WYE MARSH

An Historical Perspective, Review of Habitat Management
and Recommendations for Future Action

Ducks Unlimited Canada
September 1995

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WYE MARSH: AN HISTORICAL PERSPECTIVE, REVIEW OF HABITAT MANAGEMENT AND RECOMMENDATIONS FOR FUTURE ACTION

III OVERVIEW

Wye Marsh is a provincially significant wetland located near Midland, Ontario. Since the mid 1980's it has been managed cooperatively through a management agreement between the Ontario Ministry of Natural Resources and Ducks Unlimited Canada, with ongoing input from the Wye Marsh Wildlife Centre. The primary component of the Wye Marsh project is the management of water levels on Mud Lake and the soon to be completed Preston Cell. This report provides an update of management activities on Mud Lake and includes an historical perspective, pre-project description, project rationale, analysis of management and recommendations for further action.

Wye Marsh is an 800 hectare deltaic wetland near the terminus of the Wye River, approximately 1 Km upstream from Georgian Bay (Figure 1). It is the largest component of the Wye Marsh Provincial Wildlife Area, which is a 1,000 hectare habitat complex administered by the Ontario Ministry of Natural Resources. An area of approximately 60 hectares on the northeast corner, just south of the Ste. Marie Among the Hurons settlement, is owned by the Canadian Wildlife Service (CWS) of Environment Canada. A successful interpretive program delivered by the Wye Marsh Wildlife Centre and Friends of Wye Marsh has been in operation at this location since 1969, focusing on interpretation of wetland ecology and the area's natural history. Some 70,000 people visit this centre annually including a high percentage of school children and their teachers.

Prior to its purchase by the Crown, Wye Marsh was privately owned by the Playfair family, the owners of Canada Steamship Lines. A water control structure at the outlet of the marsh was used to maintain levels in the wetland during periods of low water on Georgian Bay. The original structure eventually fell into disrepair and was replaced in 1972 by the Ministry of Natural Resources.

During the past century, the clearing and conversion of the Wye River watershed through urbanization, logging, agriculture and tourism development has resulted in an infusion of silt and nutrients into the Wye River delta. Natural processes have been affected, altering the health of the marsh.

In response to these impacts, Ducks Unlimited, the Ontario Ministry of Natural Resources and the Wye Marsh Wildlife Centre, have together been actively involved with habitat enhancement since 1987. Activities to date include

FIGURE 1: Location Map

opening channels in the overgrown, floating mat fringe surrounding Mud Lake in 1987, a managed drawdown of Mud Lake in 1989 and 1990, and the establishment of the Preston Cell in the south end of the marsh in 1990. In addition, DU has provided technical advice for the construction of water management demonstration cells adjacent to the Wye Marsh Centre, and has actively supported the Centre and its education programs through financial, technical and logistical partnerships.

IV PROJECT RATIONALE

1. Pre-Management Habitat Conditions

Historically, water levels on Mud Lake were controlled by the dam at the outlet, and by Georgian Bay levels. A prolonged period of deep flooding in the late 1970's and early 1980's resulting from record high lake levels eventually led to an open water condition in Mud Lake. The open water "lake" that developed in the middle of the basin was surrounded by an extensive floating or restricted floating vegetation mat (photo #1).

The basin of Mud Lake is generally flat. The benthic material is a well decomposed humic organic that is suitable as a substrate for good aquatic plant growth. Although turbid conditions frequently occurred when the thin upper flocculant layer was disturbed by wind/wave action, overall water transparency was good during this open marsh phase. Principle aquatic plants at this time consisted of submergent and floating leaf species and included coontail (Ceratophyllum demersum), milfoil (Myriophyllum spicatum), bladderwort (Utricularia vulgaris), pondweeds (Potamageton spp.), duckweed (Lemna spp.), wild celery (Valisineria americana), water lily (Nyphaea adorata) and pond lily (Nuphar advena). Such plant growth was generally sparse. Emergent aquatic plants, although present, were widely scattered, low in density and of poor vigor. Emergent species included cattail (Typha spp.), hardstem bulrush (Scirpus acutus), burreed (Sparganium sp.) and wild rice (Zizania aquatica).

The floating fringe surrounding the lake has remained relatively unchanged through the pre and post management period and consists of a densely vegetated mat of varying thickness. It is primarily composed of cattail on its eastern half and sedges, hardstem bulrush, and some flag weed (Phragmites communis) on the remainder. Other species include blue-joint grass (Calamagrostis canadensis), arrowhead (Sagittaria spp.) and burreed. Speckled alder (Alnus rugosa) lines some of the inlet channels that cut through sections of the mat. There are some generally open isolated ponds scattered throughout the mat, however these are not as prominent as they were pre-management. Vegetation such as cattail, burreed, hardstem bulrush and sedges, as well as

submergent plants including pondweeds, duckweed, coontail and water lily were present in these ponds. A small fen, located on the eastern side of the basin between the mat fringe and the wooded shore continues to support species such as tamarack (Larix laricina), leatherleaf (Myrica gale), bulrush and sedges.

2. Management Objectives

The objective of the Mud Lake project was to provide improved habitat by increasing the abundance and diversity of aquatic plants in the open water area of Wye Marsh and maintaining that condition as long as possible.

Actions to achieve this included 1) a managed drawdown of Mud Lake and 2) improved water level management capabilities to manage the wetland post-drawdown.

Drawdowns are part of the natural cyclic nature of wetlands and function to "rejuvenate" basins through nutrient recycling and allowing the germination of aquatic plants from a dormant seed bank. Drawdown management is a highly effective, predictable and proven technique based on natural phenomenon of cyclic drought conditions used to restore and improve the quality of wetland habitats. Managing water regimes in this way enhances vegetation diversity and interspersion thereby providing habitat benefits (food and cover) for a broad range of wildlife species.

V PROJECT ACTIVITIES

Several management scenarios were considered for rehabilitating Mud Lake. Most involved providing water management capabilities that included development of extensive dyke systems combined with pumps. The preferred concept involved modifying the existing weir to allow a broader range of water level operation, and installing pumps to attain periodic drawdown on the open water area of the marsh. Subsequent levels on Mud Lake were to be held lower than in the recent past whenever Georgian Bay levels permitted to promote and sustain a robust aquatic plant community. During periods of high levels on Georgian Bay, water depths on the marsh would not be regulated by the control structure.

Table 1 summarizes project management from 1987 to present and includes water levels on both the marsh and Georgian Bay, management objectives and vegetation responses.

It should be noted that water level management on the overgrown vegetation fringe was not feasible due to the floating mat condition. Accordingly, a cookie cutter was used to create openings to increase interspersion, enhance "edge" and provide improved plant diversity. Approximately 5,000 metres of cookie cutter "ditch" were cut in 1987.

Weir modifications and pump installations were done in 1989. A drawdown of Mud Lake was undertaken that same year, however, internal drainage obstructions, mechanical problems with the pumps and heavy summer precipitation prevented adequate dewatering of the basin. Pumping in 1989 began April 25 but during the critical plant germination period of May and June, 0.1 to 0.3 m of water covered most of the open area of Mud Lake. Pumping was stopped in early September. Sections of the marsh substrate were briefly dewatered including the northeast corner which, due to long term silt deposition, is approximately 0.3 m higher than the rest of the basin.

Modifications were made to the pump system in 1990 and the cookie cutter was used to improve drainage between the weir and the open water area of the marsh. Pumping was initiated May 18 and by late June the marsh was essentially surface dry (photo #2). Timely rains augmented moist substrate conditions and periods of hot weather triggered the germination and growth of emergents well into July (photo #3). The pumps were shut off August 21 and the basin allowed to refill via the Wye River. The co-dominant emergent plant species that germinated during the drawdown were softstem bulrush and common cattail (Typha latifolia), both of which are shallow water emergents. Extensive giant burreed (Sparganium eurycarpum), arrowhead (Sagittaria spp.), pickerel weed (Pontederia cordata), smartweed (Polygonum spp.) and spikerush (Eleocharis spp.) also germinated. As these species are essentially all adapted to shallow water conditions, a shallow reflood was undertaken to ensure the survival and establishment of this community. Deep flooding in contrast would have caused widespread plant die-off and a speedy return to open water conditions. In addition, deep flooding may have caused unstable mat conditions and in turn floating vegetation mats. The basin was exposed relatively late in the spring of 1990, resulting in a shortened growing season and thus a reduction in the growth establishment period of the plants. Increasing water levels on emergent vegetation that is not fully developed can cause plant die-off. Photo #4 shows the basin in September of 1990 under partial reflood conditions.

The primary management objectives in 1991 was to ensure that newly established plant communities remained healthy. This was accomplished by holding water depths low at an average depth of 0.5 m. Vegetation response by mid-May was excellent (photo #5). By August, 85% of the former open water area was revegetated with robust shallow water emergents. Softstem bulrush

and common cattail continued to be co-dominant in the basin. Fortunately, water levels on Georgian Bay throughout the summer of 1991 averaged 176.8 m, enabling prescribed water levels to be maintained over the course of the growing season on the marsh.

The management objective in 1992 and in subsequent years, was to provide water depths suitable to a shallow marsh community, allowing for natural marsh dynamics to take place. As such, water levels were held at 0.6 m +/-. Lake levels continued to be low enough during 1992 to facilitate management, and by early September emergent vegetation was well established (photo #6). Part of the basin contained some open water areas.

Subsequent to 1992, water levels on the marsh were set based on measured marsh levels rather than simply by reading levels at the control structure. Changes in the basin substrate combined with high Georgian Bay levels, wind tides and Wye River base flow fluctuations necessitated this approach. Water levels in 1993 were raised 0.10 m above those set in 1992 in response to the continued growth dense emergent vegetation.

Georgian Bay water levels increased in 1993 to 177.1 m, well above the desired level to maintain the existing shallow marsh community. As such, water depths on the basin increased in excess of 0.70 m during the growing season. At this time there was a shift away from Typha latifolia and a concomitant increase in the amount of hybrid cattail (Typha glauca), a plant better adapted to deeper water. In addition, softstem bulrush stands weakened significantly in 1993.

The trends established in 1993 continued through 1994. Basin water levels were again high due to Georgian Bay water levels, notably early in the spring growth period when average basin depths were 0.75 m. Common cattail continued to be replaced by hybrid cattail, and by narrow-leaf cattail (Typha angustifolia). The extent of softstem bulrush also continued to diminish. The central and western parts of the basin achieved a 50:50 open water to cover ratio, and openings were created in the dense vegetation zone on the east side of the basin (photo #7). Concurrently, submergent plant communities had become well established in open water areas. Principle submergent species were water lily, pond lily, milfoil, bladderwort, coontail and pondweeds. It should be noted there was very little evidence of muskrat activity at this time.

Water depths on the basin in 1995 averaged 0.5 m during the growing season, a result primarily of lower Georgian Bay levels. Softstem bulrush had decreased in abundance to about 10% of the emergent plant community, falling

from a level of nearly 50% post drawdown. Narrow leaf cattail became much more prominent. Interspersion in the central and western areas continued to increase, however, in the shallower eastern zones where deep water tolerant cattail species had established, there was significant encroachment into the open ponds that developed in 1990-1994 (photo #8). Management was aimed at balancing the desirable levels of interspersion in the central/western areas with attempting to open the overgrown eastern part of the basin.

The nature of the plant community established during drawdown, the water levels required to maintain this community elsewhere on the basin, and the basin profile have combined to produce an overgrown marsh condition on the east part of the basin, and in particular the very northeast corner of the marsh near the centre. During the drawdown the Wye River, which flowed northward along the east side of the marsh, shifted its course to flow westerly toward the centre of the marsh (see infrared photos 9 and 10). This has promoted a "water starvation" condition in the northeast corner of the marsh near the Wye Centre and when combined with higher elevations and essentially 2 years of drawdown (1989 and 1990), has resulted in an overgrowth of emergent vegetation, that has not thinned out in a manner similar to the central/western part of the basin. Despite this, approximately 50% of the basin overall is presently well interspersed in ways that are of enhanced benefit to wildlife.

The lack of muskrat herbivory is also considered a major factor in the post drawdown dynamics of the marsh. Generally, muskrat populations respond very well to drawdown, especially when emergent plants such as softstem and cattail become established. This has not occurred at Wye marsh where populations may be depressed by tularemia. Wye Marsh Centre staff have found several muskrat carcasses and preliminary pathology reports support this supposition.

VI FUTURE MANAGEMENT

Water levels on Mud Lake will continue to be managed in response to the composition of the emergent plant communities across the entire basin. With the community shifts to deep water tolerant species, water levels will be increased so as to keep them at optimum densities. As such, water levels for 1996 will be 0.10 m above 1995 levels. This will encourage an opening of the overgrown eastern zone of the lake while maintaining the well interspersed western and central zone. Georgian Bay lake levels are expected to continue to decline in the foreseeable future, enhancing water level control capabilities. The transfer of muskrats from nearby marshes is also being investigated to facilitate the marsh dynamics. The use of mechanical control is also an option to increase the extent of open water in areas that are presently overgrown. Aspects of this are being designed for implementation in 1995/96.

TABLE Summary of Management Activities on Mud Lake at Wye Marsh

YEAR	AVERAGE MARSH WATER DEPTHS (m)	WATER LEVEL (m) AT CONTROL	AVERAGE SUMMER LEVELS IN GEORGIAN BAY (m)	MANAGEMENT	RESULTS
1987	1.30	177.30	N/A	Open up fringe mat	500 m of ditch cut.
1988	1.30	177.30	N/A	No management.	N/A
1989	0 - .3	176.30	N/A	Drawdown via pumping.	Channel obstructions and above normal summer precipitation prevented complete drawdown. .1 to .3 m of water on 80% of basin; some emergent plant germination (Typha latifolia, Scirpus validus) on higher elevations in northeast corner.
1990	0.00	176.00	176.50	Drawdown via pumping; cookie cutter to improve internal drainage	Basin substrate dry by end of June; strong shallow water emergent response by mid-July (Scirpus validus, Typha latifolia, Sparganium eurycarpum, Sagittaria spp.); late drawdown resulted in reduced plant vigor by September reflood.
1991	0.50	176.71	176.80	Shallow reflood to help establish emergents.	Good growth of emergents by September; Typha latifolia and Scirpus validus co-dominant and well established.
1992	0.45	176.70	176.70	Maintain shallow emergents.	Continued strong plant growth able to increase target levels by 0.1 m for 1993.
1993	0.70	176.89	177.10	Maintain shallow water community; prescribed 0.6 m depths.	Lake levels elevated marsh depths; slight shift of Typha latifolia to T. glauca; slight reduction in Scirpus validus to 25-30% of total emergent community.
1994	0.75	176.80	177.00	Maintain shallow water community; prescribed 0.6 m depths.	Lake levels and Wye River flows raised basin levels during spring above optimum depths; further loss of Scirpus validus and Typha latifolia.
1995	0.50	176.70	176.70	Maintain interspersion in the central/western areas while addressing overgrowth in eastern areas.	Significant loss of Scirpus validus in the deeper areas; continued conversion of Typha latifolia stands to T. glauca and T. angustifolia; continued opening of central and western area but a closing of the eastern zone.

TABLE 2: List of Historical Photographs of Mud Lake at Wye Marsh

Photo 1	Open marsh phase of Mud Lake. Vegetation is confined primarily to the floating mat fringe surrounding the lake. Pre-management photo taken in August, 1988.
Photo 2	Drawdown of Mud Lake to expose the substrate. Water removal delayed somewhat due to technical problems with the pumps. Photo taken in early June, 1990.
Photo 3	Drawdown of Mud Lake. Vegetation has germinated over much of the basin but growth is delayed. Photo taken in mid-July, 1990.
Photo 4	Partial reflood of Mud Lake following the drawdown earlier in the year. Vegetation distribution is excellent however plant robustness less then desired due to late dewatering. Photo taken in mid-September, 1990.
Photo 5	Year after Mud Lake was drawdown. Water levels are relatively low to encourage emergent vegetation to further establish. Photo taken in late May 1991.
Photo 6	Mud Lake 2 years after drawdown. Shallow water emergents are well established. Photo taken in mid-September, 1992.
Photo 7	Mud Lake 4 years after drawdown. The middle part of the basin has opened and ponds are starting to develop in the denser emergent zones. Submergent plant growth is extensive. Photo taken in late August, 1994.
Photo 8	Mud Lake 5 years after drawdown. Middle part of the basin continues to exhibit good interspersion while the emergent zones in the eastern area remain dense. Photo taken in mid-September, 1995.
Photo 9	False color infrared photo of Mud Lake showing the channel location of the Wye River pre-project. Photo taken in August, 1982.
Photo 10	False color infrared photo of Mud Lake showing the channel location of the Wye River after the project was completed. Photo taken in July, 1995.

PHOTO 1

PHOTO 2

PHOTO 3

PHOTO 4

PHOTO 5

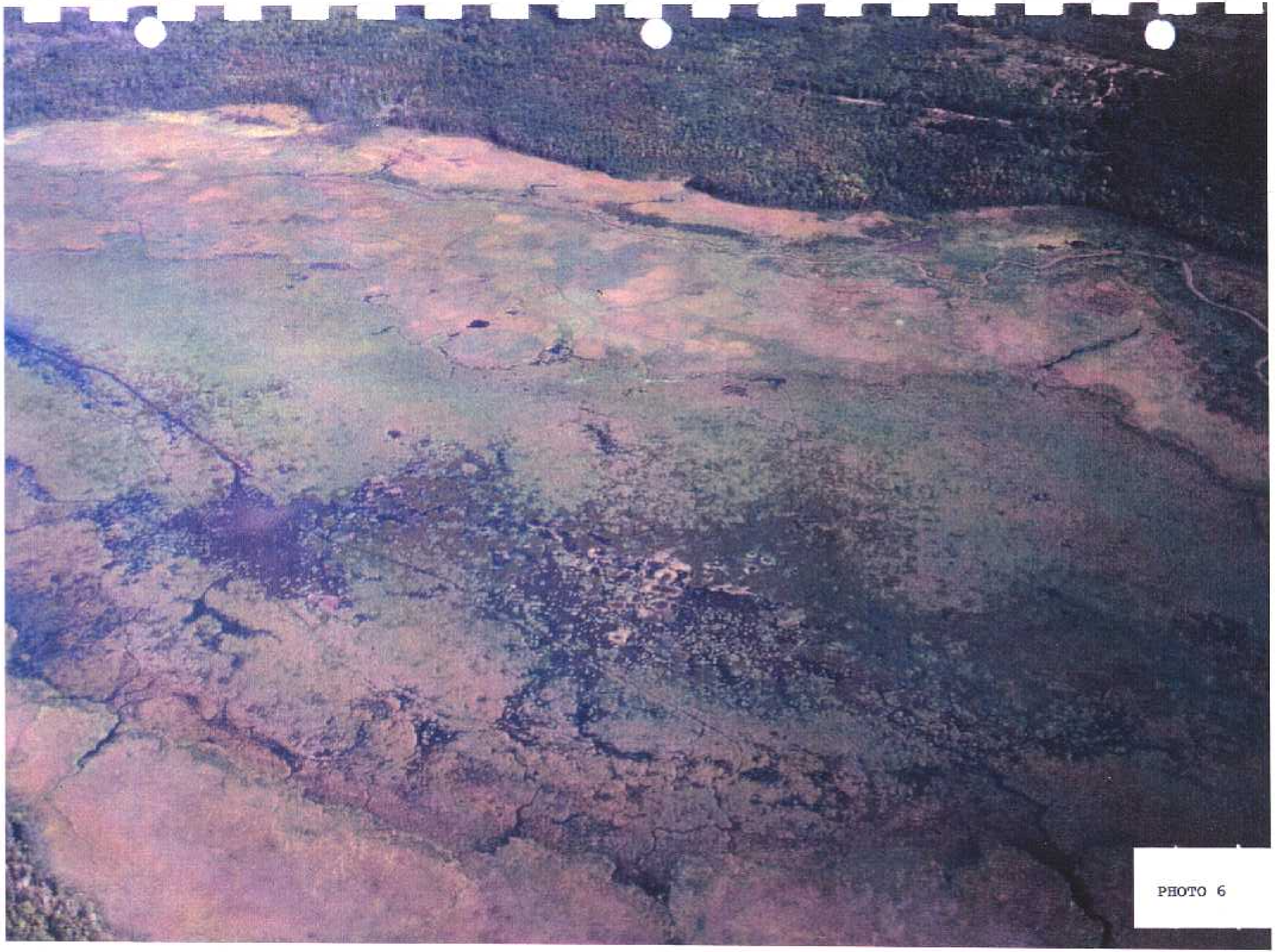

PHOTO 6

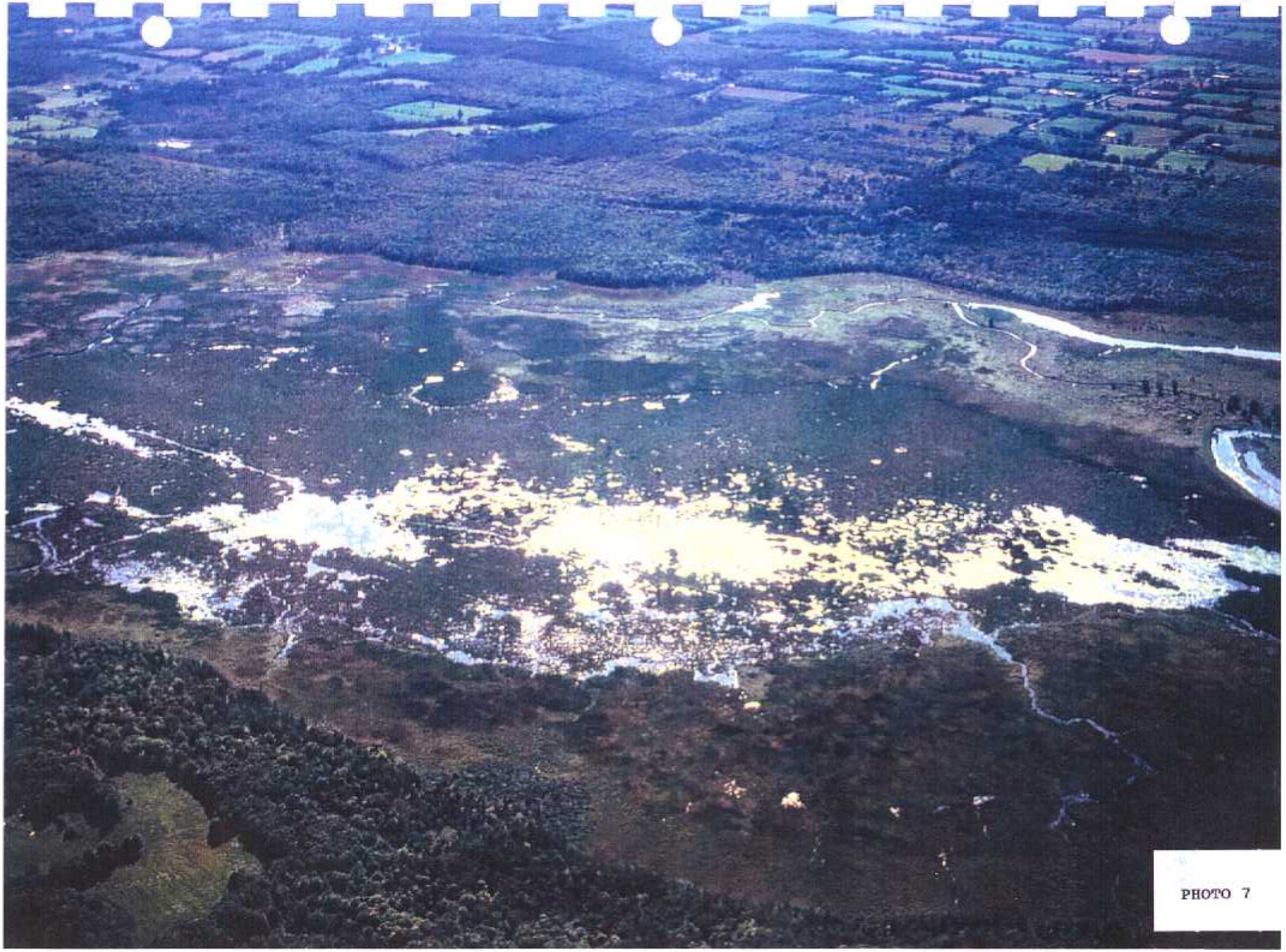

PHOTO 7

PHOTO 8

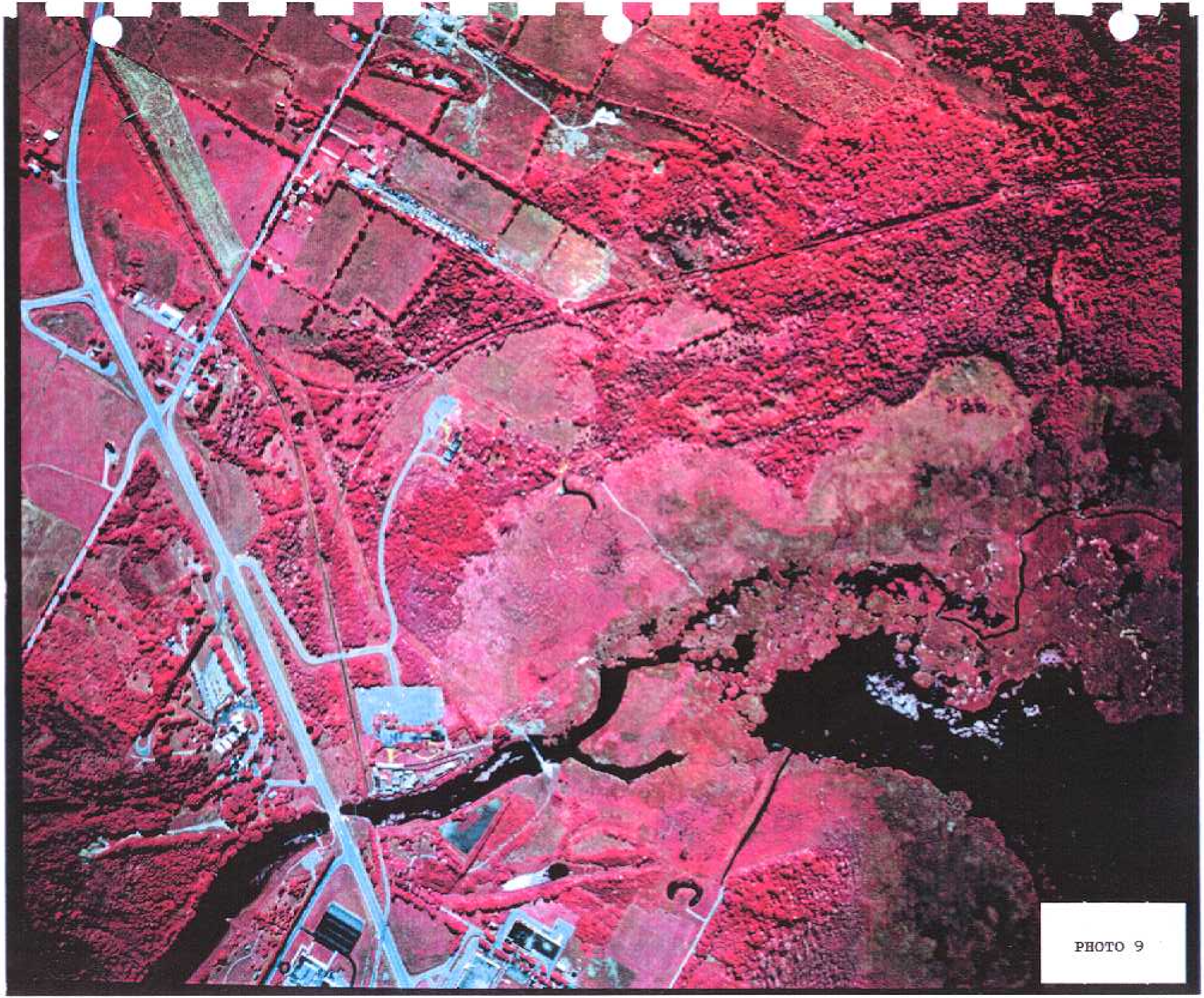

PHOTO 9

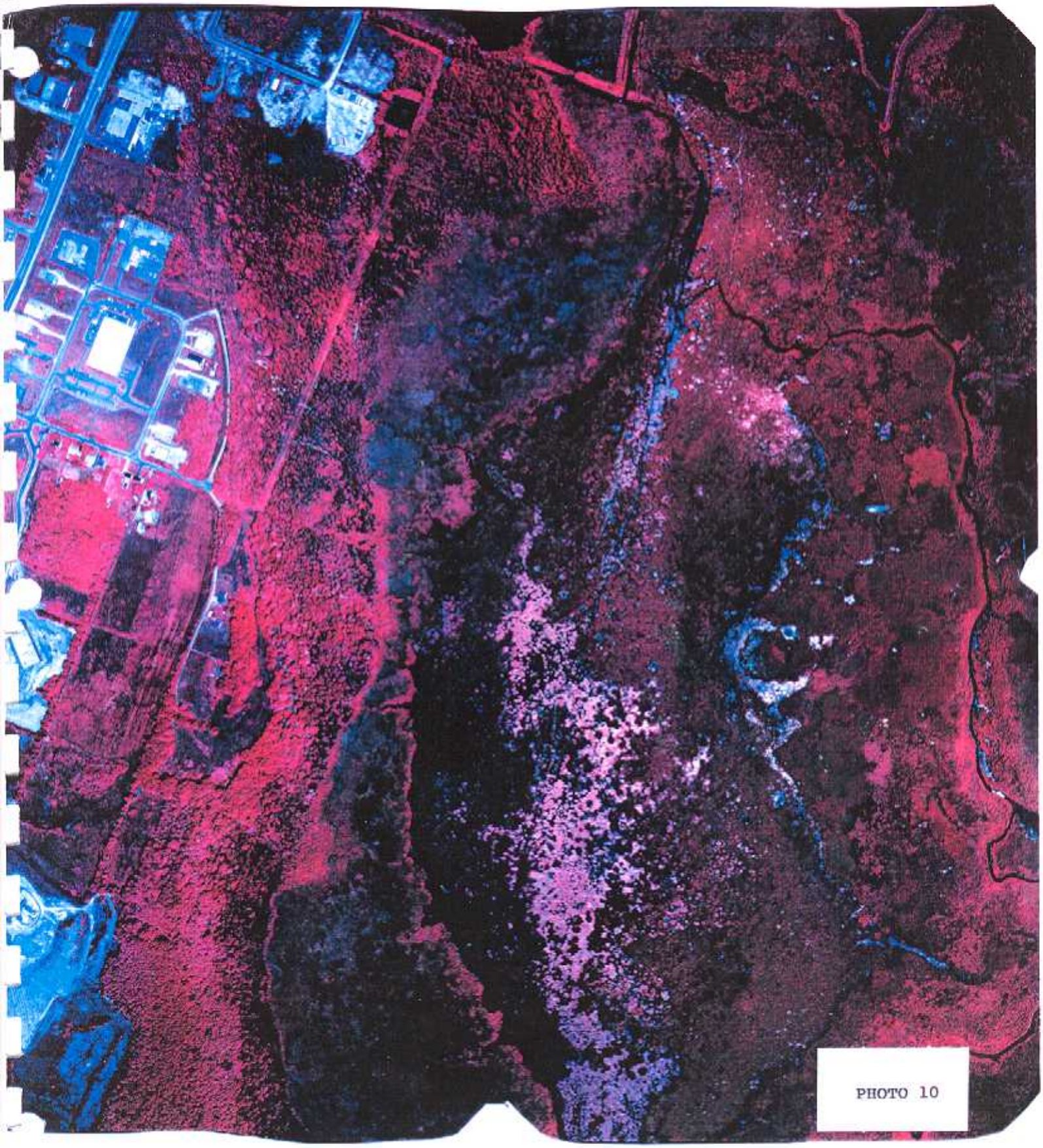

PHOTO 10