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FISH AND WILDLIFE MANAGEMENT REPORT

PROVINCE OF ONTARIO

DEPARTMENT OF LANDS AND FORESTS

Division of Fish and Wildlife

Hon. Clare E. Mapledoram
Minister

F. A. MacDougall
Deputy Minister

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(THESE REPORTS ARE FOR INTRA-DEPARTMENTAL
INFORMATION AND NOT FOR PUBLICATION)

PRIVATE SHOOTING GROUNDS

- PARADISE LOST OR PARADISE REGAINED?

by
C. H. D. Clarke

To show that private game preserves are no modern growth our footnotes (1) (2) (3) quote at length from the great literature of mankind three passages to show how old they are and how near to the core of human ambition. The very word "paradise" originally

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		Free Translation
(1)	-- ἔπεστα τά τε νῦνἐντῷ παραδείσῳ θηρία δίδωμί σοι --- Xenophon, Cyropaedia, 1.3.14	What's more, I'll give you the game now in my preserves (paradises).
(2)	*Vivaria eorum ceterarumque silvestrium primus togati generis Fulvius Lippinus: is in Tarquiniensi feras pascere instituit: nec diu initatores defuere L. Lucullus et Q. Hortensius.* Pliny, *Hist. Nat., 8*	Fulvius Lippinus was the first gentleman to set up preserves of wild boars and the like; he instituted game-keeping in Tarquinia, nor were imitators L. Lucullus and Q. Hortensius, long in following.
(3)	Mephistopheles -	Mephistopheles -
	Versteht sich! Biete nur, das fehlt dir nie.	As you wish! Just ask, you'll surely receive.
	Narr -	Fool -
	Und Schloss mit Wald und Jagd und Fishbach?	A castle, with a deer forest, shooting, and a trout stream?
	Meph.-	Meph.-
	Traun! Ich mochte dich gestrengen Herrn wohl schaun!	Done! I can set you up as a real lord!
	Narr -	Fool -
	Heut Abend wieg' ich mich in Grundbesitz!	Tonight I'll sleep on my estate!
	Meph. -	Meph. -
	Wer zweifelt noch an unsres Narren Witz!	Who says our fool has no sense!

Faust. Bd. 2

[illegible]

Footnotes (1) [illegible]
mankind th[illegible]
core of human[illegible]

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(1) [illegible]

Xenophon, [illegible]

(2) Vivarta [illegible]

(3) Mephistoph[illegible]

Teilt der [illegible]

Narr - [illegible]

Und Schloss [illegible]
ward und [illegible]

Meph.- [illegible]

Traut ich [illegible]
gestanden [illegible]

Narr - [illegible]

Heut Abend [illegible]
In [illegible]

Meph.- [illegible]

Wer zweifelt [illegible]
Narret [illegible]

meant a private hunting ground. Let the Indian have his communal Happy Hunting Grounds! -- the white man's idea was more specific. Mephistopheles' praise of the fool who chose a private hunting and fishing ground when he might have had anything in the world was surely prompted by the plight of those supposedly smarter who had chosen barren wealth and knew not what to do with it, of one of whom Faust scornfully remarks "Erst haben wir ihn reich gemacht, nun sollen wir ihn amusieren".

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(4) First we made him rich, now we have to amuse him.

How many in the Fish and Game Associations, in spite of outcry and prejudice, would turn down a free trip to the King Ranch or the Winous Point Club, even if they had to bring their own cartridges? Do not their ears prick up when they hear such magic names as Stuttgart, (Ark.) or Thomasville (Ga.), while their hair stands up with horror when some nosey outdoor columnist lets slip the secret of limit bags in an obscure public place close to home? Our outlook is no different from that of the ancient Greeks who turned the Persian name for a private hunting ground (paradise) into a synonym of heaven, or the Hebrews who used it for the Garden of Eden.

Only when paradise is lost do we seem to discover that we shared out title to it with others who could make it into a desert, or that we really had no title at all. It happens often enough today that professional wildlifers need to do some deep and clear thinking if they are not to add to the general confusion.

It ought to be self evident that hunting and fishing are not exceptions to the rule that there can be no reaping without sowing. Idle prattling about navigable waters, and game belonging to the people is no help. All it can do in the long run is to make game appear as a liability on the land, a crop produced merely to attract trespassers. If we are to have game on private lands the landowner must profit from it. If we accept the thesis that the average farmer cannot produce game worth selling, we are writing off most of our accessible private lands and leaving the hunter only such productive lands as are rented for him to share with the throng, or by him for his own use.

In Europe shooting rights are a marketable asset of all rural lands. In England a man once expected to pay £100 ($300) a year for the "rough shooting" on about 1,000 acres (5),

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(5) Lynn - Allen, Esmond - 1955. The cost to the syndicate. The Field, v. 206, no. 5369, December 1, 1955, p. 1,050.

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(4) First we [illegible]

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In Europe [illegible] rural lands. In England [illegible] year for the "rough [illegible]

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(5) Lynn - Allen, [illegible] The Field, v. 20[illegible], no. [illegible]

but we are told that the cost is much higher now, especially in accessible areas. Another writer (6) gives 3 to 6 pence per acre as the pre-war cost of rough shooting and says that it has gone up to as much as 5 shillings now, or ten times. The term "rough shooting" means that there is no great population of game, such as pheasant, grouse, partridge or roe, and no marsh worth mention. There will be no coverts especially planted to encourage game. What there will be for sure is a substantial crop of wood pigeons and, formerly, rabbits, both of which are considered pests to be kept down as much as possible, but are also highly favoured as food. There will also be a few chances a year at such birds as grouse, pheasant or partridge, rarely all three, and never many to shoot, plus a few hares and possibly a chance or two at duck, snipe or woodcock, all depending on the location. It works out generally to something under a dollar a head for game shot, at the Lynn-Allen evaluation of £100 per 1,000 acres, and more, but not necesarily two and a half times as much on Day's figure of £250 per 1,000 acres. Obviously there are wide variations in the cost and quality of rough shooting and these figures are probably not arrived at by any careful sampling, but they show all too well that good sport costs money and nothing is free. An average American who spends the same amount on a hunting trip will have less time in the field, and may get much less game.

Costs rise sharply where grouse moors, partridge manors, pheasant shoots, deer stalking grounds, or marshes are concerned. Years ago grouse moors were rented at about $5. per bird, and the rental was only the beginning. Grouse must cost at least $10. each to shoot now. Recently (February 10, 1956) the editor of "The Shooting Times" quoted an article in "The Financial Times" which compared former and recent prices for shooting in syndicates. A syndicate is simply a group of men who rent shooting rights on an area for the season. We quote, prices being in pounds:

Per Gun in Syndicate Per Season	1955	1938	Present Standard of Sport
Partridge manor (Hertfordshire)	150	250	Birds much fewer
Pheasant shoot (Suffolk)	300	200	As pre-war
Grouse moor (Yorkshire)	300	150	Variable like all grouse moors.

What is the cost per acre? According to Lynn-Allen it was once about five shillings per acre for pheasant shooting, three and sixpence for partridge, but it is now much greater in accessible places. He suggests that rent should be estimated by prospective shooters as one third of their costs, and that £400 would be a reasonable annual rent for 1,000 acres, or over one dollar per acre.

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(6) Day, J. Wentworth - 1956 - Ways to cheaper shooting. Country Life, v. 120, no. 3118, October 18, 1956, pp. 838-9.

This means more than one dollar per acre for rent alone where there is any real stand of game. On the rough shoot the farmer tolerates the thickets where pheasants hide, but the pigeons use his woods willy-nilly, and he would cheerfully see the rabbits exterminated. The spreading of myxomatosis has made the "rough shooters" sick at heart because now their rabbits are few, but their rents are unlikely to come down.

Day suggests for a farm of 200 acres a stand of a few covies of Huns, about ten pheasants, some hares and plenty of rabbits before myxomatosis. He does not mention the omnipresent wood pigeon. The shooting rents for more than $70. a year. A similar farm area in southern Ontario would be good for only three or four game birds, a few cottontails and squirrels, as much coon hunting as an average man is likely to have time for, and a chase on hare or fox twice a week for four months. You would have to throw in a good woodcock cover to put it in a class with the "average" English farm, but 'cock covers are not too rare and they can be made. At $70. it would be a good $2.50 per head for the probable kill of game, including the 'cock. There are plenty of places that could be made entirely comparable with a very little effort.

Grouse moors are large, and have to be protected and the heather managed on a burning rotation, otherwise, as in Ireland, grouse will be scarce. Partridges must be carefully included in the crop rotation, but without loss of crop income. Pheasant coverts are generally man-made, but they must fit into the farm programme. There is often rearing. For all that expense and trouble there are usually only a few big shooting days in a year, shared with many guests. In all shooting there is a constant fear of driving the game off the property.

The cost per head of game is high, but it is not a bit higher than the cost on our public shooting areas. We have to include the effort of the fellow who didn't get any as well as that of the lucky one. In fact we may as well realize that hunting can never be a cheap sport.

There may always be some game around, but for ducks, woodcock, snipe, pheasant, quail, turkey, ruffed grouse and Huns, it is possible to make coverts where none were before, and he who does should, and likely will, reap the benefit. It is a curious fact that the biggest public effort for the sportsman here is in waterfowl, and the biggest private shoots are waterfowl shoots. In upland game, where the whole procedure of management can be carried out privately on one piece of property, there are few really good private shoots on this Continent, practically all of them in the southern quail belt.

In some areas private shooting has come to be associated with the release of pheasants ahead of the gun, to be shot down "fluffy-tailed", at so much a bird. There is surely no harm in such a practice and no prejudice to the public shooting, but the European technique of putting pheasants over the guns high and

fast does seem a great deal more interesting.

We can be sure that our birds are going to cost us about the same amount each whatever we do. If we are going to have enough to go around the unit cost will not change much but the gross must go up and the recipients are going to have to foot the bill. It hardly seems right for someone else to pay. Someone has to make a start in production. If the conservation departments do it first, private imitators will arise, and vice versa.

Here in Ontario we find that we have an enormous area of public land where there will always be "free" hunting, but very little of it is within reach of our most densely populated centres. For them, the problem is just the same as in the States. However, there is one special category of lands which stand out as potential private paradises. There are many municipalities so built up that public hunting is out of the question. It is customary now to prohibit all discharge of firearms in them, including large remaining farms. A more constructive approach would be to let these farms become private shooting grounds. They are already a total loss so far as the public is concerned, but they are often rich in game, and the more persons who can be withdrawn from competition in the adjacent tier of "open" lands the better.

Until we have found out a little more about game economics let us not assume that no ordinary farmer can produce enough to sell. We lack the equivalent of the wood pigeons that the English farmer curses - and sells, but right now our rabbits are just as good as his. Each piece of game is worth at least what is being paid for it now. It might surprise us to learn how much that is. I well remember the European (continental) gentleman who assured me that our handling of the Pelee Island pheasant shoot was all wrong. He was sure that there were people who would pay $25,000. a year for the shooting rights. That is, on the average, less than $2. a bird, or $2.50 an acre. He was a little surprised to learn that the throng of gunners he so despised were already paying the islanders as much as $7.00 an acre, not including such items as provincial licences. I don't think he believed it, anyway. It is easier to figure out the value of a Pelee bird than that of most pieces of game harvested because the total effort is so easily measured, but let us not make the same mistake and underrate our farm game. The truth, when we have it, may prevent some of the best spots becoming private paradises, and yet at the same time, by encouraging such a development elsewhere, lead to better game management on all our lands.

A WETLAND MANAGEMENT PROGRAMME FOR WILDLIFE IN SOUTHERN ONTARIO

by
Antoon de Vos

The wetlands of Southern Ontario, probably the most important remaining wildlife habitats, are being drained for agricultural purposes at an alarming rate. Unless the Government appraises this situation, and possibly acquires a certain percentage of these wetlands, serious damage to the wildlife populations of Southern Ontario may result.

The problem of drainage of wetlands is not restricted to Ontario. Kenneth E. Black, of the U. S. Fish and Wildlife Service, stated recently that for nearly ten years, pothole drainage has been considered the most serious problem facing waterfowl conservation in the Midwest. Burton W. Rounds, another U. S. Fish and Wildlife Service biologist, stated similarly that the days of waterfowl hunting as we know it are numbered unless we all join together in an effort to save waterfowl habitat. He mentioned also that Iowa once had some of the finest waterfowl producing habitat, but that most of it has gone down the drainage ditch.

The U. S. Fish and Wildlife Service estimated that during the period 1945 to 1950, Minnesota's marshes in the farming region were being drained at the approximate rate of 3% per year. More recent surveys indicate a loss of 5% per year. In Racine County, Wisconsin, there has been a loss of 33% wetland acreage during the period 1934 to 1954.

The reason for the rapid disappearance of wetlands is the considerable intensification of agricultural practices during World War II and since.

Although certain drainage projects, such as that of Holland Marsh, cannot be prevented, there are others, which are unnecessary and often economically unwarranted. It therefore seems necessary that the Government undertake a survey of the wetland resources of Southern Ontario. The need for such a survey was also mentioned at the recent Water Resources Conference in London, Ontario (November, 1955).

What wildlife species benefit from wetland areas? The value to waterfowl and aquatic mammals is obvious. However, other wildlife such as pheasants, rabbits, woodcock, Hungarian partridge, raccoon and deer require such lands for cover and food, and waterfowl values should not be overemphasized.

An appraisal of the value of wetlands should not be restricted to wildlife only. Wetlands serve an important function in storing excess runoff water, and aid in keeping the ground water at a higher level.

The value of wetlands to wildlife depends largely upon their type, size, and distribution. If water is present in sufficient depth, either seasonally or annually, wetlands may have waterfowl and aquatic mammal values. Such areas may serve as breeding areas for waterfowl, or as concentration points during migration, or both. They may also harbour upland game on their edges.

Wetland areas lacking surface water are important to upland game and are used primarily for escape and roosting cover, particularly during the winter. Many types of wetlands are valuable to non-hunted species, such as song birds.

What are wetlands and how can they be classified? A wetland is an area of land containing undeveloped organic soils of varying depths in which the water table is at, near, or above the land surface.

There is need for an intensive wetland survey, since even small areas are important for wildlife management. In Wisconsin, where such a detailed survey was carried out, the following wetland types are recognized:

1) farm ponds or stock watering areas,
2) fresh meadows (soggy ground or seasonally flooded areas),
3) shallow marshes (water present during most of the growing season,
4) deep marshes,
5) timbered swamps,
6) bogs.

Emergent vegetation is used as the key to placing a wetland in the appropriate category. This is deemed necessary to circumvent the conditions found in areas where varying water levels due either to prolonged rainfall or lack of it complicated the classification process.

The general procedure used in conducting intensive wetland surveys is, first of all, to study aerial photographs. Apparent wetland areas on the photographs are outlined. Subsequently, these maps are taken into the field. Here the boundaries of each wetland parcel are outlined on the map. Probably the most important information secured on each area is wether it is drainable, or not feasibly drainable. This is based on visual inspection to determine whether gravitational drainage by open ditching and/or tiling is feasible. The degree of grazing of each area is also recorded.

Upon completion of field checking of a township, the field data are tabulated and analyzed. Where available, soil capability classifications are added and a priority rating is applied, basod on drainability, capability, location and other factors. A map of each township is prepared giving the location of all existing wetlands, lakes, streams, and cities. It was found during the Wisconsin survey that the amount of manpower required to survey an average township varies with the numbers and types of wetlands involved. On the average each township has required approximately seven man-days of field work, and three man-days of office work.

In Wisconsin, wetlands were classified in three categories, including areas from:

1) one-quarter acre to fifteen acres, where management is limited to leaving the areas undisturbed and grazing is controlled,
2) sixteen acres to approximately six hundred and forty acres, where management generally is limited only by the type of wetland involved, and
3) 640 acres or more, where management is practically unlimited.

What are the objectives we aim at in wetland surveys? The following can be listed:

1) to determine the distribution, degree of grazing, as well as the types and amounts of existing wetlands,
2) to demonstrate loss of wetlands, largely through drainage, during the past 20 to 50 years.
3) the use of the results of the inventory to further delineate the wildlife values of remaining wetlands and to develop an objective preservation and management programme for wildlife.

At present there are not sufficient research data available to see exactly the impetus of drainage on wildlife. However, some studies have been made. The recent study of the Fish and Wildlife Service in a restricted area in Iowa indicated that the most important factor influencing duck production in that area was the number of water areas available to breeding birds in the spring. Drainage of small potholes in that area was definitely detrimental to the waterfowl production. The value of wetlands to the survival of pheasants during the winter is well known.

After an intensive wetland survey has been conducted, the problem of acquisition of suitable areas will arise. Acquisition depends upon the public need for an area and the total value of the area to wildlife as a breeding and concentration unit. Acquisition by the government is not always advisable or even the best approach. The larger wetlands preferably should be in public hands. However, the purchase of numerous, widely scattered small parcels of wetlands may be costly and complex. In that case lease, preferably on a long-term basis, might be a suitable approach. It is temporarily less expensive, it does not tie up large amounts of money, and it does not affect the local tax base. However, in many cases leases are lost for various reasons, and leasing and administrative costs may be high over a number of years, and management opportunities are limited.

In addition to direct purchase and lease, incentives which result in the adoption of total land-use practices may help to save wetlands of many types and sizes. Part of the profits from wetlands might be returned to the local community; this might partly replace tax losses.

Another approach to save wetlands is to encourage civic groups and communities to maintain a wetlands area of reasonable size for wildlife as their contribution to posterity. Reduction of taxes on wetlands reserved for wildlife is also a possibility.

In the State of Minnesota efforts have been made during recent years to improve the habitat of wetlands. 12,581 lineal feet of level ditches and 77 nesting islands were constructed by dragline to improve three shallow marshes at a cost of 16 to 19 cents per cubic yard. Another method of improving aquatic habitat is the construction of carp barriers on certain watercourses. Minnesota is spending $40,000. per year to survey waterfowl and muskrat habitat and to make drainage investigations. This project has surveyed over 1,300 water areas totalling 300,000 acres.

Since the economics of land use make drainage a profitable venture, drainage appears inevitable and will likely continue in an accelerating fashion in Southern Ontario. For this reason, if we want to save a certain amount of suitable wetlands, immediate action should be taken.

FOREST WILDLIFE MANAGEMENT

by
Clyde P. Patton, Executive Director
North Carolina Wildlife Resources Commission

Presented at a Meeting of U. S. Forest Service Personnel
With International Association of Game, Fish and
Conservation Commissioners, December 4, 1956
Washington, D.C.

On forest lands, measures employed in wildlife habitat maintenance and improvement are heavily influenced by the extent of the farmers' or foresters' appreciation of wildlife values.

We do not propose to discuss wildlife values here. All of us are familiar with the pictorial presentation of these values recently published by the U. S. Fish and Wildlife Service from data collected in the Crossley National Survey of Hunting and Fishing. Wildlife values are clearly substantial. They compare favorably, public interest-wise, with forest values. The recent emphasis on them serves as an admonishment to all to fully appreciate the importance of planning and employing an effective, productive wildlife habitat improvement program on forest lands. Unless all concerned, wildlife managers, foresters, and extension specialists alike, have a proper appreciation of the actual value of wildlife, the activation of a really effective program of wildlife management will be slow, halting, and beset with frustration.

It is not enough that those in charge of national and state programs be aware of wildlife values. If such awareness and appreciation are not passed down to the level of the farm worker, the district ranger, and the logger, all the good intentions and fine programs of cooperation will be fruitless. With proper wildlife interest on the local level - the labor foremen and the supervisors - a constructive program of management can be most effectively activated.

We often have heard from wildlife managers and foresters about "overpopulation" of our deer ranges. "Underdevelopment" of range capacity is seldom mentioned, but is equally important. It appears, sometimes, that the chief emphasis is on increasing the kill to prevent malnutrition starvation, disease, and death due to lack of food. There are cases where indifference to wildlife has resulted in forest cutting practices which have eliminated food trees, shrubs, and vines, and dropped game carrying capacity to dangerously low levels. With these circumstances and practices prevailing, continued emphasis on increased kill to keep capacity and population in balance will inevitably lead to wildlife extermination. A balance between wildlife populations and available food and cover is essential, but it should be based on the maintenance of carrying capacity at the highest possible level. The only satisfactory balance is one achieved by forestry practices which give

FOREST WILDLIFE MANAGEMENT

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Presented at a [illegible] of U. S. [illegible]
With International Association of [illegible]
Conservation [illegible]
Washington, [illegible]

On forest lands, [illegible]
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constant attention to maximum wildlife habitat development on the one hand and adequate annual wildlife harvest on the other.

Too often, wildlife has been considered only as a forest by-product to be had incidentally and enjoyed without conflict with any other interests. In view of the recent additional evidence proving the dollar value of wildlife, would it not be well to reconder the importance of establishing the highest possible wildlife population levels by maintaining and improving range carrying capacity? An adequate supply of natural preferred food and cover, created through proper habitat management on the range, will provide more game, more hunting, and will also effectively reduce seedling and other forest damage somtimes attributed to game.

The action phase of forest wildlife management is based on certain principles or concepts, some of which may be enumerated. This list of ideas is neither original nor complete, but it does contain some of the more important points providing for coordinated use of forests for production of both timber and wildlife.

The twin terms "interspersion" and juxtaposition" set the pattern for both forest and farm game management. The concept of juxtaposition merely requires that all the elements of habitat necessary for a given wildlife species occur within the cruising radius of that species. The concept of interspersion requires that all parts of a given range, or management unit, have a distribution of essential habitat elements so as to make all parts of that range productive of game.

Lest the impression be created that it is proposed to convert all forest land to mast trees and pasture, other concepts must be added. Almost every forest type, and every stage of development of each forest type, is of some value to some form of wildlife. To be sure, not all are equally valuable, but it must be recognized that each does contribute something to the range. The recently cut-over forest provides abundant deer browse. This, with an increasing component of fruiting species, develops into what might be called a "grouse" stage. In due course of time the mature forest provides mast for squirrels, turkey, bear, and deer. This is pointed out to invite attention to the fact that good wildlife management does not necessarily require special or supplementary practices, but rather does require an awareness of wildlife needs which must be incorporated into cutting schedules and cutting rules.

Interspersion and juxtaposition also could be attained through consideration of wildlife needs in marking rules or prescriptions. Before any stand is scheduled for cutting, it should be carefully examined for its wildlife potential. Does cutting of this particular stand lend itself to browse production or mast production? Is it to be a heavy cut or a thinning of mast production trees? Would it be necessary to retain den trees? Certainly, if it is not in squirrel or raccoon country, den trees are not necessary. Should seed trees of certain species be left? Ought special measures be taken to protect grape tangles, old apple trees, dogwoods, or other food producing plants?

Since the productivity of the range is almost entirely determined by the nature and scheduling of logging jobs, it might be a good idea to call in the game consultants at periodic intervals to assist with the scheduling of sales and the preparation of cutting prescriptions. Preparation of forest type maps, or stand condition maps, with wildlife features also indicated would help to insure that all parts of the range were being given proper consideration.

Another "coordination concept" is that of the cutting unit. While the cutting unit idea is a product of the European school of forestry and, in some cases, has been replaced in this country by the periodic inventory, its application lends itself very nicely to forest wildlife management because it can be the most practical means of accomplishing both interspersion and juxtaposition. This approach requires that the land to be managed be divided into tracts of convenient size which may range from one to several thousand acres each. They may be individual small watersheds or property boundaries. It is not necessary that these tracts be of the same size. Other factors, such as logging access, natural fire control, or drainage units, are more important size-determining elements.

In managing such a cutting unit for deer, the entire block should be within the cruising radius of the herd. The browse needs of the herd could be met by scheduling logging in such a way as to have some part of the area, possibly 10 percent, in good deer browse range. In addition, another portion of the unit could be in optimum grouse range. A third could be in the mast-producing stage.

It is obvious that the smaller the cutting unit, the more assurance there would be of securing adequate juxtaposition of required elements for the various game species. Likewise, the more cutting units set up for this level of management, the nearer would be the maximum interspersion on the entire range. All parts of the range would be producing both timber and wildlife.

Putting together the idea of a cutting unit and a recognition of the value of the various stand ages, it is possible to go in the direction of fulfilling the requirements of interspersion and juxtaposition by manipulating cutting schedules and prescriptions. Cutting schedules often are the result of a careful choice following the consideration of a number of alternates. Sometimes market demands single out particular stands, but more often several different stands can satisfy a particular demand. The latter is bound to be more frequently the case with the constant improvement of our forests through careful management. Within the framework of such a latitude, the ranger can conduct his logging in those places where there is a need for browse, or he may refrain for a while from removing mast producing stands until other potential stands grow into productive stage.

Another important concept of value to both forest and game management is that management should, so far as possible, be related to the specific local site. An easy solution may be sought through the adoption of sweeping uniform policies, such as planting long leaf pine in the eastern part of the state and white pine in the west, but it is well known that planting site conditions vary from place to

place, almost down to the individual acre. Management policies, which make allowance for such local variation, will come much closer to satisfying the needs of wildlife than those calling for the uniform region-wide application of a single practice. Fruits, mast, and browse can be produced without disrupting policy execution, or interfering with the primary management plan, where forest management policy recognizes local variations.

A specialized aspect of site management has been described by H. D. Burke in his compendium of forest wildlife research needs; namely, the concept of forest holms: h-o-l-m-s. This calls for the preservation from cutting of selected spots of a few acres which appear to be particularly desirable or effective in providing wildlife habitat needs through some circumstance of topography, drainage, or vegetation. Examples are a small grove of hickory trees, a grape tangle, a swampy spot, an old home site, or an apple orchard.

The next concept to be considered is related to the others. Hardwoods generally are of greater benefit to wildlife than are pines. This is especially true of such hardwoods as the oaks, hickories, black gum, beech, and other fruit and mast producers. It would be disastrous to the wildlife of a hardwood forest to decree its conversion to pure stands of pine. Hardwoods in a pure stand of pine reduce its potential timber value. But hardwoods maintain wildlife range carrying capacity. With the known dollar value of wildlife at a high level, the combined value of a mixed timber stand plus game is worth more than the pine standing alone.

These are some of the more important concepts on which forest wildlife management should be based. These concepts, activated by an attitude which recognizes and respects the true values of both forests and wildlife as twin crops, can result in the application of helpful techniques and practices for both resources.

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STATISTICS AND COMMENTS ON THE PELEE ISLAND PHEASANT SHOOT - 1956.

by
L. J. Stock

Including band recoveries of imported birds released in March and September, 1956.

Number of hunters	Non-resident	825	- 85%
	Resident	147	- 15%
	Total	972	

Bag limit 6 cocks, 0 hens

Birds bagged per hunter - Cocks (36% sample) - 5.68

Percent of hunters who bagged their limit of 6 cocks - 89.0

Total birds bagged - 5,520

Composition of the bag				
Native juveniles	2853	- 51.7%		
Native adults	582	- 10.5%		
Native total			3435	- 62.23%
September releases			2042	- 37.0 %
March releases			43	- 0.77%
TOTAL bag, cocks only			5520	- 100.00%
Loss and illegal kill (10% estimated)			552	
TOTAL kill, cocks			6072	

Age ratio of native birds at the shoot - cocks 5.9 Juveniles per Adult

Sex ratios	
Pre-season (Oct. 30-31) (963 birds counted)	1.22 cocks per hen
Post-season (Nov. 7-8) (412 birds counted)	1 cock per 7.0 hens

Population Estimates, using the Kelker Index

	Number of Birds Before the Hunt	Number of Birds After Hunt
Cocks	6,832	760
Hens	5,600	5,320*
TOTAL	12,432	6,080

* This allows for five percent loss and illegal kill of hens.

Composition of the Population Before and After the Hunt, 1956

Cocks	Population Before Hunt	No. Shot	% Shot	After Hunt
Native juveniles	3,535	3,140	89	395
Native adults	717	638	89	79
Sept. imports	2,527	2,247	89	280
March imports	53	47	89	6
TOTAL Cocks	6,832	6,072	89	760
Hens				
Native	5,405	270	5	5,135
March imports	195	10	5	185
TOTAL Hens	5,600	280	5	5,320
TOTAL POPULATION	12,432	6,352		6,080

	Band Returns Number Banded	Number Shot	Percent of Bag	Survival Rate to Oct. 31
March releases - Cocks	300	47	0.77	17.7
- Hens	1,300	00	0.00	15.0 (estimated)
Sept. releases - Cocks	3,000	2,247	37.0	84.1

Band returns computed from 32 percent sample.

This survival rate compares with that of 192 cocks released in March, 1952, when 15% survived to the shoot.

Comments

The Pheasant Population

During 1956 it was necessary to revise the population twice. First after the release of 1,350 hens and 350 cocks in March and again after the release of 3,000 cocks in September. These are all incorporated, along with the native birds, in the final estimate.

The final estimate of 6,850 cocks available to shoot is very close to the total birds before the shoot, 6,832 as calculated using the Kelker Index. This accuracy supports our estimate of 5,320 hens remaining after the shoot.

Sex Ratios

The 3,000 cocks released in September resulted in a preponderance of cocks in the population shown by the pre-season sex ratio of 1.22 cocks per hen.

Both the pre-season and post-season sex ratios, we believe, are representative of the population. There was no difficulty in flushing sufficient birds for a good sample. The post-season count was taken on the Monday and Tuesday following the shoot, when the birds were dispersed throughout the whole Island, and we believe the observed cock to hen ratio of one to seven is a good one.

Survival of Banded Birds

The first shipment of some 915 birds arrived in March and were banded as released. The remainder of the March imports were banded before shipment to Pelee. During the banding operations on Pelee, 98 birds escaped, leaving approximately 300 cocks and 1,300 hens banded. The total shipment numbered 350 cocks and 1,350 hens. In the calculations the escapees are considered as native birds.

Of the 300 cocks released, 53 or 17.7 percent were alive on Oct. 31st. The survival of the banded hens was estimated at 15 percent, due to a higher rate of mortality, hence 195 hens survived to Oct. 31st. The remaining 5,405 hens are native birds.

The 3,000 cocks released in September constituted 37 percent of the bag with a survival rate of 84.1 percent. These were banded before shipment to Pelee.

Future Prospects

Comparing 1956 with previous records, we find that the hen population after the shoot in 1951 was approximately the same as in 1956 - 5,300 birds.

In 1952, the total kill was 6,900 cocks and 1,500 hens shot by 1,175 hunters. We have a record of 192 cocks released on March 15, 1952, but no hen releases. The population after the hunt in 1952 was 7,200 hens and 800 cocks.

It is obvious that both adult and chick survival must have been above average and that hatching success was good in 1951-52.

If the survival rates for adults and chicks follow the average trends, and the percentage of broodless hens is near normal, we can expect some 3,000 nesting hens in July, 1957. In

other words the same number as in 1956 after the release of 1,300 imports in March, 1956. With conditions similar to 1956, the cocks available to shoot will be about 4,000.

The population now is low and with good conditions there is a good possibility that the increase will be above average, but it is also well to bear in mind that there is no guarantee that such will be the case.

In any event, the July survey in 1957 should give a good indication of any population change.

REPORT ON AGE AND SEX OF RUFFED GROUSE SWASTIKA DISTRICT, 1956.

by
R. C. Johanson

During the 1956 season for ruffed grouse in the Swastika District, 84 wings and tail feathers were collected for aging purposes.

The following tables give the comparisons of this year's figures with those of 1955.

	1955		1956		
	Adults	Juveniles	Adults	Juveniles	Unaged
Males	12	42	7	30	1
Females	13	35	6	26	2
Unsexed	0	0	2	10	
TOTAL	25	77	15	66	3
Ratio:	1 Adult ♀ - 7.4 Juveniles		1 Adult ♀ - 11 Juveniles		

It is probable that our ruffed grouse are on the increase when comparing the figures of 1955 with the 1956 figures.

We would not call this a random sample of ruffed grouse wings and tail feathers because the ruffed grouse hunting is along various access roads throughout the District.

TWEED DISTRICT DEER, 1955

by
P. A. Thompson

As in previous years three deer checking stations were in operation during the 1955 deer season. They were located at Millbridge, Kaladar and Arnprior. The Arnprior station was operated as a joint effort by Pembroke and Tweed District. We are most grateful for the help supplied by the Belleville and District Fish and Game Club, the Kingston Rod and Gun Club and Department staff from other districts.

Figures on resident and non-resident hunters' success for the past four seasons are as follows:

	1955	1954	1953	1952
Resident Hunters	2892	2969	2627	2792
Non-Resident Hunters	135	91	133	30
Total Hunters	3027	3060	2760	2822
Deer	869	980	885	897
Success	28.7%	32.02%	32.1%	31.8%
Man Days per Deer	19.25	15.8	17.4	21.8

This year efforts were made to obtain varying success on different categories of hunters. All hunters passing through the checking stations were questioned on their hunting practices and classified under the following categories:

1. Organized: hunters who returned year after year to the same camp, cottage or house and hunted the same familiar country.

2. Local: hunters who hunted familiar country in the vicinity of their homes.

3. Casual: hunters who drive out for a day or week-end to hunt in unfamiliar country without a guide or stand on a hydro line or road side.

4. Guided: hunters who stayed in commercial camps, hotels or other accommodations, who hunt in familiar country with the services of guides who know the locality.

5. Not classified: hunters who passed through the checking stations at rush periods and were not classified.

The following is a breakdown of hunters by category showing their success.

Category of Hunters	No. of Hunters	Deer	% Success	% of Total Kill Taken
Organized	1641	517	31.5	62.3
Local	106	17	16.3	2.0
Casual	403	47	11.6	5.7
Guided	254	53	20.8	6.4
Not Classified	572	196	34.2	23.6

Weights:

Extra efforts were made to weigh as many animals as possible as they passed through the checking stations. A total of 434 deer were weighed, average weights by sex and age class are given in table I.

TABLE I

Sex	Age Class	No. Weighed	Total Weight In Pounds	Average Weight In Pounds
Male	½	63	4331	68.7
Male	1½	72	8381	116.4
Male	2½	45	6664	148.0
Male	3½	39	6869	176.1
Male	4½	21	4034	192.0
Male	5½	11	2037	185.1
Male	6½	2	341	170.5
Male	7½	1	208	208.0
Female	½	60	3774	62.9
Female	1½	34	3367	99.0
Female	2½	34	3657	107.5
Female	3½	21	2401	114.3
Female	4½	15	1769	117.9
Female	5½	9	1002	111.3
Female	6½	4	453	113.2
Female	7½	3	332	110.6

Average deer weights by age class over the past four seasons are recorded in table II.

Year	Sex	Average Weight in Pounds by Age Class ½	1½	2½	3½	4½	5½	6½	7½	8½
1955	Bucks	69	116	148	176	192	185	170	208	
1954	Bucks	69	111	140	178	174	178	-	-	203
1953	Bucks	66	110	147	186	183	198	167	-	218
1952	Bucks	70	110	147	169	195	199	204	222	226
1955	Does	63	99	107	115	118	111	113	111	-
1954	Does	63	100	110	111	112	-	116	144	-
1953	Does	64	94	104	105	117	102	102	103	103
1952	Does	61	92	110	114	112	117	-	113	-

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Aging and Sexing:

For comparison the age class percentages for 1952-53-54 and 55 are given in table III.

TABLE III

	1955	1954	1953	1952
Bucks	38.6	37.36	38.1	41.0
Does	27.0	31.10	32.4	33.3
Fawns	34.4	31.54	29.6	25.6

	Adult Bucks				Adult Does				Adult Combination Bucks & Does			
Age	1955	1954	1953	1952	1955	1954	1953	1952	1955	1954	1953	1952
1½	37.5	36.76	41.1	25.9	29.3	32.16	29.9	28.0	34.1	34.67	36.3	26.9
2½	25.8	28.53	20.2	32.5	29.8	35.34	27.7	36.4	27.4	31.62	23.8	34.4
3½	19.8	19.70	18.5	29.8	18.7	17.67	23.7	20.6	19.3	18.78	21.0	25.3
4½	10.6	8.82	11.8	6.6	10.6	6.71	6.9	6.5	10.7	7.86	9.5	6.6
5½	4.9	2.94	4.4	2.6	7.1	4.24	4.7	5.6	5.8	3.53	4.6	4.1
6½	1.1	1.47	1.0	1.6	2.5	2.47	3.5	.9	1.7	1.93	2.1	1.4
7½	.3	.88	-	.4	2.0	1.06	1.5	1.4	1.0	.96	.7	.9
8½	-	.88	1.3	.4	-	.35	1.8	.5	-	.64	1.6	.4
9½	-	-	.7	-	-	-	.4	-	-	-	.5	-

Average age for 1952 deer 2.86 years
Average age for 1953 deer 2.93 years
Average age for 1954 deer 2.76 years
Average age for 1955 deer 2.86 years

When aging figures are worked out on a district basis they again show an increase in the fawn production, 34.4% of the sample as compared to 31.5% of last season. However, when aging figures are worked out by townships it is quite plain that certain areas are responsible for this increase. H. G. Lumsden, in his 1952 report on Tweed district deer, broke the district's recognized deer area into twelve groups, each group consisted of two to five townships in size. Figures collected from the 1955 deer checking stations were applied to these areas and the following results may be compared with figures of the 1952 report. (See Fish & Wildl. Mgt. Rept. #14, Nov., 1953.)

1. McClure, Herschel, Wicklow and Monteagle

Hunters 194 Deer 62 Success 32%
Bucks 32% Does 32% Fawns 36
Fawn:Doe Ratio 110:100

2. Faraday, Dungannon, Wollaston, Limerick

Hunters 283 Deer 88 Success 31%
Bucks 39% Does 28% Fawns 33%
Fawn:Doe Ratio 116:100

3. Tudor and Lake

Hunters 272 Deer 84 Success 31%
Bucks 37% Does 31% Fawns 32%
Fawn:Doe Ratio 104:100

4. Carlow, Raglan, Radcliffe and Bangor

Hunters 60 Deer 28 Success 47%
Bucks 46% Does 18% Fawns 36%
Fawn:Doe Ratio 200:100

5. Mayo, Ashby, Cashel, Effingham

Hunters 358 Deer 109 Success 30%
Bucks 43% Does 29% Fawns 28%
Fawn Doe Ratio 97:100

6. Grimsthorpe and Anglesea

Hunters 251 Deer 85 Success 34%
Bucks 39% Does 29% Fawns 32%
Fawn:Doe Ratio 108:100

7. Griffith, Lyndoch, Sebastopol, Brudenell

Hunters 309 Deer 93 Success 30%
Bucks 40% Does 27% Fawns 33%
Fawn:Doe Ratio 124:100

8. Denbigh, Matawatchan, Abinger, Miller

Hunters 501 Deer 143 Success 28%
Bucks 43% Does 35% Fawns 22%
Fawn:Doe Ratio 62:100

9. Barrie, Clarendon, Palmerston

Hunters 121	Deer 36	Success 30%
Bucks 33%	Does 33%	Fawns 33%

Fawn:Doe Ratio 100:100

10. Brougham, Grattan, Admaston, Blythfield

Hunters 238	Deer 54	Success 23%
Bucks 44%	Does 26%	Fawns 30%

Fawn:Doe Ratio 114:100

11. Bagot, McNab, Darling, Lavant, Pakenham

Hunters 68	Deer 17	Success 25%
Bucks 35%	Does 47%	Fawns 18%

Fawn:Doe Ratio 37:100

12. Kaladar, Kennebec, Elzevir

Hunters 26	Deer 6	Success 23%
Bucks 66%	Does 17%	Fawns 17%

Fawn:Doe Ratio 100:100

District fawn doe ratio 99:100
District adult buck doe ratio 132:100

The samples from some of these groups are small, perhaps too small to draw definite conclusions. However, they do point out that the increase in the fawn production came from the western portion of the district groups 1 to 7. Group 3, the townships of Lake and Tudor, shows a substantial increase in both hunters' success and fawn production. There are two probable causes for the low rate of fawn production and hunters' success in the eastern part of the district. (1) Above average snow fall may have restricted does in their winter feeding habits to such an extent that they were unable to produce. (2) District timber management staff have indicated that portions of the forest in the eastern part of the district are more mature and that over the past 4 or 5 years cutting operations have been at a minimum in certain areas. The balance of the eastern forests has been held under timber licence for 40 or 50 years without cutting operations taking place.

Lactation and shedding of milk teeth

The first information on the lactation of female deer was collected during the 1954 season. At that time only 1½ year old deer were examined. This year, 1955, 250 female deer in all age classes passed through the deer checking stations. Department staff were able to examine 153 or 61.2% of these animals. The following table gives the percentages of milking does in each age class.

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Age Class	Milking	Dry	Total	Percent Milking
1½	7	37	44	15.9
2½	33	10	43	76.7
3½	24	6	30	80.0
4½	18	0	18	100.0
5½	6	0	6	100.0
6½	5	1	6	83.3
7½	4	2	6	66.6

The shedding of milk teeth by deer in the 1½ year age class was again checked and the results are as follows:

	Shed	Unshed	Total	Percent Shed
Males	16	29	45	35.5%
Females	10	20	30	33.3%

Crown land camp hunters:

Hunters who have established hunt camps on Crown land under authority of a land use permit were supplied with a deer report form and asked for its completion. From the 278 permittees, 200 returns were made. Of the 200 returns made, 174 were fully completed, 14 gave no date of deer killed and 12 did not use their camps. The following information was obtained from the returns made.

Permittees	Returns Made	Hunters	Deer	Percent Success
278	200	1477	741	50.2

The hunters' success from Crown land camps for the past five hunting seasons is as follows:

Year	No. of Hunters	No. of Deer	Percent Success
1951	605	467	77.2
1952	717	468	65.4
1953	986	565	57.4
1954	1589	906	56.7
1955	1477	741	50.1

The distribution of kill was calculated from 174 reports consisting of 1386 hunters and 684 deer.

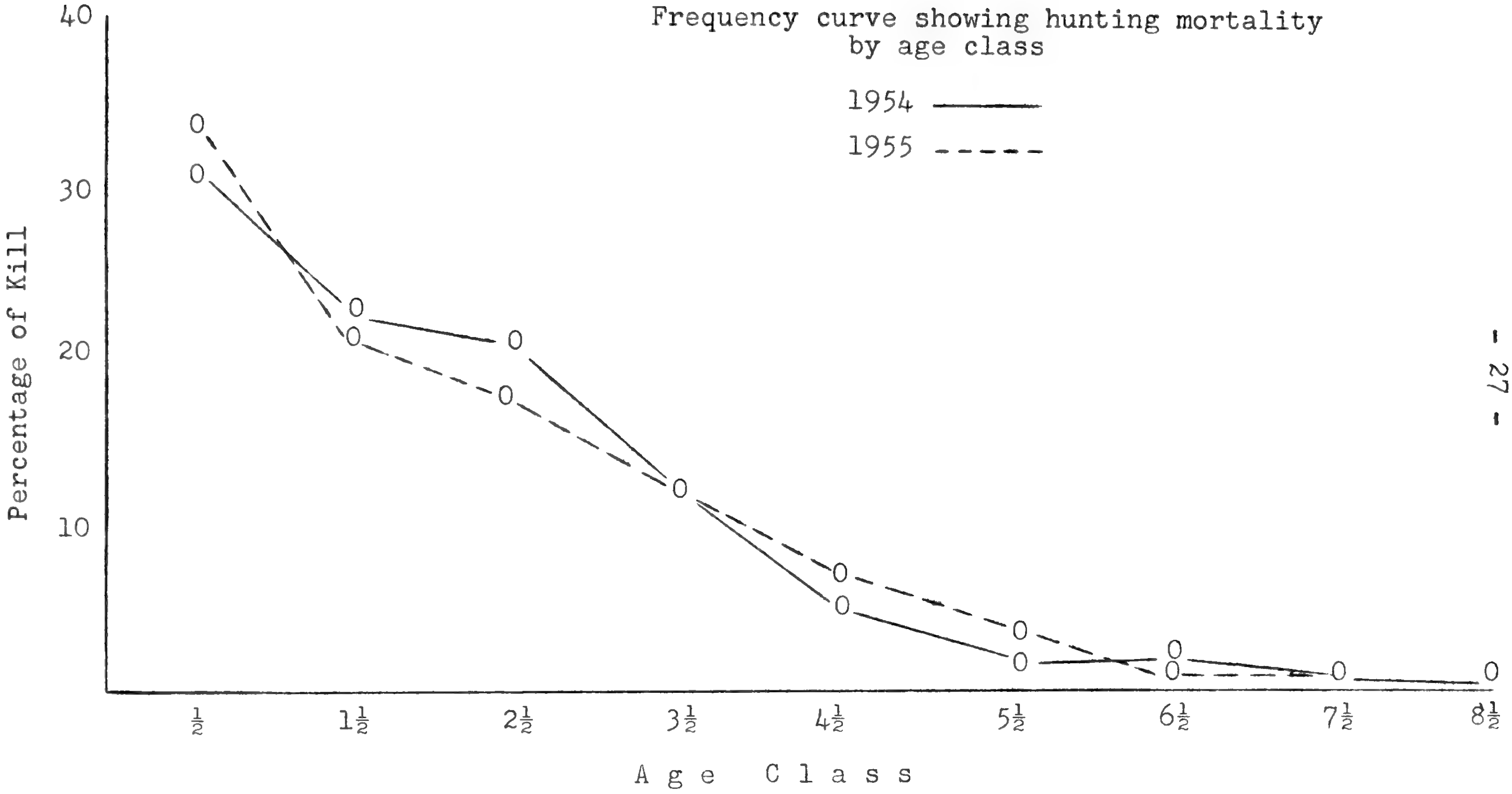
1st Week	No. Sportsmen Hunting	No. Parties Reporting	Deer Killed	% of Total Kill	% Hunter Success
Nov. 7	1225	169	118	17.2	9.6
Nov. 8	1227	171	97	14.2	7.9
Nov. 9	1217	170	100	14.6	8.2
Nov. 10	1201	169	84	12.3	6.9
Nov. 11	1163	164	70	10.2	6.0
Nov. 12	1022	146	75	11.0	7.3

2nd Week	No. Sportsmen Hunting	No. Parties Reporting	Deer Killed	% of Total Kill	% Hunter Success
Nov. 14	492	76	36	5.3	7.3
Nov. 15	484	74	23	3.4	4.7
Nov. 16	408	65	6	.8	1.4
Nov. 17	403	62	13	1.9	3.2
Nov. 18	371	57	37	5.4	9.9
Nov. 19	284	44	25	3.7	8.8

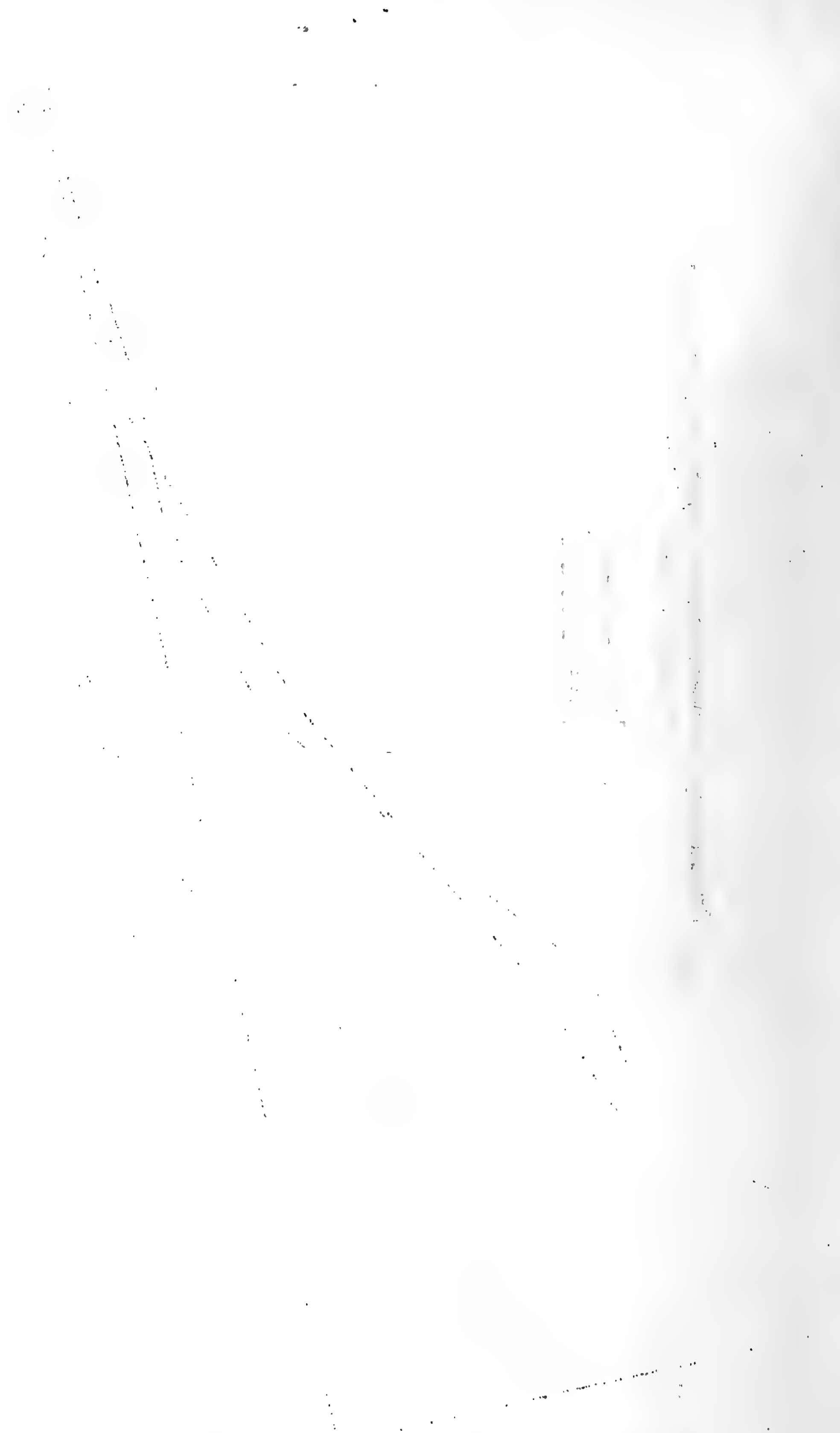
Weather

Studies have shown that snow depths of 24 inches begin to hamper deer in their movements and restrict them in their search for food. Snow depths recorded at the Dacre snow station show an average of 28.7 inches of snow, with a "B" crust on the ground from January 24th to March 28th. Over the same period the average snow depth at Bancroft was 24.8 inches. When data from the checking stations of these areas are compared we find that the Dacre area had a 28% hunters' success, a fawn-doe ration of 66 to 100 and a 22% fawn kill, while the Bancroft area had a 32% hunters' success, a fawn-doe ratio of 110 to 100 and a 36% fawn kill. Figures of this nature indicate that winter weather is probably the greatest limiting factor governing our deer herd.

Weather before and during the 1955 deer season may be partly responsible for the lower hunters' success, 28.7% as compared to 32.02% of 1954. During October 1955, Tweed District had a measured rainfall of 10.83 inches which was roughly 7 inches above average. These heavy rains flooded low areas making it possible for deer to evade dogs with ease. Many hunters passing through the checking stations with a light kill reported that high water rather than the scarcity of deer was the cause of their low success.



Frequency curve showing hunting mortality by age class



DEER MORTALITY IN THE LAKE ERIE DISTRICT, 1956

compiled by
L. J. Stock

Showing

1. The yearly kill - 5 years compared.
2. The mortality 1956 for each month in each Conservation Officer's area.
3. The mortality in each County showing total kill, cause and damage to vehicles.
4. Miscellaneous kills in detail.
5. Age classes.
6. Weights of deer.
7. Loss by mutilation and decomposition.
8. Sex ratios.
9. Susceptibility to highway accidents - bucks, does and fawns compared.
10. Comments.

TABLE I - Deer Mortality, 1956, for Each Month in Each Conservation Officers Area.

Area	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
No. 1	7	5	2	4	7	5	2	0	8	18	20	12	90
No. 2	3	3	0	3	4	4	0	2	2	5	9	8	43
No. 3	1	0	0	1	1	0	0	0	0	0	1	1	5
No. 4	5	0	0	1	0	3	0	0	1	2	5	2	19
No. 5	1	1	2	2	1	1	0	0	4	1	5	9	27
No. 6	0	0	0	0	1	1	1	0	0	2	2	1	8
No. 7	1	2	1	0	1	1	0	0	1	2	3	1	13
No. 8	3	2	0	0	0	0	0	0	0	0	10	1	16
No. 9	2	0	0	1	0	0	2	0	2	2	6	5	20
No. 10	8	1	0	0	3	2	1	1	0	3	4	4	27
No. 11	0	0	0	0	0	0	0	0	0	1	0	2	3
No. 12	0	0	0	0	0	0	0	0	0	0	0	0	0
No. 13	1	0	0	0	0	0	0	0	0	1	1	4	7
No. 14	3	2	0	3	3	1	0	0	2	2	1	0	17
No. 15	0	0	3	0	1	0	0	0	1	1	1	0	7
TOTALS	35	16	8	15	22	18	6	3	21	40	68	50	302

Yearly Kill - 5 Years Compared

		Difference
1952	222	
1953	235	+13
1954	197	-38
1955	227	+30
1956	302	+75 = 33%
TOTAL	1183	

TABLE II - Deer Kill by County, 1956, Showing Total Kill, Cause and Vehicle Damage

Area	Total Kill	Cause			No. of Accidents Reporting Damage	Damage to Vehicles
		Road Kills	Poaching	Miscellaneous		
Elgin	17	10	1	6	4	615.
Essex	25	11	8	6	8	1425.
Haldimand	43	25	9	9	6	530.
Kent	10	4	5	1	1	150.
Lambton	26	16	9	1	3	245.
Lincoln	39	19	2	18	5	700.
Middlesex	32	14	12	6	4	1100.
Norfolk	11	6	0	5	0	000.
Welland	99	53	19	27	28	5060.
TOTALS	302	158	65	79	59	9825.
Percent		52	22	26	37% sample	Average damage per vehicle $166.00

Miscellaneous Kills

Deaths due to causes other than highway accidents or poaching are grouped under miscellaneous. These are broken down as follows:

Drowned 15; caught in fences 13; by train 11; by dogs or wolves 5; two large bucks in the Niagara District died in combat with their antlers locked; two were killed by lightning; one was killed by a windfall tree; one by a corn picker; one ran through a store window in town and had to be destroyed. Of the remainder the cause of death is in doubt and is listed as unknown.

It is interesting to note that of the 302 known dead only 26 were victims of natural hazards such as drowning, combat and lightning. In all other cases the hazards were man made. These observations lend emphasis to the problems of raising big game in an intensely populated area.

Damage to Highway Vehicles

Of 59 reported accidents total damage amounted to $9,825.00 for an average of $166.00 each. The individual damage in some cases was in excess of $500.00.

Age Classes: (70% of Kill)

Age	Number of Deer	Percent of Kill
Under 1 year	49	23
1 - 2 years	83	39
2 - 3 years	48	23
3 - 4 years	22	10
4 - 5 years	6	3
5 - 6 + years	5	2
TOTAL	213	100.0

Weights of Deer

The average weight of 78 animals, 26 percent of entire kill was 116 pounds. This includes all age classes.

The average weight of 22 fawns killed in October, November and December was 76 pounds.

Loss by Mutilation and Decomposition

Positive reports of 240 animals show that 165 or 70% were unfit for human consumption. This is an increase from 39.2% in 1955. Gross loss in meat in 1956 was 19,140 pounds - almost 10 tons.

Sex Ratio

The sex ratio of 270 animals (all ages) was 1.5 males per one female.

Susceptibility of Bucks, Does and Fawns to Highway Accidents

Of a total of 131 animals involved in highway accidents the proportion of bucks, does and fawns was 68 to 32 to 31 respectively (approximately 2 to 1 to 1). Thus more bucks are killed on roads than does and fawns combined. Bucks and does were adults at least one year old; fawns under one year. All age classes are represented.

Comments

The increase in mortality over 1955 of 33 percent or 75 deer is an average increase of over 6 deer per month. If this rate is maintained the kill in 1957 will be over one deer per day. The average increase per County is over 8 deer.

In spite of the higher mortality the percentage of road casualties actually decreased from 57.7 to 52. The poaching rate increased from 9.7 to 22 percent. The increase of miscellaneous accidents accounted for the remainder.

The monthly kill follows the usual pattern, building up to a peak in November, with a minor peak in May.

The percent of fawns increased from 20 to 23 percent; the other age classes remained in approximately the same proportion.

The male to female ratio changed from 2.13/1 in 1955, to 1.5/1 in 1956.

Damage to Vehicles

The average damage to vehicles dropped slightly but the number of accidents reported doubled. Damage in some cases was in excess of $500.00.

The average weight per animal was less by 10 pounds probably due to a larger number of fawns and does in the total kill.

The total gross loss (deer unfit for human consumption) increased due to a higher percentage of wasted animals and a greater kill, to almost double that in 1955.

Many more deer are killed annually than the total 302 reported, which is a minimum. Some highway accidents are not reported. Some die from natural causes and are not found. It is impossible to know the poachers' kill - estimates vary from 5 to 12 times the number of deer found which have obviously been shot.

Damage to Crops

Although reports of crop damage, up to the present time, have been found negligible in many cases, a few reports of serious damage by deer have been heard this past year. Young orchards, forest seedlings, nursery stock and corn are the crops concerned. Loss in some cases has amounted to several thousand dollars.

WINTER LIVE TRAPPING, CHAPLEAU GAME PRESERVE, 1957

by
V. Crichton

Live trapping for fisher and marten was carried out in the Manning, Busby and Lloyd Townships in the Chapleau Game Preserve from January 30th, on which date traps were first set out, to February 15th, when the traps were picked up.

During this period of 16 days, 38 marten were trapped consisting of 23 males and 15 females.

The high and low temperatures of each day were recorded in an effort to correlate certain temperatures with movements or marten activity, as follows in Table I.

TABLE I

	Low	High (above°)	Mean	Marten Trapped
January 30	-42	12	-15°	
January 31	- 2	10	+ 4°	4
February 1	-36	18	- 9°	7
February 2	-30	18	- 6°	2
February 3	+ 5	22	+13°	4
February 4	- 2	22	+10°	3
February 5	-18	28	+ 5°	2
February 6	- 6	34	+14°	1
February 7	+12	34	+23°	4
February 8	-22	26	+ 2°	7
February 9	+12	26	+19°	1
February 10	-24	18	- 3°	0
February 11	-32	20	- 6°	0
February 12	+ 6	28	+17°	1
February 13	+16	30	+23°	0
February 14	-25	31	+ 3°	2
February 15	-25	31	+ 3°	0
				38

Disposition of Marten:

The disposal of these marten is shown as follows:

Thirty-one	(31)	marten,	19 males and 12	females,	to Sudbury.
Three	(3)	marten,	2 males and 1	female,	to Michigan.
Three	(3)	marten,	2 males and 1	female,	died.
One	(1)	marten,		female,	escaped.

What started out to be a live fisher trapping project ended in a marten trapping project.

Various places along the lumber roads were baited with horse meat, starting on January 3rd. This attracted fisher, marten and fox.

Traps were set out on January 30th. Traps numbered from 15 to 33 with an average of 27 working traps per trap-day. During this period from January 30th to February 15th, 433 trap-days were employed to take 38 marten, a total of 11 trap-days per animal unit caught.

The number of traps closed during this period was 43 from mechanical and other causes.

Other Mammals and Birds Caught

5 Downy Woodpeckers
1 Canada Jay
1 Red Squirrel

Traps Used

Two sizes of collapsible traps were used, manufactured by the National Live Trap Company of Tomahawk, Wisconsin. The smaller size measured 24" x 6½" x 6½" while the large ones were 32" x 9½" x 9½".

How Traps Were Set

Snow was scooped out to a depth of four to five inches and this depression was filled with spruce or balsam boughs. Traps were set approximately level with snow and covered well with spruce or balsam boughs.

Type of Bait Used

Beaver meat and oil of rodium.

Three fisher entered the traps, two in smaller traps and one in a bigger trap. None of the traps were strong enough to hold the fisher. The two smaller type traps were completely wrecked while the large one had the end ripped out.

Cost Per Marten

Gasoline	$ 80.42
Meals at Lumber Camps	$ 60.80
Hay and Food for Marten	$ 6.00
TOTAL	$147.22
COST PER MARTEN	$ 3.88

Conservation Officers' wages are not included in the above as they are not included in the cost of marten on summer operations.

The cost of $3.88 per marten for winter trapping to date is much lower than the cost of $10.55 per marten for summer trapping (1956), wages not included. With wages other than Conservation Officers, the cost per marten is from 17 to 25 dollars.

Summary

The types of collapsible traps used are ideal for marten trapping, especially the smaller traps. The doors on the large size traps can be sprung by marten.

Traps for fisher must be, if our past experiences are any criterion, of stronger material, with a solid back and a stronger and more rigid door.

Baiting the sites is very helpful. However, bait should be allowed to deteriorate to a fair degree before baiting the sites and should be placed earlier on the bare ground. Fresh, frozen bait such as horse meat, moose, beef, etc., is not too useful as the odour is limited.

In many cases, fisher would frequent the sites and the trap area but would not go into the traps. They often knocked the trap about and caused some damage.

The marten catch during the last seven days amounted to four marten, as compared to 34 marten in the first nine days. This drop cannot be explained as there were still plenty of marten in the area of the traps.

Cold nights did not seem to restrict the movements and activities of marten.

Fox cubes as are used in the summer feeding of marten are not recommended for winter feeding. Had it not been for careful observation, we probably would have lost a considerable number of marten from starvation. The fox cubes were hidden in the hay in the pens and not eaten. We then resorted to Dr. Ballard's Dog Food (canned) until beaver carcasses could be obtained. It is recommended that, prior to winter live trapping, a supply of beaver carcasses should be obtained with which to feed the marten. A beaver meat diet certainly results in contented marten.

Examination of marten scats indicates that mountain ash berries are part of their winter diet.

It is hoped to continue with this trapping in March.

VARIATION IN SURVIVAL RATE OF THE WESTERN REGION DEER HERD

by
R. Boultbee
October 15, 1956.

A deer check station has been operated by the Western Region of the Ontario Department of Lands and Forests for the five years from 1951 to 1955. In four of the five years the proportion of fawns was less than the next older age class due to lower availability, hunter selectivity or other cause. This condition introduced difficulty in estimating true herd proportions and rates of survival or mortality. Some investigators ignore the fawn age class and work with ages of one and a half years and over.

In a manuscript by Mr. R. C. Passmore entitled "Interpretation of Kill Curves of White-tailed Deer", dated 1953, it is stated that the relationship between two successive year classes is established during the early years of vulnerability. A succession of identical seasons might be expected to cause two successive year classes to progress through the herd in lessening numbers, but retaining the same mutual ratio till close to their dropping out of the herd.

Under natural conditions the ratio between two age classes may vary from year to year. In addition the game check introduces sampling errors. It is the purpose of this paper to study the ratio between age classes as they progress through the herd, and to separate possible sources of variation. The conclusions will help the deer worker to reach a better understanding of the influences affecting his data. Like many such studies the data are meagre, but sufficient to obtain answers with a fair degree of significance. The methods used can be applied to other life forms.

Table one gives the kill figures for the five seasons of the Western Region deer check. Fawns are excluded on the assumption that the figures are less than the true proportions.

TABLE I - Number of Deer Checked

Check Station Year	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5
1951	44	32	53	39	19	14	2	2	1
1952	51	24	18	25	14	9	9	4	3
1953	164	132	72	33	15	12	10	1	-
1954	110	144	64	21	15	17	12	3	-
1955	174	182	134	62	23	16	16	8	-

A short inspection of table one reveals changes from year to year. For instance in the 1951 check the three and a half year animals bear a ratio to the two and a half year animals of 53/32 = 1.66. One year later in the 1952 check the survivors have the ratio 25/18 = 1.39. Subsequent ratios of the same animals are 0.45, 1.13 and 1.00. Considerable change can be seen from year to year.

The type of ratio discussed in the preceding paragraph will be symbolized by the letter "Y". To identify the age classes involved a subscript will be added indicating the younger age class. For instance in the 1951 check the ratio 53/32 = 1.66 is symbolized $Y_{2.5}$.

Table two gives all the ratios obtainable from table one. Each horizontal line follows the progress of two groups through the herd. The left hand column gives the year of origin of the ratio. For instance from table one the 1954 check gives the ratio $Y_{1.5}$ = 144/110 = 1.31. The one and a half year old group numbering 110 in the ratio obviously had its origin in 1953 and reference to table two will show $Y_{1.5}$ = 1.31 opposite year of origin 1953.

TABLE II - Yearly Ratios by Year of Origin

Year of Origin	Ratio Age Classes									
	$Y_{1.5}$	$Y_{2.5}$	$Y_{3.5}$	$Y_{4.5}$	$Y_{5.5}$	$Y_{6.5}$	$Y_{7.5}$	$Y_{8.5}$	Totals	Averages
1943								0.50	0.50	0.50
1944							1.00	0.75	1.75	0.88
1945						0.14	0.44	--	0.58	0.29
1946					0.74	1.00	0.10	--	1.84	0.61
1947				0.49	0.64	0.83	0.25	--	2.21	0.55
1948			0.74	0.56	0.80	0.71	0.50		3.31	0.66
1949		1.66	1.39	0.45	1.13	1.00			5.63	1.13
1950	0.73	0.75	0.46	0.71	0.70				3.35	0.67
1951	0.47	0.55	0.33	0.37					1.72	0.43
1952	0.80	0.44	0.46						1.70	0.57
1953	1.31	0.74							2.05	1.02
1954	1.05								1.05	1.05
TOTALS	4.36	4.14	3.38	2.58	4.01	3.68	2.29	1.25	25.69	
AVGES.	0.87	0.83	0.68	0.52	0.80	0.74	0.46	0.63		0.69

Table three repeats the same ratios, but is so arranged that horizontal lines indicate the ratios derived from the same game check, shown in the left column.

TABLE III - Yearly Ratios, by Game Check Years

Year of Origin	Ratio Age Classes								Totals	Averages
	$Y_{1.5}$	$Y_{2.5}$	$Y_{3.5}$	$Y_{4.5}$	$Y_{5.5}$	$Y_{6.5}$	$Y_{7.5}$	$Y_{8.5}$		
1951	0.73	1.66	0.74	0.49	0.74	0.14	1.00	0.50	6.00	0.75
1952	0.47	0.75	1.39	0.56	0.64	1.00	0.44	0.75	6.00	0.75
1953	0.80	0.55	0.46	0.45	0.80	0.83	0.10	--	3.99	0.57
1954	1.31	0.44	0.33	0.71	1.13	0.71	0.25	--	4.88	0.70
1955	1.05	0.74	0.46	0.37	0.70	1.00	0.50	--	4.82	0.69
TOTALS	4.36	4.14	3.38	2.58	4.01	3.68	2.29	1.25	25.69	
AVGES.	0.87	0.83	0.68	0.52	0.80	0.74	0.46	0.63		0.69

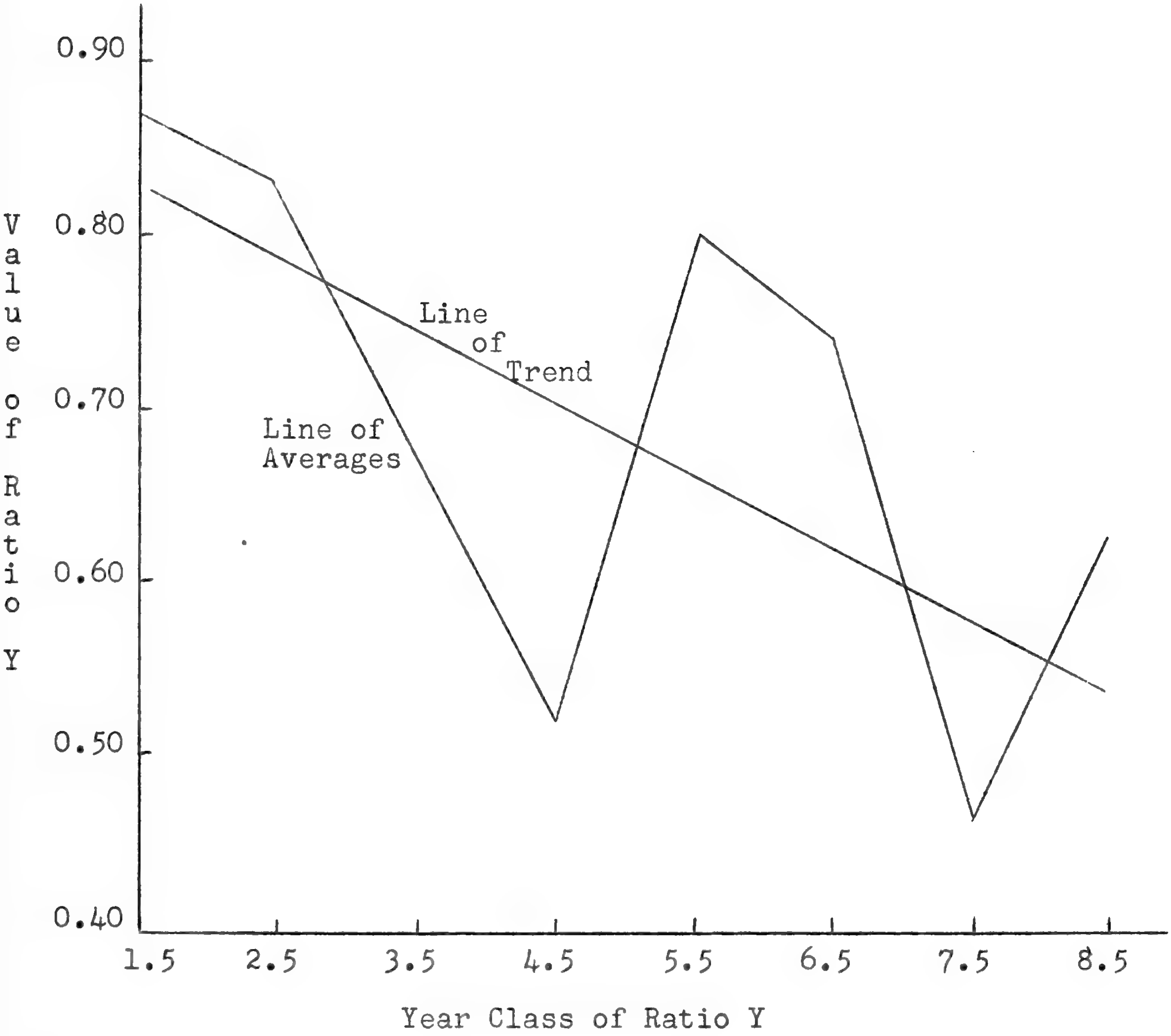
The general average of 0.69 in the lower right hand corner of tables two and three is of interest. It shows that the herd as a whole has an annual survival of 69 per cent, or annual mortality of 31 per cent. This applies to animals one and a half years and older.

Another feature of interest is the lowest line of tables two and three showing the average values of the ratio Y. This line varies considerably above and below the general average of 0.69. The reasons for this variation are the object of this study. The line of averages is shown in figure one with a straight "line of trend" fitted.

FIGURE I - Curves of Y, by Value and Year Class

EQUATION OF LINE OF TREND:

$Y = 0.8900 - 0.0415\, x$



[illegible]

[illegible]

[illegible]

The following table of variance analysis is derived from tables two and three. Its construction is described in the text book entitled "Statistical Methods" by F. C. Mills (Henry Holt & Co.), chapter XV. A knowledge of the construction is not necessary to understand the table. Conclusions are drawn in the paragraphs following the table.

Nature Variability	Sum of Squares	Degrees of Freedom	Mean Square	Significance
Between Age Classes of Y				
a) Line of Trend:	0.29	1	0.29	6% level
b) Deviations from line of trend:	0.47	6	0.08	-
Between Years of Origin of Y:	2.13	11	0.19	4% level
Between Game Check Years:	0.15	4	0.04	-
Residual	0.99	14	0.07	
	4.03	36	0.11	

Two influences are seen to be significant in their effects on the yearly survival rates, in the neighbourhood of the five per cent level. The five per cent level is customarily accepted as indicating the possible presence of a true influence as opposed to the work of mere chance. Levels of significance of one per cent or lower are usually accepted as strong proof. To say that the year of origin is significant at the four per cent level means that, on the basis of the data used, the effect found could occur by mere chance only four times in a hundred. Conversely the chances are 96 to 4 that a true influence is at work as opposed to mere chance. Such odds are acceptable to most minds.

Variability due to year class strength (year of origin) should be acceptable to most deer workers since they know from experience that a strong year class can be followed throughout its existence in the herd. This study reduces the thought to more specific terms. The strong years can easily be picked from the right hand column of table two, and also the weak years by comparing them to the general average of 0.69.

Variability due to differences between game check years is seen to have no significance. This means that the per cent level of significance indicates such a large play of mere chance that the presence of a true influence is unacceptable. This thought is also familiar to the deer worker on the basis of experience. Each game check comprises several year classes and differences would be expected to even themselves out, so that one game check should not vary greatly from another. This fact is a valuable aid in deer management, because if a "significant" change does show up in a game check some new influence will be suspected and sought. Reference to the right hand column of table three shows that the average survival does not vary far from the general average of 0.69 for different game check years.

The third source of variation, the line of trend, is seen to be significant at the six per cent level. This is above the conventional five per cent level, but odds of 94 to 6 are still good. This is the most interesting feature of the study since it suggests that on the average the rate of survival drops with increasing age. The study makes the suggestion without giving the cause. Future game checks may yield more details and perhaps improve the level of significance. It might be thought that the more rugged and crafty animals would survive to raise the survival ratio of older age classes but it appears that other forces may be at work. Several considerations come to mind. For instance the line of averages in figure one descends steadily to age four and a half and it may be that increasing availability makes the animals more susceptible to hunting pressure. Above age four and a half the line of averages becomes notably erratic and inaccuracies in aging techniques come to mind as a possible factor. This is not very important since only a small part of the herd reaches the older ages. Again the ratios of the oldest age classes are based on small numbers, a condition which could lead to swings that have no relation to the herd. With more data this last type of variability should cancel itself out.

The indications are that the line of trend represents a complex of factors requiring more data for better understanding.

A point of interest is that of deviations from the line of trend. This factor is shown not to be significant. This means that the deviations of the line of averages from the straight line of trend are due to sampling errors. Therefore the line of trend is adequately represented by the straight line of figure one rather than by a complicated curved line.

The basis of this study is the 1803 animals of table one. However the accuracy of the study, and the significances of the table of variance analysis do not depend on the number of animals but rather on the number of cells containing figures in tables two and three. This number is thirty-seven. Each year's game check will add seven or eight more cells and will correspondingly enhance the reliability of the study.

The last point of interest is one for statisticians and does not really concern the deer worker. An assumption was made in the variance table that the year of origin did not interact in any way with the value of Y in different age classes. It is difficult to conceive that any such connection could exist. Nevertheless the scarcity of data results in a crosswise structure in table two such that the smaller values of Y associated with the older age classes appear in the earlier years of origin, and vice versa. Thus in the right hand column of averages in table two there is a false appearance of a trend to higher values in going from earlier years of origin to older.

This false trend could have been allowed for in the variance table in the same manner as the trend in age classes. This course was not chosen, for clarity's sake. The modification of the "Years of Origin" section of the variance table would have been as follows:

Nature Variability	Sum of Squares	Degrees of Freedom	Mean Square	Significance
Between Years of Origin of Y:				
a) Line of trend:	0.11	1	0.11	-
b) Deviations from line of trend:	2.02	10	0.20	3%
	2.13	11		

The effect of the false trend is seen to be not significant, which justifies leaving the variance table unaltered. The significance of the remaining variance between years of origin is found significant at 3%, an improvement over the original 4%.

As more years of origin are accumulated in future game checks, table two will fill out from side to side and the so-called false trend can be expected to grow much smaller.

HYBRIDS OF SALVELINUS

by
F. E. J. Fry
November, 1956

The fertility of the cross between the speckled trout and the lake trout makes it almost certain that hybridization between these and other species of the genus, together with selective breeding of the progeny and further backcrossing, would lead to an improved variety of the lake trout for the rehabilitation of the upper Great Lakes. The desired variety would be a fish that combined the lake trout's ability to swim deep with a reasonable growth rate and maximum ultimate size together with an ability to reach maturity in three years. It would also be desirable for this fish to have the pinker flesh of the speckled trout. The F_1 hybrid has almost the completely desirable qualities except that it does not swim as deep as does the lake trout. Thus it appears that selection for the desired characters might be attained with considerable rapidity and indeed, if work were initiated at once, there might be time to produce the improved strain by the time that lamprey control is assured. Moreover, the results of the first planting of the hybrid in South Bay have shown that some of these fish have got through to their first spawning in spite of the presence of the lamprey. Thus an early start on this project might ensure the reintroduction of a trout into the upper lakes in spite of any possible failure to achieve complete control of the lamprey.

The requirements for the production of an improved lake trout appear to be as follows:

1. Suitable pond and hatchery space are needed.

2. A collection of parent species which are likely to provide desirable genes is required. These species are pre-eminently the lake trout and the speckled trout but stocks of the alpine char, the red trout of Quebec and the other isolated populations of deepwater char of Eastern North America should be collected and tested for their mutual fertility and for the qualities of their offspring. It is within the bounds of possibility that one of the latter isolated populations mentioned above may already have the desirable combination of qualities to a large degree.

3. Investigations are needed to elucidate the mechanism which determines the date of spawning so that by appropriate manipulation the various species can be induced to all ripen at the same time.

4. Tests are required by which individuals which can swim deep can be selected. The selection for early spawning and good flesh colour does not require any new technique.

5. A suitable field station for the final testing of progeny thought to possess the desired characteristics is required.

We are in the fortunate position that none of the requirements set forth above appears to be beyond our reach.

Memorandum in part prepared for presentation at the 1956 meeting of the Committee for the Laboratory for Experimental Limnology.

SOME AGE AND GROWTH RECORDS OF ONTARIO STURGEON

(*Acipenser fulvescens*)

by
O. E. Devitt

Age determinations of the following lake sturgeon were obtained by cutting the dried marginal ray of the pectoral fin into transverse sections with a fine-toothed jeweller's saw. The sections were immersed in glycerin just prior to examination and read under a binocular microscope.

The results would seem to indicate that lake sturgeon are slow growing and live a long time.

Locality - Lower Albany River

Collector - F. Racicot
Date - August, 1952.

Field No.	Length (ins.)	Line Weight (lbs.)	Dressed Weight (lbs.)	Sex	Age (Years) From Pectoral Fin Ray
9	42	15.0	11.0	♂	24
1	42	17.0	12.0	♀	24
2	43	18.0	13.0	♂	27
10	45	22.0	15.0	♂	34
8	48	26.0	17.0	♂	36
7	48	32.0	21.0	♀	40
11	49	28.0	20.0	♂	40
6	51	32.0	19.0	♀	40
5	51	35.0	24.0	♀	41
3	55	36.0	24.5	♀	45
4	57	44.0	27.0	♂	50

Locality - Lower Moose River, James Bay.

Collector - F. Racicot
Date - Summer, 1953.

Field No.	Length (ins.)	Weight (lbs.)	Sex	Age (Years) From) Pectoral Fin Ray
12	34.0	14.0	-	24
17	40.0	15.0	-	26
3	44.0	22.0	-	33
1	44.0	13.0	-	34
6	45.0	17.0	-	43
18	45.0	23.0	♀	36
14	45.0	21.0	-	36
7	46.0	27.0	-	37
16	47.0	26.0	-	35
11	48.0	30.0	-	37
4	49.0	27.0	-	34
5	50.0	38.0	-	40
2	51.0	35.0	-	41
19	52.0	35.0	-	41
8	54.0	25.0	-	41
9	56.0	37.0	-	40
15	57.0	48.0	-	51
13	57.0	38.0	-	52
10	59.0	49.5	-	52

Locality - Lake of the Woods, Kenora District.

Collector - Harold Johnson
Kenora
Date - July 15, 1953.

1	81.0	215.0	-	152

Locality - Ottawa River.

Collector - V. George
Date - Summer, 1954.

Number	Fork Length* (ins.)	Weight (Round) (lbs.)	Weight (Dressed) (lbs.)	Age (Years) From Pectoral Fin Ray
1	33.5	11.5	7.5	16
2	36.0	15.5	11.2	18
3	41.0	19.5	13.5	21
4	45.0	26.5	18.0	50
5	61.0	98.0	57.0	65

* Length (from nose tip to apex of tail V).

Locality - Chats Lake, Ottawa River, Pembroke District.
Collector - K. K. Irizawa
Date - Sept. 20-29, 1955.

No.	Length* Live or Round (ins.)	Length Dressed (ins.)	Weight Round (lbs.)	Weight Dressed (lbs.)	Age from Pectoral Fin
1	23.0	21.0	13.0	8.0	20
2	23.0	-	-	-	33
3	23.5	21.0	13.0	7.2	32
4	24.5	22.0	14.0	9.0	33
5	25.0	-	-	-	34
6	29.0	26.5	20.5	12.0	50
7	27.0	-	-	-	46
8	30.5	-	-	-	56
9	31.0	-	-	-	52
10	36.5	-	-	-	74

* New Measurements - (See 1955 Game and Fisheries Act) measured from the most posterior limit of the gill opening to the point where the posterior edge of the dorsal fin joins the flesh of the body.

Locality - Ottawa River, Horton Township, Renfrew County.
Collector - J. G. Stewart
Date - August 27, 1956.

Number	Total Length (ins.)	Weight (lbs.)	Age (Years) From Pectoral Fin Ray
1	71.0	100.0	74

Locality - Springer Township, Lake Nipissing, North Bay District.
Collector - T. C. Cusson
Date - May 20, 1955.

No.	Fork Length (ins.)	Weight Round (lbs.)	Weight Dressed (lbs.)	Sex	Age (Years) From Pectoral Fin Ray
1	82.0	143.0	96.0	♂	76

Locality - Lake Simcoe, Lake Simcoe District
Collector - Bud Ellis
Sutton, Ont.
Date - Jan. 29, 1956.

1	42.0	-	-	-	9

A REPORT OF COARSE FISH REMOVAL AT SPRING VALLEY MILL POND, WATERLOO COUNTY*

by
J. F. Gage

Introduction

Spring Valley Mill Pond is situated in the Township of Wilmot in Waterloo County, on the headwaters of Alder Creek in the Grand River Watershed.

The dam which impounds the water was constructed in 1835 and the mill was used as a saw and feed mill. It was converted later to a furniture factory, then finally as a saw, feed and cider mill. It was used as recently as 1955 for making cider.

The fishing rights are held by the Hobo Trout Club, a group of business men from Kitchener and Waterloo, who inquired about some efficient means of removing coarse fish. The pond and stream has always supported a population of speckled trout. Some years ago carp escaped from a farmer's pond near the headwaters and found their way into the pond. Common Suckers, Creek Chub, Sculpins, Blacknose Dace and Darters were also present in the pond.

Several attempts by the Club to remove the coarse fish were made with little success. These included the use of copper sulphate, dynamite, seining and draining the pond, over a ten year period.

From the time of their original entry into the pond the carp had reproduced and their numbers became objectionable from a management viewpoint.

The club agreed to finance a poisoning project and provide all the labour. The Department of Lands and Forests gave permission to the Club to use poison providing that the project was supervised by the District Biologist.

The following is a report on this project:

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* Several photographs showing Carp which had been removed from the Pond accompanied this report.

Poisoning Project - Spring Valley Mill Pond

Name:	Spring Valley Mill Pond.
Location:	Lot 13, Concession II, Township of Wilmot, County of Waterloo.
Date of Application:	October 21st, 1956.
Organization:	Hobo Trout Club, Kitchener, Ontario.
Area:	2.5 acres.
Average Depth:	5 feet.
Maximum Depth:	9 feet.
Acre Feet:	13.5
Capacity:	3,672,000 imperial gallons.
Volume of Stream Flow:	1,700 gallons per minute.
Temperature:	50°F.
pH:	7.4
Condition of Water:	Clear
Type of Bottom:	Muck - silt.
Aquatic Growth:	Chara.
Name of Toxicant:	Noxfish - 5% Rotenone, S. B. Penick Co., New York.
Amount of Toxicant Used:	5 pints.
Concentration of Toxicant:	2. ppm to .17 ppm.
Species Killed:	Carp (*Cyprinus carpio*) Common Sucker (*Catostomus commersonnii*) Creek Chub (*Semotilus atromaculatus*) Blacknose Dace (*Rhinichthys atratulus*) Sculpin (*Cottus cognatus*) Brook Trout (*Salvelinus fontinalis*) Rainbow Darter (*Poecilichthys caeuruleus*)
Total poundage killed:	500

Assistance by: Members of Hobo Trout Club: Messrs. G. Barron
E. Heller
R. Edgerdee
Ray Ford
K. MacLean

Purpose:

To remove from the pond the carp and other coarse fish in order to reduce competition between these undesirable species and trout.

Method:

The pond is approximately 2.5 acres in area, has an average depth of five feet and a maximum depth of nine feet. It is fed by a stream and three springs with a total volume of 1,700 g.p.m. The stream headwaters are located approximately 1 1/4 miles above the pond. The pond is heavily silted and contains a light growth of aquatic vegetation in the form of chara. The water feeding the pond is clear, has a pH reading of 7.4 and a temperature on October 21st, 1956, of 50°F. When the pond is drained it requires 36 hours to refill. Repeated drainings and postponements of the project had reduced the adult carp to an estimate of 15 large adults.

The capacity of the pond, 3,672,000 gallons, was calculated on the volume of flow and the time required to fill the pond. The total weight of the water in the pond when full would be 36,720,000 pounds.

In order to obtain a better kill in the pond permission was secured from the lessee and owner of the stream above the pond to apply the poison to the stream approximately one half mile above the pond site. It was felt that no carp would be found above this point.

Collections and observations above the application point produced only speckled trout, sculpins, and a few darters.

The poison to be used was Noxfish produced by the S. B. Penick Company of New York. It was procured as an emulsion with a 5% Rotenone extract.

The problem in this project was unique, in that we were dealing with a flowing stream which had to be poisoned before it entered the pond. The poison in the pond had to be maintained at a concentration sufficient to kill carp and other species. Since the stream below contained populations of desirable species such as brook trout and brown trout the concentration had to be diluted sufficiently to keep the downstream kill to a minimum when the pond overflowed.

Another problem which gave us some concern, and is likely to be present on most old mill dams, was the fact that there was some leakage around the penstock valve. Although this leakage was not great (about 10 gallons per minute) this would present a serious threat when the poison began to build up to its highest concentration. A small dam was, therefore constructed in the tail race and a gasoline pump capable of pumping 800 gallons per minute was set up ready for use.

In previous correspondence with the S. B. Penick Company in connection with the dilution required to render the water harmless they calculated that at .2 ppm we could expect a very limited kill of trout in the water downstream. They also were very helpful in making calculations to determine the lethal concentration and the time which the carp should be exposed to this concentration in order to obtain a satisfactory kill. A last minute survey of the stream flow indicated a considerable change in previous calculations so that adjustments were necessary. The figures provided by S. B. Penick and Company were used as a basis in considering the adjustments.

Time was a most important factor in this project. At exactly 2.15 p.m. the Noxfish (1 pint in 3 gallons of water) was applied to the stream by use of an ordinary garden type pressure spray pump. The application of the Noxfish in the water was preceded by a worker who carried a full pail of sawdust. The sawdust was thrown on the surface of the stream as a marker or warning of the poison which followed.

The worker walked slowly downstream adding sawdust as it dissipated around log jams and through rapids. It required two hours for the poison to reach the pond site where additional workers applied an additional pint of poison to three small springs feeding directly into the pond. This action required one hour. When the sawdust marker reached the dam the penstock valves were closed and the pond began to refill.

The entire process of application to the main stream lasted from 2.15 p.m. to 5.15 p.m. A total of three hours. The last of the poison entered the pond at 8.15 p.m.

Results:

Fish began to show signs of distress one half hour after the valve was closed. Dead speckled trout were first observed in the stream and a few later in the pond. These were the only dead trout which were actually observed in the pond.

Small dace and sculpins were the first species to succumb, followed by suckers and finally the carp. Unfortunately, it grew quite dark by 6.15 and observations were difficult, but the surface of the enlarging pond was continually broken by dying fish.

The leakage from the penstock valve was pumped out once every 90 minutes during the afternoon and evening.

The following morning the pond was found to have enlarged considerably. The bottom revealed an estimated 25 dead fish per 100 square feet. A total of twelve adult carp were recovered. Another fifty young individuals ranging from one to five inches in length were observed on the bottom. The total weight of dead fish in the pond was estimated at 500 pounds. The dead fish remained on the bottom as was our experience at Harrington Pond (June 19th, 1956), the water level rising constantly over them where they died on what was previously shallow shoreline. Four days later some of the fish began to bloat and come to the surface.

The pond was completely full in 36 hours and began to overflow at 4.15 a.m. on October 23rd. The concentration of poison was .17 ppm at this time. At 8.00 a.m. on the same day the stream below the mill dam was examined for one and one half miles. A small number of speckled trout (25) and (5) brown trout were found dead or dying. A few dead sculpins and suckers were also observed. Most of the dead fish were found within a few hundred yards of the dam. Most of those which were found further downstream still exhibited some signs of life.

Summary:

(1) Observations on the pond following the project indicate a complete kill in the pond. Re-establishment of sculpins and darters and possibly suckers may occur from the headwaters but it is considered unlikely. It is predicted that carp have been completely removed.

(2) The kill of trout below the dam is probably due to the leakage around the penstocks, unfortunately the leakage was not pumped out during the night hours.

The kill was so small considering the number of fish present downstream that it may be assumed that a dilution to .17 ppm was not lethal under these conditions.

(3) The small number of trout killed in the downstream side may be easily replaced with hatchery stock.

(4) The project was considered to be a success by the Trout Club and by the biologist supervising the project. Trout will be re-introduced to the pond at the rate of 125 yearlings per acre which is designed to provide maximum growth and satisfactory angling success for the pressure which will be exerted.

(2) The kill of [illegible]
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(3) The small [illegible]
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