DUCKS BROODS AND MANAGEMENT AT CAP TOURMENTE NATIONAL WILDLIFE AREA, QUEBEC.

a report by bert van dijk

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Contents.

Contents	page i
List of tables and graphs	page ii
Objectives of the study	page iii
Introduction	page 1
The study area	page 2
Materials and methods	page 5
Breeding pair counts	page 7
Nest searches	page 8
Marking of female ducks	page 9
Dissolution of the pair status	page 10
Brood observations	page 10
Hatching data	page 14
Sightings of marked female ducks	page 15
Marking of young ducks at the tidal marsh	page 16
Loafing,cover and interference possibilities on the water areas in the reserve and brood observations	page 17
Time spent by duck broods in the several water areas of the reserve	page 21
Estimation of the minimal number of broods and young fledged	page 21
Activity of duck broods	page 22
Grouping of duck broods	page 22
Spacing out of duck broods	page 23
Predation	page 23
Human interference	page 24
Numbers of ducks on the tidal marsh	page 24
Summary	page 25
Advice for further research in the wildlife area	page 26
Acknowledgments	page 27
Literature cited	page 28
List of plant names mentioned in the text	page 30
List of duck names mentioned in the text	page 30
List of mammals mentioned in the text	page 30
Situation of the reserve	map I
Cap Tourmente National Wildlife Area	map II
Management unit of La Ferme du Cap	map III
Management unit of La Petite Ferme	map IV
Management unit of La Grande Ferme	map V

List of tables and graphs.

Table 1.Results of five drake counts at Cap Tourmente NWA. page 7
Table 2.First initiation dates of nests found at Cap Tourmente page 8
Table 3.Nests that hatched successfully page 9
Table 4.Last data that pairs of the species that were supposed to nest at Cap Tourmente were seen page 10
Table 5.Estimated minimal numbers of duck broods per species in the several water areas of the wildlife area page 12
Table 6.Comparison of numbers of broods seen per species from 1970-1974&1976. page 12
Table 7.Hatching chronology of brood population at Cap Tourmente NWA. in 1976 page 14
Table 8.Stages of hatching of the four most common species page 14
Table 9.Time spent by duck broods in the several water areas of the reserve page 21
Table 10.Minimal number of broods and young, supposed to have fledged page 21

Graph 1.Estimated totals of duck broods on the tidal marsh(A) and in the ditches east of La Petite Ferme(B).
Graph 2.Estimated number of duck broods on the tidal marsh
Graph 3.Estimated number of duck broods in the ditches east of La Petite Ferme.
Graph 4.Estimation of the total number of duck broods of all species present on the wildlife area.
Graph 5.Number of ducks on the tidal marsh
Graph 6.Hatching chronology of brood population at Cap Tourmente NWA. in 1976.

Objectives of the study: quantitative study of waterfowl usage of Cap Tourmente National Wildlife Area in the period from May 5 till September 9, 1976.

1) estimate potential breeding population

2) estimate production

   (a) nest survey

   (b) brood survey

3) estimate usage of habitat entities at Cap Tourmente

4) estimate phenology by backdating from brood observations.

(for summary see page 25 &26)

Introduction.

Hunting pressure on ducks in Canada is considerable.In order to maintain duck populations on level,it is desirable to manage them with the aim to assure yearly a harvestable surplus(Watson 1967,Reed 1970,Dzubin & Gollop 1972).

The number of ducklings surviving till fledging will eventually compensate for the hunting losses of duck populations.

In this regard it is important to know what management practices have the highest production potential of young ducks.

A Wide range of habitat requirements for duck broods has been recorded. (Sowls 1955,Beard 1964,Mc.Gilvrey 1968,Reed 1970,Bengtson 1971 and Thompson 1974).

a)Loafing places.Many of the above mentioned authors point out the very important role in the carrying capacity for duck broods of water areas.As favorite loafing places are mentioned:mud bars,muskrat houses and dead vegetation laying on the water.

b)Cover.Cover is supposed to be a very important protection against predation and bad weather conditions and is therefore important for the survival of the ducklings.

c)Intensity of disturbance.

Agression between duck broods can induce scattering of broods and induce mortality.Beard states that the construction of many small marshes(between 10&20 acres) with all the factors for optimal brood-rearing will reduce overcrowding in the rearing areas and will help to ensure a higher degree of survival among young.

d)Food availability is important for ducklings.Food shortages might force broods to leave a certain area.Marsh areas however are one of the highest production habitats and Thompson states in his study of brood movement and habitat use by broods at Lake St.Francis,Quebec,that food probably played no dominant rôle in the choice of habitat by duck broods.

Duck broods are highly mobile.Apart from primary movements from nesting place to rearing area also secundary movements occur,possibly correlated with changing habitat properties during the season(Sowls 1955,Beard 1964,Dzubin& Gollop 1972,Poston 1974 and Thompson(1974).Reed(1970) found that most black duck broods,apart from a long trip between nest and rearing marsh,did not show considerable movements once arrived in this marsh.

The main aim of this study was to compare the several management units and natural habitat types at Cap Tourmente National Wildlife Area in relation with the occurrence of duck broods.Also was tried to get an impression of brood movement in the wildlife area.

The study area.

Cap Tourmente National Wildlife Area is situated on the northern shore of the St.Lawrence River,about 35 miles north-east of Quebec City and just east of the village of St.Joachim de Montmorency(47'08" n.latt,70'50" w.long.)See map 1.

The total area covers a surface of about 5000 acres and can be devided in four physiographic units(See map 2).(See also Laperle 1972)

A)The rocky plateau,covering appr.2400 acres.These highlands have a highest point of 1847 ft,Cap Tourmente,while the average height will be about 300 ft.The bottom consists of Precambrian rocks and is badly drained.The plateau is covered with coniferous and mixed forest growth.

At the centre of the reserve the distance from the southern boundary of the plateau till the St.Lawrence River is about 5000 ft.On the east side the plateau reaches till the St.Lawrence(Cap Tourmente),while the western past of this highland has much longer distances to the river.

At the south side of the rocky plateau we find a fault escarpment,about 300 ft high.Small streams form water falls and follow their course in the second physiographic unit,just south of the highlands.

B)The coastal plain.The plain covers a surface of about 1100 acres,of which 250 acres of mixed forest east of Le Petit Sault in the northern part of the plain.Concentrations of speckled alder are found near the small streams flowing through the plain.

The plain bottom consists for the greater part of well-drained marine sand deposits.Halfway the coastal plain we find between Le Petit Sault and La Friponne a series of beach-ridges,behind which spring runn-off may form shallow water surfaces,drying up in late spring.The southern part of the coastal plain consists of marine clay deposits,drained by the streams flowing through it.

The eastern part of the plain consists merely of haylands with as dominant species awnless bromegrass and timothy.The plain around the ruin of La Ferme du Cap consists of abandoned haylands.During July and August the haylands are mowed by local farmers.Some parts of the coastal plain between La Fripponne and Le Petit Sault are ploughed and cultivated.

The western part of the plain consists of grasslands,grazed to some extend by cow.Near the Marsollet river the plain consists of abandoned grasslands.

In the coastal plain we find several water bodies.At first several small and four bigger streams(La Fripponne,Le Petit Sault,Le Marsollet and La Blondelle).

They are bordered by grasses like rice cut-grass,skunk cabbage,sensitive fern and speckled alders.

North of the ruin we find a basin of about 1.5 acres that has been constructed in 1971.The average depth is about 1 foot,the deepest points are 3 feet.

See also map III

At the origin of La Fripponne we find a beaverpond in the coastal plain.This pond was in 1976 occupied by a family of four beavers and covers several acres of sedge meadow and deciduous forest.The forested part in the eastern part of this complex is covered with willows,speckled alders,red-osier dogwood,black ash and trembling aspens with skunk cabbage as undergrowth.The western part is covered by a vegetation of sedges,common rush,marsh horsetail,rice cut-grass, awnless brome-grass,timothy,goldenrods,asters and cape touch-me-nots,with here and there stands of willows and speckled alders.The pond with the beaver-cabin in the eastern part of the complex is locally about 6 ft. deep and near the shores about 1 foot deep.The western flooded sedge meadows have an average depth of 1 foot.

C)The coastal marsh.

South of the coastal plain we find the third physiographic unit.This unit has a total surface of about 500 acres and ranges in width from 500-1500 ft.

The bottom consists of marine clay deposits and is badly drained.Normally this marsh is flooded one to several times yearly.This breeding season the marsh was flooded completely during high tides and strong northern winds at June 12.

The streams in the coastal plain are bordered with rice-cut-grass,flowering rush,common water plantain and broad-leaved cattail.The northern part of this unit is covered by a dense vegetation of shore horsetail,scaly and erect sedge, goldenrods,cape touch-me-not,purple loosestrife and isolated stands of sweet gale.The southern part is merely covered with homogeneous stands of scaly sedge, erect sedge and pectinate spartina.Dispersed over the southern part of the coastal marsh we find small groups of willows,about 5 ft. high.

In November 1970 9 potholes were blasted in the northern part of the coastal marsh,south of the ruin of La ~~Grande Ferme~~ Ferme du Cap.They vary in depth between 3 and 5 ft. and have an average diameter of about 7 feet.After their construction they were steadily invaded by the surrounding vegetation.

In August 1972 a basin of 100x1000 ft. has been constructed south-east of La Grande Ferme.The average depth is about 1 foot,deepest point will be about 3 ft.

During the end of June the surrounding dike was undermined by musk rats,so the pond was empty and invaded by broad-leaved arrow-leaf,common water plantain and especially broad-leaved cattail.See map V.

The environs of this pond consisted of fenced hay fields with awnless brome-grass and timothy,small streams bordered by alders and hawthorn and the coastal marsh vegetation with sedges,common rush,aster,purple loosestrife and goldenrods.

D)The tidal marsh.

The tidal marsh is separated from the northern coastal marsh by a sheer escarpment of about 1-2 ft.This marsh is flooded twice every day by the fresh water of the St.Lawrence River.In the second week of June a vegetation of american bulrush, wild rice and broad-leaved arrow-leaf start to cover this marsh.The vegetation attains a height of appr.4 ft. during August.

At the end of May the surrounding fields are covered with new plant growth, especially of awnless bromegrass, timothy, asters, goldenrods, cape touch-me-not and framberries, reaching in July a height of about 3 ft. Stands of speckled alders cover these fields locally. The basin is bordered by broadleaved cattail, sedges, awnless bromegrass and timothy. In late June a vegetation of green algae, duckweed and broad-leaved arrow-leaf covered about 50% of the water surface.

In 1971 another basin has been dug out south of the ruin. The surface is 150x 200 feet and the average water depth is 1 foot, on deep places however the water can raach a depth of 3 feet. In the water we find four small islands (each about 10 ft. square) overgrown with sedges and water pepper. The basin is bordered by rice cut-grass, some broad-leaved cattail and sedges. Later in season (July, August) the water surface was covered for about 20% by green algae and emerging stands of broad-leaved arrow-leaf. The surrounding field is separated by a fence from the coastal marsh (see below) and has a vegetation of timothy, awnless brome-grass, rice cut-grass, goldenrods and asters.

In april 1972 a management unit covering about 85 acres has been constructed north and east of La Petite Ferme. The eastern part of the unit consists of 32 north-south directed ditches, separated by dikes of the same length and width (1200 resp 30 ft.) and connected by three ditches that are east west directed. One north, one in the middle and one south of the ditches. These ditches were numbered from west towards east and were situated just north of the service road. The first four western ditches dried up during early summer.

North of La Petite Ferme we find a second, smaller unit, consisting of seven shorter north-south directed ditches, on the north side coming together in a pond. This unit was during the season 1976 completely invaded by broad-leaved cattail.

The units are surrounded by hayfields, merely consisting of awnless bromegrass, timothy and clover. These three species are also most abundant on the ditches, together with sedges, sensitive fern, purple loosestrife, goldenrods, asters and cape touch-me-not. The ditches were bordered by dense, in July locally 6 ft. high stands of broad-leaved cattail, broad-fruited bur-reed, common rush, common water plantain, rice cut-grass and sprike rush, all invading the ditches when the water levels were low (1-2 feet) after the second week of July. The normal water levels in these ditches are about 3 ft.

Starting the beginning of July broad-leaved arrowleaf emerged and a vegetation of duck weed, green algae and eleodea devellopped in the water. See map IV.

North of the smaller subunit we find a pond, formed by Le Petit Sault and merely surrounded by a dense sedge vegetation. Comman Rush was most abundant in this waterbasin, which is locally 3 ft deep.

Materials and methods.

Field work was carried out between May 5 and September 9 1976.
The field work included:
1)A breeding pair count during early May.Since the spring arrival and subsequently the sex ratio of the arriving ducks has not been observed,I used an estimation of the number of drakes as a measure of the breeding population in the reserve.Used were a 20x spotting scope and 10x50 binoculars.
2)Nestsearches were carried out from mid-May till the end of June,especially in the coastal plain area.
Several methods were used:
a)Flushing hens from their nests by beating out the vegetation with 12 ft. long bamboo poles.
b)With the use of dogs.The dogs(2 German Pointers and an Irish Setter)were attached to an about 30 ft. long rope and walked the vegetation in a zigzag way,the rope dragging over the vegetation.They were led by an observer.
c)By dragging a long rope(~~60~~ 100 ft) between two men over the vegetation.
3)Marking of hens.Once the hatching date of a nest was known(using the method of Weller 1956) it was not visited till three days before hatching. The hen is at this moment very broody and will probably stay on the nest after being caught and released.The hens caught themselves in traps(4) or were caught with the aid of a dip net(1).(Sowls 1955,Reed 1970).
Hens were marked with an US Fish and Wildlife Service band and a nasal saddle (see Sugden and Poston,1968) or painted on tail and primaries with a quick-drying spray-paint(See Sowls 1955).
During July and August attempts were made to catch females and broods in floating bow-net traps baited with corn.
4)Observations of broods started the first week of June.
Used were a 20x spotting scope and 10x50 binoculars.
Observations were done by:
a)Using four appr. 12 ft. high observation towers with blinds at the southern boundary of the coastal marsh .One was situated at the west side of La Frippone, one south of La Petite Ferme and the two others between,distances between the towers being the same.Observations were mostly carried out during the first hours in the morning (starting half an hour before sunrise)and during the last hours in the afternoon till half an hour before dusk.
Observations were done when the tides of the St.Lawrence were high during these hours,so the broods were floated outof the vegetation.Tides over 15 feet were acceptable.

b)Canoetrips along the shores of the coastal marsh between La Blondelle and La Fripponne under the same circumstances as during tower observations.
c)Observations by car of the eastern part of La Petite Ferme management unit and La Grande Ferme management unit.
d)Inventories by foot near La Grande Ferme, the beaverpond, the ruin of La Ferme du Cap , the northern part of the management unit La Petite Ferme, the tidal marsh and the streams in the wildlife area.
e)The tidal marsh was searched for ducklings by foot, when tide was low. This in order to collect data about movement of the broods by the trap-retrap method(Reed 1970). The tidal marsh was divided in 17 parts of about 800 ft. each by pickets numbered from 1 till 18, starting at the end of the bulrushvegetation in the west till south of the ruin of La Ferme du Cap in the east.
f)Night observations were carried out between August 4 and 11 in the ditches east of La Petite Ferme and during early morning (1 1/2 h before sunrise) on August 11 on the tidal marsh, using a British army-nightscope with a magnification of about 5 times.

Results and discussions.

I)Breeding pair counts.

Because already quite some females had probably started nesting at the moment I started the inventories,I had to rely on numbers of pairs and numbers of drakes to make an estimation of the total potential breeding population of ducks in the wildlife area.

This may give rise to overestimations,but is in many cases the only measure of the potential breeding population(V.Haartman 1945,Dzubin and Gollop 1972, Gillespie and Wetmore 1974,Dennis 1974).

The reserve was difficult to oversee and no account could be made for ducks that changed place during the observations.Observations may thus be seriously biassed.

Hoping that most duck migration had stopped the first week of May,I took the maximum number of drakes seen in the reserve during one day as being the best estimate to be made.Unfortunately,a correction for a sex-ratio not equal to one could not be made,since the spring arrival has not been observed.Yearly data from wing-bees,if representative for the whole population,show considerable variation(Cooch and Kaiser,1972).

Table 1 .Results of five drake counts at Cap Tourmente NWA.

Black duck(BD)	PF	GF	FC	BP	Tot.	Mallard(M) PF	GF	FC	BP	Tot.	Blue-winged teal(BWT). PF	GF	FC	BP	Tot.
May 8	9	13	2	4	28+	4	3	1	1	9	20	11	4	3	38
May 9	12	5	1	0	18	1	1	0	0	2	13	4	2	1	20
May 10	2	3	0	3	8	3	0	0	1	4	10	3	3	4	20
May 11	11	11	2	1	15	1	0	1	1	3	18	5	1	0	24
May 14	6	4	1	3	14	2	1	0	0	3	13	1	0	1	15

Green-winged teal(GWT).	PF	GF	FC	BP	Tot.	Pintail(PT) PF	GF	FC	BP	Tot.	Shoveller(S) PF	GF	FC	BP	Tot.
May 8	6	2	1	0	9	0	3	0	1	4	1	9	0	0	10
May 9	7	5	1	0	13	0	10	0	0	10	1	3	0	0	10
May 10	6	11	1	2	20	8	9	1	0	18	8	3	0	0	11
May 11	8	2	0	0	10	4	3	3	0	10	6	0	0	0	6
May 14	7	4	0	1	12	10	10	3	0	23	8	1	0	0	9

Baldpate(BP)	PF	GF	FC	BP	Tot.	Wood duck (WD) PF	GF	FC	BP	Tot.	Ring-necked duck(RD) PF	GF	FC	BP	Tot.	Gadwall(GW) PF	GF	FC	BP	T
May 8	4	1	0	3	8	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
May 9	8	2	0	1	11	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
May 10	0	1	0	0	1	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0
May 11	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
May 14	7	2	0	0	9	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0

Overall total of maximal numbers:147.

+:Highest total
PF: ditches near La Petite Ferme,streams and temporary water areas in the central part of the coastal plain.
GF: pond near La Grande Ferme
FC: ponds near La Ferme du Cap
BP: beaverpond

II- NEST SEARCHES

Nest searches were carried out during May and June and revealed a total of 19 active nests. Searches were carried out especially in the complex of ditches near La Petite Ferme (covered twice). The coastal plain between La Friponne and Le Petit Sault, the beaverpond area included, was covered once, as were the coastal marsh between Le Petit Sault and La Friponne and the coastal plain near Le Marsollet and La Grande Ferme

	Coastal marsh east of Le Petit Sault	Coastal plain between La Frip.& P.Sault	Ditches near La Petite Ferme	Beaverpond
Black Duck			2	
Mallard			1	1
Pintail	1	2	1	
Blue-w.Teal		1	5	
Green-w.Teal		2	1	
Shoveller			1	
Wood Duck				1
TOTALS	1	5	11 X	2

X: 10 in the eastern part of La Petite Ferme Management Unit

PLACE

Nest cover	Bushes	Graminae	ASTERS
BD		2	
Mall		1	1
PT	1	3	
BWT		6	
GWT		2	1
Shoveller		1	
Wood Duck	in tree house		
TOTALS	1(5%)	15(79%)	2(11%)

Fate of nests

	Abandoned	Predated	Hatched
BD		1(50%)	1(50%)
Mall	1(50%)		1(50%)
PT	1(25%)	2(50%)	1(25%)
BWT	1(17%)	4(44%)	1(17%)
GWT	1(33%)	1(33%)	1(33%)
SH		1(100%)	
WD			1(100%)
TOTALS	4(21%)	9(47%)	6(32%)

The most important land most intensively searchers area was the complex of ditches east of La Petite Ferme, where 10 nests were found (50%).

Especially the Blue-winged Teal seems to depend to a high degree on this complex for nesting. Grasses and sedges composed most of the nesting cover (79%).

The hatching success of 32% can be compared with those of Thompson (1971): 39% of 33 nests, Trussart (1971): 29% of 17 nests and Giroux (1974), 41% of 17 nests. This shows that predation pressure is probably a quite constant factor from year to year working on all nests in the reserve.

The tidal marsh was not counted, many ducks feeding from other parts of the NWA. In 1970 (Thompson 1971) the black duck formed 50-60% of the total breeding population of unknown size. Bédard (1973) gives 20% black ducks in a not estimated breeding population and Giroux (1974) gives 13% black ducks in a total estimated breeding population of 59 pairs of ducks. The present study estimates 19% black duck (28) breeding pairs.

However, 13% of 59 is 8 breeding pairs and hence there is an increase of 20 pairs between these two years (1974 and 1976) or this study gave an overestimation or the study of Giroux gave an underestimation.

I think more can be said when the data about brood counts have been taken into account (see below).

Backdating the data obtained from the nests found by substracting the number of days the eggs are already incubated (Weller, 1956) and the number of eggs (supposing a laying rate of 1 egg a day-Sowls 1955, Coulter & Miller 1968, Reed 1970). Table 2.

Blue-winged Teal	first nest	May 19	N = 6
Green-winged Teal	" "	May 7	N = 3
Mallard	" "	May 2	N = 2
Black Duck	" "	May 19	N = 2
Shoveller	one nest	May 13	N = 1
Pintail	first nest	May 16	N = 4
Wood Duck	one nest	May 4	N = 1

Because the sample is very small, these data might be not representative at all for the population of the different species. Brood observations should also be taken into account (see below).

Table 3

Fate of the nests found

Blue-winged Teal	1	11 young out of	11 eggs	on June 21
Green-winged Teal	1	8 young out of	8 eggs	on July 8 (?)
Mallard	1	4 young out of	4 eggs	on June 2
Black Duck	1	5 young out of	6 eggs	on June 17
Pintail	1	9 young out of	9 eggs	on June 19(?)
Wood Duck	1	10 young out of	10 eggs	on June 12

This shows quite a high productivity of the nests. The other 68% of the nests (13) were lost by abandonment of the female (4) or lost by predation (9) before or after abandonment of tne nest by the female duck. One female duck shoveller was taken by a fox while she was incubating and a part of the eggs in the nest were found hidden in the vegetation at several feet from the nest.

Marking of female ducks

Of the six females mentioned above five have been caught and marked. The sixth, a female Green-winged Teal, has not been caught because weather conditions during the two days before her clutch hatched were bad and consequently the danger of loss of the eggs or newly hatched young was too great.

Species	Date marked	USFWS Band	Marking
Mallard	June 2	None	Orange nasal saddle with 00 painted on it with black paint
Wood Duck	June 9	505-62147	Red spray-paint on left wing, green on right wing and tail
Black Duck	June 17	1037-96001	Yellow nasal saddle with black Y painted on it.
Pintail	June 17	820-50310	Orange nasal saddle with black bar on top
Blue-winged Teal	June 18	505-62148	Yellow nasal saddle

The marking method with the nasal saddle was very satisfactory, ducks seen later in season still carried the saddle. The saddles were easy to see and the birds did not give the impression to be bothered by it. I have not seen the wood duck after she was marked. McGilvrey (1968) found painting of wood duck females unsatisfactory because the birds preened the paint out of their feathers soon after their ducklings hatched. This might also have been the case with the female wood duck. Catching with self-trapping cages is satisfactory. Checking after two hours gave good results. Only the female pintail had by then not returned to her nest on two subsequent days. The female wood duck was caught by keeping a dip net before the entrance of the nest box she nested in.

IV)Dissolution of the pair status.

Sowls(1955) states that drakes of mallard and pintail leave their hens early in the incubation stage.Shoveller and blue-winged teal wait longer before leaving their hens.Coulter and Miller(1968) found during their study of breeding biology of the black duck and mallard that the time drakes stay with the female during incubation can vary strongly.Pair bonds are ended before the clutch hatches.

On June 22 however,I observed a male blue-winged teal in company of a hen and a brood of 11 young class I(no exact age known) in the basin near La Grande Ferme. The group stayed together for about 5 minutes and disappeared in the dense broad-leaved cattail vegetation. Table 4.

Last date pairs of the species supposed to be breeding at Cap Tourmente wewe seen.

Green-winged teal	June 26	basin south of the ruin of La Ferme du Cap.
Blue-winged teal	July 6	beaverpond
Black duck	July 2	ditches east of La Petite Ferme
Mallard	June 25	tidal marsh
Pintail	June 18	tidal marsh
Shoveller	July 3	basin near La Grande Ferme
Baldpate	July 7	ditches east of La Petite Ferme
Wood duck	June 13	tidal marsh

See also data about hatching of nests(see below)

V)Brood observations

Brood observations were done between June 3 and September 8.A total of 243 sightings were made,150 in the ditches east of La Petite Ferme,58 on the tidal marsh, 21 in the beaverpond,1 in the ditches north of La Petite Ferme ,4 in the pond south of the ruin of La Ferme du Cap,8 in La Grande Ferme management unit and one in the Friponne just south of the beaverpond.

Of these 243 observations 209 were aged and counted completely.Of each brood the species,the number of young,activities and the age class according to Marshall and Gollop(1954) were recorded.

By far the most time was spent during observations in the ditches east of La Petite Ferme,because this unit lies just north of the service road and is easy to cover.

The observations at the tidal marsh were done about 8 times(4 morning and 4 evening observations) every 2-3 weeks,when water in the St.Lawrence River was high and flooded the vegetation on the tidal marsh.Other units were visited at least once every week.

Since it was probable that broods were seen more than one time,the brood sightings were screened using the divisien in plumage classes of Marshall&Gollop(1954).

In this study for six of the eight species of which broods were seen at Cap Tourmente ages in days are given for corresponding plumage classes.Only for the green-winged teal and the wood duck data are lacking.Arbitrary I supposed these species corresponding with the blue-winged teal,a duck of comparable size.

By backdating brood-sightings the approximative date of hatching could be determined.Broods having the same hatching range(since the plumage classes correspond with periods of several days) or partial overlap in these hatching ranges were supposed to be the same.Only if more than one brood of a certain plumage-class was seen at the same moment at the same time or when overlap occurred of a brood-sighting of a young brood with considerable less young than an older one they were supposed to be different.

By this way a minimal number of 106 broods was calculated.

When comparing the hatching ranges and the division of age-classes in the several water bodies in the reserve there seemed no reason to assume a considerable movement of broods between them, unless the observations are not representative at all for the duck population of Cap Tourmente or if the exchange occurs but most broods die during these trips.Four broods of black ducks,2 broods of pintails and 2 baldpatebroods might have changed from the ditches east of La Petite Ferme to the tidal marsh.A wood duck brood is supposed to have migrated from the beaverpond to the ditches.

A sufficient number of marked females would have been necessary to solve this problem,but since only five females of different broods have been marked,I can only rely on the data from observations of unmarked broods and use the observations of marked female ducks with broods as showing possible trends.

Only the division of age-classes of the black duck broods seen on the tidal marsh gives rise to suppose an ingress from other parts of the reserve or even from outside the reserve.Only the female with the yellow nasal saddle has been seen on the tidal marsh with a brood of age class $1(1^b)$.The other observations show broods of age class 2^a till 3.Three more broods were thought to have come from the ditches east of La Petite Ferme and one from the basin near La Grande Ferme after it had dried up.Two other broods might come from the western part of the tidal marsh ,that has been covered only thrice by cano,or haven't been seen on well-searched parts of the reserve.Since visibility was good during high tide and the streams in the coastal marsh between La Fripponne and La Petite Ferme were well-searched, I do not think they were raised in this area during their first period of life.

The eastern part of the tidal marsh has also not been searched very thoroughly, so also over there these broods might have been raised till age 2^a.

In order to estimate the use by broods of the several water areas in the wildlife area I constructed a hypothetical minimum population.Brood-sightings with a same hatching-range or overlap in that hatching range,of which there was no evidence there could be more than one hatched at the same time,were put together to form a hypothetical brood.Unless there was a reason to suppose these broods came from elsewhere, the time from hatching till last time seen was supposed to be the time spent by a duck brood in a certain part of the reserve.

Estimated minimum numbers of duck broods per species in the different water areas of the wildlife area.

Table 5	Species								
Place	BWT	GWT	BD	M	PT	S	BP	WD	TOTAL
Ditches east of La Petite Ferme	26	2	8+	1	12+	7	5+	1"	62
Tidal Marsh	1	9	7	3	14				34
La Grande Ferme	4′		1′						5′
Beaverpond	2	1					1	2	6
La Ferme du Cap (southern pond)	1								1
TOTALS	33	12	15	4	26	7	6	3	106

+:BD ,PT&BP(4,2,2 broods)are thought to be hatched near the ditches east of La Petite Ferme and went lateron to the tidal marsh.Their numbers are given in the totals in the ditches.1 PT went later in time from the ditches east of La Petite Ferme to the beaverpond(marked female).

′:BWT&BD.When the basin of La Grande Ferme dried up during late June,one brood of blue-winged teal and a black duck brood were supposed to have migrated to the tidal marsh.They have been added to the totals on the tidal marsh.

A total of eight duck species were recorded as breeders in 1976,hatching an estimated minimum number of 106 broods.If we compare these data with the last years'

Table 6	1970	1971	1972	1973	1974	1976
Black duck	37(67.3)"	21(47.8)	20(40.0)	17(37.0)	20(33.3)	15(14.1)
Mallard	5(9.1)	2(4.5)	-	1(2.2)	1(1.7)	4(3.8)
Pintail	8(14.5)	14(31.8)	19(38.0)	13(28.1)	18(30.0)	26(24.5)
Shoveller	-	-	-	2(4.4)	5(8.3)	7(6.6)
Baldpate	-	-	-	1(2.2)	1(1.7)	6(5.7)
Blue-winged teal	4(7.3)		7(14.0)	8(17.4)	12(20.0)	33(31.1)
Green-winged teal	1(1.8)	7(15.9)	4(8.0)	4(8.7)	3(5.0)	12(11.3)
Wood duck	-	-	-	-	-	3(2.8)
Totals	55	44	50	46	60	106

" numbers between brackets are percentages

Data 1970 after Thompson(1971),data 1971 after Trussart(1971),data 1972 after Giroux(1974),data 1973 after Bédard(1973) and data 1974 after Giroux(1974)

As can be seen in the last table,the total number of duck broods stayed relatively stable between 1970 and 1974,but the composition of breod-hatching species changed.In 1970(before the management practices mentioned in the description of the study area had been carried out)the main number of brood sightings consisted of black duck broods.Green-winged and blue-winged teal,mallard and pintail were all represented with small numbers of broods.

The first years of the management practices less species with brood were sighted,in 1971 no blue-winged teal and in 1972 no mallard broods were seen.In 1973,however,seven species hatched broods at Cap Tourmente,this was also the case in 1974.The black duck was still the most abundant brood-species, but the percentage of black ducks in the total brood population was in 1974 already half that of 1970.In 1976 this trend continued.By than the black duck formed 14.4% of the total estimated number of broods.Also in number this regression continued(37 broods in 1970,15 in 1976).

In 1976 eight brood-hatching species were recorded at Cap Tourmente.Apart from the possibility that this year the inventories were probably most intensive,I suppose the number of eight species sighted with broods and the total of 106 broods as a minimal estimate for the reserve(almost twice the number seen in 1974) is the result of succession in the several management units and especially in the complex of ditches east of La Petite Ferme.Ecological succession and diversity walk hand in hand(see Odum 1953).

This may also explain the high number of potential breeding pairs counted during early May.

The decrease of black ducks,however,is not explained by this,since big parts of the original black duck habitat still exist.Reed(1970) concluded a decrease of numbers of breeding black ducks in a marsh region on the south shore of the St.Lawrence River during the years 1963-1969.This decrease in numbers observed at Cap Tourmente might follow an overall decrease in black duck populations.Studies did not reveal a direct reason for this decrease, but the invasion of mallard,that has about the same habitat requirements and interbreeds with black duck,from the west is given as a possible reason.

The blue-winged teal was by 1976 the most abundant brood-species.The table on page 12 shows that obviously the blue-winged teal prefers the waterbodies in coastal plain and coastal marsh to raise its broods.The management practices have increased the number of water bodies in these two physiographic units,so I suppose this is why blue-winged teal have got the opportunity to hatch so many broods this year.Starting 1972 the number increased rapidly,to become in 1976 the dominant brood-species.

The beaver pond area was probably created in 1971(Trussart 1971) and seems to give good nesting and broodrearing habitat for wood ducks(Mc Gilvrey 1968). In 1973 and 1974 there were sightings of adults but not of wood duck broods. Probably also this unit had to mature before it was acceptable breeding habitat for wood ducks.

VI)Hatching data.

By backdating the approximate hatching dates of the constructed brood population were calculated.

Hatching chronology of brood population at Cap Tourmente NWA in 1976

Table 7 Graph 6	BWT	GWT	BD	M	PT	S	BP	WD
May 12-18					1(3.9)			
May 19-25			2(13.3)		1(3.9)	1(14.3)		
May 26- 1	1(3.3)	1(8.3)	1(6.7)		1(3.9)			
June 2- 8	1(3.3)		2(13.3)	1(25)	6(23.0)	2(28.6)		
June 9-15	3(10)	1(8.3)	2(13.3)	1(25)	4(15.4)	2(28.6)	1(16.7)	2(66.7)
June16-22	6(20)		2(13.3)	1(25)	4(15.4)	1(14.3)		
June23-29	9(30)	2(16.7)	2(13.3)		7(26.9)		2(33.3)	1(33.3)
June30- 6	2(6.7)	1(8.3)	2(13.3)			1(14.3)	2(33.3)	
July 7-13	7(23.3)	3(25)	1(6.7)		2(7.7)		1(16.7)	
July14-20	1(3.3)	1(8.3)	1(6.7)	1(25)				
July21-27								
July28-3		3(25)						
Total	30+	12	15	4	26	7	6	3

+:3 broods were not included,since their age was not known and they are thought to have died when the basin of La Grande Ferme management unit dried up in early summer.

Stages of hatching of the four most common species.

Table 8		first brood hatched	20% hatched	50% hatched	all hatched
Blue-winged teal	N=30	May 31	June 17	June 26	July 16
Green-winged teal	N=12	June 1	June 26	July 10	Aug 3
Black duck	N=15	May 19	May 29	June 13	July 16
Pintail	N=26	May 13	June 3	June 12	July 13

Although previous studies with less broods have made attempts to analyse these hatching(and even nest-initiation)dates,the only conclusion I want to draw is that the data mentioned above confirm the early nesting of black duck and pintail(Reed 1970,Coulter&Miller 1968 for black duck,Sowls 1955 for pintail),while the blue-winged teal is a late nester(Sowls 1955). The green-winged teal,of which I do not know data about nesting&hatching, seems to be a late nester.Although data about blue-winged teal and pintail show weeks in which hatching was supposed to be higher than in other weeks, numbers are too small and the method of backdating too imprecise to draw conclusions.Sowls(1955)warns for the dangers of backdating broodsightings in order to estimate nest-initiation dates.He states that because of relatively high losses of early nests backdating from biassed data would give a wrong idea about nest-initiation dates.

If we compare the data the last broods were supposed to hatch with the data when the last pairs were seen together,they fit the picture Sowls(1955) and Coulter&Miller (1968) give about dissolution of the pair bond.Drakes are thought to leave the females before the clutches hatch(see page 10).

By using the data Bent(1962)gives on incubation time and average number of eggs we can make an estimate about the time nests were initiated in the wild-life area.This is quite speculative,but indicates that data about nests found in small numbers like at Cap Tourmente give not a correct picture of first initiation data(see page 8).

VII)Sightings of marked female ducks.

All marked females except the wood duck have been seen several times.

a)Black duck female.Marked June 9.Nested in the complex of ditches east of La Petite Ferme.Hatched a brood of 5 young on June 9. Nesting [illegible] June 9.

27/6 At 6.10 h in the morning during high tide seen near the entrance of La Friponne.4 young age 1^b .At a distance of 150 feet from the coastal marsh swimming in the tidal marsh.

At 17.50 h found resting on the borders of La Friponne,300 ft. north of the tidal marsh.Vegetation consisted merely of rice-cut-grass.All four young were present and escaped when found to La Friponne at 10 ft.distance of the resting place.

28/7 Seen at 17.00h. during high tide near the border of the tidal and coastal marsh with 2 young of age class 2c.Stayed for about a quarter of an hour between the entrances in the tidal marsh of La Friponne and Le Petit Sault.Later they disappeared behind a land ridge.

b)Female mallard.Marked June 2.Nested in the complex of ditches east of La Petite Ferme.Hatched a brood of 4 young at June 2.

2/7 At 8.30 h seen swimming in ditch no 21 with 2 young age 2b

9/7 Without young swimming nervously in ditch 30.

25/7 Flying outof ditch 19.No young were seen.

Pintail,female,marked at June 17.Original number of young probably 9.Nested in the coastal plain north of the ditches.east of La Petite Ferme.

2/7 Seen flying many times in the beaverpond at about 6.00 h.Called loudly. Supposed to have young.

18/7 Seen with a brood of at least 3 young age 2b in the beaverpond at 6.20h.Young disappeared quickly in the vegetation of shrubs and trees that stand in the beaverpond.

19/7 Swimming alone in ditch no.27 at 7.00h

Blue-winged teal,female.Original number of young probably 11 from 11 eggs. Clutch hatched about June 21.The female was marked at June 18.

5/7 Seen with 12 young age class 1c in the ditches,feeding in open water. 20.00h

17/7 Seen with 6 young age class 2b in ditch no.22.Disappeared in the connecting ditch in the middle of 22.Early morning observation.

19/7 Seen with 6 young 2b in ditch no.27 during early morning.The whole group was preening while floating on the water.

21/7 Seen at 5.00h with 5 young 2c feeding in the open water of ditch no 29.

To follow marked female ducks is difficult at Cap Tourmente.Especially this year the vegetation was very abundant,especially broad-leaved cattail. As stated before it is desirable to mark as many female ducks as possible to make reliable statements about habitat utilization and general behaviour.The bad visibility underlines this need.

Interesting is the change of the black duck with her brood from the ditches to the marsh.It confirms the impression that female black ducks might have changed from the ditches east of La Petite Ferme to the tidal marsh I mentioned on page 11.The marked female left the ditches when her brood was still quite young.

The female pintail also changed place,another indication of the mobility of pintail broods supposed on page 11.

The blue-winged teal stayed probably all the time between hatching and fledging of the young in the ditches.Also this is not in contrary with the interpretation of the observations as mentioned at page 11.

Beard(1964)observed female ducks leaving their broods for periods till 1.15h to feed elsewhere.This happened more often as the brood got older. Hence I might have seen the mallard on such trips and the fact I saw her alone does not automatically imply her brood was dead.

For the female pintail seen on July 19 I suppose she made such a feeding trip.

VIII)Marking of young ducks at the tidal marsh.

During the last week of July and the two first weeks of August searches for duck broods were carried out in the tidal marsh.

The following broods were found:

July 29:female mallard,age class 2c in a vegetation of american bulrush, wild rice and broad-leaved arrow-leaf.USFWS band no 1037-96002. No other ducklings were observed.Female calling.Near picket 6&7, about 60 feet from the coastal marsh.

July 30:female black duck,age class 3,not yet capable to fly,in vegetation of american bulrush,wild rice and broad-leaved arrow-leaf.USFWS band 1037-96003.No other ducklings were observed,no female seen. near the escarpment of the coastal marsh,at the same height as picket no 17.

July 31:2 female pintail,age class 2a,in vegetation of american bulrush, wild rice and broad-leaved arrow-leaf.Webtagg M151&M152.No other

ducklings were observed.Female calling.Near picket 5&6 at about 70 feet distance of the coastal marsh .

Male mallard age class 2c,in vegetation of american bulrush.USFWS band 1037-96004.No other ducklings were observed.Female calling.Found near picket 3 in the extreme south of the bulrush vegetation.

Aug 4:Retrapped Mallard 1037-96004 in vegetation of american bulrush.Female calling, no other young observed.Near picket 2 in the south of the bulrush vegetation.

Aug 7:female green-winged teal,age class 1a/1b,in bulrush vegetation.Webtagg M 503. Two other ducklings were seen but not caught.Female calling.At the same heigt as picket 9,about 500 feet south of the escarpment of the coastal marsh and 300 feet west of Le Petit Sault.

Repeated observations of a female pintail near picket 6&7 and a female shoveller near picket 9 do suppose at least two more broods being in the tidal marsh.

4 outof five broods were found in the western part of the tidal marsh(west of Le Petit Sault).Only one was found east of this stream(black duck).

Combined with the observations of female ducks we find 5 broods west and 2 east of Le Petit Sault.Most observations were done in the part of the tidal marsh between La Friponne and Le Petit Sault,where,by the way,also most time has been spent for observations.So the trappings were not representative (which is very well possible with a small number like this) or broods move over the flooded tidal marsh but stay on points quite fixed during low tide(observations of female shoveller and pintail and the retrap of the young mallard).

During low tide broods stroll in the muddy tidal marsh,covered by the vegetation.

IX)Loafing,cover and interference possibilities on the water areas in the reserve and brood observations.

In order to get an impression of the use broods make of the several water areas in the reserve I evaluated the above mentioned characteristics of these water areas and the(possible)use ducklings made of it.

a)The tidal marsh

In the tidal marsh the mud beaches at the foot of the escarpment between coastal and tidal marsh were used as loafing places for duck broods.When tides were high,the broods mostly swam around.Loafing in this situation was restricted to several small islands(diameter not exceeding 3 ft.)just south of the escarpment.The borders of streams also served as loafing places during high tide, while the southern border of the tidal marsh might serve for loafing during high tide as well.When vegetation was low broods seemed to loaf in the tidal marsh on clay-clumps in the vegetation.

Cover was only scarce during tides flooding the vegetation on the marsh.

During the rest of the time the vegetation of american bulrush,wild rice and broad-leaved arrowhead gave good protection against predation and bad weather.First broods,however,arrive in the tidal marsh when cover is still quite bad.

During low water the possibility of interference of duck broods is quite small,but when water is high broods can be seen travelling along the shores of the coastal marsh and the streams.The possibility of interference seems to be higher under those conditions.Nevertheless,only twice broods were the subject of aggression.An adult black duck tried to join the brood of the marked female black duck but was chased away.Another time a brood of five young pintails(age class 2c) followed a female pintail with a brood of three 1b young and tried for about 10 minutes to peck the smaller ducklings.After the female and her young had hidden in the sedges of a small island as mentioned above,the other brood ceased its aggression.During the many observation periods on the tidal marsh these were the only cases of apparent aggression in which broods were involved.I conclude that on the tidal marsh aggression is not considerable.

b)The ditches east of La Petite Ferme.

Duck broods and hens in this management unit were seen loafing on old muskrat houses,mudbars(especially at the crossings of the ditches with the ditch in the middle of the complex,that had an east-west direction)and mowed cattail,floating in dense packets on the water.Especially those flat mudbars near the water were very common in the ditches.Cover was excellent.The vegetation on the dikes was made accessible by many muskrat pathways.Furthermore,broad-leaved cattail,common water plantain and the emerging broad-leaved arrow-leaf gave excellent cover on the water.The stands were in most cases not too dense to be a limitation for the tresspassing of the broods.

Interference possibility was small in the ditches.Compared with a pond: in the ditches 2 broods could stay at a distance of 30 ft. without being seen,because of the dike between them.Also the abundant vegetation helped in staying separated of the broods.The only interference between broods observed was on the crossings of the middle ditch and the other ditches,but never aggressive behaviour between broods or scattering of broods was observed.Two times two broods of blue-winged teal and baldpate were seen mixed for about five minutes.Afterwards the broods separated and the original numbers of young were maintained.

Hence,there seemed to be little interference between broods in these ditches and when mixing of broods occurred,they separated in the origenal number composition without apparent aggression.

c)The beaverpond.

The beaverpond offered good loafing places.No broods have been seen while loafing however.Mudbars,dead trees and beaverdams were common in this area.Dead trees in the eastern and middle part of the complex offered good overhead protection.

The surrounding vegetation(especially of broad-leaved cattail and marsh horsetail)and large parts of the shoreline vegetation were of moderate density.

In the western part of the complex "emergent"vegetation(flooded sedges) offered good cover for swimming or feeding broods.No interference of duck broods was observed,but the many trees,mudbars and spits of land gave good opportunity for duck broods to avoid mixing up and aggression.

d)La Grande Ferme management unit

Loafing of broods was observed on a muddy beach at the west side of this pond. Also the broad-leaved cattail vegetation in the centre of the basin offered good loafing places,merely muddy elevations.A muskrathouse in this vegetation might also have served as loafing place.Cover was excellent,interference was possibly reduced by the cattail vegetation and the small channals between it.

e)The ruin of La Ferme du Cap.

Good loafing places were four small islands in the pond with a vegetation of sedges and water pepper.The brood of blue-winged teal that stayed in this pond from some days after hatching till fledging was seen several times loafing on these islands.The bordering vegetation was very dense.In the western part of the pond emergent broad-leaved arrowleaf provided good cover.The pond is quite open and I suppose that interference of duck broods can occur easily if more than one brood occupies this pond.

Above mentioned parts of the reserve all served as rearing place for broods. In the following parts no duck broods have been observed,except a brood of green-winged teal in the Friponne just north of the railway

f)Dynamited ponds.

These ponds were this year very small and had in most cases no emergent vegetation.Loafing possibilities were restricted and the surrounding vegetation was very dense.I think they were too small to have a carrying capacity of more than one brood without heavy aggression.

g)Ditches north of La Petite Ferme.Poor loafing possibility.Cover good on the small water area,the surrounding vegetation was very dense(broad-leaved cattail).Interference might be quite high when several broods occupy this unit.

h)Pond of Le petit Sault.Good loafing facilities but in general poor cover in the water.The surrounding vegetation was locally well accessible.

j)Streams in the coastal plain and northern part of the coastal marsh.
Streams in the southern part of the coastal marsh were considered under (a). Streams in general provided good loafing facilities,especially mudbars.Emergent vegetation only provided cover near the borders of the streams.Bordering vegetation varied between very dense and moderate.Because of the many curves in the streams the potential interference is quite small.

k)Pond north of La Ferme du Cap.
This pond provided good loafing places(dead trees,mudbars) and the surrounding vegetation was locally not too dense.Emerging arrow-leaf could give good protection during feeding.

As already mentioned before I constructed a minimum population of duck broods by comparing the several broods on hatching date,number of young etc.
The time between the hatching and the date the young were sighted was supposed to be the time a brood had lived,and,if no overlap with hatching data of broods elsewhere occurred,the time a brood had stayed in a given water area.As already pointed out data gave no reason to suppose considerable movement of duck broods in the reserve.
By this way the number of weeks a brood stayed in a given area was estimated(one broodweek being a week or part of it a brood stayed in the given area).See graph 1
The graph shows a peaknumber of broods together in the ditches east of La Petite Ferme in the week of June 30 till July 6 of 55 broods.about 3.7 broods per acre of water.This is a very high density.Beard(1964)observed a maximum density of .75 brood per acre in a 20 acre marsh and cited Evans et al(1952:33) who found in his study considerable higher densities in a pothole region in the Minnedosa study area in Manitoba.The excact numbers were unfortunately not given.Anyhow,I suppose the complex of ditches has a very high carrying capacity,taking into account the absence of aggression during observations in this area.
The exact surface of the beaverpond area is not known,since the beavers made a considerable enlargement of the water area in late spring.Estimation shows a brood density of .8 broods/acre in the weeks from June 23-July 6 (4 broods).
The southern basin of La Ferme du Cap management unit had a density of 1.5 brood per acre(1 brood) between June 16 and August 10.
La Grande Ferme was supposed to have at least 5 broods in the basin between June 23 and July 6,a density of 2.2 broods per acre.
The tidal marsh showed a maximal number of broods in the week between July 7 and July 13.These 26 broods mean 14.9 broods per mile of shoreline.Thompson (1971) calculated a minimal number of 8.6 broods per mile of shoreline by taking the maximal number of broods seen during one day at the tidal marsh that were thought to be different.Reed(1970) (1970) using trap-retrap methods, found a densi-

ty of 10.6 broods per mile of shoreline in his study of the breeding biology of the black duck in a marsh on the south shore of the St.Lawrence River.
The high estimate in the present study compared with Reed(1970) might be the result of a differentiation in habitat use by broods of five species(see Collias&Collias 1963,Thompson 1974).An area with a limited carrying capacity for one species can carry a higher total of broods when several species use this area.The difference in habitats in the two areas should also be taken into account.
The share of each species in the total numbers of broods seen this season in the tidal marsh and the ditches east of La Petite Ferme is shown in graph 2&3.
The total number of duck broods in the reserve during this season is shown in graph 4.

X)Time spent by duck broods in the several water areas in the reserve.

By adding the week-totals of each water area we can estimate the total number

Table 9 .Number of brood weeks spent in the several entities of Cap Tourmente NWA

Place	brood weeks	no broods	no broods III
Ditches east of La Petite F.	349(57.3)"	62	32
Tidal Marsh and La Grande F.+	228(37.4)	37	21
Beaverpond	25(4.1)	6	3
La Ferme du Cap(south.pond)	7(1.2)	1	1
Total	609(100)	106	57

"=numbers between brackets represent percentages of the total
+=taken together because the basin of La Grande Ferme dried during early summer.

The importance of the complex of ditches east of La Petite Ferme is underlined another time with the data shown above.The complex of ditches shows a total number of brood weeks that is one and a half times higher than that of the tidal marsh.The other two areas are of little importance for the rearing of young ducks.

XI.)Estimation of the minimal number of brood and young fledged.

Mortality of young ducks is highest in the first days of life(see a.o. Reed 1970).Especially in the latest stage before fledging,class 3,mortality is small compared with the first days.I assumed most ducklings that reached class 3 also fledged.

Table 10.Minimal number of broods and young supposed to have fledged.

	Species								
Place	BWT	GWT	BD	M	S	PT	BP	WD	Total
Ditches east of La Petite Ferme	14(4.2)	1(3)	4(5)	2( )	2(6.5)	8(4.5)	1(2)		32 30
Tidal marsh and La Grande Ferme		6(4.3)	3(3.3)	2(3.5)		8(4.3)	2(6)		21
Beaverpond	1(2)						1(2)	1(3)	3
La Ferme du Cap (southern pond)	1(12)								1
Totals	16(4.55)	7(4.1)	7(4.3)	2(3.5)	2(6.5)	16(4.4)	4(4)	1(3)	57
Number of young	73	29	30	7	13	69	16	3	240

Because the number of nesting females per species has not been recorded accurately,and the estimations of breeding pairs have not a granted reliability,production estimates(young per female) do not seem meaningful.

From these data it is obvious,however,that most young have probably been produced by blue-winged teal and pintail.The black duck ranks third.

In 1973(Bédard) most ducklings are supposed to have fledged of black duck and pintail,with the baldpate as third.The blue-winged teal ranks fourth in this year of study.

XII)Activity of duck broods.

Activity of both adult ducks and broods was most obvious in early morning (from half an hour before sunrise till about two hours after sunrise) and late afternoon(about two hours before sunset till half an hour before sunset).All during the day broods could be observed in water areas in the reserve, but never in as high numbers as early in the morning or late in the afternoon.

Nightobservations carried out between August 4 and 11.in the ditches east of La Petite Ferme and during night at the tidal marsh showed only one time night activity of broods.At August 9/10 a brood of four blue-winged teal of unknown age,accompagnied by a hen was sighted in ditch 13 at 11.30 h, swimming.

An interesting aspect,by the way,was that this night had full moon and the sky was heavily clouded...

No other night activities have been seen during these observations.Just before the human eye is capable to detect ducks on the water ducks started the night of Aug 11 to enter the flooded tidal marsh.

Observations of female ~~pintails~~ black ducks with radio-emitters also showed no activity of these hens during the night(Reed,pers.comm).

XIII)Grouping of broods-

Three times groups of several broods were observed.

a)2 female pintails with a group of 14 young,age class 3,were seen on the flooded marsh and stayed together for at least 1h10min.

b)At august 8 a group of 21 young green-winged teal were sighted on the flooded tidal marsh in company of three females.The age class of the group was 2b . At 5.15h they came from the Friponne and stayed feeding in the not completely flooded vegetation of american bulrush,wild rice and broad-leaved arrowheaf.

This group stayed together till water levels became lower at 5.30 h.

c)On August 23 a group of 17 ducklings of the green-winged teal in company of three hens came from the Friponne.Since the age class of this brood was early 3,it was probably the same group as mentioned above.They entered the not completely flooded vegetation and I lost sight of them.

Reed told me that during areal counts groups of young were seen that seemed to be green-winged teal but he was not sure.These observations show that the supposition is probably right.

XIV)Spacing out of duck broods.

Preferences for certain types of habitat would be expected in case concentrations of duckbroods would occur.Only at the tidal marsh a certain amount of concentration was observed.The area between the observation towers(especially between Petit Sault and La Friponne,showed higher numbers of duck broods than other parts of the tidal marsh.Even if I consider that observations were mostly carried out in that area,it seems that duck broods favor this area over other parts of the tidal marsh when water is high.Thompson found as an important area in the tidal marsh the area 1000 ft east and 1000 ft west of La Friponne and concludes that the edge of the escarpment is very important for duck broods.Access channels to the tidal marsh were also important in determining the preference of duck broods for a certain part of the tidal marsh,according to Thompson.The area between Le Petit Sault and La Friponne shows both characteristics.Another place where broods(to a smaller extend) were seen were the entrances of La Blondelle and Le Marsollet.This is also recorded by Thompson.Probably streams have an important function in the life of broods on or near the tidal marsh.

XV)Predation.

Predation of nests and a female shoveller were already mentioned on page 9. This year again a big army of hungry potential predators on eggs,ducklings or adult ducks roamed in or over the wildlife area.

These potential predators were sighted:

Red fox	Vulpes vulpes	seen three times
Raccoon	Procyon lotor	seen many times
Skunk	Mephitis mephitis	seen many times
Long-tailed weasel	Mustela frenata	seen twice
Common crow	Corvus brachyrhynchos	many times seen
Raven	Corvus corax	nested on the escarpment of the highlands
Marsh hawk	Circus cyaneus	seen many times,especially over the coastal and tidal marsh
Great horned owl	Bubo virginianus	seen five times near La Grande Ferme
Great black-backed gull	Larus marinus	Seen several times near the tidal marsh
Herring gull	Larus argentatus	Common in the reserve
Ring-billed gull	Larus delawarensis	Common in the reserve

Summary

Species	drakes	broods					broods att.age 3					young att.age 3				
		PF	GF	FC	BP	Tot.	PF	GF	FC	BP	Tot.	PF	GF	FC	BP	Tot.
Black duck	28	8	7	0	0	15 /	4	3	0	0	7 /	20	10	0	0	30
Mallard	9	1	3	0	0	4 /	0	2	0	0	2 /	0	7	0	0	7
Blue-w.teal	38	26	4	1	2	33 /	14	0	1	1	16 /	59	0	2	12	73
Green-w.teal	20	2	9	0	1	12 /	1	6	0	0	7 /	3	26	0	0	29
Pintail	23	12	14	0	0	26 /	8	8	0	0	16 /	36	33	0	0	69
Shoveller	11	7	0	0	0	7 /	2	0	0	0	2 /	13	0	0	0	13
Baldpate	11	5	0	0	1	6 /	1	2	0	1	3 /	2	12	0	2	16
Wood duck	5	1	0	0	2	3 /	0	0	0	1	1 /	0	0	0	3	3
Ring-necked duck	1	0	0	0	0	0 /	0	0	0	0	0 /	0	0	0	0	0
Gadwall	1	0	0	0	0	0 /	0	0	0	0	0 /	0	0	0	0	0
Totals	147	62	37	1	6	106	30	21	1	3	54	123	88	12	2	240

PF:Ditches east of La Petite Ferme

GF:Basin of La Grande Ferme and Tidal Marsh (for drakes only La Grande Ferme,for broods mainly the tidal marsh).

FC:Management unit of La Ferme du Cap(for broods only southern basin)

BP:Beaverpond

1)Drake counts during early May revealed a potential breeding population of 147 pairs of ducks(see table 1 p 7)

Comparison with the number of different duck broods seen indicates that a drake count is an acceptable measure to estimate breeding populations. (see table 5 p.12)

2)A nest survey gave poor results.Only 22 nests were found of which 6 hatched. (see table 3 p.9).Other nests were lost because of flooding,abandonment and predation.

The brood survey indicated the presence of 106 broods from 243 brood sightings. Blue-winged teal and pintail broods were most numerous.The total number of broods thought to be different seen at Cap Tourmente was in 1976 almost twice the number observed in 1974.Ecological maturation of the management units seems to have triggered this increase.(see table 5 p.12)

3)The ditches east of La Petite Ferme were used most by duck broods(see table 9 p.21) This unit was also most successful of all management units in producing age 3 young(see table 10 p.21).

The dynamited ponds did not accomodate duck broods during this study.The maximal number of broods that might have inhabited the pond near La Grande Ferme could not be determined because this management unit dried up during early summer.

The southern pond of La Ferme du Cap unit was used by one brood this season. No preferences for certain parts of the management units were recorded.

Summary-continued.

Of the natural habitat types the tidal marsh accomodated most duck broods and in this entity also most duck broods attained age 3.The beaverpond was not important as brood-rearing area,while no sightings were made in other natural habitat entities.

The region between La Friponne and Le Petit Sault was most important for broods when the tidal marsh was flooded.

Brood movements are thought to be small.4 black duck broods,2 pintail broods and 2 baldpate broods might have gone from the ditches east of La Petite Ferme to the tidal marsh,while one female pintail went from these ditches to the beaverpond.

No high degree of aggression was observed in broods.This indicates that none of the waterareas was overcrowded by broods.

4)Black ducks and pintails were early nesters at Cap Tourmente,blue-and green-winged teal were late nesters(see table8 p.14).

Five hens were trapped on the nests and marked with nasal saddles.None abandoned the nest afterwards.Marked female ducks were not seen more than 4 times each.

Broods were most active during early morning a..d fron about 2 hours before till half an hour before sunset.

Broods of green-winged teal and pintail were seen to form groups.

The tidal marsh serves as feeding area for high numbers of ducks during August and September

Advice for further research in the wildlife area.

a)For a better assessment of production nest searches should be carried out more intensively.Possibly the population at Cap Tourmente is too small for this kind of study.

b)To get a more accurate impression of brood movement and usage of the reserve marked females are very important.Because the number of nests found is normally quite small and losses are considerable it might be wishable to trap hens during spring with the aid of cannonnets.

c)In order to be able to follow broods in all parts of the reserve I advice the installation of one or two platforms in the beaverpond area,one or two observation towers at the end of the central east-west directed ditch in the complex east of La Petite Ferme and two observation platforms near La Blondelle and Le Marsollet.

d)A point list of priorities should be decided upon in advance of the duck breeding season to concentrate fieldwork on those gaps in present knowledge most relevant to management decisions.

e)A study of the significance of Cap Tourmente NWA as a post-moult feeding area should be undertaken in relation to the entire Ile d'Orleans sector of the St. Lawrence River.

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Groningen,February 21 1974.

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List of plant names mentioned in the text.

speckled alder	-Alnus rugosa
red-osier dogwood	-Cornus stolonifera
trembling aspen	-Populus tremaloides
willow	-Salix sp.
black ash	-Fraxinus nigra
raspberry	-Rubus spec.
sweet gale	-Myrica gale
marsh horsetail	-Equisetum palustre
sensitive fern	-Onoclea sensibilis
skunk cabbage	-Symplocarpus foetidus
water pepper	-Polygonum hydropiper
clover	-Trifolium spec.
cape touch-me-not	-Impatiens capensis
purple loosestrife	-Lythrum salicaria
goldenrod	-Solidago spec.
aster	-Aster spec.
common water-plantain	-Alisima triviale
broad-leaved arrow-leaf	-Sagittaria latifolia
flowering rush	-Butomus umbellatus
spike rush	-Eleocharis spec.
american bulrush	-Scirpus americanus
scaly sedge	-Carex paleacea
erect sedge	-Carex recta
sedge	-Carex spec.
common rush	-Juncus effusus
awnless brome-grass	-Bromus inermis
pectinate spartina	-Spartina pectinata
timothy	-Phleum pratense
eleodea	-Eleodea spec.
rice cut-grass	-Leersia oryzoides
wild rice	-Zizania aquatica
broad-leaved cattail	-Typha latifolia
broad-fruited bur-reed	-Sparganium eurycarpum

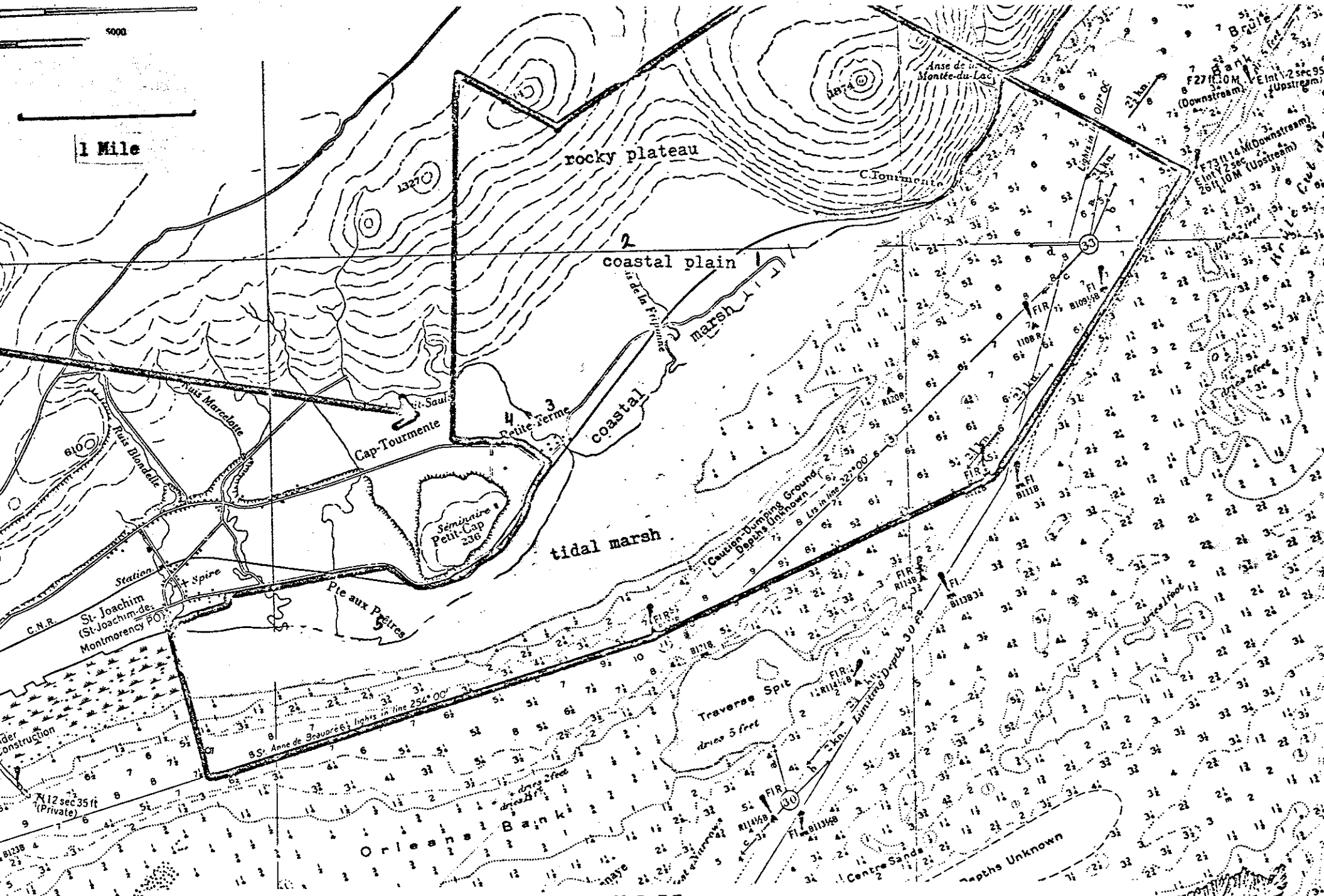
List of ducks mentioned in the text.

baldpate	-Anas americana
mallard	-Anas platyrhynchos
black duck	-Anas rubripes
shoveller	-Anas clypeata
pintail	-Anas acuta
green-winged teal	-Anas carolinensis
blue-winged teal	-Anas discors
wood duck	-Aix sponsa
gadwall	-Anas strepera
ring-necked duck	-Aythya collaris

List of mammals mentioned in the text.

At page 23 the potential predators have already been mentioned.

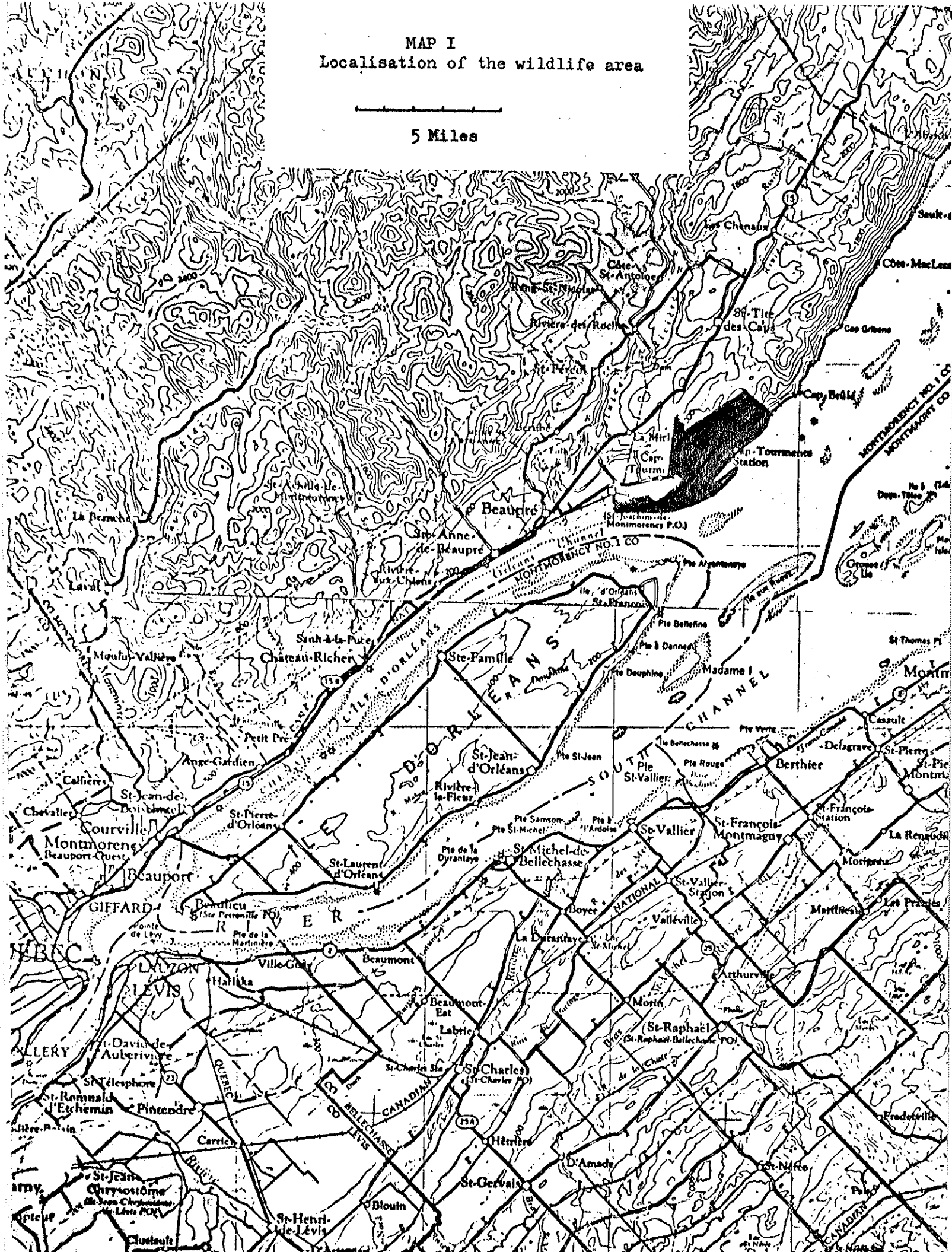
common musk rat	-Ondatra zibethicus
beaver	-Castor canadensis

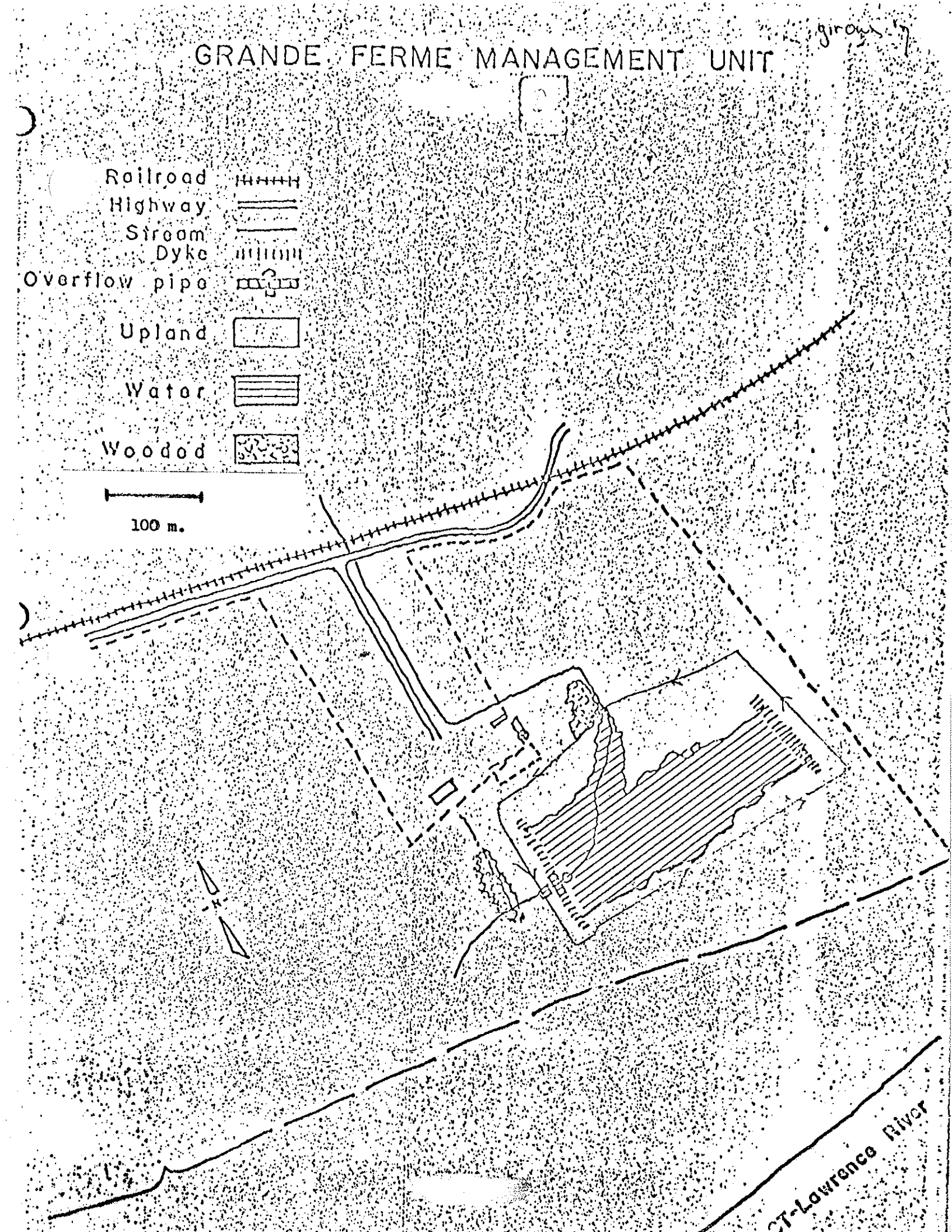


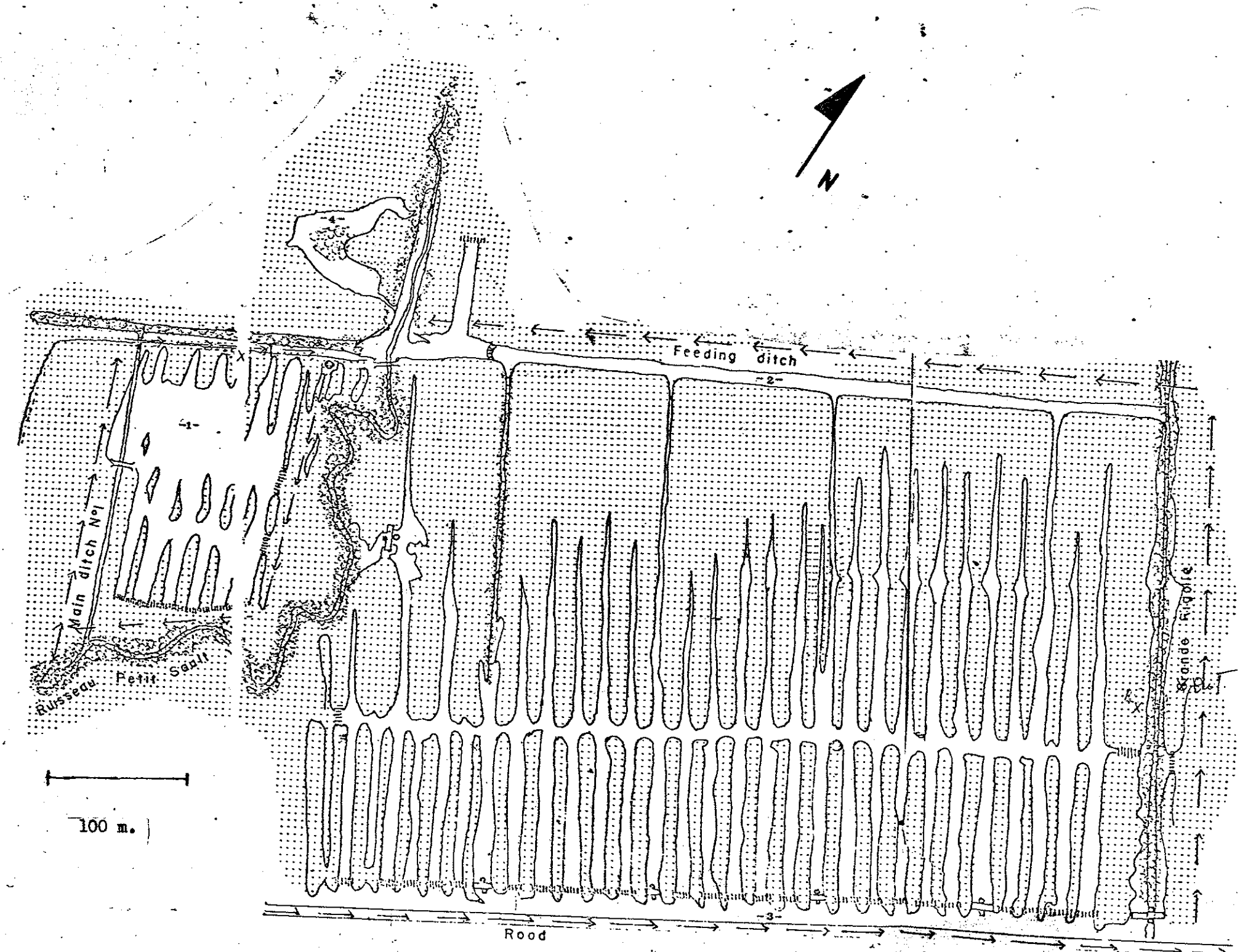
MAP II

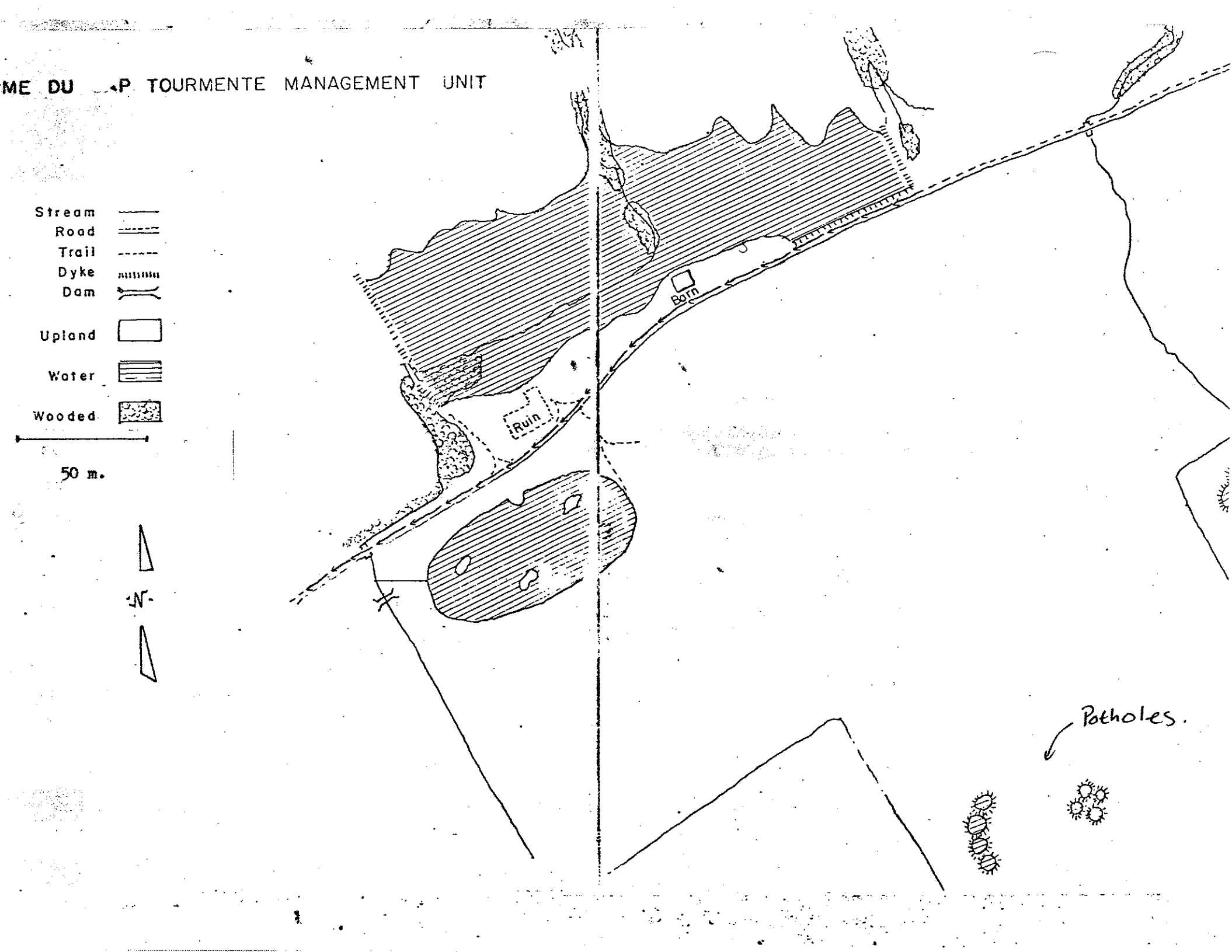
Cap Tourmente National Wildlife Area.

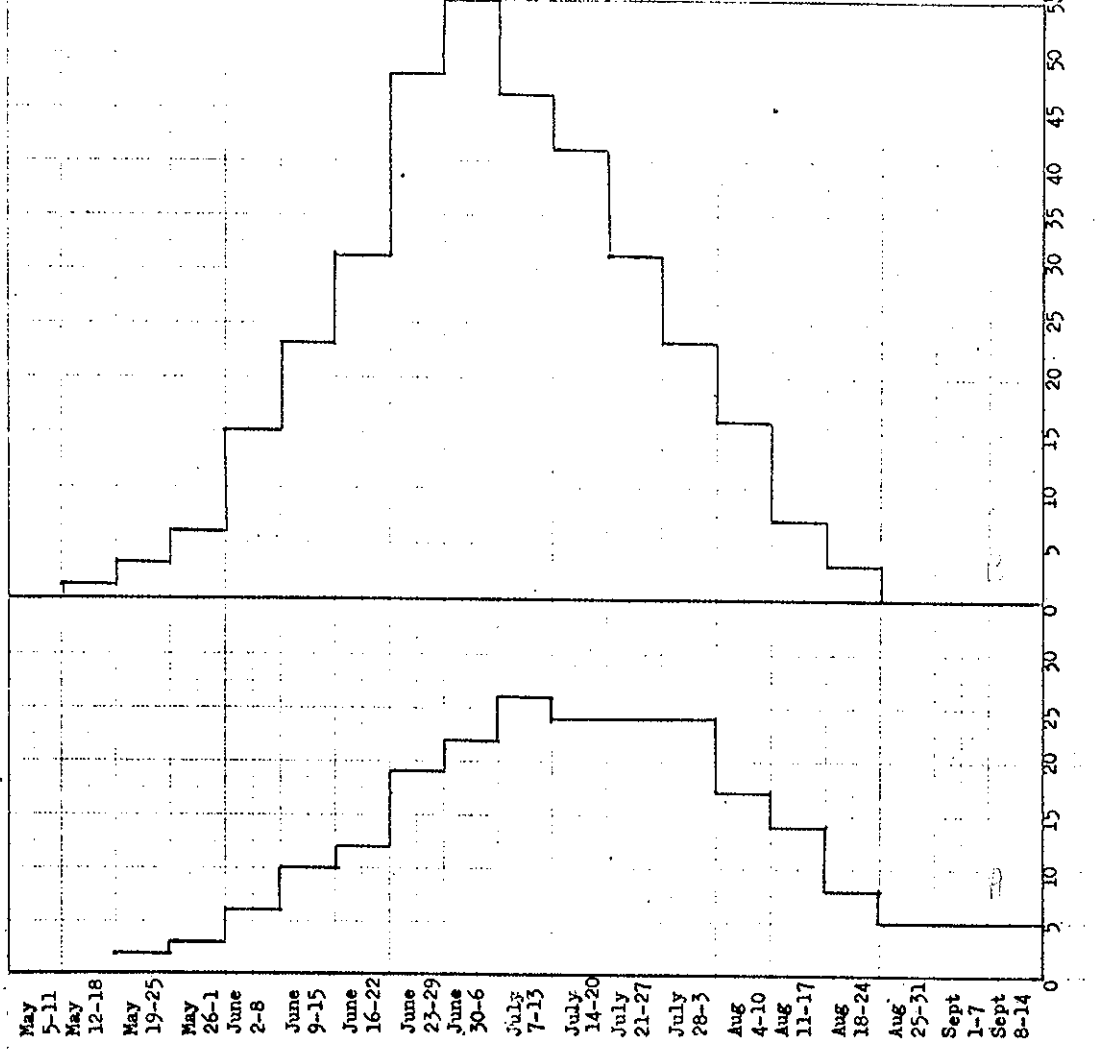
1=the ruin of La Ferme du Cap
2=the beaverpond
3=ditches east of La Petite Ferme
4=ditches north of La Petite Ferme and the natural pond formed by Le Petit Sault
5=La Grande Ferme


MAP I
Localisation of the wildlife area
5 Miles
Beaupré
Ste-Famille
St-Jean-d'Orléans
St-Laurent d'Orléans
St-Pierre-d'Orléans
St-Michel-de-Bellechasse
St-Vallier
St-François-Montmagny
Berthier
Courville
Montmorency
Beauport
GIFFARD
LÉVIS
St-Charles
St-Gervais
St-Henri-de-Lévis
Blouin
Pointe-de-Lévy
Beaumont
Pinteodre
St-Raphaël
Arthurville
Valleville
Morin
Labrie
Hêtrière
D'Amade
Fredetville
Berthier
Delagrave
Casault
Madame I
ILE D'ORLEANS
CHANNEL
RIVER
SOUTH
NATIONAL
CANADIAN
MONTMORENCY NO. 1 CO
MONTMAGNY CO
BELLECHASSE CO
LEVIS CO


GRANDE FERME MANAGEMENT UNIT
Railroad
Highway
Stream
Dyke
Overflow pipe
Upland
Water
Woodod
100 m.
N
St-Lawrence River

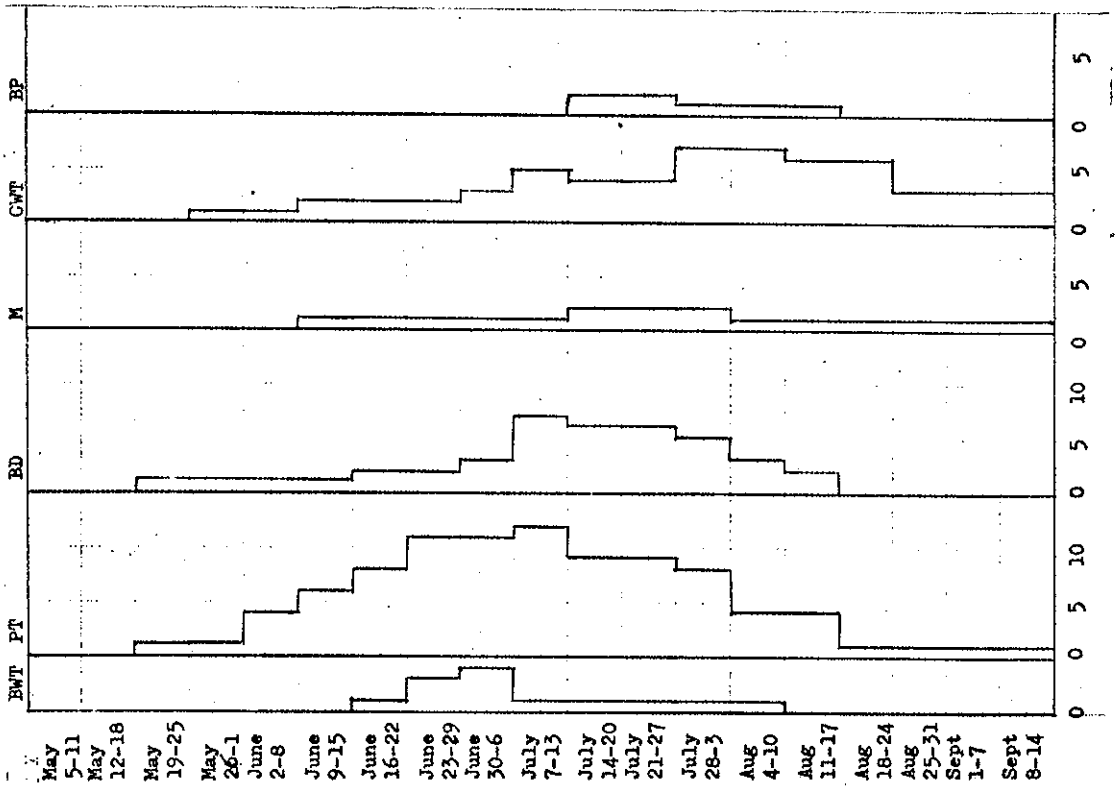

N
Feeding ditch
-1-
-2-
-3-
-4-
Main ditch No1
Rousseau Petit Sault
Rood
100 m.


ME DU P TOURMENTE MANAGEMENT UNIT
Stream
Road
Trail
Dyke
Dam
Upland
Water
Wooded
50 m.
N
Barn
Ruin
Potholes.



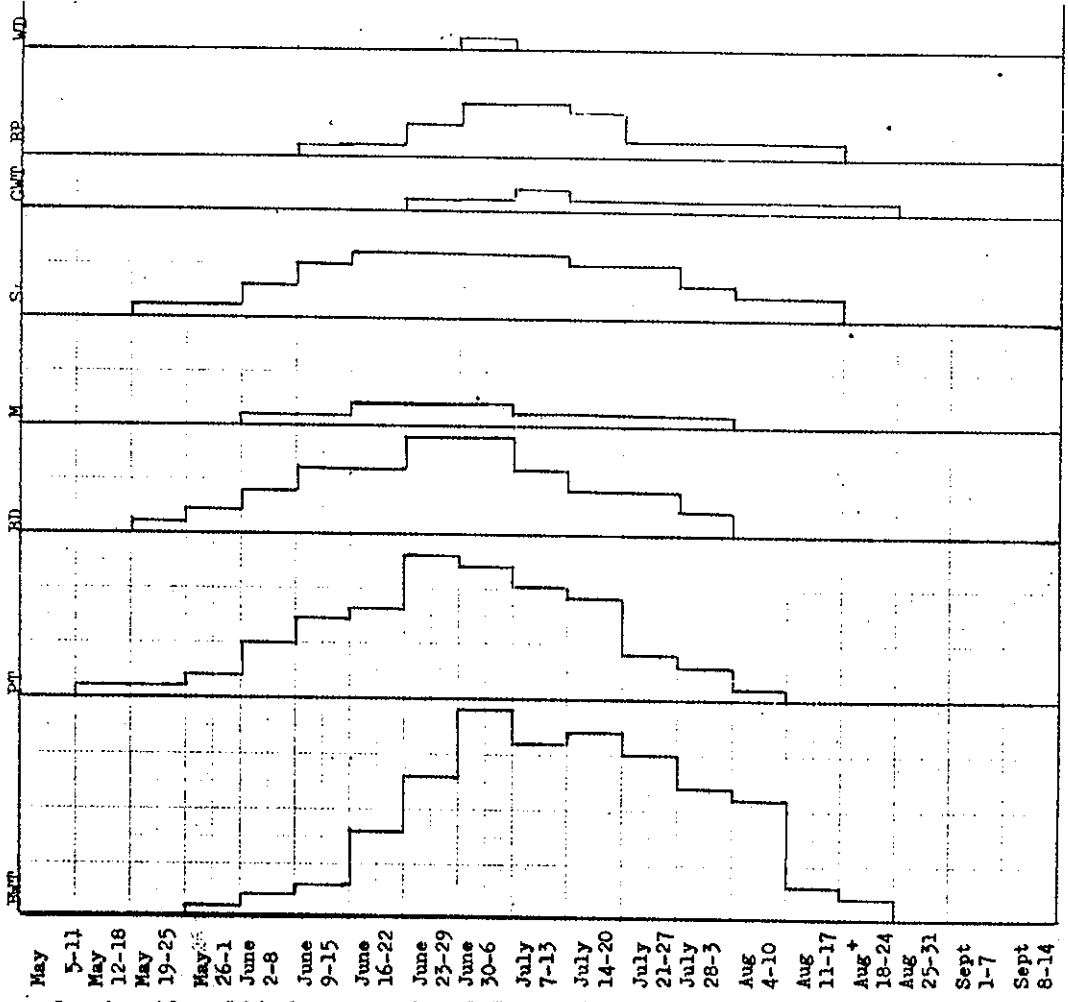
Graph I

.imated totals of duck broods on the tidal marsh(A) and in the ditches east of La Petite Ferme(B).



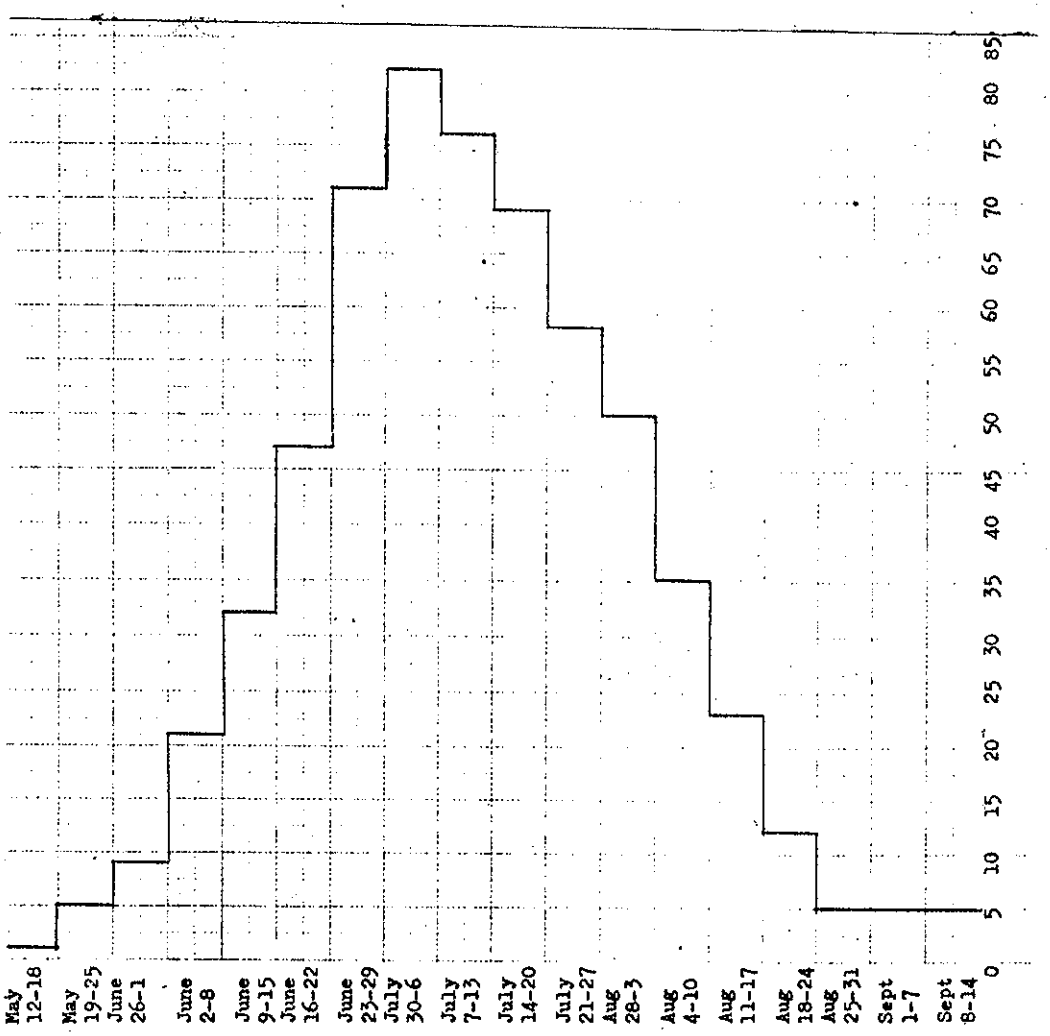
Graph II

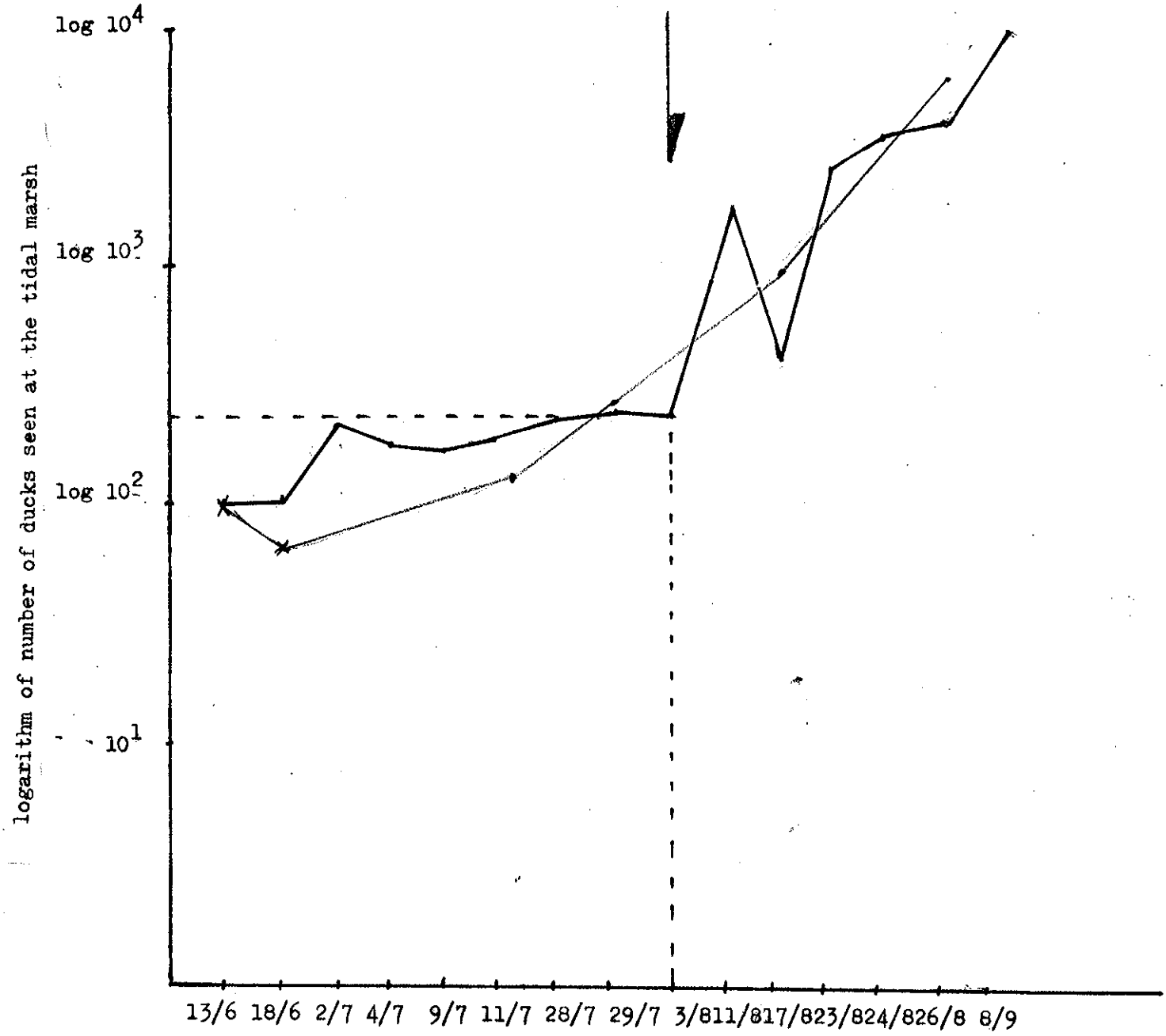
Graph III



Estimated number of duck broods in the ditches east of La Petite Ferme

Graph IV





NUMBER OF DUCKS ON THE TIDAL MARSH.GRAPH 5

Graph VI

Hatching chronology of four most common ducks at Cap Tourmente.

a) accumulative
b) numbers for each week. ▨