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SOME ACCOMPLISHMENTS OF THE COOPERATIVE RESEARCH UNITS
A SUMMARY TO JANUARY 31, 1937¹

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Federal funds for cooperative research in wildlife management first became available on July 1, 1935. Additional support has since been provided through cash from the American Wildlife Institute and through cash, or equivalent participation, from the land-grant colleges and conservation departments of nine cooperating States. In presenting some of the accomplishments of these units the writer has abstracted freely and often verbatim from reports submitted by the leaders. The information is here grouped by State in the chronological order of organization of the units.

The present leaders of the units, with dates organized, are as follows:

Virginia:	Charles O. Handley,	Virginia Polytechnic Institute,
(Sept. 9, 1935)		Blacksburg, Va.
Oregon:	Arthur S. Einarsen,	Oregon State College,
(Sept. 21, 1935)		Corvallis, Oreg.
Iowa:	Logan J. Bennett,	Iowa State College,
(Sept. 24, 1935)		Ames, Iowa.
Connecticut:	Dr. Paul D. Dalke,	Connecticut State College,
(Oct. 2, 1935)		Storrs, Conn.
Alabama:	Dr. Allen M. Pearson,	Alabama Polytechnic Institute,
(Oct. 24, 1935)		Auburn, Ala.
Utah:	Dr. Daniel I. Rasmussen,	Utah State Agricultural College,
(Nov. 1, 1935)		Logan, Utah.
Texas:	Dr. Walter P. Taylor,	Texas A. & M. College,
(Dec. 10, 1935)		College Station, Tex.
Maine:	Clarence M. Aldous,	University of Maine,
(Dec. 23, 1935)		Orono, Maine.
Ohio:	Dr. Lawrence E. Hicks,	Ohio State University,
(Apr. 9, 1936)		Columbus, Ohio.

VIRGINIA UNIT--LEADER APPOINTED SEPTEMBER 9, 1935

After a careful survey of Virginia two demonstration areas for forest-game species were chosen, namely, the North River demonstration area, in Augusta County, within the George Washington National Forest; and the Mountain Lake Demonstration area, in Giles County. Plans for the development of the North River area have been completed.

¹/ Presented March 2, 1937, at the Second North American Wildlife Conference, St. Louis, Mo.

The life history, conservation, and management of the wild turkey was chosen as the major research effort of the Unit. To work out a method of producing genuine wild turkeys for restocking purposes, 24 captivity-reared wild hens, procured from the State Game Farm in November 1935, were held over winter at Blacksburg and transferred to the Camp Lee State Game Refuge in March 1936. The hens were successfully mated to wild gobblers from the woods surrounding the open-topped enclosure in which they were confined. From these matings approximately 200 poults were raised to the age of 12 weeks or older.

Poults reared in a modified type of the Coleman movable quail pen, in contrast to those reared in commercial-type houses and open enclosures, were found to be wild to a remarkable degree when released. The Virginia Unit considers this method of handling its outstanding finding of the year.

To check survival and adaptability, 111 young turkeys, toe-punched and tattooed, were liberated on the North River demonstration area. During the hunting season a check was obtained on the numbers and weights of game killed on the area, and food-study material was obtained regarding 51 grouse, 19 turkeys, 5 bears, and 2 quail. Apparently the liberated turkeys stood up well under shooting, some hunters asserting that they were harder to kill than were the native turkeys, since they refused to come when "yelped". Tattooing and toe-punching both proved to be unsatisfactory as methods of identification, such markings being overlooked by the average hunter.

One group of young turkeys raised with a wing-clipped, captivity-reared turkey hen proved entirely unsatisfactory for restocking purposes. Although quite wild in their small enclosure, when released they simulated the actions of their mother and soon became tame.

A quail-demonstration area on lands owned and leased by the college was developed at Blacksburg during the first year and a base cover-type map was prepared, 33 feed and cover patches were planted, fenced, and mapped, and plantings were made of 336 Asiatic chestnuts, 900 pine seedlings, 850 locusts, 5,000 privet seedlings, 900 grape cuttings, 200 honeysuckle shoots, 750 pounds of Korean lespedeza, 70 pounds of Lespedeza sericea, and 1 experimental plot of wild trailing bean (Strophostyles helvola).

The quail-demonstration area was extended the second year to include some 20 adjoining farms in order to study game-management practices on private as well as public lands.

In studying the winter survival of quail, 13 coveys, consisting of about 195 birds, were located on the Blacksburg quail-demonstration area during the fall of 1935. Of these, 109 (70 cocks and 39 hens) were banded during the course of the ensuing winter. Approximately 45 percent of the quail that were on the area at the beginning of winter remained on April 1.

The study of the relation of gray foxes to nesting quail, begun at the Camp Lee State Game Refuge in June 1935, by the Food Habits Section of the Biological Survey and the Commission of Game and Inland Fisheries, cooperating, was continued during June and July 1936, the Cooperative Unit replacing the Commission.

The Unit staff has assisted in the organization of 23 county wildlife federations, and also has cooperated with State and county educational departments and with the 4-H Clubs in working out wildlife units and projects for school and club children.

OREGON UNIT--LEADER APPOINTED SEPTEMBER 21, 1935

A field study was made of severe winter conditions (not a normal expectation as the winters are usually mild) in Oregon for two winters, and these were found not destructive to small game. Food for winter was studied and found adequate in 3 feet of snow, a depth recorded only twice since 1900. Other findings were as follows:

The weather at hatching time is a big factor in limiting bird population.

The hunting kill is found one of the biggest causes of low population in relation to a stock too small to meet the demands.

The kill by automobiles on highways at numerous critical points also takes heavy toll of game birds.

The Unit helped to rearrange the curriculum in the Department of Fish, Fur, and Game Management, at the Oregon State College, to make it more thorough, applicable, and broad enough to give a good background for professional training.

Intensive instruction was given to more than 600 4-H boys for one week in conference and direct contact with them has been maintained ever since. The Unit will instruct the 4-H girls this season. It is building slowly but soundly in educating farm boys and girls to aid in (a) protecting wildlife, (b) propagating important species, and (c) getting individual farm censuses of game semi-annually.

The Unit proposed a policy of management by the Game Commission, based (a) on natural reproduction as the permanent basis of sustained yield; (b) on artificial propagation as an aid in restocking areas of critical population; (c) on the banding of all game birds released from game farms to permit study of the effects of hunting, the results of migration, adaptation to environment, range, and efficiency compared with natural reproduction; and (d) on the building up of the quail population by closures and transplanting from over-stocked coveys and areas. As soon as populations are sufficient shooting interest now lacking in quail will be built up to take the drain off of other species by working on a plan to get an accurate accounting of the annual shooting kill in Oregon.

In a deer sex-ratio census of Oregon, with 55,800 deer tabulated, the ratio was found to be 1 buck to 4 does.

Thermographic record was made of nesting wild Chinese pheasants to use as a guide in improving the technique of artificial incubation. The work is incomplete as yet, but suggests that temperatures now used often are too high, resulting in inferior chicks. Records show that atmospheric heat directly influences the temperature of eggs in the nest.

Time was devoted to range-management problems; to public- and private-guided game management on the 18,000-acre Squaw Butte area; and to work with stockmen in developing an attitude and program of benefit to wildlife.

IOWA UNIT--LEADER APPOINTED SEPTEMBER 24, 1935

Advance was made on the life history and management study of Mearns's cottontail rabbit, particular effort being concentrated on pellet-count techniques and on studies of cover, form-building habits, and food.

Research on the ecology and management of the American coot has been continued for about a year. One of the results of this study was the definite finding that the European leech causes the death of coots by establishing itself in the nostrils of the birds.

Duck studies have been continued with particular reference to the life history, ecology, and management of the blue-winged teal; the results are now being prepared for publication. In the course of these studies the leader of the Unit made a special trip to the Valley of Mexico, where he obtained valuable information on such phases of life history as flocking habits, sex ratio, food habits, time of change to nuptial plumage, initiation of courtship and mating, beginning of spring migration, migration routes in Mexico, association of teal and other birds, and types of water areas frequented, as well as on the extent of hunting in Mexico and the extent of marketing.

About 500 game birds and mammals have been examined for parasites and diseases. Most of these were collected by officers of the Iowa Conservation Commission.

In the quail-management studies two experimental areas were set up in Decatur County, one as a pay-shooting, and the other as a free-shooting, area.

Studies also have been made on the environmental carrying capacity for quail.

In November 1935 an experimental pay-shooting pheasant area was established in Winnebago County, and an experimental farmer-sportsman pheasant area near Rockwell. All phases of management are being studied on the areas.

Research on the life history, ecology, and management of the muskrat in Iowa has been carried to the point where publication of some of the results will soon be possible.

The wildlife extension program has advanced to the point where 6,000 4-H Club boys and girls have been instructed at meetings, plans made for a 4-H boys wildlife conservation club, plans made for Rural Young People's wildlife conservation clubs, three short courses given in wildlife conservation for 4-H Clubs and Rural Young People, one experimental Rural Young People's game area established, and summer camps for these groups established, which were attended by 320 members.

CONNECTICUT UNIT--LEADER APPOINTED OCTOBER 2, 1935

Upon the organization of the Connecticut Cooperative Wildlife Research Unit a game-management demonstration area of 6,400 acres, in the town of Lebanon, 7 miles south of Willimantic, was selected and at present approximately 4,500 acres are under management. A system of cover mapping based upon plant succession was developed from a similar system in use by Dr. H. M. Wight in Michigan. The mapping of the 6,400-acre Lebanon area was facilitated by having available a complete aerial mosaic map of the State. This area was established in cooperation with the State Board of Fisheries and Game and managed as a standard regulated shooting area with the added feature of wildlife management. The planting of permanent cover and food in the form of pine, spruce, and nut-bearing trees and shrubs was begun in the spring of 1936. Eleven tracts of permanent food and cover were planted, and in connection with them food strips of annuals were sown. The shrub, tree, and annual food patch areas vary in size from three-quarters of

an acre to 3 acres. Additional areas will be set aside this spring to increase the cover and the interspersation of the introduced types with natural cover. Regulation of the game kill is accomplished by the permit system of hunting together with special patrol by a deputy game warden.

The cottontail investigation has included study of life history, ecology, and management. Life history aspects now being investigated are breeding habits, food habits, and home and seasonal range. Controlled tests as to choice of foods during various seasons are now being run. The frequency of use of dens during winter is being determined by use of a double recording potentiometer.

An intensive home and seasonal range study has been in progress since last fall. Eighty-five rabbits have been trapped and tagged and in an effort to learn about their movements, about 50 live traps are operated daily. Incomplete returns indicate that territorial range varies from 0.8 to 3.8 acres in winter and from 0.5 to 1.8 acres during the fall months.

Ecological study is being conducted on three areas. On the Lebanon area the work is correlated with the farm-game management program. At the State College at Storrs the effect of various silvicultural practices upon the rabbit habitat is under observation. On the Rockville area farm-game relationships are being studied with no management in view. A complete cover map was made of the Rockville area during the summer of 1936.

A statistical analytical program is in progress at the offices of the State Board of Fisheries and Game. A standard technique has now been developed for analysis of the game kill, and short-cut methods will give necessary information for proper administration some four months prior to a hunting season. Under former methods similar information has been unavailable for 15 months after the game was killed. The new technique reduces this time to 6 months.

A 1,500-acre area 3 miles north of Storrs, mostly wooded, and typical of Connecticut hardwoods, with conifers scattered along streams and valleys, has been gridironed with lines running 5 chains apart for the purpose of seasonal grouse censuses. Two counts have been made, one in October 1936, the other in February 1937. A complete cover map of the area was prepared during the fall of 1936.

ALABAMA UNIT--LEADER APPOINTED OCTOBER 24, 1935

Research at the Alabama Unit has progressed on four problems: (1) Life history and management of the mourning dove, (2) quail management, (3) white-tailed deer management, and (4) waterfowl-food studies.

Study of the mourning dove has been given primary consideration. About 25,000 questionnaire cards requesting information on dove nests were distributed to interested persons in all parts of the State during February and March 1936. The State extension workers and game wardens assisted in this work. A summary of the approximately 600 cards returned showed the average height of the nests observed to be 10.8 feet. Forty-three percent of the nests were built in evergreen trees, 51 percent in deciduous trees, and 6 percent on the ground. These records, should be compared with an intensive study made of approximately 70 nests within a radius of 5 miles of Auburn, Ala., which showed that the average height was 26.2 feet and that 86 percent were built in pine trees. In the Auburn investigation dove nests were found in each month from February to October, inclusive, the lowest 5 1/2 feet and the highest 66 feet above ground. Intensive observations were made on several nests to determine the habits of the incubating birds and the feeding of nestlings.

About 500 doves have been trapped and banded at various seasons, and this work is still in progress. Approximately 325 dove droppings have been collected for analysis, and a graduate student has made collections of food plants and their seeds to aid in identification of their contents.

Fire ants have been reported as important enemies of the quail in several parts of the Southeastern States. A survey of their distribution in the southern half of Alabama was made to determine their possible effect on the quail population. No concentration was found in any area sufficiently great for studies of their destructiveness.

A graduate student has collected a number of quail-food plants and seeds to aid in determining the contents of quail crops, approximately 35 of which have already been collected with the cooperation of hunters and others.

In an effort to find a favorable area for experimental and demonstration work with quail, many places were visited during the spring and summer. A suitable tract has recently been selected but no constructive operations have thus far been undertaken.

An ecological study is being made of the deer on the Allison Lumber Company lands in western Alabama with a view to determining management practices. An intensive study has been made of deer killed by hunters in this area during the deer seasons of 1935 and 1936. Of 357 shot in 1935, 179 were found to have an average weight of 138 1/2 pounds, and of 98 shot in 1936 the average weight was 132 1/2 pounds. Observations are being made by a graduate student on the antlers, size, parasites, and general condition of the deer taken.

A preliminary survey has been made of the availability of food for waterfowl at the Gulf State Park in southern Baldwin County. The State Department of Conservation has designated this area as a wildlife sanctuary, and has requested recommendations for its development.

UTAH UNIT--LEADER APPOINTED NOVEMBER 1, 1935

In pursuance of the project on the life history and management study of the Rocky Mountain mule deer, careful checks were made during the winter of 1935-36 on the deer population of the Wasatch Game Preserve, which was determined to number approximately 1,370; on an adjacent winter-concentration area in Weber Canyon 2,900 were counted. Detailed studies have been carried on of summer range, movements and migrations, competition with domestic livestock, and the relationship of total numbers of the deer to hunting removal. All removal in the past 10 years has been limited and carefully supervised, thus qualifying the tract as a demonstration area.

On the Cache National Forest, studies have been made of winter mortality, concentrations, feeding habits, migrations, sex ratios, and other details of life history, and census methods applied. At three checking stations, 408 buck deer were carefully weighed and measured during the 11-day hunting season. Jaws of 84 are being used in a study of age determination. Sex counts and field censuses have been continued on this area since the hunt, and more than 1,600 deer have been observed. Animals on one area of 900 acres have been counted monthly since the study was inaugurated.

Experimental supplementary feeding is being conducted with prepared concentrates supplied by an eastern manufacturer and with those commonly used by

stockmen in the West in winter feeding of livestock. Approximately 800 deer visited the feeding area daily.

A graduate student engaged in the life history and management study of the sage grouse has spent a total of 165 days in the field. During this time 21 grouse were banded, 50 stomachs were collected for food-habit study, and 63 nests were located and studied during incubation period. Strutting, feeding, nesting, dust bathing, growth of young, flocking, migration, and other habits were observed and notes recorded. A detailed type map was made covering 50,500 acres of Strawberry Valley, an area of sage grouse concentration. A survey of present distribution and numbers of the species is being conducted by the use of 10,000 questionnaire cards. An experiment showing the possibility of loss of sage grouse from botulism also was conducted.

In a sharp-tailed grouse survey and life history study, which has been completed, only a few thousand of the birds were found in the entire State. A strong correlation has been shown by this study between the presence of remnants of original grass areas and present occurrence of this grouse.

Twenty-five quadrats were established on the Bear River marshes in waterfowl-food plant studies. From these quadrats 275 vegetative samples for qualitative and quantitative analyses were taken. A similar number of water samples and soil samples for determination of the salt content were collected. Tests for pH values, and for oxygen concentration were performed in the field. Eighty water samples were taken for analysis of the microbiota. Eleven quadrats were established at the Farmington Bay area, and 120 soil samples were taken there.

A detailed type map was made of the beaver study area, which included 18 miles of stream and 101 beaver dams. In the fall, under the direction of the State Fish and Game Department, 100 beavers were removed from this area. A State-wide survey of beaver distribution and abundance has been completed.

TEXAS UNIT--LEADER APPOINTED DECEMBER 10, 1935

The work on a survey of the wildlife resources of Walker County, Tex., is about 75 percent complete. It has included taking an extensive quail census on 9,089 acres; preparing maps of the areas about eight field camps, totaling 9,521 acres; collecting birds, mammals, reptiles, and amphibians, and studying their habits; taking a cat-dog-hog census; and studying the wildlife utility of the principal vegetative types.

Notable was the successful completion of fall and spring quail censuses, in which both man-and-dog counts and C. C. C. counts were utilized. Coveys to the number of 71 were located on 5,714 acres in the fall count. Acres per quail varied from approximately 5 on the experimental tracts to 60 in some areas of pine timber.

In the study of bobwhite quail management in Texas, critical attention is being given the effects of the introduction of Mexican quail. Mexican and Virginia birds are being mated in pens and in the wild, and young birds raised in the field are being trapped and banded. An intensive study is being made of characters of the parent stocks and of the hybrids between them. A cooperative quail introduction project has been arranged with certain Brazos County sportsmen. Damage to hatching quail by acrobatic ants (Crematogaster laeviuscula var. clara Emery) has been found. A collapsible quail trap has been developed.

Plowing in a needle-grass pasture to produce quail-food plants has been found to discourage needle grass and bitterweed and to encourage the desirable Bermuda grass, in addition to producing an abundance of goatweed and other good quail foods.

Considerable work has been done on plant relations to wildlife, with special reference to occurrence, abundance, and especially the periods of availability of quail foods, to the effects of frost on game food and cover, and to the effects of cultivation, burning, fires, timber-cutting, and soil on wildlife.

Marked progress has been made on a study of the wildlife value of cut-over timber country in four age groups. Quail are numerous in cut-over land up to 8 to 13 years after cutting, but they begin to decrease as the canopy tends to close.

The project on the life history of the gray and fox squirrels represents the first comprehensive work on the habits, occurrence, and abundance of these squirrels in eastern Texas. It develops that there are two distinct breeding seasons, one, apparently the more important, in December, January, and February, the other in June, July, and August. The fox squirrel begins breeding about two weeks before the gray. An occasional pregnant squirrel may be found at any season of the year. The Texas Game, Fish, and Oyster Commission has recently requested facts on squirrel life histories with a view to correcting the present quite inadequate hunting statutes.

Preliminary work on the Attwater prairie chicken, which belongs to the same species as the heath hen and is now restricted in its distribution to Texas, has indicated a total population of 380 on 100,000 acres in Austin, Colorado, and Wharton Counties, or an average of 1 individual to 263 acres. In a 4-day census before the season opened, covering 25,000 acres in the best prairie chicken country, two cars and several dogs were used, and only 52 birds were found, of which only 11 were young.

A Division of Wildlife Research has been established in Texas Agricultural Experiment Station. The first full-time extension specialist in wildlife conservation to be appointed by the Texas Extension Service is planning three demonstrations: (1) Game-management demonstration, (2) 4-H game-management demonstration, and (3) fish culture. It is hoped to form a wildlife committee among the farmers and sportsmen of each of the 254 Texas counties.

MAINE UNIT--LEADER APPOINTED DECEMBER 23, 1935

In a study of forest-game relationships on cut-over areas, 3 square miles have been type-mapped and a 10 percent sample plot cruise made of all tree species by types and diameter classes. Fifteen miles of plot lines have been established and eight permanent sample plots of 1-square acre each are distributed, one to each representative forest type; on these tracts a 100 percent tally of all trees by species and diameter class has been made. In the center of each 1-acre sample plot a 1-chain square plot was established on which a 100 percent tally was made of all shrub and tree species reproduction. In the four corners of the chain-square plots are mil-acre plots on which a 100 percent tally of all herbaceous growth was made. Three grouse censuses have now been taken and two deer counts were made by the strip method.

On a plot now being cut over, 3 square miles have been type-mapped and a 10 percent sample-plot cruise made of timber. Permanent sample plots have been established as described in the cut-over area. On the cut-over site, however,

there were 23 miles of plot lines established across and around it. Three grouse censuses were taken and also three deer counts made by the strip and road-count method.

A study of the woodcock indicates that in recent years the species has fallen off considerably in numbers. The study is undertaken to determine certain life habits of the bird and management manipulations necessary for its increase and maintenance in satisfactory numbers. Eighty-three birds were weighed and measured during the hunting season and it was found that the native woodcock while lighter, had slightly greater measurements. This indicates that the "flight birds" are slightly heavier but not really larger than the native birds.

A map showing distribution and relative-abundance of woodcock has been completed for Maine. One hundred soil samples were taken for pH analysis, and for a study of earthworm distribution and abundance. Five different questionnaires were sent out to sportsmen and others for the purpose of getting information on spring and fall flights, hunting losses, predation, accidents, kill, and parasites. One square mile in the Moosehorn Migratory Waterfowl Refuge has been carefully laid out, type-mapped, grid-ironed with lines 5 and 10 chains apart, cruised for timber, and censused twice for woodcock and three times for grouse.

On the project dealing with the role of fish-eating birds in the destruction of game fishes and transmission of tapeworms and other parasites to bass and other fishes in the fresh-water lakes of the State, 1 adult and 165 young gulls were banded and the nesting habits of 110 pairs were observed. Two live-trap models were tried out on gulls. On 30 lakes and streams 45 gulls and 3 American mergansers were collected. Three gull stomachs showed the presence of bass and trout, and 42 contained chiefly rough fish, as minnows, chubs, sunfish, and perch. Three parasitized bass were collected. Parasites have been isolated from the fish and from the stomachs and intestines of the 45 gulls. Full identification of the parasites has not as yet been obtained.

OHIO UNIT--LEADER APPOINTED APRIL 9, 1936

The Ohio Unit, while operating less than one year, is now well organized and has made notable advance on several research problems. Life history and management studies of the gray and fox squirrels in Ohio are well under way, and suggestive information has already been obtained particularly upon the fox squirrel. Many fox squirrels were live-trapped, of which more than 100 were tagged, and released in five woodlots, each typical of a habitat type, for testing out its ability to produce squirrels. Studies of controlled squirrel hunting were made in several counties.

Research on Hungarian partridge and pheasant problems has advanced and valuable data have been gathered on game harvest and kill, function of refuges, and special analysis of the harvest plan on each of some 20 cooperatively controlled shooting areas.

Field and laboratory research equipment have been assembled and the wildlife conservation library at the Unit is now the most complete in the State.

Progress has been made in demonstration-extension work with farmer-landowners, who have more than 90 percent of the wildlife resources of Ohio in their custody.

Each Unit has been active in educating the public on wildlife conservation, and game management through radio and press, and by addresses, personal contacts, and conferences. This educational phase of the work is a real accomplishment, whether considered by units or collectively, and is a decided factor in promoting an interest in wildlife and conservation.