

MISSISQUOI NATIONAL WILDLIFE REFUGE
SWANTON, VERMONT

ANNUAL WATER MANAGEMENT PROGRAM

2000

Prepared and
Submitted by

Robert C. Bell
Refuge Biologist

Date: 3/8/00

Reviewed by:

Zone Biologist

Date: _____

Reviewed by:

David J. Fugere
Refuge Operations Specialist

Date: 3-7-00

Approved by:

Mark W. Sweeney
Refuge Manager

Date: 3/7/00

MISSISQUOI NATIONAL WILDLIFE REFUGE

SWANTON, VERMONT

ANNUAL WATER MANAGEMENT PROGRAM

2000

Prepared and Submitted by _____ Date: _____
Robert A. Zelle, Biologist

Reviewed by: Janet Taylor Date: 1/21/2000
Zone Biologist

Reviewed by: _____ Date: _____
Refuge Operations Specialist

Approved by: _____ Date: _____
Refuge Manager

Table of Contents

I.A.	Annual Water Management Program Outline for Cranberry Pool	1
I. B.	Ecological Effects of the Past Year's Water Levels on Water Management Unit #2	2
1.	Water Supply and Use During 1999	2
2.	Related Biological Conditions and Wildlife Use	3
I. C.	Statement of Objectives for the Proposed Levels in Unit #2	4
II. A.	2000 Annual Water Management Program Outline for Water Management Unit (WMU) #1 - Big Marsh Slough & Goose Bay Pool	5
II. B.	Ecological Effects of the Past Year's Water Levels on Water Management Unit (WMU) #1	5
1.	Water Conditions During 1999	5
2.	Related Biological Conditions and Wildlife Use	6
II. C.	A Statement of Objectives for the Proposed Levels	6
III. A.	2000 Annual Water Management Program Outline for the Remaining Refuge Areas	7
III. B.	Ecological Effects of the Past Year's Water Levels on the Remaining Refuge Areas	7
1.	Water Conditions During 1999	7
III. C.	A Statement of Objectives for the Proposed Levels	8

I.A. Annual Water Management Program Outline for Cranberry Pool

Refuge: Missisquoi Water Unit Name or Number: #2

Maximum Elevation Permissible: approximately 98.80'MSL

Flowline Elevation of Lowest Drain Structure: 93.00'MSL

Elevation of General Pool Bottom (not borrow pit bottom): 95.50'MSL

A.1. Water Surface Elevations & Salinity for Past Year

<u>Date</u>	<u>Water Surface Elevations</u>	<u>*Salinity (%Sea Water)</u>
Jan. 1	NVAL	
15	NVAL	
Feb. 1	NVAL	
15	NVAL	
Mar. 1	NVAL	
15	NVAL	
Apr. 1	97.09' MSL	
15	97.39' MSL (4/19)	
May 1	97.19' MSL (5/09)	
15	not recorded	
26	97.08' MSL	
June 1	not recorded	
15	not recorded	
22	95.83' MSL	
July 1	95.20' MSL	
12	95.81' MSL	
15	not recorded	
30	94.94' MSL	

B.2. Planned Elevation & Salinity for Program Year

<u>Water Surface Elevation</u>	<u>*Salinity Objective</u>
NVAL	
NVAL	
NVAL	
NVAL	
NVAL	
(ice-out expected)	
Same as Missisquoi River	
while lake level is >	
98.80' MSL	
97.20' MSL	
97.20' MSL	
97.20' MSL	
97.20' MSL	
97.20' MSL	
97.20' MSL	
97.20' MSL	
97.20' MSL	
97.20' MSL	
97.20' MSL	

Aug. 1 dry not measurable
15 dry

During August Cranberry Pool was dry
due to drought conditions the summer of 1999.

Sept. 1	dry	97.20' MSL
15	not taken	97.20' MSL
21	95.81' MSL	

9/8/99 the stop logs were adjusted
so that top of logs was 6" above
Dead Creek level. Dead Creek was 94.17' MSL

Oct. 1	96.54' MSL	97.20' MSL
12	96.62' MSL	
15	not taken	97.20' MSL
20	96.67' MSL	

Nov. 2	96.81' MSL	97.20' MSL
15	not taken	96.00' MSL
17	96.35' MSL	

Dec. 1	not taken	Freeze up expected
3	96.55' MSL	
14	96.34' MSL	
15	not taken	96.0' MSL til spring
31	frozen	
	Ice in river 12/23/99	
	river completely frozen 12/27	

Mild weather in Dec. 1999 resulted in open water in river. Impoundments were iced up on 12/3/99 but opened some the following week. The onset of freezing temperatures began again 12/18/99 and the river was beginning to make ice the week of Dec 20.

*To be used for pools approved for brackish water management

I. B. Ecological Effects of the Past Year's Water Levels on Water Management Unit #2

1. Water Supply and Use During 1999

Lake Champlain surface elevation peaked April 9 at 98.35' MSL at the Charcoal Creek. The peak lake level was much lower than normal in 1999. The water level in the Cranberry Pool is usually uncontrollable when the lake level is above approximately 98.80' MSL. At that elevation, the Missisquoi River will overtop its bank near the barge slip west of the pool and the pool level would be directly related to the lake level. When the lake level has subsided below 98.80' MSL, the water level in Cranberry Pool becomes controllable with two water control structures located

near Dead Creek. The recharge of the impoundment did not occur through this flood effect in 1999. The annual overtopping of the river bank is the principal means of restoring water to Cranberry Pool. Without this overtopping process, it is often difficult to maintain water levels through the summer at planned elevations.

The low peak in the level of Lake Champlain was combined with less than normal precipitation though the spring and summer of 1999. The Cranberry Pool level began to drop below the desired objective in May. By August, the pool was dry except for some water in the borrow ditch along the dike. The below normal precipitation resulted in a gradual drying of the impoundment. On September 8, the stop logs were adjusted to a height about 6" above the Dead Creek level. This was done to take advantage of any sudden rise in the river level that could result from a heavy rainfall. On September 16th, 2.31" inches of rain resulted in water flowing into the Cranberry Pool and on September 22nd the pool level had risen to 95.81' MSL. The pool level rose to 96.67' MSL by October 20th and stayed above 96.00' MSL the remainder of the year.

2. Related Biological Conditions and Wildlife Use in WMU#2

The current water management plan for the Cranberry Pool (WMU#2)(see map attachment # 1) requires lowering the spring/early summer high water levels to 97.20' MSL as soon as possible, and holding that level throughout the year until November. In November, the levels are dropped down to 96.00' MSL, to increase flood storage capacity and reduce the flooding impacts of the following spring. Normally, high water levels in the spring fill Cranberry Pool well above the objective level. The intended objective of reducing water levels to the 97.20' MSL are to provide ground nesting waterfowl and other migratory birds with nesting hummocks and grassed edge habitat that are otherwise underwater during the early April to May nesting season here. This level also provides an optimum amount of interspersed emergent vegetation and water. An excellent hemi-marsh condition is maintained at 97.20' MSL and provides excellent waterfowl brood habitat and good feeding, nesting, and brood rearing conditions for other species such as black terns, moorhens, rails and bitterns. This water management regime has been shown to meet the objectives of the station Water Management Plan best, because waterfowl, marsh and wading birds, wetland passerines, and wildlife food and cover plants all respond favorably to it. Water levels outside the Pool are generally 1-3' lower during late summer and early fall. This outside level is influenced by the effects of heavy precipitation or dry conditions on the Missisquoi River watershed. During periods of low rainfall, the river is essentially at the same level as Lake Champlain. However, during heavy run off the river level may be one or two feet higher than the lake for a brief period of one or two days.

In 1999, Lake Champlain water levels never attained the 98.80' MSL needed to inundate Cranberry Pool. Then because of low precipitation, the pool could not be maintained at the 97.20' MSL objective level throughout the summer. The pool level was below the objective starting on May 12 and continued going lower until the pool was essentially dry by August 1. Heavy precipitation on 9/16 allowed water to begin to flow into the impoundment from Dead Creek and gradually brought the water level up. Low water levels in this unit as well as

throughout the delta seemed to impact traditional waterfowl use patterns in late summer and early fall. Normally, peak waterfowl use numbers approach 20,000 birds in Cranberry Pool. In 1999 peak use was approximately one half this number. It is suspected that the extensive stands of emergent food plants, especially wild rice, that were present in the delta and the lack of waste grain in surrounding agricultural fields, combined with the reduced access to refuge marsh units due to prolonged dry conditions may have all acted in concert to change local use patterns. Whatever the cause, it was obvious that many refuge marsh units, including Cranberry Pool were not used as they have been in the recent past. Likewise, pre-season banding operations in Cranberry Pool were also compromised. Local waterfowl were not attracted to the bait site in this unit because low water levels were not attracting birds to Cranberry Pool.

I. C. Statement of Objectives for the Proposed Levels in Unit #2

For the short term future, the approved elevation of 97.20' MSL will provide opportunities to optimize wildlife and habitat management in Cranberry Pool. This elevation allows waterfowl, black terns, rails, and other wetland species, predator-reduced nesting opportunities. Water levels are shallow enough in early and mid summer for effective brood rearing as the water warms and invertebrate biomass expands. Wild rice, cattail, and bulrush all flourish in the impoundment and provide a good substrate for invertebrates as well as seed production for the fall migration. Cranberry Pool provides excellent habitat for a wide variety of wildlife species. Many of Vermont's threatened, endangered, rare, and special concern species use this impoundment during at least a portion of the year. The refuge will strive to achieve water levels that continue to optimize wildlife use in 2000.

It may be desirable to evaluate the current water management plan for this pool in light of a 1994 site visit and follow-up recommendations by a moist soil/marsh management team. A periodic pool draw down rather than a sustained long term objective level water management regime may be considered in the future. In any case it will not be desirable to operate the pool at a static water level indefinitely. Periodic fluctuations in water levels help to maintain wetland diversity. The Cranberry Pool essentially was in draw-down status during the summer of 1996 and again in 1999 due to a low lake level and reduced summer/fall precipitation. A planned draw-down will be attempted at five year intervals unless drought conditions have caused the same effect within a five year interval.

There are four places to monitor water levels: Charcoal Creek, Mac's Bend Bulkhead, the Dead Creek side of the WCS, and a gauge mounted on a post inside the Cranberry Pool near the WCS. The lake level at Charcoal Creek and the pool level inside the Cranberry Pool will be monitored at least twice a month. More frequent monitoring will be encouraged at these sites and at the river elevations during the spring ice-out and high water run-off periods. The pool level will be taken using a measurement from the WCS because the pipe-mounted gauge needs to be reset for adequate accuracy.

II. A. 2000 Annual Water Management Program Outline for Water Management Unit (WMU #1) - Big Marsh Slough & Goose Bay Pool

Water Management Unit #1 is comprised of Big Marsh Slough and Goose Bay Pool and is managed as a single unit (see map attachment #1). While no meaningful water management capability exists on this unit, beaver activity (dam construction) has continued on the incomplete dike on Big Marsh Slough near Goose Bay. This beaver dam remained intact into the winter of 1999/2000 and may help to maintain water levels in this unit in 2000.

II. B. Ecological Effects of the Past Year's Water Levels on Water Management Unit (WMU) #1

1. Water Conditions During 1999

Big Marsh Slough and Goose Bay Pool continue to be treated as a single water management unit (WMU#1). They remain connected by a man made ditch that was dug during the late 1960's. Incomplete dikes, or "gut plugs" around the perimeter of these areas hold water levels once they drop below the 96.25-96.50'MSL elevation.

The stop-logs in the Big Marsh Slough dike cannot be manipulated because the WCS at Big Marsh Dike is completely silted in. To our knowledge, the WCS has not been functional for over 20 years. Management has been centered around retaining as much water as possible, for as long as possible in the summer and fall. The original plans called for complete diking of the periphery of this unit, but that has yet to occur and might not be a viable idea as the costs may far outweigh the benefits. Therefore, this unit functions in accordance with the prevailing water levels of Dead Creek and Lake Champlain, until its water level drops below the approximate perimeter elevation of 96.25'MSL. As mentioned in section II. A., beaver dam construction activity in recent years has helped to retain water levels above 96.25'MSL in WMU#1.

The connecting ditch between Big Marsh Slough and Goose Bay Pool was dammed by beavers during 1969, and has been maintained by beavers since then. Since the dam holds a minimum of 2"-4" more water in Goose Bay Pool, it has never been removed. Waterfowl habitat in Goose Bay Pool is improved by the slightly higher water levels.

Water levels in WMU#1 are not presently measurable since no known benchmark elevation is located nearby. However, if it is assumed that the levels in Big Marsh Slough are similar to those of Lake Champlain, and that Goose Bay Pool levels are slightly higher than the Lake Champlain-Big Marsh Slough levels, then the 1999 water levels can be deduced from Lake Champlain's water level readings.

By referring to the monthly gauge readings for Lake Champlain, it can be inferred that the water level in the Big Marsh Slough was equal to Lake Champlain until the lake level dropped below the

level of 96.25' MSL. 1999 was a "low water" year for Lake Champlain. The lake level peaked at only 98.34' MSL on April 10. The weather in 1999 was characterized by less than normal precipitation and higher than average temperatures during the summer. Spring and summer precipitation for much of Vermont, including the refuge, was well below the average. The effect of the low lake level at lakeshore deltas was more noticeable than previous low water years. The bars and shoals at the mouths of all three branches of the Missisquoi River and Dead Creek were impassable via motor boat without walking the boat over the shallows. By August, both the west branch and the middle branch were totally impassable.

2. Related Biological Conditions and Wildlife Use

Emergent vegetation was extensive throughout the Missisquoi Delta. The most abundant plant was wild rice. Patches of wild rice were growing in areas not usually supporting such stands. Traditional locations had an abundance of rice beyond our usual expectations.

Good brood rearing cover was provided in button bush thickets and stands of cattail and wild rice in Big Marsh Slough. Some areas of this unit traditionally used for brood rearing activity however, were quickly devoid of standing water and could not support broods through the summer. As with most other marsh units on the refuge, waterfowl broods in Big Marsh Slough were concentrated into smaller, wetter portions of this refuge marsh and probably experienced elevated predation rates than would normally occur.

More stable water levels were achieved in this pool during the fall, allowing access to wild rice for use by migrating waterfowl. Submerged aquatics and emergents, such as pickerelweed, arrowhead, pondweeds, spikerush and duckweed added to the food sources for the ducks using this unit during the annual waterfowl population peak in October. As in past years, water lilies, water shield and burreed were also common throughout the unit. WMU#1 continues to provide the highest concentration of ring-necked ducks on-refuge during October and November, and is well used by mallards and black ducks. Pied-billed grebes, moorhens, rails and black terns are also known to breed and feed in this unit.

There is an area in Big Marsh Slough where common reedgrass was aerially sprayed in 1988. To date, there has been no regrowth of this pest plant. The area should be monitored annually to detect any resurgence of the plant. This location was not monitored in 1999.

II. C. A Statement of Objectives for the Proposed Levels

No objectives are set for this water management unit because there is no operable control structure. The Big Marsh Slough/Goose Bay impoundment will be affected much the same as natural potholes such as occur on Metcalfe Island, Shad Island and Saxs Pothole. Water and vegetation will be monitored to document conditions during the year. The refuge will support to the degree possible, maintenance of the existing beaver populations which help retain water levels

useful to a variety of wildlife populations.

III. A. 2000 Annual Water Management Program Outline for the Remaining Refuge Areas

The Steven Young Marsh, (see map attachment #2) a refuge wetland restoration project in 1994, has not operated well for the past 3-4 years due to beaver impacts on the water control structure. In addition, a separate beaver dam has been constructed approximately 100 yards upstream of the project dike and has resulted in flooding of the marsh and the non-government neighboring land. The beavers will be removed during this winter's trapping program which will allow the refuge to implement water management regimes that benefit a variety of species this year. No water elevation gauge exists at this marsh unit, water elevations will be set primarily to provide nesting and brood rearing habitat for waterfowl and to discourage growth of nuisance or exotic vegetation. Elevations will be managed using stoplogs at the water control structure to minimize flooding impacts on adjacent privately owned lands while still providing adequate habitats for wetland species. Mallards, wood ducks, hooded mergansers, and goldeneyes use the adjacent grasslands and natural/artificial nesting cavities on this unit. Dense stands of duckweed are present on portions of the unit which provide an excellent source of food for waterfowl and waterfowl broods. The duckweed and various other floating and emergent plants support a variety of invertebrate species used by waterfowl and other wetland species as well. Green herons, American bitterns, snipe, and marsh wrens are commonly observed or heard on this small marsh unit. Fall migration brings mallards, wood ducks, gadwall and green wing teal to the unit.

III. B. Ecological Effects of the Past Year's Water Levels on the Remaining Refuge Areas

1. Water Conditions During 1999

1999 was a "low water" year for Lake Champlain. The lake level peaked at only 98.34' MSL on April 10. The weather in 1999 was characterized by less than normal precipitation and higher than average temperatures during the summer. Annual precipitation for Vermont was well below the average. The effect of the low lake level at lakeshore shallows was more noticeable than previous low water years. Extensive sandbars and shoals at the mouths of all three branches of the river and the Dead Creek branch were impassable via motor boat without walking the boat over the shallows. By August, both the west branch and the middle branch were totally impassable. Vegetation growth in the refuge marshland bordering the lake was robust. Dominant species include hardstem bullrush, wild rice, pickerel weed, water lily, and burreed. Submerged aquatics are dominated by Eurasian water milfoil and beds of wild celery. Wild Rice was more abundant than usual. Stands of wild rice occurred in some areas where it has not occurred in previous years.

Nuisance aquatic plants did not seem to be as prevalent in 1999. No survey of plant distribution was done. Purple loosestrife was observed in the same areas as in previous years but did not

appear to be as dense. Gallerucella sp. beetles were released along the Maquam Bay portion of the refuge in July. Follow up checks revealed complete dispersal of the beetles with no beetles being observed on host plants next to the release points.

Water milfoil, while still dense, did not appear as dominant in the areas around Goose Bay, Shad Island and Metcalfe Island. Wild celery was interspersed with the milfoil. The hot weather and low lake water level during July and August resulted in a bloom of blue-green algae. This algal bloom was particularly prevalent north of Metcalfe Island.

Muskrat and beaver populations appeared healthy. A general survey of beaver lodges late in 1998 recorded 15 known locations throughout the refuge, and similar results are indicated for 1999. No general survey of muskrat houses has occurred in recent years.

III. C. A Statement of Objectives for the Proposed Levels

Not applicable.



