

made on the processed wheat distributed by charitable and relief organizations. It is estimated that the net return from the processing tax for the first year of operation of the wheat program will be about \$105,000,000. In making this estimate, allowance was made for the wheat processed by or for producers or for charitable or relief organizations.

The Agricultural Adjustment Administration does not believe, of course, that the production of wheat in the United States should be reduced to the absolute level of our own domestic requirements. There is always the possibility that a certain percentage of our wheat can be moved in export trade to advantage, and furthermore, it is necessary that a margin of safety be provided to insure that the United States will have enough wheat for its domestic requirements in the event we should have short crops. However, it is recognized that if this margin of safety is too wide it might have the effect of depressing the price of our wheat down to, or at least toward, the world level.

C. C. CONSER,

Agricultural Adjustment Administration.

WILD-LIFE Factors Intricately involved conditions confront those who seek the most desirable use of lands that are now forested or have been despoiled of their original forest cover and await the efforts of man to restore them to profitable production. Biological principles must be the foundation of the management practices designed to improve production and will govern their ultimate success. The many species of wild animal life inevitably enter the picture either as productive assets of forests, as factors in their establishment and maintenance, or as devastating agencies to limit returns or nullify toil and expenditures in forest improvement. It is the part of intelligent foresight to consider these three aspects of forest and wild-life relationships in planning for the utilization and improvement of forested lands and for the restoration of depleted areas to productivity.

Three Classes of Forest Fauna

The productive wild-life assets of forests include chiefly fur animals and upland game. Among the latter are grouse and turkeys; the upland game mammals include rabbits, squirrels, bears, deer, elk, and moose. In the list of fur-bearers are martens, fishers, minks, skunks, foxes, opossums, and raccoons. To meet the increasing demands for recreation, for profit to the landowner, and for support of the great manufacturing and outfitting industries dependent on adequate supplies of game and fur, it is desirable to maintain and increase these wild-life assets of the forests.

The wild-life factors in the establishment and maintenance of forests comprise the distributors and planters of seed and the destroyers of insects and other destructive agencies. Well known among the seed disseminators are the squirrels, chipmunks, and seed-eating birds, which in feeding, drop or plant nuts and seeds in places favorable for growth. The hosts of small creatures that search out insects and other small enemies of the forest thus tend to keep under natural control the populations that would otherwise become excessive. The impor-

tance of this constant repression is commonly overlooked because of its very effectiveness in affording continuous protection to the forests. The far-reaching importance of the continuing processes of natural control is brought forcefully to attention only as outbreaks of destructive agencies occur, and under favoring conditions get out of bounds.

The destructive wild-life agencies are species that multiply excessively or attack valued kinds of forest plants or animals at critical stages. The maintenance in proper proportion of the numbers of these plants and animals is the key to successful forest and wild-life management. Failure to recognize this fact and ineffectiveness in dealing with it have led to disastrous losses and to the failure of many otherwise promising undertakings in forest-improvement work. Well-known examples can be cited in the Kaibab deer surpluses, when starvation among the Arizona herds resulted from an inadequate food supply; and in the destruction of numerous forest plantings through failure first to study the injurious rodent situation and apply necessary preventive measures.

For nearly 50 years the Bureau of Biological Survey has been engaged in building up a body of knowledge regarding mammals, birds, reptiles, and amphibians, based on extensive surveys and the collection and classification of specimens and the compilation of records of occurrence, distribution, life histories, and habits. The Bureau has devoted much attention not only to the relationships that wild life sustains to agricultural crop and livestock production, but also to forestry. This work has served to bring into prominence the importance of the interplay of the materials and forces of nature and the principles on which nature works.

Forest-Fauna Research under McSweeney-McNary Act

In recent years the problems of wild life as they relate to forestry production have been attacked under far-sighted congressional authorizations. Comprehensive plans along major lines of approach to essential features are being put into effect as appropriations permit. These plans involve investigations of all forms of the forest fauna—rodents, predators, fur animals, game and nongame birds, and the reptiles and other lower forms.

Under this program the study of rodents includes their relation to grazing, erosion, and soil working; their effect on ground and tree-nesting birds, including species valued as game; their influence on tree seeding and growth, including beneficial and harmful activities; their role as destroyers of harmful or beneficial insects or other small invertebrates; their agency in carrying parasites and diseases; the determination of procedure for their effective control where they are unduly destructive, or for their protection and encouragement where they are beneficial; and observations of their breeding and feeding habits and movements as these relate to their economic status.

The carnivores are studied as to their value as fur producers and their influence on the welfare and abundance of other species. The harmful relationships of the predatory species involve destruction of game and livestock and their role as carriers of parasites and diseases communicable to man, or to game, livestock, or other valuable species. Investigations are made of their breeding habits in relation to abundance and destructiveness; the necessity for control measures; and the possibility of such control or protection as the situation requires.

Fur-bearing animals of forested and other areas are studied to determine their feeding, breeding, and other habits in relation to other useful or harmful wild life and their value in pelt production. The numbers that can be maintained profitably on a given area are determined, and means are provided for producing adequate numbers to meet commercial requirements. The regions in which furs are of best quality or are most satisfactory for commercial purposes are studied and mapped.

Investigations of game animals include observations on their feeding habits in relation to tree and shrubbery growth and to livestock grazing; ascertaining the numbers that can be maintained satisfactorily on given areas; developing means of maintaining proper game populations and harvesting the surplus; and reserving areas suitable for stocking with native species.

Investigations of birds are made of both game and nongame species. Studies of nongame birds cover the occurrence, abundance, distribution, life history, and the migrations of all forest-inhabiting species, their feeding habits, including injury or benefit to tree growth or reproduction and seed distribution; and their relation to beneficial or harmful species of insects, birds, rodents, or other small animals. Studies also are made of their relationships to food or game fish in forest streams and lakes, their possible agency in the dissemination of tree diseases, and means for the control of harmful and the increase of beneficial species.

Game-bird investigations are conducted to determine essential facts regarding their distribution, movements, habits, and habitat relationships, and the factors affecting their abundance. The study of feeding habits includes observation of any direct injury or benefit to forest reproduction or growth. Consideration is also given to the value of game birds as financial or recreational assets of the forests and to means of increasing their numbers where this is desirable.

Research on similar lines is contemplated in the case of reptiles and amphibians, with particular attention to poisonous species, including such monetary losses due to their presence as death of livestock or lowered grazing values of lands. Effort will be made to determine their relationship to rodent pests, to birds with beneficial habits, to fish that are utilized by man for food, to small game, and to fur-bearing animals. Experiments will also be conducted to determine practical methods for the control of such dangerous or harmful species as rattlesnakes, copperheads, and water moccasins; and to develop means for the protection and increase of useful species.

Practical Application of Wild-Life Studies

Problems of major importance in the various regions are given first attention, and results as obtained are made available for use in forest-improvement plans. Practical application of this research and fact-finding program was found to be of special importance from the viewpoint of wild-life considerations in the vast program of land utilization and forest improvement launched under the various relief and public-works undertakings of Federal and State Governments and in cooperation with private enterprise. Thus the Biological Survey was able to cooperate in the preparation of the wild-life sections of a recent special report (Senate Document No. 12) on A National Plan for American Forestry, and has been in position to serve in an advisory capacity on wild-life interests in the formulation and carrying into effect of such far-reaching national efforts as the forest-improvement operations of

the Civilian Conservation Corps, the Tennessee Valley improvement program, land-utilization plans of the Agricultural Adjustment Administration, and in the forestry, wild-life, and recreational undertakings under the National Recovery Administration.

W. B. BELL, *Bureau of Biological Survey.*

WOODLANDS Cut by the
"Selection Method" Less
Liable to Fire Damage

The greatest concern of many owners with regard to their farm woodlands and timbered areas is that fire may sweep over their land and destroy or seriously injure their forest growing stock. If the fire danger could be reduced, more landowners would be interested in using



FIGURE 112.—Cut-over area with canopy destroyed by fire. The fuels have dried out, and the chances of reproduction are very poor.

for continuous forest production lands that are too poor for agricultural crops. Thus the owner not only would obtain an additional crop, but also provide for himself and others profitable work that could be done at a time of year or during years when other work is at low ebb.

Every timberland owner knows that if he cuts most or all of the trees on an area, this "opening up" lets in the sunlight and the hot, drying winds which were previously excluded by the dense forest canopy. Few owners, however, appreciate the effect of such openings in causing drier fuels and greater inflammability on the area and the danger which threatens not only the forest growth remaining after cutting but also all surrounding timber, adjacent buildings, etc. Tender young seedlings are exposed to the excessively high temperatures of full sunlight; sun scald and cat face are produced on saplings and poles; and the ground is so dried out that new seedlings are unable to obtain sufficient moisture to survive the period of maximum drought (fig. 112). Few even