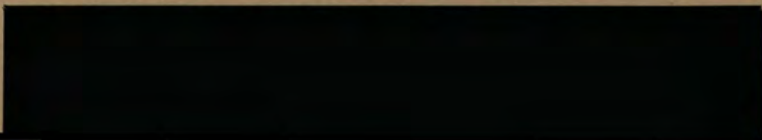

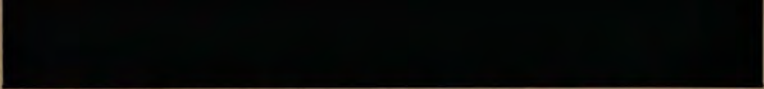


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**College of Forestry, Wildlife
and Range Sciences**





**Forest, Wildlife and Range
Experiment Station**



**University
of Idaho**

DRAFT

A PLAN FOR DEVELOPING THE ENVIRONMENTAL
MONITORING AND ECOSYSTEM RESEARCH
POTENTIAL OF THE TAYLOR RANCH
WILDERNESS FIELD STATION

SUBMITTED BY:

Edwin E. Krumpe, Director
Wilderness Research Center
University of Idaho

John C. Hendee, Dean
College of Forestry, Wildlife & Range Sciences
University of Idaho


November 26, 1986

TEACHING/RESEARCH/SERVICE
Office of the Dean
Telephone (208) 885-6441



University of Idaho
College of Forestry,
Wildlife and Range Sciences
Moscow, Idaho 83843

November 26, 1986



Dr. G. Bruce Wiersma, Manager
Environmental and Earth Sciences
Idaho National Engineering Laboratory
EG&G Idaho, Inc.
P.O. Box 1625
Idaho Falls, ID 83415

Dear Bruce:

Thank you for facilitating the visit by Ed Krumpe and myself to the Idaho National Engineering Lab November 20. It was great to finally visit with you in person. The "vision" for cooperation in environmental monitoring that we discussed will empower and give direction to our expanded work together. I like the proposed goal: A UI-INEL cooperative program of baseline monitoring and research on natural ecosystem functioning, focused on the Taylor Ranch Wilderness Field Station, appropriately instrumented to facilitate research and monitoring with a constantly expanding data base, toward the ultimate inclusion of the site in the emerging International Geosphere & Biosphere Program (IGBP).

As we discussed, I have enclosed a draft "Plan for Developing the Environmental Monitoring and Ecosystem Research Potential of the Taylor Ranch Wilderness Field Station." This is a first draft of ideas and proposals. I urge you, Dale Bruns and your other staff to candidly address the ideas and proposed actions. We are eager to proceed and expand our cooperation with you in a planned way toward the above long-range goal. The plan states the goal and objectives, describes the current situation and assumptions about the future and then proposes direction and specific actions within that context.

We also had a good visit with Lamar Johnson and Herb Hatcher. The outcome of these conversations for me is the realization that I must encourage and make possible a visit to INEL by our faculty who are candidates for specific cooperation in the area of bioprocessing. A visit to INEL seems essential to solicit interest by specific faculty in applying for summer internships at INEL through the Association of Western Universities. We have expertise and interests in your program areas of bioprocessing, tissue culture and toxic substances in wildlife reserves, as well as environmental and ecosystem monitoring--hydrology, atmospheric and vegetation.



Dr. G. Bruce Wiersma
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November 26, 1986

I will call you in the near future to get your reactions to the draft plan.

Sincerely,

John C. Hendee

John C. Hendee
Dean

JCH/pkv

c: Dennis Keiser, INEL
Lamar Johnson, INEL
Art Gittins, UI Associate Vice President for Research
Leon Neuenschwander, FWR Associate Dean for Research
Ed Krumpe, Director, UI Wilderness Research Center

DRAFT COOPERATIVE PLAN

A PLAN FOR DEVELOPING THE ENVIRONMENTAL MONITORING AND ECOSYSTEM RESEARCH POTENTIAL OF THE TAYLOR RANCH WILDERNESS FIELD STATION

UNIVERSITY OF IDAHO-COLLEGE OF FORESTRY, WILDLIFE AND RANGE SCIENCES
AND
IDAHO NATIONAL ENGINEERING LABORATORY

PURPOSE

The University of Idaho-College of Forestry, Wildlife and Range Sciences Wilderness Research Center operates the Taylor Ranch Field Station as a focal point for interdisciplinary wilderness-related research by the University and cooperating organizations. This is a plan for a cooperative effort between the University of Idaho and the Idaho National Engineering Laboratory (INEL) to develop the potential of the site for environmental monitoring and research on natural ecosystem functioning. The plan calls for cooperation in training of personnel, co-planning and cost-sharing in establishing necessary instrumentation, cooperation in developing research proposals and in securing the future value of the site for monitoring and research through its official designation in international environmental monitoring programs.

This cooperative effort seeks to establish the Taylor Ranch Wilderness Field Station as an official background-monitoring site for an integrated global environmental monitoring network such as the IBGP, International Biosphere-Geosphere Program now evolving; the designation of the Frank Church-River of No Return Wilderness as a Biosphere Reserve; a joint program of research on instrumentation and methodology for ecosystem monitoring; cooperative training of faculty and research staff; affiliate faculty appointments for INEL scientists; co-authored scientific publications; and possibly national symposia or workshops on global monitoring.

CURRENT SITUATION

Background

The basic goal of the Wilderness Research Center is to facilitate and sponsor research to expand understanding of natural ecosystems, components of natural environments and natural phenomena; the comparative use of such information to evaluate man-altered environments elsewhere; and the effects of wilderness uses on resources and participants. Established in 1972, the Center's administrative offices are housed in the University of Idaho-College of Forestry, Wildlife and Range Sciences, thus taking advantage of the interdisciplinary expertise and resources of the College and the University.

For the past 14 years the Taylor Ranch Field Station has been the location of research on the ecology of wilderness wildlife species (including mountain lion, big horn sheep, bobcat, owls), animal and bird community relationships, predator-prey relationships, and habitat relationships. Archeological research (funded by the National Geographic Society) has studied the prehistoric settlement and subsistence patterns of the Big Creek drainage. Research is in progress to evaluate indicators of

biological, physical, and social conditions affected by human use of wilderness.

Location and Facilities of the Taylor Ranch

The 65-acre Taylor Ranch field station, located on the Big Creek Drainage in the heart of the 2.3 million acre Frank Church-River of No Return Wilderness in central Idaho, is ideally suited to conduct such research. It is staffed year-round; has basic laboratory facilities, residence cabins, pack stock and an airstrip; four pristine mountain streams cross the property; and it is the focal point for an ongoing research program. 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 a regional atmospheric monitoring program in the central and northern Rockies.

INEL Leadership in Atmospheric Monitoring

The Idaho National Engineering Laboratory has taken a leadership role in developing the concept and methodology for an integrated global background monitoring network. The Environmental and Earth Sciences Division has proposed a network that would; (1) establish reference levels for pollutants that have potential for global contamination; (2) serve as an early warning system for detecting global spread and trends of pollutants; (3) establish background levels for selected ecosystem parameters against which data from more impacted areas can be compared; and (4) contribute to the study of biogeochemical cycles. This program of integrated environmental monitoring could benefit from the cooperative use of the permanently staffed facilities in the mountains of central Idaho at the Taylor Ranch.

ASSUMPTIONS ABOUT THE FUTURE

Environmental monitoring is becoming a major field of applied science with rapidly developing methodologies, instrumentation and scientific organization, and accumulating data bases. This trend will continue and the value of monitoring data from remote, pristine sites will play an important role in understanding and managing environmental impacts as they accumulate in managed areas. Internationally, environmental monitoring will become increasingly important with the industrialization of less-developed nations and the continued exploration and development of world energy reserves.

The University of Idaho has made a long-term commitment to wilderness research¹. It will continue to provide the location, facilities, staff, and support that is unique in many respects. With the recent renovation of wet and dry laboratory facilities and the development of a research plan, the Wilderness Research Center is poised to undertake a significant program of ongoing research.

1 The "Plan for Excellence" - College of Forestry, Wildlife and Range Sciences-University of Idaho identifies wilderness as one of 15 Quests for Excellence on which there will be a focus of future teaching and research.

The University of Idaho is a major land grant university with established cooperative agreements and relationship with federal agencies and other land grant universities. Especially close working relationships and active cooperative programs are maintained with Washington State University in Pullman, Washington, eight miles from the UI campus.

INEL has identified seven characteristics which an environmental monitoring sites should possess². These are: permanence, central planning and coordination, design theory, flexibility, archived samples, quality assurance, and good research and development interaction. Sampling sites should be located in remote background areas as well as in urban, industrial, and agricultural areas. Clearly, a cooperative program of research between the INEL and the Wilderness Research Center should facilitate the mutual accomplishment of their respective goals.

DIRECTION AND ACTION:

Based on the above-stated goals, current situation and assumptions about the future, the following direction and actions are proposed:

- * A field trip will be arranged to the Taylor Ranch Wilderness Field Station so INEL and University scientists can plan "on-site" the instrumentation needs and proposed details for cooperation in environmental monitoring and research.
- * A priority order of business is the development of an instrumentation plan for the joint monitoring of atmospheric, meteorological, and hydrological deposition of pollutants, ecosystem functioning and throughput of these contaminants and baseline levels based on the naturalness of the site. A goal is to insure that the measurements and data collection and analyses methods are compatible with a long-range ecosystem functioning approach to monitoring.
- * Develop a plan for the joint training and collaboration of personnel from UI and INEL. This will build the relationships, collegueships and commitments necessary for a strong research program. Joint training of faculty, staff, and graduate students should be considered, as well as affiliate faculty appointments for INEL scientists with the University of Idaho.
- * Work towards the designation of the Frank Church-River of No Return Wilderness as a Biosphere Reserve.
- * A program of cost-sharing for site development and instrumentation within the wilderness should begin immediately to build program identity. The Wilderness Research Center stands ready to commit approximately \$20,000, or more, towards this goal at the Taylor Ranch Field Station during the next year. Instrumentation of the site needs to proceed in a coordinated and planned way.

* Develop a plan toward inclusion of the Taylor Ranch-Wilderness Field Station as a designated site in such international, environmental background monitoring programs such as the IGBP International Biosphere-Geosphere Program now evolving.



Idaho National Engineering Laboratory

January 8, 1987

John C. Hendee, Dean
University of Idaho
College of Forestry
Wildlife and Range Sciences
Moscow, ID 83843

DRAFT PLAN FOR DEVELOPING THE ENVIRONMENTAL MONITORING AND ECOSYSTEM
RESEARCH POTENTIAL OF THE TAYLOR RANCH WILDERNESS FIELD STATION -
GBW-02-87

Dear John:

I read your draft plan of action for developing joint projects on the Taylor Ranch Wilderness Field Station. I really like it. I have no substantive comments and would like to proceed with your suggested plan of action.

I am going to try to call you today and by the time you get this letter, you will know whether or not I was successful. However, in case we do not connect, I am taking the liberty of contacting Bill Gregg next week when I am in Washington to discuss the potential of Biosphere Reserve status for the River of No Return Wilderness. Bill Gregg is head of the U.S. Biosphere Reserve Program.

Also within the next couple of weeks, we will have a better feel for our funding and I believe that once that is properly defined, it would be wise for us to get together, perhaps at the University of Idaho and develop some specific plans.

Best Regards,

A handwritten signature in cursive script, appearing to read "G. Bruce Wiersma".

G. Bruce Wiersma, Ph.D.
Manager
Environmental & Earth Sciences

tjt

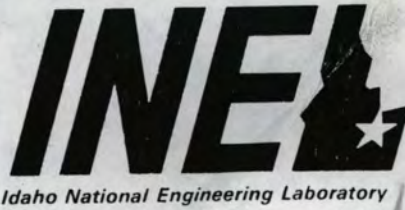
cc: 



EG&G Idaho, Inc.

P.O. Box 1625

Idaho Falls, ID 83415



cc. Dean Hendel
Ed Krueger
Mike Falter
Jim Atkinson

October 15, 1986

Dr. Leon Neuenschwander
Associate Dean for Research
and International Programs
University of Idaho
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)

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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

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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.

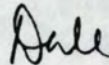
In closing, I would like to say that the Taylor Ranch area is ideally suited for a whole range of other complementary research projects including watershed, stream, and vegetation studies. However, for acid deposition in particular, I do not expect that either the aquatic or terrestrial communities - 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

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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.

