Progress Notes 3610596G **Canadian Wildlife Service**

Progress Notes contain *interim* data and conclusions and are presented as a service to other wildlife biologists and agencies.

Disponible également en français

No. 155, March 1985

Effects of agricultural burning on occupancy rates of small wetlands by breeding ducks

by George S. Hochbaum[1], Leon T. Kummen[1], and F. Dale Caswell[1]

Introduction

A major portion of the prime waterfowl breeding habitat in western Canada occurs in areas of intense agricultural activity. Modifications to small wetlands in these areas (burning, mowing, clearing, filling, and draining) are commonly carried out by agriculturalists in an effort to increase farm yields (Fritzell 1975). Such disturbances are thought to reduce waterfowl use and productivity, although few studies have documented this (Hochbaum and Caswell 1978, Trauger and Stoudt 1979). This study was designed to monitor breeding duck populations on burned and unburned wetlands to determine if occupancy rate is independent of agricultural burning of pond margins.

Methods

Data on 1307 ponds were collected in May of 1980 and 1981 on 23 roadside transects, varying in length from 16 to 29 km, in southern Manitoba and southeastern Saskatchewan. All ponds within 200 m of the road were numbered on aerial photographs and surveyed from the ground once each year. Seasonal, semi-permanent, and permanent wetlands were studied and classified according to Shaw and Fredine (1956); changes in conditions such as burning, filling, cultivation, and clearing were recorded. The same transects and individual ponds were visited in each year of the study. Numbers of basins vary between years because only ponds containing water were evaluated.

Only burning of pond margins was considered in relation to occupancy rates. Spring and autumn burns were recorded and the size of each burned area estimated. Pond margin was arbitrarily defined as that part of the pond border extending 10 m from the outer edge of the wet meadow zone. Breeding waterfowl, identified as to species, were noted for each pond. Only pairs and lone drakes were included in the analysis. Data on flocks of males and grouped birds of mixed sex were not used because of their questionable breeding status. The presence of one or more pairs or lone drakes of a single species was used as a measure of occupancy.

Data were summarized for Mallard (*Anas platyrhynchos*), Gadwall (*A. strepera*), Pintail (*A. acuta*), Blue-winged Teal (*A. discors*), Shoveler (*A. clypeata*), and Canvasback (*Aythya valisineria*) by their presence or absence on burned and unburned ponds, which were classified by wetland type. Several tests were used to determine if occupancy was independent of or associated with margin burning: Pearsons's chi-square, Yule's chi-square, Yate's chi-square, mean-square contingency coefficient, tetrachoric correlation coefficient, and Cole's coefficient of interspecific association (Cole 1949). The tests of independence and association were applied to 2 × 2 contingency tables for years, pond types, and species.

[1]CWS, 501 University Crescent, Winnipeg, Manitoba, R3T 2N6.

Results and discussion

The springs of 1980 and 1981 were characterized by drought conditions in western Canada and burning was common. In 1980, 10% of 976 ponds and in 1981, 12.7% of 331 ponds had burned margins (Table 1). Ground counts indicate that duck numbers ranged from 15 to 90 pairs per square kilometre.

Although seasonal ponds were most numerous, occupancy was highest on semi-permanent and permanent wetlands. However, within these classifications occupation rates on burned and unburned wetlands were similar (Table 2). Occupancy was lower for Canvasback than for the dabbler species. In most instances, each species was observed on less than 50% of the ponds available to it in each classification (Table 2).

The hypothesis that there is no relationship between the occupation of ponds by breeding pairs of different species and agricultural burning in the adjacent margin cover was not rejected by any of the tests of independence. Also, no relationship between the occupation of ponds by waterfowl species and margin burning was indicated by tests of association. This suggests a random choice by the species of waterfowl studied of burned and unburned wetlands. We think the observed densities were low enough to indicate selectivity rather than merely a reflection of dispersion patterns resulting from social intolerances among species.

It was observed in the introduction that the disturbances to breeding habitat that frequently occur in areas of intense agricultural activity are thought to reduce waterfowl use and productivity. For example, although some species, such as Pintail, will nest in stubble fields some distance from water, one might expect most pairs to frequent basins with undisturbed margins, to be used for nest sites later. Burning could also be predicted to disrupt the pond community in some manner, e.g. by reducing food resources, and thereby interfere with bird use. However, this study indicates that the burning of margins does not influence pond use by breeding ducks. Factors such as food resources, activity patterns, and territoriality are probably more important to breeding waterfowl early in the nesting season (Krapu 1979, Swanson *et al.* 1979, Owen and Reinecke 1979, Titman 1981). We conclude that ponds with burned and unburned margins are equally important components of duck home ranges prior to the break-up of pairs and that burning does not influence use.

On the other hand, burning pond margins probably affects nest success because loss of cover influences predation rates on nests (Duebbert 1969). Brood survival may also be reduced (Dzubin and Gollop 1972) because birds are forced to nest farther from water. We suggest that

Environment Canada / Environnement Canada
Canadian Wildlife Service / Service canadien de la faune

the entire wetland–upland complex and breeding biology of the species determine duck dispersion on breeding ranges. We conclude that burning of pond margins alone has little effect on breeding duck occupancy of small wetlands and that further studies are needed to determine whether waterfowl production is affected by fire in the vegetated area surrounding small wetlands.

Acknowledgements
We wish to thank K. Brace, S. Wendt, L. Sugden, G. Townsend, and D. Nieman for their comments on earlier drafts of this paper. We are grateful to D. Wilson for her patience in typing the many drafts we produced.

References

Cole, L.C. 1949. The measurement of interspecific association. Ecology 30:411–424.

Duebbert, H.F. 1969. High nest density and hatching success of ducks on South Dakota CAP land. Trans. N. Am. Wildl. and Natl. Resour. Conf. 34:218–228.

Dzubin, A.; Gollop, J.B. 1972. Aspects of Mallard breeding ecology in Canadian parkland and grassland. Pages 113–151 *in* Population ecology of migratory birds. US Fish and Wildl. Serv. Rep. 2.

Fritzell, E.K. 1975. Effects of agricultural burning on nesting waterfowl. Can. Field-Nat. 89(1):21–27.

Hochbaum, G.S.; Caswell, F.D. 1978. A forecast of long-term trends in breeding Mallard populations on the Canadian Prairies. Can. Wildl. Serv. Prog. Note No. 90. 8 pp.

Krapu, G.L. 1979. Foods of female dabbling ducks during reproduction. Pages 59–70 *in* Waterfowl and wetlands — An integrated review. LaCrosse Printing Co., LaCrosse, Wisc.

Owen, R.B.; Reinecke, K.J. 1979. Bioenergetics of breeding dabbling ducks. Pages 71–94 *in* Waterfowl and wetlands — An integrated review. LaCrosse Printing Co., LaCrosse, Wisc.

Shaw, S.P.; Fredine, C.G. 1956. Wetlands of the United States. US Fish and Wildl. Serv., Circ. 39.

Swanson, G.A.; Krapu, G.L.; Serie, J.R. 1979. Foods of laying female dabbling ducks on the breeding grounds. Pages 47–59 *in* Waterfowl and wetlands — An integrated review. LaCrosse Printing Co., LaCrosse, Wisc.

Titman, R.D. 1981. A time activity budget for breeding Mallards (*Anas platyrhynchos*) in Manitoba. Can. Field-Nat. 95(3):266–271.

Trauger, D.L.; Stoudt, J.H. 1979. Spatial and temporal habitat relationships of breeding dabbling ducks in prairie wetlands. Page 43 *in* Waterfowl and wetlands — An integrated review. LaCrosse Printing Co., LaCrosse, Wisc.

Table 1
Number of ponds with burned margins and total ponds by wetland type during 1980 and 1981

Pond type	1980 Number burned	1980 Total ponds	1980 % burned	1981 Number burned	1981 Total ponds	1981 % burned
Seasonal	51	579	8.8	19	164	11.6
Semi-permanent	36	287	12.5	16	87	18.4
Permanent	11	110	10.0	7	80	8.7
TOTAL	98	976	10.0	42	331	12.7

Table 2
Use of wetlands by breeding pairs of ducks, by duck species, pond type, and margin condition, during 1980 and 1981

Pond type: margin condition	1980 Ponds occupied, by species MAL*	GAD	PIN	BWT	SHO	CAN	1980 Total no. of ponds sampled	1981 Ponds occupied, by species MAL*	GAD	PIN	BWT	SHO	CAN	1981 Total no. of ponds sampled
Seasonal:														
burned	17	2	7	6	6	0	51	5	0	3	1	2	0	19
unburned	153	10	59	66	37	0	528	53	6	14	23	15	2	145
Semi-permanent:														
burned	11	2	3	7	4	1	36	6	3	4	4	1	0	16
unburned	77	13	27	66	23	4	251	32	10	11	19	16	7	71
Permanent:														
burned	7	1	3	5	1	5	11	3	0	2	2	2	1	7
unburned	48	11	22	38	14	13	99	37	17	18	35	20	13	73
TOTAL:														
burned	35	5	13	18	11	6	98	14	3	9	7	5	1	42
unburned	278	34	108	170	74	17	878	122	33	43	77	51	22	289

*MAL — Mallard
GAD — Gadwall
PIN — Pintail
BWT — Blue-winged Teal
SHO — Shoveler
CAN — Canvasback