

THE WITNESS: [Dr.] Vincent Schultz... Pulman, Washington Professor of Zoology, Washington State University.

**DIRECT EXAMINATION OF AEC EXPERT**

Q. And [what] particular academic discipline [do] you now specialize in?

A. Radiation ecology, statistical ecology, and population dynamics.

**MR. EARDLEY:** I will stipulate to his qualifications.

**MR. YANNACONE:** As what?

**DR. SCHULTZ** Why don't we just say ecology, for the record, if you like.

Q. In the course of your regular professional activities have you had occasion to investigate and evaluate ecological studies specifically in connection with the operation of the Nevada Operations Office [of the Atomic Energy Commission! as set forth in NVO No. 40, Revision No. 2"]?

A. You're throwing numbers at me. Now, if you're asking whether I have had the opportunity to evaluate ecologically the Nevada research test site and [sites! all over the United States, the answer is yes.

Q. In the course of your regular activities as such, have you been an employee of or consultant to the Atomic Energy Commission?

A. The answer is also yes and no. For six and a half years I was ecologist with the Atomic Energy Commission, the Division of Biology and Medicine, Environmental Science Branch ....

Q. Doctor, in the course of your regular professional activities have you had occasion to see this bulletin-, [the Project Rulison Postshot Plans and Evaluation"]?)

A. Yes.

Q. Have you had occasion to specifically review Appendix B, "Biological Considerations"?

A. Yes, sir.

Q. Have you had occasion to look at the portions which deal with the meteorological and the atmospheric monitoring”?

A. I have read the entire report.

Q. And are you satisfied that this report fairly and accurately represents the entire substance of the work that will ultimately be used to evaluate the ecological effects of Project Rulison?

A. What ecological effects are we talking about?

Q. That’s what I was about to ask you.

A. If you have read the last page, you will see that I stated that "there will be no ecological effect from Project Rulison."

Q. Okay. And in quotation marks it says, "Panel concluded that, “ecological effects in the natural environment, distinguished from that of man and his domestic species, are not anticipated, e.g., on the population and their winter ranges,” is that correct?

A. Yes, sir.

Q. Doctor, would you please, for the record, so we will have a frame of reference, tell us what you as an ecologist for the Atomic Energy Commission consider ecological effects”!

A. Well, I would say an ecological effect is a time effect. I can probably explain it better with a little example: one in which we consider effects on the structure and functions of an ecosystem. Do you understand what we mean by an ecosystem?

Q. You tell us what the AEC considers it [to mean].

A. I didn’t know whether you wanted every word defined in [my] presentation or not. But the AEC considers — whoever the AEC is — I consider it the sum total of the physical and biological components and environment, and by ecological effects ... I would say non-repairable effects, if you want it in laymen’s terms.... If for example there was an accident of some type, and I’m not referring to Rulison, [and] half of a deer population was destroyed. As a result of the biotic potential [of the] species and what we know about deer, there would not be an ecological effect. This population would come

back to, quote, normal, if you like. Changes in successional patterns [such as], say, up at Woodwell's, [who] has been involved with this [on] Long Island [at] Brookhaven National Laboratory, would be an ecological effect. If one leaf were killed this would not be an ecological effect in my definition.

Q. And is it your considered professional opinion, then, without any testing or any further research, that the flaring of the tritium in the form of tritiated water [vapor] from the Project Rulison cavity and its release into the Rulison regional transport systems will produce no ecological effects.

A. Yes, sir. If I may comment on this, I very rarely make definite statements, as I am trained also as a statistician, and I doubt very many ecologists do, but I am so positive about this situation that I made it, and it is, oh, probably only the second positive statement I have made since I got married when I said, "I do," to the minister.

Q. Doctor, what is it about the environmental characteristics of tritium in the region of Project Rulison that enables you to achieve this degree of positiveness in your statement"?

A. Well, I believe, first, one reason, because of the safety procedures that the AEC is involved with. You want to consider an accident case or —

Q. No, I want to consider the sustained release of tritium,

A. I say this on the basis [of] the levels we are dealing with as far as tritium is concerned, extensive knowledge of radiation studies that have been done on effects on ecosystems and on individual species have shown that fairly high levels are needed to have any ecological effects, and we are not dealing with that ballpark figure at Rulison, if I can assume that the figures that were given to me are correct, and I do.

Q. This is what we would like in the record now. What figures were given you"?

A. Well, 10,000 curies I believe was the latest, the accident, if the total amount came out, 10,000 curies.

Q. In other words, is it your considered professional ecological opinion that even if you released 10,000 curies, or 94 percent of that, [which is what] I think the maximum possible probable accident is supposed to be, this would have no ecological effect on the regional transport systems as you understand them?

A. In the region, yes, sir. Now, we are not talking about it on a square meter of ground, obviously. You have to talk about the deposition pattern and a few other things before you can draw a conclusion.

Q. Have all these been considered?

A. Yes, sir.

Q. And are they all included in this exhibit, ...

A. Oh, absolutely not.

Q. Then where do you find them when you look for them!

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A. Not in there. You want to talk about ecological [effects]? There have only been a few studies that have been involved with tritium, and they haven't been published, but we are talking about a pollutant in the environment, ionizing radiation. There are a lot of studies with gamma radiation, as you are probably aware, and they have not done any specifically with tritium. You don't look at every single isotope in the world to understand principles in ecology and effects of pollutants. You would never get enough in my general opinion.

Q. In other words, you're basing your opinion on extrapolation from studies based on transport systems and considerations or isotopes that have been studied, such as Cesium-137.

A. No, not entirely, we have a report by Rhoades, Platt, *et al.* They were probably seeing effects on ... sagebrush, at six to eight hundred rads, and we are not talking about those types of figures in this situation.

Q. Is there any study that you can point to with reflect to the evaluation of the transport systems for tritium in any complete regional transport system?

A. Talking about entire ecosystems?... The answer is no.

Q. There are some rather complete studies, are there not, published by the Atomic Energy Commission or sponsored by the Atomic Energy Commission, with respect to the transport of certain nutrients and certain radioisotopes throughout entire ecosystems?

A. [In] my general opinion as a scientist, through the entire ecosystem you are asking for something maybe only God could do. [But] within reason, there have been some fairly definitive studies on transport through an ecosystem of cesium.

Q. And from these studies, are you able to evaluate transport characteristics for the entire system?

A. No, not entirely. One can't base all conclusions on specific studies. I often tell my students there is no substitute for biological innovation, know-how, and common sense, and that's involved in this situation, also. That's a quote, incidentally, from Simm and Row, and I don't want to steal it.

MR. YANNACONE: Thank you. You are excused.