To President Richard Gil[redacted]

From John H. Ehrenreich, Dean

Subject Taylor Ranch

University of Idaho
Inter-Office Memorandum

Date September 29, 1980

In reference to your memo of September 15 concerning the Taylor Ranch, the college does have a technical board which serves both the Taylor Ranch and the Wilderness Center. This board has been in existence for quite some time and is currently composed of the following individuals:

Dr. Paul Dalke, Professor Emeritus, Wildlife Ecology (also initiated concept of Wilderness Center and Taylor Ranch);
Dr. Mike Falter, Professor, Fishery Resources;
Dr. Winnie Kessler, Assistant Professor, Wildlife Resources;
Dr. Ed Krumpe, Assistant Professor, Wildland Recreation Management, Acting Department Head, and Instructor, Wilderness Resources;
Dr. Leon Neuenschwander, Associate Professor, Fire Ecology;
Dr. Ken Sowles, Professor, Forest Products, Head of Forest Products Department, and manager of Taylor Ranch;
Dr. Ernest Ables, Professor, Wildlife Resources, Director of Wilderness Center, and Associate Dean of Students.

The members of this board have changed over the last few years given the particular emphasis we were placing on activities at the ranch. Until last year, the College of Forestry did not have a budget set up to fund Taylor Ranch activities. As a result, the cost figures for fiscal 76-79 are based on our best estimates (see attached budget page). During this time four major sources of funding were used to keep the Taylor Ranch open:

1. external research projects;
2. general education funds;
3. miscellaneous receipts collected from user fees and private donations; and
4. funds provided by the financial vice president.

As far as financial arrangements with the current caretaker and his wife, Mr. Hourihan is currently employed by the college as a senior maintenance craftsman. This year he is taking a 3-month leave without pay to devote time to his packing business. Mr. Hourihan pays the college $1500/year as a fee for using the Taylor Ranch facilities in his packer business. Mrs. Hourihan is occasionally hired by the college to cook for research staff and students who frequent the ranch.

John H. Ehrenreich, Dean

Attachment

TAYLOR RANCH FIELD STATION
Operating Budget Estimates
1976-1980

	75-76	76-77	77-78	78-79	79-80
Personnel (not including benefits)	$14,000	$18,200	$16,500	$22,200	$22,600
Travel	8,800	9,500	13,800	14,800	13,200
Other expense	1,600	2,200	2,400	2,300	9,000
Capital outlay	4,000	5,000	1,000	4,000	100
	$28,400	$34,900	$33,700	$43,300	$44,900

Note: Personnel costs include salary for caretaker, graduate students and hourly help.

MEMORANDUM FOR KEN SOWLES

SUBJECT: Preservation & improvement of Taylor Ranch property

Account No. 886-Y005 has $1,339 in it at the present time.

I was unable to get standard university funding for the Taylor Ranch property increased from the general education budget for FY 1979 as much as I had hoped, and I hope that additional funding for CO and other areas can be included in the university budget for FY 1980 and subsequent years, so that you can do such things as repair the runway when necessary -- as you will know, for safety reasons and because of the university's investment in this property, it cannot be allowed to deteriorate.

Today I transferred $5,000 into the above-cited account. You should plan on that money lasting through June 30, 1979 for use in accordance with my memos to you dated June 28, 1976; October 6, 1976 and April 4, 1977. This should take care of the CO situation. Before leaving, by sending a copy of this memo to Jerry Wallace, I shall ask him to do what he can to get an additional $5,000 built into the general education budget for plant outlay projects on a regular continuing basis, starting in FY 1980. With reference again to the general education budget for the Taylor Ranch for FY 1979, as I remember we were able to increase this account $5,000 for CO ~~OE~~. If we can go up another $5,000 for CO for FY 1980, perhaps the need for periodic augmentations of the "Y" account cited above will no longer be necessary.

I appreciate the good job which you and John Enrenreich have done for the university in managing and operating the Taylor Ranch "on a shoestring," and I wish you both good success in the future.

Sherman Carter, June 23, 1978

cc: John Ehrenreich
Bob Steele
Jerry Reynolds
Jerry Wallace

Income account you can budget the way you want it.

October 2, 1990

Taylor Ranch

Ranch Operations

1. Lanham cabin
   a. progress
   b. what remains to be done
   c. ~~May~~ communication - summer
2. gabion construction and stream bank stabilization along airstrip

3. stock: replace and reduce numbers
   a. progress
      -return mare and mule to Hornocker, auction grey mare
      -sell mule team w/harness to provide funds for new stock
      -remove stock from ranch during winter
   b. rationale for replacing stock
      -safety, reliability, utility, versatility (purchase 4 Morgans - light work horse: ride, pack, pull)
      -provide good stewardship (reduce grazing pressure on ranch)
      -give up permit on wilderness bench
      -provide grazing for other researchers stock
      -reduce maintenance (haying, free interns for research)
   c. need to develop procedure for eventual turnover of stock - sell when we can still get some money to purchase new stock
   d. winter pasture - board at UI Ag farm, cost = hay + someone to feed (me and/or IH)

4. winter caretakers

Research

1. current
   a. EG&G: environmental monitoring
   b. Minshall (ISU): aquatic invertebrate response to natural fires
   c. Leonhardy: prehistoric settlement and use patterns
   d. Bunting & Morgan: spotted knapweed population effects on native plant communities
   e. Peek: non-forested community descriptions; forested and non-forested community production estimates
   f. Garton: small vertebrate community monitoring
   g. Hayward: forest owls
   h. Akenson: competion among bighorns, elk, and deer; bighorn sheep mortality patterns
   i. Yeo & Peek: Lochsa elk population management - funding credited to WRC
2. proposed
   a. expand bighorn research: IDFG desires this
   b. noxious exotic plants: knapweed, cheatgrass - symposium (May 1992), R. Mack (WSU), AgSci, outfitters (Jepson), FS
   c. grouse: K. Reese
   d. ecosystem pulse studies: J. Franklin

e. wolf recovery: proposal in review
f. old forest monitoring: landscape ecology - stand sizes, shapes, distances; already have pilot studies in place on Palouse RD, proposed for old-growth forest monitoring for northern Idaho
g. remote country energy and communications: Forest Products, College of Engineering
h. wilderness user impacts: Wildl. Rec.
i. human development: College of Education, Wildl. Rec.

Teaching

1. student interns and graduate students: maintain 3 interns to be involved in ongoing research; establish continual funding through WRC for 1 graduate student at Taylor Ranch
1. ~~Ecological Research in Wilderness~~ (summer: 3 weeks): students participate in ongoing research associated with Taylor Ranch, invited lectures from researchers, students provide field assistance with long term ecological monitoring
2. cooperative courses with San Franscico State Univ.: incorporated with existing research; split income with SFSU, SFSU provides exposure
3. winter ecology (Christmas break): with J. Peek
4. wilderness management seminar for professionals: spring break; invited speakers, field practicums
5. other faculty teaching?

Advisory Committee – December

1. move EGG monitoring station to suitable site (off ranch)
2. involve Wilderness Watch as ally
3. funding for graduate student
4. annual courses to be offered at Taylor Ranch
5. future improvements to facilities
   a. sprinkler system for airstrip and fire safety
   b. hydro power system
6. visibility of Taylor Ranch
   a. brochure
   b. conferences, professional presentations
   c. WRC office

TO: Dr. M. Hornocker, College of Forestry, Wildlife and Range Management
Dr. Donald Johnson, College of Letter and Science
Dr. Edgar Michalson, Water Resources Institute
Dr. Douglas Grant, College of Law
Dr. David E. Olson, College of Engineering
Dr. Floyd Frank, College of Agriculture
Dr. H. Duncombe, College of Letters and Science
Dr. V. Montgomery, College of Education
Dr. Peter K. Wilson, School of Business, BSC
Dr. R. Daubenmier, Department of Biological Science, WSU
Dr. Vincent Schultz, Department of Biological Science, WSU

TO:

FROM: R. W. Stark, Coordinator of Research RWS September 7, 1971

SUBJECT: Wilderness Research Center - Technical Advisory Committee

Dr. Erickson, Director of our Wilderness Research Center has indicated that your expertise would be invaluable in a technical advisory capacity to the Center.

At his request it is my pleasure to ask you to serve on the Technical Advisory Committee of the Wilderness Research Center for a year term.

In these early years of development of the Center, the full scope and breadth of Wilderness Research should be explored and our future course plotted. We hope you will assist Dr. Erickson in this endeavor. Please advise.

To Dean Stark

From Albert W. Erickson, Wilderness Research Center

Subject Appointments to Technical Advisory Committee

UNIVERSITY OF IDAHO
Inter-Office Memorandum

Date August 25, 1971

It would perhaps be well to implement the Technical Advisory Committee for the Wilderness Research Center.

As a prelude to your inviting Dr. Hendee and Mr. Troyer, I corresponded with them and enclose copies of their responses. I have also discussed the subject with the other persons suggested and I expect most of them will respond favorably if approached.

The suggested appointees, the area of their specialties and the suggested periods of their appointments are as follows:

1. Dr. Maurice Hornocker*, Wildlife; or Dr. Edward Tisdale, Range Management; College of Forestry, Wildlife and Range Management (2 years)

2. Dr. Doyle Anderegg, Botanist; or Dr. Donald Johnson*, Zoologist; College of Letters and Science (4 years)

3. Dr. Edgar Michalson*, Economist, Water Resources Institute (4 years)

4. Dr. Douglas Grant*, Resource Law, College of Law (2 years)

5. Dr. David E. Olson*, Systems Modelling, College of Engineering; ~~or~~ both. Dr. Floyd Franks*, College of Agriculture (4 years)

6. Dr. H.S. Duncombe*, Political Science, College of Administration (2 years)

7. Dr. V.E. Montgomery*, Psychology, College of Education (2 years)

8. Dr. Peter K. Wilson*, School of Business, Boise State College, Boise (2 years)

9. Dr. R. Daubenmier*, Vegetation Analysis, Department of Biological Science, Washington State University (4 years)

10. Dr. Vincent Schultz*, Biometrician, Department of Biological Science, Washington State University (2 years)

11. Dr. G.A. Petrides, International Parks and Wilderness, Department of Fisheries and Wildlife, Michigan State University, East Lansing (4 years)

† 12. Dr. John Hendee, Wildland Recreation Research, 4507 University Way, N.E., Seattle, Washington 98105 (2 years)

† 13. Mr. Willard Troyer, Wilderness Supervisor, U.S. Fish and Wildlife Service, Anchorage, Alaska (4 years)

14. Ex Officio, Research Coordinator

To Dean Stark

From

UNIVERSITY OF IDAHO
Inter-Office Memorandum

Subject Page 2

Date August 25, 1971

As indicated in your response to my previous memo, the committee proposed is somewhat cumbersome. However, it is unlikely that the non-University of Idaho appointees will be able to attend regularly but their inclusion shows our desire for outside participation.

As regards the University of Idaho representation, we are faced with the problem of adequate cross-University involvement. I felt that the best way to handle this was to name a well-represented committee with the likelihood that a few would likely miss any meeting which was called. In this way we would seemingly always have sufficient members present to function.

Please understand that I am not bound to the committee structure suggested nor to the nominees proposed. Thus, if you think alterations are desirable, please so indicate. However, if you do propose changes I would appreciate discussing the changes briefly before action is taken.

THE WILDERNESS RESEARCH CENTER

COLLEGE OF FORESTRY, WILDLIFE AND RANGE SCIENCES

INVITES APPLICATIONS FOR SUMMER STUDY

UNDER A STUDENT WILDERNESS STUDY PROGRAM

Undergraduate independent study in the Idaho Primitive Area

$600 honorarium plus expenses

Academic course credit

Undergraduates in the College of Forestry, Wildlife and Range Sciences who are interested in spending a summer conducting independent research of their own choosing are invited to submit a research proposal to the Dean, College of Forestry, Wildlife and Range Sciences, for summer field studies at the Taylor facility in the Idaho Primitive Area. Proposals may cover any area of natural resource management/ecology. Awards will be made on a competitive basis to persons submitting the best proposals. Proposals will be judged by a faculty committee on innovation, literature search, detail in methods used, potential for attainment of objectives, and educational value. The emphasis may be resource and/or sociologically oriented.

Students whose proposals are approved will receive academic course credit under FWR 499 (directed studies in fisheries, forest, range, recreation, and wildlife sciences) upon completion of the summer work and acceptance of a research report. Food, housing, air travel to and from the Taylor facility, and most equipment will be provided. An honorarium of $600 will be awarded. Interested students are urged to discuss ideas with advisors and other faculty.

Deadline for submitting proposals will be April 3, 1978.

To Dean Ehrenreich

From James M. Peek

Subject Initiation of a plan and philosophy for Taylor Ranch facility

UNIVERSITY OF IDAHO
Inter-Office Memorandum

Date 28 March 1975

This represents initial thoughts on the direction that planning for the Taylor facility might take. It is intended to stimulate input and ideas. Since outside people and agencies will rapidly become involved, this is intended solely for our own use and should serve as a stimulation for discussion. This type of plan should be considered of high priority and politically sensitive. The advisory board should discuss this and arrive at a course of action for implementation (assign priorities).

The best use of the Taylor Ranch facility will be as an environment where educational and research activities may be developed which are simultaneously compatible with wilderness values and which contribute to an enhancement and understanding of wilderness. As an inholding which is typical of many such areas in Idaho wilderness, it can serve as an example of how human activity can be conducted in a localized area without detracting from wilderness values and also as a location where research on restoration of impacted grounds to conditions compatible with wilderness may be conducted. Both determinations on human activity levels and restoration activities are pressing needs, applicable to wilderness in general and the Taylor Ranch in particular. The following outline is intended to initiate thinking along these lines. The studies require an interdisciplinary approach to the issue.

The basic assumption is that an inholding in wilderness owned by the University of Idaho should serve as an example of human use and land that all individuals would come to recognize as being appropriate for wilderness. This goal represents a high challenge.

cc. Ken Sowles

Primary Objective:

To create an educational and research facility which is compatible with wilderness values, to be used as an example of human activity of a level and kind appropriate to wilderness.

1. Restoration of grounds and buildings to a condition compatible with wilderness.
   a. Pastures and fields
      (1) Use of fire, fertilizer, native seed stock to restore to original condition.
      (2) Determination of appropriate amount needed.
      (3) Evaluation of irrigation and haying activities as to whether they should be continued, and if so at what level.
   b. Livestock
      (1) Grazing plan: numbers, location, timing.
      (2) Disposition in winter
   c. Airstrip
      (1) Maintenance plan
      (2) Regulation of use
      (3) Timing of use
   d. Buildings
      (1) Are locations appropriate
      (2) How many are needed
      (3) Maintenance plan
      (4) Equipment and facilities appropriate for wilderness-style use
      (5) A philosophy regarding retention of buildings in wilderness to provide "pioneer"-style experience, rustic facilities, is needed.

2. Outfitter facilities and activities. (We should recognize the unique opportunity to study outfitter use in wilderness and should cooperate with the outfitter to obtain much needed data, useful to land managers and maintenance of the unique life style and means of living exemplified by outfitters.)
   a. Facilities: economics of temporary vs. permanent facilities (what style is approrpiate to wilderness experiences outfitters provide?)
   b. Impact on grounds: plan for minimizing impact.
   c. Garbage disposal, level of use, plan for rotating location, fuel
   d. Stock-- grazing plan, holding corrals.
   e. Activities-- hunting, fishing, nonconsumptive, economic, and ecological evaluations.
   f. Subsidization of outfitter to minimize financial risk, assure cooperation, and maximize data-gathering process when activities outside of his usual ones are asked.

3. Creation of a traditional, classic style of western backcountry hospitality to foster community relations and wilderness understanding.
   a. Open-door policy?
   b. Basic facilities available to whom?
   c. Emergency rations?
   d. How to implement and minimize risks to buildings, equipment and wilderness values?

4. Grounds clean-up
   a. Plan for cleaning up to determine costs, appropriate methods.
   b. Plan for garbage disposal.

5. Rules for use of facilities by University personnel.
   a. A style of conduct compatible and appropriate to wilderness use will be expected and must be developed. This is to be considered an educational goal.
   b. Provisions for continuing assessment of usefulness and applicability.
   c. It must be kept in mind that freedom and informality are both integral parts of wilderness use, so these guidelines must be carefully developed.

6. Determination of maximum number of individuals allowed to use facility.
   a. For which purposes
   b. At one time, seasonally, annually

INTER-OFFICE MEMORANDUM
UNIVERSITY OF IDAHO
DEPARTMENT OF WILDLAND RECREATION MANAGEMENT

January 13, 1987

TO: Ables, Fazio, Garton, Leonhardy, Falter, Stoszek, Ham, Hendee, Hornocker

FROM: Ed Krumpe, Wilderness Research Center

SUBJECT: Wilderness Research Center and Taylor Ranch Update Meeting on Friday, Jan. 16th at 9:30 am. Room 102

The Advisory Board will meet in Room 102 at 9:30 am. to give you an update on the activities at Taylor Ranch and the Center.

MEETING AGENDA

I. TAYLOR RANCH VIDEO TAPES FROM NEWS BRUEAU

II. INEL ENVIRONMENTAL MONITORING PROPOSAL
A. November meeting
B. Draft proposal and reply

III. SUMMARY OF LAST YEAR'S ACTIVITIES
A. Wilderness Interns
B. Research Projects
1. Cougars
2. Sheep
3. Indicators
C. Facilities
1. Laptop computer, lab, cookhouse, bridges, mule team
D. Cooperative activities
1. IDFG fish census and big game compostion counts
2. Northwest Power Planning Council
3. USFS trail crew
4. Boreal Owl study
5. Wildlife Research Institute
E. Visiting Researchers
1. Dale Bruns, Jerry Franklin, Evie Bull, Sonny LaSalle, Dean Hendee, Mike Scott, Leon N., Joe Ulliman

IV. PROPOSED FEE STRUCTURE

V. SUMMER WILDERNESS FIELD STUDIES COURSE AT TAYLOR RANCH

VI. INTERNSHIP PROGRAM
A. Ranch work
B. Archeology
C. Cougar behavior monitoring
D. Wilderness condition indicator project
E. Other suggestions?

VII. TAYLOR RANCH MAINTENANCE PROJECTS
A. Airstrip stabilization & improvements
B. Flooring and roofs
C. Fencing
D. Wood stoves
E. Septic systems
F. Solar power

VIII. ONGOING RESEARCH
A. Air quality and acid deposition
B. Archeology
C. Evaluating wilderness indicators
D. GIS (Geographic Information System)
E. Plant and animal collections
F. Summary of research projects (brochure & display)

IX. DISTINGUISHED WILDERNESS RESOURCES LECTURESHIP
A. Jay Hair, Executive Director, National Wildlife Federation
B. April 8, 1987

University of Idaho
Sherman F. Carter
Financial Vice President
Moscow, Idaho/83843
Phone: (208) 885-6174

9 August 1977

MEMORANDUM FOR KEN SOWLES

SUBJECT: Preservation and improvement of Taylor Ranch Property

As you know, Account No. 886-Y005 was established for the above described purpose. On June 30, 1977, there was a total of $6,288.94 in that account. Expenditures from the account and encumbrances against it during the month of July totalled $2,546.94. As of August 5, 1977, University accounting records showed a credit balance of $3,742 in the account. I do not know whether or not all of the requisitions written against this account have been deducted from it.

Action is now being taken to credit an additional $4,000 to the account. I hope that $7,742 will take care of special maintenance needs at the property for the rest of the current fiscal year. If it will not, please let me know. I want to thank you and Dean Ehrenreich, on behalf of the University, for the good work which you are doing with respect to the Taylor Ranch property. Because of the two of you, many important improvements have been made at minimal cost.

When more urgent projects have been completed, it would be a good thing if you could arrange to have a wooden floor and wooden walls, perhaps three or four feet high, placed in the tent used by students while they are living at the ranch and working on research projects. Although the dirt floor in this tent is covered with cloth material, a wooden floor would permit students occupying the tent to live more comfortably. I realize that putting in such things as water systems and foundations under buildings which you are currently doing are more important than the floor project suggested above.

Please keep me posted regarding maintenance of the University's ranch property, any special problems that develop, and let me know when there are significant unfinanced needs or when I can be of help.

Sherman

Sherman Carter

SC/cw
cc: Bob Steele
Jerry Reynolds
John Ehrenreich
President Gibb

Copy to Dick 4/[illegible]/77

APR 5 1977

University of Idaho
Sherman F. Carter
Financial Vice President
Moscow, Idaho/83843
Phone: (208) 885-6174

April 4, 1977

MEMORANDUM FOR KEN SOWLES

SUBJECT: Preservation and improvement of Taylor Ranch property

This concerns account No. 886-Y005, established for the above-described purpose. I have not checked the status of this account recently, but the other day you mentioned that about $4,000 should be in it. That fits with my understanding, as described in my memo to you dated October 6, 1976.

Your plans for insulating the cabin which was moved last summer, and performing related work which you described when we talked about the Taylor Ranch property last week, seems to me to be well justified. To ensure that there is enough money to handle such important work, and to do any other critically essential maintenance on the property for safety, and to protect the University's investment and interests, (to include maintenance work on the runway, when that is needed), within the next few days, I shall have an additional $4,000 credited to account No. 886-Y005.

This will be all such distributions into that account which are now planned by the central administration of the University until about one year from now. I shall then attempt to make arrangements to augment the account about another $4,000 at that time. We will continue under current understandings as to the type of things which may and may not be purchased from this account and we will also continue current procedures for expending funds from this account; namely, requisitions must be signed by you or John Ehrenreich and cleared through me.

Please keep me posted as to the condition of the Taylor Ranch property, particularly if any significant problem or need develops or I can be of help in any way.

Sherman

Sherman Carter

SC/cw
cc: Bob Steele
Jerry Reynolds
John Ehrehreich

University of Idaho
Sherman F. Carter
Financial Vice President
Moscow, Idaho/83843
Phone: (208) 885-6174

October 6, 1976

MEMORANDUM FOR KEN SOWLES

SUBJECT: Preservation and improvement of Taylor Ranch Property

This concerns the memo that I sent to you on 28 June regarding Account No. 886-Y005 which we established as explained in that memo. I indicated in it that the initial credit balance in the account would be set at $4,500; however, upon rechecking the account, I found that, for some reason, all that actually got credited to the account was $3,500.65. While reviewing the status of this account several days ago, I found that the total of the expenditures made from it plus the encumberances to that date caused the account to be overdrawn $114.35. That was prior to the processing of the requisition for air freight which we took care of just the other day--offhand, I do not know whether or not any other requisitions were being processed against the account other than those which resulted in the figures cited above.

To put the account back "into the black," yesterday, I had an additional $4,999.35 credited to the account. With the aforementioned credit of $3,500.65, this means that we have credited a total of $8,500 to the account since it was created last June; and you should still have, after deducting all encumberances and requisitions now pending against the account, around $4,000 which you may draw on, as needed, to preserve and maintain the property in accordance with the criteria which have been established for making expenditures from this account, as per our agreements and my memo of 28 June. A note to me with your last requisition indicated that as of now we have pretty well taken care of the immediate, critical needs, as you see them, and that you are not now aware of any other requirements for expenditure from this account. I hope that with the additional funding now credited to it, that this will cover the needs which develop (e.g., if the runway needs to be patched up after the spring runoff, in order for the runway to be safe, etc.) which develop during the next year.

Sherman Carter

SC/cw
cc: Dean John Ehrenreich

University of Idaho
Sherman F. Carter
Financial Vice President
Moscow, Idaho/83843
Phone: (208) 885-6174

October 6, 1976

MEMORANDUM FOR KEN SOWLES

SUBJECT: Preservation and improvement of Taylor Ranch Property

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Sherman Carter

SC/cw
cc: Dean John Ehrenreich

University of Idaho
Sherman F. Carter
Financial Vice President
Moscow, Idaho/83843
Phone: (208) 885-6174

June 28, 1976

MEMORANDUM FOR PERSONS LISTED BELOW

SUBJECT: Preservation and improvement of Taylor Ranch property

Relatively small plant outlay projects and capital expenditures are required, from time to time, at the Taylor Ranch, which are beyond the ability of the College of Forestry to finance. Such expenditures are necessary for safety, or health, or for the preservation of this University property. Within the past year the University has provided such special funding to repair the runway at the ranch, which Big Creek had eroded, and to install a waterline and certain toilet and sewage facilities.

For accounting and auditing purposes, all such special expenditures, which have heretofore been charged in various ways, henceforth will be made through the one account designated below. Before any expenditures are charged against this account, a requisition must be initiated either by Ken Sowles or John Ehrenreich and be signed by me personally.

Account No.	Account Title	Initial Credit Balance
886-Y005	Preservation & Maintenance of Taylor Ranch Property	$4,500

Expenditure of up to $2,500 of the above-cited funds, as necessary, may now be made, to buy materials and equipment required for the projects listed below, if the College of Forestry will arrange to transport such items to the site and to pay for the labor involved in completing the work, as it did when the last waterline, toilet, and sewage facilities were constructed at the ranch about one year ago.

a. Construct a waterline to, and running water facilities in, the caretaker's cabin.

b. Construct sewage disposal facilities and a bathroom-washroom for that cabin.

c. Purchase a refrigerator for the caretaker's cabin.

Sherman Carter

SC/cw
cc: John Ehrenreich
✓Ken Sowles
Jerry Reynolds
Dale Alldredge

Response to President, Board of Regents & Governor FOR WED. '76

In February 1975 Dean Ehrenreich assumed directorship of the Wilderness Research Center. This action was taken because of the lack of effective leadership the Center was given over the past years.

Unfortunately, the Wilderness Research Center has had a history of difficulty almost from its inception in 1969. These difficulties were brought about due to poor judgement on the part of the two previous directors, thus leaving Dean Ehrenreich no option other than that action he has taken.

Presently the Wilderness Research Center is directed by the Dean with a Technical Board consisting of four individuals who have a strong desire to see the Center succeed and ~~each~~ have having successful backgrounds in developing, funding and administering new and varied programs which lend breadth and depth to the wilderness concept.

The original concept has not changed but the objectives and thrust have been modernized to better meet the needs of the University and State. The administration of the Center is on campus in the College of Forestry, Wildlife and Range Sciences. The original plan for having the headquarters in the heart of the Idaho Primitive Area has proven impracticable due mainly to inaccessibility. The Taylor Ranch is being retained and more fully utilized as a field station where the research effort is no longer limited to only wilderness, but all research involving pristine conditions of the natural resources.

Since Dean Ehrenreich and the Technical Board have assumed responsibility for the Wilderness Research Center the research activities have gone from zero to over $100,000 worth of research projects with much more in the offing.

These projects include:

1. Bighorn Sheep Behavior Elinder + Jon Bennett
2. Communication Patterns in Recreation
3. Timber Values of the Idaho Primitive Area
4. 5 Student Honorariums for Individual Short Term Research
5. Aquatics of Highland Streams

In the near future an advisory committee representing all factions interested in wilderness research and education, on and off campus, will be activated to bring total input of ideas and concerns into the Center.

The Dean and Technical Board are also preparing publicity materials for the Center in the form of a brochure and newsletter to better communicate its purposes and accomplishments.

An effort is being made with the assistance of the University of Idaho Foundation, Inc. to promote a fund for the operation and maintenance of the Center.

University of Idaho
Sherman F. Carter
Financial Vice President
Moscow, Idaho 83843
Phone (208) 885-6365

October 6, 1976

MEMORANDUM FOR KEN SOWLES

SUBJECT: Preservation and improvement of Taylor Ranch Property

This concerns the memo that I sent to you on 28 June regarding Account No. 886-Y005 which we established as explained in that memo. I indicated in it that the initial credit balance in the account would be set at $4,500; however, upon rechecking the account, I found that, for some reason, all that actually got credited to the account was $3,500.65. While reviewing the status of this account several days ago, I found that the total of the expenditures made from it plus the encumberances to that date caused the account to be overdrawn $114.35. That was prior to the processing of the requisition for air freight which we took care of just the other day--offhand, I do not know whether or not any other requisitions were being processed against the account other than those which resulted in the figures cited above.

To put the account back "into the black," yesterday, I had an additional $4,999.35 credited to the account. With the aforementioned credit of $3,500.65, this means that we have credited a total of $8,500 to the account since it was created last June; and you should still have, after deducting all encumberances and requisitions now pending against the account, around $4,000 which you may draw on, as needed, to preserve and maintain the property in accordance with the criteria which have been established for making expenditures from this account, as per our agreements and my memo of 28 June. A note to me with your last requisition indicated that as of now we have pretty well taken care of the immediate, critical needs, as you see them, and that you are not now aware of any other requirements for expenditure from this account. I hope that with the additional funding now credited to it, that this will cover the needs which develop (e.g., if the runway needs to be patched up after the spring runoff, in order for the runway to be safe, etc.) which develop during the next year.

Sherman Carter

SC/cw
cc: Dean John Ehrenreich

Testimony on Wilderness Allocation in Idaho

by

John H. Ehrenreich

As Dean of the College of Forestry, Wildlife and Range Sciences at the University of Idaho, I have been keenly interested in the RARE-II process in Idaho. I am exposed to and can sympathize with the views of the so-called environmentalists and industry people. However, based on my experience as a natural resource administrator and as a professional ecologist, I would like to make a few brief comments about the RARE-II process and then comment specifically on The River of No Return Wilderness proposals.

The first point deals with the results of current wilderness conflict resolution methodologies. The wilderness issue in Idaho, and across the nation, is not whether to have wilderness--the issue is how much more acreage, in addition to existing wilderness, primitive and other similar reserved areas do we want and where in the United States should these additional areas be located?

The U.S. Forest Service RARE-II process was an approach to determine how much more wilderness we should have from U.S. Forest Service-administered lands (National Forests)--and this, of course, is just part of the picture--of this fact we should not lose sight. The Idaho additional wilderness and further planning acreages (to come from National Forests) recommended by the Forest Service, the acreages recommended by Idaho's forest industries and acreages recommended by environmental groups are tabled below for the entire state.

	Wilderness	Further Planning
Forest Industry [1/]	1,563,888	499,465
Forest Service [2/]	2,171,165	1,220,977
"Alternative W" [3/]	4,760,568	881,957

It is obvious that the RARE-II process has not resulted in a consensus within the state. Therefore, the resolution of the wilderness issue must be one of compromise. However, in reaching a RARE-II compromise we should keep in mind acreages of lands

---

1/ Forest Service--USDA, Forest Service RARE II Summary Final Environmental Statement Roadless Area Review and Evaluation (January 1979).

2/ Forest Industry--A Forest Products Industry alternative to the Forest Service RARE II Land Allocation Proposal for the national forest of Idaho (January 1979).

3/ "Alternative W"--RARE II in Idaho: A Citizen's Alternative. Only inventoried areas were used in this analysis (1978).

administered similar to designated wilderness by many different agencies and organizations. In Idaho there are currently more than 6,000,000 acres of special use designated areas treated or managed similar to wilderness.[4/] In addition to designated Wilderness these include Primitive areas, National Recreation Areas, National Wildlife Areas, National Parks and Monuments, Natural Areas, State Parks, Department of Defense lands and Department of Energy lands. This constitutes about 11.5% of the total land of the State of Idaho. Now, I understand that the Bureau of Land Management will be considering about 8,000,000 acres in Idaho for possible inclusion of some of these acres into the National Wilderness System--and this is in addition to the above-mentioned RARE-II lands in Idaho being considered for possible inclusion in the National Wilderness System. I wish to call this to the attention of Congress and trust that Congress will consider this in relation to "Wilderness in a balanced land use framework" for Idaho alone and all the states of the nation as a group.

In addition to the above points of consideration, I wish to call to the attention of Congress the following information in relation to The River of No Return (Idaho Primitive Area) proposals for which you are holding these hearings.

River of No Return Wilderness Proposals

Group	Core	Acres Additions	Total	Associated with Additions: Direct and Indirect Jobs[8/]	Associated with Additions: Jobs Not Gained[9/]
Alternative W [5/]	1,570,331	950,091	2,520,422	-209.7	813.2
For. Serv. [6/]	1,570,331	530,252	2,100,583	-106.7	349.7
For. Prod. Ind. [7/]	1,570,331	407,823	1,978,154	- 53.6	259.1

Please note that the U.S. Forest Service recommendations and those of forest products industries are very similar in total acreage.

4/ Sharp and Sanders (1978) Rangeland Resources of Idaho. Misc. Pub. No. 6 Forest, Wildlife and Range Experiment Station. 75 pp.

5/ "Alternative W"--RARE II in Idaho: A Citizen's Alternative. Represents the views of the Wilderness Society, the Sierra Club, the Idaho Conservation League and the Idaho Environmental Council. Only inventoried areas were used in this analysis.

6/ Forest Service--USDA, Forest Service RARE II Summary Final Environmental Statement Roadless Area Review and Evaluation (January 1979).

7/ Forest Products Industry--A Forest Products Industry alternative to the Forest Service RARE II Land Allocation Proposal for the National Forests of Idaho (January 1979).

8/ Direct and Indirect Jobs: The net change in forestry and nonforestry employment resulting from wilderness classification of the RARE II decision units. These values are based on changes in current resource use and programmed harvest values.

9/ Jobs not Gained: The net change in forestry and nonforestry employment resulting from wilderness classification of the RARE II decision units if potential (long term) timber resource outputs would have been realized under nonwilderness classification. These values are based on changes in potential timber yield values as defined in the USDA, Forest Service Environmental Statement.

The second point deals with problems related to "managing" wilderness once it is designated. At best the term "wilderness management" is not well understood nor well practiced--especially when considered in light of the dynamics of forest and range ecosystems. These ecosystems are living--dynamic--communities that are not only influenced by the biological and physical forces within the ecosystem but by the biological, physical, social, economic and political forces and pressures from outside the ecosystem. One can somewhat visualize (even though we may not well understand) the effects of various types of fire in these ecosystems --or wildlife population disruptions--or disease or insect infestations--or other vegetation changes--but we have little understanding of the interactions among these factors or with other factors such as human carrying capacity.

It is simply not enough to merely "designate" an area wilderness--funds must then be appropriated to manage these areas. Not to do so is courting ecological disaster and will result, in the least, changes in the ecosystem which are disastrous or incompatible with the reason the areas are designated wilderness in the first place. In other words, the public must realize, and Congress must realize, that it will cost many millions of dollars to properly manage an area once it is designated wilderness. To ignore this fact is wrong and what's worse, to let the public think that the only cost is the loss of a few jobs or the intangible loss of certain other types of uses is deceiving the public. The public should know that this need and this cost is real and it is not a single matter of merely declaring an area wilderness--obligations go with that declaration.

When one advocates designating an area as wilderness and ignores "management" of these areas afterwards, they are either not knowledgeable of the ecology of these environments or really don't care about the environment they wish to preserve and are thus deceiving the public. And Congress should also realize that they are not doing their job when they designate an area as wilderness and then don't appropriate the funds to manage them.

Now, in relation to designating large areas as wilderness, such as the proposed River of No Return Wilderness, it should be remembered that it is much more difficult--and much more expensive--to properly manage one large area than several small areas. There are, of course, some advantages to having a large area vs. small areas--but this should be recognized and the advantages weighed against the disadvantages.

The third comment deals with the lack of scientific information regarding wilderness--scientific information which is needed to properly manage wilderness areas. The great bulk of research funds granted by state and federal governments are oriented toward consumptive uses of forest, range and wildlife resources or toward integrated management of these resources. Congress is not doing the complete job when it considers designating an area as wilderness and doesn't consider the funds needed to derive the scientific information needed for this management. The public and Congress recognize the cost of supporting research for other uses of forest and rangelands as well as the costs of actual management. The public should then be informed that if we are to have a wilderness system that there should be a research cost that goes with it. Again, when one advocates designating an area as wilderness and ignores wilderness research for better understanding and management of these areas they are either not knowledgeable of the ecology of these environments or really don't care about the environments they wish to preserve and have some other purpose behind their advocacy.

The University of Idaho has a Wilderness Research Center specifically designated for wilderness-oriented research. This Center could, for example, provide many of the scientific answers needed to properly manage the proposed River of No Return Wilderness Area and other wilderness areas in the Pacific Northwest and Rocky Mountain areas. However, the problem is that even though more and more areas are being designated wilderness by Congress, little consideration is being given to providing funds to support research efforts to help in understanding and managing these areas.

I wish to thank you for this opportunity to express my thoughts on wilderness. I have done ecological research on natural areas and wilderness since 1954 and obtained a PhD in this area in 1956. So you can see I have a long and deep-seated background and interest in this field and thus particularly appreciate this opportunity which you have provided.

copy to Dick
Leon
Jeff
For discussion w me

MEMORANDUM

JEFFREY J. YEO
WILDERNESS RESEARCH CENTER
UNIVERSITY OF IDAHO
MOSCOW, ID 83843
(208) 885-5779

October 8, 1992

TO: John Hendee, Director, WRC

SUBJECT: strategies for Taylor Ranch budget cut

The loss of the Taylor Ranch maintenance budget (U01-X007) results in a $15,000 cut in operations and maintenance funds for the field station. I'm left with about $15,000 to cover annual costs (caretakers, irregular help, airplane rental, propane, radio, phones, mail, livestock, facility maintenance, etc.). Our basic annual expenses average $25,000 so obviously some things have to go. Following are approaches and suggestions for dealing with this drastic loss of funds.

1. seasonal caretakers: Originally, I thought that Jim Peek's sabbatical leave at Taylor Ranch would eliminate the need for caretakers during winter 1992-93. However, Jim's commitments to national committees and advising of students means that he will be coming out from the field station several times this winter, totalling about 2 months. I am currently attempting to recruit volunteers to cover the periods when Jim won't be at the field station. I would cover their food and travel but no salary. We need someone at the field station daily to continue the decade-old weather record as well as for our commitment to USFS for water quality monitoring and meteorology. Also, protection of the facilities and maintenance of the air strip in winter can be a daily task. So my intent is to provide continual caretaker presence but at a cost of about $1000-$1500 for the entire winter. However, it depends on my luck getting volunteers.

✓ Too much of your time. Use interns.

2. livestock: We currently are supporting 4 horses for riding and packing at an annual cost of about $2800 (ignoring the 25-50% of my time spent working with the stock) and an initial outlay of $5000. Our use over the past 2 years has been too little even for the health of the horses. Although I foresee an increase in subsequent years, there are good options other than owning our own stock. I've talked with Steve Zettel, the local outfitter, about various approaches to our needs and he will be sending me some options and costs that could be advantageous to both parties:

a. He would exchange packing services needed for our classes and research for winter storage of his tents and stoves at the field station. We have the space and that way I wouldn't have the daily requirement of horse care, the safety concerns of unexpected landings with stock on the airstrip, and would free up time for me to pursue research and teaching responsibilities. I also wouldn't have to trail horses in and out each year which takes more time and is dangerous. Right now, I'm mostly a prisoner of the ranch as long as there are horses pastured there. In

? I'm uncomfortable with any outfitter arrangement that get me in the middle of the FS - outfitter politics

addition, we would have the advantage of experienced packers who know the country. Zettel is insured and the risk if we do the packing ourselves with inadequately trained interns is large.

b. We sell our stock and pasture the number of Zettel's horses that we needed during the summer. We would have free use of the stock during the period when we most needed them and then no costs during the rest of the year. However, as long as there's horses pastured at the field station, much of my time will be taken with handling them, repairing fences, training, etc.

still have fence upgrades

c. We sell 2 of our horses which reduces our annual cost by about $1400. We would make better use of each horse (which means they'd be healthier) and my time taken by horse care would be reduced. Field station pastures also would be in better shape. We could lease additional horses during those times when we needed them. Selway Lodge typically pays $150/horse/season.

Currently, the airstrip is maintained with a combination of grazing and some cutting with a weedeater. An excellent shrub/grass cutter for rough areas can be bought for $700-$800. This machine would maintain the airstrip in much better condition than currently and would eliminate shrubs on the airstrip which can't be done now. About 3 hours/month in the early summer would be needed to maintain the airstrip. The downside is that we would be using a gas-powered machine but still there would be much less use overall than in years past (e.g. generator).

No!

3. internships: During the past 2 years, I've allocated $3000 for wilderness research internships. This year I will apply for funds to support interns from the Bleak and DeVlieg endowments. However, I think if we are to attract high quality interns, we will need to provide larger awards (~$2000-$2500/intern/summer). This might be accomplished with funds from cooperative courses with San Francisco St. Univ. Wildand Studies Program.

Lets advertise 1 intern re Course study -
1 operations intern

Bleak
McIntyre Stein?
deVlieg
SF State

TAYLOR RANCH FISCAL YEAR 1993
PROPOSED OPERATING BUDGET
(686-X100 & U01-X007)

Wages (686-X100)	
Student Interns	3,000
*Caretakers	5,000
Irregular Help	1,000
Subtotal	**$ 9,000**
Travel (686-X100 & U01-X007)	
Air Taxi charter & freight	5,000
Travel Expenses	2,000
Subtotal	**$ 7,000**
Operating Expenses (U01-X007)	
Livestock maintenance	
winter board (Challis)	1,100
transportation	200
farrier	500
veterinarian & supplies	500
grain	200
Subtotal	$ 2,500
Propane	500
Miscellaneous Expenses e.g. hardware, building supplies, cleaning,office supplies, telephone charges	6,000
Subtotal	**$ 9,000**
Capital Outlay (UO1-X007)	
Landing field sprinkler system	2,000
Solar power system	3,000
Subtotal	**$ 5,000**
TOTAL	**$30,000**

*Professor Jim Peek will be spending 9 months (Sept. 92 - May 93) predominantly at the ranch thereby reducing expenses for caretakers from $9,000 to $5,000.

TEACHING/RESEARCH/SERVICE
Wilderness Research Center
208-885-5779/6442
FAX: 208-885-6226

University of Idaho
College of Forestry, Wildlife
and Range Sciences
Moscow, Idaho 83843 U.S.A.

Jeff - Thanks for quick turnaround and review comments. I incorporated. Bring them up if necessary.
John 1-19-93

Memorandum

To: *John Hendee*
From: *Jeffrey J. Yeo*
Date: *1/15/1993*
Subject: *WRC Advisory Committee meeting*

Term is a good topic.

1. It seems to me that soon we should formalize the composition and function of the advisory committee. Maybe not at this next meeting but discussions probably could begin then (e.g,. should the committee to be composed of specific members with terms or something looser, like any one who wants to attend?)

We have specific members from UI now.

2 I think we should discuss how the Center handles administrative costs and how outside monies are handled by the Center. Why would anyone want to have their research affiliated with the Center? Is there an advantage to being affiliated with the Center? Should we have fellows of the Center or some financial advantage for affiliating with the Center for contracts?

good topic

3. WRC advisor visits to Taylor Ranch: I think these should be hosted visits for now. I've had second thoughts since our discussion last Thursday about having advisors stay at Taylor Ranch while Jim and Pat Peek are gone. Although ideally life at Taylor Ranch should be simple, I've found the field station is much more complex and demanding than it first appears. Things break, water doesn't flow, stuff happens. It takes me a couple days to familiarize a new caretaker with the place. I don't know how this would work with WRC advisors.

ok

4. Jim and Pat Peek will be away from Taylor Ranch beginning about March 15 through about April 15 this spring. As we discussed, interaction between Jim while he's at Taylor Ranch and some of the WRC advisors would be worthwhile. So we should think about getting advisors to visit Taylor Ranch either prior to March 15 or between April 15 and May 1.

ok

5. I've made a few notes on your draft letter to the advisory committee. Most are redundant with this memo.

Hiring Hendee

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Wildland Recreation Research
4507 University Way N.E.
Seattle, Washington 98105

August 11, 1971

Dr. Al Erickson, Director
Wilderness Research Center
University of Idaho
Moscow, Idaho 83843

Dear Al:

I am very flattered at your preliminary invitation to serve on an advisory committee to the Wilderness Research Center. I would be happy to serve in such a capacity if invited. It is well within my scope of responsibilities to help serve in a facilitating capacity a potentially productive and challenging venture such as represented by the Wilderness Research Center. In addition, of course, the activities you will be engaged in strike close to one of my warmest professional interests and I look forward to associating with you and your colleagues in launching your research program. Please be advised that if officially invited I would be happy to serve on your advisory committee to the extent that my time and budget permits.

I was also flattered by your suggestion of a possible affiliate appointment to the University of Idaho faculty. I am sure such an affiliation could prove mutually fruitful under the right conditions. I am enclosing a vitae following guidelines operating at the University of Washington and I hope this will be adequate for your evaluation of my credentials. I look forward to your response on this matter.

On a recent trip through Idaho I gained my closest look at some of Idaho's wilderness and back country resources although I wasn't able to venture far into any of them. However, I was struck by the importance of wildlife to the use of these areas. Considering your background and some of the impressions I gained I would highly recommend that you give thought to focussing a good deal of your attention on wilderness and back country game management problems and policies. A further thought is to specifically expand your official scope of interest to backcountry areas that may never be classified as wilderness but will nevertheless serve as an environment for similar extensive recreation use. I would enjoy some future conversation on these matters with you.

Sincerely yours,

John C. Hendee

JOHN C. HENDEE
Project Leader

I. PERSONAL VITAE FOR JOHN C. HENDEE

6542 42nd Avenue NE, Seattle, WA 98115

Home Phone: 206-LA3-7932
Work Phone: 206-442-7817

PERSONAL DATA:

Born: November 12, 1938, Duluth, Minnesota

Married: Nita Wilson in 1957. Now have two children, John Jr., age 12, and James, age 9. Wife is nursing student at Shoreline College and will receive her R.N. in 1972.

EDUCATION:

Public schools in Duluth, Minn., Portland, Ore., Denver, Colo., and Oakland, Cal. (Fremont High School).

Michigan State University, B. S. (Forestry), 1960. Oregon State University, M.F. (Forest Management), 1962. University of Washington, Ph.D. 1967 granted by College of Forest Resources following an interdisciplinary program relating sociology, political science and economics to forest recreation.

PROFESSIONAL EMPLOYMENT RECORD:

Forestry Aid, Waldport District, Siuslaw National Forest, Jan. 1961-Sept. 1961.

Forester, Mary's Peak District, Siuslaw National Forest, Sept. 1961-June 1962. (35 hours per week while earning Masters at Oregon State U.)

Forester, Waldport District, Siuslaw National Forest, June 1962-Feb. 1964.

Forester, Fire Research, U.S. Forest Service, PSW Forest Experiment Station, Berkeley, Cal. Feb. 1964-Aug. 1965.

Educational leave Sept. 1965-Aug. 1966.

Research Forester, Recreation Research Project, U. S. Forest Service, PNW Forest Experiment Station, August 1966-1967.

Project Leader, Recreation Research, U.S. Forest Service, PNW Forest and Range Experiment Station, 1967-present.

Affiliate Assistant Professor of Forestry, University of Washington, College of Forest Resources, Spring 1968-present.

HONORARIES AND PROFESSIONAL ORGANIZATIONS:

National Merit Award Scholarship (baseball), Mich. St. Univ.
National Wildlife Federation Fellowship, Univ. of Wash.
Hugo Winkerwerder Memorial Scholarship, Univ. of Wash.
McIntyre-Stennis Research Assistant, Univ. of Wash.
Phi Kappa Phi National Scholastic Honorary, Ore. St. Univ.
Xi Sigma Pi National Forestry Scholastic Honorary, Univ. of Wash.
Sigma Xi National Scientific Research Honorary, Univ. of Wash.
Adelphi Honorary, Univ. of Wash.

2. TEACHING EXPERIENCE AND CURRENT RESPONSIBILITIES:

Spring 1968, developed and taught graduate course, Recreation Research Methods, Forestry 552

Steering committee to guide recreation short courses at Oregon State University, 1968 to present

Forestry 456 (Wilderness preservation and Management) Univ. of Washington Fall quarter 1969 to present

Forestry 550 Graduate Studies in Forest Recreation, Univ. of Washington (Several graduate students over past four years)

CURRENT GRADUATE STUDENT SUPERVISION:

Graduate students in the area of forest recreation

Roger Clark. Doctoral candidate shceduled for completion of degree in December 1971. I have supervised his program and research while serving on his graduate committee. Employed as research assistant for 3 years.

Dale Potter. Doctorate student in his second year studying human behavior aspects of wildlife management. Supervise program of study and research. Employed as staff scientist in recreation research.

Lee Evison. Masters candidate scheduled for completion of degree in August 1971. I have supervised his research and advised on his program while serving on his committee.

Ron Coulter. Masters candidate, serve on committee and have supervised his research.

Arnold Schoeck. Masters candidate-currently supervising him in research that may be his thesis while serving on his committee.

Richard Kringle. Masters candidate-serve on his committee.

Paul McIntosh. Masters candidate-serve on committee.

Randal Washburne. Masters candidate and have advised extensively during the past two years. Now employ as research assistant.

Chaired session at annual meetings of Rural Sociological Society, 1969 in Boston.

Presentations at international conferences:

Presented papers the past two years to the North American Conference on Wildlife and Natural Resources.

Research funds or assistantships solicited personally:

Have administered for Forest Service about 10 cooperative agreements with the Univ. of Washington, College of Forest Resources over the past 6 years totaling about $60,000.

To John H. Ehrenreich, Dean

From Ken Sowles

Subject Taylor Ranch Funding

University of Idaho
Inter-Office Memorandum

Date 21 November 1978

Once again I find the Taylor Ranch budget out of funds. This has become the usual situation under which we have been trying to operate.

It is impossible to operate and maintain the ranch without knowing from year to year how much money we have to work with. Short and long term research projects cannot be planned or the numbers of student and staff that might utilize the ranch facilities.

I have personally been fighting the Taylor Ranch budget battle for 5 years receiving only tid bits of funding and empty assurance that next year will be better. We have arrived at the end of the trail with nowhere else to turn.

As much as I hate to do it, I am forced to make the following recommendations:

1. Operate the ranch only during the summer months.

2. Pull Arlow and the horses out along with all the equipment.

3. Sell the property.

I see very little support for the ranch coming from central administration and therefore assume we are in for even harder times.

Ken Sowles

[illegible] Atkenson
September 1982

YOUR COPY

Research Ideas for Taylor Ranch

Wildlife

Bighorn sheep movements
Stream fluctuations
Bird list
(Small) Mammal list
Mortality of ½ curl rams (1yr old)
Sheep summer & winter range
Sheep herd size determinant
Sheep - social organization (prey ecol)
Raptors - fall migration
Wood supply vs cavity nesters inventory
* Wolf transplant & preliminary studies (Bart O'Gara, UM)
Cutthroat trout migration
Deer migration
* Snag mortality in burns
Bear ecology
Cutthroat trout - rainbow cross
Limiting factors of population of ungulates (elk)
Big game (Sheep) age profiles
BG - population limitations — forage Winter/Summer
BG reproductive rates
Amino acid analysis - Epidimology - Nutrition (Bill)

Recreation

On & off trail use by hunters
* RONRW Comprehensive LM Plan, USFS
Wilderness use - purpose & method of entry

Botany

Habitat types/plant comm. plotted on aerial photos
* Plant reference collection (herbarium)
Plant list of species
Spruce budworm/Tussock Moth in natural ecosyst
Mistletoe - managed vs unman
Fire succession/ecology

Physical

* Weather station
Geologic?
Solar panels

Cultural/Historical

Indian camps & use on Big Cr.
Outfitting in modern times

Cavity nests - band & popul. long term marked
Longterm Pop of BigGame

YOUR COPY

~~Suggestions from Faculty Survey~~

Faculty survey

Genetic variation - trees & bugs ; gene pool
Soils
blue grouse ecol.
overgrazing by pack animals -? controversial
species diversity
historical use - anthro
succession - plant/animal
historical aerial photography - veg. changes over time
human perceptions of natural environments
role of outfitters in wilderness
riparian plant community study } Steve
Plant community study } Brunsfeld
aquatic insects — also all limnology
ecology of mountain meadows
natural sediment loads of streams
ecology of boreal owls
population dynamics of lightly harvested or semi natural mammal popul.
kinds, interactions, rates, impacts of tree problems as related to disturb areas
nutrient cycling in undisturbed forest setting
plant & plant comm. survey for changes in existing classifications
plants indicating strange habitats } Fred Johnson

STRATEGIC PLAN AND POLICIES FOR THE UNIVERSITY OF IDAHO WILDERNESS RESEARCH CENTER AND THE TAYLOR RANCH WILDERNESS FIELD STATION

Approved _____, 1994

John C. Hendee Director UI Wilderness Research Center	Jeff Yeo, Scientist/Manager Taylor Ranch Wilderness Field Station	Jeanne Shreeve Vice Provost-Research

A:\STRATEGI.
August 18, 1994

TABLE OF CONTENTS

STRATEGIC PLAN AND POLICIES FOR THE UNIVERSITY OF IDAHO WILDERNESS RESEARCH CENTER AND TAYLOR RANCH WILDERNESS FIELD STATION

INTRODUCTION

The Wilderness Research Center was first conceptualized with the purchase of the 68-acre Taylor Ranch in 1969, a unique facility entirely surrounded by the Frank Church-River of No Return Wilderness. In 1972, the University of Idaho established the Wilderness Research Center to coordinate a focus interdisciplinary wilderness-related research by the University of Idaho and cooperating organizations including then and now work at the Taylor Ranch facility. There is opportunity and need for such research in Idaho, which has more wilderness and potential wilderness than any state outside Alaska. In addition to its Taylor Ranch Field Station, the Wilderness Research Center is supported by access to the Clark Fork and McCall Field Campuses which are near existing or proposed wilderness in north and central Idaho, respectively , and three designated Research natural Areas on the University Experimental Forest. These, along with the many outstanding faculty interested in wilderness, give the University a potential for excellence in research and related education on wilderness, natural ecosystems, and nature conservation.

July 1, 1994, President Elizabeth Zinser designated the Wilderness Research Center as the sixth campus-wide research center, joining biotechnology (IMAGE), Water Resources (WRRI) Aquaculture, Materials Science, and International Programs (IPO). The Center Director position, was restored to full time and John Hendee appointed as director with an administrative secretary, modest operating budget, and a suite of three new offices was constructed adjacent to the Department of Resource, Recreation and Tourism in the College of Forestry, Wildlife and Range Sciences. Additional support is provided from CFWR in the form of two research assistants and budget and administrative services. Under the reorganization and expansion of the Center the director will report to the Vice Provost for Research (Jean'ne Shreeve), and will be a tenured full professor in the Department of Resource, Recreation and Tourism and administrative services will be provided by the CFWR deans office. Thus the historical relationship with CFWR is maintained even though a new degree of autonomy and campus wide focus is established.

In coordinating university-wide wilderness research, the Center cooperates with University and College research offices. The Center benefits from the counsel of a University advisory committee of diverse faculty and administrators.

Organization of the Plan

This plan provides policy direction for the research and education programs of the Wilderness Research Center (WRC) including its Taylor Ranch Wilderness Field Station (TR). The plan describes the major functions of the Center and Taylor Ranch and their operational structure. Detailed information is provided for the following major functions:

I. Purpose of the Wilderness Research Center

II. Research Program
III. Education Program
IV. Wilderness Field Station Program
V. Organization and Structure

The format for presenting the Center's three programs incudes a discussion of the following:

a. Statement of objectives
b. Assessment of the current situation
c. Assumptions about the future
d. Policy guidelines (directional statements toward meeting the objectives considering current and probable future conditions).

Specific direction for the Center's operations are developed under yearly action and project plans. Progress is periodically assessed by program reviews and advice from the advisory committee. Each year an annual report of the Center's accomplishments is prepared.

PURPOSE OF THE WILDERNESS RESEARCH CENTER

The Center was established to coordinate and focus interdisciplinary wilderness research at the University of Idaho and with cooperating organizations. Since its inception, the purpose of the Wilderness Research Center has been to encourage research and educational programs leading to a better understanding of the structure and function of natural ecosystems, humankind's relationships to them, and their perpetual protection as wilderness.

Research

During its 25 year history an impressive list of studies and record of research has been compiled by the WRC, much of it at the TR Wilderness Field Station. The studies at Taylor Ranch are summarized in an illustrated monograph (Hendee &Yeo 1992) and a more complete list of all the research associated with the WRC is indicated in Appendix A "Funding of Current and Post Research Associated with the UI Wilderness Research Center" and Appendix E, Publications associated with the Wilderness Research Center.

Wildlife studies have traditionally led the WRC Agenda but, during the past decade the human relationships to wilderness have emerged in importance of WRC research. There has been important work by Krumpe and students in limits of acceptable change (LAC), wilderness planning and work by Hendee and students on the use of Wilderness for personal growth. This strategic plan proposes a dual focus in future research on: (1) Wilderness Monitoring--including all kinds of flora, fauna and physical resource studies that describe and measure wilderness conditions and natural process and interactions. (Wilderness as a Land Laboratory in the words of Aldo Leopold (1941); and (2) Wilderness Use Effects including a major effort in studying the use of Wilderness for personal growth, therapy and education. These two areas of emphasis for research are stated as objectives in the following:

1. Wilderness Monitoring: Conduct and facilitate long-term research into natural phenomena and ecosystem dynamics of wilderness, including baseline inventory and descriptive studies.

2. Wilderness Use Effects: Conduct and facilitate studies and programs aimed at identifying the effects of wilderness experiences on users including effects described as personal growth, therapy, education, leadership development and other alleged effects of use.

Education

During its entire history the WRC and TR have pursued education in concert with research such as internships at Taylor Ranch and with most studies involving graduate students. The WRC has also offered educational programs independent of its research including courses in Wilderness Management and impacts, the distinguished wilderness lecture series and co-sponsorship of conferences. The educational objectives of the WRC are stated as follows:
Provide and facilitate educational programs to disseminated research findings and promote a broader understanding of wilderness resources, and wilderness management, wilderness values and uses among the general public, governmental agencies, user groups, and scientists.

These research and educational objectives take advantage of the unique opportunities afforded by Idaho's wilderness resources. Benefits to Idaho will accrue as the Center's efforts continue to (1) explain the dynamic processes of natural ecosystems, to help protect them and contribute to management of developed and (2) explain human responses to wilderness experiences and their impacts which will help determine the acceptable level of human uses of wilderness that will allow its continued existence in its primeval state.

RESEARCH PROGRAM

Objectives: (1) Establish a long-term program of research that builds a reliable wilderness research date base. (2) Secure, broaden, and diversify short-term and long-term funding to support the research program. (3) Disseminate research findings through journals, monographs, experiment station publications, conference presentations and proceedings. (4) Provide up-to-date research equipment, facilities and logistical support. (5) Promote research by cross-section of University faculty and cooperators. (6) Promote graduate and undergraduate research opportunities.

Current Situation (1994)

1. The Wilderness Research Center has conducted research throughout the Northwest and Alaska; however, the majority of the research has been conducted in the Frank Church-River of No Return Wilderness (RNRW) because of the existence of the Taylor Ranch Field Station in the remote lower Big Creek drainage. The University has not provided funding to the Center for research, Though some research has benefitted from logistical support by the field station. Most of the Center's research has been funded through outside grants and contracts. Research projects associated with the Center have attracted nearly one million dollars since its inception (see Appendix A). To date, research funding has been sporadic and opportunistic making it extremely difficult to implement a planned and focused long-term research program.

2. The Wilderness Research Center and its Taylor Ranch Field Station are a repository for pertinent data about wilderness, including: a library collection of research publications; written and recorded information from agencies, local businesses and individuals; maps and aerial photographs; and plant and animal specimen collections. In addition, in cooperation with the University of Idaho Library, a special collection of wilderness written material have been initiated on the main campus.

3. Several research projects have been conducted and others are in progress to study various wildlife species in undisturbed environments or those species associated with wilderness settings. These studies include ecology of the species, animal and bird community relationships, predator-prey relationships, and wildlife habitat relationships. Species studied include cougar, marten, owls, bighorn sheep, bobcat, and most recently amphibians.

4. Some research has been conducted on indicators of human impacts on natural and social conditions in wilderness.

5. Research has been initiated to define and describe the conditions and processes that are associated with perceived personal growth outcomes from wilderness experience, and thereby enable more beneficial and efficient use of wilderness for personal development, therapy, education, and leadership development. A literature search and summary of all previous studies of use of wilderness for personal growth is nearing completion; a survey of existing wilderness-personal growth programs is being initiated; and Wilderness Discovery, a wilderness experience program for poverty youth in Federal Job Corps Centers of the Forest Service has been feasibility tested (1993), operated at three western Job Corps Centers in 1994 and will be expanded to a fourth Center in the east in 1994 under Forest Service and Department of Labor Funding for the pilot program and study of effects.

6. A new laboratory at Taylor Ranch Field Station includes basic labware, microscopes, reference collections, some conventional wet lab facilities and laptop computer with solar power source.

7. Taylor Ranch Field Station provides an excellent staging area for research. It includes a landing field, a resident scientist/manager capable of assisting in research project planning and execution, pack stock for packing support, ten buildings including four with space for scientist and field personnel. Total overnight single bed capacity at the Taylor Ranch Field Station is six persons.

8. External funding: Currently one research associate (Pitstick) is employed under Department of Labor and Forest Service funding; one MS student (Pittman) is supported by the Forest Service--Aldo Leopold Wilderness Research Institute, two MS students (Friese and Gager) and part of another MS student (Russell) are supported by McIntire-Stennis funds through CFWR Experiment Station. The Ralph M. Bleak endowment, established in 1992, now stands at more than $100,000 and yields close to $6000 per year for student wilderness research and education.

Assumptions about the Future

1. A decline in the number of acres of land unaltered by human activity will increase the value of wilderness and natural environments for research and, thus, the importance of the Wilderness Research Center and its Taylor Ranch wilderness research field station. The emerging emphasis on ecosystem management of public lands and concern over forest and ecosystem health will further increase demand for research on natural processes.

2. Federal agencies will decrease emphasis on classification of additional areas and focus on management of existing classified wilderness. This will increase information needs and further increase the demand for wilderness research. As scientific knowledge related to wilderness grows, and as the Center establishes its basis of support and expertise, more focused research directions will be needed.

3. The TR Field Station and surrounding wilderness will continue to be an important location for studies of wildlife species and relationships in natural environment, and will grow in value as additional information is collected.

4. Enhancement of existing baseline and monitoring data will increase outside interest in doing research near Taylor Ranch Wilderness Field Station. Due to limited capacity of the facilities at Taylor Ranch, requests to conduct research there will exceed capacity. Therefore, research projects requiring use of the Field station will need to be evaluated and prioritized.

5. Widespread use of wilderness for personal growth and education, and completion of WRC studies, literature search and surveys on this topic, should draw favorable attention, attract students and hopefully funding for research and education.

6. As the Wilderness Special Collection at the University of Idaho Library continues to grow, the Center will be able to draw upon these resources to attract scholars studying historical and policy aspects of wilderness in Idaho and the Northwest.

Policy Guidelines

1. Highest priority for research by the WRC at the TR Field Station will be for projects which: develop a greater understanding of the functioning of natural systems and that cannot be conducted adequately in altered environments; are of the highest scientific quality; involve University of Idaho faculty and graduate student research; are cooperative projects with other agencies or organizations; are interdisciplinary; are of state or regional significance; are interrelated with current or past projects; and, are expected to build the Center's expertise and ability to attract subsequent research.

2. Findings from research at TR will be compile to serve as a long-term ecological monitoring program that focuses on indicators of natural and human influenced conditions. Elements to be considered in the monitoring program include:
   - *atmospheric and climatological conditions
   - *water quality and hydrology
   - *wildlife species composition, diversity, abundance, distribution, and trend

*visitors' perceptions of naturalness
*soil erosion, deposition, stability, and compaction
*plant communities, species composition, distribution, and trend
*range condition
*exotic species
*wilderness visitor encounters
*natural and extraneous noise levels

3. Studies and programs pertaining to wilderness use effects will generally not be conducted near Taylor Ranch thereby reserving capacity of the Field Station for Wilderness monitoring research.

4. For all research projects conducted under the auspices of the Wilderness Research Center, in cooperation with the Center, of utilizing the Taylor Ranch Field Station, a copy of the research proposal must be submitted to the director who will keep it on file along with an explanation of the expected involvement or support of the Center and/or the Taylor Ranch Field Station. Affiliation with the Center or use of the Field Station will require approval of the Director. An evaluation report (e.g. dates, accomplishments, publications, and critique) must be filed after any project is completed and will be summarized in the annual report of the WRC. Research standards of the FWR Experiment Station will be followed by the Wilderness Research Center since the WRC operations in affiliation with CFWR.

5. Research and monitoring will respect limitations of wilderness and be carried out with the most sensitive and unobtrusive methods possible to acquire essential data.

6. Upon completion of research projects sponsored and/or supported by the Wilderness Research Center will recognize the Center's contribution in the publication(s). An FWR Experiment Station number will be assigned to the publication(s).

7. Upon completion of research projects sponsored and/or supported by the Wilderness Research Center, the principal investigator(s) will deposit with the Center a copy of any reports and publications which result, as well as copies of the data base generated from the research (computerized format with location reference whenever appropriate). Publications will also be deposited with the University of Idaho Library Wilderness Special Collection.

8. Graduate assistantships (MS & PhD) and or research associate positions will be established with external funding as possible. Research will be established as opportunities permit. A solicitation campaign will be mounted in coordination with the College of Forestry, Wildlife and Range Sciences where the WRC is located.

EDUCATION PROGRAM

Objectives: (1) Continue to sponsor the annual Wilderness Resources Distinguished Lectureship. (2) Conduct regional and/or national workshops or conferences concerning wilderness

research and management. (3) Promote wilderness related scholarships for undergraduate and graduate students at the University of Idaho. (4) Continue a wilderness internship program. (5) Develop and offer wilderness management short course(s) for professionals, educators, and the lay public. (6) Provide expertise to external organizations relative to wilderness research, management, and policy.

Current Situation (1994)

1. The Center has annually sponsored a Wilderness Resource Distinguished Lectureship, attracting national experts at the forefront of wilderness issues and management (see Appendix B). Each lecture has been printed in booklet form and widely distributed. The three most recent lectures have focused on "a vision for wilderness (respectively) in the National Forests (Worf); national parks (Contor); Fish and Wildlife Refuges (Reffolt); with the remaining lecture completing the "Vision Series". To be focused on wilderness managed by the BLM.

2. The Center conducted the First National Wilderness Management Workshop in 1983, leading to publication of the book, Issues in Wilderness Management and a national, multi-agency and interest group publication in 1985 of Wilderness Management--A Five -Year Action Program. This publication is now in it third printing, totaling 15,000 copies.

3. The Center supports a summer student internship program at Taylor Ranch for 2-3 students to participate in research projects and assist with operations and maintenance. This program dates back to 1972.

4. The Center initiated the Michael Frome Scholarship for Excellence in Conservation Writing and continues to aid the College and Department of Wildland Recreation Management in soliciting funding for the Selway Bitterroot Wilderness Memorial Scholarship established in 1980. These scholarships are solely supported through private contributions.

5. Since 1992, a summer course has been offered at Taylor Ranch on "Field Methods in Wilderness Ecology". This course is limited to twelve students and is offered cooperatively by UI and San Francisco State's Sierra Institute.

6. The Taylor Ranch Field Station provides outstanding educational and field experiences offering hands-on training for a limited number of students working on research projects, as interns and as employees.

Assumptions About the Future

1. Increasing awareness of wilderness and protected areas worldwide will create more interest in education about wilderness and protected area use, protection and management. The Wilderness Research Center will continue to sponsor workshops, conferences, and lectures which draw together scholars, researchers, and managers spanning many disciplines to address wilderness management issues.

2. There will be increasing demand for use of the Taylor Ranch Field Station as a wilderness education laboratory and location for professional continuing education. Educational program expenses of the Center including the Taylor Ranch Field Station will continue to grow and require increased financial support.

3. The Center will increase its role in publication, including journal articles, research reports, monographs on the local history and natural history, brochures, species lists, and other appropriate educational materials. The Center will continue to be called upon to provide expertise and educational programs to external organizations.

Policy Guidelines

1. Educational activities and conferences conducted by the Wilderness Research Center will be limited to wilderness, natural ecosystem, and nature conservation related topics. Priority will be given to those activities conducted by University of Idaho faculty or staff, offer University credit, and which are self supporting.

2. Educational programs co-sponsored by the Center and/or using Taylor Ranch Field Station, (conferences, short courses, etc) will require a proposal (including objectives, justification, agenda, and budget) approved by the Center Director. An evaluation report (e.g., dates, attendance, accomplishments, and critique) must be filed after each program and will be included in the WRC annual report.

3. All educational programs sponsored by the Wilderness Research Center and conducted in wilderness will respect limitations of wilderness and employ the most unobtrusive and low impact techniques.

4. When educational opportunities are made available through employment or field courses, highest priority will be given to full-time University of Idaho students over equally qualified outside students.

5. The Center's student intern program will continue to support a few motivated students to learn wilderness skills and participate in wilderness research.

WILDERNESS FIELD STATION PROGRAM

Objectives: (1) Provide a location, staging area and facilities at Taylor Ranch Wilderness Field Station in the Frank Church-River of No Return Wilderness, to support wilderness-dependent research and education programs of the UI Wilderness Research Center and cooperators.

Current Situation (1994)

1. Taylor Ranch is remote and must be accessed by bush plane or a 37-mile trail that is only open seasonally. Most supplies and people arrive by plane from Cascade, McCall, Moscow, or Salmon. Regular flights bring mail and supplies weekly from June to November and bi-monthly during December to May. A radio cooperative located in Cascade, Idaho, provides radio phone communication on an intermittent schedule. Access, transportation, and communication are major expenses which are slowly increasing.

2. A full time scientist/manager, Dr. Jeff Yeo, spends five months or more at Taylor Ranch and the remainder of the year on the UI campus in Moscow working on WRC business. Jeff is assisted at Taylor Ranch in the summer by Jeete Moroche, who is on continuing volunteer status and intermittently employed as needed. When Jeff Yeo is not at Taylor Ranch, a caretaker is in full time residence.

3. Two research operations interns are competitively selected each year to spend the summer at Taylor Ranch working under direction of the scientist/manager to hep with maintenance and operation of the Field Station and assist with research.

4. Four buildings are designated for housing, with temporary housing possible in other buildings or tents. Current sleeping capacity is 6. Some cabins have running water eight months of the year (April-November). No electricity or engines (other than an emergency generator) are available on the site. Lighting is provided by propane lights or Coleman lanterns. Limited propane refrigeration is available. Kitchens are outfitted with propane stoves, dishes and cooking utensils. Bunk bed frames and mattresses are available. Buildings are heated with wood stoves.

5. A field laboratory includes basic labware and wet lab facilities, a portable compute r (IBM PC Convertible), microscopes, species lists, reference animal collections and herbarium, map and aerial photo collection, and a library collection of research publications pertinent to the area, as well as agency publications and reference books.

6. Four head of pack stock are available for transporting equipment and personnel to wilderness locations away from Taylor Ranch Field Station. Some camp gear is available at the station.

7. WRC and Taylor Ranch Field Station personnel have achieved, through hard work and cooperation, a good working relationship with agencies, organizations, and private individuals operating in the surrounding area. Arrangements can be made for special services, including: long-term data collection, packing services and camp set up, short-term cooking and organizing for groups, and other services to facilitate research. (See Fee Schedule in Appendix C). The Taylor Ranch has provided facility support for employees of the Idaho Fish and Game and Forest Service working in the area.

8. Several research projects are currently being conducted from the Taylor Ranch Field Station. During the past decade public relations efforts have included two award-winning video tapes about Taylor Ranch Field Station which were shown nationwide by approximately 154 public and commercial broadcasting stations. The Mister Wizard Science Show aired a Taylor Ranch

video tape over approximately 132 stations. ABC Good Morning America showed a five-minute video tape on the mountain lion research at Taylor Ranch Field Station. A feature-length (28 min.) television program titled, "Taylor Ranch—America's Wildest Classroom" has been prepared by the University of Idaho News Bureau for broadcast over Idaho's Public Television Broadcasting network. "Idaho the University" magazine produced a feature article on Taylor Ranch in the Winter of 1986 issue. The Taylor Ranch Field Station has also been featured in several newspaper and magazine articles. The Center Director and the Taylor Ranch managers made several public presentations, including slide shows at national and regional scientific and professional meetings.

Assumptions about the Future

1. The demand to use Taylor Ranch Field Station for research and educational purposes will steadily increase.

2. Operating expenses for maintenance, flights, horse feed, equipment and supplies, building repairs and materials, and labor costs will continue to increase both from inflation and as a result of increased use and aging of the facilities, e.g., stream bank stabilization; repair of roofs, water lines and septic systems; replacement of inefficient wood stoves.

3. As demand for use of the field station increases, more detailed guidelines will be needed to prioritize research and educational projects to be conducted from Taylor Ranch Field Station.

4. Income from fees assessed for use of Taylor Ranch Field Station facilities must increase to support more of the cost of operations and maintenance and begin to provide seed money to help support worthy studies.

5. Public relations efforts with the public at large, other researchers, the wilderness management agencies, and the commercial operators within the wilderness must be increased as the Taylor Ranch Field Station becomes more widely known.

6. The Center will need to work with the U.S. Forest Service and Idaho Fish & Game guidelines to ensure that research and monitoring methods will respect limitations of wilderness and be carried out with the most sensitive and unobtrusive methods possible to acquire essential data.

Policy Guidelines

1. The Taylor Ranch Field Station shall only be used for research and educational activities within the general objectives of the University of Idaho Wilderness Research Center or seeking to further those objectives. Taylor Ranch will only be used for educational activities that utilize a wilderness-dependent field setting, emphasize hands-on learning, and normally offer University credit. Research and educational activities not dependent upon natural, undisturbed ecosystems or related to their use will be conducted elsewhere. Use of the facilities for non-wilderness related activities, commercial activities, recreation, personal or nonofficial business

is specifically prohibited.

2. Management and operation of the field station must be sensitive to its unique location surrounded by designated Wilderness. Activities at Taylor Ranch, along with associated research and travel to and from the Ranch, will be conducted in such a manner as to have minimal influence on the wilderness character of the surrounding land. No electrical generator (hydro or diesel-powered), transmission lines, or outside lighting will be permitted. Unobtrusive solar collectors on cabin roofs will be used to recharge batteries and collect hot water, thus reducing dependency on bottled propane.

3. All use of the Taylor Ranch Field Station facilities must be approved by the director of the Wilderness Research Center or the Taylor Ranch Field Station scientist/manager. The airstrip will remain private and may only be used for purposes related to the Wilderness Research Center. Permission to use the airstrip must be obtained from the director or scientist/manager. Taylor Ranch Visitor Policies are outlined in Appendix D.

4. The Wilderness Research Center will seek to accommodate researchers in normal use of the facility and provide other services subject to Taylor Ranch use fees. All use will be accounted for within the fee structure by either collection or waiver of fees. Waiver of fees may be approved by the director of Wilderness Research Center to support objectives of the Center. A detailed fee schedule is included in Appendix C and is consistent with fees charged for the use of similar University of Idaho facilities. Fees will be re-evaluated annually and adjusted as necessary.

5. Research activities will be given first priority at Taylor Ranch, followed by educational programs.

ORGANIZATION AND STRUCTURE

The Wilderness Research Center, after 25 years as an administrative unit of the University of Idaho housed in the College of Forestry, Wildlife and Range Sciences, was re-emphasized and expanded July 1, 1994 to make it the sixth, campus-wide center along with biotechnology, water resources, aquaculture, materials science and international programs. The WRC director (Hendee) reports to the Vice Provost for Research (Shreeve) but is housed the CFWR building in a suite of three offices adjacent to the Resource, Recreation and Tourism Department where he is a faculty member. CFWR provides administrative services and support including bookkeeping, and provides a college link for plans, proposals, budgets, personnel, policy and other matters of major importance. Thus, the Director maintains close liaison with CFWR administration, while reporting directly to the Vice Provost for Research.

The director seeks advice and guidance concerning policy and programs from the Wilderness Research Center Campus Advisory Committee. The scientist/manager of the Taylor Ranch Wilderness Field Station (Yeo) reports to the director but is also adjunct assistant professor of Wildlife programs require additional staff (e.g.) project technicians, research associates, interns irregular help) they are supervised by either the director, or scientist/manger depending upon

assigned tasks. Dr. Ed Krumpe, Professor of Resource, Recreation and Toursim is Principal Scientist for Wilderness Management in the WRC, reflecting the long association with the Center and the fact that part of his salary is paid by the WRC.

Responsibilities of the Director

The director is the chief executive who has been delegated responsibility for administration and management of the Center's policy, programs, budgets, and facilities. Policies for the Center are contained in the Center's Strategic Plan which is prepared by the Director with counsel from the advisory committee. Annually, budgets and action plans for each of the Center's programs and facilities are prepared by the Director, reflecting counsel from the advisory committee, and submitted to the Vice Provost for research.

The director is responsible for development and implementation of Center programs and management of WRC facilities. Major responsiblities of the director include: (1) preparing annual budgets and action plans for research and education programs (2) pursuing cooperative research projects; (3) soliciting funding for Center programs; (4) conducting wilderness research and education activities; (5) long range planning; (6) organizing, conducting and publishing the Wilderness Resources Distinguished Lectureship; (7) preparing annual job descriptions and evaluations for Center personnel; (8) preparing and submitting an annual report; (9) coordinating public relations'; (10) maintaining close working relationships with advisory committee members and wilderness management agencies; and (11) handling correspondence.

Wilderness Research Center Budgets

The Center currently operates under four annual budgets. The Wilderness Research Institute (Center) Budget provides salary for the director, administrative secretary, Taylor Ranch Scientist/Manager and partial salary for the principal scientist for the Wilderness management. A WRC operating budget provides for administrative and operating expenses and a Taylor Ranch Operations Budget provides funds for the daily maintenance and operations of the Taylor Ranch Wilderness Field Station. The Taylor Ranch Capital Improvement Budget, administered through the Physical Plant, provides for major improvements and maintenance projects. A WRC Income Budget is used to receive income from fees at Taylor Ranch and also income from Wilderness Research Center sponsored conferences, book sales, and service contracts.

The director develops annual budget requests, income estimates, and proposals for expenditures of final allocated budgets with input from the scientist/manager and staff. The CFWR dean's office coordinates approval of the Capital Improvement Budget with the Physical Plant director. Once budgets are approved, the Wilderness Research Center director is responsible for implementing annual plans and the management of income expenditures.

Responsibilities of the Taylor Ranch Field Station Scientist/Manager

The Scientist/manager reports to the director and is responsible for management of the Field Station facilities and coordination of research and education activities conducted there. The

scientist/manager serves as the principle on-site contact representing the Center to the public, Frank Church-River of No Return Wilderness management personnel, Idaho Fish and Game personnel, Center researchers and visitors, outfitters and guides, commercial and private pilots, media representatives, and local residents. He/she also has research and education responsibilities including planning and conducting field research, assisting researchers in collecting field data, and hosting potential researchers and representatives of potential funding institutions in coordination with the director . Overall, the scientist/manager's duties in priority are (1) manage Taylor Ranch facilities; (2) facilitate and coordinate the research and education activities of other faculty and cooperators working from the ranch and (3) conduct research and education. The scientist manager submits an annual report of activities at the Taylor Ranch Field Station for the annual report of the Wilderness Research Center and Focus--Report of the FWR Experiment Station, and writes periodic reports of research at TR for other publications such as "Frankly Speaking", newsletter of the FC-RNRU.

More specifically, tasks of the scientist/manager include: (1) maintenance of buildings including 11 structures; (2) grounds maintenance such as fencing, maintaining water and irrigation systems, provision of firewood; (3) livestock care, training ,and utilization ; (4) supervisory responsibilities like recruiting and training temporary help and student interns; (5) administrative duties such as scheduling facility use and collecting fees, making purchases, maintaining radio communications, scheduling flights for transportation and resupply, packing researchers to remote sites, keeping Field Station daily log; (6) public relations responsibilities like meeting planes, providing Field Station torus, disseminating literature, making professional presentations to scientific and lay publics, making emergency radio calls, hosting visitors; and (7) research activities such as maintaining field laboratory and library, continuing the herbarium and small mammal collections, explaining Field Station capabilities to visiting researchers, initiating cooperative research, writing proposals, soliciting funding, collecting data, and publishing results.

Responsibilities of Other Staff

Responsibilities of additional staff (e.g. project technicians, research associates, scientists, interns, irregular help) will be defined in job descriptions. These will be developed as needed by the director or scientist/manager. The WRC director and advisory committee work toward creating opportunities for other faculty, scientists, post doctoral fellows, and research associates to affiliate and work with the Center.

Wilderness Research Center Campus Advisory Committee

The purpose of the Wilderness Research Center Campus Advisory Committee is to provide advice to the WRC on the functions of the Center and the operation of its Taylor Ranch Field Station. Members will assist the Center in attaining balance by helping develop policy, insuring that all aspects of the wilderness resource are considered in its research and education programs and that there is campus wide participation in WRC programs and activities. The committee also helps identify sources of funding and assists in the preparation, evaluation, and support of proposals. One valuable function of the committee is as a sounding board and source of advice and wisdom toward

establishing and maintaining high standards of excellence to which the Wilderness Research Center aspires.

Committee Membership. The Wilderness Research Center Campus Advisory Committee will consist of representatives from pertinent scientific disciplines and program areas of the University. Members are nominated by the Wilderness Research Center Director and appointed with concurrence of the Vice Provost for Research. Members are appointed for three-year staggered terms. Members serve without compensation.

In the past members of the advisory committee have often been the faculty with an interest in working at the Taylor Ranch Wilderness Field Station or seeking WRC funding. The intention in the future is to have a campus advisory committee with membership aimed at developing policy and programs of the Center, for the benefit of faculty and scientists seeking to participate--rather than including primarily persons seeking direct work with the WRC.

Committee representation may reflect views form the following disciplines, subunits and organizations.

University Disciplines:

Archaeology
Botany or Biology
Fisheries
Forestry
Geology & Earth Resources
History
Range
Water Quality
Wildland Recreation Management
Wildlife

University Subunits:

University Research Office
College Research Office
Federal Research Coop Unit

External Organizations:

In the future the views of external organizations and influential private citizens with demonstrated leadership in Wilderness matters should be included in some advisory structure.

Federal Land Management Agency (e.g. USFS, BLM, NPS, USFWS)
Idaho Natural Resource Agency (e.g. Fish & Game, Parks & Recreation)
Private Association of Wilderness Users (e.g. Idaho Outfitters and Guides Association)

Conservative Organizations (e.g. The Nature Conservancy, Wilderness Society, WILD Foundation)

Committee Organization and Function. The Wilderness Research Center Director will chair meetings, provide an agenda in advance, generate and distribute minutes, Committee members may submit agenda items to the Director at any time. The committee will meet about four times each year. From time to time, the committee will meet at the Taylor ranch Field Station to review operations on site.

The advisory committee will receive copies of publications, study reports, plans, proposals and correspondence pertinent to the Wilderness Research Center. Members are encouraged to communicate directly with the director at any time.

LITERATURE CITED

(this page is not in the correct format yet)

Hendee, John C. and Yeo, Jeff., 1992, The Taylor Ranch Wilderness Field Station (Monograph)

Leopold, Aldo 1941 Wilderness as A Land Laboratory p_ Living Wilderness

Yeo, Jeff, Krumpe, Ed and Hendee, John C. 1993 a Vision for Research at the Taylor Ranch Wilderness Field Station in the Frank Church River of No Return Wilderness;Proceedings : Symposium on Future Views for management of the Frank Church River of No Return Wilderness.

APPENDIX A
FUNDING OF CURRENT AND PAST RESEARCH
ASSOCIATED WITH THE
WILDERNESS RESEARCH CENTER

Project/Principal Investigator	Funding Source	Amount
Mountain Lion Ecology & Predator-Prey Study Dr. Maurice Hornocker	NY Zoological Soc. Smithsonian Inst. National Geographic Soc.	$150,000 50,000
Prehistoric Settlement & Subsistence Patterns Dr. Frank Leonhardy	National Geographic Soc. USDA Forest Service U of I Research Council Idaho State Historical Soc.	20,000 2,000 3,200 2,000
Ecology of the Bobcat in River of No Return Dr. Maurice Hornocker & Gary M. Koehler	USDA Fish & Wildlife Dept. National Wildlife Federation	225,000
Bighorn Sheep Competition on Winter Range Ms. Holly Akenson	Wilderness Research Center	10,000
Identification & Evaluation of Indicators to Monitor Wilderness Conditions Dr. Edwin Krumpe	McIntire-Stennis Wilderness Research Center	20,000
Assessing Recreation Impacts in the Wilderness Dr. Edwin Krumpe	McIntire-Stennis Wilderness Research Center	10,000
Habitat of Boreal Owls in Central Idaho Dr. Oz Garton and Gregory D. Hayward	ID Fish & Game, USFS, WRC National Bluebird Society	47,000

Human-Bear Interaction at Pack Creek Preserve, Admiralty Island, AK Dr. Edwin Krumpe	USDA Forest Service	9,000
Communication with the Wilderness Visitor Dr. James Fazio	Northwest Regional Commission	20,000
Laptop Computers to Measure Campsite Impacts Dr. Edwin Krumpe	McIntire-Stennis & WRC	4,000
Comparison of Wilderness Inventory Techniques of BLM & USFS Dr. Edwin Krumpe	McIntire-Stennis & WRC	5,000
Assessment of Scientific Studies at Glacier National Park Drs. Gerald Wright & Ed Krumpe	National Park Service	20,000
Wilderness Evaluation Approaches of the BLM & USFS: A Survey Research Comparison Martin Sharp & Dr. Edwin Krumpe	FWR Experiment Station Wilderness Research Center	2,000
Resource Partitioning Around Six Forest Owls in the River of No Return Wilderness Dr. Oz Garton and Gregory D. Hayward	Multiple Sources	???
A Winter Passerine Ecology Study in the River of No Return Wilderness Dr. Winward Kessler and Susan L. Tank	???	????
Documentation of Historical Resources in the Idaho Primitive Area, Big Creek Drainage Dr. James Fazio and John W. Hartung	National Geographic Society	???
Amphibian Survey of Big Creek Drainage		

Dr. Charles Peterson, ISU	Payette National Forest	3,000
Wilderness Monitoring of Amphibian Populations in the Frank Church-River of No Return Wilderness Dr. Charles Peterson, ISU	Idaho State University Wilderness Research Center	
Meta-population Analysis of Amphibian Populations in Relation to Fish Stocking in the Bighorn Crags Dr. Charles Peterson	Intermountain Research Station	6,000
Wilderness Stream Community Response to Wildfire Dr. Wayne Minshall, ISU	Payette National Forest	20,000
Methodologies for Assessing Stream Integrity in Wilderness Dr. Wayne Minshall, ISU	Aldo Leopold Wilderness Research Inst.	40,000
Natural Regulation of Bighorn Sheep Population Dr. James Peek	Idaho Department of Fish & Game	
Monitoring Vegetation Composition & Productivity In Big Creek drainage Dr. James Peek	McIntire-Stennis	
Monitoring Terrestrial Community Response to Natural Disturbance Dr. Jeffrey Yeo	Wilderness Research Center	
Ecological Fitness of Naturally Regulated Forest Grouse Lineages Dr. Kerry Reese	Wilderness Research Center	
Annual Monitoring of Juvenile Chinook Salmon Outmigration Timing and Survival		

National Marine Fisheries Service	National Marine Fisheries Service
Annual Monitoring of Anadromous Chinook Salmon and Steelhead Reproduction	
Idaho Department of Fish & Game	Idaho Department of Fish & Game

Studies Associated with Wilderness Use

Year	Project/Principal Investigator	Funding Source	Amount
1988	Analysis and Abstract of 103 Wilderness Laws James Browning, John Hendee, and Joe Roggenbuck	McIntire-Stennis	$ 15,000
1992-94	Identify and Classify Published Studies of Use of Wilderness for Personal Growth John Hendee, Randy Pitstick	U.S. Forest Service	15,000
1992-93	Wilderness Discovery - Feasibility of Seven Day Wilderness Experience Program for Poverty Youth in the Curlew Job Corps Center, Colville National Forest John Hendee, Randy Pitstick	Colville National Forest	15,000
1993-95	Wilderness Discovery Two Year Pilot Program and Study of Effects John Hendee, Randy Pitstick	U.S. Forest Service U.S. Dept of Labor University of Idaho Forest Service Aldo Leopold Wilderness Research Institute	105,000
1994-1995	Meaning of Wilderness Experience to Economically Disadvantaged Youth		14,000

APPENDIX B

WILDERNESS RESOURCES DISTINGUISHED LECTURESHIPS

Date	Distinguished Lecturer	Title
1977	Senator Frank Church	Wilderness in a Balanced Land Use Framework
1978	Roderick Nash	Wilderness Management: A Contradiction in Terms?
1979	Cecil D. Andrus	Reorganization and the Department of Natural Resources: Implications for Wilderness
1980	Mr. Patrick F. Noonan	Preserving America's Natural Heritage: the Decade of the Eighties
1981	Russell E. Dickenson	Wilderness Values in the National Parks
1982	Michael Frome	Battle for the Wilderness: Our Forever Conflict?
1983	Agency Directors (USFS, BLM, NPS, USFWS)	Issues in Wilderness Management
1984	Brock Evans	In Celebration of Wilderness: The Progress an d the Promise
1987	Jay D. Hair	Wilderness: Promises, Poems and Pragmatism
1988	Ian Player	Using Wilderness Experience to Enhance Human Potential
1989	Chief Oren Lyons	Wilderness in Native American Culture
1991	Bill Worf	A Vision for Wilderness in National Forests
1992	Roger Contor	

		A Vision for Wilderness in the National Parks
1994	Bill Reffalt	A Vision for Wilderness in the U.S. Fish & Wildlife Refuges

APPENDIX C

TAYLOR RANCH FEE SCHEDULE-Draft 7/30/94

The Wilderness Research Center will seek to accommodate researchers in normal use of the Taylor Ranch facilities and provide other services subject to user fees consistent with fees charged for the use of similar University of Idaho facilities

1. LODGING

Daily lodging fees will be $10.00 per person. Lodging includes a cooking facility with kitchen utensils bunk beds (no bedding), drinking water, and lighting. From September 15 through April 30 an additional daily fee of $4.00 per cabin will be charged for firewood. All lodging fees are charged for actual days of occupancy.

2. FOOD SERVICES

Taylor Ranch users are expected to bring their own food and prepare their own meals. Provisions for meals for major groups will be negotiated separately.

3. TRANSPORTATION OF SUPPLIES AND EQUIPMENT

Field Station staff can provide horse-packing services to transport research equipment and camp supplies to study sites or remote camps for approved WRC research projects. A daily fee of $10 per horse and $50 for the employee handling stock will be charged. Services for establishing and breaking down research field camps will be $50 per station employee per day.

4. DATA COLLECTION

If researchers want Field Station personnel to collect data in their absence, a fee may be negotiated based upon the frequency and the amount of time and effort required.

5. CLEAN-UP

Users are responsible for keeping cabins clean and leaving buildings as found. Cleaning supplies are available for use in each cabin. If additional cleaning or repairs by station personnel are necessary after the premises ar evacuated, a $25.00 per hour maintenance fee plus costs will be levied.

6. PAYMENT OF FEES

All fees are payable to the U of I Wilderness Research Center. Fees and payment schedules should be negotiated and agreed to in writing with the Center Director or the Taylor Ranch Scientist/Manager prior to initiation of all projects. Arrangements may include arrangements

in advance for exchange of services to the station to offset fees, e.g., assisting with cutting firewood or putting up hay at an hourly rate.

APPENDIX D
TAYLOR RANCH FIELD STATION VISITOR POLICIES- Draft 7/30/94

The Taylor Ranch Field Station is a facility of the University of Idaho Wilderness Research Center and is, therefore, managed in keeping with the purpose and objectives of the Center. The primary purpose of Taylor Ranch Field Station is to provide for research and educational activities dependent upon a wilderness setting. All uses and management practices at the Field Station must also be compatible with the Frank Church-River of No Return Wilderness Management Plan.

Anyone wanting to use the field station facilities must apply to the Director of the Wilderness Research Center or the Taylor Ranch Scientist/Manager. Permission to use the airstrip must be obtained from the director or scientist/manager. Users will be subject to the established Taylor Ranch fee schedule which is consistent with fees charged for the use of similar University of Idaho facilities.

*Users are responsible for providing and preparing their own food unless otherwise arranged in advance.

*Users are responsible for air freight costs incurred in transporting equipment and supplies.

*Users are responsible for keeping cabins clean and leaving buildings as found. Cleaning supplies are available for use in each cabin.

*Users are responsible for disposing of their own garbage. This includes flying out metal, glass, and other items that are not burned or composted.

*Users may fish during their free time. They may not hunt from Taylor Ranch. No fish or game may be flown from Taylor Ranch. All Idaho fish and wildlife regulations must be obeyed.

*A radio-phone is available for emergency or business purposes. All business phone tolls are to be paid by the caller.

*Arrangements can be made for researchers to use ranch equipment (tents, etc.) and pack stock, if available, and upon approval of scientist/manager , subject to established fees.

*Being located within a wilderness setting and having limited facilities, Taylor Ranch can accommodate limited numbers of people. Short-term users of less than three months must obtain permission from the scientist/manager to have personal guests. Users may not bring pets except with prior permission of scientist/manager.

*Users should exhibit "backcountry hospitality," including accommodating emergency requests such as radio use, giving directions, and explaining ongoing projects.

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A PROPOSAL TO ESTABLISH A MONITORING PROGRAM FOR THE UNIVERSITY OF IDAHO TAYLOR RANCH FACILITY AND THE ADJACENT FRANK CHURCH RIVER-OF-NO-RETURN WILDERNESS

A PROPOSAL TO ESTABLISH A MONITORING PROGRAM FOR THE UNIVERSITY OF IDAHO TAYLOR RANCH FACILITY AND THE ADJACENT FRANK CHURCH RIVER-OF-NO-RETURN WILDERNESS

EXECUTIVE SUMMARY

This proposal reviews approaches to monitoring programs for the environment, describes a representative sample of programs that are in progress, and expands from this base to a monitoring program for the University of Idaho Taylor Ranch facility in the Frank Church River-Of-No-Return Wilderness. A review of existing projects in the Big Creek drainage upon which the Taylor Ranch is located, along with the proposed course of action that would incorporate these projects into the monitoring proposal. The geology, vegetation, fire history, and Indian use within this area is reviewed as the context in which a monitoring program would exist. The value of understanding effects of increased atmospheric carbon dioxide on vegetation and fauna is discussed, with the role that monitoring may help to understand this phenomenon. The budget is purposefully kept low in order to facilitate its perpetuation and to help ensure that the monitoring program could be continued over the long-term. The Taylor Ranch facility has supported a wide variety of projects done by many agencies and individuals over its thirty-year existence. These projects provide the basis for the proposed monitoring program, which would complement and augment educational programs associated with the facility. The monitoring program will in turn provide a background of information that will stimulate formal research projects, and enhance the educational value of the facility.

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A PROPOSAL TO ESTABLISH A MONITORING PROGRAM FOR THE UNIVERSITY OF IDAHO TAYLOR RANCH FACILITY AND THE ADJACENT FRANK CHURCH RIVER-OF-NO-RETURN WILDERNESS

Aldo Leopold (1941) was among the first to recognize the role of wilderness as a basis for understanding the effects of humans upon this world. Leopold wrote that two available 'norms' existed where a "base-datum" of how "healthy land maintains itself as an organism" could be obtained. These areas were lands that remained relatively natural despite centuries of human occupation, and areas where land was wilderness. While many view the value of the nation's wilderness areas as primarily recreational, Leopold recognized that the principle value was scientific, to serve as a basis for judging man's effects on similar areas elsewhere. The scientific value was further recognized with the establishment of the Man and the Biosphere Program (Risser and Cornelison 1979), that has designated ecological reserves across the nation and the world for the purpose of preserving representative ecosystems and to provide opportunities for study. Arcese and Sinclair (1997) considered ecological baselines essential for reconciling arguments about maintenance of biological diversity, natural state of biotic communities and ecosystems, and the range of variation that will be observed in them in the absence of human intervention.

Davis and Halvorson (1988) considered the national park ecosystems to be "miner's canaries", and the concept applies to many areas that are relatively undisturbed by the human presence. Monitoring of these ecosystems could develop standards that may be used to warn of impending environmental change across broader areas. A program for Great Smoky Mountains National Park is in place (Herrmann and Bratton 1977, Peine, Pyle and White 1985). The Channel Islands National Park, California, also has a monitoring and inventory program (Davis and Halvorson 1988).

The large reserves managed by the US Department of Energy and the Department of Defense are also suitable places for monitoring. A monitoring program was developed for the Hanford Site near Richland, Washington, managed by the Department of Energy (1996). Research natural areas in the northwestern states are also recognized as suitable for long-term monitoring programs (Johnson, Franklin and Krebill 1984). And Vora (1997) reported the development of a program to monitor ecosystems on the lake states national forests. There is obviously extensive interest by all federal land management agencies in monitoring.

Today, wild lands, including wilderness ecosystems, are threatened by excessive recreational use, fire suppression where fires were naturally important processes, invasion of alien plant species, various uses of waters which flow through wilderness, air pollutants, and management of adjacent lands that affects the integrity of the wilderness system (Cole and Landres 1996, Society of American Foresters 1988). However, these areas still provide as close an approximation to that "base datum" as exists in the contiguous United States. Wilderness areas have been established in national parks, national wildlife refuges, the national forests, and public lands administered by Bureau of Land Management.

As the search for better understanding of man's effects on the natural world continues, the value of larger units of land that are intact and encompass the range of biodiversity and dynamic processes that exist at many scales becomes more clear. Likens (1992) defined ecosystems as units of land that include all organisms and components of the abiotic environment within the boundaries. This means that, ideally, all organisms that are native to the unit are present, soils and watersheds are intact, and all are functioning within some dynamic range that occurred in the absence of human interference. In order for the functioning to occur within a unit of land, the ranges of all animals should ideally be within the wilderness. In North America, these conditions may exist, except for migratory birds and insects, in a few areas. For instance, Peek (1990) proposed that the ranges of populations of the largest mammals could be used to index ecosystem boundaries in the Rocky Mountain west, and could include the grizzly bear and the elk.

Five independent factors that determine ecosystem processes include parent material, climate, topography, potential biota, and time (Jenny 1941). Chapin et al. (1996) extended this to include

dynamic elements including local climate, soil resource supply (productivity), functional groups of organisms, and disturbance regime. These interactive factors both control and respond to ecosystem characteristics, and must be conserved if an ecosystem is to be sustained. In the Rocky Mountain wilderness areas, disturbance regimes, primarily the wild fire regime, and lack of major predators, a primary functional group of organisms, are among the major alterations of the associated ecosystems.

Few national parks or wilderness areas are complete, self-contained ecological units (Houston 1971). For instance, the Greater Yellowstone Ecosystem that includes Yellowstone National Park, comprises 14,000,000 acres. This areas has been substantially modified by many actions, including supplemental feeding of migratory elk in winter (Chapin et al. 1996), presence of major towns such as Jackson, Wyoming, that encourage and incorporate significant recreational installations including ski resorts, emphasis on recreational opportunities inside the Park itself, modification of elk migration and movement patterns through differential hunting pressures on the southern portions of the ecosystem (Smith and Robbins 1994), all of which modify dynamic processes.

Christensen et al. (1996) concluded that our ignorance of the dynamic processes that operate over wide ranges of spatial and temporal scales allowed designation of boundaries of management jurisdictions without considering these processes. For example, the biosphere reserves of the northwestern United States are too small to include major dynamic processes. However, in spite of this original lack of perception, some areas are relatively intact and large enough to permit natural dynamic processes to prevail. A prime example of this fortuitous designation is The Frank Church-River-of-No Return Wilderness in central Idaho, consisting of 2,361,767 acres, the largest protected area in the contiguous United States (The Wilderness Society 1989, Figure 1).

II. DESIGN OF MONITORING PROGRAMS

Silsbee and Peterson (1992) provided reasons for monitoring programs which have general value, and various legal requirements may also provide ample justification. Simply providing information to document changes for the sake of familiarity with resources is useful, as is attainment of knowledge to obtain better understanding of the ecosystem involved. Monitoring to determine alterations to sites or

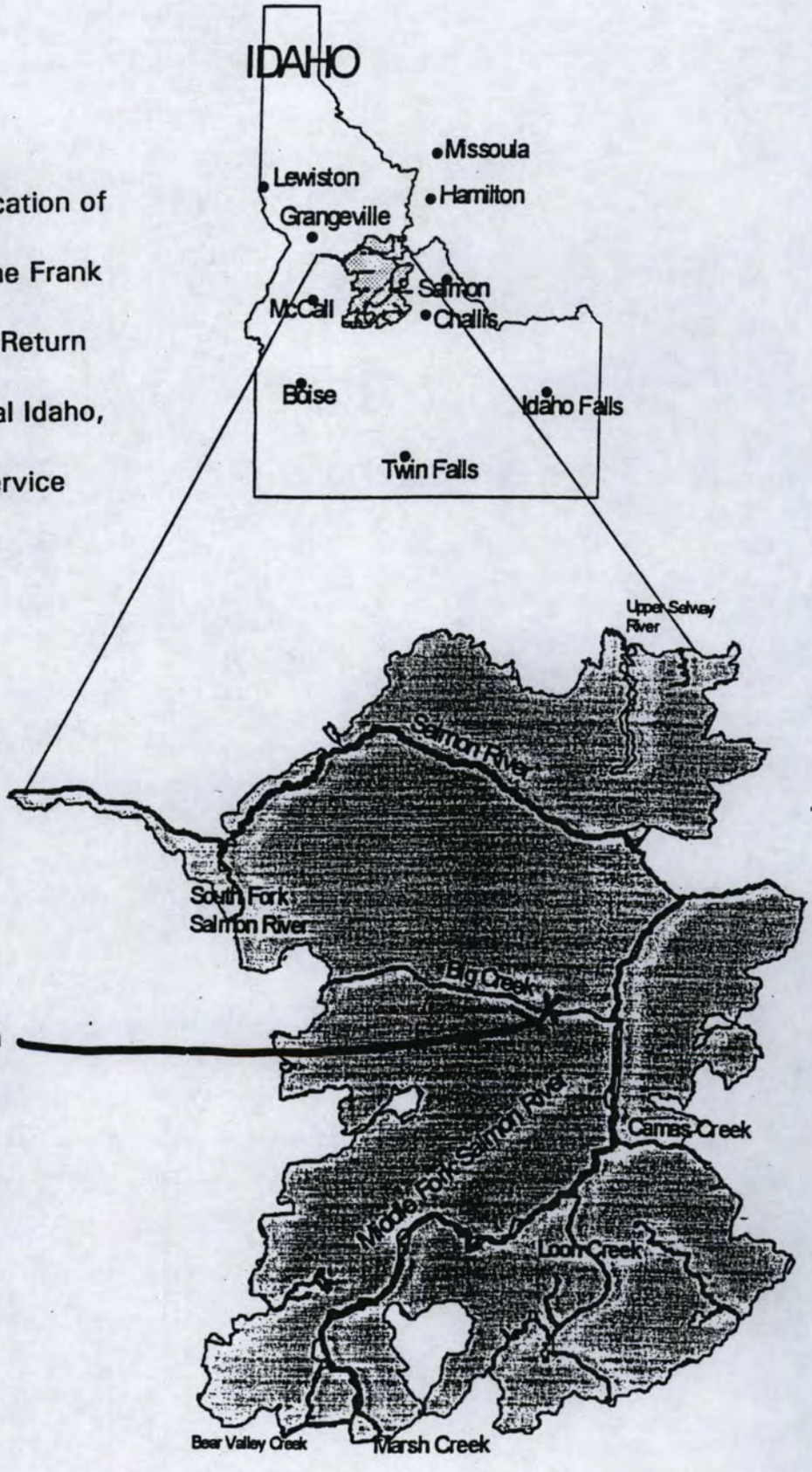


Figure 1. Location of Taylor Ranch and the Frank Church River of No Return Wilderness in central Idaho, after U.S. Forest Service (1998).

habitats by human activity allows managers to make better decisions, and can provide background information that is needed by researchers and others. The reference point to which other areas may be compared is another reason for monitoring, just as Leopold (1941) recognized.

Selection of attributes for study requires understanding the values of the area and the purpose for which it is used. Attributes need to be measured accurately, easily and cheaply if at all possible, since funding for long-term collections of information must be assumed to be scarce. Sites for inventory and monitoring should be selected for their significance, should be representative of other areas, and chosen in a random manner to allow statistical inferences to be drawn from observations.

Davis and Halvorson (1988) considered the design of an ecological monitoring program to have five basic steps:

1. Determine what, where, when, and how to monitor;
2. Establish data management procedures;
3. Establish reporting procedures;
4. Document monitoring protocols;
5. Implement and institutionalize monitoring.

It is obviously not possible to monitor all species or species assemblages, much less other ecosystem attributes. However, Davis and Halvorson (1998) provided criteria for developing monitoring programs that included:

1. An array of ecological roles and examples of different trophic levels and life forms;
2. Species with special legal status such as endangered, threatened, or species of special concern;
3. Endemic and alien species;
4. Harvested species;
5. Keystone species which dominate or characterize entire communities;
6. Others with special public interest.

Garton (1984) outlined a baseline inventory for research natural areas that considered cost and time constraints. A cost-efficiency rating of methods to assess topographic, soil, geological, climate,

vegetatal, and faunal attributes was provided. For instance, monitoring of terrestrial vegetation may consist of photo interpretation, the least intensive method, to mapping of plant communities on the ground, the most intensive attribute. Monitoring of terrestrial fauna may range from simple determination of a species' presence to survival/fecundity estimates, the most expensive and time consuming attribute. Decisions about which assessment will be applicable in any given area will depend upon the assessed value of the information and will vary considerably.

Indicators for monitoring biodiversity should be sufficiently sensitive to provide an early warning of change. They should be distributed over a broad geographical area and otherwise widely applicable, capable of providing a continuous assessment over a wide range of stressors. Logistical considerations are critical and indicators should be easy and cost effective to measure, collect, assay and calculate, capable of differentiating between natural and anthropogenic causes, and be ecologically significant (Noss 1990). At the landscape level, aerial photographs and other remote sensing systems can provide information on distribution and size of habitats. Time series analyses can be used to detect changes within communities and habitats. Censuses may provide assessments of population trend, while the more elaborate genetic analyses which may detect rates of gene flow and inbreeding depression may be used to assess genetic diversity. Noss (1990) provided a ten-step process for implementation a monitoring system including:

1. Determination of goals and objectives;
2. Gathering and integration of existing data sets;
3. Establishing baseline conditions;
4. Identification of ecosystems and localized areas at risk;
5. Formulation of questions to be answered by monitoring;
6. Selection of indicators;
7. Identification of control areas and treatments;
8. Design and implementation of a monitoring program;
9. Validation of relationships between indicator and goals and objectives;
10. Analysis of trends and recommendations of management actions.

Monitoring programs on public lands have been active in various configurations for extensive periods. Land management agencies have conducted condition-trend surveys and forest inventories since the 1950s, and in some cases even earlier. The US Fish & Wildlife Service has maintained a long-term monitoring program for migratory birds since 1956, and bird populations have been monitored through mid-winter counts by numerous cooperators since 1965 (Robbins et al. 1986, 1992). Many state wildlife agencies have conducted census and production-survival estimates of big game populations and other hunted species, with some records extending back some 50 years. These data sets provide useful information in assessing long-term trends in species distribution and population size, and could be incorporated wherever possible into ecosystem monitoring. Legal requirements to monitor endangered and threatened species also provide data sets of value in monitoring. Vora (1997) listed 15 organizations that are conducting national monitoring programs in Canada and the United States, some of which occur on both public and private lands, and involve the public as well as professionals.

III. THREE EXAMPLES OF MONITORING PROGRAMS

The Great Smoky Mountains National Park monitoring system involves use of maps and aerial photography and satellite imagery, a geologic survey, soil survey, data on the hydrologic regime, climate and weather records, and check lists of vascular plant, vertebrate species, descriptions of watersheds including trout populations which are sampled on a 7-year interval, vegetation maps and human history (Herrman and Bratton 1977). In addition black bear populations have been monitored in the park since 1966 (Pelton and Van Manen 1996). The situation where a formalized monitoring program may be augmented by long-term research on specific species or situations can be capitalized upon.

The Arid Lands Ecological Reserve in south-central Washington Site provides an example of monitoring that was developed in conjunction with The Nature Conservancy. The approach was to define four levels of concern at which management actions would take place. A species list for the site is examined and the entire known flora and fauna are then classified into these levels. Level I biological recourses are those that require minimum status monitoring because of their recreational, commercial or ecological role. Mule deer and elk are species representative of this level. Level II resources are those that require legal consideration through laws such as NEPA or the Migratory Bird Treaty Act, when any activities on the Hanford Site are contemplated. Level III resources are those that are either listed by the

state or federal jurisdictions and have unique or significant values or are considered to be particularly sensitive to environmental change and may require mitigation when activities are undertaken, or may preclude conducting those activities. The sage sparrow is an example of a level III species because it requires shrub-steppe habitat that has been reduced by 85-98% of its original area in Washington and Oregon since European settlement (Noss et al. 1995). Ferruginous hawk nest sites and bald eagle perches also fit into this level at Hanford. Level IV resources are those that require preservation as the primary management option because of federal legal status or regional and national significance and thus preclude activities that might jeopardize their continued existence on the Site. The fall chinook salmon is classified as endangered and thus is a Level IV classification. A GIS system is used to incorporate inventory data along with cover map of the site. The land cover map is the base map that provides the primary reference for establishing location and importance of the biota for the Site and may be referred to whenever activities are planned.

An ecosystem monitoring program for the national forests in the Lake States uses key indicators of ecological processes and biological diversity, focusing on plants and birds (Vora 1997). Using the Noss (1990) criteria as a general guide, a program for a portion of the Superior National Forest included protection of rare species habitats and rare ecosystems by checking these areas for integrity and evidence of degradation. Population trends of a few indicators including owls and woodpeckers, brook trout, ruffed grouse and large mammals (deer, moose, black bear) are obtained with the cooperation of Minnesota Dept of Natural Resources. Evaluations of controversial management practices such as use of prescribed fire to increase blueberry production is included in the monitoring program. Long-term regional monitoring programs which include assessment of reforestation, forest insect populations, changes in forest cover and reproduction of the common loon are incorporated into the monitoring program by participation with these efforts. A few long-term programs to monitor trends of a rare butterfly and use of mixed species tree and shrub plantations by neotropical migrants are added. Finally, monitoring is incorporated into other maintenance and field activities by checking use of nest boxes, evaluating success of wild rice seedings and checking reserve trees left in clearcuts.

A wide variety of programs and approaches are available for monitoring. The objectives of the agency, purposes for which the land is being managed, interests and availability of personnel, and nature

of the area under consideration will all affect the nature of the monitoring effort in any given area. Each of the monitoring programs reviewed have different objectives and approaches, but all would provide inventories of important resources through time that would provide highly useful information.

Scott (1998) recommended that monitoring to estimate change in forests be done with permanently established plots on a 5-20 year cycle. Shorter survey cycles may be necessary when judging human influences on resources, but also if major events necessitate that monitoring take place more frequently, as may happen when fires occur. In situations where dramtic change may occur, as is likely in wilderness where forests are subject to fire, insect and pathogen influences, permanent plots appear to be the best approach for measuring attributes of vegetation change in forests.

Monitoring for productivity of shrubs and grasses may be done annually, and has been conducted since 1987 in the vicinity of the Taylor Ranch. Permanently established transects along which vegetation is clipped, counted or measured are in place. A 4 m^2 circular plot is used to measure shrubby vegetation and a 2 X 5 dm plot is used in grasslands. Sample sizes have been checked by analyzing change in mean and variance as sample size increases: 20 plots represent a compromise between logistical constraints and statistical reliability for shrubs and grasses using these plot sizes in this area.

IV. TAYLOR RANCH FACILITY

Taylor Ranch Field Station comprises 65 acres located within the Frank Church River-Of-No-Return Wilderness, approximately 35 miles from the nearest trail head and 7 miles from the confluence of Big Creek with the Middle Fork (Figure 1). Hendee et al. (1993) provide a history of the Taylor Ranch. The University of Idaho acquired the ranch in 1969 from Jess Taylor, an outfitter. The site was originally homesteaded in 1900, with Taylor acquiring it in 1934.

The Taylor Ranch field station is intended to facilitate and support research and educational programs that are appropriate for the wilderness setting and that lead to better understanding of this ecosystem. The facility has a U.S. Weather Service reporting station with over 18 years of daily weather records and an automated solar-powered meteorological station that measures temperature, precipitation, wind speed and direction, relative humidity, barometric pressure, and solar radiation. A field laboratory with herbarium, computers, microscopes, pH meter, water filtration equipment, field

sampling equipment, maps and aerial photographs is in place. A geographic information system that includes the FCRNRW is available on the University of Idaho campus.

Taylor Ranch is staffed year long with managers. Taylor Ranch is accessible by trail during snow-free months and, with its own private 750 m long airstrip, by light plane yearlong. Mail and groceries are delivered weekly by plane. Housing is available for up to 20 people. Scientists and students have three kitchens equipped with stoves, ovens and refrigerators available. A laboratory-classroom and cookhouse are suitable for group gatherings indoors. The laboratory is equipped with microscopes, glassware, reference collections of plants and animals, maps and aerial photos, basic field equipment such as binoculars, spotting scopes, sample containers, plot frames, etc. A tool shop equipped with hand tools suitable for use in wilderness and some electrical equipment is present. Pack and saddle stock are available for transportation of personnel and equipment to remote sites. A micro-hydroelectric system driven by water was recently installed to provide electricity for the facility. Radio and satellite telephone provide reliable communications.

V. THE FRANK CHURCH RIVER-OF-NO-RETURN WILDERNESS

The Wilderness encompasses most of the Middle Fork of the Salmon River and its major tributaries, including Big Creek, draining a 360,000 acre area eastward to the Middle Fork (Figure 1). The FCRNRW is a very rugged mountainous region, drained primarily by the Middle Fork of the Salmon River and its tributaries. Elevations range from less than 600 meters to over 3,000 meters. Soils in the region are primarily derived from granitic Idaho batholith parent material. This batholith formed during the Cretaceous period over 55 million years ago. Shallow, coarse soils, interspersed with granitic outcroppings, characterize the ridges (Larson and Lovely 1972). Tisdale (1969) reported the major soil type as brown podzol, revised from Ross and Savage (1967).

On the southeastern portions of the range, Challis volcanics of tertiary age constitute the predominant formation (Ross 1937). The major portion of the area is composed of latite and andesite flows and flow breccia. Some of the area is underlain by Germer tuffaceous material, that is the result of explosive volcanic ash showers. Soils derived from the Challis Volcanics are generally very fertile (Ralm and Larson 1972).

Approximately two-thirds of the FCRNRW has recent geologic map coverage that requires compliation work, but coverage is poor in the lower Big Creek area. The Taylor Ranch area has a highly complex geological pattern, with at least three formations present, including Challis volcanics and batholith formations (Reed Lewis, Idaho Geological Survey, pers. comm. 1995). However, the available surveys conducted by Idaho Geological Survey and US Geological Survey are not supported with adequate field mapping in this area because access is so difficult (Lewis op. cit.).

Climate of the FCRNRW was described by Finklin (I988). Weather stations at Challis (5175 feet above mean sea level), Middle Fork Lodge (4480 feet), Taylor Ranch (3835 feet), and Campbell's Ferry (2310 feet, now at Yellowpine Bar) provide an indication of the variation in temperature and precipitation. Generally, a decrease in precipitation from west to east occurs. Campbell's Ferry on the main Salmon River averaged 24 inches, Taylor Ranch 15 inches, Middle Fork Lodge 17 inches, and Challis 7 inches annually. Thus the station with the lowest elevation, Campbell's Ferry, had the highest precipitation, while the highest station, Challis, had the least precipitation. The Salmon River and its South Fork lie within a 20-30 inch rainfall belt, the Middle Fork in a 10-20 inch belt, and the valleys containing the towns of Challis and Salmon lie in a rainfall belt of 10 inches or less (Finklin 1988). Riggins, Idaho, on the extreme western side of the region at 1800 feet msl, has 17 inches of annual precipitation, and that portion of the Salmon River around Riggins lies within a 15-20 inch rainfall belt, reflecting the lower elevation and the very deep canyon country of this area.

Approximately 50% of the precipitation comes during November through March, with December and January being the highest months, except in the eastern canyonlands where May and June are the wettest months. Annual snowfall averages 20 inches at Challis, 54 inches at Middle Fork Lodge, 47 inches at Taylor Ranch, and 73 inches at Campbell's Ferry.

Temperatures also show a gradient between the various portions of the study area, although they are not as pronounced as the moisture gradient. Challis has the lowest mean minimum temperature in January at 10.5^{0}F., followed by Middle Fork Lodge (13^{0}F), Taylor Ranch (14^{0}F) and Campbell's Ferry (19^{0}F). Average maximum July temperatures are 86.5^{0}F at Challis, 86.5^{0}F at Middle Fork Lodge, 87^{0}F. at Taylor Ranch, and 92^{0}F at Campbell's Ferry.

The pattern is a slightly warmer, wetter climate on the northwest portion of the region and a slightly drier, cooler climate on the eastern side. Likely, the Pacific Ocean fronts which move up the Columbia River system commonly invade the Salmon River Canyon at least up to its confluence with the Middle Fork and also into the South Fork, influence weather patterns. The eastern rangelands are located within a rain shadow and are more influenced by interior continental weather patterns.

Shrub-steppe vegetation in this region has been described by Hironaka et al.(1983), Mueggler and Stewart (1980), Tisdale (1986) and Peek et al. (unpubl. ms. Shrub steppe vegetation of the Salmon River Region). The sagebrush-grassland habitat types reported by Hironaka et al. (1983) for southern Idaho extend into the mountain rangelands of this region. Of 32 habitat types identified, 18 were dominated by bluebunch wheatgrass and/or Idaho fescue, and/or by the various subspecies of big sagebrush. Bitterbrush, mountain mahogany, threetip sagebrush, and dwarf sagebrush were components of other habitat types.

Tisdale (1986) reported on the canyon grasslands along the Snake River, Clearwater River, and lower Salmon River up to 20 miles east of Riggins, immediately adjacent to the FCRNRW. These plant communities are within the Pacific Northwest Bunchgrass Region, that is predominantly underlain by basalt with surface deposits of volcanic ash, a fertile substrate when compared with the decomposed granites of the Idaho Batholith that characterize much of the mountain grasslands in our study area. Tisdale (1986) described 8 grassland habitat types of which 5 were dominated by bluebunch wheatgrass and/or Idaho fescue. Shrub dominated communities included common snowberry and mountain mahogany, but big sagebrush was absent. Hironaka et al. (1983) speculated that the extensive cloudy periods characteristic of this region in winter prevented the nondeciduous sagebrushes from photosynthesizing sufficiently to persist, based on experimental evidence developed by Pearson (1975). Tisdale (1986) described an Idaho fescue-sedge dominated habitat type which extends into the FCRNRW.

Mueggler and Stewart (1980) described 29 habitat types for mountain rangelands of western Montana, including 22 dominated by Idaho fescue and/or bluebunch wheatgrass. Again, big sagebrush, threetip sagebrush, bitterbrush, dwarf sagebrush, and mountain mahogany were associated dominant species.

These investigations of vegetation adjacent to the central Idaho mountain rangelands have several attributes in common. First, bluebunch wheatgrass and Idaho fescue consistently occur as dominants on appropriate sites throughout the broader region encompassed by these investigations. Big sagebrush and bitterbrush also have broad distributions, although both are absent from the low elevations of the lower Salmon River and Snake River region, even as they both reappear north of these low canyons and west of the Palouse Prairie region in Washington. Needle-and-thread grass is well distributed throughout the region on drier sites, but may be represented on disturbed sites on habitat types dominated by other species.

There is a gradient of vegetation distributed from the Pacific Northwest bunchgrasses to the Great Plains shortgrasses to the arid Great Basin shrub-steppe that has representative species within the intermountain region. The occurrence of blue grama in western Montana indicates a Great Plains influence, while the sagebrushes and mountain mahogany suggests Great Basin influence . The bunchgrasses may indicate the Pacific Northwest influence, while rough fescue, distributed northerly along the eastern front of the Rocky Mountains into Canada, suggests influence from the northerly region.

The permanency of this vegetation complex is a consideration. Tisdale (1986) considered the grassland types of the lower Salmon-Snake River region to be highly stable and not likely to change without a major climatic change. However, the shrub communities appeared to be responsive to changes in fire and grazing regimes. Mountain mahogany and common snowberry may have increased their range in the absence of fire, and short-term climatic change may also make the shrub complex more responsive when environmental conditions change. However, Johnson (1986) concluded from an examination of vegetative change across the western range that changes in the sagebrush complex were site-specific and related to kind of use and site characteristics. Generally there has been no major shift in sagebrush distribution as a result of use, and the distribution of sage over a 115 year period was essentially the same.

Gruell (1983), Houston (1973), Tisdale et al. (1965) and others provide evidence from undisturbed sites that a general increase in shrubs had occurred across the west. Nevertheless, changes in habitat type require long periods encompassing significant climatic change. An example from Grays Lake,

Idaho, approximately 150 miles east from the central Idaho mountains shows dramatic change over a 70,000 year period (Beiswenger 1991). A cold dry sagebrush steppe occurred from 70,000-30,000 Before Present, a conifer woodland from 30,000-11,500 BP, a juniper-forb complex from 11,500-7100 BP. The more recent cooler, moist climate has again produced increases in conifers and decreases in steppe plants. The hypothesis that changes in climate may first be noticed in shrubs seems tenable.

Shrub-steppe community classifications for the Salmon River Mountains, including the FCRNRW, provided by J.M. Peek, J.C. Claar, W.O. Hickey, J.L. Lauer, and J.J. Yeo. (Shrub steppe vegetation of the Salmon River Region, on file, College of Forestry Wildlife and Range Sciences, University of Idaho) are tentative. At least 15 different habitat types are present, dominated by various sagebrushes, mountain mahogany, bitterbrush, Idaho fescue, and bluebunch wheatgrass. Three attributes of the vegetation pattern stand out for the region, coinciding with the moisture gradient. First, sagebrush communities are common and well-developed on the southern portions of the area, and become scarce and less well developed along the main Salmon River and in the South Fork. Second, there is a tendency towards a juxtaposition of more mesic habitat types with the counterpart under a sparse Douglas fir or ponderosa pine understory. Thus an Idaho fescue/bluebunch wheatgrass habitat type may be positioned next to a Douglas fir stand with the herbaceous union much the same as without the conifer component. Third, there is an increasingly larger component of forbs in the communities of the same habitat type along the southeast to northwest gradient. Appendix I provides a provisional key to the shrub-steppe communities.

Fifty-one forest habitat types were identified by Steele et al. (1981). Whitebark pine, ponderosa pine, Douglas fir, Englemann spruce, grand fir, subalpine fir, and lodgepole pine communities are present. A zone of lightning-caused fires extends across the northern edge of the FCRNRW along the Salmon River which has more fires than elsewhere in the central Idaho region or the rest of Idaho and Montana. The western portions also have a higher frequency of stand-replacing fires than the eastern portions. These patterns are related to the precipitation pattern in the region. Nevertheless, major fires have occurred in the past decade have occurred across the FCRNRW, including the 1991 Rush Creek Fire of 8487 acres, just above the Taylor Ranch (Figure 2). Appendix II provides the key to the forest communities in the region, excerpted from Steele et al. (1981).

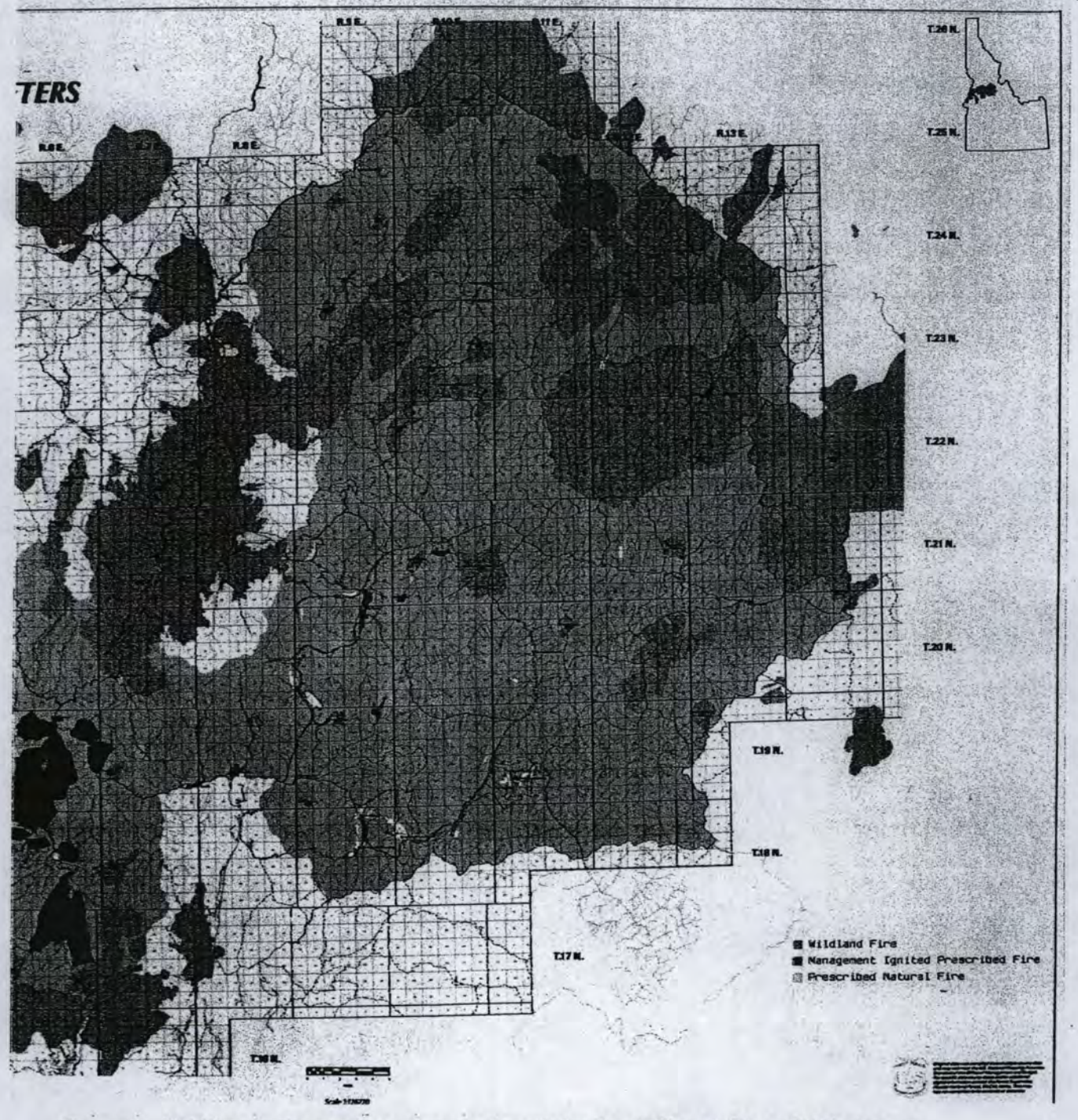


Figure 2. Wildfires in the northwestern portion of the Frank Church-River OF No Return Wilderness, provided by Sam Hescock, Fire Management Officer, Krassel Ranger District, Payette National Forest, 1998. Big Creek is the major drainage in the center of the map. The light brown is wildland fires, dark brown is prescribed fires outside of the wilderness on the South Fork, and the light green is the area where prescribed natural fire is allowed to burn within the wilderness.

There are highly unique habitat types in this area that may be especially important to monitor through time. A Douglas fir/mountain mahogany type represents a dominant conifer that evolved in fire-dominated habitats and a major understory species which is highly fire intolerant. Such sites likely represent a tension zone wherein the Douglas fir will be favored during more moist conditions and the mountain mahogany will be favored during droughty conditions. Over a 12-year period, seedlings of both species have been observed within these communities, but at different periods, leading to this interpretation. Again, this suggests a high sensitivity of at least some plants and plant communities to the wide variation in precipitation patterns that are characteristic of this region, and lends support to the thesis that the area may serve to provide information on long-term environmental change in the absence of local human interference.

Upper Big Creek is in a mining district that is occasionally active. The Payette National forest has been monitoring sediment trends in streams within the Big Creek drainage since 1983 (Nelson et al.1996). Water quality problems that have resulted from these dispersed mining operations include accumulations of heavy metals in sediments and fish. Cobble embeddedness is measured by placing a 60 cm hoop randomly within a stream site that approximates juvenile salmonid rearing areas and measuring the proportion of particles with maximum diameter >45 cm, < than 300 mm, and fines <6.3 mm in the hoop. Variable trends in cobble embeddedness in Monumental Creek were apparent from the 1983- 1995 period. Mitigation measures have lead to improvements in recent years, but the effects of mining remain evident. Ries et al. (1991) concluded that adverse effects on fish habitat of mining in the 1980s generally improved, which was supported by Nelson et al. (1996).

VI. RELEVANCE OF RESEARCH IN WILDERNESS TO UNDERSTANDING GLOBAL CHANGE

Vitousek (1994) pointed out that while ecologists are often advised to learn to deal with uncertainty, it is certain that a number of components of the environment are changing and the change is human-caused. Increasing concentrations of carbon dioxide in the atmosphere, alterations in the biogeochemistry of the global nitrogen cycle and ongoing land use changes are well documented, if still controversial (Idso 1998). Land use changes in wilderness are largely discounted, but increases in

atmospheric carbon dioxide and alteration of carbon and nitrogen cycles are expected to affect plant communities. Most of the increase in CO_2 is attributable to fossil fuel combustion rather than deforestation.

Photosynthetic rates of many plants in natural ecosystems may be enhanced by increased carbon dioxide concentrations (Bazzaz 1990). In other plants there appears to be little response, and in other cases plants grown in elevated CO_2 levels show a decline in photosynthetic rates. St. Omer and Horvath (1983) reported that 4 California native winter annuals varied in their ability to persist at elevated CO_2 levels. Bazzaz (1990) concluded from his review that rising CO_2 levels may enhance photosynthesis and growth, increase allocation of biomass to underground plant parts, and enhance water use efficiency, and that CO_2 interacts strongly with nutrients and temperature, among other environmental variables. Coughenour and Chen (1997) also reported that increased temperatures interacted with increased CO_2 levels in grasses. Responses of individual species may be highly variable (Strain 1969, Marshall and Zhang (1994) which may in turn eventually alter community composition. Lindroth et al. (1993) reported that aspen stored more starch at elevated atmospheric CO_2 while maple stored more defensive carbon compounds. Long and Hutchin (1991) concluded that there was insufficient information to predict responses of primary production to climate change, but there is obviously a substantial amount of effort being directed at the ecological effects of climate change.

While grazing changes and fire prevention are generally held responsible for changes in forest and shrub-steppe plant composition across the arid West (Madany and West 1983, Martin and Turner 1977, Gruell 1983, Austin and Urness 1998), this may also be related to the effects of rising atmospheric CO_2 as this affects photosynthesis, respiration, and growth of plants. Peek (Long-term rangeland vegetation trend, Middle Fork Salmon River Idaho, in Proceedings Wilderness Science in a Time of Change, Missoula, Montana, May 1999) provided evidence of declines in shrubs in several plant communities across the FCRNRW based on examination of exclosures and adjacent stands. Current fire management policies that allow fires to burn under most circumstances in this wilderness (US Forest Service 1998) could eventually eliminate the effects of past fire suppression. Grazing, primarily pack and riding stock, is now concentrated around a few inholdings and is regulated to reduce effects on plant communities. There is evidence of the effects of past grazing influences on vegetation in some areas

such as the Cabin Creek area where there was a major human presence in the recent past, but much of this area is now without the influence of grazing. Also, exotic species such as knapweed (Centaurea maculosa) are invading some areas which have not been grazed appreciably in the last half-century, but thus far the presence of these aggressive invaders is localized. If fire suppression and livestock grazing have been the major influences that humans have had on these communities, then current policy which eliminates or dramatically reduces these influences means that there are substantial opportunities to investigate systems to detect natural change or climate-induced change. Evidence of change may be detected in trends in productivity of dominant plants over time. Lindroth et al (1993) reported that elevated CO_2 atmospheres predicted for the next century which have measurable changes for individual plant species will affect community structure and nutrient cycling on a broader level. Polley (1997) reported that transition zones between grasslands and forest may be among the initial areas experiencing species change as CO_2 rises or climate changes, and that trees and shrubs may increase at the expense of grasses. Among the herbivorous species, Post et al. (1997) concluded that recent trends of increasingly warm winters in northern Europe and Scandinavia would lead to reduce body size and fecundity of red deer (Cervus elaphus). If this is an indication of how global warming may affect ungulates, then interactions between predator and prey as well as between prey and forage may be affected. The opportunity to assess trends in plant and animal communities in a relatively intact ecosystem of large size where other human intrusion is minimized could materially help to understand effects of global changes in the northern Rocky Mountain region.

VII. PAST RESEARCH IN AREA

A variety of studies have been conducted from the Taylor Ranch (Appendix III) and in the Big Creek drainage. The sampling reviewed here illustrates the value of the work for both understanding wilderness ecosystems and for application to other aspects of resource management. Work in 1964 was initiated on the mountain lion (Hornocker 1970). This work identified the social system and intrinsic regulatory mechanisms involving territoriality and land tenure which provides fundamental information needed to manage and conserve this species and other solitary cats (Hornocker and Bailey 1986). It

was through this work that the mountain lion was designated a game animal in Idaho (Hornocker 1971). Subsequently, this species was designated a game animal in most states and provinces that maintain populations, and an orderly regulated harvest was then established. The population was again monitored during a 4-winter period from 1983-84 to 1986-87 (Quigley et al. 1989). A total of 13 individuals were considered resident, 3 males and 10 females in the original study area from the mouth of Big Creek to Monumental Creek. This compared with the earlier estimates of 9 residents, including 3 males and 4 to 6 females. The increase appeared to be a numerical response to a one-third increase in elk. A reduction in female home range size likely facilitated the increase.

The bobcat population was investigated during the 1982-85 period by Koehler (1989). Density of this species is low, attributable to limited prey in winter and severe winters. Voles, cottontail rabbits, and ground squirrels comprise most of the diet, with mule deer and bighorn sheep frequently occurring as winter food items for bobcats in this area. While this area is apparently premium habitat for the mountain lion, it is of poorer quality for the smaller bobcat.

Nez Perce Tribe wolf monitoring reports indicate that at least two packs of gray wolves now inhabit the Big Creek drainage. These wolves are part of the introduction that occurred in 1995 in the Middle Fork of the Salmon River. Pups have been produced by each pack, suggesting that permanent home ranges have been established by these packs. Wolves or their sign have been seen on the Taylor Ranch, east of the major elk wintering areas that appear to be the primary winter range for wolves, suggesting that the entire Big Creek drainage is within the range of wolves for a part of the year. As wolves continue to adjust to this area, opportunities to investigate their interactions with other predators, most especially the mountain lion which shares a common prey base, and to examine the effects on prey that are game species are obviously great. Robinson (1953) reported that when exploitation of the predator complement in an area is initiated, very often the larger species that are the focus of control efforts are reduced while smaller species proliferate. The restoration of large predators will likely have consequences for the smaller species in return. Both cougars and wolves are known to kill coyotes and bobcats. Investigations into the relationships of these carnivores were initiated in December 1998 in the Big Creek drainage. An assessment of the effects of combined predation upon big game populations is also ongoing.

Deer, elk, and bighorn sheep populations are monitored by Idaho Department of Fish & Game. Deer populations fluctuate with winter severity, and are the least understood. During the 1960s and 1970s, populations appeared to increase, but appear to have declined since. Elk populations increased in the area until recent years and may now be stable. Calf production and survival has been relatively low in recent years. These monitoring programs are of substantial value in evaluating effects of the introduced wolf and other investigations into habitat and relationships with associated species. For instance, Akenson (1992) concluded that bighorn sheep and mule deer were positively associated in spring while elk and bighorn were less associated at any time of year, but the relationships may change with changes in population sizes. Investigations into what may naturally limit populations in time and space in systems that are relatively intact are few, and this area provides an excellent opportunity to do so.

Mountain sheep populations in the Big Creek drainage have been relatively uninfluenced by man for at least half a century. While exploitation of ewes and lambs by whites occurred in the 1930s and 1940s, hunting has been limited to mature rams since the 1950s. Populations declined during the 1980s from highs around 200 to lows of around 40. Most of the mortality was attributed to disease (Akenson and Akenson 1992). The pathogen Pasturella haemolytica appears to be the proximal factor in most mortality. These dieoffs may be related to external stressors such as the extended drought periods of the late 1980s, coupled with high density populations (Foreyt 1989). An alternative hypothesis is that the dieoffs are internally mediated through changes in tolerance to pathogens as population densities change (Jaworski et al. 1993, Cassirer et al. 1996). While Pasturella haemolytica biotypes T, A1, and A2 found in domestic sheep (Foreyt 1989), the Pasteurella trehalosi biogroup 2 strain Idaho-1 was isolated from this mountain sheep population (Jaworski et al. 1993) and is common in wildlife, having been isolated from Dall sheep, mountain goats, elk, and deer. This provides evidence that the recent dieoff of mountain sheep in central Idaho was not related to prior contact with domestic sheep. If so, this still further implies that mountain sheep in the Big Creek drainage have been relatively uninfluenced by human activity for at least half of this century. The issue is important because influences past and present, within and beyond the wilderness boundaries, do have effects inside those boundaries. Questions as to how intact the ecosystem is, and how to define the ecosystem are raised. While mountain sheep are a highly

prized species that receives extensive attention, what influences have we had on other less well-known species in the region? At this point, it appears that these mountain sheep are naturally regulated. Table 1 shows the population monitoring efforts of Idaho Fish and Game in the Big Creek drainage.

Table 1. Summary of bighorn sheep population data for Big Creek, taken from Idaho Fish & Game Progress Reports, Project W-170-R. No data were taken in 1981, 1983-86, and 1990.

YEAR	TOTAL	EWES	LAMBS	RAMS	UNCLASSIFIED
1973	63	29	6	24	4
1974	83	36	22	25	
1975	95	46	23	26	
1976	110	60	13	37	
1977	68	41	9	18	
1978	114	47	43	24	
1979	102	61	19	20	2
1980	110	59	9	39	3
1982	105	52	20	33	
1987	177	114	19	35	
1988	172	116	18	30	
1989	200	122	19	57	
1991	93	64	4	25	
1992	107	62	20	24	
1993	118	82	13	25	
1994	38	22	1	15	
1995	115	85	7	23	
1996	101	73	9	19	

Seven forest owl species were investigated during the 1980s by E.O. Garton and G.D. Hayward (see appendix III for references). These owls included the pygmy, saw-whet, boreal, great-horned, and screech owls. The flammulated and long-eared owls were rare. Pygmy owls were food and habitat generalists that preyed more on birds than the other owls did. Flammulated owls specialized on forest moths, saw-whet, boreal, screech, and great-horned owls preferred mammalian prey, and each species selected different sizes of prey or different habitats, thereby minimizing competition. The largest and smallest owl species differed primarily in choice of prey while intermediate-sized owls differed most in habitat use. The boreal owl, characteristic of spruce-fir forests where the primary prey item, the redback vole, was most common, was the subject of more intensive study. With annual adult boreal owl mortality approximating 46%, the population in the Chamberlain Basin that includes the northern headwaters of Big Creek, may be dependent upon immigration from other areas to sustain itself. If this is the case,

then there is again evidence that segments of this wilderness ecosystem are dependent upon a much bigger system than expected.

Archeological investigations by Leonhardy (1985) and Thomas (1988) provided a hypothesis as to how Sheepeater Indians existed within the Big Creek drainage. House pit sites within a half of a mile of the Taylor Ranch revealed that mountain sheep were a major food source. The hypothesis developed was that the small bands of Indians moved from one camp site to another as mountain sheep became less available: an optimal foraging strategy was in place. If this hypothesis is correct, then questions about the nature of sustainable use of resources are raised. What lessons do we learn from this situation where aboriginal peoples could not establish permanent camps likely because of a variable supply of resources, that may apply to contemporary resource management strategies for this region?

G. W. Minshall, Stream Ecology Center, Idaho State University, has been collecting information to define the natural range of variation of wilderness streams and to determine the effects of wildfire on streams in the Big Creek drainage. This long-term (20 year) study is defining the recovery sequence for stream communities following wildfire and testing stream ecosystem theory. Environmental, population, and community-level responses have been measured in streams, immediately after fire and over the subsequent 1 to 20 years. In addition, several streams subjected to wildfire 50 years previously have been examined. The research design utilizes comparative approaches that focus on forested watersheds in the Frank Church Wilderness of central Idaho and Yellowstone National Park. The fires on Big Creek partially burned streams that have been sampled. Subtle changes in streams are evidenced, as compared to streams in drainages that were completely burned in the Middle Fork and in Yellowstone. Thirty-two streams within the Big Creek drainage were examined for habitat heterogeneity and benthic macroinvertebrate (insect) assemblages (Minshall and Robinson 1998). Most habitat measures show highest variation within smaller streams suggesting major environmental differences between the smaller and larger streams in Big Creek drainage. Some biota were related with stream size as well. These results in Big Creek are likely more comparable to conditions following prescribed fire, again illustrating the value of research in wilderness. These investigations provide valuable insights into the fundamental processes operating in stream ecosystems, as well as information useful to resource managers

concerned with the effects of fire, the establishment of guidelines concerning fire in wilderness areas, and strategies for watershed and stream habitat rehabilitation following fire.

Big Creek is a major spawning area for anadromous and non-anadromous native salmonids. Investigations were initiated as far back as 1941 with surveys of chinook salmon spawning areas and staging pools (Rich 1948). These surveys were duplicated in 1997 to assess influence of human disturbance on anadromous fish habitat in the Snake River Basin (McIntosh et al. unpublished). Chinook redd surveys were initiated in the early 1950s (Hauck 1951). Since 1957, redd counts of index areas which support the largest numbers of redds are conducted annually by Idaho Fish and Game Department employees (Hassemer 1993). In addition, US Forest Service, National Marine Fisheries Service, and the Nez Perce Tribe conduct research and monitoring in the area. Redd and parr counts of Chinook salmon are provided in Appendix IV.

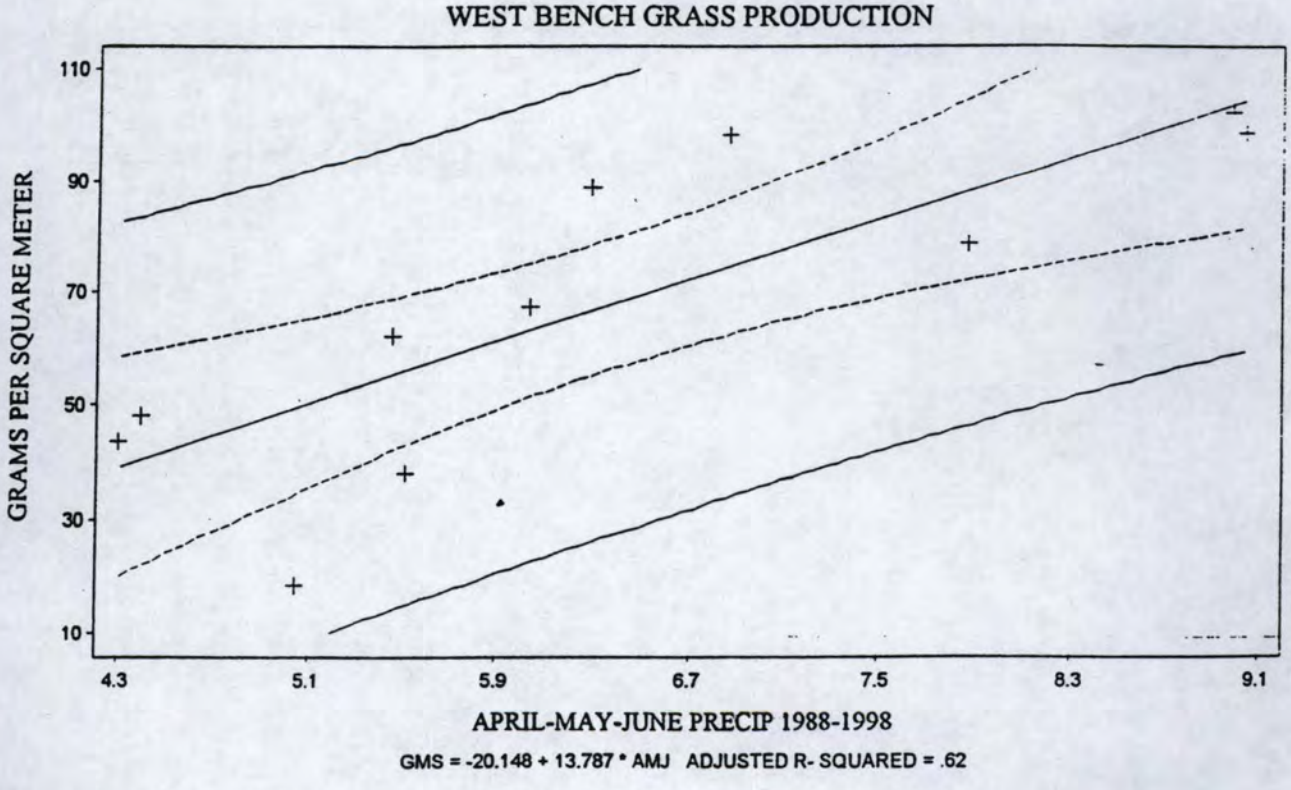
Since 1995, R. Thurow (pers. comm. November 1998) has been investigating chinook salmon redd distribution and potential spawning patches to test the hypothesis that habitat area, quality, or location in relation to other spawning populations strongly influences the occurrence of spawning chinook salmon. This work involves mapping chinook redds and spawning areas in the entire Big Creek drainage, including Cave, Monumental, and Rush Creeks. In addition, Thurow (1982, 83, 84, 85, 87) assessed the distribution and status of wild steelhead, chinook salmon, cutthroat trout, redband trout, and bull trout in the Middle Fork Salmon. This research described the distribution, abundance, genetic structure and habitat preferences of steelhead plus distribution and status of the other salmonids.

Chinook salmon parr collected from lower Big Creek and Rush Creek spawning areas are among the largest of spring-run salmon in the Salmon River (Achord et al. 1996). Parr collected in July and August of 1994 averaged 75 mm long and weighed 5.3 grams, as compared to parr collected in the upper Big Creek drainage which averaged 62 mm long and weighed 3.4 grams on average. The lower Big Creek parr have the highest detection rate at dams along the Snake River as well (Achord et al. 1996). The wild fish that were larger when initially collected and released had a significantly higher rate of detection the following spring and summer than smaller parr. The larger fish also migrate in April and May, earlier than smaller fish. These investigations characterize the

migration timing of different wild stocks of chinook in the Snake River drainage, determine how consistent patterns are, and identify environmental factors that influence migration timing.

Mallet (1963) and Bjornn and Mallet (1964) studied the life history and ecology of cutthroat troutin the Middle Fork, including Big Creek. This species is migratory within the drainage, and fish spawning in Big Creek moving to winter in the Middle Fork and the main Salmon River. Appendix IV includes the Idaho Fish and Game snorkel counts of these species in selected transects in Rush Creek and Big Creek.

A twelve-year record of plant production has accumulated in the Taylor Ranch area. Current year's growth of bluebunch wheatgrass, mountain mahogany, bitterbrush, sagebrush, and ninebark is measured at eight sites in late June or early July. These records provide an opportunity to produce correlations with rainfall and temperature. The graph of West Bench grass production illustrates the relationship between April-May-June precipitation and production of bluebunch wheatgrass over an eleven year period. The linear equation explains 62% of the relationship and is highly significant (P=.0022). This site is not subject to extensive grazing by wild ungulates, indicating that spring precipitation may be used to predict production. Continued collection of field data should refine the reliability of the prediction. Plant production is considered to be a fundamental influence on herbivorous species in the area so this work provides useful information for a variety of other investigations.



VIII. PROPOSED APPROACH TO MONITORING

The above review provides several conclusions concerning the value and merits of using the Taylor Ranch facility as a base for establishing a long-term monitoring program:

(1) monitoring should be tied to educational experiences for students.

(2) the monitoring should be directed at local resources that have relevance to understanding ecosystem processes in the region including beyond the wilderness boundaries,

(3) the monitoring should include resources that are of importance to regional interests,

(4) the topographic diversity of the area which creates high biodiversity offers opportunities to evaluate ecosystem change attributable to increased CO_2 levels in the absence of other human influence,

(5) numerous individuals and organizations have accumulated information and demonstrated an interest in one or more resources in the area which should be capitalized upon,

(6) there is evidence of human influences within the wilderness boundary which must be considered in evaluating natural change or CO_2- induced change,

(7) interdisciplinary approaches to monitoring are in order.

(8) long-term monitoring must be economical and efficient.

(9) monitoring should provide a basis for research.

A. The following activities have been regularly continued in the Taylor Ranch area and are proposed for long-term monitoring.

Bighorn sheep population inventory

Census and recruitment efforts are conducted by Idaho Department of Fish & Game as often as possible. In addition, Taylor Ranch managers record numbers of sheep by sex and age when they are seen near the facilities. Inventories depend upon finances and available time, so are not as systematic or regular as desirable. Three systematic surveys should be done with either fixed-wing or helicopter. The initial survey should be done in mid-June after parturition and when lamb production and early survival can be estimated. Another aerial survey can be accomplished in early winter to further estimate lamb survival through fall. A final survey should be accomplished in March to estimate population composition, numbers, and overwinter survival.

Plant production

Grass production is indexed by clipping selected dominant species to 5 cm above ground level in 20 2 X 5 dm rectangular plots spaced at 2 m along a transect. Plots are permanently marked. Material is bagged, oven dried at 40^0 C for 24 hours, weighed to the nearest 0.01 gm. A 50 gm sample is selected from the collection for analysis of C, N, H, Se, Mb, P, Zn, Cd, Pb, Co, Ni, Mn, Fe, Cr, Mg, Al, Vn, Cu, Ca, and K. Seed stalk heights and percentage with seed heads are also estimated from a sample of 100 plants.

Shrub production is indexed by obtaining lengths (0.1 cm) and weights (0.01 gm) of 50 twigs (current year's growth) of each species, coupled with twig density measurements in 20 4 m^2 circular plots. Individual twigs are measured for length and weight in the field, and then oven-dried at 40^0C for 24 hours. The oven-dried weight of the aggregate sample is subtracted from the wet weight to obtain the percentage of moisture that is lost, and the oven-dried weight/wet weight figure serves to correct all weights to the oven-dried figure. A mean twig weight may be multiplied by the estimated number of twigs per m^2. A 50 gm sample of twigs is selected from the oven-dried collection at each site for nutrient analysis as with the grasses.

Anadromous fish inventory

Snorkel censuses of fish are conducted in Big Creek along the Taylor Ranch reach of Big Creek by Idaho Fish and Game (Hall-Griswold and Petrosky 1998). Chinook salmon, steelhead, cutthroat, bull trout, and whitefish populations have been counted. Census is conducted when water temperatures are >10C when fish are most observable, and preceding fall outmigration (Thurow 1994). Redd counts of chinook salmon along selected transects are obtained by Idaho Fish & Game and the Nez Perce Tribe annually. These studies are funded but the attached budget includes support for redd surveys.

Campsite condition inventory

Recreation impacts on 53 sites along Big Creek were inventoried in 1986, 1994 and 1998. The purpose of the inventory is to assess the effects, if any, of recreational camping. Information on site location, vegetation, landform, mineral soil exposure, tree scarring, root exposure, trails, size of camp area and a photograph record are among the items that are examined. A rating of impacts into low, medium and high categories is assigned and a summary rating provided for each site allows calculation

of a total score. This score is compared against an impact index and trends can be examined. Since Big Creek is an anadromous fish spawning stream, recreational impacts to the streambank are of particular interest.

B. The following activities have been undertaken but not continued regularly in the Taylor Ranch area and are proposed for long-term monitoring.

Geologic Mapping and Map Compilation.

Field work to map the geology and soils in the lower Big Creek drainage is an essential underpinning for understanding plant and animal ecology in the area. Mapping of the 15' quadrangle in the Taylor Ranch area to a final scale of 1:24,000, with a simplified version at 1:100,000 will require three months of field work. Mapping of the middle portion of Big Creek to similar scales will require similar field effort. The upper Big Creek area is mapped. These assessments will require two summers of work and may then be augmented with more detailed geologic studies.

Mountain lion investigations

At six-year intervals, the mountain lion population should be inventoried in winter in the Big Creek drainage. An effort to capture every individual between Monumental Creek and confluence of Big Creek with the Middle Fork over a three winter period, so there would be effort in three of every six years. This approach is based on experience in this area. Lions will be treed using dogs, immobilized, and marked with lip tattoos for further identification. Standard measurements, weight, sex and age of each individual will be obtained. The proportion of females with cubs will be recorded. Procedures for capture and marking are found in Hornocker (1970) and Lindzey (1987).

Stream ecosystem inventory

Overton et al. (1997) provide guidelines for fish and fish habitat inventories that are applicable to Big Creek and its tributaries. Sections of Big Creek and adjacent tributaries may be examined for habitat type, average depth, number of pools and their depth, substrate fines and composition, bank stability, undercut, temperature and woody debris. Forms provided by Overton et al. (1997) may be used to ensure that the information collected may be compared with inventories of streams elsewhere in this region.

Amphibian and reptile inventory

Sampling for amphibians may be conducted following (Bury and Corn 1991). Populations of the Pacific rattler (Crotalis viridus) and tailed frog (Scaphus truei) are proposed for monitoring. Funnel traps placed along transects are proposed to census the rattlesnake population (Heyer et al. 1994). Since adult tailed frogs are difficult to sample, sampling 30 m stream segments for tadpoles using a D-frame net on selected streams will be accomplished in August at lowest stream flows.

Breeding bird inventory

The North American breeding bird survey consists of counts under standardized conditions by skilled observers, that provides an index to population size and relative abundance (Link and Sauer 1998). Taylor Ranch offers additional information of value for this survey. A raptor population includes two known golden eagle nests in the Big Creek drainage (Thurow and Peterson 1978). These nests may be observed in June to determine whether they are occupied and if so, whether young are present, and number. Other raptors, which include accipiters, falcons, and buteos, may be surveyed along a transect consisting of the trail system along the creek up to the Monumental Creek confluence with Big Creek. A bald eagle population occupies the drainage, especially in winter, and individual sightings should be recorded as they are observed. Look-see methods have proven adequate to assess breeding raptors as long as equal time is spent studying each site in detail (Bibby et al. 1992).

Owls may be censused with night time playback tapes. A survey route has been established along Big Creek, and a camp at Rush Point serves to census owls at higher elevation in the drainage (Hayward and Garton 1988).

Breeding passerines may be censused in riparian zones, grassland and Douglas fir habitats. Ten point-count routes can be established in each habitat, using the methodology of (Ramsey and Scott 1981). Efforts to standardize bird population surveys (Ralph et al. 1995) illustrate the problems in assessing populations, and an adaptive approach to these surveys is needed to ensure that adequate sampling for this area is obtained.

Ruffed grouse and blue grouse populations are abundant in this area and are minimally hunted. Mark-recapture estimates of populations and brood surveys can be readily accomplished in the

immediate vicinity of the Taylor Ranch. The Jolly-Seber method of estimating population size is appropriate for use with these grouse populations (Lancia et al. 1994).

IX. BUDGET

Personnel	
Student internships (4@ $1000.00/month, 2.5 months)	$10,000
Principle investigators (8@ $1000.00)	8,000
Mountain lion capture specialist	5,000
Geologist salary (3 months)	9,000
Travel	
Principle investigators, $300.00 ea.	2,400
Flights, (20 hours @ $180.00/hour)	3,600
Operating expense	
Supplies and equipment	5,000
Sheep census, (4 hours @ 250.00/hour)	1,000
Mountain lion locations (20 hours @ $180.00/hour)	3,600
Total Expenses	$47,600

X. Acknowledgments

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APPENDIX 1. KEY TO NON-FORESTED, SHRUB-STEPPE COMMUNITIES, SALMON RIVER MOUNTAINS. This provides a listing of the extant nonforested communities, after Peek et al. (1994).

1a. Douglas fir, Ponderosa pine, or other conifer species present..... 2

1b. Conifers not present..... 3a

2. Not shrub-steppe: refer to Steele et al. (1981) for identification of forested communities.

3a. Little greenbush present as more than occasional component; cliff sites. Little greenbush/mountain mahogany habitat type.

3b. Little greenbush absent or scarce; cliffs or other sites..... 4a

4a.Mountain mahogany present as more than occasional component. 5a

4b. Mountain mahogany absent or scarce..... 6a

5a. Idaho fescue present- Mountain mahogany /Idaho fescue habitat type.

5b. Idaho fescue absent- Mountain mahogany/Bluebunch wheatgrass habitat type.

6a.Bitterbrush present more than occasional..... 7a

6b. Bitterbrush absent or scarce..... 8a

7a. Idaho fescue present: Bitterbrush/Idaho fescue habitat type.

7b. Idaho fescue absent: Bitterbrush/ bluebunch wheatgrass habitat type.

8a. Mountain big sagebrush present as more than occasional..... 9a

8b. Mountain big sagebrush absent or scarce..... 10a

9a. Idaho fescue present: Mountain sagebrush/Idaho fescue habitat type.

9b. Idaho fescue absent: Mountain sagebrush/bluebunch wheatgrass habitat type

10a. Threetip sagebrush present,more than occasional 11a

10b. Threetip sagebrush absent or scarce..... 12a

11a. Idaho fescue present: Threetip sagebrush/Idaho fescue habitat type.

11b. Idaho fescue absent: Threetip sagebrush/Bluebunch wheatgrass habitat type.

12a. Low sagebrush present as more than occasional 13a

12b. Low sagebrush absent or scarce 14a

13a. Idaho fescue present: low sagebrush/Idaho fescue habitat type.

13b. Idaho fescue absent: low sagebrush/bluebunch wheatgrass habitat type.

14a. Basin big sagebrush present as more than occasional: Basin big sagebrush/bluebunch wheatgrass habitat type.

14b. Basin big sagebrush absent or scarce 15a

15a Wyoming big sagebrush present as more than occasional. 16a

15b Wyoming big sagebrush absent or scarce 17a

16a. Wyoming big sagebrush/bluebunch wheatgrass habitat type.

17a. Idaho fescue present as more than oCcasional: Idaho fescue/bluebunch wheatgrass habitat type.

17b. Idaho fescue absent 18a

18a. Needle-and-thread grass absent or scarce. Bluebunch wheatgrass, Sandberg bluegrass, Arrowleaf balsamroot habitat type.

18b.Needle-and thread grass present, abundant. Bluebunch wheatgrass/Sandberg bluegrass/ needle-and-thread habitat type.

APPENDIX II. KEY TO FORESTED COMMMUNITIES IN FCRNRW, AFTER STEELE ET AL. (1981). This provides a listing of the extant forested habitat types.

1. Abies grandis present and reproducing more successfully than ..... Abies lasiocarpa ABIES GRANDIS SERIES (item E)1. ..... Abies grandis not in the indicated climax 2
2. Abies lasiocarpa present and reproducing successfully ..... ABIES LASIOCARPA SERIES (item G) .....
2. Abies lasiocarpa not the indicated climax..... 3
3. Picea engelmannii present and reproducing successfully..... PICEA ENGELMANNII SERIES (item D)
3. Picea engelmannii not the indicated climax 4
4. Pinus flexilis a successfully reproducing dominant in old growth stands; often sharing that status with Pseudotsuga ..... PINUS FLEXILIS SERIES (item A)
4. Pinus flexilis absent or clearly seral 5
5. Pseudotsuga menziesii present and reproducing successfully ..... PSEUDOTSUGA MENZIESII SERIES (item C)
5. Pseudotsuga menziesii not the indicated climax 6
6. Pinus albicaulis well represented and reproducing successfully..... PINUS ALBICAULIS SERIES
6. Pinus albicaulis not the indicated successional dominant 7
7. Pinus contorta dominant and reproducing successfully ..... PINUS CONTORTA SERIES (item F)
7. Pinus contorta not the indicated successional dominant 8
8. Pinus ponderosa present and reproducing successfully..... PINUS PONDEROSA SERIES (item B).....
8. Pinus ponderosa not the indicated climax 9
9. Populus tremuloides the indicated dominant..... POPULUS TREMULOIDES SERIES
9. Populus tremuloides not the indicated dominant ..... Minor forest types

A. Key to Pinus flexilis Habitat Types

1. Juniperus communis well represented ..... PINUS FLEXILIS/JUNIPERUS COMMUNIS h.t.
1. J. communis poorly represented..... 2
2. Cercocarpus ledifolius is well represented..... PINUS FLEXILIS/CERCOCARPUS LEDIFOLIUS h.t. .....
2. C. ledifolius poorly represented..... 3
3. Festuca idahoensis well represented ..... PINUS FLEXILIS/FESTUCA IDAHOENSIS h.t.
3. F. idahoensis poorly represented, Hesperochloa kingii.....(Leucopoa kingii) common PINUS FLEXILIS/HESPEROCHLOA KINGII h.t.

B. Key to Pinus ponderosa Habitat Types

1. Physocarpus malvaceus well represented ..... PINUS PONDEROSA/PHYSOCARPUS MALVACEUS h.t.
1. P. malvaceus poorly represented..... 2
2. Symphoricarpos albus well represented ..... PINUS PONDEROSA/SYMPHORICARPOS ALBUS H.T. .....
2. S. albus poorly represented 3
3. Symphoricarpos oreophilus or Prunus virginiana well represented PINUS PONDEROSA/SYMPHORICARPOS OREOPHILUS h.t.
3. S. oreophilus and P. virginiana poorly represented..... 4
4. Purshia tridentata well represented ..... PINUS PONDEROSA/PURSHIA TRIDENTATA h.t. .....
a. Festuca idahoensis well represented..... FESTUCA IDAHOENSIS phase 4b. F. idahoensis poorly represented..... AGROPYRON SPICATUM phase
4. P. tridentata poorly represented 5
5. Festuca idahoensis well represented ..... PINUS PONDEROSA/FESTUCA IDAHOENSIS h.t.

5. F. idahoensis poorly represented 6
6. Agropyron spicatum well represented on sites in good condition
PINUS PONDEROSA/AGROPYRON SPICATUM h.t.
6. A. spicatum poorly represented on sites in good condition and Stipa spp. well represented PINUS
PONDEROSA/STIPA OCCIDENTALIS h.t.

C. Key to Pseudotsuga mensiesii Habitat Types

1. Vaccinium caespitosum common ..... PSEUDOTSUGA MENZIESII/VACCINIUM
CAESPITOSUM h.t.*
1. V. caespitosum scarce..... 2
2. Linnaea borealis common..... PSEUDOTSUGA MENZIESII/LINNAEA
BOREALIS h.t. .....2. L. borealis scarce 3
3. Physocarpus malvaceus and/or Holodiscus discolor well represented PSEUDOTSUGA
MENZIESII/PHYSOCARPUS MALVACEUS h.t. .....
3a. Pinus ponderosa present or potentially present .....
a. Calmagrostis rubescens and/or Carex geyeri dominant;. Physocarpus forming only a broken, patchy
cover..... CALAMAGROSTIS RUBESCENS phase*
b. Not as above..... PINUS PONDEROSA phase
3b. P. ponderosa absent and unable to establish ..... PSEUDOTSUGA MENZIESII phase
3. P. malvaceus and H. discolor poorly represented 4
4. Acer glabrum well represented..... PSEUDOTSUGA MENZIESII/ACER GLABRUM
h.t. .....
4a. Penstemon wilcoxii and/or Clematis columbiana usually present; sites mainly west of the Big Wood River
..... ACER GLABRUM phase 4b. Pinus flexilis
usually present, sites mainly east of the Big Wood River SYMPHORICARPOS
OREOPHILUS phase .....
4. A. glabrum poorly represented..... 4
5. Vaccinium globulare or Xerophyllum tenax well represented PSEUDOTSUGA
MENZIESII/VACCINIUM GLOBULARE h.t.
5. V. globulare and X. tenax poorly represented 6
6. Symphoricarpos albus well represented..... PSEUDOTSUGA
MENZIESII/SYMPHORICARPOS ALBUS h.t. .....
6a. Pinus ponderosa present or potentially present..... PINUS PONDEROSA phase
6b. P. ponderosa absent and unable to establish ..... SYMPHORICARPOS ALBUS phase
6. S. albus poorly represented 7
7. Spiraea betulifolia or S. pyramidata well represented ..... PSEUDOTSUGA MENZIESII/SPIRAEA
BETULIFOLIA h.t. .....
7a. Pinus ponderosa present or potentially present..... PINUS PONDEROSA phase
7b. Calamagrostis rubescens well represented ..... CALAMAGROSTIS RUBESCENS phase
7c. Not as above in 7a or 7b..... SPIRAEA BETULIFOLIA phase
7. S. betulifolia and S. pyramidata poorly represented..... 8
8. Osmorhiza chilensis well represented..... PSEUDOTSUGA MENZIESII/OSMORHIZA
CHILENSIS h.t. .....
8. O. chilensis poorly represented..... 9
9. Calamagrostis rubescens well represented..... PSEUDOTSUGA MENZIESII/CALAMAGROSTIS
RUBESCENS h.t. .....9a. Pinus ponderosa present or potentially present
..... PINUS PONDEROSA phase
9b. P. ponderosa absent and unable to establish; ..... Festuca idahoensis well represented
.....FESTUCA IDAHOENSIS phase
9c. Not as above in 9a or 9b..... CALAMAGROSTIS RUBESCENS phase
9. C. rubescens poorly represented 10
10. Cercocarphus ledifolius well represented and the indicated climax dominant shrub
.....PSEUDOTSUGA MENZIESII/CERCOCARPUS
LEDIFOLIUS h.t. .....
10. C. ledifolius poorly represented or seral 11

11. Berberis repens well represented..... PSEUDOTSUGA MENZIESII/BERBERIS REPENS h.t. .....
11a. Carex geyeri abundant..... CAREX GEYERI phase
11b. C. geyeri not abundant, Symphoricarpos oreophilus abundant, stands never achieving closed canopies ..... SYMPHORICARPOS OREOPHILUS phase
11c. S. oreophilus not abundant, stands eventually achieving closed canopies BERBERIS REPENS phase
11.B. repens poorly represented..... 12
12. Carex geyeri well represented..... PSEUDOTSUGA MENZIESII/CAREX GEYERI h.t. .....
12a. Pinus ponderosa present or potentially present..... PINUS PONDEROSA phase
12b. P. ponderosa absent and unable to establish; Symphoricarpos oreophilus or Artemisia tridentata well represented..... SYMPHORICARPOS OREOPHILUS phase
12c. Not as above in 12a or 12b..... CAREX GEYERI phase
12. C. geyeri poorly represented..... 13
13. Juniperus communis well represented..... PSEUDOTSUGA MENZIESII/JUNIPERUS COMMUNIS h.t.
13. J. communis poorly represented..... 14
14. Arnica cordifolia or Astragalus miser well represented or a dominant forb of normally depauperate undergrowths..... PSEUDOTSUGA MENZIESII/ARNICA CORDIFOLIA h.t. .....
14a. Arnica cordifolia well represented..... ARNICA CORDIFOLIA phase
14b. A. cordifolia poorly represented; Astragalus miser well represented ASTRAGALUS MISER phase.....
14. A. cordifolia and A. miser poorly represented or not a dominant forb 15
15. Symphoricarpos oreophilus, Ribes cereum or Prunus virginiana well represented .....PSEUDOTSUGA MENZIESII/SYMPHORICARPOS OREOPHILUS h.t.
15. S. oreophilus, R. cereum and P. virginiana poorly represented 16
16. Festuca idahoensis well represented..... PSEUDOTSUGA MENZIESII/FESTUCA IDAHOENSIS h.t.
16a. Pinus ponderosa present..... PINUS PONDEROSA phase
16b. P. ponderosa absent..... FESTUCA IDAHOENSIS phase
16. F. idahoensis poorly represented; Agropyron spicatum or Melica bulbosa well represented on sites in good condition..... PSEUDOTSUGA MENZIESII/AGROPYRON SPICATUM h.t.

D. Key to Picea engelmannii Habitat Types
1. Equisetum arvense abundant..... PICEA ENGELMANNII/EQUISETUM ARVENSE h.t.*
1. E. arvense not abundant..... 2
2. Carex disperma well represented..... PICEA ENGELMANNII/CAREX DISPERMA h.t. .....
2. C. disperma poorly represented..... 3
3. Galium triflorum, Actaea rubra or Streptopus amplexifolius common either individually or collectively PICEA ENGELMANNII/GALIUM TRIFLORUM h.t.*
3. Not as above, Hypnum revolutum (a prostrate moss) well represented PICEA ENGELMANNII/HYPNUM REVOLUTUM h.t.

E. Key to Abies grandis Habitat Types
1. Clintonia uniflora present..... ABIES GRANDIS/CLINTONIA UNIFLORA h.t.
1. C. uniflora absent..... 2
2. Coptis occidentalis common..... ABIES GRANDIS/COPTIS OCCIDENTALIS h.t.* .....
2. C. occidentalis scarce..... 3
3. Vaccinium caespitosum common..... ABIES GRANDIS/VACCINIUM CAESPITOSUM h.t.

3. V. caespitosum scarce ..... 4. Linnaea borealis common
ABIES GRANDIS/LINNAEA BOREALIS h.t. .....
4a. Xerophyllum tenax common ..... XEROPHYLLUM TENAX phase
4b. X. tenax scarce; vaccinium globulare well represented .... VACCINIUM GLOBULARE phase
4c. Not as above in 4a or 4b ..... LINNAEA BOREALIS phase
4. L. borealis scarce 5
5. Acer glabrum, Physocarpus malvaceus or Holodiscus discolor well represented. If only common then Adenocaulon bicolor or Disporum trachycarpum present ABIES GRANDIS/ACER GLABRUM h.t.
5a. Acer glabrum well represented; if only common then at least more prevalent than Physocarpus and Holodiscus ..... ACER GLABRUM phase
5b. A. glabrum poorly represented and less prevalent than Physocarpus and Holodiscus
PHYSOCARPUS MALVACEUS phase
5. Not as above 6
6. Xerophyllum tenax well represented ..... ABIES GRANDIS/XEROPHYLLUM TENAX h.t.*
6. X. tenax poorly represented 7
7. Vaccinium globulare well represented ..... ABIES GRANDIS/VACCINIUM GLOBULARE h.t.
7. V. globulare poorly represented 8
8. Spiraea betulifolia or Lathyrus nevadensis well represented ABIES GRANDIS/SPIRAEA BETULIFOLIA h.t.
8. S. betulifolia and L. nevadensis poorly requested; Calamagrostis rubescens well represented
ABIES GRANDIS/CALAMAGROSTIS RUBESCENS h.t.

F. Key to Pinus contorta communities1. Calamagrostis canadensis or Ledum glandulosum well represented .....ABIES LASIOCARPA/CALAMAGROSTIS CANADENSIS h.t.
1. C. canadensis and L. glandulosum poorly represented..... 2
2. Streptopus amplexifolius, Senecio triangularis, Ligusticum canbyi orTrautvetteria caroliniensis well represented either individually or collectively
ABIES LASIOCARPA/STREPTOPUS AMPLEXIFOLIUS h.t.
2. Not as above 3
3. Clintonia uniflora present ..... ABIES LASIOCARPA/CLINTONIA UNIFLORA h.t.
3. C. uniflora absent 4
4. Coptis occidentalis common ..... ABIES LASIOCARPA/COPTIS OCCIDENTALIS h.t. ..... or ABIES GRANDIS/COPTIS OCCIDENTALIS h.t. .....
4. C. occidentalis scarce 5
5. Menziesia ferruginea well represented ..... ABIES LASIOCARPA/MENZIESIA FERRUGINEA h.t.
5. M. ferruginea poorly represented 6
6. Vaccinium caespitosum common ..... PINUS CONTORTA/VACCINIUM CAESPITOSUM H.t. .....
6. V. caespitosum scarce 7
7. Linnaea borealis common ..... ABIES LASIOCARPA/LINNAEA BOREALIS h.t. ..... or ABIES GRANDIS/LINNAEA BOREALIS h.t.
7. L. borealis scarce 8
8. Alnus sinuata well represented ..... ABIES LASIOCARPA/ALNUS SINUATA h.t.
8. A. sinuata poorly represented 9
9. Xerophyllum tenax well represented ..... ABIES LASIOCARPA/XEROPHYLLUM TENAX h.t. ..... or ABIES GRANDIS/XEROPHYLLUM TENAX h.t.
9. X. tenax poorly represented 10
10. Vaccinium globulare well represented ..... ABIES LASIOCARPA/VACCINIUM GLOBULARE h.t. ..... or ABIES GRANDIS/VACCINIUM GLOBULARE h.t. .....
10. V. globulare poorly represented 11

11. Spiraea betulifolia well represented ..... ABIES LASIOCARPA/SPIRAEA BETULIFOLIA h.t. ..... or PSEUDOTSUGA MENZIESII/SPIRAEA BETULIFOLIA h.t.
11. S. betulifolia poorly represented 12
12. Luzula hitchcockii common ..... ABIES LASIOCARPA/LUZULA HITCHCOCKII h.t.
12. L. hitchcockii scarce 13
13. Vaccinium scoparium well represented ..... PINUS CONTORTA/VACCINIUM SCOPARIUM h.t.
13. V. scoparium poorly represented 14
14. Calamagrostis rubescens well represented ..... ABIES LASIOCARPA/CALAMAGROSTIS RUBESCENS h.t. ..... or PSEUDOTSUGA MENZIESII/CALAMAGROSTIS RUBESCENS h.t. ....
14. C. rubescens poorly represented 15
15. Carex geyeri well represented ..... PINUS CONTORTA/CAREX GEYERI h.t.
15. C. geyeri poorly represented 16
16. Juniperus communis well represented ..... ABIES LASIOCARPA/JUNIPERUS COMMUNIS h.t. ..... or PSEUDOTSUGA MENZIESII/JUNIPERUS COMMUNIS h.t.
16. J. communis poorly represented 17
17. Arnica cordifolia well represented or the dominant forb of normally depauperate undergrowths .....ABIES LASIOCARPA/ARNICA CORDIFOLIA h.t. ..... or PSEUDOTSUGA MENZIESII/ARNICA CORDIFOLIA h.t.
17. Not as above; Festuca idahoensis common ..... PINUS CONTORTA/FESTUCA IDAHOENSIS h.t.

G. Key to Abies lasiocarpa Habitat Types

1. Caltha biflora common ..... ABIES LASIOCARPA/CALTHA BIFLORA h.t.
1. C. biflora scarce 2
2. Equisetum arvense abundant ..... PICEA ENGELMANNII/EQUISETUM ARVENSE h.t.
2. E. arvense not abundant 3
3. Carex disperma well represented ..... PICEA ENGELMANNII/CAREX DISPERMA h.t.
3. C. disperma poorly represented 4
4. Calamagrostis canadensis or Ledum glandulosum well represented ABIES LASIOCARPA/CALAMAGROSTIS CANADENSIS h.t.
4a. Ledum glandulosum well represented ..... LEDUM GLANDULOSUM phase
4b. Not as above in 4a; Vaccinium caespitosum common..... VACCINIUM CAESPITOSUM phase
4c. Not as above in 4a or 4b; Ligusticum canbyi or Trautvetteria caroliniensis present LIGUSTICUM CANBYI phase
4d. Not as above in 4a, 4b, or 4c ..... CALAMAGROSTIS CANADENSIS phase
4. C. canadensis and L. glandulosum poorly represented..... 5
5. Streptopus amplexifolius, Senecio triangularis, Ligusticum canbyi or Trautvetteria caroliniensis well represented either individually or collectively ..... ABIES LASIOCARPA/STREPTOPUS AMPLEXIFOLIUS h.t.
5a. Ligusticum canbyi or Trautvetteria caroliniensis present... LIGUSTICUM CANBYI phase
5b. L. canbyi and T. caroliniensis absent..... STREPTOPUS AMPLEXIFOLIUS phase
5. Not as above 6
6. Clintonia uniflora present ..... ABIES LASIOCARPA/CLINTONIA UNIFLORA h.t.
6a. Menziesia ferruginea well represented ..... MENZIESIA FERRUGINEA phase
6b. M. ferruginea poorly represented ..... CLINTONIA UNIFLORA phase
6. C. uniflora absent 7
7. Coptis occidentalis common ..... ABIES LASIOCARPA/COPTIS OCCIDENTALIS h.t.
7. C. occidentalis scarce 8
8. Menziesia ferruginea well represented ..... ABIES LASIOCARPA/MENZIESIA FERRUGINEA h.t.

8a. Luzula hitchcockii common ..... LUZULA HITCHCOCKII phase*
8b. L. hitchcockii scarce ..... MENZIESIA FERRUGINEA phase
8. M. ferruginea poorly represented 9
9. Acer glabrum well represented ..... ABIES LASIOCARPA/ACER GLABRUM h.t.
9. A. glabrum poorly represented 10
10. Vaccinium caespitosum common ..... ABIES LASIOCARPA/VACCINIUM CAESPITOSUM h.t.
10. V. caespitosum scarce 11
11. Linnaea borealis common ..... ABIES LASIOCARPA/LINNAEA BOREALIS h.t. .....
11a. Xerophyllum tenax well represented ..... XEROPHYLLUM TENAX phase*
11b. X. tenax poorly represented; Vaccinium scoparium well represented VACCINIUM SCOPARIUM phase
11c. Not as above in 11a or 11b ..... LINNAEA BOREALIS phase
11. L. borealis scarce 12
12. Alnus sinuata well represented ..... ABIES LASIOCARPA/ALNUS SINUATA h.t
12. A. sinuata poorly represented 13
13. Xerophyllum tenax well represented ..... ABIES LASIOCARPA/XEROPHYLLUM TENAX h.t.
13a. Vaccinium globulare or Spiraea betulifolia well represented VACCINIUM GLOBULARE phase
13b. Not as above in 13a; Luzula hitchcockii common ..... LUZULA HITCHCOCKII phase
13c. Not as above in 13a or 13b; Vaccinium scoparium usually abundant VACCINIUM SCOPARIUM phase*
13. X. tenax poorly represented 14
14. Vaccinium globulare well represented ..... ABIES LASIOCARPA/VACCINIUM GLOBULARE h.t. .....
14a. Vaccinium scoparium abundant ..... VACCINIUM SCOPARIUM phase*
14b. V. scoparium not abundant ..... VACCINIUM GLOBULARE phase
14. V. globulare poorly represented 15
15. Spiraea betulifolia well represented ..... ABIES LASIOCARPA/SPIRAEA BETULIFOLIA h.t.
15. S. betulifolia poorly represented 16
16. Luzula hitchcockii common ..... ABIES LASIOCARPA/LUZULA HITCHCOCKII h.t.
16a. Vaccinium scoparium well represented ..... VACCINIUM SCOPARIUM phase
16b. Not as above in 16a, Luzula hitchcockii well represented LUZULA HITCHCOCKII phase
16c. Not as above in 16a or 16b 22
16. L. hitchcockii scarce 17
17. Vaccinium scoparium well represented ..... ABIES LASIOCARPA/VACCINIUM SCOPARIUM h.t.
17a. Calamagrostis rubescens well represented ..... CALAMAGROSTIS RUBESCENS phase
17b. Not as above in 17a; Pinus albicaulis well represented ..PINUS ALBICAULIS phase
17c. Not as above in 17a or 17b ..... VACCINIUM SCOPARIUM phase
17. V. scoparium poorly represented 18
18. Calamagrostis rubescens well represented ..... ABIES LASIOCARPA/CALAMAGROSTIS RUBESCENS h.t.
18. C. rubescens poorly represented 19
19. Carex geyeri well represented ..... ABIES LASIOCARPA/CAREX GEYERI h.t.
19a. Artemisia tridentata well represented ..... ARTEMISIA TRIDENTATA phase
19b. A. tridentata poorly represented ..... CAREX GEYERI phase
19. C. geyeri poorly represented 20
20. Juniperus communis well represented ..... ABIES LASIOCARPA/JUNIPERUS COMMUNIS h.t. .....
20. J. communis poorly represented 21
21. Ribes montigenum well represented or the dominant plant of normally depauperate undergrowths ..... ABIES LASIOCARPA/RIBES MONTIGENUM h.t.
21. Not as above 22

22. Arnica cordifolia well represented or a dominant forb of normally depauperate undergrowths LASIOCARPA/ARNICA CORDIFOLIA h.t. ..... ABIES

22. Not as above; Pinus albicaulis usually well represented and Abies lasiocarpa often stunted ALBICAULIS - ABIES LASIOCARPA h.t. PINUS

APPENDIX IV. SUMMARIES OF SALMONID SURVEYS IN BIG CREEK.

Table 1. Numbers of spring chinook salmon redds counted in upper Big Creek (Jacobs Ladder to Logan Creek) , 1957-1997, excerpted from Elms-Cockrom 1998, and from lower Big Creek (Copper Camp to Monumental Creek pack bridge)1986-1995, Nez Perce Tribe surveys) and 1957-1971 (Idaho Fish & Game Surveys), excerpted from Kucera and Blenden (1998) .

YEAR	REDDS UPPER	REDDS LOWER	YEAR	REDDS UPPER	REDDS LOWER	YEAR	REDDS UPPER	REDDS LOWER
1957	225	535	1971	32	52	1985	70	14
1958	129	338	1972	60		1986	41	26
1959	88	217	1973	96		1987	24	21
1960	155	352	1974	28		1988	93	40
1961	377	160	1975	77		1989	26	11
1962	223	360	1976	22		1990	13	22
1963	148	220	1977	9		1991	12	21
1964	51	121	1978	95		1992	23	22
1965	73	83	1979	15		1993	46	21
1966	123	55	1980	4		1994	2	4
1967	67	94	1981	22		1995	1	1
1968	90	33	1982	7		1996	1	
1969	65	72	1983	27		1997	26	
1970	68	23	1984	42		1998	13	

Table 2. Steelhead and chinook snorkel counts in Big Creek, taken from Hall-Griswold and Petrosky (1998). These are the wild B-run steelhead and the wild spring run chinook numbers per 100 M^2.

			CHINOOK		STEELHEAD		STEELHEAD	
SECTION	LOCATION, ETC.	YEAR	age 0	age 1 parr	age 0 fry	age 1 fry	age 2 parr	age 1,2 parr
L1	200 yds above	86	2.16	0.00	0.00	9.73	6.49	16.22
L1	mouth of Big Cree	87	1.39	0.00	0.00	0.15	0.46	0.61
L1		88	0.98	0.00	0.00	4.26	2.30	6.56
L1		89	3.61	0.00	1.31	1.97	0.00	1.97
L1		90	0.00	0.48	1.45	7.27	4.36	11.63
L1		91	0.33	0.00	0.00	0.00	0.00	0.00
L1		91	0.00	0.00	0.00	1.01	1.01	2.02
L1		92	0.10	0.00	0.41	0.51	0.92	1.43
L1		97	0.00	0.00	0.00	0.47	1.25	1.72
Taylor Ranch vicinity		86	2.15	0.00	0.21	0.07	0.04	0.11
Taylor Ranch vicinity		87	2.10	0.00	0.23	0.02	0.05	0.07
Taylor Ranch vicinity		88	1.92	0.05	3.21	0.09	0.09	0.18
Taylor Ranch vicinity		89	1.40	0.00	2.79	0.29	0.01	0.30
Taylor Ranch vicinity		90	0.21	0.00	1.95	0.33	0.15	0.48
Taylor Ranch vicinity		91	1.13	0.00	1.22	0.32	0.50	0.82
Taylor Ranch vicinity		92	1.39	0.00	2.34	1.66	0.59	2.25
Taylor Ranch vicinity		97	0.05	0.00	0.00	0.00	0.00	0.00
Logan Creek		86	6.94	0.00	1.30	0.33	1.74	2.07
Logan Creek		87	0.74	0.00	0.00	0.00	0.00	0.00
Logan Creek		88	4.40	0.00	1.37	1.86	0.59	2.45
Logan Creek		89	10.12	0.27	0.00	0.27	0.00	0.27
Logan Creek		90	7.76	1.65	0.38	0.76	0.45	1.21
Logan Creek		92	0.00	2.82	0.00	0.00	0.00	0.00
Logan Creek		93	0.74	0.41	9.26	1.23	0.25	1.48
Logan Creek		94	2.97	0.00	0.58	0.00	0.00	0.00
Logan Creek		95	0.00	0.00	0.00	0.46	0.00	0.46
Logan Creek		96	0.82	0.14	0.00	0.14	0.41	0.55
Logan Creek		97	0.13	0.00	0.54	0.00	0.67	0.67
Upper Big Creek		92	15.49	0.43	0.00	0.00	0.00	0.00
Upper Big Creek		93	15.89	2.86	22.62	0.14	0.29	0.43
Upper Big Creek		94	20.73	0.37	0.37	0.37	0.00	0.37
Upper Big Creek		95	0.00	0.00	0.00	0.00	0.00	0.00
Upper Big Creek		96	0.00	0.00	0.19	1.03	0.00	1.03
Upper Big Creek		97	0.48	0.00	0.00	0.10	0.38	0.48

Table 3 . Wild B-run steelhead and wild spring run chinook parr counts, Rush Creek, (Hall-Griswold and Petrosky, 1998).

			CHINOOK		STEELHEAD		
SITE NO.	TRANSECT LOCATION	YEAR	PARR	YRLNG	< 2 INCH	3-5 INCH	6-8 INCH
1	MOUTH OF SHELLROCK CREEK	89	0.00	0.00	0.00	0.00	0.00
1	MOUTH OF SHELLROCK CREEK	90	0.19	0.00	15.65	2.51	0.19
1	MOUTH OF SHELLROCK CREEK	91	0.00	0.00	0.00	0.00	0.48
10	MOUTH OF TELEPHONE CREEK	91	0.00	0.00	1.36	2.53	1.75
11	MOUTH OF SOUTH FORK RUSH CK	91	0.00	0.00	10.14	2.08	1.30
11	MOUTH OF SOUTH FORK RUSH CK	92	1.70	0.00	3.19	1.70	0.43
12	MOUTH WEST FORK RUSH CREEK	91	0.00	0.00	4.29	0.95	0.48
12	MOUTH WEST FORK RUSH CREEK	92	0.15	0.00	0.87	0.73	0.44
2	DOWNSTREAM FROM WEST FORK	91	0.00	0.00	0.88	0.00	0.44
2	DOWNSTREAM FROM WEST FORK	92	0.00	0.00	0.00	0.00	0.00
3	4400 FEET ELEVATION	91	0.00	0.00	0.00	0.31	0.31
3	4400 FEET ELEVATION	92	0.00	0.00	0.00	2.54	1.82
4	DOWNSTREAM FROM SITE 6	91	0.00	0.00	0.00	3.33	1.66
4	DOWNSTREAM FROM SITE 6	92	0.00	0.00	0.00	0.31	0.31
5	DOWNSTREAM FROM SITE 7	91	0.00	0.00	0.71	2.35	1.41
6	MOUTH OF LEWIS CREEK	91	0.00	0.00	4.55	1.20	1.20
7	DOWNSTREAM FROM LEWIS CREEK	91	0.00	0.00	0.00	0.93	0.70
8	AT TAYLOR RANCH DIVERSION	91	0.00	0.00	2.98	1.74	1.74
9	MOUTH OF RUNNING CREEK	91	0.00	0.00	1.64	1.36	1.36
	ABOVE CROSSING	92	0.00	0.00	0.61	0.00	0.31
	ISLAND	92	0.00	0.00	0.52	0.00	0.00
	LOG JAM MIDDLE	92	0.00	0.00	0.00	1.79	1.00
	UPPER R NGE CRE EK	92	0.00	0.00	1.04	2.91	1.45
	MOUTH	92	0.00	0.00	0.00	4.01	0.80
1	SOUTH FORK OF RUSH CREEK	91	0.00	0.00	0.00	0.00	0.65
1	SOUTH FORK OF RUSH CREEK	92	0.00	0.00	0.00	4.44	0.00
	UPPER SOUTH FORK OF RUSH CREE	92	0.00	0.00	0.00	13.26	2.34

Table 4. Snorkel surveys of cutthroat trout and bull trout in the Big Creek drainage, summarized from Hall-Griswold and Petrosky (1998).

			CUTTHROAT TROUT						BULL TROUT						
STRATA	SECTION	YR	0-2 IN	3-5 IN	6-8 IN	9-11 IN	12-14 IN	15-17 IN	18 IN +	0-2 IN	3-5 IN	6-8 IN	9-11 IN	12-14 IN	15-17 IN	18 IN +
LOWER	L1	86	0	0	0	2	2	0	0	0	0	0	0	0	0	0
LOWER	L1	87	0	0	1	1	0	0	0	0	0	0	0	0	0	0
LOWER	L1	88	0	0	2	1	1	0	0	0	0	0	0	0	0	0
LOWER	L1	89	0	0	0	0	1	0	0	0	0	0	0	0	0	0
LOWER	L1	90	0	0	0	3	1	1	0	0	0	0	0	0	0	0
LOWER	L1	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LOWER	L1	91	0	1	5	1	0	0	0	0	0	0	0	0	0	0
LOWER	L1	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LOWER	L1	97	0	0	2	1	0	0	0	0	0	0	0	0	0	0
MIDDLE	TAYLOR 1	86	0	0	0	10	23	22	5	0	0	0	4	6	9	9
MIDDLE	TAYLOR 1	87	0	0	1	5	23	13	0	0	0	0	0	7	14	6
MIDDLE	TAYLOR 1	88	0	1	1	6	33	28	6	0	0	0	0	3	2	3
MIDDLE	TAYLOR 1	89	0	0	4	12	31	42	0	0	0	0	0	2	7	3
MIDDLE	TAYLOR 1	90	0	0	0	11	37	31	2	0	0	0	0	3	2	1
MIDDLE	TAYLOR 1	91	0	0	0	8	16	12	0	0	0	0	0	0	2	0
MIDDLE	TAYLOR 1	92	0	0	0	6	36	21	0	0	0	2	2	1	0	1
MIDDLE	TAYLOR 1	97	0	0	6	4	3	3	0	0	0	0	0	0	0	0
MOUTH	CABIN CR	87	0	0	0	0	1	0	0	0	0	0	1	0	0	0
MOUTH	CABIN CR	92	0	0	5	7	4	0	0	0	0	0	0	0	0	0
MOUTH	CABIN CR	95	0	0	2	3	9	7	0	0	0	0	0	0	0	0
UPPER	LOGAN CR	86	0	1	5	4	1	0	0	0	0	0	0	0	0	0
UPPER	LOGAN CR	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UPPER	LOGAN CR	88	0	0	0	0	0	0	0	0	0	1	0	0	0	0
UPPER	LOGAN CR	89	112	15	0	0	0	0	0	0	0	0	0	0	0	0
UPPER	LOGAN CR	90	12	21	11	1	0	0	0	0	0	0	0	0	0	0
UPPER	LOGAN CR	92	0	0	0	0	1	0	0	0	0	0	0	0	0	0
UPPER	LOGAN CR	93	0	0	1	0	0	0	1	0	0	0	0	0	0	0
UPPER	LOGAN CR	94	0	0	0	0	1	0	0	3	0	0	0	0	0	0
UPPER	LOGAN CR	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UPPER	LOGAN CR	96	0	0	0	1	1	0	0	0	0	0	0	0	0	0
UPPER	LOGAN CR	97	0	0	0	0	0	0	0	0	1	2	0	0	0	0
UPPER	NEAR FORD	92	0	9	0	0	0	0	0	0	0	0	0	0	0	0
UPPER	NEAR FORD	93	0	0	0	0	0	0	0	0	0	2	0	0	0	0
UPPER	NEAR FORD	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UPPER	NEAR FORD	95	0	0	0	1	0	0	0	0	0	0	0	0	0	0
UPPER	NEAR FORD	96	0	0	0	0	0	0	0	0	0	1	0	0	0	0
UPPER	NEAR FORD	97	0	1	1	0	1	0	0	0	0	1	0	1	0	0

Hall-Griswold, J.A. and C.E. Petrosky. 1998. Idaho habitat/natural production monitoring, Part 1, general monitoring subproject annual report 1996. Project 91-73. U.S. Dep. Energy, Bonneville Power Administration, Division of Fish and Wildlife. (in prep)

Hassemer, P.F. 1993. Salmon spawning ground surveys, 1989-1992. Idaho Fish & Game Dept. Project F-73-R-15. Boise.

Hauck, F.R. 1951. An aerial survey of chinook spawning utilization on the Salmon River drainage. Idaho Dept. Fish & Game Project F-1-R-1. Boise.

Hayward, G.D. and E.O. Garton. 1988. Resource partitioning among forest owls in the River of No Return Wilderness, Idaho. Oecologia 75:253-265.

Hendee, J.C., J.J. Yeo, V. LaSalle, and J. Akenson 1993. The University of Idaho Taylor Ranch Wilderness Field Station. University of Idaho Forest, Wildlife and Range Experiment Station Misc. Publ.15. 37pp.

Herrmann, R. and S.P. Bratton 1977. Great Smoky Mountains National Park as a biosphere reserve: a research/monitoring perspective. USDI National Park Serv. Research/Resources Management Rep. 23. 38pp.

Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster. 1994. Measuring and monitoring biological diversity Standard methods for amphibians. Smithsonian Institution Press, Washington, D.C. 364pp.

Hironaka, M., M.A. Fosberg, and A.N. Winward. 1983. Sagebrush grass habitat types in southern Idaho. Univ. Idaho Forest, Wildlife, and Range Expt. Sta. Bull. 35. 44pp.

Hornocker, M.G. 1970. An analysis of mountain lion predation upon mule deer and elk in the Idaho Primitive Area. Wildl. Monogr. 21. 39pp.

Hornocker, M.G. 1971. Suggestions for the management of mountain lions as trophy species in the Intermountain Region. Proc. Western Association of State Game and Fish Commissioners 51: 399-402.

Hornocker, M and T Bailey 1986. Natural regulation in three species of felids. pp 211-220 in SD Miller and DD Everett, eds. Cats of the World: biology, conservation, and management. National Wildlife Federation, Washington, DC.

Houston, D.B. 1971. Ecosystems in National Parks. Science 172: 648-651.

Idso, S.B. 1998. CO_2-induced global warming: a skeptic's view of potential climate change. Climate Research 10: 69-82.

Jaworski, M.D., A.C.S. Ward, D.L. Hunter, and I. V. Wesley. 1993. Use of DNA analysis of Pasteurella haemolytica biotype T isolates to monitor transmission in bighorn sheep (Ovis canadensis canadensis) J. Clinical Microbiology 31: 831-835.

Jenny, H. 1941. Factors of soil formation. McGraw-Hill, New York.

Johnson, J.L., J.F. Franklin and R.G. Krebill 1984. Research Natural Areas: baseline monitoring and management. USDA For. Serv. Gen. Tech. Rep. INT-173. 84pp.

Johnson, K.L. 1986. Sagebrush over time: a photographic study of rangeland change. In E.D. McArthur and B.L. Welch, compilers. Proceedings-symposium on the biology of Artemisia and Chrysothamnus. USDA For. Serv. Gen. Tech. Rep. INT-200. Pp223-252

Koehler G.M. 1989. Demography of a low productivity bobcat population. J. Wildl. Manage. 53:197-202.

Kucera, P.A. and M.L. Blenden. 1998. Summary report of 1997 project activities relating to threatened chinook salmon populations listered under the endangered species act. Nez Perce Tribe, Dept. Fisheries Resources Management, Lapwai, Id.

Lancia, R.A., J.D. Nichols, and K.H. Pollock. 1994. Estimating the number of animals in wildlife populations. Chapter 9, pp 215-253 in T.A. Bookhout, ed. Research and management techniques for wildlife and habitats. The Wildlife Society, Bethesda, MD.

Larson, K. and C. Lovely 1972. Idaho Primitive Area study: soil and water resource inventory. U.S. Dep. Agriculture, 105 pp.

Leonhardy, F.C. 1985. Archaeological excavations in the River of No Return Wilderness area. Unpubl., presented at the NW Anthropological meetings. On file, University of Idaho Wilderness Research Center, Moscow, Idaho 6pp.

Leopold, A. 1941. Wilderness as a land laboratory. The Living Wilderness 6: 3.

Likens, G. 1992. An ecosystem approach: its use and abuse. Ecology Institute, Oldendorf/Luhe, Germany

Lindroth, R.L., K.K. Kinney, and C.L. Platz. 1993. Responses of deciduous trees to elevated atmospheric CO2: productivity, phytochemistry, and insect performance. Ecology 74: 763-777.

Lindzey, F.G. 1987. Mountain lion. pp 658-668 in Wild furbearer management and conservation in North America. Ontario Ministry Natrual Resources, Toronto.

Long, S.P. and P.R. Hutchin 1991. Primary production in grasslands and coniferous forests with climate change: an overview. Ecol. Appl. 1: 139-156.

Madany,M.H. and N.E. West 1983. Livestock grazing-fire regime interactions within montane forests of Zion National Park, Utah. Ecology 64: 661-667.

Mallet, J.L. 1963. The life history and seasonal movements of cutthroat trout in the Salmon River, Idaho. Univ. Idaho, MS thesis, Moscow.

Marshall, J.D. and J. Zhang. 1994. Carbon isotope discrimination and water use efficiency in native plants of the north-central Rockies. Ecology 75: 1887-1895.

Martin, S.C. and R.M. Turner 1977. Vegetation change in the Sonoran Desert region, Arizona and Sonora. J. Ariz. Acad. Sci. 12: 59-69.

McIntosh, B.A., J.R. Sedell, R.F. Thurow, S.E. Clarke, and G.L. Chandler. Historical changes in pool habitats in the Columbia River basin. Ecol Appl. (In press)

Minshall, W.W., and C.T. Robinson. 1998. Macroinvertebrate community structure in relation to measures of lotic habitat heterogeneity. Arch. Hydrobiol. 141: 129-151.

Mueggler, W.F. and W.L. Stewart. 1980. Grassland and shrubland habitat types in western Montana. USDA Forest Serv. Gen. Tech. Bull INT-66. 154 pp.

Nelson, R.L., L.J. Wagoner, D.C. Burns, J. Lund, and M. Faurot. 1996. Deposition of fine sediment in selected streams on the Payette National Forest, Idaho. Payette National Forest, McCall, ID 146 pp.

Noss, R.F. 1990. Indicators for monitoring biodiversity: a hierarchical approach. Conservation Biology 4: 355-364.

Overton, C.K., S.P. Wollrab, B.C. Roberts, and M.A. Radko. 1997. R1/R4 (Northern/Intermountain Regions) fish and fish habitat standard inventory procedures handbook. USDA For. Serv. Gen. Tech. Rep. INT-GTR-346. 73pp.

Pearson, L.C. 1975. Daily and seasonal patterns in photosynthesis in Artemesia tridentata. J. Idaho Acad. Sci 11:11-19

Peek, J.M. 1990 Ungulate populations and species diversity pp 297-303 *in* 17th Natural Areas Conference and Yosemite Centennial Symposium Proceedings.

Peine, J.D., C. Pyle, and P.S. White 1985. Environmental monitoring and baseline data management strategies and the focus of future research in Great Smoky Mountains National Park. USDI National Park Service Research/Resources Management Rep. SER-76. 114pp.

Pelton, M.R. and F.T. van Manen 1996. Benefits and pitfalls of long-term research: a case study of black bears in Great Smoky Mountains National Park. Wildlife Society Bulletin 24: 443-450.

Polley,H.W. 1997. Implications of rising atmospheric carbon dioxide concentration for rangelands. J. Range Manage. 50:561-577.

Post, E, N.C. Stenseth, R. Langvatn, and J-M. Fromentin. 1997. Global climate change and phenotypic variation among red deer cohorts. Proc. Royal Soc. London B 264: 1317-1324.

Quigley, H.B., G.M. Koehler, and M.G. Hornocker. 1989. Dynamics of a mountain lion in central Idaho over a 20-year period (abstract). Page 54 in R.H. Smith ed. Proc. 3rd mountain lion workshop, Prescott, Arizona.

Ralph, C.J., J. R. Sauer, and S. Droege. 1995. Monitoring bird populations by point counts. USDA For. Serv. Gen. Tech. Rep. PSW-GTR-149. 187 pp.

Ralm, G. and K. Larson. 1972. Land characteristics and soils and hydrological evaluation. USDA Forest Service, Intermountain Experiment Station, Ogden, UT 135 pp.

Ramsey, F. L. and J. M. Scott. 1981. Analysis of bird survey data using a modification of Emlen's method. in Estimating numbers of terrestrial birds. Studies in Avian Biology 6. pp 483-487.

Rich, W.H. 1948. A survey of the Colmbia River and its tributaries with special reference to the management of its fishery resources. USDI Fish & Wildl. Serv. Spec. Sci. Rept. 51. Washington, D.C.

Risser, P.G. and K.D. Cornelison. 1979. Man and the Biosphere. University of Oklahoma Press, Norman, OK. 109pp

Robbins, C.S., D. Bystrak, and P.H. Geissler 1986. The breeding bird survey: its first fifteen years, 1965-1979. US Fish and Wildlife Service Resource Publication 157. 196pp.

Robbins, C.S., J.R. Sauer, and B.G. Peterjohn. 1992. Population trends and management opportunities for neotropical migrants. Pp 17-23 in *D.*M. Finch and P.W. Stangel, eds. Status and management of neotropical migratory birds. USDA For. Serv. Gen. Tech. Rep. RM-229.

Robinson, W.B. 1953. Population trends of predators and fur animals in 1080 station areas. Jour. Mammal. 34: 220-227.

Ross, C.P. 1937. Geology and ore deposites of the Bayhorse region, Custer County, Idaho. USDI Geol. Surv. Bull. 877. 161 pp.

Ross, S., and C. Savage. 1967. Idaho earth science. Idaho Bureau of Mines and Geology, Earth Sci. Ser. No. 1. 271 pp.

Scott, C.T. 1998. Sampling methods for estimating change in forest resources. Ecol. Appl. 8: 228-233.

Silsbee, D.G. and D.L. Peterson 1992. Planning for implementation of long-term resource monitoring programs. Environmental Monitoring and Assessment 10:1-10.

Smith, B.L., and R.L. Robbins. 1994. Migration and management of the Jackson elk herd. USDI Nat. Biol. Serv. Res. Publ. 199. 61pp.

Society of American Foresters 1988. Statement of William H. Banzhaf, Society of American Foresters, before the Subcommittee on Parks and Public Lands, Committee on Interior and Insular Affairs, U.S. House of Representatives on The USDA Forest Service's Wilderness Management Program, 6 July 1988. 6 pp. Washington, D.C.

St. Omer, L. and S.H. Horvath. 1983. Elevated carbon dioxide concentrations and whole plant senescence. Ecology 64: 1311-1314.

Steele, R, R.D. Pfister, R.A. Ryker, and J.A. Kittams. 1981. Forest habitat types of central Idaho. USDA Forest Service Gen. Tech. Rep. INT-114. 138 pp

Strain, B.R. 1969. Seasonal adaptations in photosynthesis and respiration in four desert shrubs growing in situ. Ecology 50: 511-513.

The Wilderness Society 1989. The National Wilderness Preservation System 1964-1989. The Wilderness Society, Washington, D.C. (map)

Thomas, F.S. 1988. Mountain sheep and mountain sheep hunters. M.S. Thesis, University of Idaho,Moscow. 96pp.

Thurow, R. 1982. Middle Fork Salmon River fisheries investigations. Idaho Dep. Fish and Game Job Progress Rep. Projec F-73-R-5. Boise.

Thurow, R. 1983. Middle Fork Salmon River fisheries investigations. Idaho Dep. Fish and Game Job Progress Report Project F-73-R-5. Boise

Thurow, R. 1984. Wild steelhead trout populations in Idaho. Pp 38-40 In F. Richardson and R.H. Hamre, Eds. Proceedings of the symposium. Wild Trout III. Yellowstone National Park, WY.

Thurow, R. 1985. Middle Fork Salmon River fisheries investigations. Idaho Dept. Fish and Game Job Completion Report Project F-73-R-6. Boise.

Thurow, R.F. 1987. Use of catch and release regulations to aid restoration of wild steelhead trout in Idaho. Pp 157-167 in R.A. Barnhart, and T.D. Roelofs, eds. Symposium on catch-and-release fishing: a decade of experience. Humboldt State University, Arcata, CA.

Thurow, R.F. 1994. Underwater methods for study of salmonids in the intermountain west. USDA For. Serv. Gen. Tech. Rep. INT-GTR-307. 28 pp.

Thurow, T.L. and S.R. Peterson. 1978. A preliminary survey of raptorial birds in the Idaho Primitive Area. Idaho Forest, Wildlife and Range Expt. Sta. Note No. 31. 5pp.

Tisdale, E,W, 1969. The sagebrush region in Idaho. A problem in range resource management. Univ. Idaho Agric. Exp. Sta. Bull 512. 15 pp.

Tisdale, E.W. 1986. Canyon grasslands and associated shrublands of west-central Idaho and adjacent areas. Univ. Idaho Forest, Wildlife, and Range Expt. Sta Bull 40. 42 pp.

Tisdale, E.W., M. Hironaka, and M.A. Fosberg. 1965. An area of pristine vegetation in the Craters of the Moon National Monument, Idaho. Ecology 46: 349-352.

US Dep of Energy. 1996. Hanford's biological resources: management by level of concern. Chapter 4. in *H*anford Site Biological Resources Management Plan, DOE/RL 96-32. Richland, WA

U.S. Forest Service. 1998. Frank Church-River of No Return Wilderness Draft Environmental Impact Statement. Salmon Idaho.

Vitousek, P.M. 1994. Beyond global warming: ecology and global change. Ecology 75: 1861-1876.
Vora, R.S. 1997 Developing programs to monitor ecosystem health and effectiveness of management practices on lakes states national forests, USA. Biol. Cons 80: 289-302.

APPENDIX III. BIBLIOGRAPHY OF REPORTS AND PUBLICATIONS FROM TAYLOR RANCH.

Akenson, H.A. 1992. Spatial relationships and behavior of bighorn sheep sharing a winter range with mule deer and elk in central Idaho. MS Thesis, University of Idaho, Moscow. 75pp.

Akenson, H.A. 1999. Predicting summer lamb mortality in free ranging bighorn sheep. Bienn. Symp. Northern Wild Sheep and Goat Council 11 (in press)/

Akenson, J. J. and H. A. Akenson. 1986. Selected journal entries. Idaho The University 4(2):18-20.

Akenson, J.J. 1992. A Century of Taylor Ranch history. Mss. on file. University of Idaho Wilderness Research Center, Moscow, Idaho. 40pp.

Akenson, J.J. and H.A. Akenson 1992. Bighorn sheep movements and summer lamb mortality in central Idaho. Bienn. Symp. Northern Wild Sheep and Goat Council 8: 14-27.

Anderson, S.J. 1976. The ecology of pocket gophers in a wilderness environment. Unpubl. Wilderness Res. Center, Univ. Idaho, Moscow. 52pp.

Anonymous. 1987. Competition among mountain lions, bobcats, and coyotes in the River of No Return Wilderness. Unpubl., Wildl. Res. Inst., Moscow.

Bender, J. 1980. A preliminary survey of the rattlesnake (*Crotalus viridis)* in the Idaho Primitive Area. Wilderness Research Center, University of Idaho, Moscow. 13pp.

Bloedel, E.E., A. Bolle, W.J. Briggle, B. Christie, A. Elser, M. Frome, J.M. Kelly, E.E. Krumpe, M. Miller, M. Plenert, and R. Williams. (n.d.). Wilderness management-a five-year action program. Unpubl., University of Idaho, Moscow. 12pp.

Bordenave, P. 1980. Soil relationships of the Taylor Ranch and vicinity. Unpubl. Wilderness Res. Center, Univ. Idaho, Moscow. 20pp. plus photographs.

Brown, W.C. 1968. The Sheepeater campaign. Idaho County Free Press. Grangeville, ID 29pp. (originally published in: Idaho Historical Society. Tenth Biennial Report. Boise. 1926)

Buettner, E.W. 1987. Ecology of selected streams in the Frank Church River of No Return Wilderness. M.S. Thesis, Univ. Idaho, Moscow. 69pp.

Claar, J.J. 1973. Correlations of ungulate food habits and winter range conditions in the Idaho Primitive Area. M.S. Thesis, University of Idaho, Moscow. 85pp.

Elliot, C.L. 1975. The effect of altitude upon various physical and reproductive factors in a population of P*eromyscus maniculatus.* Unpubl., Wilderness Res. Cent., Univ. Idaho, Moscow. 16pp.

Elliot, C.L. 1977. Easternmost record of the band-tailed pigeon in Idaho. West. Birds 8:107.Elliot, C.L. 1978. Cannibalism exhibited by the Columbian ground squirrel. J. Idaho Acad. Sci. 14:51-52.

Elliot, C.L. 1979. Seasonal home range of a colony of Columbian ground squirrels in the Idaho Primitive Area. J. Idaho Acad. Sci. 15:53-55.

Elliot, C.L. 1980. Ecology of Columbian ground squirrels in the Idaho Primitive Area. M.S. Thesis, Brigham Young Univ., Provo, UT. 100pp.

Garton, E.O., P.H. Hayward and G.D. Hayward. 1989. Management of Prey Habitats and Populations. Pages 298-304 in Proceedings Western Raptor Management Symposium. National Wildlife Federation, Washington, D.C.

Haley, K. 1979. Beaver distribution, abundance and habitat characteristics along Big Creek drainage, Idaho Primitive Area. Unpubl., Wilderness Res. Cent., Univ. Idaho, Moscow. 23pp.

Hartung, J.W. 1978. Documentation of historical resources in the Idaho Primitive Area, Big Creek drainage. M.S. Thesis, Univ. Idaho, Moscow. 161pp.

Hartung, J.W. 1978. Documentation of historical resources in the Idaho Primitive Area, Big Creek drainage. M.S. Thesis, University of Idaho, Moscow. 162pp.

Hayward, G.D. 1983. Resource partitioning among six forest owls in the River of No Return Wilderness, Idaho. M.S. Thesis, University of Idaho, Moscow. 132pp.

Hayward, G.D. 1986. Activity pattern of a pair of nesting flammulated owls (O*tus flammeolus)* in Idaho. Northwest Sci. 60:141-144.

Hayward, G.D. 1987. Betalights: An aid in the nocturnal study of owl foraging habitat and behavior. J. Raptor Res. 21:98-102.

Hayward, G.D. 1989. Habitat use and population biology of boreal owls in the northern Rocky Mountains. Ph.D. Dissertation, University of Idaho, Moscow. 113pp.

Hayward, G.D. and E.O. Garton. 1983. First Nesting Record for Boreal Owl in Idaho. Condor 85:501.

Hayward, G.D. and E.O. Garton. 1984. Roost Habitat Selection by Three Small Forest Owls. Wilson Bulletin 96(4) 690-692.

Hayward, G.D. and E.O. Garton. 1988. Resource partitioning among forest owls in the River of No Return Wilderness, Idaho. Oecologia (75):253-265.

Hayward, G.D., P.H. Hayward and E.O. Garton. 1987. Movements and Home Range Use by Boreal Owls in Central Idaho. Pages 175-184 in Proceedings - Northern Forest Owl Symposium, Winnipeg, Manitoba.

Hayward, G.D., P.H. Hayward, E.O. Garton and R. Escano. 1987. Revised breeding distribution of the Boreal Owl in the northern Rocky Mountains. Condor 89:431-432.

Hayward, G.D., P.H. Hayward and E.O. Garton. 1993. Habitat use and population biology of boreal owls in the northern Rocky Mountains. Wildlife Monographs 124 59 pp.

Hayward, P.H. and G.D. Hayward. 1989. Lone ranger of the Rockies. Natural History 98(11):78-85.

Hendee, J.C. 1989. A futures agenda for wilderness in the natural resource professions. Proceedings, Society of American Foresters Annual Convention, Spokane, 1989.

Hendee, J.C., C. Schoenfeld, and J.M. Peek. 1981. Wilderness Wildlife: research opportunities and limitations in designated wilderness areas of the United States. IUFRO World For. Congress, Kyoto, Japan. 11pp.

Hornocker, M.G. 1967. An analysis of mountain lion predation upon mule deer and elk in the Idaho Primitive Area. Wildl. Monogr. 21. 39pp.

Hornocker, M.G. 1967. An analysis of mountain lion predation upon mule deer and elk in the Idaho Primitive Area. Ph.D. Thesis, Univ. British Columbia, Vancouver, B.C. 115pp.

Hornocker, M.G. 1969. Winter territoriality in mountain lions. J. Wildl. Manage. 33:457-464.

Hornocker, M.G. 1969. Defensive behavior in female bighorn sheep. J. Mammalogy 50:128.

Hornocker, M.G. November, 1969. Stalking the mountain lion to save him. National Geographic 136(5):638-655.

Hornocker, M.G. 1970. An analysis of mountain lion predation upon mule deer and elk in the Idaho Primitive Area. Wildl. Monogr. 21. 39pp.

Hornocker, M.G. 1971. Suggestions for the management of mountain lions as trophy species in the Intermountain Region. Proc. Ann. West. Assoc. State Game & Fish Commissioners. 51:399-402.

Hornocker, M.G. and W.V. Wiles. 1972. Immobilizing pumas, Fe*lis concolor,* with phencyclidine hydrochloride. Intl. Zoo Yearbook 12:220-222.

Hornocker, M.G., J.J. Craighead, and E.W. Pfeiffer. 1965. Immobilizing mountain lions with succinylcholine chloride and pentobarbital sodium. J. Wildl. Manage. 29:880-883.

Koehler, G.M. 1987. Demography of a low productivity bobcat population. Ph.D. Diss., Univ. Idaho, Moscow, 32pp.

Koehler, G.M. 1988. Bobcat bill of fare. Natural History 97(12):48-57.

Koehler, G.M. and M. G. Hornocker. 1989. Demography of a low productivity bobcat population. Journal of Wildlife Management 53:197-202.

Koehler, G.M and M.G. Hornocker. 1991. Seasonal resource use among mountain lions, bobcats, and coyotes. Jour. Mamm. 72:391-396.

Koehler, G.M. and M. G. Hornocker. 1989. Influences of seasons on bobcats in Idaho. Jour. Wildl. Manage. 53: 197-202.

Krumpe, E.E. 1985. Wilderness monitoring. Wilderness Research Center, University of Idaho, Moscow, ID. 33pp.

Krumpe, E.E. 1990. A legacy of wilderness management: a link between two national wilderness management conferences. Pages 34-37 in D. W. Lime (ed.), Managing America's enduring wilderness resource. Conference Proceedings. Minneapolis, MN, Sept. 11-17, 1989.

Leonhardy, F. 1983. The late Quaternary alluvial chronology of the Middle Fork of the Salmon River: First approximation. Unpubl., Laboratory of Anthropology, Univ. Idaho, Moscow. 17pp.

Leonhardy, F.C. 1985. Archaeological excavations in the River of No Return Wilderness area. Unpubl., presented at the NW Anthropological meetings. On file, University of Idaho Wilderness Research Center, Moscow, Idaho 6pp.

Leonhardy, F. and F.S. Thomas. 1985. Archeological excavations in the River of No Return Wilderness area. Unpubl., presented NW Anthropological Meetings, Ellensburg, WA, March, 1985. 6pp.

Lombardi, L. 1979. A survey of yellow-bellied marmot colonies in the Big Creek drainage with a special reference to behavior. Unpubl., Wilderness Res. Cent., Univ. Idaho, Moscow. 11pp.

Merigliano, L.L. 1987. The identification and evaluation of indicators to monitor wilderness conditions. M.S. Thesis, University of Idaho, Moscow. 273pp.

Merigliano, L.L. 1989. Indicators to monitor the wilderness recreation experience. Pages 156-162 in D. W. Lime (ed), Managing America's enduring wilderness resource. Conference proceedings, Minneapolis, MN, Sept. 11-17, 1989.

Merigliano, L.L. and E.E. Krumpe. 1986. Scientists identify, evaluate indicators to monitor wilderness conditions. Park Science 6(3):19-20.

Moors, D.P. 1989. Testing the limits: have we gone too far? Idaho The University 7(2):16-21. [Soviet visit to Taylor Ranch]

Movius, A. 1991. 248th Mountain cabin movers. Pages 18-19 in Field Strip XI(2) Winter 1990-91, Idaho National Guard.

Peck, S.A. 1977. Habitat influences on the weight cycle of the Columbian ground squirrel. Unpubl.,Wilderness Res. Cent., Univ. Idaho, Moscow. 21pp

Peek, J.M. 1988. Vegetation studies in the Middle Fork, Salmon River, June 1988. Unpubl. report. Dept. Fish & Wildlife Resources, University of Idaho, Moscow. 27pp.

Pritchett, J. 1986. UI anthropologist tracks Idaho's shadowy people. Idaho The University 4(2):16-17.

Quigley, H., G.M. Koehler, and M.G. Hornocker. 1987. Mountain lion population dynamics over a 20-year period on Big Creek in central Idaho. Unpubl. report; Wildl. Res. Inst., University of Idaho,Moscow.

Rich, B.A., R.J. Scully, and C.E. Petrosky. 1992. Idaho habitat/natural production monitoring. Part 1,General Monitoring Subproject. Annual Report, 1990. Idaho Dept. of Fish and Game. Bonneville Power Administration Contract DE-A179-84BP13381. Project 83-7.

Robberts, R.L. 1983. The Sheepeater campaign: an archaeological perspective. Weber State College.

Savage, G. 1986. Taylor Ranch: UI's unique wilderness resource. Idaho The University 4(2):13-21.

Seidensticker, J.C. 1973. Mountain lion social organization in the Idaho Primitive Area. Ph.D. Dissertation, University of Idaho, Moscow. 146pp.

Seidensticker, J.C. and R.E. Welch (compilers). 1972. The birds of Big Creek and Chamberlain Basin, Idaho Primitive Area. Unpubl. USDA For. Serv., Payette Natl. For., McCall, Id. 3pp.

Seidensticker, J.C., M.G. Hornocker, R.R. Knight, and S.L. Judd. 1970. Equipment and techniques for radiotracking mountain lions and elk. Univ. Idaho For., Wildl. and Range Exp. Stn. Bull. No. 6. 20pp.

Seidensticker, J.C., M.G. Hornocker, W.V. Wiles, and J.P. Messick. 1973. Mountain lion social organization in the Idaho Primitive Area. Wildl. Monogr. 35. 60pp.

Steuter, A.A. 1975. Some aspects of blue grouse, D*endragapus obscurus,* summer ecology in the Idaho Primitive Area. Wilderness Research Center, University of Idaho, Moscow. 24pp.

Steuter, A.A. 1976. Modeling of some aspects of a blue grouse population. Wilderness Research Center, University of Idaho, Moscow. 11pp.

Tank, S.L. 1983. A winter passerine ecology study in the River of No Return Wilderness, central Idaho. M.S. Thesis, Univ. Idaho, Moscow. 70pp.

Tank, S.L. and W.B. Sidle. 1986. Habitat relationships of wintering passerines in the River of No Return Wilderness area of central Idaho. Northwest Sci. 60(4):238-242.

Thomas, F.S. 1988. Mountain sheep and mountain sheep hunters. M.S. Thesis, University of Idaho,Moscow. 96pp.

Thornburgh, D.A. 1976. Potential natural vegetation of the Taylor Ranch and vicinity. Unpubl., Wilderness Res. Cent., Univ. Idaho, Moscow. 31pp.

Thurow, T.L. 1977. Raptor populations and nesting season ranges in the Idaho Primitive Area. Unpubl., Wilderness Res. Cent., Univ. Idaho, Moscow. 13pp.

Thurow, T.L. 1978. An ecological and taxonomic investigation of P*eromyscus maniculatus serratus* in Idaho. Great Basin Nat. 38:469-472.

Thurow, T.L. and S.R. Peterson. 1978. A preliminary survey of raptorial birds in the Idaho Primitive Area. Idaho For., Wildl. and Range Expt. Sta. Note No. 31. 5pp

University of Idaho. 1988. Management Plan for the UI Wilderness Research Center and Taylor Ranch Wilderness Field Station. 29pp.

U.S. Public Law 88-577. Wilderness Act. Act of September 3, 1964. 78 Stat. 890.

U.S. Public Law 96-312. Central Idaho Wilderness Act of 1980. Act of July 23, 1980. 94 Stat. 948.
Wynne, K.M. 1978. An investigation of lungworm infestation and intermediate host presence of two bighorn sheep ranges of central Idaho. Unpubl., Wilderness Res. Cent., Univ. Idaho, Moscow. 15pp.