

cc. Dean Hendel
Ed Krumpal
Mike Falter
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007-21-1026

October 15, 1986

Dr. Leon Neuenschwander
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Moscow, Idaho 83843

TAYLOR RANCH SITE - DAB-34-86

Dear Leon:

Thank you for the invitation to visit you and your colleagues at the University of Idaho and for the trip into Taylor Ranch. I really enjoyed myself and our discussions about potential cooperative research efforts at the Taylor Ranch site. I think the area has tremendous potential as a remote wilderness research center. I have discussed my trip with Bruce, and as I indicated to you earlier, our primary interest would be the potential use of the area for atmospheric monitoring. In this regard, I have outlined a few suggestions below.

Because Taylor Ranch is located in the center of the largest contiguous acreage of wilderness in the lower 48 states, it could serve as an excellent background site for any regional atmospheric monitoring program in the central to northern Rockies. There would be no local sources of contamination and in all likelihood, probably no major regional sources either. The fact that you can and do have field technicians and operators on site year-around is a significant advantage also.

I would recommend that you consider the possibility of eventually monitoring the following:

meteorology: wind speed, wind velocity, temperature, barometric pressure, precipitation, humidity, solar radiation

particulates: total particulates, sulfates, trace elements (especially metals)

Dr. Leon Neuenschwander
October 15, 1986
DAB-34-86
Page 2

gases: nitrogen dioxide, sulfur dioxide, total oxidants (i.e., ozone for your area)

wet deposition: Ca^{++} , Mg^{++} , K^+ , Na^+ , H^+ , NH_4^+ , HCO_3^- , SO_4^- , Cl^- , NO_3^- , conductivity

other: nitrates (particulate), nitric acid (vapor).

Neither Bruce nor I have any direct experience with setting up a meteorological station for a long-term effort. However, I think it would be best to avoid putting anything down in the canyon of Big Creek (or elsewhere with potential "canyon" effects). I believe you would get a much better data base on large scale conditions of your airshed if you were located up on one of the open benches above the ranch. The micrometeorology within the canyon is likely to be quite complex and could obscure results needed on a broader scale. I did check with Ray Dickson (who directs the NOAA laboratory here in Idaho Falls) on this matter. He said that there are no standard rules for such cases where the micrometeorology may be complex. He suggested collecting data simultaneously at a couple of sites on a short term basis to see which gives the best broader scale patterns; these might be compared with met data at airports (etc.) that are near but outside the wilderness area. He has personally studied micrometeorology within canyons and has seen significant variability within a 40-foot distance. Therefore, he also thought it best to be out of canyon and up on an open bench if possible.

A method for low-volume sampling of particulates is fairly well established. In fact, Bruce is one of the major scientists involved with developing and applying this for remote areas. I have enclosed a copy of one of his reports for your reference. Actually, the atmospheric sampling procedure is just one aspect of a larger, integrated multimedia monitoring program that would fit very well into a wilderness research program; the report gives a good review of all of these areas. One of the advantages of this approach is the growing database for other remote areas which will be quite useful for comparative purposes.

Measurement of gases in remote areas is much more difficult to do at this time. As I indicated, we have a research effort underway at present to develop and apply gas monitors in wilderness areas. Both a portable, battery-operated nitrogen dioxide monitor and a portable gas calibrator are now available commercially (from different companies). We are also testing a portable, prototype SO_2 /total oxidant monitor in remote areas. However, I do not feel comfortable enough to recommend these methods at the present time even though the studies are going well and I believe that the monitors can be used eventually in a wide range of applications. I feel like we need a larger database and more field testing before I recommend their long-term use to other researchers. As an alternative to

Dr. Leon Neuenschwander
October 15, 1986
DAB-34-86
Page 3

real-time monitors, however, a number of filter-pack systems have been employed. We are using a teflon-nylon filter pack outside the wilderness to sample nitrates and nitric acid. However, this unit requires conventional AC power and we have not designed our system to be portable and battery operated. Some people at Oak Ridge National Laboratory are working on a smaller filter pack system and in the near future this may be modified for remote application; we may try doing it ourselves this next year.

A method for sampling wet deposition for subsequent chemical analysis is now very well established as part of the National Atmospheric Deposition Program (NADP). There is a wet-dry bucket sampler that is easily available and can be powered on batteries or solar. The only problem that you may find with wet deposition sampling is a logistical one. Usually, a sample is sent out weekly for chemical analysis and there are some limits on sample holding time. If samples cannot be shipped out weekly, you might want to check the possibility of setting up a small analytical laboratory at the ranch. As an alternative, at least on an interim basis, pH and conductivity can be measured in the field and you may want to do this for weekly bulk deposition samples until you can expand your research program and facilities. Dr. James Gibson is the national program coordinator for NADP and his address is included on an enclosure that I am sending for your reference.

In summary, I think our potential interest in the Taylor Ranch site would be as a "control" to monitor background atmospheric inputs to a remote wilderness area. Hopefully, the brief outline above gives you an idea of some of the things that can be done. I would suggest setting up a met station as a reasonable start along with bulk deposition sampling for pH and conductivity in the field. Particulate sampling for trace elements would be the next most feasible aspect to add after that. As your program and facilities evolve, other components can be added. Also, on the short term, we expect a number of other monitors and methods to have been worked out sufficiently to recommend their application at remote sites.

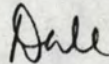
In closing, I would like to say that the Taylor Ranch area is ideally suited for a whole range of other complementary research projects including watershed, stream, and vegetation studies. However, for acid deposition in particular, I do not expect that either the aquatic or terrestrial communities - at least those areas most accessible from Taylor Ranch - will be especially sensitive. This is just my guess at present, but generally it is thought that the most acid-sensitive ecosystems (especially aquatic) in the Rocky Mountain region occur at elevations above 9500 feet. However, I would not rule out other possibilities, but I do think some basic surveys and inventories would be needed to further evaluate these systems. I would recommend an extensive survey of water quality throughout the tributary drainages near Taylor Ranch to evaluate

Dr. Leon Neuenschwander
October 15, 1986
DAB-34-86
Page 4

potential acid sensitivity. The EPA considers their most acid sensitive aquatic systems to be those with alkalinities less than 200 $\mu\text{eq/L}$ but there are many systems in the west where alkalinities may be routinely below 100 $\mu\text{eq/L}$.

Please feel free to contact me or Bruce if you have any questions. We are very much interested in developing cooperative research projects, and I am very impressed with your staff and facilities. I will keep you informed of how our research program is progressing. Please give my regards to Ed and Mike. I certainly enjoyed my visit with all of you.

Sincerely,



Dale A. Bruns, Ph.D.
Environmental Fate & Effects

dmh

Enclosure:
As stated

P.S. If my slides of the trip turn out well, I will send you a set.

Concept paper - DEC 8
Technical Session JAN 12
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