Al Zelley
Refuge Manager
Missisquoi N.W.R.
P.O. Box 163
Swanton, VT 05488

April 29, 1996

Dear Al,

Enclosed is a copy of my 1995 black tern report for your files. I wasn't sure if Steve Parren had given you a copy yet. I believe he has been keeping you informed about the black tern and other marsh bird work we have planned for this summer. I have enclosed though a proposal in your format for you to look at and so it can serve as my request for a permit to enter the closed portions of the refuge. I plan to start setting up the marsh bird census routes around May 15, the aerial photos will be taken around June 1, and the actual censuses will occur during the month of June.

Are you going to be able to hire some help for the refuge to replace Deb? How does Cranberry Pool look this spring, is there any water in it? I would be curious to see if it will hold water this year. Will you folks be doing a black tern census on the refuge again this summer? If you want some help let me know, I would be glad to help out since I hope to be up there censusing portions of the refuge anyways. I hope things go smoothly up there this spring with the cookie cutter, it is quite a rig.

Sincerely,

Nat Shambaugh

Nat Shambaugh
RD 2, Box 4155
Montpelier, VT 05602

223-6011 (H)
244-4510 (W)

4. JUSTIFICATION:

In 1996, The Vermont Dept. of Fish and Wildlife (VDFW) and the U.S. Fish and Wildlife Service (USFWS) plan to perform vegetation control activities at various managed wetlands in Vermont. The marshes where this is proposed are: Dead Creek W.M.A., Mud Creek W.M.A., and Mississquoi N.W.R. (Long Marsh, Charcoal Creek and Big Marsh Slough). Cattails (typha ssp.) and other emergent vegetation are taking over these marshes, reducing the amount of open water, and making them less suitable for waterfowl. It is anticipated that these management activities will be in the long term best interest of other "nongame" marsh birds as well as waterfowl, due to the increase in interspersion of water and vegetation. This study aims to collect baseline information on marsh bird response to the proposed vegetation management so it will be possible to determine the short and long term effects of this management strategy.

The species selected for this study will be the black tern, a state listed threatened species, and several marsh nesting birds such as bitterns and rails about which little is known in Vermont. In order to gain the most information from this study, several projects which will require similar data are being consolidated. The foundation upon which this project is built is a series of aerial photographs to be taken shortly after the vegetation management and during the black tern and other marsh bird nesting seasons. These photos will be utilized to document the extent of vegetation control, and determine habitat usage by the various marsh birds studied both at the areas of management and selected other marshes in the Champlain valley.

In order to determine the effects of vegetation management on marsh birds it is necessary to have reliable estimates of abundance. For black terns a suitable census technique has been developed over the past several years (Shambaugh 1992). There is very little information on presence or abundance of bitterns and rails in Vermont. Two small scale surveys have been performed over the last 10 years (Kibbe 1991 and Shambaugh 1995), but a uniform methodology has not been developed. In the Great Lakes Region, a protocol for volunteer monitoring of marsh birds has been developed, tested, and put into use for several years (McCracken 1995). This method will be tested in Vermont in 1996 both to gather information on these species and to determine if this protocol could be used as the basis for a volunteer marsh bird monitoring program in Vermont.

In addition to the above work, the effort initiated in 1995 to boost the black tern breeding population at South Bay W.M.A. will be continued. This project aims to increase

suitable nesting substrate for this species by placing artificial nest platforms within the marsh. This marsh has a seeming shortage of suitable nesting habitat and a breeding population of only 4-5 pairs. In 1995 six platforms were placed in the marsh, three large and three small (Shambaugh 1995). Five pairs of black terns nested in this wetland in 1995, three on large style platforms and two on natural substrate. Since all three large platforms were utilized, it is clear that terns will readily use platforms and the large size is preferred. It is proposed that nest substrate be supplemented in this marsh for a five year period in order to determine if the population will respond.

5. PROCEDURE:

A) MATERIALS AND METHODS

Vegetation management: The vegetation control will be performed by VDFW and USFWS personnel using a floating barge termed a "cookie cutter" owned by the USFWS. Cutting should begin around April 15, and be complete by June 1, 1996.

Aerial photography: Aerial photographs of the areas depicted in Appendix 1 will be taken on June 1 ($\pm$ one week). The photos will be color infra-red 9" x 9" photos taken at a scale of 1:5000 as in the black tern habitat study of 1994 (Shambaugh 1995). The scale was selected to enable ease of comparison with ortho-photos of the areas involved.

Black tern census: The black tern nest survey will be performed as in previous years (Shambaugh 1992) except that an effort will be made to locate all nests so they can be plotted on the aerial photographs. In addition, a Global Positioning System (GPS) unit (if available) will be used to identify precise coordinates for each nest. This information will be useful when it comes time to interpret the habitat data from the photos and for entering the data into a Geographical Information System (GIS) if desired.

Marsh bird monitoring: The Long Point Bird Observatory marsh bird monitoring technique (McCracken 1995) will be used in 1996 in order to collect data comparable to similar data from other parts of the country. This protocol was selected because it has already been developed, tested, and is in widespread use. In addition, since this protocol was designed as a volunteer based monitoring program it is hoped it could be the basis for a similar program in Vermont. A GPS unit will be used to precisely describe the locations of monitoring stations and routes so they can be repeated in future years if desired. The field work for this portion of the study will be shared between the author and Steve Parren of the VDFW.

Artificial nest platforms: Seven large style artificial nest platforms of the design used previously in Vermont (Shambaugh 1996) will be placed in South Bay W.M.A. These platforms will be placed within the emergent vegetation at the area where black terns have been nesting in recent years.

B) RESULTS:

The results of these efforts will be presented in the following ways in a final report:

1) GPS locations for all black tern nests found and GPS locations for the marsh bird monitoring routes and stations will accompany the aerial photos (if a GPS unit becomes available in time).
2) Results of the marsh bird monitoring efforts will be presented in tabular form similar to the 1995 data (Shambaugh 1996).
3) Results of the black tern census will be tabulated as in previous years (Shambaugh 1996).
4) Utilization rates will be listed for the artificial nest platforms.
5) Based on the amount and quality of data generated by the aerial photos, black tern census, and marsh bird monitoring efforts, a proposal will be submitted listing recommended analyses which could be performed on the above data to derive habitat utilization information.

C) INTERPRETATION:

The amount and type of interpretation which should be performed in order to synthesize all of the above information and the costs involved can not be determined until the data is in hand. Therefore this proposal covers only the field work necessary to collect the data and the time necessary to compile and summarize the data.

6. COOPERATORS: Steve Parren of the Vermont Dept. of Fish and Wildlife, Nongame and Natural Heritage Program will assist with this project, but will be concentrating on the south end of Lake Champlain.

7. RESPONSIBILITY: Nathaniel Shambaugh, on contract to the State of Vermont, and Steve Parren of the Vermont Dept. of Fish and Wildlife will be the only persons with any responsibility with respect to this project.

8. COST: The funds for this project are coming from the Vermont Dept. of Fish and Wildlife.

9. SCHEDULE:

April and May 1996: Vegetation control by VDFW and USFWS.

May 1996: Set up platforms and monitoring routes.

June 1, 1996 (approximately): Aerial Photographs taken.

June 1996: Marsh bird monitoring and black tern census performed.

July 1996: Determine platform usage and remove platforms.

July thru November 1996: Data tabulation and report generation.

10. REPORTS:

A final report on the field work will be submitted by April 1, 1997.

11. PUBLICATIONS: It is intended that the results from this project will be published at some future date.

Submitted by:_____ Date:_____

Nathaniel Shambaugh
RD 2, Box 4155
Montpelier, VT 05602

BLACK TERN AND OTHER MARSH BIRD RESEARCH ACTIVITIES IN VERMONT: 1995

FEBRUARY 16, 1996

Submitted to: The Nongame and Natural Heritage Program
Vermont Department of Fish and Wildlife
103 South Main St.
Waterbury, VT 05671

NATHANIEL SHAMBAUGH

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ACKNOWLEDGMENTS

I would like to thank both Steve Parren and Norm Moreau of the Vermont Department of Fish and Wildlife (VDFW) for their help searching for black tern colonies on Lake Memphremagog using a department motorboat. Also Chris Fichtel of The Nature Conservancy and Steve Parren (VDFW) for looking for black tern activity at East Creek and Little Otter Creek respectively. I would also like to thank Ted Allen for volunteering to fly me over various wetlands so I could get a birds eye view, and Deb Poelker of Missisquoi National Wildlife Refuge for giving up some of her days off to help me survey the refuge. This project would not have been possible without the support of the VDFW Nongame and Natural Heritage Program, the Vermont Nongame Wildlife Fund, the USFWS Endangered Species Office, and the USFWS Region 5 Nongame Migratory Bird Office.

INTRODUCTION

Marsh bird monitoring activities by this investigator in 1995 were expanded beyond black tern (Chlidonias niger) research to include an evaluation of monitoring techniques for other marsh birds such as rails and bitterns. Field work was therefore divided into two phases: black tern population monitoring, and (other) marsh bird censusing. In addition, a review of recent research activities throughout the country was undertaken to determine research and management needs for the black tern in Vermont (Shambaugh, 1995a).

BLACK TERNS

Black tern (BT) monitoring activities in 1995 were dominated by a search for new or previously undocumented nesting colonies in both the Lake Memphremagog and Lake Champlain basins. For those not familiar with Vermont's wetlands, the location of all known black tern colonies in Vermont are depicted in Figures 3 through 8. The single known colony within the Lake Memphremagog basin (South Bay) has had only 2-4 pairs in recent years (see Table 1). It was therefore decided that a thorough search of the main lake was warranted to determine if any other colonies are present. The search of the Lake Champlain basin for additional colonies was initiated because of the low lake levels during the spring of 1995. On May 15, 1995, when black terns should be looking for nest sites, the Lake Champlain lake level was 29.1 m as compared to a 40 year mean of 30.0 m. Only once in the past 40 years has the water been lower on this date. A water level about one meter lower than normal could have a profound effect on nesting habitat availability so an effort was made to determine where black terns chose to nest under these conditions.

In addition to the colony searches and routine census work, artificial nest platforms were put out on Lake Memphremagog at the South Bay colony site. This was undertaken because it appears that there is a shortage of natural nest substrate in this area. Artificial nest platforms have been utilized on an experimental basis previously in Vermont and several other states (Hickey 1995, Mazzocchi 1995, Shambaugh 1994). In Vermont, 11 platforms of two designs ('large' = 0.8 m x 0.8 m and 'small' = 0.4 m x 0.4 m) were put out at the Goose Bay colony site within

Missisquoi National Wildlife Refuge (N.W.R.) in 1993 (Shambaugh 1994). The purpose of this experiment was to determine if platforms would be used by black terns and which design was preferred. Of the six pairs of terns which nested in the Goose Bay area in 1993, two nested on 'large' platforms, one on a 'small' platform, two on natural substrate, and one could not be located. The fate of any of these nests is unknown. This initial attempt demonstrates that this management technique is feasible in that black terns in Vermont will use artificial platforms when available.

In other parts of the country artificial nest platforms have been used for this species at least as far back as 1988 when William Bush (Bush 1988) put out 0.6 m x 0.6 m styrofoam platforms within Erie National Wildlife Refuge in Pennsylvania. Unfortunately, no black terns nested on the refuge so no information was gained. In 1990 and 1991 a total of 20 platforms were put out in marshes along the Mississippi River in Minnesota (Faber 1992). These platforms were also of two designs, 0.6 m x 0.6 m and 0.8 m x 0.8 m wooden frames with wire mesh across the top. Eight of 10 large style platforms were utilized and four of 10 small. Nest success, defined in this Minnesota study as having at least one egg hatch, was significantly greater for artificial platforms than natural sites (89% vs. 52%, $X^2 = 4.36$, $p = 0.036$). Tonawanda N.W.R. in western New York experimented with artificial platforms in 1992 by putting out eight platforms in one marsh; four were utilized and three of those were successful. Platforms were used at Tonawanda N.W.R. again in 1995 as part of a habitat selection experiment. This time 14 platforms were put in one marsh. Fourteen pairs of black terns nested in the marsh, four of them on platforms (J. M. Hickey 1995). Also in 1995, 25 platforms were put out at Perch River Wildlife Management Area (W.M.A.) in central New York. Eleven of 48 nests found in this area were on artificial nest platforms; again nest success was greater on platforms at 55% vs. 29% (I. Mazzocchi 1995). It can be seen from these various experiments that black terns will readily use artificial platforms of several designs. Larger platforms seem to be preferred over smaller, and nest success seems to be as good or better than on natural substrate.

Supplementing nest substrate with artificial platforms may be of use as a management tool in situations where there seems to be insufficient suitable nest substrate, the water levels fluctuate drastically, or terrestrial predation seems to be a problem. Platforms were put out at the South Bay colony site of Lake Memphremagog in 1995 because it has seemed to this investigator for several years that this marsh has a shortage of suitable nest substrate. In this marsh there is very little muskrat activity and therefore minimal floating vegetation or debris to use as nest substrate. This area has been a black tern nesting area at least

intermittently for 25 years. It is unknown why this population is currently so small, but a lack of suitable nesting substrate may be contributing.

MARSH BIRDS

During the summer of 1995 preliminary work was done towards the goal of developing a method for monitoring population levels of other marsh birds such as rails and bitterns within Vermont marshes. Similar to the black tern, these birds are obligate marsh dwellers with a limited or unknown range in Vermont.

The Vermont Department of Fish and Wildlife has proposed vegetation management efforts at both Dead Creek W.M.A. and Mud Creek W.M.A. in the near future in order to control cattail (Typha spp.) growth. Although the primary goal of this management is to improve waterfowl habitat, it has been recognized that it is important to take into consideration 'nongame' species. The first step in this process is to evaluate the impacts of any management activities on obligate marsh birds. It is believed that the management proposed could benefit both game and nongame birds by increasing habitat diversity but this remains to be documented.

The overall goal of this project is to develop a protocol for monitoring not just presence but also abundance of marsh birds so that the effects of management activities on these species can be assessed. Ideally, the method should be suitable to be used as the basis for a volunteer monitoring network. The objective for 1995 was to gather preliminary data on the presence of selected species while determining which techniques might work best in Vermont. Species chosen for this project were: American bittern (Botaurus lentiginosus), least bittern (Ixobrychus exilis), Virginia rail (Rallus limicola), pied-billed grebe (Podilymbus podiceps), and common moorhen (Gallinula chloropus). These species were chosen because they are obligate marsh inhabitants, and very little is known about their population status in Vermont. The red-winged black bird (Agelaius phoeniceus) and marsh wren (Cistothorus palustris) were also included because they are ubiquitous, highly visible and their relative abundance might be used to indicate suitable habitat for the more secretive species.

The rails, bitterns, grebe, and moorhen are very difficult to census accurately because they are secretive, and because their habitat is often inaccessible. The technique most commonly used is to play recorded vocalizations of the various species to elicit a vocal or visual response. The use of taped calls to elicit responses from secretive marsh birds has seen a large increase in interest in recent years as concern for these species has

the past five years. The platforms were put out on May 21, when black terns were present but egg laying had not yet commenced. Platforms were put out scattered through the emergent softstem bulrush (Scirpus validus) and pickerelweed (Pontedaria cordata) which dominate this portion of the marsh. The platforms were anchored in place using nylon cord (approximately 1.5 m long) attached to pieces of concrete block, after the platform was in place some of the previous year's dead emergent vegetation was tied on top using twine.

MARSH BIRDS

The technique selected for the marsh bird survey was a modification of the call-response technique of Gibbs and Melvin (1993). In order to make this survey as reproducible as possible, stations were located on aerial photographs taken of Dead Creek W.M.A (Addison). and Mud Creek W.M.A. (Alburg) at a scale of 1:5000 in 1994 (Shambaugh 1995). Stations were located approximately every 150 m along the edge of dense cattail beds. At Dead Creek the route included 15 stations along the main creek channel from the Brilyea dams north about 2.6 km to the end of the emergent vegetation bed north of Route 17 (see Figure 1). At Mud Creek the route consisted of 12 stations starting at the boat launch and extending around the periphery of the south pool within the main marsh (see Figure 2). In addition, a portion of Dead Creek W.M.A. which underwent vegetation control in 1994 was surveyed using the same technique. This area, Brilyea Pond West (see Figure 1), was drained during the summer of 1994 then the dense cattails were crushed using a bulldozer. Although there is no pre-treatment data, and the monitoring protocol has not been finalized, it was decided to start gathering data on this site.

The aerial photos were taken into the field during the fieldwork in order to relocate each station as accurately as possible. The distance between stations was a compromise necessitated by the conflicting goals of detecting all birds present, and covering each study area completely in a reasonable time.

The tape recording utilized for this project was derived from Cornell Laboratory of Ornithology (1983) and Borror (1967). The format consisted of approximately 20 seconds of calls followed by approximately 10 seconds of silence, the silences being present to listen for responses. This was repeated twice for each species, then the next species' calls were started. The total length of the tape was about five minutes. The marsh wren and red-winged blackbird were not included on the tape because they vocalize often without enticement. The numbers recorded for the latter two species were those heard to vocalize between each pair of stations.

RESULTS AND DISCUSSION

BLACK TERNS

Lake Memphremagog

On May 21, 1995 six artificial nest platforms (three large and three small) were placed at South Bay W.M.A. in the area where black terns have been nesting in previous years. At the time the platforms were placed seven adult terns were seen in the area, with birds observed performing courtship displays and perching on several old muskrat structures, though no nesting activity had started. The platforms were utilized as perches by the terns immediately after being put in place.

On June 12, 1995 Norm Moreau, Steve Parren (S.P.), (both of VDFW) and myself (N.S.) searched the main body of Lake Memphremagog, south of the Canadian border, by motorboat for suitable nesting areas or unknown nesting colonies. No colonies were found, and the only promising emergent marsh was at the mouth of the John's River. S.P. and N.S. also canoed to the South Bay colony site to check on nesting progress there. Ten adults and five nests were found, three nests had three eggs, and two contained two. Of the five nests found, three were on the large style platforms and two were on natural substrate. The two nests on natural substrate were both found on the muskrat structures where terns were seen perching on May 21.

On July 2, the South Bay colony site was re-visited. All nest sites occupied on June 12 were vacant at this time, but 10 adults were still present and actively defending a patch of emergent vegetation in the center of the marsh. This indicated that all five nests may have successfully hatched and the adults were defending hatchlings which had congregated in this emergent bed. To avoid excessive disturbance, the vegetation was not entered to confirm this.

Because all three large platforms were utilized, and no small, it appears that large platforms may be preferred over small. This supports the data from 1993 when two of three platforms used were of the large design. These data also indicate that there may in fact be a shortage of suitable nest substrate at the South Bay colony site, or that artificial platforms are preferred over natural sites. The evidence that all five pairs hatched successfully also indicates that survival was not decreased for those nesting on artificial platforms.

Lake Champlain

On May 20, black tern census work was initiated in the Lake Champlain basin for 1995. On this date, portions of M.N.W.R. were surveyed for black tern activity to determine if nesting had started. It was discovered that Cranberry Pool, an impoundment within the refuge and a historic colony site, had essentially no water in it. This pool normally floods to a 0.5 - 1.5 m depth during spring runoff then gradually recedes during the summer. Cranberry Pool is an actively managed impoundment within the refuge where black terns have nested for at least the past five years. Apparently low spring runoff and/or a lack of beaver damming activities caused this lack of a normal spring flood. This marsh was therefore unavailable for black tern nesting in 1995.

By the first of June when breeding should be starting, it was apparent that Lake Champlain water levels would remain low during the 1995 breeding season. On June 1, the water was approximately 0.6 m lower than the 40 year mean for this date (29.1 m vs. 29.7 m).

Dead Creek W.M.A. was censused on May 28, and June 7, 1995. Of the five areas where black terns have been found to nest previously only the Panton Rd N. site had nesting activity. At this colony five adults were observed, two nests were found containing three eggs each, and a third nest was probably present but could not be located. Also on June 7, the Little Otter Creek (Ferrisburgh) colony sites were searched for black tern nesting activity and none was found. The Little Otter Creek area was re-surveyed by S.P. on June 28, again with no black terns observed.

By mid-June the lack of observed nesting in the south end of Lake Champlain made it clear that either the terns were not nesting or they had moved to other sites. A detailed search was therefore undertaken for either new or previously undiscovered colony sites. The following areas were investigated by canoe or from shore: Brilyea Pond West, Hospital Creek, and Whitney Creek (all within Addison,VT), The Narrows (West Haven, VT), Bulwagga Bay (Crown Point, NY), Putts Creek W.M.A. (Crown Point, NY), Kelly Bay (Alburg, VT), King Bay (Champlain, NY), and East Creek (Orwell, VT). No black tern nesting was found at any of these locations.

On June 17, a search of the periphery of Missisquoi N.W.R. was performed with the help of Deb Poelker, Refuge Operations Specialist. Normally in mid-June, one would find adults incubating eggs or attending newly hatched young. The results of the 1995 survey serve to illustrate how unusual this year was. At Goose Bay 14 adults and one fledgling were observed, at Gander Bay an active colony was found for the first time at this locale with 12 adults and three fledglings. At Charcoal Creek North a total of 28 adults were observed with those nests found containing eggs. We

found 24 adults and one fledgling at Charcoal Creek South. Apparently some of the terns in these areas started nesting extremely early in the year (presumably due to the low water). Generally in Vermont black terns lay eggs around May 25 - June 20. For fledglings to be flying well on the 17th of June they must have come from eggs laid around the first week in May! To find fledglings and eggs at the same time in one area is highly unusual in this investigator's experience, especially this early in the summer.

It is not known whether the presence of a colony at Gander Bay is a response to the low water levels in 1995 or if they nest here periodically. This site had been surveyed twice in the previous five years with no nesting found.

Mud Creek W.M.A. was censused twice for black terns, on June 4 and July 2. It was found that the north end, where black tern nesting is generally concentrated, was isolated from the rest of the open water by cattails. The emergent vegetation in this marsh is unusual among Vermont's tern nesting areas in that it is primarily floating cattail mats. These mats can change position dramatically during the winter, and that is what happened in the winter of 1994-1995. It was therefore necessary to maneuver a canoe across several meters of this mat in order to reach open water in the north pool. If this trend of encroaching cattails at Mud Creek W.M.A. continues, it is anticipated that the north pool will become inaccessible to people within several years. Within 10 to 15 years this Wildlife Management Area as a whole will probably not be a significant nesting area for black terns because the cattails will have taken over and little open water will remain.

As in the past two years, the majority of black tern nesting activity at Mud Creek was in areas of the marsh which are inaccessible. The number of breeding pairs had to be estimated based on repeated counts of flying adults. Since these counts were made from a distance and not from flushed birds, they are probably underestimates.

MARSH BIRDS

Two areas were selected for the preliminary assessment of marsh bird monitoring techniques: Dead Creek W.M.A., in the area of Route 17, and Mud Creek W.M.A., in the south pool of the main marsh. These areas were chosen because they are both on state managed lands, are both impoundments, and are both proposed for some sort of vegetation management in the near future. Dead Creek was surveyed three times, on April 30 as a practice run checking for only least bittern (LB), American bittern (AB), and pied-billed grebe (PBG), then the more formal attempts on May 28, and June 25, 1995 when Virginia rail (VR) and common moorhen (CM) were included. On the April 30 survey the only birds detected were one PBG and

one AB. This was clearly too early to find nesting birds; even the marsh wrens were not present in large numbers. Table 2 lists the results of the two later surveys at Dead Creek. The route was canoed in the same direction each time, starting at the south end at Brilyea ponds at about 7:00 am, and canoeing north the full length to the north end of the emergent vegetation. Canoeing the route in the same direction makes repeated visits more comparable but may add a bias to early or late stations due to weather, time etc. As at Mud Creek, the censuses were started between 6:30 and 7:00 am and took about three hours to complete.

It can be seen that there were few responses by AB, PBG, or CM to the taped vocalizations at Dead Creek (Table 2). This may be due to lack of good habitat, large territory sizes for these species, or poor response to the tapes. The VR seemed to be fairly numerous in the area, especially around sites 3-5 and 14-15.

The LB seems to respond reliably to the tape; birds were detected in the same area on both dates. Because this species is not as loud as the others they can not be heard for great distances. The ability to hear this species declines rapidly as wind speed increases so it is imperative that there be only minimal wind during the survey attempt.

Two sora (Porzana carolina) were heard in the Dead Creek area during the 1995 marsh bird surveys. One was heard in response to a Virginia rail call at site 3. The other called from a dense cattail patch in Brilyea Pond as described below. In addition, two immature bald eagles (Haliaeetus leucocephalus) were observed together at Brilyea Pond West.

The Mud Creek survey area was made up of a total of 12 stations, three from the boat launch through the swampy area to the portage at the peninsula, and nine around the periphery of the south pool. As at Dead Creek, the stations were censused in the same order each time starting around 7:00 am on May 31, and July 2, 1995. The trends at Mud Creek are similar to Dead Creek: fair to poor response for AB, PBG, and CM while VR responded well again (see Table 3).

Unfortunately, only one LB was found during either visit to Mud Creek. This may be due to the poor carrying quality of this species' vocalizations, or it may be that they were not present. Because this marsh is a large open marsh there is often a strong breeze, making it difficult to hear the LB. Again it appears critical that it be very calm if one wants to census this species well. There was probably a PBG nest at site B as the response came from the same location on both visits, and there was probably one near site three as well. No AB responded to the tape on either visit though they are routinely seen at this marsh and one was even flushed from near site 5 on July 2. There may very well be only one pair of AB which utilize this marsh so a lack of response on any one day might not be unexpected, but the fact that an AB was present in the immediate vicinity and didn't

respond to the taped calls is disconcerting. As at Dead Creek, the VR was by far the most common of the species of interest. The center of abundance for VR at this marsh appears to be the area around sites 3-5, which is the south end of the marsh near the old railroad tracks.

One census attempt was conducted at the Brilyea Pond West area of Dead Creek where cattail control was performed in 1994. The results in Table 4 show a very low response for all species surveyed. In fact the only response observed was a single AB. Past the end of the route where dense cattails predominate, a VR was heard and an indeterminate bird. Upon playing the standard tape two VR responded. At that point a sora call was played and a sora responded, confirming the indeterminate bird to be a sora. No black terns were observed in this area during 1995.

Also, three or more pied-billed grebes were heard on several occasions at both Goose Bay and South Bay black tern colony sites. Both of these areas apparently contain very good habitat for this species as more were heard at these locations than on the monitoring routes. In fact S.P. and N.S. observed an adult PBG accompanied by three chicks at South Bay on June 12.

CONCLUSIONS

BLACK TERNS

The 1995 nesting season was a difficult one for black terns in Vermont. At the south end of Lake Champlain only three nesting pairs were found instead of the normal 10-20. This may have been due to the low water levels, but the three pairs found were located at Panton Rd. North, a colony site under the direct influence of Lake Champlain. If the low lake levels were a problem one would think the terns would tend to nest at Route 17 North or South, both of which are within an impoundment where water level was approximately normal. The cause of this poor nesting is unknown, but the six-year record of nesting activity indicates a decline during the whole period (see Table 1). The next several years will tell us if this trend will continue. It may be that this reflects the decline in habitat due to the takeover of cattails and that controlling the cattails as has been proposed will reverse the trend.

At the north end of Lake Champlain, Cranberry Pool was devoid of water due to low lake levels, lack of beaver activity, failure of the water control structure, or a combination of the above. If this continues in the future it will mean the loss of a major refugia for this species in the north lake, away from the fluctuating lake levels and away from human disturbance. This marsh is unique among Vermont black tern colonies in that it is a buttonbush swamp and that

the area is closed to the public. Reestablishment of a functioning impoundment at Cranberry Pool would benefit not only the waterfowl of M.N.W.R. but also black terns and other reclusive marsh birds.

At both Mud Creek and Charcoal Creek the black terns seemed to do quite well this year even though one of these is an impoundment and the other fluctuates with the lake. Unfortunately, as mentioned earlier, Mud Creek appears to be filling in with cattail mats and may not have significant open water in 10 - 15 years unless vegetation management is undertaken. In the immediate future this won't affect the terns but it will make it more difficult to determine the actual number of nesting pairs utilizing the marsh. Charcoal Creek is now unquestionably the most important nesting area for black terns in Vermont Almost half of the active nests in Vermont have been found there during each of the last two years.

On the positive side a new colony was discovered at Gander Bay in Missisquoi N.W.R. This bay is next to Goose Bay on Missisquoi Bay, and therefore directly affected by fluctuating lake levels. It may be that this area had suitable nesting habitat in 1995 only because of the low water levels, or it may become a routine nesting area.

The high utilization rate of artificial nest platforms by black terns in 1995 in both Vermont and New York (Mazzocchi 1995, Hickey 1995) indicates that this management technique has much potential for supplementing nest substrate. Terns readily use these structures, and reproductive success appears to be as good or better than on natural substrate. This technique is not a suitable strategy for the long-term management of this species, but should be considered as a stop-gap measure when conditions warrant.

MARSH BIRDS

The use of taped vocalizations to determine the presence of these marsh bird species appeared to work well. The Virginia rail, least bittern, and American bittern all tended to approach the tape to investigate, especially the Virginia rail, less so with the others. Virginia rails appear to be quite common in both of the marshes investigated. All species except pied-billed grebe and common moorhen were detected in larger numbers at Dead Creek than Mud Creek. The reason these two alone are more numerous at Mud Creek is unknown but may be simply an aberration due to the low numbers.

The results found at each station on different dates do not appear to be quantitatively comparable. If two Virginia rail are found at a given station on the first census, there is little likelihood of finding two there the second time. The only thing one can say is that if a species was detected at a station the first time, it is likely one will be

detected somewhere nearby on the second visit. The common moorhen, pied-billed grebe, and American bittern may be better censused early in the season, while the Virginia rail and least bittern appear to respond better later, this is similar to the results found by Gibbs and Melvin (1993). Because of these trends it is important to survey each marsh twice during the season.

With the technique utilized it is unknown how well sites within a route can be compared. Each route was censused in the same direction each time. Therefore, the first site was always censused around 7:00 am, while the last was censused around 10:00 am. It is unknown how the effects of time, sunlight, wind, temperature, etc. effect response rates. Some of this information has been gathered for the techniques used by Gibbs and Melvin (1994), and McCracken (1994), this makes it advantageous to follow one or the other method as closely as possible.

It was found that the attempt to record all responses to the tape biased results toward narrower marsh areas. At Dead Creek for instance, there are some areas where responses are easily heard between the station and the marsh margin, while at others the distance responses could be heard was only about half way to the margin. In very large or wide marshes with inaccessible vegetation, large portions are not adequately surveyed. For this reason it would be advantageous to adopt the McCracken method which quantifies only responses within a 100 m radius of the station. All birds observed outside this circle are recorded as "other marsh birds" but not quantified.

There appears to be a slight tendency for Virginia rails to be most common where black terns tend to nest (sites 3-5 at Dead Creek and 3-4 at Mud Creek), and marsh wrens to be most numerous where Virginia rails are. Observations of aerial photos indicate that these may be areas of greater interspersion of water and vegetation. More data is necessary to determine if these trends are real.

The fact that sora were heard on two occasions at Dead Creek makes it possible that this species is more common than generally believed in Vermont. As this is another species dependent on dense emergent marshes the addition of this species to the monitoring protocol should be considered.

Pied-billed grebes were not detected in large numbers at either site in 1995. It is possible that these are not very suitable marshes for this species. This bird was heard prominently and often at both Goose Bay and South Bay black tern colony sites in 1995. These marshes are not cattail marshes, but are made up of less dense emergent vegetation. Since this species swims through vegetation to travel instead of walking like the rails and bitterns, it is logical that it would prefer these marshes.

The results of the marsh bird survey at Brilyea Pond West indicate that vegetation management has a possible

detrimental impact on these species during the first year after management. This is to be expected because the areas where control is effective had very sparse emergent vegetation, which is not suitable for rails, bitterns, or black terns. It is expected that this will improve dramatically in the next several years, but it demonstrates how important it is to leave some vegetation undisturbed.

RECOMMENDATIONS

1) Coordinate with Canadian researchers to census the Canadian portions of Lake Memphremagog and Missisquoi Bay for additional black tern colonies.
3) If at all possible, repair the water control structure at Cranberry Pool within Missisquoi National Wildlife Refuge so that it will hold water.
4) Continue to place artificial nest platforms at South Bay W.M.A. while efforts are undertaken to determine if a management strategy is necessary for this area. This can be reevaluated if #1 above reveals more colonies on this lake.
5) Continue planning for the proposed vegetation management at both Dead Creek W.M.A. and Mud Creek W.M.A. so that control can be attempted at at least one of these sites within the next 1-3 years while minimizing any possible negative impacts on marsh nesting birds.
6) Consider the use of artificial nest platforms in or near traditional black tern colony sites if vegetation control occurs there. Use of platforms should be continued for two years or until natural nesting substrate is sufficient.
7) Finalize the prototype methodology for marsh bird monitoring before the 1996 breeding season and test it in more detail during 1996. Specific recommendations include:
   - include sora
   - either utilize the Long Point Bird Observatory technique (McCracken 1994), or something similar where the results are semi-quantitative so trends can be detected.
   - each route should be made up of about eight stations 100 or 150 m apart. This distance is sufficiently large that a significant portion of a marsh can be surveyed.
   - attempt to complete each survey within two hours, and only census on calm days.
   - perform surveys between June 1 and July 1, or at most May 20 - July 10.
   - at least initially, each site should be surveyed

twice, early June, and late June. It may be possible to reduce this to one survey per site in future years, once more experience is gained as to the optimal timing.
- include wetlands other than cattail marshes, such as swamps and less dense marshes in the overall monitoring program.

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FIGURE 1.

1995 DEAD CREEK MARSH BIRD CENSUS ROUTES AND STATIONS

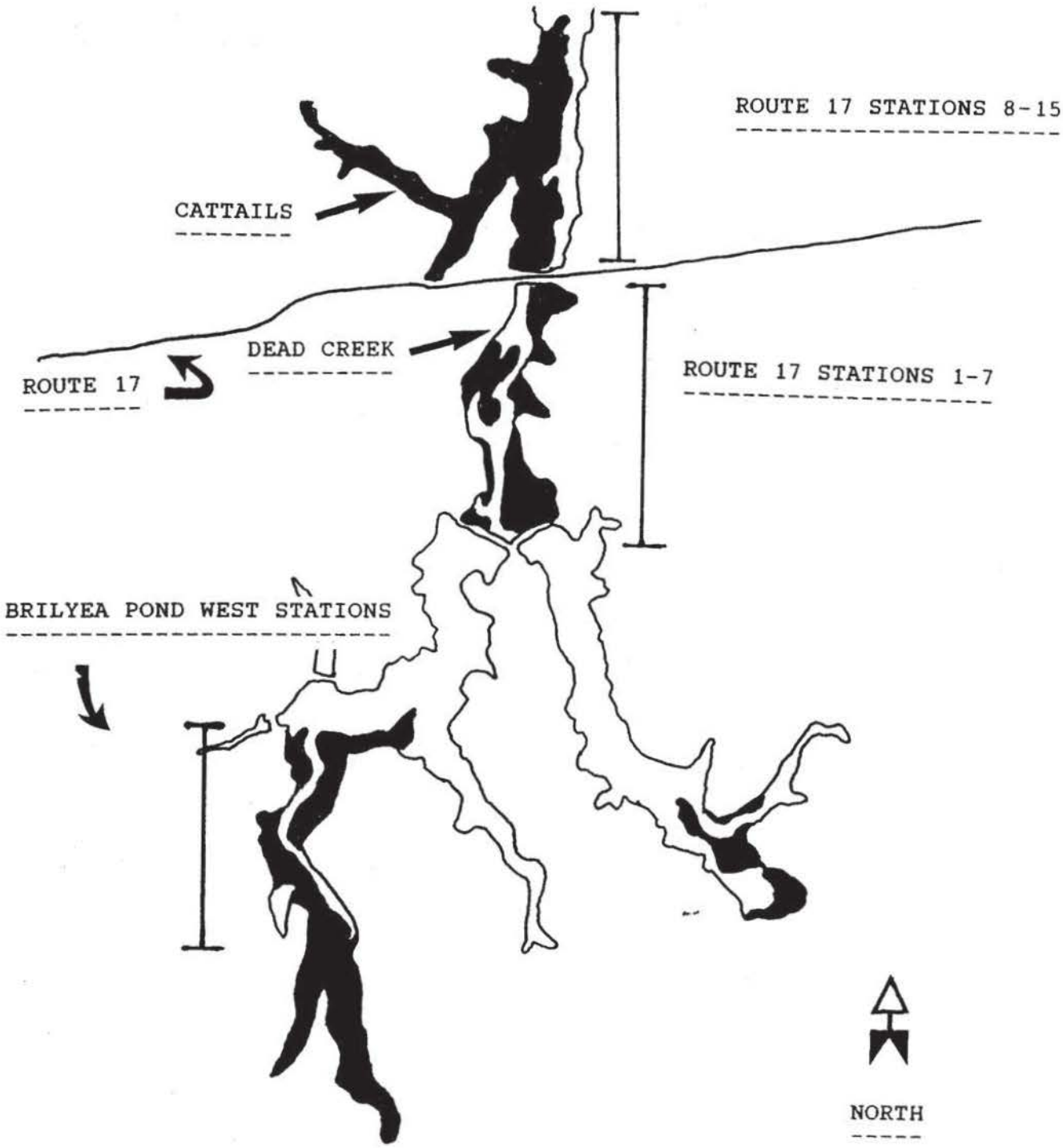
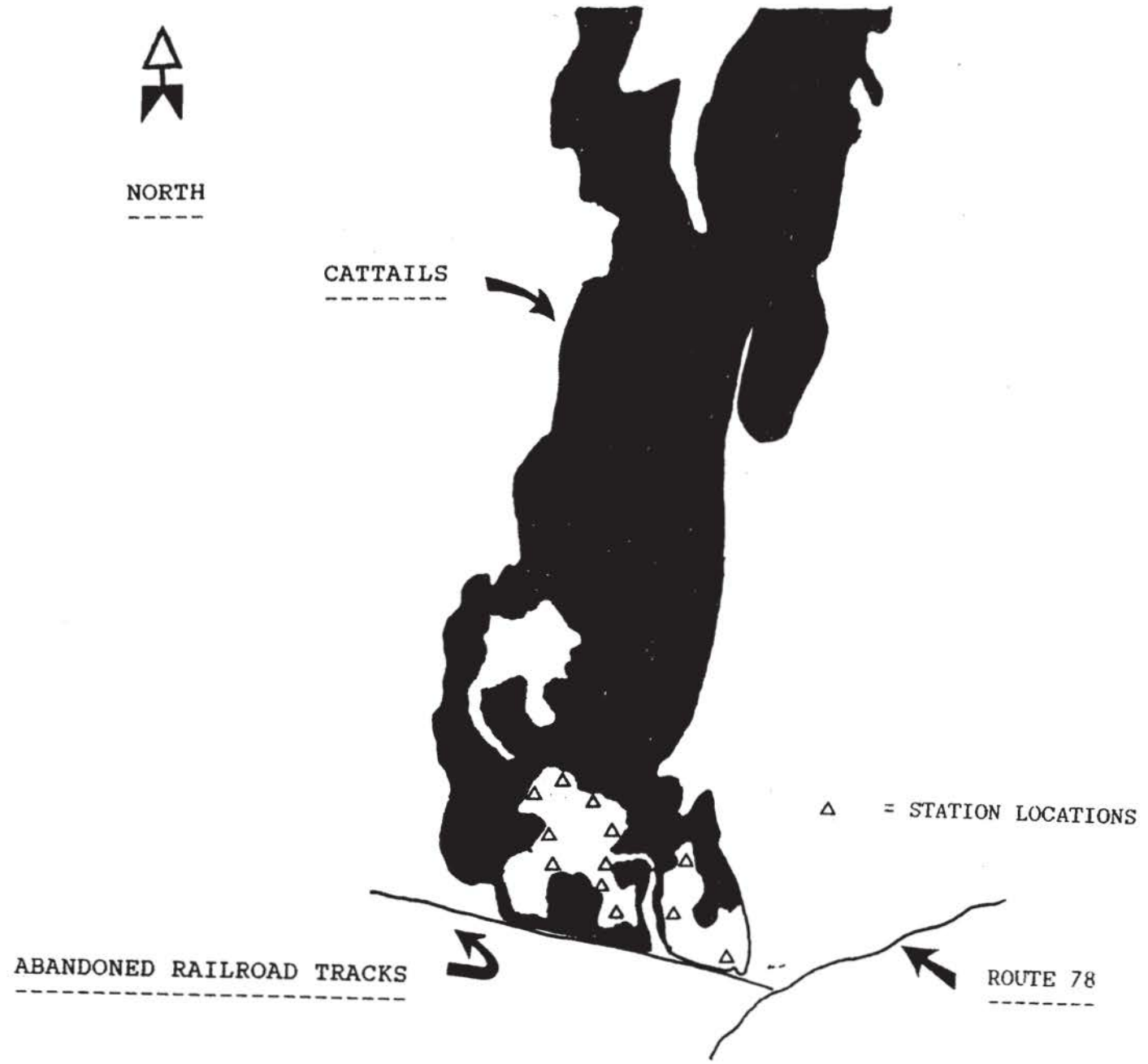


FIGURE 2.

1995 MUD CREEK MARSH BIRD CENSUS STATIONS



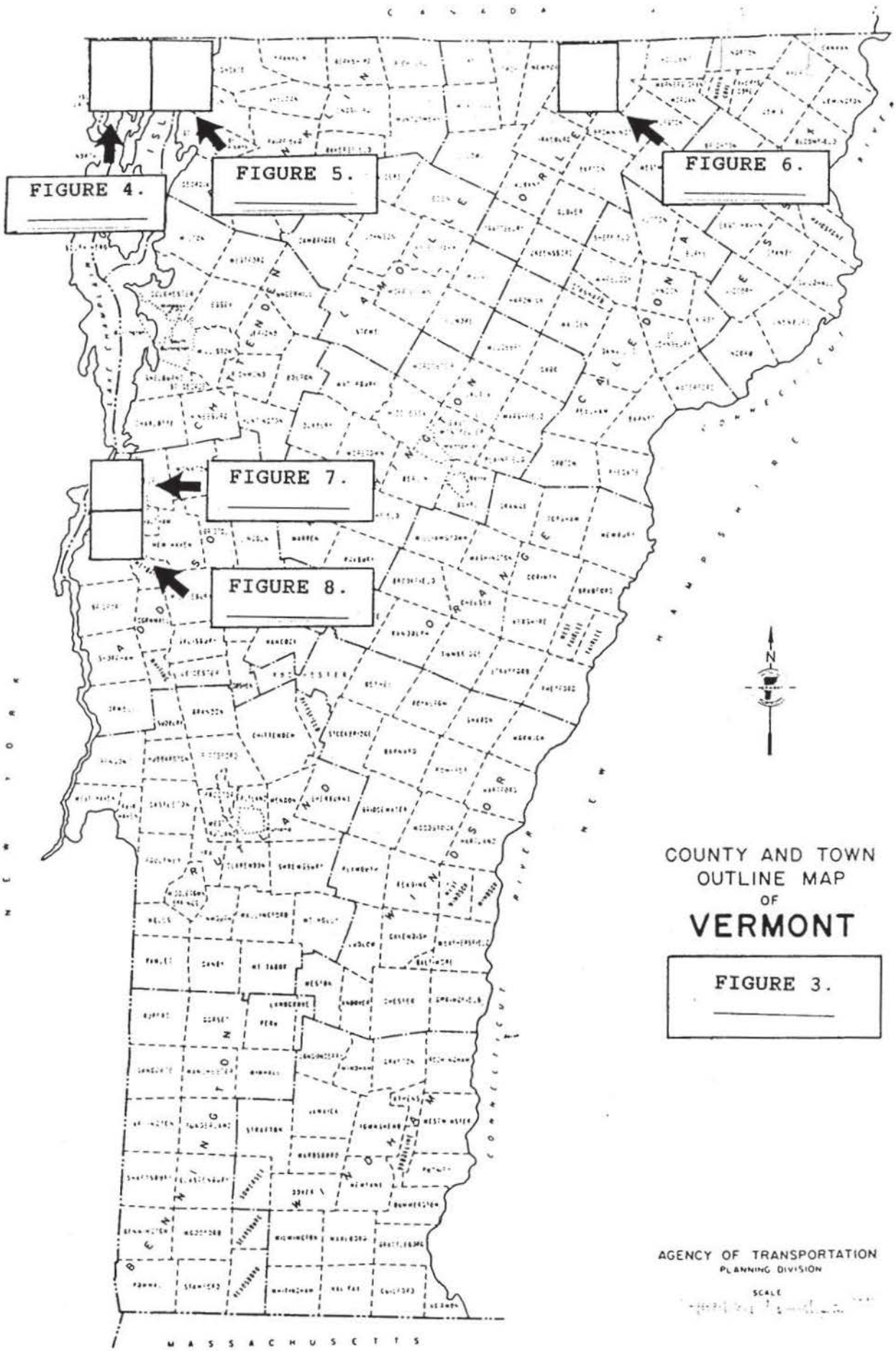


FIGURE 4.
FIGURE 5.
FIGURE 6.
FIGURE 7.
FIGURE 8.
CANADA
NEW YORK
MASSACHUSETTS
N
COUNTY AND TOWN
OUTLINE MAP
OF
VERMONT
FIGURE 3.
AGENCY OF TRANSPORTATION
PLANNING DIVISION
SCALE

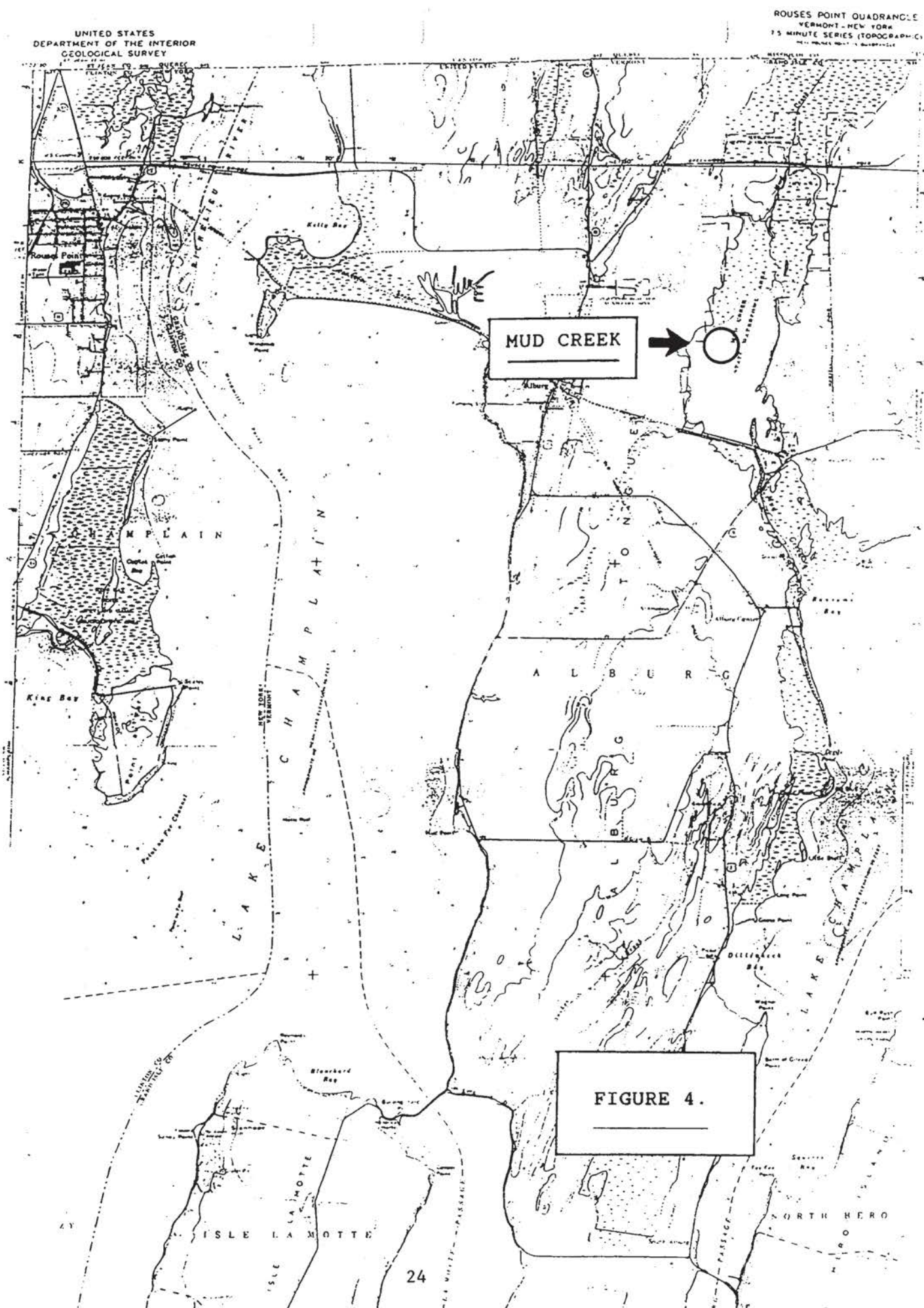

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ROUSES POINT QUADRANGLE
VERMONT - NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)
MUD CREEK
Rouses Point
Kelly Bay
Alburg
CHAMPLAIN
King Bay
LAKE CHAMPLAIN
ALBURG
ISLE LA MOTTE
NORTH HERO

FIGURE 4.

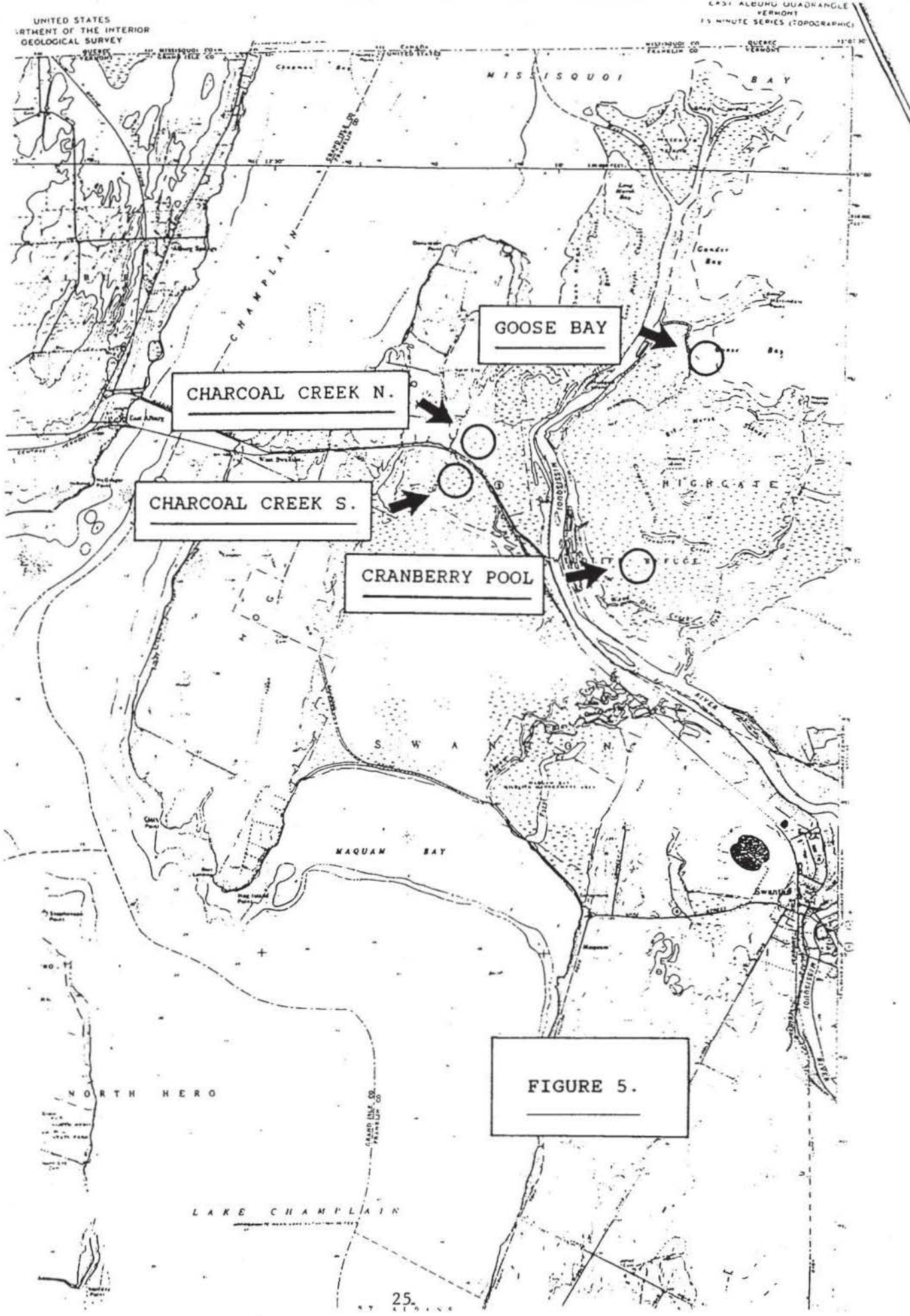

GOOSE BAY
CHARCOAL CREEK N.
CHARCOAL CREEK S.
CRANBERRY POOL
MISSISQUOI BAY
CHAMPLAIN
HIGHGATE
SWANTON
MAQUAM BAY
NORTH HERO
LAKE CHAMPLAIN

FIGURE 5.

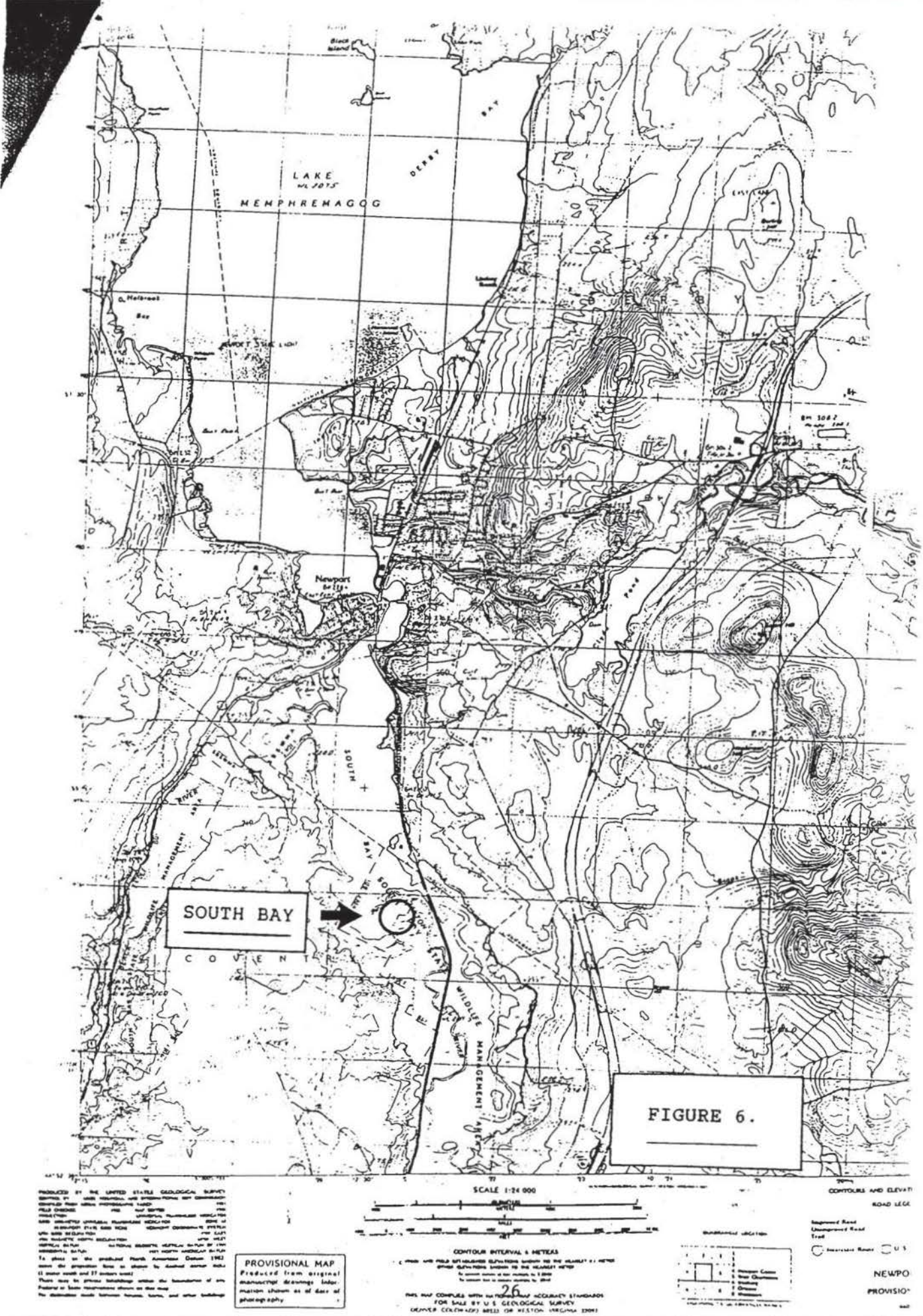
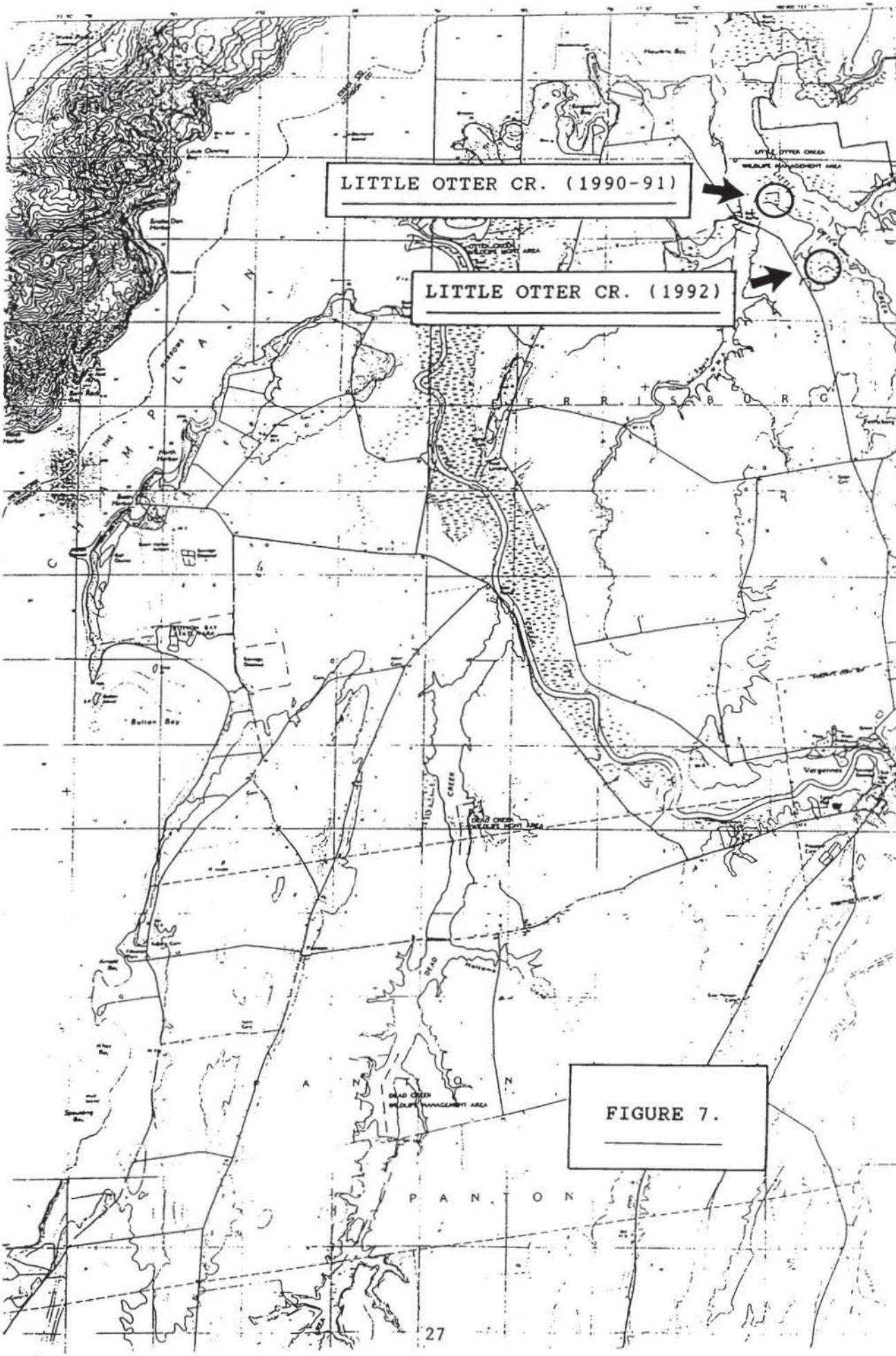
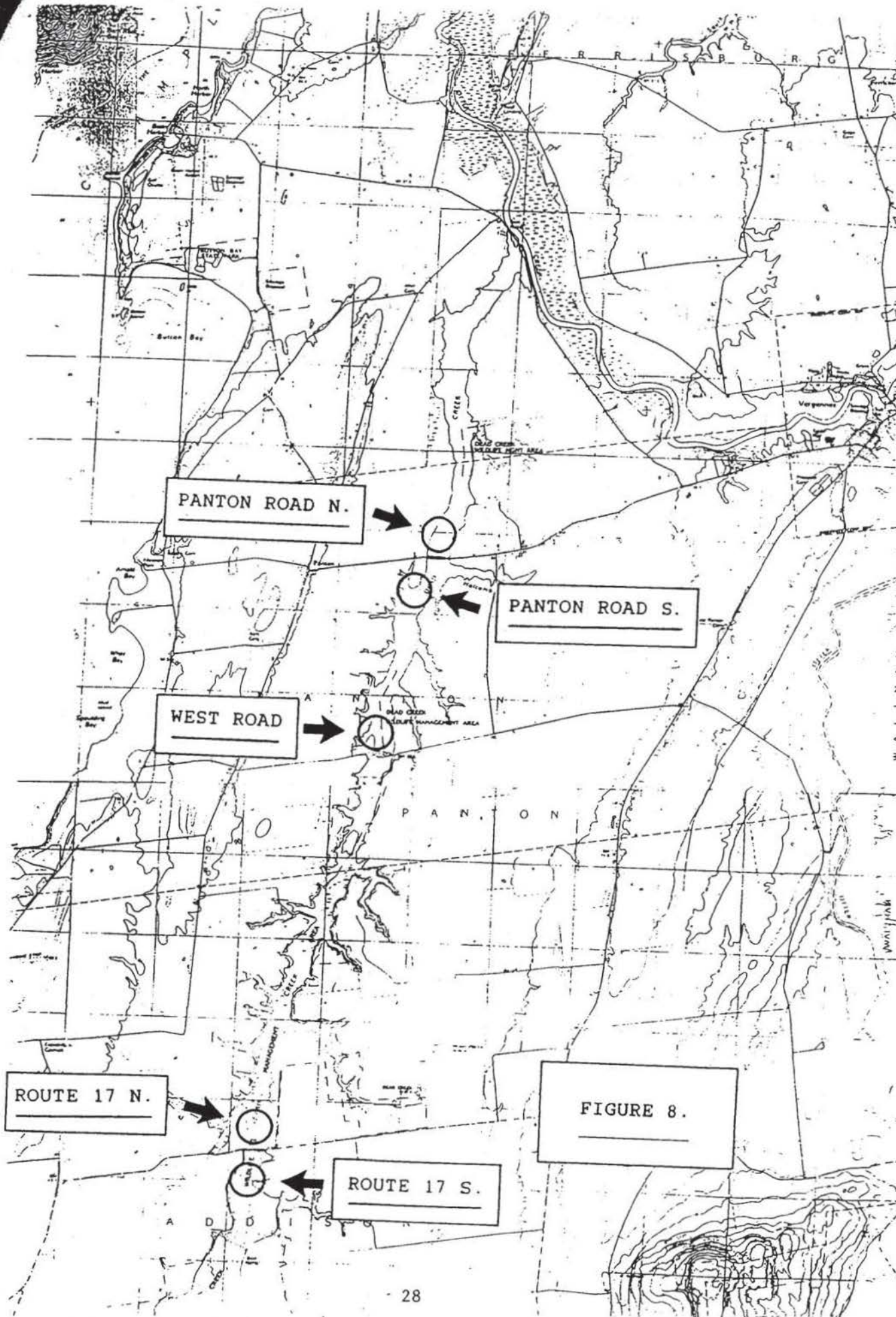

LAKE
MEMPHREMAGOG
DERBY
BAY
Newport
SOUTH
SOUTH BAY
COVENTRY
WILDLIFE MANAGEMENT AREA
SCALE 1:24 000
CONTOUR INTERVAL 6 METERS
PROVISIONAL MAP
Produced from original manuscript drawings information shown as of date of photography
NEWPO
PROVISIO

FIGURE 6.


LITTLE OTTER CR. (1990-91)
LITTLE OTTER CR. (1992)
FIGURE 7.


PANTON ROAD N.
PANTON ROAD S.
WEST ROAD
ROUTE 17 N.
ROUTE 17 S.
FIGURE 8.