SIXTH ANNUAL REPORT

Forest Wildlife and Range Experiment Station

For The Fiscal Year

1953 - 1954

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September 1954

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INTRODUCTION

The fiscal year 1953-54 was one of definite progress and accomplishment for the Station. Thirty-seven projects, covering a great variety of subjects in Forest, Range, Wildlife and Fisheries Management were in active progress. These projects covered every major division of the state and almost every division of wild land management problems. Progress made in these studies is noted in this report and is evidenced also by numerous publications, press and radio releases, and appearances before various groups.

The staff available for Station work consisted of two men on full time research, together with a varying portion of the time of all other staff members (13). In addition, considerable manpower was contributed by graduate students, particularly by the ten research fellows who participated directly in station project research. Available research manpower for the Station was decreased by the loss of one position, on the occasion of Dean Jeffers' retirement and his replacement from within the staff. In addition, two men, Ferrell and Hubert, were transferred from full time research to academic positions having teaching as well as research duties. The death of Dr. Hubert at the close of the year took from the Station an illustrious and devoted scientist who contributed greatly, both in his earlier years on the staff, and again since his return in 1947.

This Sixth Annual Report differs somewhat from the Fifth Annual Report in which detailed information was given for each project and for staff activities. The emphasis this year has been placed on research accomplishments. The material is presented under four main headings, as follows: 1) Summary of projects and status, 2) Work accomplishments, 3) Evaluation and comments and, 4) List of publications.

I. SUMMARY OF FWR EXPERIMENT STATION PROJECTS 1953-54

No.	Title(Abbreviated)	Started	Present Status	Personnel
	A - FOREST MANAGEMENT AND UTILIZATION			
E.S. 1	Wood Preservation Service Tests	1946	Cont. Act.	Hubert,Ellis,Wohletz
E.S. 2	Slash Bibliography	1952	Completed	Sullivan, Seale,Olson
E.S. 3	White Pine Stem Anatomy	1953	New Act.	Johnson
E.S. 4	High Frequency Current Seed Treatments	1952	Cont. Act.	Pitkin
E.S. 5	Chemical Debarking of Trees	1952	Cont. Act.	Hubert,Ellis
E.S. 6	Idaho Tree Diseases	1950	" "	Hubert,Slipp
E.S. 13	For. Mgt. Studies on the College Forest	1951	" "	Deters
E.S. 14	Growth and Yield in White Pine	1951	" "	Deters,Gillette
E.S. 17	Photomicrography of Native Woods	1952	" "	Ellis
E.S. 18	Spectrochemical Analysis of Idaho Trees	1952	" "	Ellis
E.S. 19	Christmas Tree Test Plantings	1953	New "	Pitkin
F.P. 1	Forest Pathology Herbarium	1937	" "	Slipp
F.P. 2	Forest Pathology Stock Culture	1937	" "	Slipp
F.P. 3	White Pine Blister Rust Study	1940	" "	Slipp
S.R. 11	Mortality of Young White Pine	1948	Cont. "	Hubert,Ferrell,Johnson
S.R. 11b	AEC Forest Tree Physiology	1951	" "	Ferrell, Johnson,Hubert
S.R. 24	Slash Disposal Study	1949	" "	Olson,Sullivan,Ferrell Hubert
C.F. 4	Ratio of Foliage to Branchwood	1952	Completed	Sullivan,Seale,Olson
C.F. 5	Time and Cost Study in Logging	1953	"	Deters,Anderson
	B - RANGE MANAGEMENT			
E.S. 7	Evaluation of salt-desert ranges	1951	Cont. Act.	Sharp
E.S. 7a	Testing Methods for Condition and Trend	1951	Completed	Sharp
E.S. 8	Study of Medusa-head Rye	1950	Cont. Act.	Sharp,Tisdale
E.S. 9	Ecology and Product of Sagebrush Ranges	1949	" "	Tisdale, Sharp
E.S. 10	Ecology of Douglas-Fir Zone in B.C.	1935	" "	Tisdale
E.S. 11	Sheep Grazing on cut-over White Pine Areas	1939	" Inact.	Tisdale
E.S. 12	Range Reseeding with Pelletized Seed	1948	Completed	Tisdale
E.S. 15	Ecology and Control of Halogeton	1950	Cont. Act.	Tisdale,Holl

B - RANGE MANAGEMENT (Contd)

No.	Title (Abbreviated)	Started	Present Status	Personnel
S.R. 27C	Ecology and Control of Goatweed	1951	Cont. Act.	Tisdale,Hironaka
S.R. 38	Evaluation of Range Reseeding	1952	" "	Sharp,Barnett
C.F. 4	Effects of Logging on Ground Cover in Ponderosa Pine Zone	1952	Completed	Tisdale, Mohan
P.2	Range Mgt. Manuscript	1950	Cont. Inact.	Tisdale

C - WILDLIFE MANAGEMENT

W.U. 2	Distribution of Idaho Birds	1947	Suspended	Burleigh
W.U. 11	Life History and Ecology of Blue Grouse	1952	Cont. Act.	Dalke,Caswell
W.U. 14	White Tail Deer Food and Cover Requirements	1952	" "	Hungerford,Basile
W.U. 15	Seasonal Movements of the Sage Hen	1952	Completed	Dalke,Pyrah
W.U. 16	Steelhead Trout in Clearwater R.	1952	"	Pratt,Whitt
W.U. 18	Productivity of Ruffed Grouse	1952	Cont. Act.	Hungerford
W.U. 18A	Effects of Thinning on Wildlife Food and Cover	1952	" "	Hungerford, Marsh
W.U. 19	Ruffed Grouse Populations	1951	" "	Hungerford
W.U. 20	Productivity of Mule Deer	1952	" "	Dalke,McConnell
W.U. 21	Limnological Study of Lake Pend Oreille	1952	Completed	Pratt,Stross
C.F. 3	Fishery Mgt. in the National Parks	1950	Cont. Inact.	Pratt,Giles

WORK ACCOMPLISHMENTS

I. Forest Management and Utilization

A. Projects Completed During The Year

Project No.: E. S. 2. Bibliography On Slash Disposal

A large number of publications including the Journal of Forestry, Forest Service publications, and trade journals were reviewed and the material on slash disposal classified and indexed. A summary of this material and a card index were prepared. This bibliography will be of great value in the slash disposal research project.

Project No.: E. S. 14. Growth And Yield Studies In The White Pine Type

This study was completed during the year and the results reported in the thesis of Jack Gillette. The effects of 30 years of thinning cuttings in white pine were evaluated. It was found that light thinning, to about 62 percent of the normal basal area, resulted in the greater total cubic-foot volume production and the greater diameter growth than occurred in heavily thinned or unthinned stands.

Project No.: C. F. 4. Ratio Of Foliage To Branch Wood

This sub-project was completed and the results presented in the thesis of John Sullivan. A fairly reliable ratio of foliage to branch wood was determined for the more important tree species. Original determinations were made by means of water displacement of collective samples and by means of correlation. A short-cut method was evolved based on the weight of samples. These data will be valuable in the continuing study of slash disposal.

Project No.: C. F. 5. Time And Cost Study Of A One-Man Logging Operation

This was a thesis study made by Mr. R. B. Anderson in connection with his M. S. (For.) program. This study involved a breakdown of time spent and costs incurred in a small logging operation.

B. Continuing Projects.

Project No.: E. S. 1. Wood Preservation Service Tests

A complete re-evaluation and inspection of all service tests in the State was completed in company with the Extension Forester. Photographs were taken and posts collected for display mounting. This material is currently being displayed among the county agents and extension specialists in the State. The tests now include about 1000 fence posts dating back from 5 to 12 years. Most of the native species suited for fence post use have been included in the tests.

Future plans call for a report summarizing results to date, followed by publication of the results as a paper or Station bulletin. It appears that re-examination every 3 to 4 years will constitute adequate maintenance on this project. A few treatments will be made of trees killed in chemical debarking experiments to determine the effect of debarking chemicals upon subsequent preservation.

The project should continue for another 10 years or more.

Project No.: E. S. 3. Investigation Of Normal Western White Pine Stem Anatomy

To learn more about the normal stem anatomy of western white pine in order to facilitate comparisons with diseased trees. Over 100 samples covering most of the range of the species have been prepared and are being examined. A final report on the project is being prepared.

Project No.: E. S. 4. Effects of High Frequency Current Treatment On Tree Seeds

Additional tests with new equipment are now in progress. Unless the results are more promising than those obtained last year, the tests will be completed within one year.

Project No.: E. S. 5. Chemical Debarking Of Idaho Tree Species

During the year 317 trees were treated and the effects of five different chemicals evaluated. The majority of the treatments were made in July, with additional tests in November to assess the value of applications in the non-growing season. In addition to current tests, the Clarkia Peak

tests were re-examined and a preliminary examination for peeling effectiveness was made on all the plots.

An interim report written by Dr. Hubert in April 1954 summarizes the results up to that time. Several highly effective, non-dangerous, poisons have been tested for killing coniferous trees by application to a girdle at the base of the tree. A new technique of application has been worked out which is apparently better than the previous methods.

A review of the information needed and work to be done in the future is being made on the basis of results obtained to date. Killing effectiveness, freedom of peeling, beetle attacks and costs are among the factors to be considered. Some additional tests will be made during the summer and fall of 1954. Periodic re-examination of plots will be necessary to check the effect on peeling. A few posts from poisoned trees on the Clarkia plots will be treated by the cold-soak preservation method.

By next year this project should be on a maintenance basis and should be concluded within two more years unless results suggest extension or revision.

Project No.: E. S. 6. Tree Disease Research

Due to the death of Dr. Hubert, the work on this project has been temporarily assumed by Mr. A. W. Slipp. No field work was done during the current fiscal year, but a preliminary investigation of dieback of Russian olive and needlecast of ponderosa pine is planned beginning in July, 1954.

Project No.: E. S. 13. Forest Management Studies On The College Experimental Forest

Inventories of growth in several commercial tree species were continued on the College Experimental Forest. In addition, thinnings were made on several plot areas.

Project No.: E. S. 17. Photomicrography Of Native Woods

During the year four undergraduate students interested in this subject prepared sections of about 10 species, and made preliminary tests of equipment for obtaining photographs at various scales of magnification. One set of photographs was prepared for use in the Wood Technology

course. The power unit of a new Zirconium-oxide light source was purchased, and the remainder of the unit will be obtained next year.

This project will continue indefinitely as students and time are available and will provide authenticated slides and photomicrographs of native woods for reference, teaching and research use.

Project No.: E. S. 18. Spectrochemical Analyses of Idaho Trees And Other Plants

Principal emphasis has been given to analysis of the minor chemical elements of grand fir (Abies grandis). Field collections of wood and foliage of 113 trees collected previously have been sorted and stored. About 20 representative specimens have been ashed and spectrum-pure chemical salts have been obtained for calibration work. Procedures for taking and analyzing spectrograms have been worked out in cooperation with the departments of Physics and Agricultural Chemistry. Analytical results were obtained from the University of B. C. for the elements copper, zinc, iron and mangenese in these samples. These will be correlated with collection data to see if any trends can be found.

Based on the major analyses currently being made, calibration work will be done first. This will be followed by exploratory analyses to determine the levels of occurrence of various elements in relation to location, age, locality and soil type for the sample trees. These data should indicate the number of tests necessary and details of the approach to be used.

The major share of analytical work on grand fir should be completed this year. Future extension of this work will depend on results and interest shown. The method looks promising and applicable to a variety of problems in the field of forest land management.

Project No.: E. S. 19. Christmas Tree Test Plantings

This project was begun in 1953. The objective is to test the adaptability of the Christmas Tree species in different parts of the state and to obtain information on growth, cultural practices and investments required per acre.

Personnel included F. H. Pitkin and Vernon Burlison in cooperation with staffs of the branch Agricultural Ex-

periment Stations. Fifty specimens of each of nine different evergreen species were planted on each of the University Branch Experiment Stations. Survival and growth studies were begun on this material and will be continued. This experiment was planned to last about 10 years.

Project No.: F. P. 1. Forest Pathology Herbarium

This was maintained and a few new specimens added. Only specimens determined by competent authorities are accessioned to the herbarium. Considerable material was used throughout the year for research and instructional use.

Project No.: F. P. 2. Forest Pathology Stock Culture

Approximately 20 new isolations of fungi were added to the collection during the year. Normal maintenance was maintained and virtually all items were transferred to screw-cap culture tubes. These tubes enable the period between successive transfers to be extended to as much as a full year in the case of all but a few rapidly growing species.

Project No.: F. P. 3. White Pine Blister Rust

The results of one portion of this project were summarized in a publication (Research Note No. 7) issued earlier in the year. This publication presents a new technique for estimation of damage by blister rust to white pine stands. The method, which employs the principle of survival probability, is simple to apply and more accurate than existing methods. It is based on an evaluation of the risk that cankers on branches of each tree in the sample will reach the trunk. Once in the trunk the canker is almost certain to kill a tree that is not approaching felling age. It was established that cankers originating beyond two feet out from the trunk need not be considered as significant threats. Survival probability for cankers in various classes of distance from the trunk and a damage survey method employing these data are suggested.

Further analyses were made during the year leading towards additional publications. Most of this work was concentrated upon the progressive increase and subsequent decline of foliage on cankered branches. Normal increase in shading has been found responsible for suppression of cankered branches, thus acting to eliminate most threatening cankers before they reach the trunk.

Routine inspection of the 12 plots was conducted during the field season and maintenance of plots was continued. During the winter a student assistant assigned to the project by the U. S. Forest Service accomplished much transcription of data and summarization of results.

A major portion of the field work on this project has now been accomplished, and the principal activity remaining is that of analyzing and interpreting the results and publishing them. It is expected that this can be completed in approximately three years.

Project No.: S. R. 11. Mortality Of Young Western White Pine Trees (Pole Blight)

Study of experimental plots during the past year indicated a steady increase in the mortality of dominant and codominant pole blight trees. The time between the appearance of the first symptoms and death of pole blighted trees was estimated at 24 years on the basis of plot data obtained to date. Analysis of data from the plots set up to study the spread of the condition showed no definite pattern, although an occasional tree on the outskirts of the plot appeared to be newly diseased. Intensification of symptoms in the central area of the plots was noted. The pattern of mortality and symptom changes for the two "spread" plots resemble closely conditions noted on conifers attacked by Armillaria mellea.

Work on fume effects during the past summer was carried on using transects with plots located at various distances from Kellogg, Idaho. Plants were collected at each of these plots and analyzed for markings due to fumes. Foliar markings were found at distances up to twenty miles from the smelter, while pole blight was found both within this range and at greater distances from the smelter.

Inspection of complete nutrient solutions into pole blighted trees gave no evidence of recovery from the condition.

During the summer of 1954 disease spread and fume effect plots will be re-examined. In addition, grafts of pole blighted scions onto healthy stock will be made. Work will begin on the examination of vertical roots of pines to determine the extent to which they may be diseased.

A five year progress report was prepared by Dr. Hubert in May 1954, in addition a thesis by C. S. Hodges on growth studies of the fungus Armillaria mellea.

It is impossible to predict the possible duration of the project because of the failure so far to determine the cause of pole blight, and the situation created by the death of Dr. Hubert. Certainly the investigation is far from complete, and new approaches to the problem are needed.

Project No.: S. R. 11-B. A E C Forest Tree Physiology

This project was continued along the lines established previously, with emphasis on the use of radioisotopes as a tool in comparing the physiology of pole blighted and healthy trees. A considerable number of trees, both large and small, including pole blighted, Armillaria infected and healthy controls were injected with radioisotopes to determine rate of movement and areas of deposition of minerals. The results indicated that rates of movement in tops of pole blighted trees were less than in healthy trees, although rates of movement in pole blighted trees as a whole were greater than in healthy trees. Rates of movement in small trees affected by Armillaria were less than in corresponding healthy trees. Patterns of distribution of P-32 in small Armillaria infested treeswere suggestive of that in pole blighted trees. In large trees infected by the fungus the results were too variable for adequate comparison with other types of trees. A paper on the movement and deposition of P-32 in healthy and pole blighted trees was presented to Plant Physiology for publication. During the winter many analyses were made for calcium and the data compiled for analysis and publication. In addition attempts were made to carry on microdissection of bark tissues for radio-calcium, but this met with little success. A paper on greenhouse phases of the study, using radioisotopes to determine the action of the Leptographium fungus was sent off for publication.

Plans for the coming year include more work on the distribution of P-32 and CA-45 in large Armillaria affected trees, in pole blighted and healthy trees early in the year, and in trees suffering from other infections.

It appears that the work on this project will be about 95 percent completed by the end of the year unless new developments occur. A few follow-up studies will remain and these should be completed in one additional year.

Project No.: S. R. 24. Slash Disposal Studies

Good progress was made on this project during the year. The principal results may be summarized as follows:

1) It is now possible to anticipate slash problems and in part control them before cutting operations start. The average cubic volume of slash likely to result per M. B. F. harvested by species and diameter classes has been determined. The method is now being used by the U. S. Forest Service in timber sale appraisals for computing the cost of slash disposal. Additional data are being obtained for some species and diameter classes to improve the accuracy of the existing information.

2) The relation of solids to voids in slash has been worked out for a number of species and types of arrangement. Slash is a loosely arranged bed of fuels made highly inflammable by the presence of needles and twigs and by the type of arrangement and hence the amount of space allowed for oxygen needed for combustion.

3) In cooperation with the Forest Service, tests of the relative inflammability of species have been conducted for current and year-old slash of five species. The plots have recently been set up again for similar tests of the four remaining tree species of commercial importance in this region.

4) Fuel arrangement as related to fire spread and throwing of sparks has been studied to some extent, but difficulty in devising sampling techniques has retarded progress.

5) The problem of cedar slash resulting from pole-making operations is being studied. The cedar pole industry has been asked to participate in a study of logging and peeling methods to reduce slash hazard.

6) Slash reduction by natural processes is being studied on six plots, including two established during the current year. Rates of compaction and needle cast are being determined on these plots and these factors incorporated in the inflammability tests for aging slash.

7) Studies of the effects of fires on forest soil were continued. Seeding and planting plots were established on burned and unburned areas to test for differences in survival and growth rate.

Publications during the year included Research Notes on: 1) Solids and voids in logging slash and 2) Slash volume in relation to species and timber volume harvest.

Work for the coming year will be carried along all lines noted above except number (2) which can be regarded as completed. The development of revised "slash meters" will be continued as new data becomes available. This project will probably require another five years of work at the present level.

II. RANGE MANAGEMENT RESEARCH

A. Projects Completed During The Year

Project No.: E. S. 7(a). Testing Of Methods For Determining Range Condition And Trend

A manuscript presenting the results of this study was published in the March, 1954 issue of the Journal of Range Management. The results of the study indicate that the loop transect method is well adapted to following changes in range condition on salt desert shrub, sagebrush-grass, and reseeded ranges. Three men reading permanent transects on two different dates were in close agreement as to the data obtained. It is recommended that the loop procedure be used in studies where changes in condition are to be determined on the range types listed above.

Project No.: E. S. 12. Study Of Range Improvement By Reseeding With Pelletized Seed

A final report on this project was published in March, 1954 in the form of "Station Research Note." The principal results obtained were as follows: (1) Seed pelletizing failed to improve the amount or rate of germination, or the subsequent growth of any of the species tested. (2) Marked differences were found in the effect of different pelletizing processes upon the enclosed seed. Pelletizing by the "coating" method caused less mechanical damage to the seed and resulted in higher germination than did pelletizing by the "compression" method. (3) Two large-scale field tests with pelletized seed broadcast by airplane on burned-over sagebrush-grass ranges in Idaho resulted in failure. (4) In field trials where surface grass seeding showed some success, unpelletized seed gave as good or better results than the best available pelletized seed.

In view of these results it is recommended that broadcast seeding without soil preparation be used only in cases where normal cultural practices cannot be carried out and then only on high-quality sites. In cases where broadcast seeding does appear feasible, it is recommended that pelletized seed not be used. Unpelletized seed is much cheaper, and by using a slightly heavier rate, some of the excessive loss due to surface broadcast seeding can be overcome. It would appear that surface broadcast seeding can play only a very limited role on ranges of the types studied.

B. Continuing Projects

Project No.: E. S. 7. Evaluation Of Salt-Desert Shrub Range Types In Idaho

Thirty-four sites each containing three permanent transects have been established in various portions of salt-desert shrub range in southern Idaho. Records from these transect clusters have been obtained over a period of three years and valuable information concerning the halogeton problem has come from this study. Much further information concerning the original composition of the various salt-desert shrub types, and their reaction to different kinds of grazing management, insect attacks, etc. will be obtained as the project continues.

Plans for the coming year include the establishment of some additional transect clusters, and re-examination of a number of those already established. This project is of a nature which calls for long-term study, for another 10 years approximately.

Project No.: E. S. 8. The Study Of The Medusa-Head Problem In Idaho

Work done during the past year consisted mainly of additional observations of the life-history of the plant, along with limited testing of control measures. Seed germination studies indicate that there is some carryover of viable seed beyond the first year after production. Studies were made to indicate the exact stage of growth at which viable seeds are present. Such data are important as a basis for the development of control measures based on reseeding, burning, or other means. The results of these studies are being prepared for publication.

The medusa-head problem is increasing rapidly in southwestern Idaho and requires much more intensive study than it has received to date. Plans for the coming year call for the services of a full-time range research man who will spend approximately half his time on the medusa-head problem. The work planned includes studies of the life-history of the plant, the effects of burning as a control measure with or without reseeding, and of the competitive effects of other plant species. Studies will be made also of the yield, nutritive value and grazing utilization of medusa-head. The cooperation of the Idaho Agricultural Experiment Station, the U. S. Forest Service, and the Agricultural Research Service of the U. S. D. A. will be invited in handling this problem.

Project No.: E. S. 9. The Ecology And Productiveness Of - Sagebrush Grass Ranges In Southern Idaho

Limited progress was made on this study during the past year

due to lack of personnel and funds. Most of the 20 sites previously studied were visited, and 3 more sites were established. A brief reconnaisance was made of areas in Owyhee and Twin Falls counties to locate further areas for study. A summary of results to date was given at a symposium on sagebrush conducted by the Pacific section of the Ecological Society at their annual meetings at Pullman, Washington, in June.

During the coming year this project will have greatly increased support as a result of funds granted under regional project W-25 (RM-27) to the Agricultural Experiment Station. The sagebrush-grass study will be continued under the direction of the Forest, Wildlife and Range Station, working in close cooperation with a soils specialist of the Department of Agronomy. Half the time of a range research assistant will be utilized for this project.

The importance of a basic knowledge of the sagebrush-grass type is becoming increasingly evident in connection with efforts to improve the condition and management of southern Idaho ranges. This project should be continued on the scale noted above for a period of 5 years or more,

Project No.: E. S. 10. Ecology of Douglas Fir and Ponderosa Pine Zone of Interior B. C.

The results of this piece of personal research are being prepared for publication, and a limited amount of additional work is being conducted through cooperation with the Range Experiment Station at Kamloops, British Columbia. This research is serving as a valuable basis for studies now in progress at the Kamloops Station on the management of timber ranges in interior B. C.

The present project should be completed within a year, but some limited participation in additional studies with the Kamloops Station may continue for a period of 4 or 5 years.

Project No: E. S. 11. The Influence of Sheep Grazing On Cut-Over White Pine Areas in Northern Idaho

This project is inactive in its present form. Further studies of the nature and utilization of the grazing resources in northern Idaho should be considered in the future work program of the Station. Some of this work could be done on the Experimental Forest in conjunction with work already in progress.

Project No.: E. S. 15 The Ecology and Control of Halogeton in Idaho

A graduate thesis covering the work done during the third and fourth years of this project was completed in May, 1954. The principal results obtained were as follows: 1. Halogeton was found to be capable of germinating over a considerable period, but mortality of early and late germinating seedlings was extremely high. The majority of plants reaching maturity were those germinating in April and May.

2. Laboratory tests confirmed the dormant nature of the "brown" form of seed. Varying amounts of germination, ranging up to 20 percent, were obtained from samples that had been buried for periods as long as two years. This ability of brown seed to remain dormant in the soil for long periods complicates the control problem.

3. Vigorous stands of several kinds of perennial vegetation were found to control halogeton. Attempts to determine the exact amount of perennial cover of various species required are complicated by variability in vegetation and site factors. Studies to date indicate that a minimum cover index of about 20 percent as determined by the loop-transect method is required for stands studied in south-central Idaho.

4. Continued studies of the control of halogeton by range reseeding indicate that crested wheatgrass is the most successful species for south-central Idaho. Stands established on ground formerly occupied by sagebrush-grass have been highly successful in controlling halogeton. Difficulty has been met in establishing crested wheatgrass or other introduced forages on saline soils formerly occupied by the salt-desert shrub range types. Halogeton itself grows equally well on either saline or non-saline soils in this area.

5. The improvement of native stands of salt-desert shrub types in the Raft River valley under good grazing management has been striking. Halogeton has declined on these sites in direct proportion to the increasing cover and vigor of the perennial vegetation.

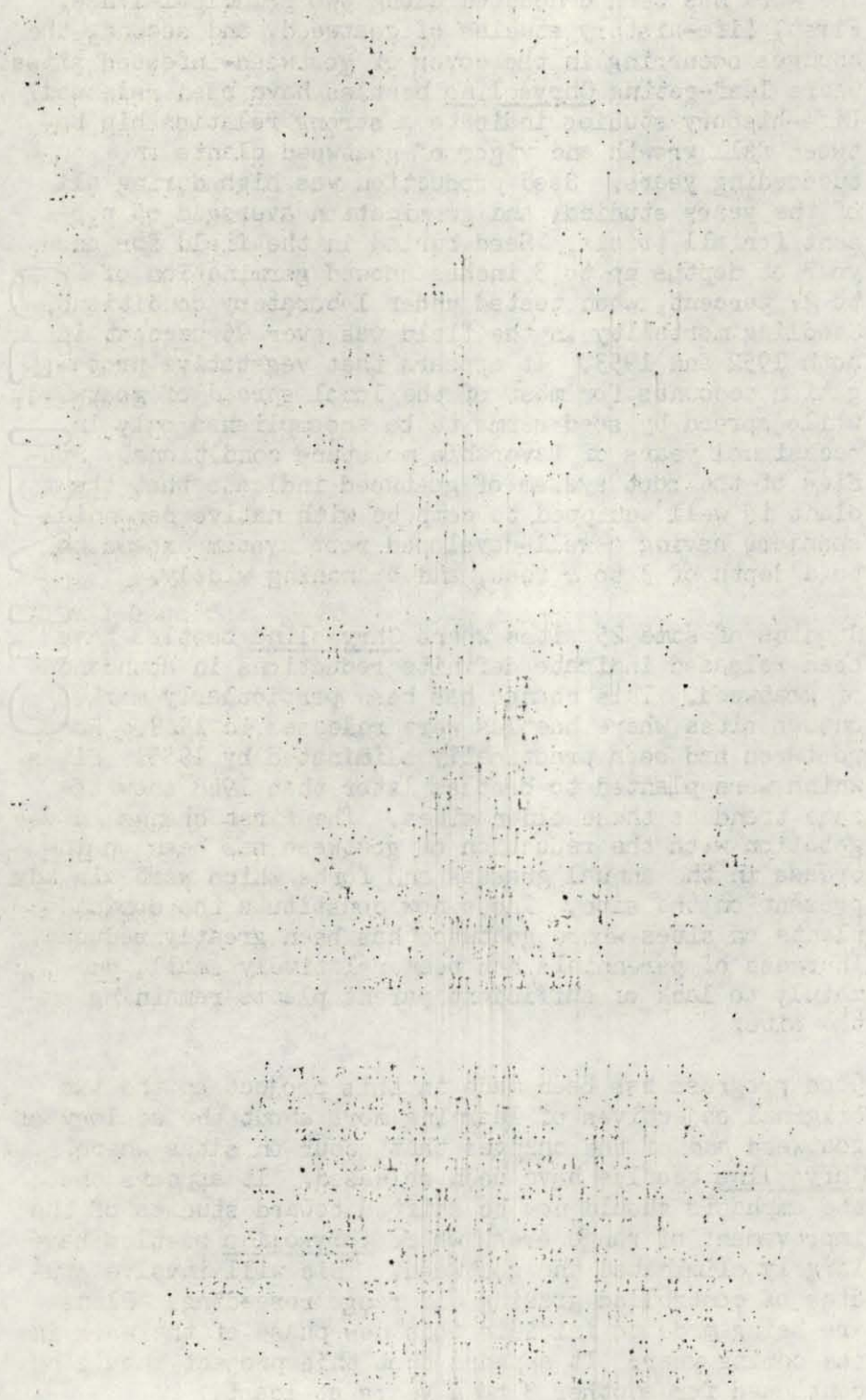
This project will be continued on a reduced scale during the coming year. Several of the major objectives of the project have been largely obtained, while the emphasis currently being placed on halogeton research by the Agricultural Research Service of the U. S. D. A. makes it desirable for our staff to devote the major part of their efforts to other equally important, but less studied problems. Long-term studies of the effect of various types and amounts of perennial range cover on halogeton will be continued, as well as limited studies on halogeton seed germination and longevity.

Project No.: S. R. 27-C. Ecology And Control Of Goatweed (Hypericum perforatum)

A thesis containing the results of the second and third years of work on this project was completed in May, 1954. The work has been conducted along two principal lines. First, Life-history studies of goatweed, and second, the changes occurring in the cover of goatweed-infested sites, where leaf-eating Chrysolina beetles have been released. Life-history studies indicate a strong relationship between fall growth and vigor of goatweed plants in succeeding years. Seed production was high during all of the years studied, and germination averaged 65 percent for all trials. Seed buried in the field for one year at depths up to 3 inches showed germination of 20 to 27 percent, when tested under laboratory conditions. Seedling mortality in the field was over 95 percent in both 1952 and 1953. It appears that vegetative propagation accounts for most of the local spread of goatweed, while spread by seed seems to be accomplished only in occasional years of favorable moisture conditions. Studies of the root system of goatweed indicate that the plant is well equipped to compete with native perennial species, having a well-developed root system extending to a depth of 3 to 4 feet, and branching widely.

Studies of some 25 sites where Chrysolina beetles have been released indicate definite reductions in abundance of goatweed. This change has been particularly marked on two sites where beetles were released in 1948. Here goatweed had been practically eliminated by 1953. Sites which were planted to beetles later than 1948 show the same trend as these older sites. The first change in vegetation with the reduction of goatweed has been an increase in the annual grasses and forbs which were already present on the site. These now constitute the dominant plants on sites where goatweed has been greatly reduced. Increase of perennials has been relatively small, due mainly to lack of sufficient parent plants remaining on the site.

Good progress has been made in this project on the two original objectives of learning more about the ecology of goatweed and of the changes that occur on sites where Chrysolina beetles have been released. It appears that the emphasis should now be shifted toward studies of the improvement of range areas where Chrysolina beetles have largely eliminated the goatweed. This will involve studies of controlled grazing and range reseeding. Plans are being made to initiate this new phase of the work in the coming year. It appears that this project should be continued for another 3 to 4 years at least.



Project No.: S. R. 38 (Formerly R.M.19) Evaluation of Range Reseeding

This project was put on an active basis by means of its incorporation as Special Research Project 38, starting July, 1953. Accomplishments to date have been as follows: (1) Seven reseeded areas in southern Idaho have been selected for detailed studies of yield, forage utilization, nutritive value, and changes in plant cover under various grazing practices. These areas represent a variety of conditions existing within the sagebrush grass type in south-central Idaho. (2) Tests were conducted on the development of a rapid sampling procedure for these reseeded stands. (3) A proposed cooperative grazing trial plan was drawn up in cooperation with the Agricultural Experiment Station and Bureau of Land Management. This phase of the project would provide for controlled grazing and intensive studies of a reseeded area in the Raft River Valley.

Work on this project will continue along the lines indicated during the coming years. With increasing emphasis on reseeding of depleted range lands in Idaho, this project should assume increasing importance during the next few years. It is recommended that it be continued for at least 5 years.

Project No.: C.F. 4. Effects of Logging on Ground Cover in the Ponderosa Pine Zone.

This project was completed and the results presented in a professional paper by Mr. J. M. Mohan. The results indicated a removal of about 25 percent of ground cover by tractor logging. Soil stability also was decreased appreciably, but recovered in 5 to 6 years. Forage index was found to be closely related to soil depth, especially on soils less than 20 inches deep.

Project No.: P. 2. Range Management Manuscript.

This project is inactive due to pressure of other work and is not likely to be reactivated for several years.

III. WILDLIFE AND FISHERIES MANAGEMENT

A. Projects Completed During The Year

Project No.: W. U. 15. Seasonal Movements Of Sage Grouse

This project was completed in March, 1954. The principal results included the development of sexing and aging techniques useful to game managers working with sage grouse. The best time for census records on this bird were also determined. Limited band recoveries from trapped birds indicated extensive seasonal movements.

More banding and trapping studies are needed to further establish patterns of movement. This study should be followed by one which will endeavor to determine a suitable breeding census method.

Project No.: W. U. 16. Age, Growth And Migration Of The Steelhead Trout In The Clearwater River Of Idaho

This project was completed in 1954 and the results summarized in the Master's thesis of Charles Whitt. Some of the outstanding results are as follows:

1) Tag returns indicate that steelhead trout in the Clearwater pass Bonneville Dam on their upstream migration during July to September. Approximately 10 percent of these fish continue upstream and constitute the fall run at the Lewiston Dam in October through December. The majority over-winter in the river below lewiston and continue through the Lewiston fish ladders and up to the spawning area during February through June. Time required for the 320 mile journey from Bonneville to the Lewiston Dam ranged from 84 days for the fall run to 297 days for the spring run.

2) Time of migration appeared to be influenced by certain environmental factors. The spring run began when the water temperature reached 42 degrees Fahrenheit and continued at an increased rate with increased volume of water flow. It should be possible to estimate with reasonable accuracy the numbers of steelhead trout migrating past the Lewiston Dam from sample counts taken according to conditions of water flow.

3) There is considerable variation in total age as well as in number of years of stream and ocean life of

steelheads taken at the Lewiston Dam. Sixty percent of the young steelheads had spent two years in the ocean before returning to spawn. The largest single age group, four years old, comprised 37.1 percent of the total population. Only 1.63 percent of the fish had spawned previously, a figure which indicates that in such a population management should be based on a single spawning.

Project No.: W. U. 21. A Limnological Study Of Lake Pend Oreille With Special Consideration of the Ecology of the Kokanee

The project was completed and the results embodied in a Master's thesis. Study has provided a classification of the lake on the basis of selected limnological features and has provided detailed information on the food and food habits of the kokanee, a fresh water form of the sockeye salmon. The results indicate the following characteristics of Lake Pend Oreille. 1) It is a deep 1150 feet, cold lake of relatively large size, 126 sq. miles. 2) It stratifies thermally during the summer months and is in a state of continuous overturn during most of the winter. 3) Its water is moderately hard. The total alkalinity is 70 parts per million of calcium carbonate. It is slightly alkaline in reaction, (pH 7.5 to 8.4) and is nearly saturated with oxygen at all seasons from the surface to depths of 400 feet. 4) The carbon dioxide content ranges from 0 to 4.6 parts per million in the upper 400 feet. 5) The lake is very transparent, except for the area near the major inlet during the spring runoff period. 6) The phytoplankton population is composed almost entirely of diatoms. 7)The zooplankton are most abundant in the summer and are composed mostly of rotifers and copepods.

It was found that the kokanee feed almost entirely on this zooplankton during the year of their maturity, and probably throughout their entire life. These fish are selective in their feeding habits, as evidenced by the high proportion of Daphnia in the stomachs although rotifers and copepods greatly outnumber daphnids in the plankton samples. The kokanee were found to double their body weight in the last year of life, most of this increase taking place during August and September. Growth then slowed appreciably till spawning and death in November.

The project suggests the need of further study of the life history of the kokanee, particularly such phases as natural mortality, growth rate, and the distribution and migration within the lake.

B. Continuing Projects

Project No.: W. U. 2. Distribution Of Idaho Birds

This project has been suspended due to the assignment of the project leader (Mr. Burleigh) to other studies. Two to three more years would be needed for completion of this project and such completion is highly desirable.

Project No.: W. U. 11. Life History And Ecology Of The Blue Grouse In The North Rocky Mountains

Nearly 800 wings and tails of blue grouse collected in Idaho and southern Washington were examined. Detailed studies of the nesting range and development of census methods are in progress. This work will continue during the coming year. It is estimated that this project is about 50 percent completed. It should continue for three to five years more.

Project No.: W.U. 14. White-tailed Deer Food And Cover Requirements

The first phase of this project was completed during the year and the results submitted in a Master's thesis. The principal accomplishments of the project to date include the following: 1) Completion of a detailed cover-type map for the eight-hundred acre Hatter Creek deer enclosure on the College Experimental Forest. 2) Determination of the basic forage resources of the area as correlated with with cover types. For each major cover type, the acreage composition and percent of ground cover were determined. 3) A study was initiated on the availability of four key browse species under varying snow conditions. 4) A test of the ability of red-stem ceanothus to withstand different degrees of clipping was set up on a sample plot area. Here the effects of three clipping treatments are being studied. The data from two growing seasons have been obtained.

While certain phases of this project have been largely completed, other aspects require continued effort. The studies of browse availability as affected by snow needs to be continued for a number of years to include a variety of winter conditions. The clipping studies should also be continued with an expansion of the number of individual shrubs included in each treatment. The whole project should continue for approximately five more years.

Project No.: W. U. 18. Productivity Of Ruffed Grouse In Northern Idaho Forests

During the year a series of thinning plots at the Priest River Forest Experiment Station were analyzed to determine the effects of older thinnings on wildlife food production. The effect of more recent thinnings made on the College Experimental Forest were also determined and the results reported in a Master's thesis by A. H. Marsh.

In another phase of the project, work was continued on the collection of ruffed grouse wings and tails, and their analysis for sex and age composition. A comparison was also made of the hunter take with the total grouse population on the Flat Creek study area. This project is about 75 percent complete, but requires further work, both on the effects of thinning practices and on fluctuations in the grouse population.

Project No.: W. U. 18-A. Effects Of Thinning On Wildlife Food And Cover

This is a subproject of W. U. 18 which was set up to study the immediate effect of experimental thinnings made on the Experimental Forest. The short term effects on food of both grouse and deer were determined, and permanent plots established for longer term studies.

Project No.: W. U. 19. Ruffed Grouse Population And Census Methods

The annual fall census was conducted in September, while drumming counts were made in the spring, and some brood counts were made in the summer. A Research Note (Number 10) was published on the results of some of the drumming count studies.

This project should continue for at least two more years in order to carry the grouse population studies through a complete cycle.

Project No.: W. U. 20. Productivity Of Mule Deer On Cassia Division, Sawtooth National Forest

This study involves the determination of the productivity of different age classes of deer. By the end of the year the project was about 85 percent completed and the graduate student assigned to it had finished his portion of the work. The completion of the project will be carried on by the unit leader. It was found that fertility rates

vary with age, and the variation from year to year indicates the need for data obtained over a period of at least four to five years. The results to date indicate the high degree of productivity in all age classes in the area studied.

This project should be continued on a reduced scale for at least three more years in order to build up a reliable body of information.

IV. EVALUATION AND COMMENTS

Many features of Station policies and program were discussed in some detail in the Fifth Annual Report. For this reason, only developments of particular interest during the past year will be included here.

1. The completion of eight projects and addition of only two new, continuing studies resulted in a drop in total Station projects. This represents a desirable effort to keep the research program in balance with available research manpower. This is a healthy trend in view of the large number of projects being carried by a relatively small staff, and of a growing teaching load due to increasing undergraduate and graduate enrollment.

2. A strong need for research in forest soil and forest insect problems exists in the State. The Station has recognized these problems and taken action on them to the extent that existing personnel and funds permitted. A request for a special research project covering certain forest soil studies was submitted and approved to begin July 1, 1954. A request for a staff member in Forest entomology was submitted with plans for 1955-57 biennium.

3. The only change of personnel during the year was the death of Dr. Hubert. This position will be filled in the near future. Research manpower in Range Management was decreased by the appointment of Dr. Tisdale as Assistant Director of the Station. To offset this situation, and to obtain better contact with range problems and personnel in southern Idaho, plans were made to hire a full-time man for range research. This plan was approved and became effective on July 1, 1954. This man will be located at Boise during the entire field season (about 8 months) and at the University for the remainder of the time.

4. Excellent results continued to be obtained from graduate Research Fellows. Eight of these men completed their work and presented theses dealing with various aspects of Station projects. One Research Fellowship in Range Management was dropped in order to obtain a full-time man.

5. Transportation for staff during the field season, although still a limiting factor, was improved over previous years. This was due primarily to the acquisition of two new carry-all type vehicles, one as a replacement and the other as an addition. These vehicles proved highly useful and versatile. Their acquisition, along with careful planning and scheduling, and the loan of one vehicle each from the Bureau of Land Management and U. S. Forest Service provided reasonably satisfactory transportation during the peak work months of June, July and August. Replacements of additional vehicles before the next field season will be necessary, however, as several of these are badly worn out.

6. Excellent relations were maintained with many agencies and individuals cooperating with the Station. At University level, integration of work was particularly close between Range Management and the Agricultural Experiment Station. Five out of six major range projects were conducted in cooperation with one or more Agricultural departments.

Cooperation with federal agencies was affected, but in no way weakened by organizational changes within the Departments of Agriculture and the Interior. In the Forest Service, the merging of the Northern Rocky Mountain Forest and Range Experiment Station with the Intermountain Station means that all of Idaho is now included within the area served by this one enlarged Station. This should facilitate the cooperation which already existed with each of these Stations. Another effect was to place those phases of range research relating to reseeding and range week control largely within the newly formed Agricultural Research Service. It is too soon to tell how this move will affect cooperation in these fields, but no particular difficulties are anticipated.

In the case of the Bureau of Land Management, the principal change has been the reduction of regional offices from five to three and the establishment of State offices. It is apparent that the State offices will now be the key centers. This development should facilitate our cooperation with the Bureau by providing a strong local office, whose personnel should be in closer touch with the range and other public land problems of the State than were the former regional officials.

Respectfully submitted,

Ernest Wohletz, Director

E. W. Tisdale, Assistant Director

V. PUBLICATIONS BY STATION STAFF

1. Research Notes (Forest, Wildlife and Range Experiment Station).

Olson, D. S. Solids and voids in logging slash. Res. Note No. 8. Sept., 1953.

_____. Slash volume in relation to species and timber volume harvested. Res. Note No. 9. Sept., 1953.

Hungerford, K. E. A ruffed grouse drumming count technique for northern Idaho conditions. Res. Note No. 10, Sept. 1953.

Moomaw, J. C., E. W. Tisdale, L. A. Sharp and K. B. Platt. Studies of pelletized seed for range reseeding. Res. Note No. 11. March, 1954.

2. Journal Articles.

Dalke, P. D. Blue grouse hunting in Idaho. Idaho Wildlife Review, 7: 10-11. 1954.

Ferrell, W. K. Effect of environmental conditions on survival and growth of forest tree seedlings under field conditions in the Piedmont region of North Carolina. Ecology 34: 667 - 688. 1953.

Hubert, E. E. Studies of Leptographium isolated from western white pine. Phytopathology, 43(11): 637 - 638. 1953.

Hungerford, K. E. Some observations on the life history of the Idaho ruffed grouse. The Murrellet, 34: 35-40. 1953.

Sharp, L. A. Evaluation of the loop procedure of the 3-step method in the salt-desert shrub type of southern Idaho. Jour. Range Mgt. 7(2): 83 - 88. 1954.

Tisdale, E. W., A. McLean and S. E. Clarke. Range resources and their management in British Columbia. Jour. Range Mgt. 7(1): 3 - 9. 1954.

Zappettini, George. The taxonomy of Halogeton glomeratus. Amer. Midl. Nat. 50(1): 238 - 47. 1953.

3. Graduate Theses.

Anderson, R. B. Time and cost study - One-man salvage logging operation. M. S. thesis, June, 1954.

Basile, Joseph Vincent. Availability of white-tailed deer browse within the Hatter Creek Enclosure. M. S. Thesis. June, 1954.

Caswell, Edwin Brainard. A preliminary study on the life history and ecology of the blue grouse in west central Idaho. M. S. Thesis. June, 1954.

Gillette, Jack Eugene. Results of thinning a western white pine stand. M. S. Thesis. June, 1954.

Hironaka, Minoru. The ecology and control of St. Johnswort in Idaho - Part II. M. S. Thesis. June, 1954.

Hodges, Charles Sasnette, Jr. Growth Studies of an isolate of Armillaria mellea (Vahl) Quel. M. S. Thesis. June, 1954.

Holl, Royal George Deitrich. A study of the ecology and control of Halogeton in Idaho - Part II. M. S. Thesis, June, 1954.

Marsh, Alfred Heber. The influence of silvicultural thinnings on the Production of the key foods of the white-tailed deer and ruffed grouse. M. S. Thesis. June, 1954.

Pyrah, Duane Brown. A preliminary study toward sage grouse management in Clark and Fremont Counties, Idaho, based on seasonal movements. M. S. Thesis. June, 1954.

Sullivan, John Dennis. A volume analysis of logging slash in northern Idaho. M. S. Thesis. June, 1954.

Whitt, Charles Richard. Age, growth, and migration of steelhead trout in the Clearwater River, Idaho. M. S. Thesis. June, 1954.

Mohan, Joseph Manley. Some effects of logging on ground cover in the Ponderosa Pine zone of southern Oregon. M. F. Professional Paper. June, 1954.