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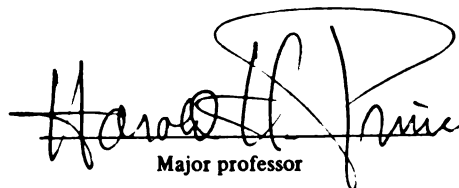
Distribution and Nest Success of  
Yellow-headed Blackbirds (Xanthocephalus  
xanthocephalus) Around Saginaw Bay, Michigan

presented by

Charlotte E. Young

has been accepted towards fulfillment  
of the requirements for

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**DISTRIBUTION AND NEST SUCCESS OF  
YELLOW-HEADED BLACKBIRDS (*Xanthocephalus xanthocephalus*)  
AROUND SAGINAW BAY, MICHIGAN**

**By**

**Charlotte E. Young**

**A THESIS**

**Submitted to  
Michigan State University  
in partial fulfillment of the requirements  
for the degree of**

**MASTER OF SCIENCE**

**Department of Fisheries and Wildlife**

**1996**

## **ABSTRACT**

### **DISTRIBUTION AND NEST SUCCESS OF YELLOW-HEADED BLACKBIRDS (*Xanthocephalus xanthocephalus*) AROUND SAGINAW BAY, MICHIGAN**

**By**

**Charlotte E. Young**

The historical breeding range of Yellow-headed blackbirds has recently expanded to include several coastal and inland areas in Michigan including Saginaw Bay. Distribution and nest success of Yellow-heads around the western and southern portions of Saginaw Bay, Michigan were evaluated in 1994 and 1995 by conducting singing male surveys in potential breeding habitat and nest studies in colonies with  $\geq 6$  males. Forty -eight males were found in 1994 and 30 in 1995. Almost complete nest destruction occurred in 1994 due to two record breaking storms in May and June, resulting in only 3% nest success. Nest success was based on apparent nest success. Nest success of a reduced number of breeding birds in 1995, was approximately 41%. Although the amount of potential Yellow-head habitat around Saginaw Bay is large, annual storms may limit numbers and nest success.

## **ACKNOWLEDGMENTS**

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## INTRODUCTION

Despite being one of the most abundant marsh-inhabiting icterids in western North America, second only to the Red-winged blackbird (*Agelaius phoeniceus*), the Yellow-headed blackbird's (*Xanthocephalus xanthocephalus*) breeding range has been historically limited to the arid and semiarid areas of North America. Although being found in arid (<20" rainfall annually) and semi-arid areas (20–40" rainfall annually) may seem contradictory to a marsh inhabiting species, these drier areas contain some of the most productive lakes and marshes in the region because they often have no outlets and therefore, concentrate nutrients entering from the surrounding watershed. In addition these lakes normally lack fish, which when present, may depress the quantity of emerging aquatic insects to very low levels. Within these arid/semi arid areas, Yellow-head breeding areas range from south-central British Columbia, north-central Alberta and Saskatchewan and southern Manitoba, south through the Great Plains and Great Basin to northern Arizona, central New Mexico, northern Texas and Oklahoma (Fig. 1). They are absent west of the Cascade Mountains in Washington, but have been known to breed in the Willamette Valley of western Oregon. They appear again west of the Cascade-Sierras in the lowlands of California, south to the Imperial and Lower Colorado Valleys. To the east, the breeding range has historically been roughly congruent

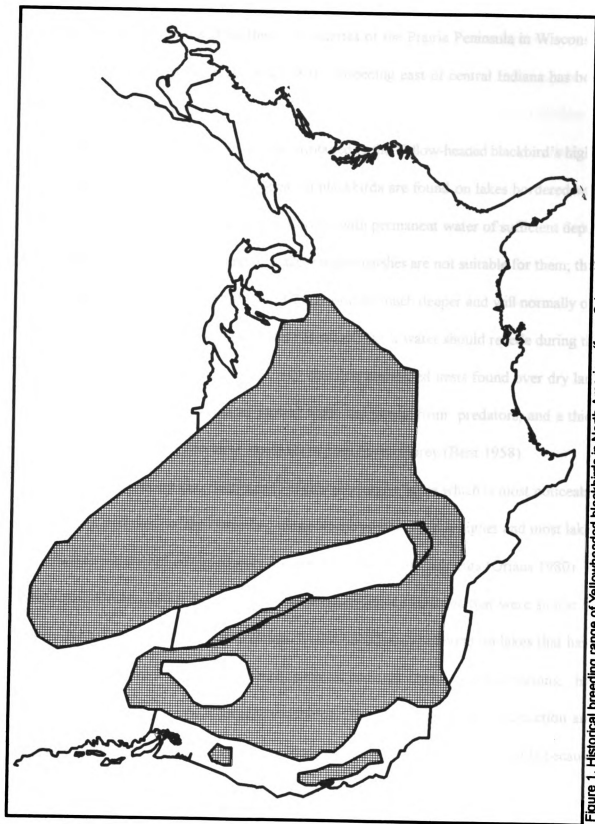


Figure 1. Historical breeding range of Yellowheaded blackbirds in North America. (from Orians 1980))

with the former northern and southern boundaries of the Prairie Peninsula in Wisconsin, Illinois, Indiana, and Missouri (Orians 1980). Breeding east of central Indiana has been extremely rare historically.

This limited breeding range may be attributed to the Yellow-headed blackbird's highly specific habitat requirements. Yellow-headed blackbirds are found on lakes bordered with suitable aquatic vegetation, or marshes or sloughs with permanent water of sufficient depth. Unlike Red-winged blackbirds, damp or shallow water marshes are not suitable for them; they prefer to nest over water that is from .6 to 1.20 m or even much deeper and will normally out compete Red-wings for these particular sites (Bent 1958). If water should recede during the process of nest building, Yellow-heads may abandon unfinished nests found over dry land (Bent 1958). Deep water serves to protect nests and young from predators, and a thick growth of tall vegetation, serves to shield them from birds of prey (Bent 1958).

Yellow-heads are also restricted to highly productive lakes which is most noticeable at the eastern periphery of their breeding range where precipitation is higher and most lakes have outlets and do not conspicuously fluctuate or concentrate nutrients (Orians 1980). In Wisconsin, Orians (1980) found most Yellow-heads limited to lakes that were similar to prairie potholes without external drainage. Yellow-heads can be found on lakes that have outlets, but only when some disturbance, such as extreme water level fluctuations, has opened up dense patches of emergent vegetation. This increases *in situ* production and emergence which results in better foraging conditions for Yellow-headed blackbirds because insects are concentrated on fewer stalks (Orians 1980).

The variety of foods required by the Yellow-headed blackbird changes throughout the breeding season, but overall season averages consist of  $\approx 66\%$  animal (insect) matter and  $\approx 34\%$  vegetative matter (Willson 1966). Animal food is primarily composed of Odonata (Coenagriidae, Lestidae), Diptera (Chironomidae, Ephydriidae), Coleoptera (Dytiscidae) and smaller quantities of Ephemeroptera, Hemiptera, Homoptera, and Arachnida. Vegetative matter is primarily composed of grains, particularly oats and corn, and weed seeds including barngrass (*Choetochloa*), *Panicum*, ragweed (*Ambrosia*), and *Polygonum*. Yellow-heads will forage close to the water among marsh plants (cattails, sedges, etc), in shallow water close to the shoreline, and in any suitable farm fields surrounding the colony. However, the Yellow-head relies perhaps most heavily on food sources available within its territory. Good foraging sites for Yellowheads are nearly always accompanied by suitable nesting sites in emergent vegetation (Orians 1980). Suitable breeding areas include a thick growth of tall aquatic vegetation such as cattails (*Typha*), tules, or reeds (*Scirpus* or *Phragmites*), for nest placement. In extreme conditions, Yellowheads have also been known to use small trees and shrubs in standing water (Miller 1968).

Yellow-heads are colonial nesters. Males engage in polygynous mating and are territorial. Male Yellow-heads are vocal throughout the breeding season, using a variety of songs not only when attempting to attract potential mates, but also when establishing and maintaining their territory boundaries (Fautin 1940). Calls are normally made by males while sitting on top of the tallest emergent vegetation available, where potential mates and other males are most likely to see them (Fautin 1940). Territory sizes, under normal conditions within established colonies, may range on average from  $7 \text{ m}^2$  to  $+2,210 \text{ m}^2$  (Orians 1980).

Territory size for Yellowheads is dependent on several key factors including marsh productivity, surrounding upland food resources, the amount of edge available in a potential territory, and the amount of open water around the potential territory. Usually, Yellow-heads will preferentially select territories with the most edge or open water/emergent vegetation interface, where the best foraging sites are found (Orians 1980).

### **Michigan Observation and Breeding Records**

The Yellow-headed blackbird's breeding range has remained fairly consistent over the years with only a few casual sightings farther south and east. Recently, though, the Yellow-head has begun to expand its eastern breeding boundaries. In part, this range expansion has included several coastal and inland wetland areas in the state of Michigan. The recent enlargement of the Yellow-headed blackbird's breeding range may be its third attempt at crossing Michigan borders. Historical accounts trace two other potential expansion periods.

The first account postulates that the Yellow-head nested in Michigan soon after settlement. Cook (1893) believed that breeding occurred in the extreme southwest part of the state as it was a common summer resident in the large marshes around Chicago in the 1870's and was found in abundance just to the east in Lake County, Indiana. However, he was unable to document any breeding activity in Michigan. It is known that there are no Yellow-heads in these areas today but whether that is due to a historical absence of the birds in these areas or simply to a current lack of adequate breeding habitat is unclear.

The first documented sighting of the Yellow-headed blackbird in Michigan was on 17 May, 1890, in the upper peninsula in Dickinson County (Barrows 1912). A single male specimen was taken by E.E. Brewster but no breeding activity was noted.

After the 1890's, there were no summer records until the 1930's (Fig. 2). Two Yellow-heads were sighted at Bruce Crossing in Ontonagon Co., on 24 August 1931. Another bird was sighted during mid-May of 1933, at Portage Lake in Manistee Co (Wood 1951). Campbell (Wood 1951) sighted 2 birds at Erie Marsh in Monroe Co., on 29 April 1934. The species was also noted in Huron County on Lone Tree Island on 2 June 1935 (Wood 1951). The last sighting during this proposed range expansion period was 1 June 1941, at Higgins Lake in Roscommon Co. (Wood 1951). However, despite the number of individual sightings within Michigan and even though breeding was documented just to the south in Lucas Co., Ohio in 1938 and 1940, no known breeding activity was recorded in Michigan during this time period (Fig. 2).

Yellow-headed blackbirds were not recorded in Michigan again until the mid-1950's (Fig. 2). The first 1950's sighting and the first confirmed breeding pairs in Michigan's history were found on 01 July 1955, on the Presque Isle River in Gogebic Co., 2 1/4 mi southwest of Marenisco and about six miles from the Wisconsin state line (Walkinshaw et al. 1957). Two males, 1 with 3 mates and 1 with 2 mates, were found, along with 2 nests. On 20 and 21 June 1956, 2 nests were found in Gogebic Co. Sightings of Yellow-headed blackbirds were also reported from Dickinson, Menominee and Ontonagon Co., (Dodge 1961). During the same summer, 1 adult male was sighted on the Saginaw Bay, Bay Co., (T14N R6E Sec. 14), 150 miles north of the eastern most breeding range (Wolf and Grefe 1961). There was



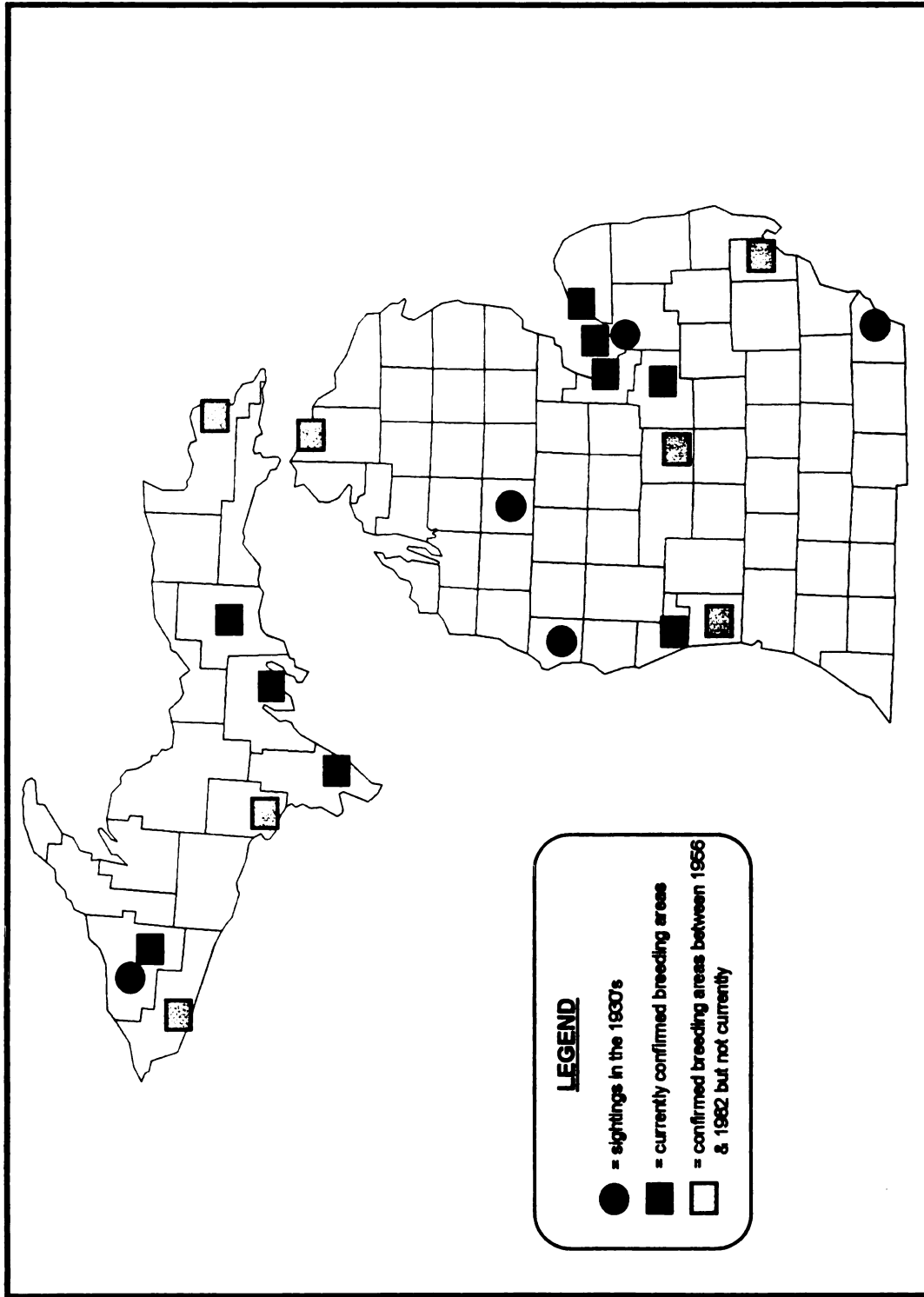


Figure 2. Historical and current sightings/confirmed breeding areas of the Yellow-headed blackbird in Michigan.

another sighting in the same area in 1958. In 1959, water levels in the Saginaw Bay were low and no birds were observed. In 1960, the Yellow-head returned to the Saginaw Bay, but this time in somewhat more substantial numbers. Between 4 June and 25 June, a colony was found on Saginaw Bay near Quanicassee in Bay Co., consisting of several adults that had constructed 7 nests (Kenega 1961). In 1961, 5 nests were found in Hampton Twp. ( Grefe and Kenega 1962). In 1962, 6 adults with 3 nests were found at the north end of Nolet Rd., Bay Co. (Cuthbert 1963). Two more notable colonies were found around the Saginaw Bay in 1978 and '79. In 1978, a total of 25 Yellow-heads were observed inland at the Tobico Lagoon, now known as the Tobico Marsh ( Kenega 1983). In 1979, a total of 80 individuals were documented, 15 males, 25 females, and 40 fledglings, at the Nayanquing Point Wildlife Area (McWhirter et al. In Kenega 1983). In 1983, 5 nesting pairs were found near Essexville in Bay Co. (Kenega 1983). Breeding Yellow-heads were not documented in Tuscola and Huron Counties until 1983.

Over the past 35 years, nesting has been confirmed at least once in 15 Michigan counties, including 3 inland sites. At least 3-7 of these counties, however, seem to have permanently "lost" their breeding populations (Fig. 2). This sporadic use of certain breeding areas by Yellow-heads despite seemingly ample habitat, combined with their low population densities, has resulted in very little documentation of Yellow-head distribution and nest success around the state.

This study was designed primarily to determine the breeding distribution of Yellow-headed blackbirds around Saginaw Bay in Michigan in 1994 and 1995 relative to potential nesting habitat and the nest success of the Yellow-headed blackbird in two colonies.

## STUDY AREA AND METHODS

This study was primarily conducted in coastal wetlands along the west, south, and east coasts of Saginaw Bay, Michigan, the coasts of Bay County, Tuscola County, and Huron County, respectively (Fig. 3). Currently, the emergent zone of these wetlands is dominated by cattail (*Typha angustifolia*), bulrush (*Scirpus americanus*), and arrowhead (*Sagittaria latifolia*).

### **Singing Male Survey**

The coasts of Huron, Tuscola, and Bay Counties, stretch well over 100km around Saginaw Bay. Since it was not feasible to randomly search the entire area for Yellow-heads, a focal point was needed. Although water depth is a primary consideration of Yellow-head habitat selection, it was decided that the initial survey would focus on areas containing suitable emergent vegetation because the absence of emergent vegetation precludes the need for appropriate water depth. Therefore, areas on the National Wetland Inventory maps (NWI 1977) classified as either *Palustrine, Emergent* (PEM) or *Lacustrine, Emergent* (LEM), were considered potential Yellow-head breeding areas.

Initially, no distinctions were made between persistent (*Typha*) and nonpersistent (*Scirpus*) emergent vegetation. Although *Scirpus* is normally considered a persistent emergent, for this study it was considered a nonpersistent because intense winter scouring action in Saginaw Bay destroys all above ground *Scirpus* remnants. *Scirpus* only reappears when new growth comes in during the spring.

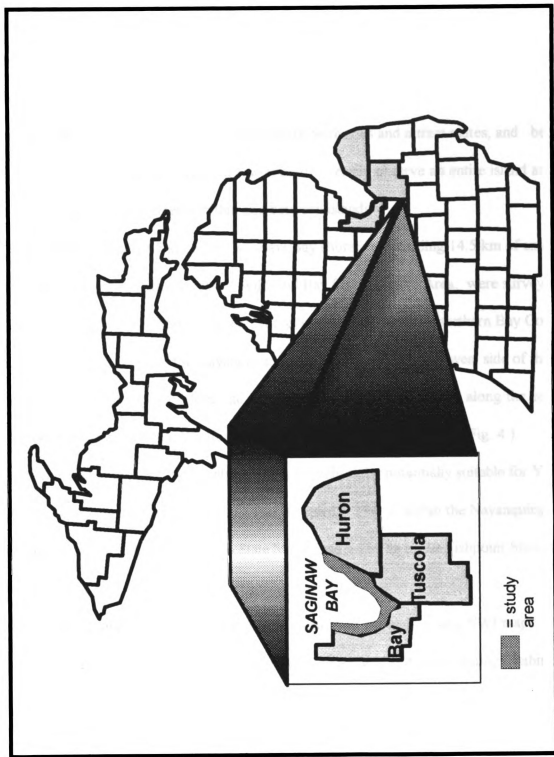


Figure 3. Three county coasts, Bay, Tuscola & Huron, where Yellow-headed blackbird studies were conducted in 1994 and 1995. Location of specific study area is indicated with hatchcross marking.

Survey routes for singing males were set up for coastal and inland areas with nest potential habitat along the Saginaw Bay coastline and are identified in Fig. 4.

Singing male surveys were conducted 24 May to 24 June, 1994, and 7 April to 21 June 1995. Surveys were conducted during this time period because males are particularly vocal during this period while trying to establish territories and attract mates, and because island emergent vegetation was still low enough to easily observe an entire island and any male Yellow-head movements within and between islands.

Approximately 97 km of the Saginaw Bay shoreline, including 14.5 km of emergent vegetation surrounding the islands of Wildfowl Bay State Wildlife Area, were surveyed for singing Yellow-headed blackbird males. Surveys were conducted in northern Bay Co. from Erickson Rd. just north of the Nayanquing Point Wildlife Area on the west side of the Bay, continuing south and east along the coast of Bay Co., east and north along the coast of Tuscola Co., and ending at Wildfowl Point in Huron Co., at Henne Rd. (Fig. 4 ).

An additional 606 ha of "inland" areas thought to be potentially suitable for Yellow-headed blackbirds were also searched. This included  $\approx$  194 ha within the Nayanquing Point Wildlife Area,  $\approx$  152 ha of the Tobico State Marsh, and  $\approx$  260 ha of the Fishpoint State Game Area (Fig. 4).

Finally, due to vegetation changes revealed upon groundtruthing NWI maps, survey routes were set up in several additional areas exhibiting potential nesting habitat not indicated.

**Figure 4. Yellow-headed blackbird singing male search routes along Saginaw Bay in 1994 & 1995. Complete searches were conducted in areas with potential habitat. Incomplete searches were conducted in areas with no potential habitat.**

Searches were conducted by at least 2 people between the hours of sunrise and 10:00 a.m..

In order to make searches for potential habitat and singing male Yellow-heads more efficient, a john boat was used to travel the coast. Once an emergent vegetation island was located, the boat was stopped and the motor turned off. Each island was then observed for a period of 15 minutes. Binoculars were used to help positively identify Yellow-heads. During that time interval, numbers of males were recorded, if observed or heard. If an island contained males, a more thorough search was completed to determine their exact numbers.

Island searches were performed by paddling the boat to the southern, northern, eastern and western most point of the island and recording any males heard or observed during a 5 minute period. Since males are so vocal and flamboyant, and vegetation was not fully grown to obstruct our view of the island or the birds, the majority of islands containing males could be surveyed this way without fear of missing any males. However, there were three islands that were too large to be assured of counting exact numbers of males using this method. These islands were searched more thoroughly by walking transects across the entire island at 50m intervals. Five minute observation periods were made at the approximate mid-point of each transect to listen for, observe, and record numbers of Yellow-head males. Searching the interior of these islands as well as the exterior helped assure us that we were not counting the same male more than once and resulted in an accurate count of all males present. Throughout the breeding season, at least 3 searches were made of each area with potentially suitable habitat.

### **Nest Success**

From the singing male surveys completed in 1994, two breeding colonies, one within the Quanicassee State Game Area at Coreyon Point and one within the coastal vegetation adjacent to Vanderbilt Park (T14N, R7E) , were identified where an estimate of nest success was made (Fig. 4). (See Appendix A for a complete legal description of nest success study sites.)

In 1994, from 24 May to 10 July, and from 7 April to 18 July, 1995, *Typha* islands, totaling 145 ha and 45 ha respectively, were surveyed weekly for singing males and nests. Extensive observations of individual islands at each colony were made throughout the breeding season. Three islands of vegetation were used by the colony at Vanderbilt Park in 1994 and 0 in 1995. Island 1 was visited 8 days during the season; Island 2 was observed 9 days; Island 3 was observed 8 days. At the Coreyon Point colony, three islands were used in 1994 and 2 in 1995. In 1994, Island 1 was observed 9 days; Island 2 , 9 days; Island 3 , 8 days. In 1995, Island 2 was observed 17 days and Island 3 was observed 17 days. These extensive observations of the movements of males and aggressive encounters between males at each island allowed us to determine general territorial boundaries. Male territories were noted and general boundaries were mapped using the “mapping” or “spot-map methods” (Davis and Winsted 1980). Spot mapping methods consisted of marking the spots on a map of the island where individual males landed within the island or had an aggressive encounter with another male. Island outlines for Vanderbilt Park were derived by digitizing infrared photos with the geographic information system, ARC-Info. Island outlines for Coreyon Point



were derived by plotting each nesting transect walked across the island and the transect's length on graph paper and then digitizing the drawing. At the end of each season, general territory boundaries were mapped by assuming that the points on an island where the most male aggressive encounters had been spot mapped signified a territory boundary. Approximate territory sizes were then derived by digitizing the plotted territory boundaries in each island with ARC-Info. Biasing of estimates from varying methods of map interpretation and any observational skills bias were avoided in large part since only one person was conducting surveys.

Nest searches were made by walking transects at 5m intervals across all territories. Once a nest was located, number of eggs or nestlings, vegetation type, nest height above water and distance to the nearest edge of the vegetation patch was noted. The nest was then marked by tying fluorescent flagging on surrounding vegetation or on the vegetation actually supporting the nest. However, both methods of flagging nests posed problems. If flagging was tied on the surrounding vegetation, it was often removed by the adult Yellow-headed blackbird making nest relocations difficult ; using vegetation that supported the nest was more difficult to see. Care was taken at all times throughout the breeding season to minimize disturbances during observations or nest checks.

Fate of the nest was determined by returning once half way through the  $\approx 11$  day incubation period; then visiting daily starting 2 days before the expected hatch date until hatchlings were found; visits were then made 2 times during the first 9 days of the  $\approx 11$  day time period required for fledging; and then daily starting 1-2 days before the expected fledge date. This schedule allowed an optimal amount of time to pass between nest checks, normally

allowing for estimates of hatching, fledgling, or nest destruction within 3 days. If young were absent from the nest nine days after hatching and there was no evidence of nest destruction or nest predation (blood, bones, etc.), the nest was considered a success. The number of young observed on the visit prior to young being absent was the number of young assumed to have fledged.

During 1995, the transect method for nest searches was modified. At the beginning of the vegetation growing season, a center point was established within each vegetation island used by singing males. Transects were traversed on either side of the center point at 5m intervals, with each transect being numbered and its distance from the center point noted. Each transect was paced and any nest found on the transect or within 1m to either side of the transect was flagged and recorded. The number of paces along the transect where the nest was found was also noted to help in relocating nests. If a nest was observed not on a transect or within one meter to either side of the transect it was also flagged and recorded but not included in overall seasonal numbers. However, low densities of Yellow-heads resulted in a nest not falling on or 1m around the transect only once.

Due to the unique nature of the Yellow-head populations around Saginaw Bay, sample sizes were too small to employ traditional nest success estimates so results were based on apparent nest success. Apparent nest success is biased because the estimate does not account for nests missed that were initiated and destroyed and not located (Miller and Johnson 1978).

## **RESULTS**

### **Hydrology**

From 1950, just prior to the arrival of the Yellow-headed blackbird in Saginaw Bay, to 1995, the average annual water level has been 176.58m (Fig.5) (NOAA-IGLD 1992). Peak annual water levels during that period occurred in 1952 (177.09m), 1973 (177.12m), 1985 (177.12m) and 1986 (177.28m). Low annual levels occurred in 1959 (175.99m), and from 1963-65 (175.88m, 175.65m, 175.88m). Water levels averaged 176.73m and 176.67 in 1994 and 1995, respectively.

Daily water levels can fluctuate over 0.5m in elevation due to storm surges and the resultant seiche activity (Fig. 6). During the 1994 season, two storms around the Saginaw Bay resulted in record high water levels in the coastal emergent wetland zones. The first storm on 26 May, resulted in lake level surges of more than 30 cm, up to 177.5 m, the third highest of the decade. A second storm, on 24 June, produced surges of up to 50cm higher than the normal average, up to 177.7 m, the second highest of the decade. Daily water level averages on 26 May and 24 June are considerably higher than normal (Fig.6).

The storms had a devastating impact and destroyed most of the established nests. The Yellow-headed blackbird breeding activities were divided into three separate intervals. The first interval, the initial breeding period, occurred prior to 26 May. The second interval, the

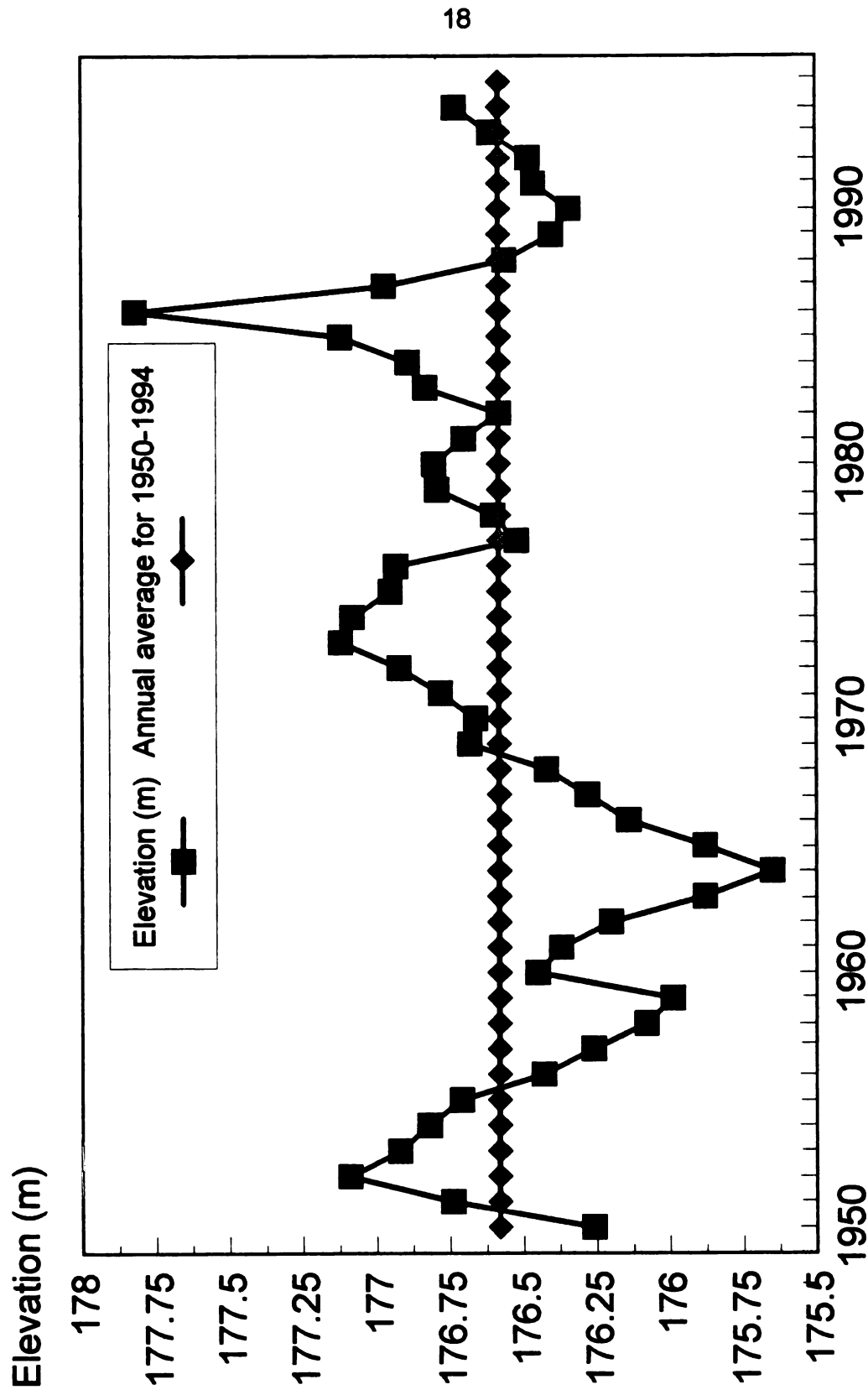


Figure 5. Annual elevational changes in Saginaw Bay water levels for the period of 1950-1995. Also includes average water level for same period (in meters). (IGLD 1985)

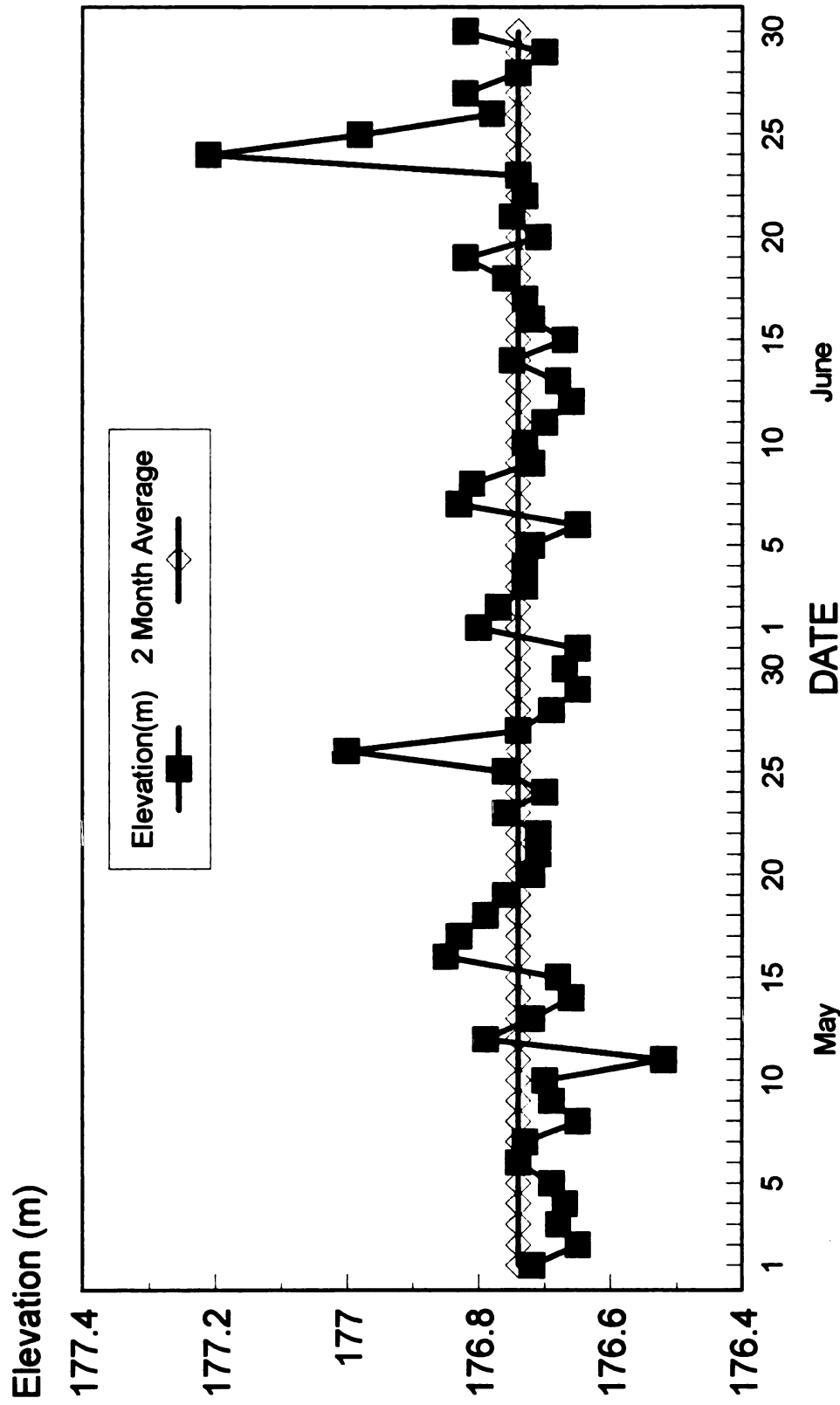


Figure 6. Average daily elevational changes in Saginaw Bay water levels for May & June 1994 (in meters).  
Also includes monthly average. First storm on 26 May ; 2nd storm on 24 June (IGLD 1985)

re-establishment period, between 27 May and 23 June. The final interval followed the storm on 24 June.

### **Singing Male Surveys**

Searches for singing males were made along 97 km of Saginaw Bay shoreline and 606 ha of inland areas, from northern Bay Co., to Wildfowl Point in Huron Co. (Fig. 4). However, only 52 km of shoreline and 606 ha of inland potential breeding habitat existed (Fig. 7). Yellow-headed blackbirds made use of 10.5 km of shoreline in five areas and 334 ha at 2 inland sites in 1994, and 6.1 km of shoreline in four areas and 334 ha at 2 inland sites in '95 (Fig. 7). Distributions of Yellow-headed blackbird males were calculated for each vegetation island within these areas by counting the number of individual males observed or, more often, heard. All males were found in *Typha* islands even though *Scirpus* islands were available also.

Eleven isolated singing males ( $\leq 3$  males) were located in six areas and in two breeding colonies ( $>3$  males) of 31 and 6 singing males in 1994 (Table 1). However, these numbers may be biased because singing male surveys were not started until after breeding and egg laying had already begun. Seven isolated singing males were located at four areas and in two breeding colonies of 17 and 6 singing males in 1995 (Table 1).

Three areas had substantial changes in the number of singing males observed between 1994 and 1995 (Table 1). The most obvious was at Vanderbilt Park. In 1994, this area accommodated six males and six females and was one of the breeding colonies where nest searches were conducted. In 1995, the area did not contain any Yellow-heads. *Typha* Island

Figure 7. Potential and occupied Yellow-headed blackbird habitat surveyed for singing males around Saginaw Bay during 1994 & 1995. Number of singing males and location of occupied areas are summarized. Nest searches were conducted in part of area V and all of area VI.

Table 1. Summary comparison of Yellow-headed blackbird distribution results found in 1994 and 1995. Roman numerals indicate site location on Fig. 5.

| <b>Distribution of Male<br/>Yellow-headed blackbirds</b> | <b>1994</b> | <b>1995</b> |
|----------------------------------------------------------|-------------|-------------|
| Nayanquing Point (I):                                    | 3           | 2           |
| Jones Road (II):                                         | 1           | 2           |
| Finn Road (III):                                         | 3           | 2           |
| Farley Road (IV):                                        | 2           | 0           |
| Coryeon Pt/Nebobish (V):                                 | 31*         | 17*         |
| Vanderbilt Park (VI):                                    | 6*          | 0           |
| Fishpoint Game Area (VII):                               | 2           | 6*          |
| Sumac Boat Launch (VIII):                                | 0           | 1(?)        |
| <b>Total # Males:</b>                                    | <b>48</b>   | <b>30</b>   |

\* breeding colony

1 at Coryeon Point contained 6 males in 1994 and 0 in 1995. Low water levels in the Saginaw Bay at the beginning of the breeding season resulted in insufficient water levels in the Island in 1995. Two singing males were located in an inland artificial impoundment at the Fishpoint Wildlife Area in 1994 but 6 males were observed in 1995. The impoundment, being a mixture of emergent and shrubby vegetation, with fairly low water levels, would not normally attract this number of Yellow-heads. However, the impoundment outlet tube was accidentally smashed together some time prior to the snow melt preventing drainage of the area at the beginning of the breeding season in 1995. This resulted in the elevation of the water level to lake level until the tube was fixed around 25 May 1995. Prior to that, singing male surveys



were conducted in the area on two occasions: 5 May 1995 and 16 May. Six males were observed during both surveys. A third survey on 30 May, after the tube was fixed, revealed noticeably lower water levels in the impoundment and only 3 males were observed. Zero males were observed during a final survey on 12 June.

North of the Sumac boat launch, there were no males located. Although in 1993, there had been a few individuals noted at the Wildfowl Bay State Wildlife Area, there were none observed during the summer of 1994 or '95.

### **Nest Surveys**

Six *Typha* islands totaling 145 ha and with 25 singing males were searched for nests on 25 May, and on 2, 3, 7, 8, 16, 17, 21, 29, 30 June, and 1 July in 1994. Twenty-four nests were located. Rechecks of 21 nests resulted in a total count of 74 eggs that fledged two young (Table 2). However, numbers of nests and number of eggs produced may be somewhat biased for 1994, as nest searches were not started until after egg laying had

**Table 2. Results of Yellow-headed blackbird nest search efforts conducted during 1994 and 1995 at the Coryeon Point and Vanderbilt Park colonies found along Saginaw Bay, Michigan.**

| <b>Location</b> | <b>Yr.</b> | <b><u>Nest Search</u></b> |                 | <b>#</b>             | <b>#</b> | <b>#</b>    | <b>#</b>       |
|-----------------|------------|---------------------------|-----------------|----------------------|----------|-------------|----------------|
|                 |            | <b># islands</b>          | <b>Size(ha)</b> | <b>Singing Males</b> |          | <b>Eggs</b> | <b>Fledged</b> |
| Coryeon Point   | 1994       | 3                         | 62              | 19                   | 16       | 54          | 0              |
|                 | 1995       | 2                         | 45              | 7                    | 5        | 22          | 9              |
| Vanderbilt Park | 1994       | 3                         | 83              | 6                    | 6        | 20          | 2              |
|                 | 1995       | 0                         | 0               | 0                    | 0        | 0           | 0              |

already commenced and then only 3 days before the first major storm of the season. Three of the six *Typha* islands equaling 83.4 ha, were at Vanderbilt Park (Fig. 8) and were approximately 25.7 ha, 30.3 ha and 27.4 ha in size.

The remaining three islands were at Coryeon Point, totaling  $\approx 61.8$  ha (Fig. 9). Island 1 was  $\approx 16.6$  ha and was unusual in the fact that although water depths throughout some of the Island were suitable for Yellow-heads, the Bay side of the Island actually graded upward to form a saturated shrub/scrub ridge inhabited by Red-winged blackbirds (*Agelaius phoeniceus*). Since it was difficult to determine the true extent of potential Yellow-headed blackbird habitat within the Island, Yellow-head territory sizes were approximated using the spot method, rather than the Island's size. Island 2 was  $\approx 19.2$  ha, and Island 3 was  $\approx 26$  ha in size. Although there were several other cattail islands in the area, they were not utilized by Yellow-heads.

Observations made at Vanderbilt Park on 24 May, 1994, resulted in a total of 6 males distributed over three islands (Fig. 8). Although a nest search was not conducted, one Yellow-headed blackbird nest with four eggs in it was located (Appendix B).

Eight males were observed in Island 1 at Coryeon Point (Fig. 9) and 4 nests, one with 1 egg, two with 2 eggs, and one with 4 eggs, were located on 25 May, 1994 (Appendix B). All five nests, one at Vanderbilt Park and four at Coryeon Point, were destroyed between 25 May and 2 June, most likely by the storm on 26 May (Fig. 6).

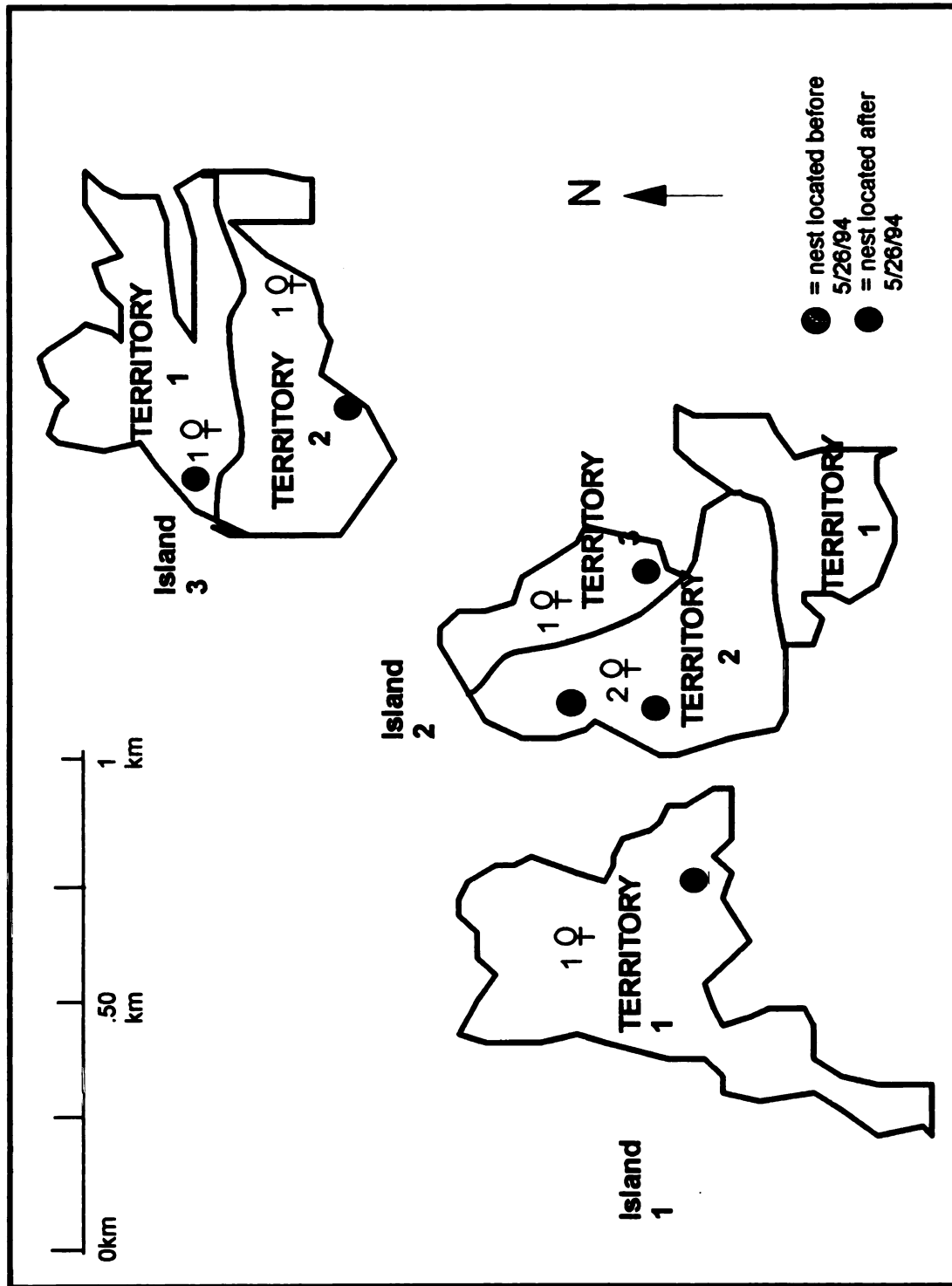


Figure 8. Vanderbilt Park Yellow-headed blackbird colony in 1994. Location of approximate territories of singing males and nests before and after storm surge on 5/26/94.

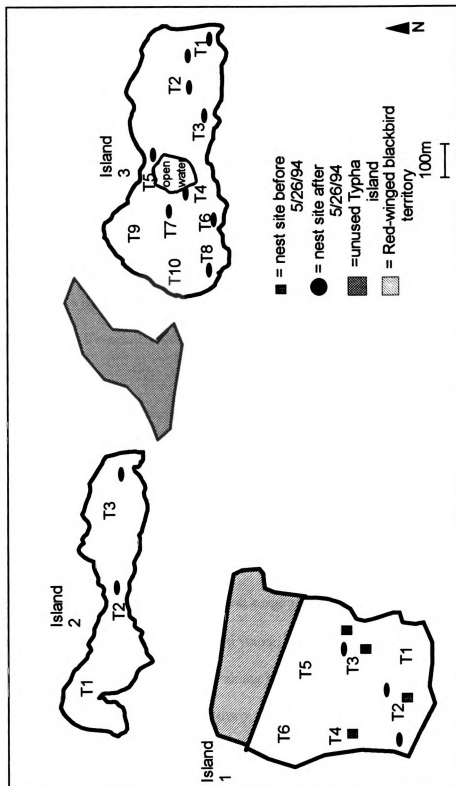


Figure 9. Coreyon Point Yellow-headed blackbird colony in 1994. Location of approximate territories of singing males (T1-10) and nests before and after storm surge on 5/26/94.

Distribution, numbers, and territories of males following the storm were determined by extensive observations conducted at each island. The number of males and females most often seen in an island during these observations was assumed to be the true number of Yellow-heads in the island. (See Appendix D for a complete breakdown of number of days each island was observed, how long it was observed and number of males and females found each day of observation.) Distribution of males at Vanderbilt Park in June remained the same as it was prior to 26 May. At Coryeon Point, however, Island 1 had two less singing males resulting in a total of 6 singing males in June. Observations after 26 May at two additional islands at Coryeon Point revealed three males at Island 2 and ten males at Island 3 resulting in a total of 19 singing males (Fig. 9).

Observations of female Yellow-headed blackbirds during this time revealed six at Vanderbilt Park and 18 at Coryeon Point. Females were not evenly distributed among males, ranging from 0-2 per territory. The average number of females per male was approximately one.

Five nests were found at Vanderbilt Park and 14 were found at Coryeon Point. These nests were initiated after the 26 May storm surge and were subjected to another storm surge on 24 June. Rechecks of 16 nests after the second surge revealed the destruction of all but one nest. Seven of the destroyed nests contained young, while the other eight still contained eggs. Only one nest at Vanderbilt Park, containing two young, produced fledglings. The young were due to fledge the day before the storm which may have helped them survive.

During the interval following the second storm, one male, believed to be the sire of the fledglings, was active at Vanderbilt Park for two weeks after 26 June. Eight singing

males, 3 males in Island 1, one in Island 2, and 4 in Island 3, were counted 5 and again 7 days after the storm at Coryeon Point. Surveys completed on 5 and 12 July, resulted in 3 singing males, 2, 0, and 1 respectively.

Apparent nest success for 1994, based on fledgling success, was only 3%. Only 39% of the 74 eggs hatched and only 7% of that 39% fledged.

In 1995, two *Typha* islands, Islands 2 and 3 at Coryeon Point, totaling 45 ha and containing 7 singing males and seven females were searched for nests (Fig. 10). Six nests containing 22 eggs fledged 9 young (Table 2). The Vanderbilt Park site was not utilized by Yellow-headed blackbirds nor was Island 1 at Coryeon Point.

Island 2 contained 3 territories (Fig. 10 ). Territory 1 was approximately 8.83 ha in size but contained no females. Territory 2 was approximately 4.46 ha in size and contained 0 females. Territory 3 was  $\approx$  5.95 acres in size and contained one female that produced one nest.

Island 3 which had contained 10 territories in 1994, contained only 4 territories in 1995 ( Fig. 10). Territory 1 was  $\approx$  7.89 ha in size and contained 2 females and 2 nests. Territory 2 was  $\approx$  5.14 ha in size and contained 1 female and 1 nest. Territory 3 was  $\approx$  5.40 ha in size and contained 1 female and 1 nest. Territory 4 was  $\approx$  7.52 ha in size, contained 2 females and 1 nest.

The inland artificial impoundment at Fishpoint Wildlife Area harbored 6 males at the beginning of the breeding season (5 and 16 May) which by this study's definition, made it a breeding colony (Fig. 11). Males were present in the area due to high water levels resulting from a blocked outlet pipe. Once the pipe was fixed on or around 25 May, the number of

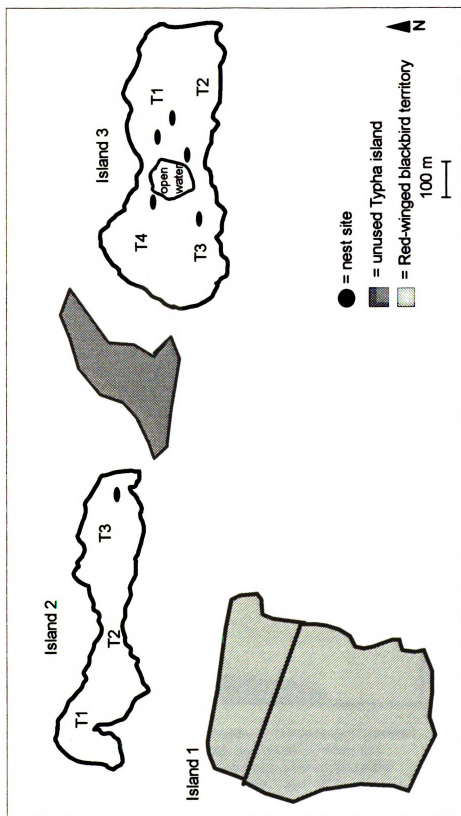


Figure 10. Corey Point Yellow-headed blackbird colony in 1995. Location of approximate territories of singing males (T1-T4) and nests.

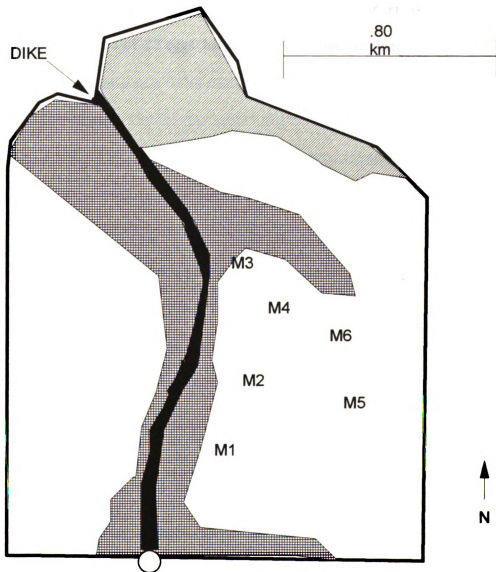


Figure 11. Fishpoint Wildlife Area distribution of Yellow-headed blackbird singing males before 5/30/95. By 6/12/95 all males had left the area. Flooding occurred only on east side of dike. SS= shrub/scrub area; FO = forested area; other areas are a combination of open water and cattail.



males dropped to zero. No nest searches were conducted in this area since numbers of males dropped shortly after breeding began.

Apparent nest success for 1995, based on fledging was 41% (Appendix C). All 6 nests produced young but only 13 of 22 eggs hatched and 9 survived to fledge.

## **DISCUSSION**

At first glance, Michigan's Saginaw Bay would appear to provide an ideal setting for Yellow-headed blackbird breeding. With over 52 km of shoreline emergent vegetation and 606 ha of inland emergent vegetation that could serve as suitable habitat for Yellow-heads and considering the Yellow-head has been a confirmed breeder in parts of the Saginaw Bay for 35 years, the densities of singing males observed in 1994 and 1995 seem low. This becomes even more apparent when considering the number of singing males observed at an "established" breeding colony like Coryeon Point.

Given the size of each of the islands at the colony, the number of males inhabiting each one is much lower than would be expected. Based on the literature, size of male territories within a colony may range from  $7\text{m}^2$  to  $5715\text{m}^2$  (Orians 1980, Lederer 1978, Willson 1966). Territory sizes at Coryeon Point ranged from approximately  $25,000\text{m}^2$  to  $88,000\text{m}^2$ , the smallest territory being nearly four times larger than the largest territory recorded in the literature.

Numbers of females observed at the breeding colonies also reinforces the seemingly minimal use of potential habitat. The number of females found in several territories was comparable to the low end of ranges offered by the literature. Reports range from 1.7 to 5.2 females per territory (Orians 1980, Willson 1966, Fautin 1940). The majority of Saginaw Bay

territories contained numbers of females (0-1) below literature ranges. Low numbers of females in some territories and not in others may involve two possible explanations: 1) some territories may be more preferable than others, or 2) there are not enough females. The first explanation appears more likely because if some territories were not more preferable than others, all males would be expected to acquire the same amount of females (Ammann 1938). Finding unevenly distributed numbers of females per territory, seems to discount Ammann and suggests that some territories must be more preferable.

That the number of singing males and females observed were lower than expected, may be partly explained by the characteristics used to define "potential" Yellow-headed blackbird habitat. For this study, any area, either along the Saginaw Bay coast or within a mile inland from the coast, comprised of emergent vegetation, either persistent or nonpersistent, was considered potentially suitable for Yellow-headed blackbirds. Using vegetation as the sole means of identifying potential habitat discounts the importance of any other habitat attributes that the Yellow-head may prefer or even require. It is probable, then, that some of the original 52 km and 606 ha identified as potential habitat was not suitable for Yellow-heads. While this may not directly effect the number of birds observed, it may affect the number of birds one would expect to find inhabiting the Saginaw Bay and the locations at which they might be found. The differences in numbers of males observed between 1994 and 1995 at Island 1 at Coryeon Point (6, 0) and at the artificial impoundment at the Fishpoint Wildlife Area (2, 6) are two examples that strongly suggest the number of birds observed may vary from year to year depending on factors other than just presence of emergent vegetation.

Estimated nest success, in terms of apparent nest success, was low in 1994. It is difficult to compare nest success in this study to success ranges in the literature due to the wide range the literature seems to offer. Reported ranges are from 0% to 56%, (Orians 1980, Lederer 1978, Willson 1966, Bent 1958, Fautin 1941, Ammann 1938) with the majority being between 20% and 40% . When considering the majorities reported, nest success in 1994, could not sustain colony numbers for any length of time. Apparent success in 1995, was comparable to the literature.

Poor nest success in Yellow-headed blackbirds has been partially attributed to the much lower overall success rates of Yellow-heads compared to other passerine species. It may also be the result of predation on Yellow-head nestlings and eggs by snakes, small mammals (mink, fox, racoon), birds of prey, and gulls. However, it is most often due to heavy rainstorms, high winds, and fluctuating lake levels (Bent 1958). Storm surges appear to be the primary reason for poor nest success results in 1994. The timing of the two storms, one on 26 May and the other on 24 June, almost guaranteed the failure of all nesting attempts that year. The storms came only 28 days apart. From nest initiation to fledge, Yellow-headed blackbirds require 25 to 36 days (Bent 1958). Any renests or new nests would have required immediate initiation following the storm on 26 May to successfully fledge before the second storm. Nest searches on 2 June, seven days after the storm, demonstrated either partially completed nests or nests without a full clutch of eggs. Both scenarios would make it almost impossible for nests to be successful before the second storm.

It would appear then, as is evidenced by lower than expected numbers of singing males, females showing preferential territory selection, and low nest success rates, that

Saginaw Bay does not provide an ideal setting for Yellow-headed blackbird breeding.

The low quality of habitat may be attributed to a variety of factors including but not limited to: 1) quality/type of emergent vegetation available; 2) insufficient or low quality food supplies; 3) short term fluctuations in Saginaw Bay lake levels due to storm surges or seiche activity; and 4) long term fluctuations in Saginaw Bay lake levels.

In the western portion of its range, the Yellow-head is known to use *Scirpus* spp. islands for nesting as often as cattail islands (Orians 1980). However, around the Saginaw Bay, Yellow-heads always chose *Typha* islands to establish territories in, despite the fact that a large number of *Scirpus* islands were also available. The reason for this appears to be that, due to destruction of above ground *Scirpus americanus* biomass by winter scouring in the Bay, it does not emerge in the spring soon enough to be taken advantage of by Yellow-heads. *Typha*, while emerging slightly earlier, also has the advantage of being a persistent emergent, allowing immediate use of islands upon Yellow-head arrival in the spring. It is estimated that at least 8km of what was considered potential habitat were areas dominated by *Scirpus*.

Another potential problem with the quality of vegetation around Saginaw Bay may be stem densities in cattail stands. Orians (1980) found that the quality of a patch of emergent vegetation decreases with increasing numbers of stalks for several reasons. First, the greater the stem densities, the greater the amount of sunlight that is intercepted before it reaches the water where it is available for submerged vegetation. This may result in little in situ production of aquatic insects in denser islands. Second, the denser an island is, the greater probability that aquatic insects will emerge within a few m of the outer edge of emergent

vegetation. Finally, assuming a constant emergence rate, increasing stem densities reduces the number of insects emerging per stem, reducing Yellow-head encounter rates with prey (Orians 1980). That stem densities in some cattail islands in Saginaw Bay may be too thick, may be indicated by more females' selection of the outer most territories in an island.

Finally, *Typha* islands around the Bay that are bordered by forests, may be considered lower quality by Yellow-heads and may not be utilized. Yellow-heads forage almost exclusively on the ground in uplands and rarely forage in trees (Orians 1980). Emerging insects that fly inland are more likely to land in trees and be unavailable to Yellow-heads.

Adult Yellow-headed blackbirds require high amounts of protein, particularly during the breeding season, not only for themselves but also for young (Willson 1966). Protein is obtained by consuming large quantities of invertebrates, most often emerging insects (Bent 1958). The number of invertebrates available on different marshes is a function of lake chemistry, depth, and permanence; the kinds of predators present; and the nature of submerged and emergent vegetation present (Orians 1980). If invertebrate levels in Saginaw Bay are low due to any one of these reasons, it may be limiting Yellow-head densities in the area.

Based on the last two years of study, what appears to be the most likely reason for low numbers of Yellow-headed blackbirds around the Saginaw Bay are both short term and long term fluctuating water levels.

Great Lakes coastal marshes, like those around the Saginaw Bay, are unlike other Midwestern freshwater marshes due to the fluctuations in lake levels caused by seiche activity (Burton 1985). Seiches can produce fluctuations that last from less than an hour to several

hours and vary from a few centimeters to more than a meter (Burton 1985). These daily, even hourly, fluctuations in lake levels may profoundly influence Yellow-headed blackbird nesting success. Not only could seiches flood nests and drown young, but they also could result in the abandonment of certain areas by Yellow-head adults due to insufficient water levels (Bent 1958).

Daily water fluctuations may also help explain territory and nest site selection by female Yellow-heads. While it appeared that the majority of females selected territories with the maximum amount of edge possible, they also appeared to select territories on the shore side of Typha stands rather than the Bay side, even when it seemed less edge might be available on some shore side territories. Eighty-five percent of females selected shore side territories, the remaining 15% were on lake side territories. Daily water fluctuations would be more likely to adversely effect Bay side territories before shore side ones.

While daily water fluctuations may periodically result in a few lost nests, what appears to be the real detriment to breeding Yellow-headed populations around Saginaw Bay and probably the reason for consistently low numbers of birds despite inhabiting the area for 35 years, are the high and low water periods produced by 7-10 year cycles of water level fluctuations. The elevational difference between low and high periods in lake levels is about 1.75m (Burton 1985). The storms that occurred in 1994, and nearly resulted in 100% nest destruction at both breeding colonies, were the worst since 1985. Lake level surges during the storms were 0.63 m above the average water level between 1950 and 1994 (176.58m).

Not only do low and high water levels appear to affect Yellow-head nest success directly, but they may also effect populations indirectly by reducing or increasing the amount

of available habitat around the Saginaw Bay. The elevational differences between high and low water levels can have profound effects on the plant communities of coastal marshes (Harris et al., 1981). At high water levels, much of the emergent zone, up to 50%, becomes open water (Jaworski et al., 1979). At low water levels, open water decreases from 50% of the marsh area to approximately 15% (Burton 1985).

Increases and decreases in Yellow-head populations around the Saginaw Bay may coincide with long term water levels (Fig. 5 ). The arrival of Yellow-heads to Saginaw Bay in 1955, came three years after a record high year in 1952. Their arrival would have come about the time that open water and emergent vegetation would be in a near hemi-marsh state. They were observed again in 1956-58 but not in 1959 because water levels had dropped too low and perhaps because emergent zones were too thick because of the decrease in open water. Yellow-heads appeared again in 1960 when water levels had increased to just below average levels, again at a time that maximized edge with average vegetation stem densities and average water levels. In the years following, according to the literature, Yellow-head populations were more prominent during the decline of water levels after a high water year, remained stable during average water level years, decreased at low water level periods, and then increased during the years prior to a high water year, only to repeat the same cycle again. 1994 appears to have been at or near a high water level year. If this is true, then 1995, should be the first year on the road back to recovery for the Yellow-headed blackbird.



Despite the fact that the Saginaw Bay seems to provide excellent habitat for Yellow-headed blackbirds, upon closer inspection a number of potential factors are revealed , including available food resources, emergent vegetation stem densities, and daily and cyclic water levels, that may prevent the Yellow-headed blackbird from ever becoming a common species in the coastal marshes around Saginaw Bay.

## **APPENDICES**

## APPENDIX A

Table 3. Singing male Yellow-headed blackbird location legal descriptions.

| <i><b>SITE</b></i> | <i><b>LEGAL DESCRIPTION</b></i>                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SITE I:</b>     | At Nayanquing Point Wildlife Area, 3 males were observed in 1994, 2 in 1995 in the south permanent artificial impoundment. This impoundment is located southeast of Prevo Rd. in Fraser Township, Bay Co. MI; T16N, R4E, NE1/4, NE1/4 of Section 26 & NW1/4, NW1/4 of Section 25.                                                                                                                                                                                         |
| <b>SITE II:</b>    | One male was observed in 1994, 2 in 1995, in a .5 mi coastal cattail island located at the north end of Jones Rd., in Hampton Twp., Bay Co. Mi; T14N, R 5E, north of Sec. 6.                                                                                                                                                                                                                                                                                              |
| <b>SITE III:</b>   | Three males were observed in 1994, 2 in 1995, in a .25mi coastal cattail island located at the north end of Finn Rd. in Hampton Twp., Bay Co. Mi.; T14N, R5E , north of Sec. 9.                                                                                                                                                                                                                                                                                           |
| <b>SITE IV:</b>    | Two males were observed in 1994, 0 in 1995, in a .5mi coastal cattail island at located at the north end of Farley Rd. in Hampton Twp., Bay Co. Mi.; T14N, R6E , north of Sec. 10.                                                                                                                                                                                                                                                                                        |
| <b>SITE V:</b>     | Thirty -five males were observed throughout approximately 2.5 miles of cattail islands between Nolet Rd. and ½ mile southeast of Nebobish Rd. in Hampton Twp., Bay Co., Mi.; T14N, R 6E, north of Sec. 11 and between Sections 14 and Section 24 along the coast. Nineteen of these birds were concentrated at the north end of Cotter Rd. at Coryeon Point in the Quanicassee Wildlife Area. This colony was one of two used for the nest success portion of this study. |
| <b>SITE VI:</b>    | East of the Quanicassee River, 6 males were observed in 1994, 0 in 1995, within 3 coastal cattail islands located between Quanicassee Rd. and Bradford Rd., slightly northeast of Vanderbilt Park in Wisner Twp., Tuscola Co., Mi; T14N, R7E, west of Section 21. This colony was second of two used for nest success studies.                                                                                                                                            |
| <b>SITE VII:</b>   | At the Fishpoint Wildlife Area, two males were observed in 1994, 6 in 1995, in a 1.0 mile artificial impoundment located at the northeast corner of the Thomas Rd./ Ringle Rd. intersection in Akron Twp., Tuscola Co. Mi. T15N, R8E, Section 15.                                                                                                                                                                                                                         |
| <b>SITE VIII:</b>  | One male was heard in 1995, in the cattail stands adjacent to the Sumac Boat Launch located in Fair Haven Twp., Huron Co. Mi.; T , R , Sec. 22.                                                                                                                                                                                                                                                                                                                           |

## APPENDIX B

Table 4. Yellow-headed Blackbird nest success summary for 1994 season. Nest ID-V= Vanderbilt Park site, C=Coryeon Point site. First number after letter = Island nest found in; second number = territory found in. BH = nest destroyed before eggs hatched; BF = nest destroyed before hatchlings fledged; M = nest missing-located once.

| Nest ID (a)   | Date Found      | # Eggs    | # Eggs Hatched | # Young Fledged | Period Destroyed | Date Destroyed     | Cause of Destruct. |
|---------------|-----------------|-----------|----------------|-----------------|------------------|--------------------|--------------------|
| 1V22          | 5/24/94         | 4         | 0              | 0               | BH               | 5/26/94            | flooding           |
| 2C12          | 5/25/94         | 2         | 0              | 0               | BH               | 5/26/94            | flooding           |
| 3C13          | 5/25/94         | 2         | 0              | 0               | BH               | 5/26/94            | flooding           |
| 4C13          | 5/25/94         | 4         | 0              | 0               | BH               | 5/26/94            | flooding           |
| 5C14          | 5/25/94         | 1         | 0              | 0               | BH               | 5/26/94            | flooding           |
| 6V11          | 6/2/94          | 2         | M              | M               | M                | M                  |                    |
| 7V22          | 6/2/94          | 1(4)      | 4              | 2               |                  |                    |                    |
| 8V23          | 6/2/94          | 1(4)      | 0              | 0               | BH               | 6/24/94            | flooding           |
| 9V31          | 6/2/94          | 1(4)      | 0              | 0               | BH               | 6/24/94            | flooding           |
| 10V32         | 6/2/94          | 2(4)      | 3              | 0               | BF               | 6/24/94            | flooding           |
| 11C31         | 6/7/94          | 4         | 4              | 0               | BF               | 6/24/94            | flooding           |
| 12C31         | 6/7/94          | 4         | M              | M               | M                | M                  |                    |
| 13C32         | 6/7/94          | 4         | 3              | 0               | BF               | 6/24/94            | flooding           |
| 14C12         | 6/16/94         | 4         | 0              | 0               | BH               | 6/24/94            | flooding           |
| 15C12         | 6/16/94         | 3         | 3              | 0               | BF               | 6/24/94            | flooding           |
| 16C13         | 6/16/94         | 3         | M              | M               | M                | M                  |                    |
| 17C22         | 6/16/94         | 4         | 4              | 0               | BF               | 6/24/94            | flooding           |
| 18C23         | 6/16/94         | 4         | 0              | 0               | BH               | 6/24/94            | flooding           |
| 19C33         | 6/16/94         | 3         | 0              | 0               | BH               | 6/24/94            | flooding           |
| 20C34         | 6/16/94         | 4         | 4              | 0               | BF               | 6/24/94            | flooding           |
| 21C35         | 6/16/94         | 4         | 4              | 0               | BF               | 6/24/94            | flooding           |
| 22C36         | 6/21/94         | 4         | 4              | 0               | BF               | 6/24/94            | flooding           |
| 23C37         | 6/21/94         | 4         | 0              | 0               | BH               | 6/24/94            | flooding           |
| 24C38         | 6/21/94         | 3         | 0              | 0               | BH               | 6/24/94            | flooding           |
| <b>Totals</b> | <b>24 nests</b> | <b>83</b> | <b>29</b>      | <b>2</b>        | <b>3 Missing</b> | <b>20 Destroy.</b> |                    |

a) see Appendix A for legal description of Vanderbilt Park (Site IV) and Coryeon Point (Site V).

## APPENDIX C

**Table 5 . Yellow-headed blackbird nest success summary for 1995 season. Nest ID- C= Coryeon Point site. First number after letter = Island it was found in; second number = territory found in within island. BH= nest destroyed before eggs hatched; BF= nest destroyed before young fledged.**

| <b>Nest ID (a)</b> | <b>Date Found</b> | <b># Eggs</b> | <b># Eggs Hatched</b> | <b># Young Fledged</b> | <b>Period Destroyed</b> | <b>Date Destroyed</b>        | <b>Cause of Destruct.</b> |
|--------------------|-------------------|---------------|-----------------------|------------------------|-------------------------|------------------------------|---------------------------|
| 1C34               | 5/26/95           | 4             | 3                     | 3                      | NA                      | NA                           | NA                        |
| 2C33               | 5/26/95           | 4             | 2                     | 2                      | NA                      | NA                           | NA                        |
| 3C32               | 5/26/95           | 0(4)          | 3                     | 2                      | NA                      | NA                           | NA                        |
| 4C21               | 5/31/95           | 0(3)          | 2                     | 0                      | BF                      | 6/18/95                      | high winds                |
| 5C31               | 6/2/95            | 3             | 1                     | 0                      | BF                      | 6/18/95                      | flooding                  |
| 6C31               | 6/2/95            | 2(4)          | 2                     | 2                      | NA                      | NA                           | NA                        |
| <b>Totals:</b>     | <b>6 NESTS</b>    | <b>22</b>     | <b>13</b>             | <b>9</b>               |                         | <b>2</b><br><b>Destroyed</b> |                           |

**a) see Appendix A for legal description of Coryeon Point (Site V)**

## APPENDIX D

**Table 6. Yellow-headed blackbird island observation accounts at Coryeon Point colony for 1994 and 1995 and Vanderbilt Park for 1994.**

| Colony (year)                | Tot. # Days Obs. | Tot. # Hours Observed | # ♂/♀ Obs. vs # days vs # hrs.                                                                           | Number males/females Assumed at Island |
|------------------------------|------------------|-----------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------|
| <i>Vanderbilt Park ('94)</i> |                  |                       |                                                                                                          |                                        |
| Island 1                     | 8                | 5                     | 1/1 (4 days- 2.5 hrs)<br>0/0 (4 days- 2.5hrs)                                                            | 1/1                                    |
| Island 2                     | 9                | 15.5                  | 3/3 (4 days-8 hrs)<br>2/3 (1 day -2hrs)<br>1/1 (4 days-5.5 hrs)                                          | 3/3                                    |
| Island 3                     | 8                | 9.5                   | 2/2 (4days-4.5 hrs)<br>1/0 (1day-2 hrs)<br>0/0 (3days-3 hours)                                           | 2/2                                    |
| <i>Coryeon Point ('94)</i>   |                  |                       |                                                                                                          |                                        |
| Island 1                     | 9                | 17                    | 8/6 (1day-3 hrs)<br>6/7(3 days-7hours)<br>5/7(1 day-1hour)<br>3/4(2 days-3.5 hrs)<br>2/1(2 days-2.5 hrs) | 6/7                                    |
| Island 2                     | 9                | 8.5                   | 2/1(1 day-1.5hrs)<br>3/2(4days-3.5hrs)<br>1/1 (2 days-2 hrs)<br>0/0 (2 days-1.5hrs)                      | 3/2                                    |
| Island 3                     | 8                | 17                    | 10/9(3days-7hrs)<br>9/8 (1day-2.5hrs)<br>4/5 (2 days-4.5 hrs)<br>2/3 (1day-1.5hrs)<br>1/1 (1day-1.5hrs)  | 10/9                                   |
| <i>Coryeon Point ('95)</i>   |                  |                       |                                                                                                          |                                        |
| Island 2                     | 17               | 29.5                  | 1/1 (3days-4.5hrs)<br>2/1 (5 days-7.5hrs)<br>3/1 (9 days-17hrs)                                          | 3/1                                    |
| Island 3                     | 17               | 41                    | 1/0 (1day-1.5hrs)<br>5/3 (2 days-5.5hrs)<br>3/4(2days-6 hrs)<br>4/5 (12 days-28hrs)                      | 4/5                                    |

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