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Duck Lake Surveys in Minnesota

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of the fins and body during combat. In the larger tanks contacts are not so frequent and escape from attack is easier. Infection rarely develops and usually clears without treatment.

These observations definitely show that activity increases with an increase in temperature while at the same time activity decreases as the volume of water available per fish increases.

It is quite apparent that defense of territory is one of the big factors in dominance. The alpha fish usually claims the entire tank for himself and in so doing pushes the other fish into one corner near the surface where they hang in a rather limp, lifeless cluster. It is when they try to move from this position that they are attacked. The beta fish strongly objects to this treatment and consequently in trying to escape from it is bitten more often than the others. However, he may eventually gain control of and defend a small portion of the available tank space. Periodically the gamma fish is able to get control of an even smaller area but he is never able to hold it for more than a few hours.

At this time further conclusions are impossible, however, experiments with both young and adult bass will continue, as will experiments already under progress with other fresh water species.

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DUCK LAKE SURVEYS IN MINNESOTA

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During the 7 year period 1946 through 1952, 862 shallow lakes, marshes and potholes have been surveyed throughout 80 counties in Minnesota. These investigations have been commonly known as Duck Lake Surveys, and have been carried out by the Game Research Unit of the Minnesota Department of Conservation. Two primary objectives of this work are: to provide a basis for evaluating, maintaining and improving waterfowl and muskrat habitats in Minnesota; and to provide information about waterfowl lakes and marshes for groups and individuals in accordance with their requests to the Division of Game and Fish.

Eight wildlife management students are hired each summer to assist the two full time biologists in carrying out the field work.

Data obtained on the survey of each water area include: (1) Legal description and location of area. (2) Size. (3) Meander status (public or private waters). (4) Public access and extent of public use. (5) Base map traced from aerial photographs. (6) Maximum and average water depths. (7) Aquatic plant distribution and relative abundance of each species. (8) Inlets. (9) Outlets. (10) Bench mark (water level plane of reference). (11) Extent of drainage area and drainage ratio. (12) Water level fluctuations. (13) Water control structure (if present). (14) Water sample for chemical analysis. (15) Turbidity readings (water clarity), including notes on silt deposits, rough fish action, algae density and pollution. (16) Shoreline use (immediate and adjacent) and percentages; particular note given to destructive land use practices such as overgrazing and erosion. (17) Wildlife utilization and habitat conditions, with special note on waterfowl, muskrats and rough fish. (18) Historical data: Waterfowl breeding and migrational use; hunting and trapping pressure; wild rice harvests; aquatic plantings (amounts, costs, results); fish winter-kills; rough fish controls and harvests; dry periods; drainage ditch history. (19) Local landowner's and sportsmen's opinions.

Final maps and reports of these surveys are completed in the office during the winter months.

Improvement suggestions presented in the final report usually include one or more of the following recommendations: (1) Shoreline fencing. (2) Erosion control. (3) Rough fish control. (4) Water level control. (5) Algae control. (6) Shoreline cover plantings. (7) Aquatic plantings. (8) Recommend for state purchase to save from drainage.

Requests for surveys originate from one or more of the following sources: (1) Sportsmen's clubs. (2) Other interested groups or individuals. (3) Bureau of Wildlife Development. (4) Bureau of Game. (5) Bureau of Fisheries. (6) Division of Water Resources. (7) Area Game Biologists. (8) Area Field Supervisors.

The lake survey information is used extensively from time to time by the above groups or individuals and the Department of Conservation in carrying out various management techniques. Some specific results and uses are:

We have saved sportsmen thousands of dollars in averting needless aquatic plantings.

Eighty six wild rice plantings were made by the department, using lake survey information for selecting lakes and planting sites.

Thirty shoreline fencing projects are now established under a co-operative agreement with the Conservation Department and the landowners.

Small water areas in danger of being drained are recommended for purchase by the state.

Summarization and analysis of survey information, including aquatic plant — water depth and bottom data — and aquatic plant range maps (this work is now under way).

This lake survey project has been very popular with sportsmen, administrators, and game men. The findings have offered a direct link among research investigations and practical wildlife habitat management.