



**ARTICLES**

# Spruce Budworm Control

By ROBLEY W. NASH

State Entomologist, Maine Forest Service

The spruce budworm control project in northern Maine now being prepared for execution in June, 1960 will be a duplicate of and can best be described by events of the 1958 control project.

Features of that project are: 1) detailed field studies leading to the decision to spray; 2) contract specifications; 3) recognized close management; 4) full cooperation of many agencies; 5) financing; 6) low per acre cost; 7) publicity program and personal contacts; 8) inspection pilot-plane system; 9) associated studies; and 10) protection obtained with minor side effects.

*History.* Maine previously experienced a severe outbreak from 1910-20 with no means of combating it. Losses amounted to 28,000,000 cords of fir and spruce. In the mid-40's threat of new infestations led to cooperative, annual, field surveys by entomologists of Maine and the U. S. Forest Service. Annual population increases prompted aerial spraying in 1954 on 20,000 acres in Aroostook. A good situation thereafter changed abruptly in August, 1955 when a mass flight of moths from Canada seriously infested northeastern Maine. Infestations increased rapidly in northeastern Aroostook and led to the aerial spraying of 302,000 acres in 1958.

*Control Responsibility.* Fire prevention-control, management and the State Entomologist's office are divisions of the Maine Forest Service involved in the protection of Maine's forest lands. Statutes set forth the entomological responsibility for control of large insect and disease outbreaks and define, in addition, partial financing by State funds.

*Control Approaches.* There are three possible control approaches to discuss—management, biological, and chemical. Management measures for this insect are largely theoretical, but if finally proven effective they will be long range in scope. Biological control, by parasitic insects was failing. These insects are important, thus stress is placed on determining their relative effectiveness and abundance. In the areas to be sprayed, budworm populations had gone well beyond effectiveness of parasites. Many parasite species are native to Maine, however efforts were made here to establish species from western states. In brief, all possible has been done with no success. The one approach possible was that of chemical or insecticide application.

*Surveys.* Detailed annual field studies by ground and air are the basis for decisions on the need of applying chemical control. The following factors were evident by the fall of 1957 in the heavily infested area. Trees extensively defoliated since 1956 were in poor condition, top killing was imminent and increment loss was considerable, increased populations in 1958 were evident, and parasitism was low with no reason to expect improvement. Alleviation of the situation could only be obtained by spraying in 1958.

*Recommendation and Legislation.* The unanimous recommendation was to spray 300,000 acres in 1958 from Ashland, northeasterly, at estimated costs of \$1.00 per acre. The 98th Legislature in special session October, 1957 provided three-fourths of the total cost, equally by state appropriation and by special tax, unique in that all land whether in or remote from the spray area was taxed as suggested by

the owners prior to the session. The remaining 25% was provided through funds of the U. S. Forest Service who, in addition, provided technical help on the job.

*Planning and Cooperation.* A 24-page contract and specifications were drawn up to insure full control over the spray planes contracted for. Caribou Airport was the base of operations. Extensive planning involved progressive discussion with departmental members, U. S. Forest Service, Maine Aeronautics Commission, Caribou Airport Manager, and Forest Protection Ltd. of New Brunswick. Important assistance was given by many other state, Federal, and private agencies.

The low unit cost of the operation was

primarily due to the valuable cooperation of Forest Protection Ltd., a non-profit organization set up for large budworm control programs in New Brunswick. Participation with them in large volume purchases, plus having them mix and deliver the insecticide to Caribou, all at cost, was of distinct benefit. In addition they rented us, at a very nominal cost, nearly all of the extensive equipment involved in storing and dispensing the insecticide and gasoline at the airport. Therefore, the operation had the essence of an international forest insect control project.

*Contracts and Materials.* Eight TBM planes, each carrying 7,800 gallons of insecticide, and pilots were contracted for to



do the major spraying. The contract also provided for two Stearman planes and pilots for spraying around irregular boundaries and waterways. Supervision of spray applications was provided by five Cessna 180 aircraft contracted separately and flown by experienced observer pilots solely responsible to us. All planes and headquarters were radio-equipped. Maps were supplied each pilot showing spray blocks and flying hazards. One gallon of solution, containing one pound of DDT, was applied per acre as a fine mist.

*Publicity.* Extensive prior local publicity, of the aims, reasons, and methods to be used, involved all news media and local service-clubs talks. More importantly, personal explanation was given all residents near the spray area. Telephone notification was provided a few minutes prior to spraying their areas.

*Entomological Studies.* Budworm feeding occurs over a 6-week period. Successful control can be obtained only in a 12-15 day period. Daily analysis of caterpillar development starting in mid-May showed the proper time to start spraying. Pre- and post-spray collections at 200 sampling points in the area gave the degree of kill of budworms by the spray. At these sampling points amount of spray-deposit was also determined for correlation with budworm mortality.

*Spraying Procedures.* Airport facilities included the placing of a small trailer for office and radio headquarters. Tanks for 40,000 gallons of insecticide and one 10,000 gallon tank for aviation gasoline were installed. Loading of planes involved 200 g.p.m. delivery, accurately metered because payment for spraying was on a gallonage basis. A centrifugal trailer pump, with one in ready reserve, delivered the insecticide from storage to four loading stations at the edge of one runway. Detailed and highly important arrangements synchronized plane landing, loading, and take-off to prevent any delay. Time was the critical factor since suitable spraying

weather is limited to fair days having neither wind nor convection currents; usually from daybreak to 7:30 and from 7 to dark.

Upon arrival of planes at Caribou spray equipment was calibrated to deliver insecticide at the required rate; and orientation flights were made. The spray area was divided and mapped into rectangular blocks, 8 by 2 miles, each assigned to a pair of pilots. One spray-trip the length of a block and back emptied the tanks after which planes returned for reloading. This involved only one turn in dispensing each load. Planes sprayed in pairs, treating a strip 800 feet wide. An observer-guide pilot was above each pair and in communication by radio. Southern blocks were released for spraying on June 9. Spraying began June 10, was completed June 20, and involved 38 hours in 9 spray periods.

Safety measures assigned by a U. S. Forest Service safety expert and stressed throughout the project, included a crash truck, a town fire truck with foam, CO<sub>2</sub> fire extinguishers at loading stations, fencing 24-hour police guard, and other effective regulations.

The entire project was recorded in still and 16mm moving pictures.

*Associated Studies.* The staff studied effects of the spray on budworm parasites, and completed the first year of a 2-year study of the effects of aquatic insects. The second year of this study was sponsored by The Conservation Foundation (New York) who also sponsored a study of possible effects of spray on plant succession.

Fishery biologists of the State Department of Inland Fisheries and Game closely cooperated by making a 2-year study of fish reactions. Game biologists checked the area for effects on birds and animals.

*Results.* Budworm mortality studies showed a 96% reduction in population which was considered highly successful. Regular budworm larval surveys, the aerial defoliation survey, and the final sur-



vey of the year, that for eggs, also indicated excellent control.

Studies showed the spray caused no harmful effects on budworm parasites. Through 1959 per cent parasitism has been higher in the sprayed area than in unsprayed areas.

Numbers of aquatic insects in streams were materially reduced temporarily. Populations were recovering by August, 1958. First 1959 collections in early June showed good populations, with rapid increases and good species representation as the season advanced.

Fishery studies through 1959 are not yet completely analyzed. Thirteen streams were studied. Pre- and post-spray population estimates were made by electrofishing apparatus. Blocking nets, totaling 6,500 feet of stream area, were operated to determine the extent of fish kill. Total 1958 fish mortality observed was 8,884 of which 216 or 2% were brook trout, the rest being suckers, sculpins, minnows and sticklebacks. Thirty per cent of the trout found were young-of-the-year. Preliminary conclusion of the biologists from analyzing data of 1958 is that spraying has reduced the populations of trout and other fishes in the DDT-treated area, but no serious effect on the overall long-term trout population is apparent.

Game Biologists found that song bird, game bird, and game animal populations remained unchanged. One dead chipping sparrow was found. Analysis showed DDT in its tissues but whether a lethal amount is a matter of conjecture. Entomologists in the spray area through August found on diligent search only one other bird. This died of a broken neck. No injury to domestic animals occurred.

Study of plant succession in spruce-fir forests is not yet completed.

Reduction of the budworm population succeeded in protecting a large area of valuable forest and its related values. In addition, the wildlife habitat was protect-

ed from effects of widespread budworm devastation.

The Conservation Foundation, beside financially supporting studies, observed the overall project. They have publicly stated their high impression of the execution, close management and results of the operation.

*Expenditures.* Direct expenditures for the project totaled 77 $\frac{3}{4}$  cents per acre. This includes studies in assessing results as well as the parasite and aquatic insect study. Addition of salaries of permanent employees assigned to the job, raised the unit cost to 84 $\frac{1}{4}$  cents.

*Situation leading to 1960 spraying.* The 1958 spray area included a margin of less severe infestations. Elsewhere, anticipated progressive declines in populations occurred except in an area to the west of the 1958 spray area and in a much smaller area to the south. In the western area a serious degree of resurgence occurred in 1959. This was evident from analysis of all 1959 field data which showed intensive 1959 defoliation, increased egg numbers to indicate more serious defoliation in 1960, decline in increment, expected start of tree death in 1960, definite lag of parasitism with no indication of improvement, and spread of the moths to give high egg deposition in the western edges of the 1958 spray area.

The above conditions led to the recommendation to the Forest Commissioner that 175,000 acres be aerially sprayed for spruce budworm control in June, 1960. Spraying is to be done west of Portage and Ashland and will include areas of heavy egg deposition eastwardly into the 1958 spray area in order to reduce all components of recently resurged populations. It will also include a small area east of Squa Pan Lake. Legislation by a special session of the 99th Maine Legislature January 1960 provided funds in the same manner as for the 1958 project. The process of effecting the project is now underway.

# Recreational Planning for Maine Wildlands

*By* JOHN T. MAINES

Manager of Woodlands, Great Northern  
Paper Co.

The unsettled timberlands of Northern Maine have long held attraction for a limited number of recreation seekers, and several of the earlier ones who took the trouble to write of their experiences include Henry David Thoreau and James Russell Lowell. During the 1800's travel through the area was principally by canoe or on foot. Probably the heaviest canoe traffic through the Northern Maine woods was about the turn of the century, when it is reported that hundreds of parties were outfitted each summer in Greenville to run the Allagash and explore and fish in the tributary lakes and streams. During all of this time, as today, the public has been free to enter and use this vast wildland area.

During the past 30 years the mode of travel in the area, as well as the number

and type of people seeking recreation has had a considerable change. Although logging and pulp cutting have been going on for over 100 years, only during the past 30-40 years has permanent road building been underway to any great extent. This development of private roads for access to mature timber for truck hauling has resulted in the opening up of the perimeters of the area to heavier recreational use. Although these roads have been built by landowners and woods operators they have for the most part been opened to the public without charge.

Traffic surveys have been made during the past two years on the Realty Road running west from Ashland, and on the Allagash River. The road count the first year was 14,209 persons on recreation (counted one way). The 1959 road count on a com-





20-Mile Swing Traffic Survey Station

parable basis with 1958 indicates over 16,000. The river figures are 409 (July-November) for the first year and 808 (June-October) in 1959, traffic being counted both ways at the Michaud Farm, 4 miles above Allagash Falls. Most of the river traffic both years was local people going to and from the Round Pond region, with the second largest group coming from boys' camps. The adult canoe parties of the early 1900's are gone, but have been partially replaced by the boys' camps. A road traffic survey at 20 Mile Swing above Rockwood counted 18,345 people using this private road in 1959 for recreational pursuits.

The recreation seeking public is now getting into this area by car, and quite often with a boat, trailer, and motor. The use of float planes has also made this area much more accessible to sportsmen, and many of the lakes once considered remote, now have more air traffic on weekends in June than some of our small airports.

The demand for shore lots for private camps is increasing each year but the demand is greatest near the towns and cities and in Southern Maine where a summer camp can be close to home and the job. To most people, the increased privacy is not worth the cost and time involved in getting into a camp in a roadless area.

Timber production and recreation have been going on for over 100 years on these privately owned and managed timberlands.

The owners have paid the taxes, built and maintained the roads and provided for protection from fire and insects through the Maine Forestry District and at the same time allowed free public access and use. Campsites and lunchgrounds maintained for free public use, have been leased to the Maine Forest Service without charge. This policy has resulted in excellent recreation for Maine sportsmen as well as adding considerably to the attraction of Maine as a vacationland for tourists.

The charging of fees for use of private roads, landings, and campsites has not seemed necessary or advisable, and most landowners appear reluctant to get into this business. As public use increases this situation may change and there is some evidence that the sportsman paying a fee for a privilege appreciates it more than the one who goes free. More camping facilities will be needed at the points of heaviest use, and there is no reason that they should not be self supporting.

Future recreational development of the area might be well handled by an association of landowners. Such an association could establish policies and develop plans in cooperation with the Maine Forest Service, the State Park Service and the Fish and Game Dept. Cooperative projects with local Fish and Game clubs would improve landowner-sportsman relationships and an association could provide the personnel,

equipment, and services necessary to meet increasing public use.

While the idea of an association has merit, there are obvious stumbling blocks. These would include the undivided ownership of many towns, the number of different owners that would be involved, and the differences in their objectives of ownership. A number of questions in regard to campsites, use of roads, and other important policy matters must be answered in the years ahead. An association would have the advantage of presenting a uniform and progressive policy for recreational development of this important resource that could be coordinated with existing State agencies in the resource field.

Other possibilities for recreational development include a national park or a State park or parks. Strong opposition to the national park idea is in evidence by landowners, industries depending on forest products, and sportsmen, and this opposition appears sufficient to make the establishment of a federal park unlikely. We cannot afford to lock up large areas of productive timberland for the idle and unproductive use of a few people during the short vacation season.

Our State Park Service has its hands more than full in those parts of the State now enjoying heavy recreational use. Future development of the State facilities should be confined to these areas, at least until such time as State and private facilities in Southern and coastal Maine are adequate to meet the demand. More camping facilities are badly needed in many of the existing State parks as well as Baxter State Park.

It appears then that the recreational development of Northern Maine wildlands will fall upon the shoulders of the present landowners. These owners can be expected to continue to provide the free public use of their land and facilities up to a point where this use seriously interferes with the primary use of the land, which is the production of timber. At this point, and some believe we have now reached this

point in a few locations, the area in question should be zoned to accommodate both timber production and recreation and there is no reason that either will suffer. At this point the employment of professional planners, game biologists, and other specialists by timberland owners would be advisable, and this is being done in Maine and elsewhere in the country.

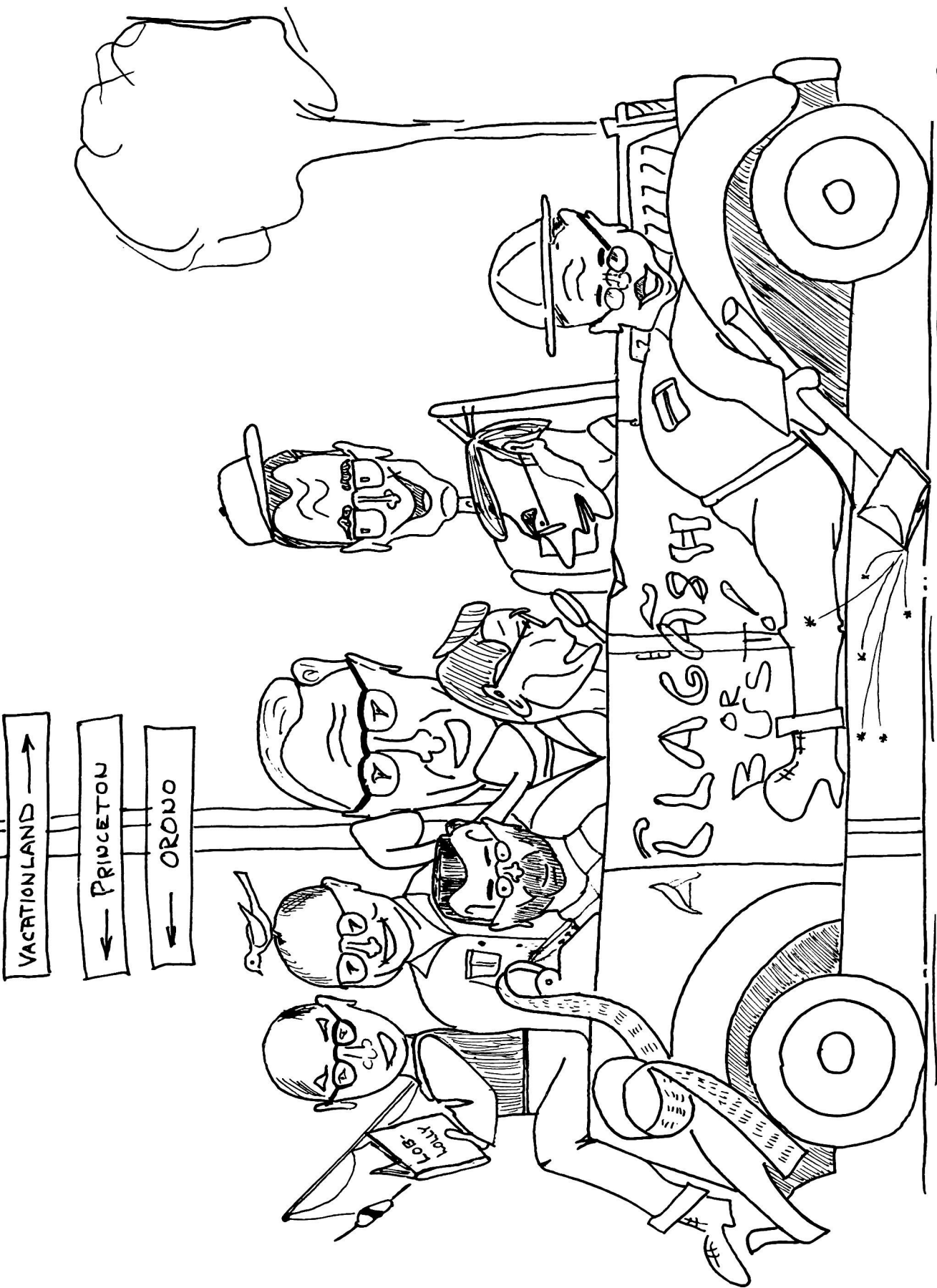
The increased public use of Maine's wildland will not be as explosive as the proponents of "Preservation Now" would have us believe, and those getting into this area will continue to be the overflow from the coast and settled areas, plus the few having the time and energy to rough it. The attraction of fishing and hunting will diminish with increased public use and we already have formidable competition in these fields from Eastern Canada.



Realty Road Traffic Survey Station

Future development should be based on full use of the area, providing for the greatest good for the greatest number of people. While some landowners are sympathetic with the desires of the preservationists to keep out all roads, outboard motors, airplanes, and all but the hardest of people, such a policy would not provide the full use essential to the future prosperity and progress of Northern Maine. The full development of this great natural resource must continue with recreation taking its increasingly important place in our plans.





# Maine Wood Density Project

How many pounds of dry wood fiber per tree or tons per acre? Research currently being conducted in the state may furnish data which will allow this question to be answered.

Maine forest land owners, the U. S. Forest Service and the Forestry Department of the Maine Agricultural Experiment Station are cooperating in a study of the wood density of Maine softwoods. The Penobscot Research Center, U. S. Forest Service, has general supervision of the whole project. They also will be responsible for the destructive sampling of about 1000 trees, the data from which will be used to correlate density (specific gravity) at breast height, as determined by increment cores, with specific gravity of the total merchantable volume of the tree and also to show variations in density within the stem. Somewhat over a freight-car load of disk and increment cores will be collected and sent to the U. S. Forest Products Laboratory in Wisconsin for specific gravity determinations and data analysis.

The land owner group has contributed money to the Station for the purchase of supplementary laboratory equipment and for training of a Station employee at the Forest Products Laboratory. The land owners are further contributing to the project by the collection of increment cores and are assisting in the destructive sampling. They have established over the past several years nearly 2000 permanent growth study plots which are remeasured at five-year intervals. At the time of remeasurement they will collect two increment cores from each of 5 softwood trees on each plot. Since some plots will contain no softwoods, or fewer than five, it is estimated that over the five-year period about 15,000 increment cores will be obtained.

Each core is identified as to the plot it comes from, the tree species and size and the side of the tree, in reference to the plot center, from which it was extracted. The cores are inserted into paper drinking straws and mailed to the laboratory in Orono.

The University's part of the cooperation is to furnish personnel and laboratory space for processing the cores. A representative received training at the Forest Products Laboratory last summer and participated in preparing the working plan for the entire project. The processing of the cores from the mass sampling consists of checking field data and cores to detect and correct errors, drying the cores, weighing, re-soaking to check measurements, and counting the growth rings for total age at breast height. This past field season, during which relatively few plots were due for remeasurement, some over 1100 cores were received and processed.

Cores are assigned a serial number and filed in separate envelopes for future side studies which may be initiated. Specific gravity values are computed and entered on the data sheets. All data sheets will be forwarded to the Forest Products Laboratory where analysis and correlations will be made in electronic computers. The task of writing the report for publication will be a joint responsibility of the personnel of the Penobscot Research Center and the station.

New equipment, which was made possible by industry contributions, included a Mettler multi-purpose balance, a Freas mechanical convection oven, and a wide-field binocular microscope as well as numerous smaller pieces of equipment necessary for the work.

Here we have a pooling of personnel, equipment and know-how by three different groups working toward more basic knowledge of wood quality.

# White Pine Study

*By* FRANK K. BEYER

For over fifty years foresters have studied white pine in New England. During this time by careful experimentation and observation a store of knowledge has been built up that is invaluable in white pine culture. However, there is still a need for certain basic information that will enable us to predict the yield that can be expected upon each of the great variety of sites encountered within its commercial range. On a vast area of forest land where intensive management may be contemplated in the future and on a considerable area of land where it may be desirable to plant forest trees, no reliable gauge of relative site values now exists. Since it is believed that some of these sites have a basic productivity that justifies the intensive management practices contemplated while others do not, the need for site value studies is apparent.

There have been many studies done in the past that are related to this problem. These studies have dealt with limited portions of the problem such as the effect of a local site factor complex or with the effect of individual site factors upon growth. Based upon a variety of methods for measuring growth or evaluating each site factor the data presently available cannot be combined to show the effect of whole site complexes upon the growth of stands.

The present study is a regional research program sponsored by the United States Forest Service and supported in part by Federal funds. The field work is being undertaken by the Agricultural Experiment Stations of Maine, Massachusetts, and New Hampshire. In Maine one Experiment Station member from the School of Forestry assisted by student labor is, during the summer months, establishing and measuring the necessary sample plots. Approximately ninety plots are to be distributed over the nine most southern counties. These counties are the important white pine producing area of the state and the northeastern portion of the major

white pine producing area of New England.

These plots will be selected with the aid of the Service Foresters of the Maine Forest Service. They will represent ages from thirty to seventy years and cover a wide range of stand densities. They will cover the major soil types encountered in the area. Careful observations, counts and measurements will be made to fully and accurately describe the vegetation present from ground cover to crown cover. Equally careful observations and measurements will be made to describe site conditions such as soil, terrain, and climate. Sample trees will be identified, measured, bored for age and growth, and described. Certain sample trees will be measured and bored at stump height, breast height and at a point one standard log length above stump height. At the conclusion of the study complete stem analyses will be made of these sample trees. Sectional ladders will be used to reach the higher points of the hole. After four years have elapsed each plot will be visited again, remeasured and redescribed. Where the plots can be preserved long enough a third set of measurements will be made at the end of eight years.

The data secured from these plots will be subjected to multiple regression analysis by Forest Service personnel at the Northeastern Forest Experiment Station. Publication of preliminary findings is planned at the end of the first four-year period. Regional and local publications will follow. It is intended that this study will clarify the matter of site evaluation for white pine, and that a generally applicable method of site evaluation will result. It is also intended that valuable information will be secured on tree form, and on diameter, height and volume growth as related to development of the tree, the condition of the stand, and the quality of the site.

# WILDLIFE







**MANAGEMENT**

# Required Training and Professional Opportunities In The Field of Wildlife Management

*By* SANFORD D. SCHEMNITZ

Wildlife management is a science concerned with the production of a maximum annual harvest of wildlife on a sustained yield basis on a given area. In this respect, wildlife management is related to forestry since the forester strives toward repeated harvests of forest products from forest lands. When certain wildlife species conflict with the economic uses of the land by man, the wildlife manager often practices various control measures.

Why do we need wildlife managers? The answer to this question is complex. In brief, there is a definite need to produce more game and fish in a habitat being continually restricted by urbanization and industrialization. In 1955, a survey indicated that 25 million people in the United States participated in the sports of hunting and fishing. As future human populations continue to increase at a rapid rate with a trend toward people enjoying shorter working hours and longer vacations, the recreational demands for fish and game by this mushrooming outdoor sporting public will also increase. To meet this increased demand, college trained wildlife managers will be needed to gather the basic research facts and practice the intensive game and fish management essential for increased wildlife production.

Many students are attracted to the wildlife curriculum primarily because they like the outdoors and like to hunt and fish. Certainly these outdoor sporting hobbies will be no handicap. In addition, a potential wildlife management student should have a sincere vocational interest in wildlife ecology and an aptitude for the biological sciences. Scientific game and fish management programs require the services of trained men, well grounded in basic and applied science.

Let us look for a moment at the various activities of a typical, college-trained professional wildlife worker and see how the various courses that he takes at the University of Maine fit into his everyday duties.

The biologist spends much of his time in the field in the great outdoors observing various wildlife species in their natural habitat. In order to adequately interpret what he sees, he must be familiar with and able to identify the various plants (dendrology and plant taxonomy) and animals (ichthyology, entomology, mammalogy, invertebrate zoology, ornithology). He finds his way around in the woods with ease after a summer of field experience at summer camp. After his observations are recorded, he must analyze and summarize his data (mathematics, statistics) and write up various reports (English composition, technical composition).

Frequently the wildlife worker will come upon carcasses as well as sick and diseased wild animals during his field travels. Often he will be able to examine and autopsy the specimen and diagnose the symptoms of disease or cause of death (wildlife disease and parasite control, bacteriology, parasitology).

Many animals find shelter and food in the forest. The game manager is concerned with how various forest practices (silviculture, forest management, fire control) affect the habitat of forest game. The wildlife manager must be familiar with various soils (forest soils) since basic soil fertility affects wildlife productivity.

He often makes census and inventories of wildlife species that are fundamental to good management (game management, fish management). In order to measure the quality of the habitat, our wildlifer

must measure the vegetation (forest mensuration) and locate his study plots on maps (surveying and drawing).

One of the existing problems confronting wildlife workers today is their inability to adequately communicate with the general public and instill in them an appreciation of the basic, simple principles of ecology and sensible methods of game management. In order to convey more adequately our message to the people, wildlife workers must develop a proficiency in public speaking (speech). Public confidence in sound wildlife management depends largely on simple but adequate explanations of game and fish conservation in terms that the lay public can understand.

Wildlife management students are urged to supplement their academic training with field experience during the summer months by accepting temporary employment with a public agency engaged in fish and game conservation. Summer wildlife jobs are arranged for by the School of Forestry. This type of work gives the student an opportunity to apply in the field the knowledge he has learned in the classroom as well as acquire new skills.

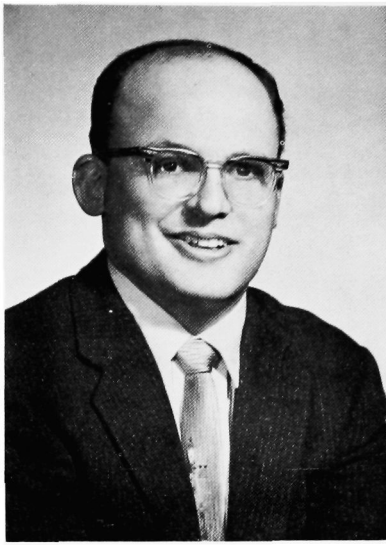
Many of the superior undergraduate students enter graduate school where they work for a Master of Science Degree in Wildlife Conservation. These students expand upon their undergraduate training by taking additional course work as well as undertaking an original research problem to meet their thesis requirements. Frequently graduate students receive financial aid in the form of an assistantship or fellowship often totalling about \$2,000 per year. Graduates with advanced degrees often find employment in research and teaching positions that require this additional training.

Employment opportunities in the wildlife profession are diverse but are mainly restricted to public employment although some of the larger timber companies (e.g. Weyerhaeuser Co.) recently have hired

wildlife biologists. Each of the 50 states employ college trained fish and game managers, research biologists, information and education personnel, law enforcement personnel, and fish and game hatchery personnel. Various Federal agencies employ trained wildlife management graduates. These include the Fish and Wildlife Service, the National Park Service, the Forest Service, Army Engineers and the Soil Conservation Service.

The Fish and Wildlife Service is the Federal agency that employs the largest number of wildlife college graduates. Students must pass the Federal Civil Service Entrance Examination. The Bureau of Commercial Fisheries hires wildlife management graduates interested in fisheries to work on anadromous (salmon), marine and inland fisheries studies. The Division of Sport Fisheries of the Bureau of Sport Fisheries and Wildlife hires graduates for work in fish hatcheries and as fishery management and research biologists. The Branch of River Basins has a need for fish and game specialists. In the Division of Wildlife, the Branches of Predator and Rodent Control, Enforcement, Wildlife Refuges, Wildlife Management Services, and Wildlife Research hire students interested in game management work. The number of vacancies vary from year to year depending on personnel turnover and expansion of the programs.

Salaries for wildlife graduates generally are as high as many professional fields. Graduates with a Bachelor of Science degree can expect to start out at a monthly salary of about \$350 to \$450 usually with opportunities for annual increments and advancement in job status. Advancement and jobs requiring added responsibility will commence as working skills and experience are acquired. In addition to monetary rewards, professional workers in forestry, wildlife, or soil conservation derive satisfaction from the feeling of accomplishment associated with their contributions to science and the benefit of mankind.



Temporary Assistant Professor  
Sanford D. Schemnitz  
Game Management

Dr. Sanford Schemnitz (alias Simon Lagree according to the senior wildlife class) came to the University of Maine in September as a Temporary Assistant Professor of Forestry in the Wildlife Department. He was born in Cleveland, Ohio and attended schools in Ohio, Wisconsin, and California before college. Dr. Schemnitz received his B. S. Degree from the University of Michigan, his M. S. Degree from the University of Florida, and his Ph. D. from Oklahoma State University.

He is a member of several professional and honorary societies. His professional societies include the Wildlife Society, Society of American Foresters, Ecological Society of America, American Society of Mammalogists, and the Southwestern Association of Naturalists. Dr. Schemnitz is a member of the following honorary societies: Phi Sigma (Biology), Xi Sigma Pi (Forestry), and Sigma Xi (Research).

Besides his scholastic achievement he has done considerable work on upland game and waterfowl. This includes specific research on the gray squirrel, wild turkey, white tail deer, ringneck pheasant, and the scaled quail. His hobbies include hunting, fishing, photography, hiking and reading.

Dr. Schemnitz will be leaving us next fall when Dr. Quick returns from Africa. The wildlife classes wish to express their thanks and wish the "best of luck" to Mr. and Mrs. Schemnitz.



# The Challenge of Atlantic Salmon Restoration

*By* W. HARRY EVERHART<sup>1</sup>

Sportsmen argue and discuss the merits of various game fish, but most every angler will agree that the Atlantic salmon is tops in game fish royalty. The only fishable populations of Atlantic salmon in the United States are found in our Maine rivers.

The Atlantic salmon fisherman is well aware of the recreational value of fishing as he measures it in many hours of pleasant relaxation. Unfortunately however, many people fail to realize the commercial value of the sport fishing. Economists have estimated that salmon anglers are willing to spend as much as \$10 a pound to catch Atlantic salmon, and our catch records tell us that the average salmon taken in our Maine rivers weighs 10 pounds. Hundred dollar fish deserve consideration.

Not too long ago the Atlantic salmon in the United States was well on its way towards becoming the "whooping crane" of the fish world. The problem had begun in colonial times, but the end was near. Now you might justly wonder how this could happen to such a virile and gamy animal capable of producing thousands of offspring. Why, this Atlantic salmon even has built-in protective devices to carry it through critical periods. First, there's the habit of straying into other rivers. Suppose every Atlantic salmon returned only to the river in which it was reared as a young fish. Then a catastrophe could

eliminate forever an entire river population, but with straying, fish from other rivers would eventually repopulate the area when living conditions were suitable again. Or suppose that the life cycle was so fixed that all fish lived three years in fresh water and two in the ocean. Entire runs could be eliminated by drought years or some unfavorable environmental factor, or by disease. Fortunately, the number of years spent in fresh water and in the ocean varies so that elimination of an entire year's run is improbable. Finally, as a method of insuring fertilization of the eggs, the small male salmon are mature during the spawning season and capable of fertilizing the eggs. Even if most of the adult males fail to return, some of the mature eggs would be fertilized. These are only a few evidences of how well the Atlantic salmon is adapted for its life in the river and ocean.

Did some natural phenomenon arise and upset the survival and cause the decline? There is no proof of any. You hear talk about the warming of the oceans and similar changes, but there is absolutely no indication that any such thing was responsible for the decline of the Atlantic salmon in Maine.

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<sup>1</sup>Dr. Everhart is Chief of Fishery Research and Management for the Maine Department of Inland Fisheries and Game and the Atlantic Sea Run Salmon Commission and Professor of Zoology at the University of Maine.

Actually the villain is one of the most destructive animals of all, MAN. By 1763, only five years after the town of Machias was settled, the Machias River was blocked at its mouth to fish migration. More and more dams appeared as more and more rivers were industrialized. But dams weren't the only obstacle invented by Man. Pollution was another. As domestic sewage and industrial wastes poured into the lower portions of the rivers, the salmon moving upstream faced a double threat. His migration was blocked and the very medium in which he lived destroyed. Whole watersheds and river systems were eliminated as is our Penobscot River today. Here were problems the salmon hadn't faced as he evolved and adapted to his environment. He would become extinct before natural selection could give rise to an Atlantic salmon capable of flying over obstructions to reach the vitally necessary spawning and nursery areas in the upper reaches of the rivers.

The Atlantic salmon needed help. The picture was discouraging, but to a few Maine citizens and trained fishery scientists the situation was not hopeless. Other kinds of salmon were being passed successfully over higher dams by efficient fish passage devices in other parts of the world, and many of our Maine rivers have practically no pollution. So the challenge of Atlantic salmon restoration was taken up from the Aroostook River in the north to the Sheepscot River in the south. Emphasis was placed on eight major rivers, but smaller rivers were not neglected.

First we had to take an inventory of our stock, and stock in this instance was suitable water area. A good salmon river

must provide passage upstream for the mature adults on their spawning migration, pools for protection of the fish until spawning time in the fall, spawning areas of suitable size gravel with clean water, nursery areas to maintain the young salmon, and, lastly, passage downstream for the young fish. Fishery scientists traveled our rivers and streams cataloging the obstacles and measuring the areas available as good homes for the mature and young salmon.

Armed with this information the Atlantic Salmon Commission was able to plan and organize a logical program for restoring this valuable natural resource. Figure 1 sums up diagrammatically the major problems, suggested solutions, and progress to date.

If Atlantic salmon were the only important natural resource in Maine the restoration program would simply amount to the removal of all dams and the elimination of pollution. Obviously, other water users must be considered in salmon restoration, and they, in turn, must consider our fishery resources if everyone is to benefit from the multi-purpose use of our waters.

Most of the dams in Maine are low structures that would present few problems to migrating salmon if present fishway design information were utilized in providing fish passage.

An important part of the restoration program is the rearing and stocking of young salmon to supplement natural populations and as seed to rebuild salmon populations lost when dams obstructed and killed off the original runs. Research in Russia, Canada, and Maine has determined that young salmon migrate downstream to

the ocean at a given size, and that this size must be coordinated with certain water temperatures and water flows. Stream life of the young salmon is a critical period. Natural mortality is high and only a relatively few young salmon survive to migrate to the ocean and return as mature adults.

Consequently it would seem desirable, if possible, to shorten the period of stream life to reduce the chances of a young fish dying before he is large enough to migrate to the ocean. One way of accomplishing this would be to grow larger fish in the hatchery. Fish culturists at the East Orland salmon hatchery have installed large boilers capable of raising the winter water temperatures several degrees. The increased water temperature will shorten the hatching period, increase the growth rate, and make it possible for the Atlantic Salmon Commission to plant young salmon so large that they will spend only a minimum time in fresh water before migrating to the ocean.

Cooperation between fishery resources and forestry industry can be illustrated by our program with the St. Regis Paper Company. The St. Regis Paper Company operates the dam at Whitneyville on the Machias River. Once salmon pass this obstruction they have 50 miles of river with almost 850,000 square yards of spawning and nursery area available. In 1954 the Whitneyville fishway passed only 12 per cent of the salmon counted into the lower Machias River. Modifications to the fishway in 1955 permitted 35 per cent of the run to pass. This year, 1959, ninety per cent of the salmon made their way through the fishway and over Whitneyville dam. This increase in fish passage is the result

of close cooperation by the company in providing modifications and desirable flows at the fishway entrance. Further help has been given in the headwaters of the Machias by careful manipulation of water levels. Finally, St. Regis has provided all of the timbers for the 400-foot year-around weir that spans the Narraguagus at Beddington and provides access to the weir site. *These are encouraging signs for Atlantic salmon restoration.*

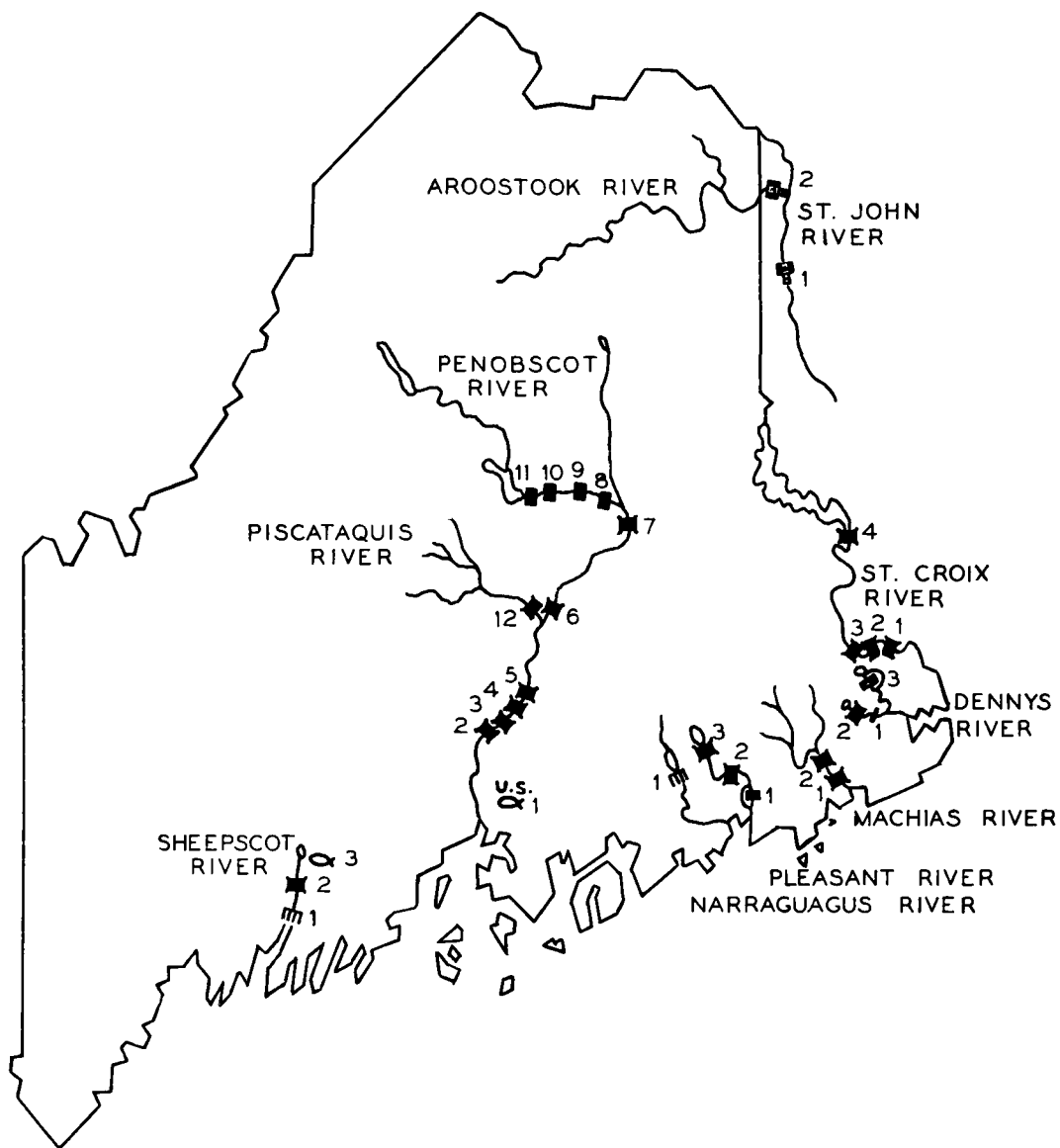
Figure 1. Major Maine Atlantic salmon rivers with critical restoration problems, some suggested solutions, and progress to date.

#### *Aroostook River*

1. Beechwood Dam on the St. John River over which all Aroostook-bound salmon must pass in a conveyor-type fishway.
2. Proposed fishway trap and conveyor to pass salmon over Tinker Falls obstruction near the mouth of the Aroostook River.

#### *St. Croix River*

1. New Brunswick Power Commission Dam at Calais with no fish passage provided.
2. Woodland Dam with no fish passage facilities.
3. Grand Falls Flowage Dam with no fish passage facilities.
4. Spednic Lake Dam with inoperable fishway.





### *Dennys River*

1. A natural obstruction and remains of an old wooden dam have been removed on Cathance Stream.
2. A water control dam and fishway should be provided at the outlet of Cathance Lake to provide better water flows for increased nursery areas to increase numbers of Atlantic salmon in lower Dennys fishery.
3. Dam and power station at the outlet of Meddybemps Lake. Water flow is a critical problem on the Dennys River.

### *Machias River*

1. Better fish passage should be provided in the Gorge and at the first dam in Machias.
2. Whitneyville fishway is passing fish through the cooperation of the dam owner, but a better designed fishway would require fewer man-hours to manipulate fishway and water flows.

### *Pleasant River*

1. Atlantic salmon pass first dam by swimming easily up the run-around.
2. A denil fishway and weired canal pass alewives and Atlantic salmon over this natural obstruction, Saco Falls.
3. A water control dam and fishway should be provided at the outlet of

Pleasant Lake for better water flows.

### *Narraguagus River*

1. Atlantic Salmon Commission research weir designed to operate year-around is the basic fact finder for a 10-year investigation.

### *Penobscot River*

1. Atlantic Salmon Hatchery with a capacity for 1,000,000 fall-fingerling Atlantic salmon operated at East Orland by the U. S. Fish and Wildlife Service.
- 2.-7. Efficiently operating fishways in these major dams would permit Atlantic salmon to reach ideal spawning and nursery areas in the East Branch of the Penobscot River.
- 8-11. Dams on West Branch providing impoundments for water power and primary sewage treatment.
12. Dam at mouth of Piscataquis River closing off this valuable tributary from Atlantic salmon production.

### *Sheepscot River*

1. U. S. Fish and Wildlife salmon weir for counting fish.
2. Newly constructed Denil fishway at Cooper's Mills.
3. Inland Fisheries and Game Hatchery at Palermo rearing salmon for stocking in the Sheepscot River.



## Wildlife Camp 1960

*By* STANLEY CHENOWETH

On June 7, 1959, twelve wildlifers, seven canoes, and numerous flyrods and hip boots arrived at Camp Robert I. Ashman. While the foresters were touring the countryside on their spring trip, we were to spend a week at the camp, under the direction of Dr. Quick gathering first hand information on the wildlife of the area.

Bright and early the following morning we learned that wildlife camp was not all play. The flyrods were just barely unpacked when we found ourselves canoeing up Musquash Stream in search of beaver and muskrat. Porcupine damage study, marsh ecology studies, and mammal trapping followed in quick succession. Under the guidance of Dr. Richards, who spent several days with us, we had a badly needed review of aquatic plants. In an all too short week we gained valuable training in field methods and making accurate observations.

During the week there were many extra-curricula activities that kept us occupied and provided a few chuckles. By some coincidence it was discovered that Grand Lake Stream was "chock full of salmon." This fact was to occupy the minds and talents of the wildlife class for many weeks to come. There was also "Patrick's Folly." For the uninitiated, it is located about 100 yards in from the highway on R2S2. On one occasion, upon returning from a reconnaissance from the upper reaches of Musquash Stream, "Doc" Quick discovered an overabundance of wildlifers in the canoes. A quick roll call discovered two stowaways and we had to take the girls back.

Time flew and at the end of the week we gave a reluctant goodbye to "Doc" Quick, who was already polishing his elephant gun, and looked to the arrival of the forestry class.



No Mosquitoes



Catch Many Muskrats?



Aquatic Plant Study



I Can't Get Down



REF. No. ....

Masindi, Uganda  
British East Africa

1 March, 1960

The Class of 1960  
School of Forestry  
University of Maine

Gentlemen:

This year I shall not be able to personally congratulate you on the occasion of your graduation and so I should like to do so with this letter. Now that you have finished your course of study you are ready to begin your professional careers. I am sure that you will carry the tradition and spirit of a Maine Forester with you as you go to your posts throughout the country. Good luck, Gentlemen!

My assignment here is one that combines theory and practice and probably is an ideal "refresher course" for an instructor. Further, it is a good combination of forestry and wildlife management with a bit of exploration thrown in for good measure.

The British Protectorate government is putting things in order so that when the African nations take over the administration of the country they will have a firm foundation from which to begin self-government.

The Ministry of Natural Resources is conducting surveys of natural resources and preparing plans for balanced and integrated development. My part of this job breaks down into two major projects, one, a population analysis of the elephants of Uganda national parks and the other, an estimate of the effects of elephants on future forest production.

We have been censusing elephants from the air with a Cessna Voyager. This is a rare sport because we have taken the doors off the aircraft and this gives the sensation of riding a chair through the air with all the wind and sound effects that you can imagine would go with such an exercise. Usually, we census from an altitude of 600 feet but sometimes drop down to fifty feet to have a close look. It is amusing to see the bull elephants wheel to face the airplane and the trunks go up to try to get the smell of whatever is after them in a sort of "up periscope" drill. Sometimes we find huge herds of more than a thousand elephants in one great compact group. It is impossible to count them under these conditions so we circle up to 2,000 feet and I have been taking high oblique photos of these herds with a K 20 aerial camera. Then I can sit comfortably at a table and count! One herd consisted of 1,200 animals. Most of the work, of course, is done from the ground where we must go afoot overland, to classify the elephant herds and to study their behavior in the forests. The classification consists of enumerating the animals according to size classes which reflect roughly the age distribution of the population. An average herd unit consists of 16 animals with four totos or babies, four old mothers, a big bull or two and the balance of intermediate age classes. Sometimes when we need a close look we get too close and a big old mother elephant with a new toto resents the intrusion and threatens to charge. We keep our Rigby .416 at the ready but elephants generally give ground if one stands his ground quietly. Buffalo are the unpredictable ones! They actually advance at you. I wouldn't call it an outright charge but they do come right at you and it is best to get behind an ant hill or otherwise make yourself scarce. Buffalo seem to be an occupational hazard in elephant studies!

The phase of the work concerned with the effects of elephant damage to future timber production is very interesting. There are all sorts of distractions. Chimpanzees protest one's presence with loud calls, baboons announce your advance through the jungle and hundreds of kinds of colorful birds flush and call a warning to all other creatures. Luckily, the elephant does not panic and so we get a good chance to observe them. They gouge giant mahoganies with their tusks and after "mudding up" in the wallows rub themselves against the tremendous boles of giant forest trees.

I am using standard methods of vegetation analysis to estimate the effects of elephant damage. First, of course, the sampling areas have to be located and fortunately aerial photos are available, even if they are to be different scales. We record species, crown class, ground cover and regeneration, and the degree of damage done by elephants. Most of my work so far on this phase of the job has been in the small relic forests that dot the vast grasslands or savannas. Although I have not gotten to the stage of interpreting data I believe that I can distinguish at least five types of forests that represent transitions from high tropical forests to savanna woodland.

The crew is entirely African and when I try to load them with the gear that we need for the job they insist on keeping one hand free -- for their spears. They go bare footed through razor-sharp grass and thorn thicket and over rocks scorching hot enough to fry eggs.

To feed this crew I shoot "camp meat" two or three times a week. Usually, we kill a waterbuck, or wart hog. Sometimes one of the many kinds of antelope or a buffalo are found handy to camp. Last week I shot a buffalo with some misgiving because I thought it was too big to be used without waste. The beasts weigh in the order of a ton and a half! But we needed meat. It wasn't long after the shot that hordes of vultures appeared wheeling on the wind currents. In a half hour or so five natives appeared out of the bush, spears in hand, guided to the kill by the circling vultures. You never saw, such a job of butchering -- except in An P 44, Doc Witter cutting up a deer -- within minutes great chunks of meat were disappearing into the bush on the heads of porters and an hour later there wasn't a thing left for the vultures. Nothing was wasted, not even "unmentionables". In the black tropical night around the fire it is intriguing to see the people smoking meat on racks built over deep pits of glowing embers and to hear the chant and chatter of satisfied people. From the background one sees a ring of spears stuck in the ground, their points silhouetted against the blue-black sky, an inner ring of dark human forms and a center of glowing coals.

This part of Africa is a strange place. It is an odd sight to see a man riding a bicycle with a bow and arrow in his hand. He is dead-serious about his business of shooting edible rats. This strange mixture of two ages, the bow and the wheel, probably reflects a sudden emergence of a new age for Africa and is part of the reason for the technical assistance programs extended to African nations by the British government and the United Nations.

You have chosen an interesting and challenging profession. One that historically has been dedicated to the service of communities and countries and I know that as you all go out on the job you will find it a satisfying experience to be a Maine Forester. Congratulations!

Sincerely,

