary tributary, there is no way that we can check it, and that is what we're saying, therefore, we run these fingers back up here, and they may not be 800 feet around this thing, but there are certain stipulations that we have got to put in here, because just for the very simple reason that this 800 foot won't work

there.

Bob's point is we can probably get some aesthetic value out of it, because we are not locked into the 800 feet.

MR. SMITH: I did not want to throw in aesthetics, because I did not think that was part of our primary consideration.

DR. CURRY: But you thought we were just locked into the 800 feet?

MR. DAVIS: I am with you all the way on this, except for this point: The buffer we have in fee and we will control it carefully. The finger we are saying up the tributary streams we are going to impose certain restrictions.

All right, from a practical point of view, we are going to have to say now what those restrictions are, or else we are never going to achieve any agreement or any basis upon which to make additional settlement.

MR. RUMBURG: Shall we say it is going to be necessary to protect these tributaries? Once we say that, we have to say what type of management plan we are imposing to protect them.

MR. HATZIMANOLIS: And how long.

DR. CURRY: Being from Washington, one way one learns to be a waffle very early, could we say it will be harvested according to management practices. This is for the initial court order accpetable to the Secretary of the Interior, and then he puts the burden on the company to come up with a management plan for our review, and then we respond as acceptable or unacceptable for the

following reasons -- but make them come up with the initial plan rather than us come up with the guidelines.

MR. DAVIS: How are you going to tell Congress how much it is going to cost them, which is a requirement?

MR. HATZIMANOLIS: And for how long? What is the time frame?

MR. DAVIS: I am not trying to stop that, but these are the questions that we have been through on some of this other stuff, because we are supposed to go to Congress and tell them what this is going to cost, and what the benefits will accrue as a result of this.

DR. CURRY: What is your figure for land acquisition of this whole area?

MR. DAVIS: The 10,000-acre buffer was $10 million.

DR. HELLEY: Would you show it what that is?

MR. DAVIS: I got another map.

DR. CURRY: I think we can set total land acquisition as the outside perimeter.

MR. DAVIS: 47,200,000 for 9,775 acres of Redwood Creek.

DR. HELLEY: If you subtracted Harry Weir, the price would drop in half.

MR. DAVIS: There may be some inconsistencies in the figures, $5,000 an acre.

DR. CURRY: One of the reasons I go by the acquisition figure, I don't know if you get your severance costs in that.

When you separate, if you buy like half the tract from a man, the cost of severing that portion of his property -- it is cheaper in some instances to buy the whole thing than the penalties.

MR. HATZIMANOLIS: Because he cannot carry on.

DR. CURRY: You diminish the value of the remaining tract.

DR. JANDA: If hypothetically we decided that this Arcata south was so critical that we had to have it, they would be denied access to Harry Weir Creek, there would be a great deal of cost to them.

DR. CURRY: Another thing, we are paying severance costs here, because ostensibly they did not come down to Redwood Creek.

MR. DAVIS: That is another thing that the corridor up the lateral streams is going to do, because the roads have to cut across those corridors.

DR. JANDA: No, they would have to bridge or use culverts 40 inches in diameter. We would tell them how to make their road crossings.

MR. HATZIMANOLIS: It gets to a point pretty soon where the logger decides he is going to have five or ten roads, and we think he could have gotten by with two roads, because he wants more stompage.

DR. CURRY: After it takes him eight months to process the application for the first bridge.

MR. DAVIS: The United States is going to pay for all

that for all those eight months.

DR. JANDA: Don't you agree that the tributaries must be protected? It is unfortunate, but that is the way it is.

DR. CURRY: Is it smarter economically in the long run to go and buy this?

MR. DAVIS: This is where I think we are getting so darned many restrictions and everything else cranked into this, that is justified, I am not critical of them, but we are getting very close to being back to recommending that this come into the Park, period.

DR. JANDA: Put it that way, that either we enter into these contracts or else we buy it, if it is cheaper.

DR. CURRY: In terms of our briefings, we might be leading up to that point.

DR. HELLEY: This was our conclusion as our survey team.

MR. DAVIS: Any time you impose restrictions on these people, it is an extremely complicated operation and setup, and we don't even in this room realize all the doors that we're going to be opening for claims against the United States.

DR. HELLEY: We stipulated that you just couldn't let it sit there in the present state of its condition.

DR. JANDA: Perhaps the management cost in that Arcata north and south, to prevent further damage to the Park, would be sizable. So there are hidden costs every which way.

DR. CURRY: Actually -- and this is where we have to

consult with BOR -- we might reduce some of our severance costs on the original purchase because some of it is roads in there, and if you say that you cannot log it anywhere --

MR. DAVIS: They have about five million for severance.

DR. STONE: Supposing you could purchase it, okay, then with the idea that you would be able to log it, this would be contrary to the whole general orientation of the Sierra Club in their effort initially to get this appendage down there, so the whole watershed could be brought to the Park.

DR. CURRY: We can purchase and lease back, we can get a lease back, so they can cut. In other words, we would own the fee to it and they could come in and cut on the deeded, which is another can of worms.

DR. CURRY: What would you do, add it to the Park?

MR. HATZIMANOLIS: The tax base, the county will say, "Wow, we cannot sit for that one."

DR. CURRY: You can put in some kind of language --

MR. HATZIMANOLIS: Somebody is going to have to pay, either Uncle or the logger, but it is going to come out of one or the other.

MR. RUMBURG: One of the great objections is the fact that we're removing so much from the tax base, and there ought to be some thought given to an adjustment.

DR. CURRY: I don't want to get us too far into political considerations. We are going to have that hassle later on. Let's

try to work a couple of ideal things: Do we have the data to justify acquisition? If we have the data to justify tributaries and road --

DR. HELLEY: By the time we have the data, we won't have the Park as it is now. I don't think it will be there.

DR. CURRY: I think we have the data to say this won't work.

DR. JANDA: Two men, two to three days, you can put together with surveying equipment and cameras, you can document it, get all the data that you would need to justify whatever practices you want to do.

DR. STONE: I don't think it would be that easy. In other words, I am sitting here, tell me why you would have to have that little number of streams? What is it that you want to control, suspended sediment? Do you want to control those that bounce along the stream? What is it that you want to control?

Do you want to control the amount of water going down through there? What is it that you want to control?

You're going to stop me from continuing with my logging operations, all right, I am agreeable with this, provided you can tell me why or how I should change them -- so tell me what it is that you want.

DR. JANDA: You are posing the threat and I think we can go out and document what actual physical harm was done to downstream lands by logging activities.

DR. STONE: Can you tell me that was logging activity, or was it this particular flood, which is an exceptional one, almost as great as the 1964 flood.

DR. JANDA: Let's talk about walking around Harry Weir Creek, the channel even of the mainstream, the rocks are moss covered, the banks are moss covered, ferns come down into the bottom of the channel. You walk down those other creeks, the rocks have been completely scoured bare, the whole geometry of the channel is completely different. The bank vegetation has been buried or eroded away -- all the rock pools which characterize Harry Weir Creek have been filled in with gravel.

Harry Weir Creek was subjected to precisely the same storms as those other basins, and geologically it is about the same, the slopes.

DR. STONE: What you're saying, you would describe the part of the Harry Weir Creek that is now in the Park, you would describe that and then you would go across to the other area that has been logged, and you would say, "This is the difference between the two, and if you continue with your present activity this is what this one is going to look like"?

DR. JANDA: Yes.

DR. STONE: "I want you to stop for this reason, because you're going to destroy this particular character," is that what you're saying?

DR. JANDA: You are trying to get me to say that I want

Harry Weir Creek remain pretty. What I'm saying -- you lawyer types -- I'm saying that because of the things that were done in this basin, right now things are unsightly within the Park, so if you do the same things in this basin, you're going to make things unsightly here, plus these consequences, if they happened at this point rather than at that point, they would have conceivably affected this landslide and conceivably affected Big Tree Grove.

DR. STONE: You have to tell me to stop, and you have to list in the order of causes and you have to give me evidence of it.

DR. JANDA: If you do the things in this creek that you have already done in that creek, the things that happened at the outlets of these creeks, it is reasonable to expect them to happen at the outlet of this creek, and therefore the consequences or potential consequences of that action we find unacceptable.

DR. STONE: The thing is, you are comparing two creeks. How about comparing McDonald Creek, which has a fan, and Bridge Creek, which has a lot more material moving out of it and no fan.

DR. JANDA: Bridge Creek has a lot more water.

DR. STONE: Bridge Creek has a lot more water, it is moving more, more travel than Redwood Creek.

Marlowe claims they uncovered and dragged out logs last year, and he said the same area was re-silted, deep enough to cover the logs, had they not dragged them out. He's talking about a deposit of gravel of 10 or 20 feet moving in, and this is progressively moving out into Redwood Creek. That particular one is

not forming a fan that we're getting on McDonald Creek. If you contrast the Harry Weir and McDonald, why can't you contrast Weir and Bridge Creek?

DR. JANDA: Bridge Creek?

DR. STONE: I would have to see the different grain size of materials, different slopes. This is the thing that you would be up against, which you would have to explain.

DR. JANDA: We can do that, though, that all can be done.

We can sit down here at the board right now and in 15 minutes make a list of factors that control erosion rates.

And then we would take this list in the field, and complete this list, and we could say, "These are the properties, drainage areas, drainage density, the slope of the channel, the size of the grain sizes, that sort of thing." Do it for all the streams and see how comparable they are. We have done that a little bit, we have been going at this in sort of a half-baked effort.

The only thing I have done is compare these obvious factors for Copper Creek with Harry Weir Creek.

DR. STONE: I don't want to sound like a broken record on the Harry Weir Creek, you're asking for a stop order. What, specifically, is it that you don't want to happen?

DR. JANDA: The most specific thing I don't want a slug of sediment and logs coming out of the creek that will threaten the stability of the channel.

DR. CURRY: You are going to put a stop order on all the tributaries.

DR. JANDA: It is in a position to have the greatest threat.

DR. STONE: You have to say what you don't want it to do, and you have to work with them and say, "Okay, if you do the following, this is what will happen."

DR. JANDA: Isn't this what we have been saying all along here?

DR. STONE: I would like to get it down more specifically.

DR. JANDA: On paper?

DR. STONE: I don't think we have a court case.

MR. DAVIS: How about purchase of the 800 feet that we discussed, and then require cable logging on the rest of it?

DR. CURRY: That is mechanical, though, and does not answer Ed's question, if I am correct.

DR. STONE: That is right.

DR. CURRY: What damages are occurring, what are likely to occur.

DR. STONE: That is why you want the stop order. You have got to spell it out.

DR. CURRY: You have the fan from Arcata north and south.

DR. JANDA: Both of these streams come out on the outside of a bend, so the full force of Redwood Creek will take it.

DR. CURRY: Is that one reason why Bridge Creek does not

do it, or is it the volume of water?

DR. JANDA: I don't know the situation there that well.

MR. DAVIS: Arcata north and south don't look bad from the Park side. There is no evidence of anything happening.

DR. JANDA: From the buffer site coming into the Park, stuff is coming down and those cuts were just made in '70 and '71, is that right? I am pretty sure.

DR. CURRY: Do you anticipate their movement into the Park in the next couple of years?

DR. HELLEY: One of the things you can say about Harry Weir Creek, we don't want the carrying capacity of the channel of Harry Weir Creek at its confluence with Redwood Creek to change plus or minus ten percent. You can measure that before they do any serious logging.

DR. STONE: This is what you really get down to. You say you don't want the channel to change.

DR. HELLEY: These are the levels.

DR. STONE: You have to come up with this, and then is where you get your documentation and say, "We think what is now going on in the upper reaches will change it."

Is it just the channel you are concerned with or is there anything else?

DR. HELLEY: Capacity, too.

DR. CURRY: Can we document or say, "If you cut Harry Weir tributary according to your present practices, you will increase

the load of the main creek by X number of cubic yards?"

MR. HATZIMANOLIS: Even if we say that, can we say that is deleterious?

DR. JANDA: We might be able to put some limits, we can put limits on. They will be pretty wide limits.

DR. HELLEY: We don't have the data and we are not going to have the time to get the data. We said that earlier.

DR. JANDA: That is the merit of the study, but the study can only be done as a moratorium. It is going to take two to three years for a study.

DR. CURRY: What kind of data do we have elsewhere that we can use here to suggest that we want a cease and desist?

DR. HELLEY: Ed does not like transfer data, he wants it on the site.

DR. CURRY: The only way he can get it on the site is to stop everything in its path.

DR. HELLEY: That is what we said.

DR. CURRY: Do we have enough data, even though Ed is not happy doing it that way, using that as the best method that we have, scientific method right now, as a justification for a stop order until we have further study? That is really what we have to do, knowing full well that the consequences may be that we might be stuck with the purchase.

DR. STONE: Your difficulty is that Arcata has already logged Little Lost Man and May, these are small streams, and what

kind of destruction they developed over there -- very little.

MR. DAVIS: You cannot prove it there.

DR. STONE: So you're faced with the same problem there, what is the destruction that would result?

DR. JANDA: I think those streams, their gradients and slopes are not as steep as these.

MR. DAVIS: There are some pretty wicked ones.

DR. STONE: The question was, are they the same geology, and the minute you start extrapolating, that comes up right away.

I did not want to raise that question, they are not the same geology.

MR. JACKSON: That is not the same ball game.

DR. STONE: Somebody else suggested that maybe you can extrapolate.

MR. DAVIS: This is the frustrating thing for me, there is an awfully large percentage of the Lost Man drainage that has been harvested and goes through an old growth forest in the Park, and I am sure there is a little more sediment along that stream bed within the Park, but basically there is no obvious physical evidence of change.

MR. RUMBURG: But the one thing they have decided now and pointed out, there is a different geologic picture between those two areas.

DR. JANDA: Lost Man Creek does not actively cut a canyon and meander back and forth, and is not associated with landslides

along its banks. I have never been at Lost Man Creek, I have some pictures that Clyde took, and those slopes are in pretty bad shape and continuing to erode and send debris counts into Lost Man Creek.

If you look at Lost Man Creek as an analogy of Redwood Creek and the smaller tributaries to Lost Man Creek, you come up with a much better analogy on the worm.

Some of the steep tributaries to Lost Man Creek have sent deltas and fans and things.

DR. STONE: You ought to look at it, the difficulty with photos is that they only relate to a small part of the total area, and the last time I was there I did not get this impression at all, and I have not been there since this major flood.

Now the other thing is, if you cannot use geology because it is different, this morning we were looking at Blue Creek, and we certainly cannot use Blue Creek and the Klamath. So what are you going to use for extrapolation? This bothers me every time you extrapolate.

DR. JANDA: You can put limits on your extrapolation by all the factors that are involved. You can still put limits, we don't know anything right now.

DR. STONE: I was not proposing the extrapolation myself, somebody else did.

DR. HELLEY: You would like an on-site study?

DR. STONE: You have to spell out what is it that you are really afraid will happen. I think this has to be spelled out,

what will happen if you go ahead and continue to let them log.

DR. CURRY: Will you increase the organic matter that could likely be deposited in the Big Trees area; is that one?

DR. STONE: That would be one, and if you said, "Look, you can't do that," they would make a special effort to clean out the channel, I think they would, if you said this is one of them. They would say, "Okay, fine, that is fine, you can come out and inspect us once a week or once a month. What else do you want us to do?"

DR. CURRY: "Maintain your roads."

DR. STONE: "I will do that, so help me God."

DR. HELLEY: No Cat logging.

DR. STONE: Now I think you can say, "Why is it that you don't want any Cat logging?" I am still trying to get down --

DR. HELLEY: You don't want to see the sidecast in the stream, decrease the sediment load.

DR. STONE: You want to keep the sediment load to something before they started logging.

DR. HELLEY: That is right.

DR. STONE: You think this is a legal right, you own that part of the stream, "You can't put any more in it up above."

DR. HELLEY: We own the mainstream, there is only one of a kind of these things, and we are trying to do everything we can to protect them. There is only one of them.

DR. JANDA: In that respect, maybe the onus ought to be on

them.

DR. STONE: Maybe the judges have the philosophy when you have seen one tree you have seen them all. If you had this kind of approach, you have to say specifically, "We don't want any more sediment than what we used to be getting here, and the reason is because we are afraid what it will do to the Big Trees," if that is what your concern is.

MR. DAVIS: I wouldn't limit it to the Big Trees, unless that is the only thing we can justify. We're talking about the whole corridor.

DR. CURRY: The stream bed.

MR. DAVIS: And the growth on both sides.

DR. STONE: If you limit it and say, "I am concerned with the bed load that is moving through the sidestreams into Redwood Creek, this is the limit we will fix on it, no more than that," they could come back and say, "But why are you concerned with that, when you have all this massive amount coming down Redwood Creek?" And you're back to the old story again that you have to show the judge that this is indeed damaging, because it is stopping the flow of that gravel progression down.

DR. JANDA: And we could show on a per square mile basis the yield of bed load from these areas is probably in excess of what it is from most of the Redwood Creek basin. There are a couple of parts that look like they would be problem areas, it would be a way of looking into the Park, Wax Creek is several

tens of square miles, like one gigantic source of landslides.

DR. STONE: Even the slide we saw before we came down the bridge, Redwood Valley, this is a massive amount coming in, so you got slides coming in all along and if you limit the amount and say, "I don't want any more than so much coming in from these side streams, so much bed load."

DR. JANDA: Bed load and logging debris. We are concerned not just with the aggradation, logs working their way down the tributaries as well as the bed load.

DR. STONE: I think the logs working the way down to the tributaries, they can be cited under the Fish and Game.

DR. JANDA: Jack is right, the logs will stop --

DR. STONE: I think your organic debris, a large part of that can be controlled and will not be a problem. With some care, they can do that, and if they are cited, they will do that.

I am trying to figure out what your case is.

DR. JANDA: Lots of case histories is all we can present, quantifying observations of bed load.

DR. CURRY: Can't we say that it has been an active area historically and we cannot at this point say that another million cubic yards will do it, and you will totally obliterate it, we cannot pinpoint that spot, but we know that the problem is of such a nature right now that an added increase at this time significantly above what it presently is could so affect that stream bottom as to destroy the Park values which the Secretary of

the Interior is charged to protect.

And that what we are really asking the companies to do -- and we won't worry about purchase or anything like that -- we are asking them to keep the input of sediment at such a level, which we can determine the existing level of such and such, and it ought not to increase above X percent -- that is something else that should go in.

And that they should maybe cease and desist any practices that would go over or cause that stream load to go over. In other words, don't stop them but suggest ways that they can reduce the impact and just have sort of a standing court order, when we monitor that stream, if they go above, they're going to have to stop cutting the timber until they figure out a way to improve it.

DR. HELLEY: Don't you think you are always going to have these problems until you control from divide to divide?

DR. STONE: If you can get a court order saying you won't put any more sediment in than the following --

MR. DAVIS: Can we tell them that the seasonally adjusted level is --

DR. STONE: The Park Service can measure it, if you have a court order.

DR. JANDA: We have a hard time in saying like tons or cubic yards. We have to be talking more in terms of modifications to the geometry of the delta and the changes.

We don't know how to come to grips with it. Ed has worked as hard as can be in measuring bedrock, but sampling bedrock and bed load is a different and difficult thing --

DR. STONE: I am opting for Arcata, and just a cooperative situation, you tell me what to do and I will do it. You tell me how much sediment I will put in and I will see that we won't get any more -- you just tell me.

DR. JANDA: I think if we can establish -- which we have not done -- in the nature of the channel geometry in the area and what is acceptable, and you say you cannot introduce so much logging debris that you will influence the channel geometry in this way.

DR. HELLEY: He is going to say, "How much is that?"

DR. JANDA: It changes, that is the only monitoring tool that you have.

DR. STONE: "I keep operating, I don't want to foul up your park. When are you going to shut me down?"

DR. JANDA: We have to tell him, "Based upon our observations," when he used these practices in an adjoining drainage basin that the geometry of the channel was changed in a way which was deleterious. That is all we can do. If that is unacceptable, we can't say anything. If that is unacceptable, I'm sorry, but that is all there is.

DR. HELLEY: Buy it all.

DR. STONE: What is the geometry of the stream that is

unacceptable?

DR. HELLEY: An increase in the bed elevation of the stream beyond which it starts to cut the bank.

DR. CURRY: And which it is doing now, and it appears it is just about on the threshold of added quantity, quantitative change becomes a qualitative change.

DR. HELLEY: Point of no return.

DR. CURRY: And therefore we cannot absorb any more sedimentation at this time, we know there is a tremendous load going through there and we are saying the tributaries cannot contribute any more, because when they contribute they reduce the carrying capacity of the river in there, regardless of where it comes from. It affects the Park.

DR. STONE: I thought we were back to where we almost defined on the tributaries what we wanted. Now we are back on Redwood Creek and the stuff you can dump into it.

DR. JANDA: We are concerned with the tributaries, because they affect Redwood Creek.

DR. STONE: That is the only reason we want to control the tributary.

DR. JANDA: There are two reasons: There is the Park, here is the creek and the tributaries, the tributaries are affecting the channel of Redwood Creek and we are also concerned because that portion of those tributaries is part of the Park.

DR. STONE: Can you tell me what it is that you don't

want me to do to that portion of the tributaries that are a portion of that part of the Park?

DR. JANDA: A typical cross section would be something like that with maybe an old redwood sitting at the bank. We don't want things to go on up there, we don't want gravel to come down this bank, and to abrade this tree and sever the root and have it topple into the creek. We don't want the flood discharge coming down the creek that you start cutting so much that you undercut the bank and topple the tree.

We want to protect the Park resources that exist in and adjacent to the tributaries in that Park.

DR. STONE: We have had floods in '65 and '64, and this recent one here. All right, as you go up those you see areas that have broken loose, you see trees that are hanging, slides are taking place along these tributaries. These things were activated in the past. Now what is it that you're asking me to do, not accelerate it? Will you tell me what the present rate is?

DR. HELLEY: We can do some of that stuff.

DR. JANDA: We can tell you how many slides, how many undercut banks, how many filled gravel pools there are.

You have walked along the stream, you tell us what is different about walking along some of these culvert streams walking in --

DR. STONE: I'm not in a position to do anything, this thing is dynamically going on, there is cutting taking place,

there is changing in the geometry of that stream bed. I assume there is, because this has been going on. You don't think so?

MR. BROWN: There may not be.

DR. STONE: I can take you up Arcata north, and there is a lot of massive slides in it.

DR. HELLEY: One of the things we can do is we can age those classes on that stream and say it stood there 600 years, and if it made that --

DR. STONE: It did not start to slide.

DR. JANDA: If you look at eccentricity, like this guy who looks at trees and sees eccentricity patterns and a long history of sliding.

DR. STONE: This is where there is recent soil movement, and it blocked sliding, and that is in Arcata north.

DR. JANDA: That is a reactivation of something that has been going on for a long time. Some of the things there is no indication of it ever having gone on before, it has not happened in the past.

DR. STONE: Now the thing is, what I'm trying to find out, what is the dynamic pattern that would go on, if we were not logging, because all I want to do is when I log I don't change that dynamic pattern.

So you have to be able to tell me, it seems to me, in a court of law actually what that pattern is, because I am very willing not to disturb it.

MR. BROWN: Do it in terms of stream profiles.

MR. DAVIS: So much of this we have to come out and state what we want to see done and assume that this is the best that can be done within reason, and tell the companies exactly what we're going to do.

In other words, acquiring the 800-foot buffer, put in our lateral stream protection zones and any other requirements, spell it out and be willing to pay the bill for that, and be willing to accept along with the company the consequences as to what happens, because if we leave it open-ended or keep trying to put the monkey on industry's back, we're not telling them what we're expecting them to do and we are not sharing in the outcome with them.

It seems to me if we can define, and I think we were getting close to it when Dick was up in front of us a few moments ago, and get down to a few basic things that we felt were defensible, we say we are going to acquire the interest to see that this is accomplished, and live with the consequences, that then we are on fairly firm ground, instead of having to prove that everything is going to work out just fine or isn't going to work.

Can we state a few things that we want done?

Maybe I'm trying to make it too simple and it isn't that simple, and acquire the interest to impose that and share in the responsibility of the outcome.

DR. CURRY: I thought we had kind of stated what we wanted

done and where we got hung up, it seemed to me, was why we wanted it done, and all we really need to do is refine that a little bit.

Ed has been raising some points here of just what are our limits to explain why we want it done, and I don't think he is raising it that we should not do it, but he says, "let's be aware of our limitations to explain why we precisely want to prescribe this particular medicine." We are saying we want to prescribe it because there is a certain amount of logged material we don't want to come down, it is in these units. There is bulldozer material and so forth, it is in these, and it has worked its way down to the stream, and we can anticipate -- we don't know the precise rate, it has not been said -- but one way that we can protect it, we have got an insurance zone here that we're going to have totally under our complete ownership and control, and we hope by the time it reaches down there we will have some restraining techniques on the way.

That is, in a sense, our basic case here. On this stream there is not evidence of all that clutter in the stream, there isn't evidence right now of a high limit of stuff washing out, or a possible breakup and flushing effect.

DR. JANDA: Which stream?

DR. CURRY: Harry Weir I'm talking about, Harry Weir Creek we can contrast that portion in here with the portion on the tributaries.

DR. JANDA: There is a slug working its way down these

streams.

DR. CURRY: We know there are slugs in here, we know there are no slugs or minimal slugs in here (indicating). We want to prevent slugs going in here, because we know from past history that slugs in here put logs in here, and we can say it has aggraded the stream dramatically, and you have got a lot of pictures to show it.

MR. LANGLEY: One reason we can't compare Bridge Creek with this here or over there is that these were logged at different times with different techniques, different equipment, but it is a lot better to compare those things with, say, Bull Creek.

DR. HELLEY: We can use Harry Weir Creek as a control on the change if we are monitoring it right now when they are cutting it.

DR. JANDA: If we were going to do a study, we could probably get reasonably good data from monitoring a tributary, but one of the things I'm most concerned about in going back and forth across the creek, the forest seems to be different on both sides of the creek. The west-facing slope seems to be more open forest, fewer blow-downs and a lot less logs on the forest floor than the east side, which is denser stand.

DR. STONE: You're talking about over here on the Georgia-Pacific as against the other, one is heavy volumes, the other is light volumes.

One has different undergrowths, I would not want to compare them.

MR. LANGLEY: You can still go up on the west slope up Bridge Creek.

DR. CURRY: If we accept Ed's point about not extrapolating data from one area to another area, each of these areas, there is not a uniform management plan.

DR. STONE: Can't you go back up on the Harry Weir, taking a positive look at it and say, "This is the area that has been logged." Didn't you find some debris from the logging that is currently going on on the Harry Weir?

DR. JANDA: It just started this year.

DR. STONE: How far did it move?

DR. JANDA: Only where the Cats pushed it, since it is the dry season.

DR. STONE: Can you show in any area of the upper regions that it is moving down?

DR. JANDA: Not until it rains.

DR. STONE: How can you say that anything detrimental has happened?

DR. HELLEY: It is getting ready to move.

DR. CURRY: You have introduced a new series into your stream bed, is it in it?

DR. JANDA: Some places where the Cats shoved it in.

DR. STONE: You don't have any evidence of it yet of this

moving down. You said there was a slug?

DR. HELLEY: He said on the Arcata south.

DR. JANDA: I am afraid one will come down.

DR. STONE: Can you go to the Arcata north and south and show how far from the logged area this moved?

DR. JANDA: Yes.

DR. STONE: And document this and say, "This is what is happening, and we don't want this in our tributary streams"?

MR. LANGLEY: I don't think I would say just that, I would point to what happened on the other side before you go as to what is starting to happen here.

DR. CURRY: You can say you got a slug that is all ready and waiting to be launched for the next season, and it is getting bigger.

Do your measurements there, too.

DR. STONE: It seems to me you could go up here and say, "This is a place where I think you should start."

DR. CURRY: Get them to move the slug out.

DR. STONE: Identify it, say it exists there, say, "We are going to measure it this year, how far it moves. We want you to stop it."

I think actually they can come in with a stop and desist order for something specific like this, rather than be general and say, "This is what you have done, stop it."

And if you can do that, I think you can go on to the

next step.

DR. JANDA: It seems reasonable, looking at what their practices have been, all the logging practices adjacent to the Park that we really can extrapolate from what the past history of logging has been, and saying, "Your past history suggests to us"--

DR. STONE: Their past history on Lost Man and the one on May, if you look at their past history elsewhere it does not suggest it.

DR. HELLEY: In the same geology it does.

DR. STONE: They did log and log an area by the Big Trees; was there any erosion resultant from it? I looked at the big area.

DR. JANDA: The clear cut right at the bank down there.

DR. STONE: Look at that, and it is a nice job.

DR. JANDA: We are relative again.

DR. STONE: It looks like hell.

DR. JANDA: But there are gullies in the road, gullies two and three feet deep on some roads, pretty low gradients and that is a flat area.

DR. STONE: I think there are some gullies but I did not see any gully that went for any distance. There is cutting in spots but there is not any extended gully off of that area.

DR. JANDA: We have to go out there and walk out the gullies and see how far they are.

DR. STONE: I am saying that I don't think that argument,

because of what you have done in the past, shows what you're going to do in the future. But I think you can say on this area, which has been logged right up here in this watershed, "We know this is what you put into the stream and we think it is going to move at the following rate, and at some time it is going to come out at the bottom, and we want it removed, and we don't want any more to come into our stream. Stop, desist."

MR. LANGLEY: This is going to cost money.

DR. STONE: This is their problem, this is my Park, you are not going to be able to put that stuff in my stream.

DR. CURRY: What if it is an effluent?

MR. LANGLEY: There may be two kinds of justification: One justification would be for the purpose of getting funds from Congress to do these things. For that you would have to go to the other side and show what happened in the past.

The other is the justification to the company, justifying why you want them to do that thing. You just point out that is what has happened up here.

DR. STONE: You can go to court tomorrow and say, "We want you to stop this practice."

MR. LANGLEY: For the purpose of stopping the company.

DR. STONE: Not stopping the company, stop this practice and correct the situation, because you're going to damage our property below.

MR. LANGLEY: But you have to have further justification

to get money.

DR. JANDA: If we really want to stop them right now, the Congressional mandate is as clear in terms to the aquatic eco system as it is in terms of Big Trees.

DR. CURRY: Park resources.

DR. JANDA: It is a little bit touch and go in terms of whether we're going to raise the level of the stream bed, precipitate landslides, but once you start talking about the aquatic eco system, even changing the suspended sediment in the rivers, you are going to change the eco system very quickly, so from the point of view of building a case in terms of trying to get any stop and desist order, something that is going to be hotly contested in court, maybe the tack you ought to take is at least as part of your case involve the aquatic eco system, because there can be no controversy there in terms of what is happening.

The salmon riffles are silted over, the rearing pools are filled, critters are actually physically buried.

DR. STONE: That is not due to my streams, you understand, that is due to Redwood Creek upstream.

DR. JANDA: I am talking about the tributaries, these little loops, that is something that you are mandated to protect.

DR. STONE: Fine, you tell me to stop it and you get a court order to stop me from doing, and all you have to do is tell me what it is that I am doing. If you go into the upper reaches, you can show me. I am putting sediment into it, and you say,

"stop it," and I have to stop it.

DR. JANDA: I think we can do that.

DR. STONE: That is what I think you are actually talking about.

MR. DAVIS: Can you really show that on the tributaries?

DR. JANDA: Bob Averett can show it better, he has bioassay data on logged and unlogged tributaries. There was a lot of exception in a report that came out in January by the State people, where they talk about equal bioassay before and after logging. Bob says there has been a conversion from a producing eco system to a consuming eco system.

DR. STONE: I think the real question is on these streams we're trying to protect, the subsidiary streams, the laterals that happened already, has it happened on the logged one versus the unlogged one?

DR. JANDA: I can show you some pictures of some of the streams, there is nothing left.

DR. STONE: Within the Park? I don't think you can show me within the Park where this has happened.

DR. JANDA: I think I could.

DR. STONE: Maybe you can now, but you couldn't have awhile back.

DR. HELLEY: Just wait.

DR. STONE: Let's stop them.

DR. CURRY: And that is a legitimate legal remedy to

anticipate, that is injunctive form of relief, after your neighbor cuts the tree on your property line it is too late to do it.

Joe Rumburg raised a point there in a side conversation, and the only reason I mention it is because I want to make sure it gets into the record. We are talking about tributaries, we're not asking to cease and desist cutting, we're saying, "Keep your stuff out of the tributaries because that does have a deleterious effect on the Park resource, and we have the mission to protect."

DR. STONE: On the tributary resource that is part of your Park.

DR. CURRY: Why be specific, it has an impact on our Park resource and it can be a tributary, and then there is some discussion whether it has on the main channel.

DR. HELLEY: Where do you stop with that line?

DR. CURRY: The fact that it has an impact on any part of the Park resource is legitimate enough, and there is no sense answering a question that is not asked yet.

MR. SMITH: It seems to me the big question at the moment is whether we can come up with the forest practices short of no logging whatsoever, which would allow the company to get in and do their logging on the slope, as opposed to telling them, "You go ahead and log. You establish your own management practices and we will monitor the streams and tell you when you have exceeded the sediment flow that is acceptable to us."

DR. CURRY: Let them devise the practices that we are trying to come up with.

Respond to this point, can't we just say, "Keep your stuff out of the stream. I don't care how you do it," and have the court order them to keep the stuff out of the stream. If they have the cable log to do it -- fine, but the injunctive relief we are seeking is to keep these tributaries free, and any portion of the Park free, from extraneous material, whether it is an untolerable sediment, or logs, or something like that. The best way, we cannot set precise measurement practices, is to say, "Keep the stuff out of the stream."

DR. JANDA: And specify why.

DR. CURRY: And specify why it has to stay out of the stream, because already on past experience, as Phil has said, we can cite areas within the Park, we can cite numerous other areas in the Northern California area, of what has happened that this stuff gets in and moved.

DR. JANDA: Then it is up to them to answer your questions.

DR. STONE: You know what I'm going to do, you told me this and I'm saying all we're talking about is incidental as it relates to Redwood Creek, because I have the gigantic watershed above me that is moving the stuff down. I won't put any more stuff in your stream than you tell me, but I don't really care, Redwood Creek, I think, is something that has its own problem, so when you're telling me why not to do it, I think Redwood Creek

clouds the whole issue.

You can tell me you don't want to destroy --

DR. CURRY: But the tributaries cloud Redwood Creek.

DR. STONE: What we have here, it seems to me, is a legitimate position that those tributaries that are within the quarter mile belong to the Park, you don't want them changed, because they are part of the primeval redwood forest, and they will be changed if you pour that much sediment into it. That is where your argument should be, and then you don't have somebody coming in saying, "Redwood Creek is the highly erodable thing, and that has been going on for ages and ages and ages."

You are down to specifics, you don't want the aquatic eco systems destroyed, they are easily defined, they're probably still productive and not consumptive as they now stand.

Bob can go up to the upper reaches of the tributaries in the logged-over area and find out major changes that have already taken place.

You put in silt and you no longer have the productivity that is taking place, so you can take the upper part of the logged area and the lower part that is in the Park and say, "This is happening, stop it." And this is where you would have the argument and they would have a hard time meeting it.

When you bring Redwood Creek in, I can show you all kinds of slides.

DR. JANDA: And just among us cats here, the kinds of

things that we want to do to protect these things are precisely the same things we want to protect the inputs along Redwood Creek, it is the only thing we can do.

This would be a hard argument to beat, frankly, it would have to be tied to how much activity there is as a result of normal geological erosion, but I think if you can tie it down --

DR. CURRY: We have got to get busy monitoring the other question, because that is going to come up. The timber companies won't bring it up, but the conservation groups will come back and get into the other questions.

DR. STONE: And you have to have it monitored pretty well, well up, you want to have this to be able to monitor way up, if you're not going to make it a buffer.

I don't know whether you want to call it a buffer or management zone. It is a little different sort of thing than a buffer, because you are saying, "Okay, you can handle this any want you want, provided you don't put any more effluent," so you have to have actually some monitoring stations up in the cutover to see actually or just below the cutover keep progressively ahead, to see what is happening, so that if you are ahead of the cutover and something happens, they have to stop.

That is the only way, it seems to me, you can keep ahead of them and keep them from getting to the point where it moves down into the Park.

I could visualize that you might be able to sell something

like this. It would be kind of hard to rebut.

MR. DAVIS: This would be on top of the fee acquisition of the 800-foot strip, I did not want to drop that out.

DR. STONE: I think you have to have that. How does this set with you, Dick?

DR. JANDA: I think it is a good tack, it would be hard to defeat.

I don't think our case on Redwood Creek is all that bad, but this is really a much tighter case. The only thing I dislike about it, someone might say, "It is such a small portion of your total resource."

MR. LANGLEY: That does not justify doing it.

DR. CURRY: That begs the question. What we're talking about is one tree, when you get right down to the nitty-gritty of the whole thing, because the presence of that one tree in there has eliminated a whole range of options for us.

DR. STONE: Now you have to define the study very quickly and find out what it is that you don't want them to do.

MR. LANGLEY: He just stated that. Don't dump anything in the creek.

DR. CURRY: We don't want any material added to those tributaries that is not presently there, no introduction of any additional matter into those tributaries.

DR. JANDA: Someone might say you have to be more specific, but we could come up with tested, seasonally adjusted bases.

DR. CURRY: You don't want man-introduced materials.

MR. SMITH: Man-caused.

DR. STONE: I don't see why you don't put a monitoring station in right away and say, "it should not be exceeded." I think you need monitoring and very quickly.

DR. JANDA: We're getting to the word "monitoring" and to "studies" again. At this point, I talked with Jerry LaRue and Jack Young up in Eureka last week, and both of these guys had some things they would like entered into the record in the area of studies. One is, Jack Young would like to emphasize his belief that the study that we were talking about up there in terms of looking at all of Redwood Creek, in terms of sediment inputs, the history of the landscape in Redwood Creek, the future of the landscape in Redwood Creek, is an outstanding opportunity not only to do the Park a service but all of the North Coast of California a service.

He has talked with people at the Arcata State College, or Humboldt State --

DR. STONE: California State University, Humboldt.

DR. JANDA: And he has talked with many of the people on the staff there, and they're all very enthusiastic about the desirability of using Redwood Creek as a microcosm for the area, and they and Bob Averett and our group had stressed that probably the unifying theme of that study would not be something like landslides but something much more general. What the future of

the landscape in Redwood Park and the adjacent area would be.

Jerry LaRue pointed out a much more practical problem, and that is at the present time we are only monitoring Redwood Creek at the south boundary and at Orick, and it is very difficult under inclement weather, when we most want our data, to get to this station. Jerry feels to make the most out of the stations that we have the old stream gauge which he had with the old Highway 299 across Redwood Creek, it should be reactivated, because he can get to that on a continuous basis, and then we have two stations, one at Orick and 299, which we can play correlation games with to make this record a better record.

The other thing he urged us to consider was the fact that he feels, as we would feel, to monitor some of the inputs on some of the tributary streams, that access again will be a problem, and what we probably would have to go to would be making episodic or periodic measurements, as the jargon that the Geological Survey uses goes, trying to come up with load discharge relationships, stage discharge relationships, and correlate them to the long-term record, and on that basis we might be able to put some numbers on some of these inputs, but basically Jerry was concerned about access and it is most desirable to get data at this particular point, and you may not be able to get good data because of the access to the country.

Jack Young said -- and you people in the Park have a better feeling about that -- he felt that any purchases which were

made of cutover land would not raise many eyebrows at all in Humboldt County, the biggest eyebrows would be raised in terms of additional purchased of old growth.

MR. DAVIS: That is very correct.

DR.JANDA: I have a question, we keep asking ourselves about studies and funding. We very quickly get to money and manpower. What are the chances, you know the survey is getting an awful lot of cooperative funding from other agencies, the survey does not have a big program, but it can re-program inhouse, even if Morton calls on the phone himself and says we have to do it, there has to be additional monies, otherwise there just could not be a study.

DR. HELLEY: You should stress the manpower, because most of us are stretched so thin you could look through us.

DR. JANDA: We are looking into graduate students and other people. I think if the money was available you can work the manpower situation out. Maybe not you or I.

DR. CURRY: The unbridled enthusiasm of Lionel is overwhelming.

MR. DAVIS: We just got our print-out, and we have a little money, quite a little starting to show up in '74 and '75 fiscal year for stream monitoring and studies to determine how that stream monitoring should be done. It is quite possible that if it is directed to the proper channels --

MR. RUMBURG: We have a great deal of money programmed

with USGS on the basis of studies. Maybe we need to reassess our priorities.

DR. JANDA: Would it be desirable to call Gleason on the phone, the Water Resources Administrator for the Western Region, to see if he could meet some of you people? If we really want to follow this conversation farther, we're going to get into policy matters.

MR. RUMBURG: We need to determine within our organization what our priorities are and where we want the program money, and the same thing is going to occur in your outfit. If we should decide we want to adjust our priorities, we have to come back to you, and your Water Resources man would say, "No, we can't change our program merely because you fellows want to. We will be glad to do additional work if you can find additional money." So what we're talking about in the way of funding --

DR. JANDA: I don't have these figures right now, I hate to give them to you, but I think the reactivation of the gauge, this is a ball park figure, at 299, I think a daily sediment record is $8500 a year.

DR. HELLEY: Installation, the water record and the sedimentation. Installation cost would be rather minimal, because there is a bridge and so forth, and on some of these tributaries even the periodic measurement would be okay, because we want to get event sampling, concentrating on large events. We would have to have some sort of access.

Would the Park Service be amenable to having cables anchored to trees?

MR. DAVIS: In our management zone?

DR. HELLEY: Yes.

MR. DAVIS: I would rather not have them, to tell you the truth.

DR. HELLEY: If you want the data --

MR. BROWN: Stream flow sedimentation operation and maintenance from a minimum of $2800 to a maximum of $8400. The minimum would be stream flow and periodic sediment only, maximum one stream flow turbidity, sediment including at the time old sediment with bedrock.

MR. RUMBURG: If this works according to the system we have established, it should be up to Jack to determine what he wants in the way of his program and what his priorities are. He adjusts with the Region, and they come in and they say, "We believe this is important enough now until we are requesting a program change," and we, in turn, will initiate a program change with the program we have with you, or attempt to find enough money.

DR. JANDA: Does this seem like a reasonable thing, then? I am committed to leave for my field area in Southwestern Oregon next week, driving up Highway 101. I can stop in and see you people with the research proposal, which we have sort of put together in bits and pieces, sit down and talk to you as to the

specific stations and specific cost, and what we think we might learn.

MR. DAVIS: Fine.

DR. JANDA: It is your prerogative to take it from there.

MR. BROWN: Does anybody know what the State of California feels about this? We do a lot of cooperative work with them on these stations, and I think they probably have an interest in monitoring what is going on in Redwood Creek for their own interest. The north coastal river basins, Redwood Creek, Mad River and Eel, they have been divided up for study among three or four organizations, the Corps of Engineers has the Mad River basin, they are interested in monitoring that, and probably the State feels that way about Redwood Creek.

MR. RUMBURG: I'm sure they would be interested. They have already indicated they feel we should give them an opportunity to get involved to the greatest degree possible in our research programs, and I think we recognize that we need to keep them aware of what research we're doing, so that we don't duplicate in any sense.

It would be certainly of interest to them what we are proposing to do, and they should get the results of the study, too. Jack should follow up with his local State people.

DR. JANDA: Dick, what do you want us to do, in terms of things on paper to send to you, and when?

DR. CURRY: What we need is the future study design that

we have to come up with.

I am at a loss, because I don't know what all we got in the big book that you just gave us. What we need now is to write a position paper to present within the Department, and I think this record will help immeasurably in that respect. The arguments are there, etc., at least the outlines of the arguments are there.

I think any supportive data for the specific actions that we want to take, photo documentation, we have got pretty complete records.

MR. RUMBURG: When you develop your resource proposals, recognize at this point in time it is extremely difficult for us to get them funded without the option of having a year or so to get it cranked into the program, but have it set up on a priority basis of what are the most important things that we ought to get on right now, and try to keep them as limited as you can, whether with an expanding program that will get us where we need to go for the next two or three years, this then gives us the latitude of programming the way we normally should. Whatever we do this year, beginning '73, we will merely have to try to find out whatever money we can find, because it will not be programmed money.

DR. CURRY: Assuming we're going to operate on the option of seeking injunctive relief from the timber companies, asking them not to dump anything into those tributaries, I think what we need is a brief outline of the kind of support data that we're going to have to have to make our case, really.

What do we presently have, and what do you think we need to make, and that sort of dovetails it to Joe, because that would be the first order of priority.

MR. DAVIS: And the supportive thing behind the 800-foot.

DR. CURRY: The support data behind the 800-foot.

MR. RUMBURG: I am a bit confused at this point in time. We are discussing the 800-foot, then additional buffer putting in the tributary streams. Now we have decided this is something we are imposing on the landowner. Therefore, are we cranking it in as a part of our buffer? Because we said, "This is a responsibility we're giving you to be sure that you don't contaminate that tributary stream in any way," so we have backed off from saying we're putting a protective zone on those tributaries by placing this on the landowner, this responsibility.

DR. CURRY: I think that is one option. Let's go through the options: One option is to adopt the full acquisition of the area, which was proposed in the November proposal.

Basically, you have to have the same data for every option.

Another option is to enter into cooperative agreements where we have specific set logging practices, road maintenance practices, soil vegetation protection, and whatever, on the main tributaries.

A third variation on the theme is to seek immediately injunctive relief from the courts, ordering the companies not to

introduce, and we will have to work out the language, but let it suffice for the time being not to introduce additional materials as the direct result of their logging practices into the tributaries on the grounds that it will damage the Park resources.

What has been consistent all the way through an initial proposal of the study group was to acquire an 800-foot buffer that will start on the eastern slope approximately.

DR. STONE: At the beginning of the appendage.

DR. CURRY: At the beginning of the appendage down around to the southern boundary, and to the mouth of Bridge Creek.

DR. JANDA: Go down one more.

DR. CURRY: It is not the mouth of Bridge Creek that we're talking about, aren't we back up here (indicating)?

DR. STONE: You are to Bridge Creek, actually.

DR. JANDA: The downstream range of Bridge Creek, as opposed to the mouth. This area is still uncut, so you would need a buffer there still.

DR. CURRY: It would still drain into this portion?

DR. STONE: Yes.

DR. JANDA: That is the cuts of it, wherever the 800-foot is not cut.

DR. CURRY: Are there any portions where it still is uncut?

DR. JANDA: On the western edge on the Bridge Creek drainage.

DR. CURRY: Would you include any of the uncut portions on the western slope, or would it be sufficient to stop here? Let's say this portion right here is not logged. (Indicating) You want to pick that up?

DR. JANDA: Yes, if that is not logged you are immediately upslope from the potential landslide area, you can overlook the slopes --

MR. RUMBURG: Should we not, looking long range, establish it as a viable buffer zone at this point?

DR. STONE: Whether you need to buy it outright I don't know one way or the other, it is one more area that you take out of their hands, and they would be protesting that much more. They would like to use it as second growth, and if they manage it second growth, I see no real difficulty.

It had already been converted, what we're talking about is the process of conversion. We don't believe they will be able to convert it, the second growth is still maintained in the integrity of the Park.

MR. RUMBURG: What about the point in time when they will come back for logging on that second growth? Should we not have the option of protecting that zone at that point in time also?

DR. STONE: I think you should. I think that will be 60 years from now. I would think by that time forest practices would advance to a point where there would be very little problem.

I think once these companies get well into the second

growth, and if they have 50 years behind them and are well structured, then I see no real difficulty.

MR. DAVIS: There is nothing in any way we do now that precludes us from exercising other rights.

MR. RUMBURG: I am cautious enough to want to have some control over that buffer strip at some point in time that it might be necessary, and if they could log it at that time with practices that would not affect it, I don't see why we could not enter into an agreement to do it. That is my personal opinion. I had rather make sure we had it.

DR. CURRY: Are there any other options before us? There is the option of doing nothing.

MR. RUMBURG: Do we want to now say anything about the tributaries in relation to the buffer, or are we going to leave this totally in the hands of the companies merely to respond to our restrictions?

DR. CURRY: We got two problems here: We have the 800-foot buffer, that is one issue; and then we have the tributary issue, and I thought we had three variations on the theme there, really: total acquisition, setting specific cooperative agreements, specifying specific company practices around the buffers, or in this zone of influence.

The third option is a court order, seeking a court order to cease and desist logging practices that have the impact on tributaries, and those logging practices could affect roads, etc.,

resisting putting debris in the stream channels.

DR. STONE: What you have to do is supply the facts that you have observed, a movement of soil on the following distances.

DR. JANDA: So the 800-foot buffer will be adequate to handle this?

DR. STONE: Yes.

DR. JANDA: In terms of it being 800 feet, we have to go back to your statement.

DR. STONE: The difference on the sides of the creek.

(Whereupon the meeting adjourned at 4:35 p.m.)