Finalized by: Sharon

Originated by: Ralph

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FWS/ARW-WAM1

April 21, 1994

Memorandum

To: Refuge Manager, Horicon National Wildlife Refuge

From: Wildlife Associate Manager 1

Subject: Annual Water Management Plan

Enclosed is the approved copy of your 1994 Annual Water Management Plan. Please take note of the comments from Bob Dahlgren. Good luck!

/signed/

Ralph Lloyd
Acting Wildlife Associate Manager

WAM1:RLloyd:sharon:4/21/94:x3701 (G:\WAM1\AGS\WATRPLAN.94)

United States Department of the Interior

Fish and Wildlife Service

Division of Migratory Birds and Refuge Biology

425 State Street

P. O. Box 2484

LaCrosse, Wisconsin 54602-2484

TAKE PRIDE IN AMERICA

In Reply Refer to:

April 7, 1994

Memorandum:

To: Chief, Division of Migratory Birds and Refuge Biology, Region 3, Twin Cities, MN

From: Assistant Regional Refuge Management Biologist, P.O. Box 2484, La Crosse, WI 54650

Subject: Review of Horicon NWR 1994 Annual Water Management Program

I'm happy to concur with the subject plan. It's good to see evaluations, even though perhaps crude, made of the vegetation in units: and a record of waterfowl use: and a recognition of management possibilities for shorebirds. The emphasis on habitat management objectives is encouraging.

I didn't understand fully the "prediction" summary but presume it would not be a prediction if it wasn't for 1994. The date should be added to this summary page.

The continuation of a good biology program at Horicon bodes well for the migratory bird resource. This document was thoughtfully done. Keep up the good work!

Robert B. Dahlgren

Amendment to Water Management Plan

Horicon National Wildlife Refuge

Mayville, WI

December, 1993

Submitted by: _____ Date: 12/21/93
Patti A. Meyers, Project Leader

Reviewed by: _____ Date: 1/27/94
Division Refuge Biologist

Reviewed by: _____ Date: 2/2/94
for Regional Engineer

Approved by: _____ Date: 2/2/94
Wildlife Associate Manager - 1

Purple Loosestrife Control

Purple loosestrife can be a serious threat to the quality of wetland habitats. It has vigorous and varied methods of reproduction and once established, becomes even more difficult to eradicate. Loosestrife has also shown some resistance to chemical control.

Purple loosestrife can be identified by its tall, showy, pink flowers which can bloom from late June to early September. In Wisconsin, blooming generally begins in mid-July and peaks in August. Mature loosestrife plants can be six feet tall and have as many as 30 or more stems growing from a single perennial rootstalk. The stems are rigid and four sided with opposite leaves, though there can be some variations. Reproduction can be accomplished from several methods. Three year old plants can produce over one million, flat, thin-walled seeds that can easily drift in flowing water. The seeds can also be transported in the feathers and fur of waterbirds and mammals. Loosestrife is a perennial plant and each year the rootstock expands, adding more stems. Loosestrife also has the capacity to reproduce vegetatively from stems or rootcrowns.

Water management planning at Horicon NWR should also include control of purple loosestrife. At the time of this writing most of the populations of loosestrife are small and scattered. The only exception is a robust population in the eastern part of Potato Lake (approximately 50 acres).

There are several methods of controlling loosestrife. Chemical control has demonstrated the best results with Roundup for upland sites, Rodeo for wetland areas, and 2,4-D. However, there are several disadvantages to using chemicals. Rarely does a single application result in complete control. Also, use of equipment, such as an ATV, in wetlands can cause damage to the plant community. Rodeo and Roundup are broad-spectrum herbicides and extensive use could alter species composition and diversity, thus altering the quality of the wetland habitat. 2,4-D is a broadleaf herbicide (thus not effecting necessary monocots). However, 2,4-D's best results are seen when used during early growth stages but the plant is harder to identify. Rodeo and Roundup should be used about the 2nd week of August at the late flowering stage. Spot spraying with hand-held equipment does the least amount of harm to the wetland basin. With careful application and avoiding drift, surrounding desirable plants will quickly grow into the spots of dying loosestrife.

Flooding of purple loosestrife seedlings has shown good success. Duration of water is more important than depth; twelve inches or more of water for 5 weeks can have 100% mortality. However, seedlings with terminal growths above the water line will survive flooding.

Mowing along banks where equipment can access will reduce the vigor of purple loosestrife. Combine mowing and spraying with a herbicide and grasses may reestablish and outcompete the loosestrife. Tilling will damage the woody stem and rootstock but shoots can sprout from broken rootstalks and root crown so spot spraying and seeding with native grasses or reed canary grass is recommended. In future moist soil areas, Japanese millet will suppress loosestrife seedlings plus provide quality food for waterfowl.

Loosestrife plants growing in moist soils can be hand pulled, though older plants become more established and thus harder to pull out the complete roots. Again, since plant remnants can regenerate into new plants, all plant material should be removed from the wetland.

Detection and control of purple loosestrife will be an ongoing project at Horicon NWR. Personnel should always be looking for the easily recognizable flowers in July and August and making notes of their location so control measures can be planned. Since moist soil units are part of the refuge water management plan, some loosestrife production will have to be tolerated since it seems to be impossible to have a quality moist soil unit without also providing an ideal location for loosestrife. However, if the loosestrife populations start to become too established a management compromise will have to be made and control will then be the main objective for that unit for a period of time.

Thompson, Daniel Q. 1989. Control of Purple Loosestrife. Waterfowl Management Handbook 13.4.11.

Approved 3/11/92
Ltrs to station
DA

1992 ANNUAL WATER MANAGEMENT PROGRAM

HORICON NATIONAL WILDLIFE REFUGE

MAYVILLE, WISCONSIN

Submitted by: Patti A. Meyers Date: 1/27/92
Patti A. Meyers, Project Leader

Reviewed by: Terry L. Penny Date: 2/3/92
Acting Regional Engineer

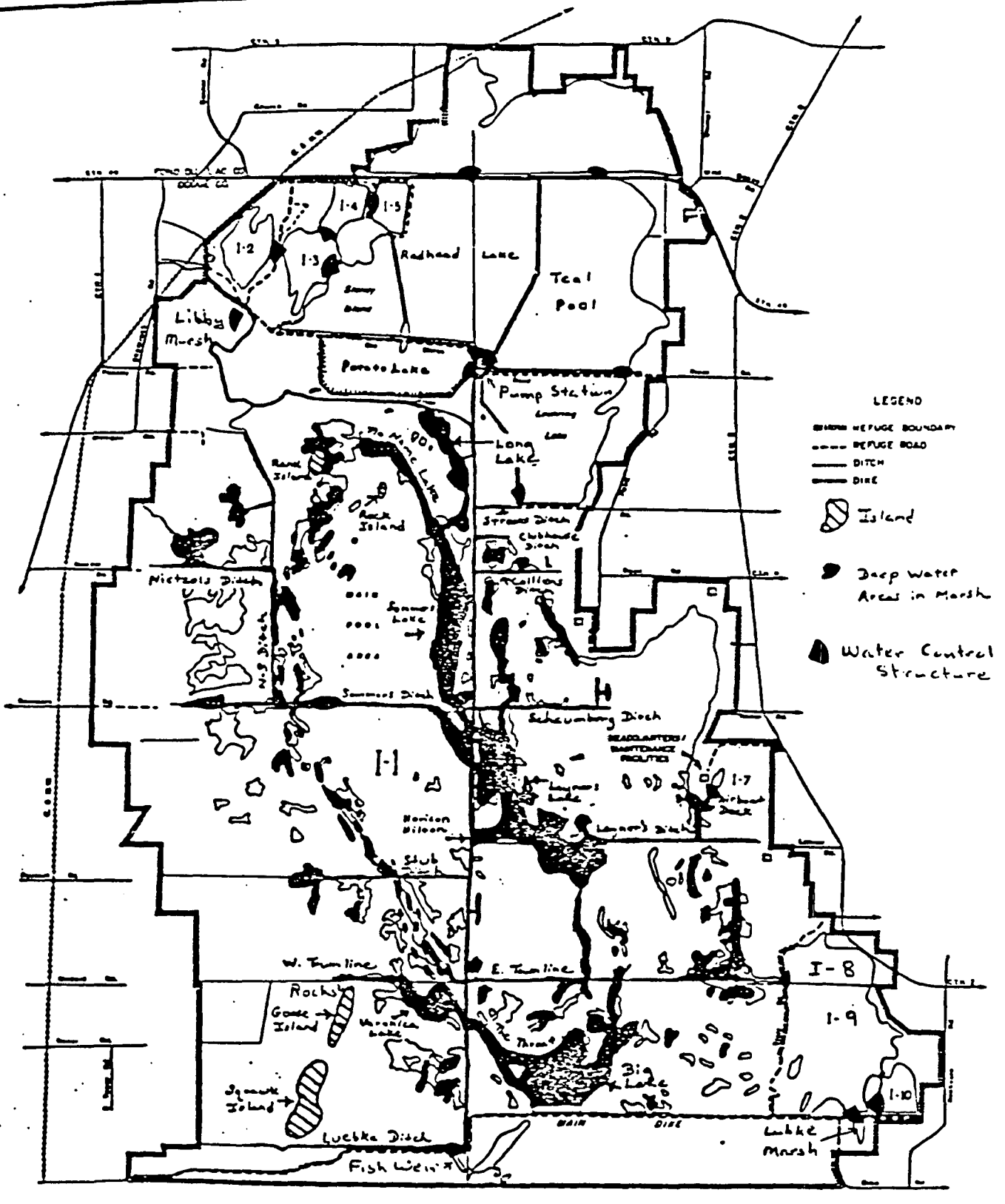
Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved by: _____ Date: _____

1992 ANNUAL WATER MANAGEMENT PROGRAM

INDEX



Revised 2/84

HORICON
NATIONAL WILDLIFE REFUGE

DODGE AND FOND DU LAC COUNTIES, WISCONSIN

Overview

A water management program was not completed for 1991 so the 1990 program was used as a guideline.

Precipitation for the winter of 1990-1991 was below average, resulting in below average spring runoff. Spring rains were also below average; therefore, excess spring water was not as much of a problem as in past years. However, the months of June and July had above average rain that also occurred in one or two day time spans. Hopefully the quick rise in water levels did not destroy many nests. September and October also had above normal rainfall but this time the higher water levels helped reduce the botulism potential and allowed moist soil areas to be accessible to the fall waterfowl migration. Temperatures were unusually cold in October and November, causing most of the refuge to ice over in early November and waterfowl use to drop off earlier than normal.

Purple loosestrife continues to be a problem on the refuge. Unfortunately, due to staff shortages, the problem was not adequately surveyed in 1991 to compare the problem to past years. Also, only some of the known loosestrife were hand pulled; therefore, control of the plant was minimal.

Use day totals for coots, geese, and ducks for the last five year period are as follows:

Year	Coots	Ducks	Geese
1987	2,983,250	6,991,851	10,919,955
1988	1,091,790	10,138,142	11,508,440
1989	1,285,199	6,656,331	11,976,774
1990	2,788,220	7,271,325	8,765,800
1991	1,747,310	9,941,686	9,028,000

Main Pool or I-1

Acres: 12,000
Maximum elevation: 77.00
Flowline elevation of lowest structure: 70.00
Elevation of general pool bottom: 74.00

1991 Habitat Conditions

Water discharge began at the end of February with the plan to lower the level to 76.00 by April for nesting. However, the gate was closed in March at high water levels and not opened again until April 19. Plus precipitation in June and July was well above normal so a level of 76.00 was not reached until July 12. The gate was opened again at the end of July and water was lowered to 75.50 by July 31. Gates remained closed until October. These higher water levels (75.7 - 76.0) during the growing season have been predominate since the drawdown of 1988.

Late in the fall the gate was opened frequently to allow the release of fall rains which were also well above normal. On December 19, it was closed for the remainder of the year at 76.40.

The electric fish weir was in operation when the gate was open, except in February and March when carp were not running yet. The total hours of operation for 1991 was 2654 (Jan-March: 440 hours, April-June: 1026, July-Dec: 1188).

There were not any formal waterfowl surveys on the Main Pool by airboat in 1991 due to staff shortages. Waterfowl surveys were only completed using the survey route by road and extrapolating for the whole refuge. However, the areas of the Main Pool that are seen from the survey route has had decreasing duck use every year since 1988. Big Lake (the southern most part of the Main Pool) had been used by canvasbacks and other diving ducks in good numbers since 1988. But the diving ducks are more spread out to other units and also dropping in number of use days.

The carp population seems to be growing extensively since the carp treatment in 1987 & 88. With increasing carp, it is suspected that submerged aquatics, such as sago pondweed, and moist soil development has been sharply decreasing, thus causing lower use days by waterfowl in the Main Pool.

Muskrat populations are still recovering from the 1988 drought when they experienced their lowest numbers since the Main Pool drawdown in 1976. More muskrat houses/feeders have been seen in 1991 than the last few years, mainly in the cattails north of the Main Dike around Big Lake. Hopefully with the higher water levels of the last year and another mild winter the population will increase to more average numbers.

1992 Water Level Objectives

The objective of 1992 will be to provide stable water levels from the second week in April through the first week in August. A graduate study found that nesting redheads need stable water levels during this critical time period. Also, rising water levels have a much more detrimental effect than lowering water levels. A water level rise of 5" in 2 to 3 days may cause abandonment of the nest due to flooding.

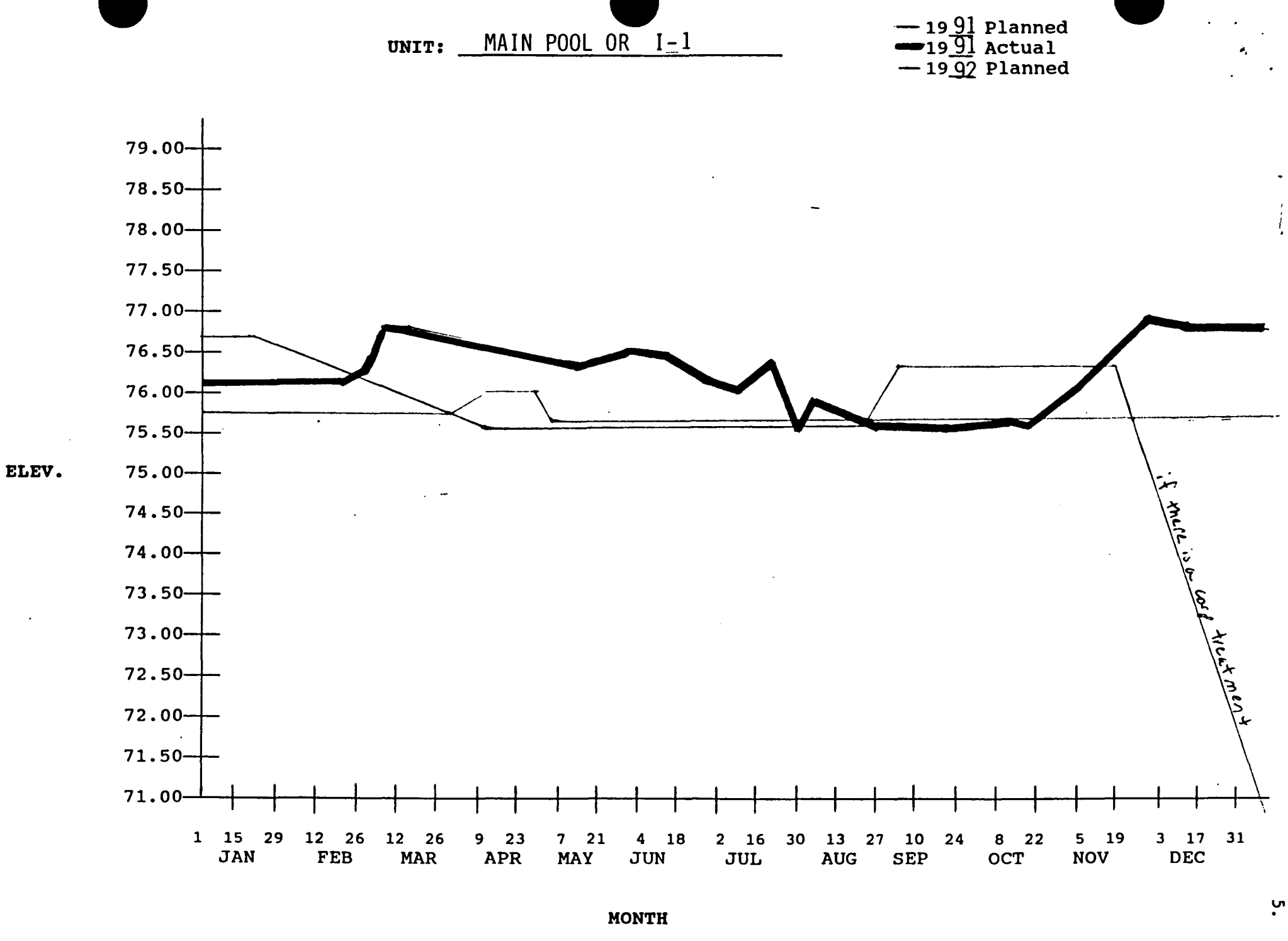
Water discharge will begin as soon as it is possible in the late winter/early spring and dropped down to a level of 75.5 as close to the second week of April as possible. After reaching that level, keeping the water stable should be priority for nesting redheads.

Moist soil development has been hampered since 1988 due to higher water levels and the carp decimating the plants. At a level of 75.5, moist soil plants may have a chance to develop in the shallower areas of the marsh.

Starting in August, or whenever the rains permit, the water level will be allowed to rise gradually to 76.25. This will allow any moist soil plants that have developed to be available to feeding migrant waterfowl.

If a carp treatment is scheduled to start the winter of 1992-93 than the water level will be drawn down as low as possible starting around the end of November. This will depend on the fall waterfowl use. If a carp treatment is not planned for the winter the water levels will be lowered to 75.50 - 75.75 to make room for the next spring runoff.

UNIT: MAIN POOL OR I-1



Teal Pool

Acres: 700
Maximum elevation: 78.50
Flowline elevation of lowest structure: 71.60
Elevation of pool bottom: 75.60

1991 Habitat Conditions

Due to botulism difficulties, teal pool has been managed at 77.75 - 78.00 since 1986. This high level also optimizes over-water nesting and brood habitat. In 1991, boards were only pulled to release extra water quicker after heavy rains.

Water levels were fairly stable in the first half of the year until June when the above average rains raised the level to 78.74 on the 17th. Boards were pulled until the water level returned to 78.00. It is unknown if nests were lost during the high water. In August the water level dropped below 77.85 due to evaporation. A mild botulism outbreak occurred the first week of September. Luckily we received 3.5 inches of rain the first two weeks of September and cooler temperatures to offset the botulism. Note that the water level reading for September 16 was 77.76, but extensive mudflats were still exposed. A check on the accuracy of the water gauges is needed.

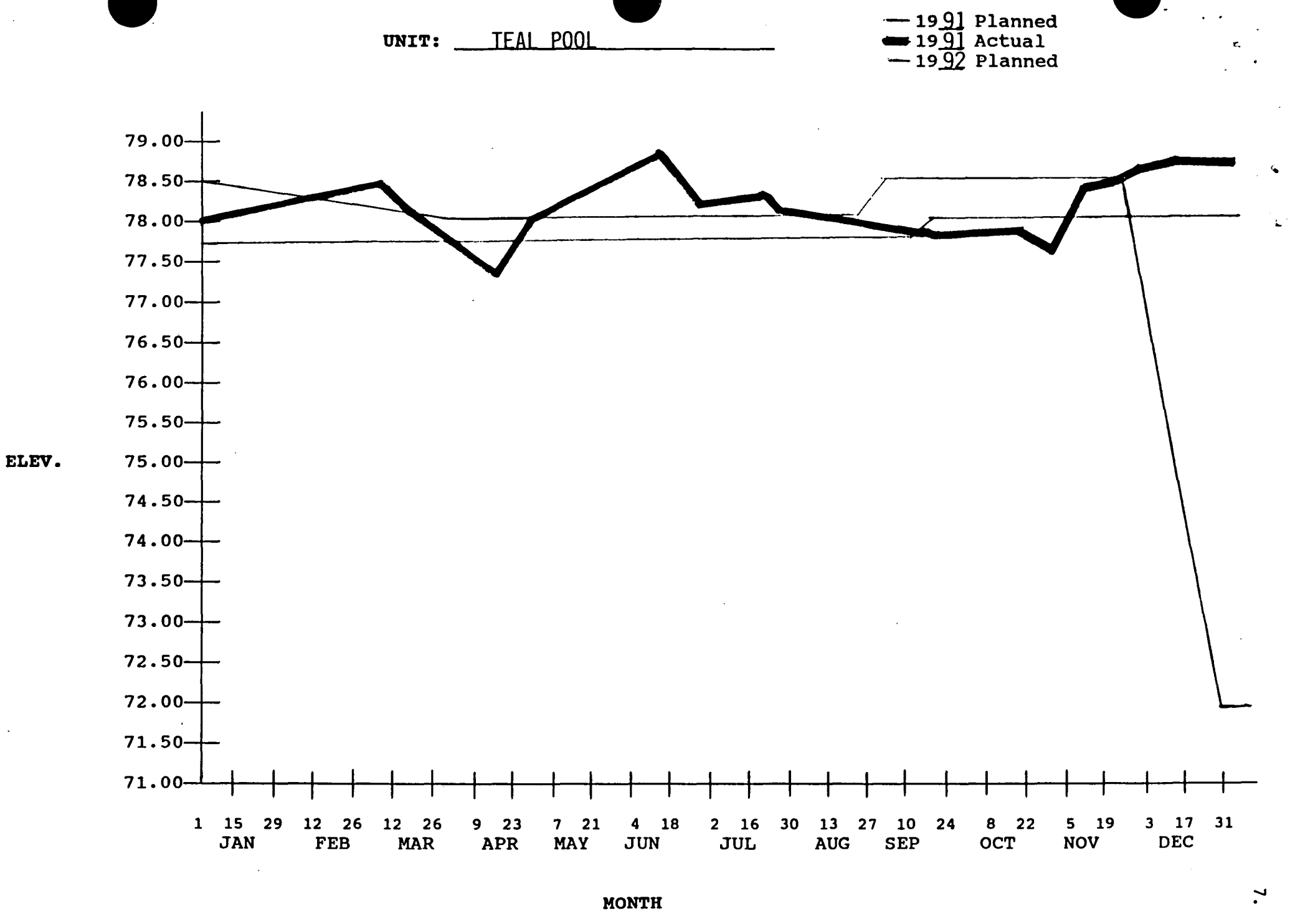
This unit has a good mixture of emergent vegetation to open water. The emergent vegetation consists of cattail and bulrush. As mentioned before the mudflats are exposed in the summer allowing moist soil production. Muskrat activity seems to be good. Unfortunately there are a few large patches of purple loosestrife in the interior and several stands of it along the dikes.

Waterfowl and coot use on this unit was good in 1991. It was heavily used by both spring and fall migrating Canada geese. Of the duck use, only 1 % was by diving ducks but 2 broods of redheads were observed along with mallard and Canada goose broods. This pool was also used by large numbers of molting wood ducks.

1992 Water Level Objectives

This unit will continue to have water levels held high, mainly due to potential botulism problems. Water should be drawn down to 78.00 by April 1 and held stable until the end of August. Hold water stable by not letting the water level rise too quickly after heavy rains. At the end of August, allow the water to rise as high as possible to flood any moist soil production and to help alleviate potential botulism die-offs. In November, or when duck use has dropped off, drop water levels to 72.0 for the winter to kill off carp.

UNIT: TEAL POOL



Redhead Lake

Acres: 550
Maximum elevation: 78.99
Flowline elevation of lowest structure: 71.60
Elevation of general pool bottom: 75.40

1991 Habitat Conditions

The water level was to be held at 78.00 throughout 1991. Water levels had started to drop below 78.00 in April and May, but the June rains raised the level to 78.27. Water dropped to 77.32 by September until the fall rains raised it to 78.32 and two boards were pulled.

This unit was monitored for botulism in September but only a few birds were found and it is unknown if they contracted botulism in redhead or from another impoundment.

Very little in exposed mudflats or moist soil development was seen in this impoundment in the late summer. Cattail stands seem to be extensive. Hopefully the high water for the last couple of years has been stressing them some. In the areas of open water, the submergent vegetation looks to be thriving. Muskrat populations appear to be rather low in this unit.

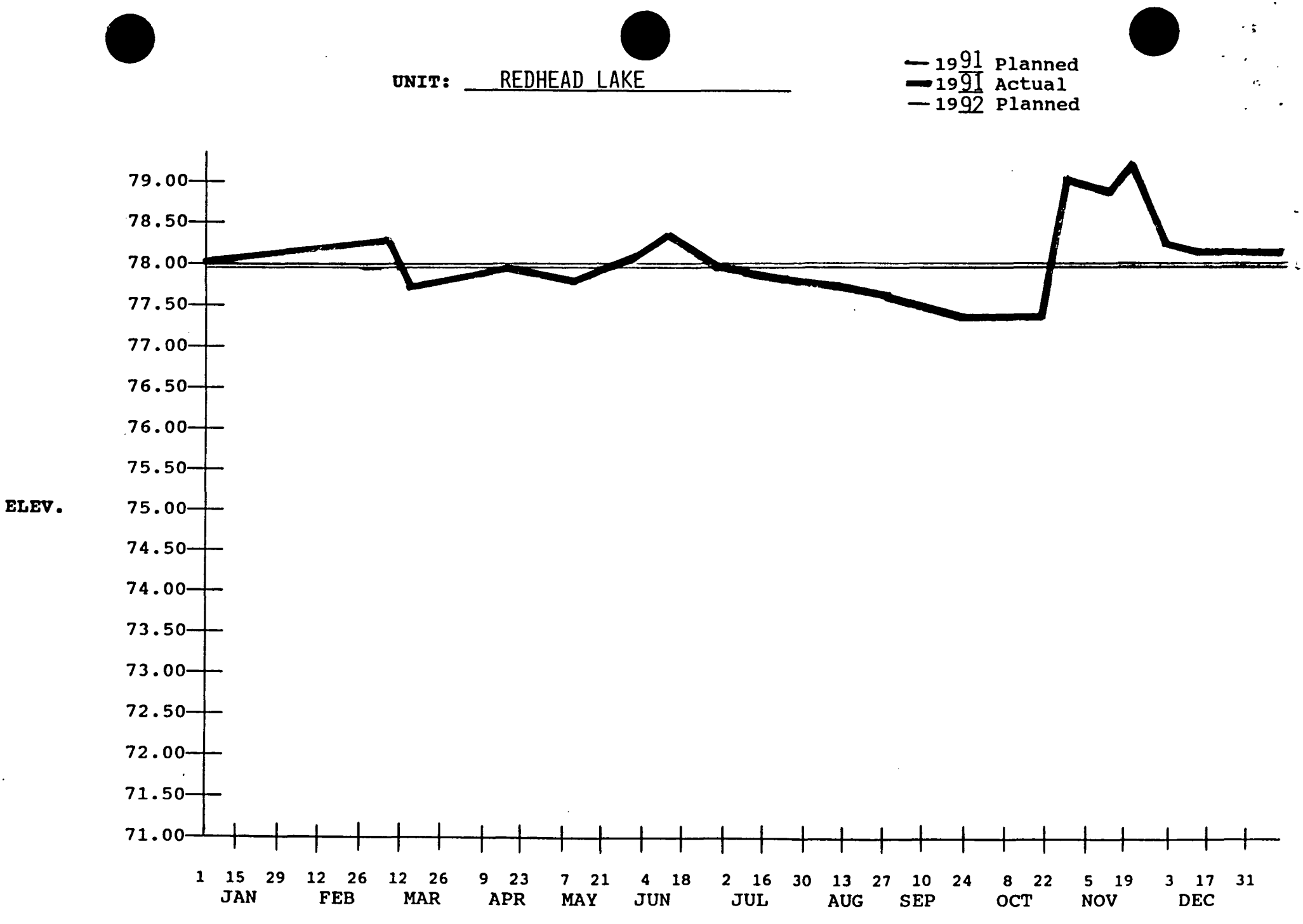
This unit was used by all ducks, 28 % observed to be diving ducks. It also had an extremely high use of coots. Canada geese used the impoundment, but not as much as the shallower units. Ruddy, redhead, mallard, and Canada goose broods were observed in this unit.

1992 Water Level Objectives

This unit will also have its water level remain high, mainly due to the fact that units nearby will have the water drawn down. Also this unit does not have much potential for moist soil development and perhaps the high water will stress the cattail.

Bring water levels down to 78.00 as soon as possible after spring rains and continue to hold at this level throughout the year.

UNIT: REDHEAD LAKE



Stoney Island Pool

Acres: 206
Maximum elevation: 78.50
Flowline elevation of lowest structure: 74.00
Elevation of general pool bottom: 75.60

1991 Habitat Conditions

This unit has been drawn down repeatedly in the last few years to prepare for a prescribed burn, which has not been completed. In 1991, the water level was to be maintained at a higher level of 77.50 and water levels were close to that level. Late summer levels dropped only to 76.85 in September. Fall rains brought the level back up to 77.60 by late October.

This unit is an extensive cattail mat (hopefully not floating) with very few areas of open water. The northwest corner is starting to develop a brush problem. Not much has been seen for muskrat activity either.

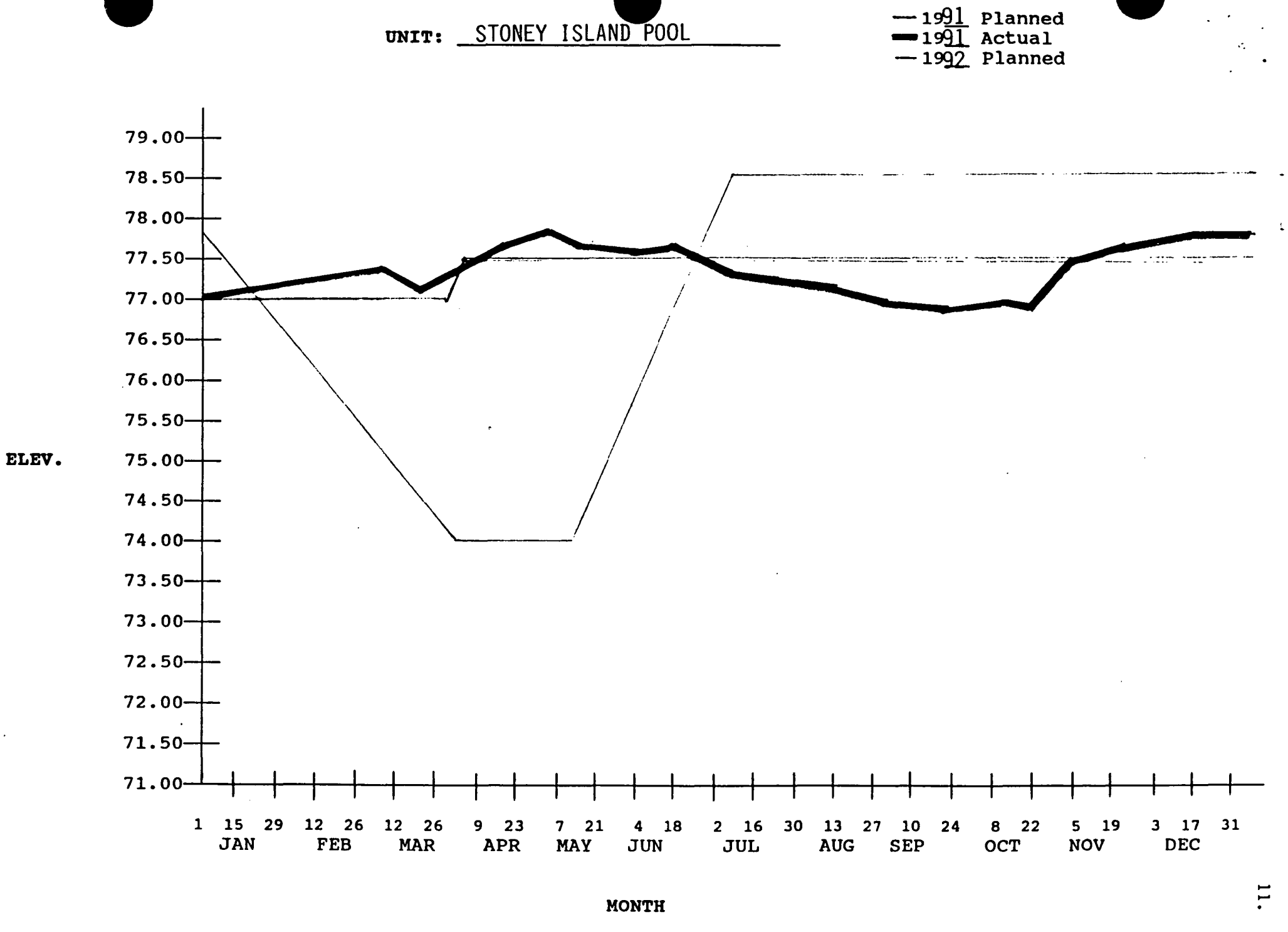
Waterfowl surveys in 1991 showed low use on this unit as it has been for the past few years. No waterfowl broods were seen and only three coot broods were observed during the year.

1992 Water Level Objectives

This unit needs to have a major disturbance to thin the cattail stand. Once again Stoney Island has been planned for a prescribed burn in 1992. If weather or lack of staff prevents a prescribed burn from happening than an attempt will be made to disk the unit.

Begin drawing water down as soon as possible after the ice thaws to 74.00. It would be preferable to burn this unit as early in April as possible and still catch some spring rains to reflood. Immediately following the disturbance (burning or disking), hold all water in an attempt to reach full pool (78.50) to stress sprouting cattail. If summer rains prevent any reflooding then pumping should be considered. Hold as high of water level as possible for the remainder of the year.

UNIT: STONEY ISLAND POOL



Potato Lake

Acres: 400
Maximum elevation: 78.50
Flowline elevation of lowest structure: 71.60
Elevation of general pool bottom: 75.50

1991 Habitat Conditions

This unit was designated to be a moist soil unit in 1988. At that time it was choked with cattails. In 1990, the unit was partially disked and then burned in August; the unit was too wet for either method to be successful. In November, the unit was burned again after a substantial amount of time to dry off. Approximately two thirds of the unit burned. In 1991 the unit was dewatered again and the entire unit, except 50-60 acres, was disked at the end of August. This time a rubber-tracked Caterpillar Challenger was rented to pull a newly acquired tandem disc. Water was pumped on starting August 28 to Sept. 9. Between September 11 and 14, over 2.5 inches of rain were received and the water level in Potato was 77.36 by Sept. 16. By freeze-up, the water level was at 77.90.

Cattails started to sprout immediately after disking, but with the quick reflooding the cattail was obviously stressed. However, purple loosestrife appeared in vigor in the northwest corner of the pool and along the borrow ditches.

Waterfowl response to the disking and reflooding was immediate in the fall of 1990. In March of 1991 during the spring rains, a pool in a low spot near the road filled up and 1100 mallards were observed. On September 11, just after water had been pumped on, almost 2000 mallards and over 1200 blue-winged were counted along the survey route on Potato. On Oct. 30 almost 200 shovelers were counted on the route. This unit was also heavily used in the fall by Canada geese. Hopefully their use will help stress the cattail more.

During the times of the draw downs, shorebirds were prevalent, with several good sightings made. Also, a peregrine falcon was seen several times in the fall.

1992 Water Level Objectives

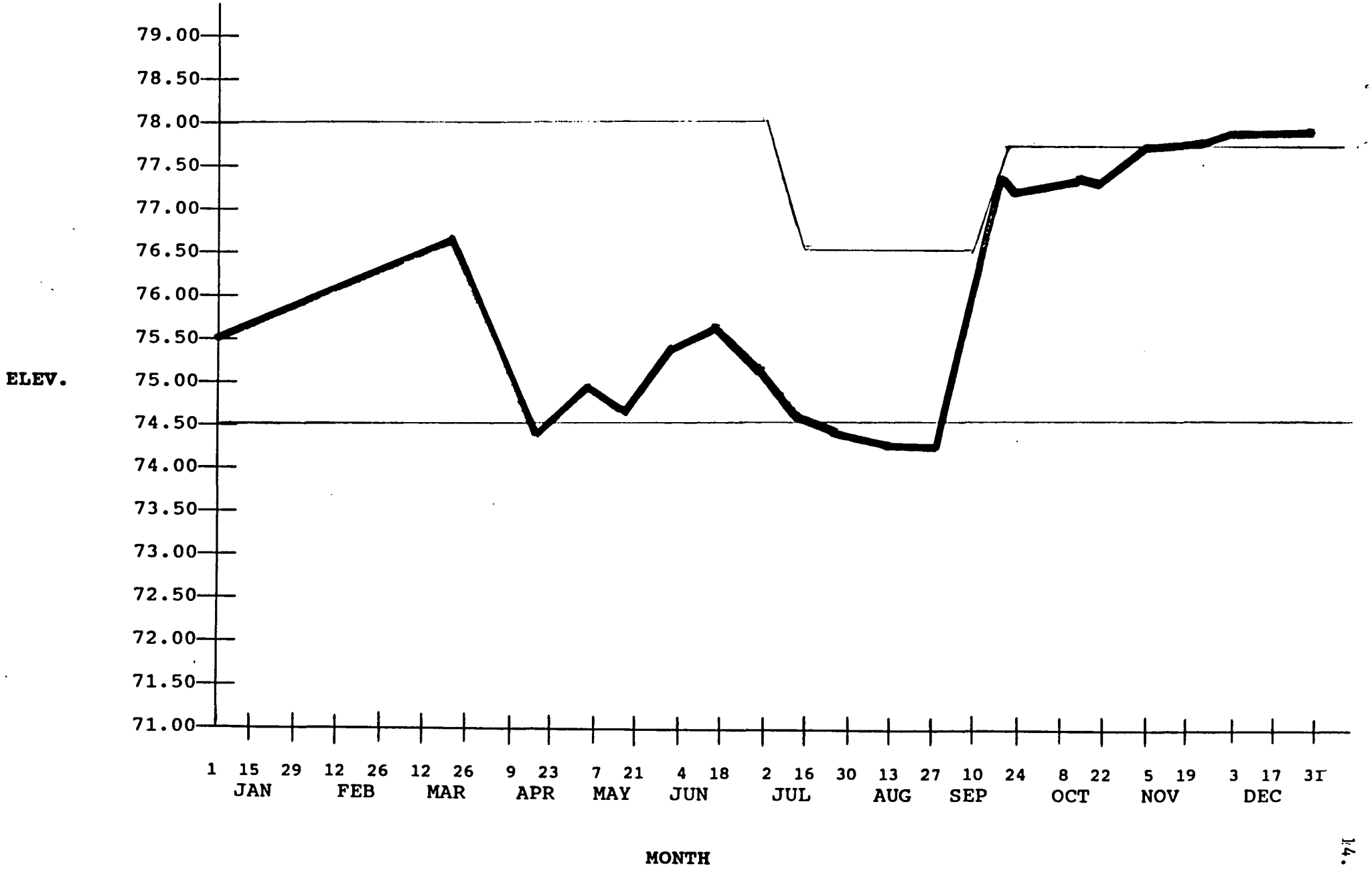
In an attempt to further stress the cattail, moist soil production will be delayed. Water will be held high 77.5 - 78.00, throughout the spring and early summer. If cattail development is halted, then water levels may be dropped in late July to 76.5 to allow some moist soil production. Water levels will be returned to 77.5 with the fall rains to make any moist soil plants available to the fall migration.

If water levels drop over the summer and cattail development continues, the unit should have water pumped into it to keep the

plants stressed. In no way should cattail production be encouraged.

Purple loosestrife will be monitored carefully in 1992 and in the future. This unit should have priority for loosestrife control if it is to be a successful moist soil unit.

UNIT: POTATO LAKE



Leuhring Lake

Acres: 480
Maximum elevation: 79.00
Flowline elevation of lowest structure: 71.60
Elevation of general pool bottom: 75.60

1991 Habitat Conditions

The cattail mats that re-rooted during the 1987 drawdown and 1988 drought have been held at mid-pool to high since. In 1991, the water level remained above 77.71 until mid-May when the levels started to fall, dropping to 75.87 July 1. However, by the end of July the level was back up to 77.66. Levels remained above 77.3 until November when fall rains brought the water up to 77.96 by ice-up.

Hopefully, the cattail mats in this unit are still rooted. The cattail is still extensive, making observations on waterfowl use difficult. Muskrat use in 1991 seems to be improving every year and may help open up some areas.

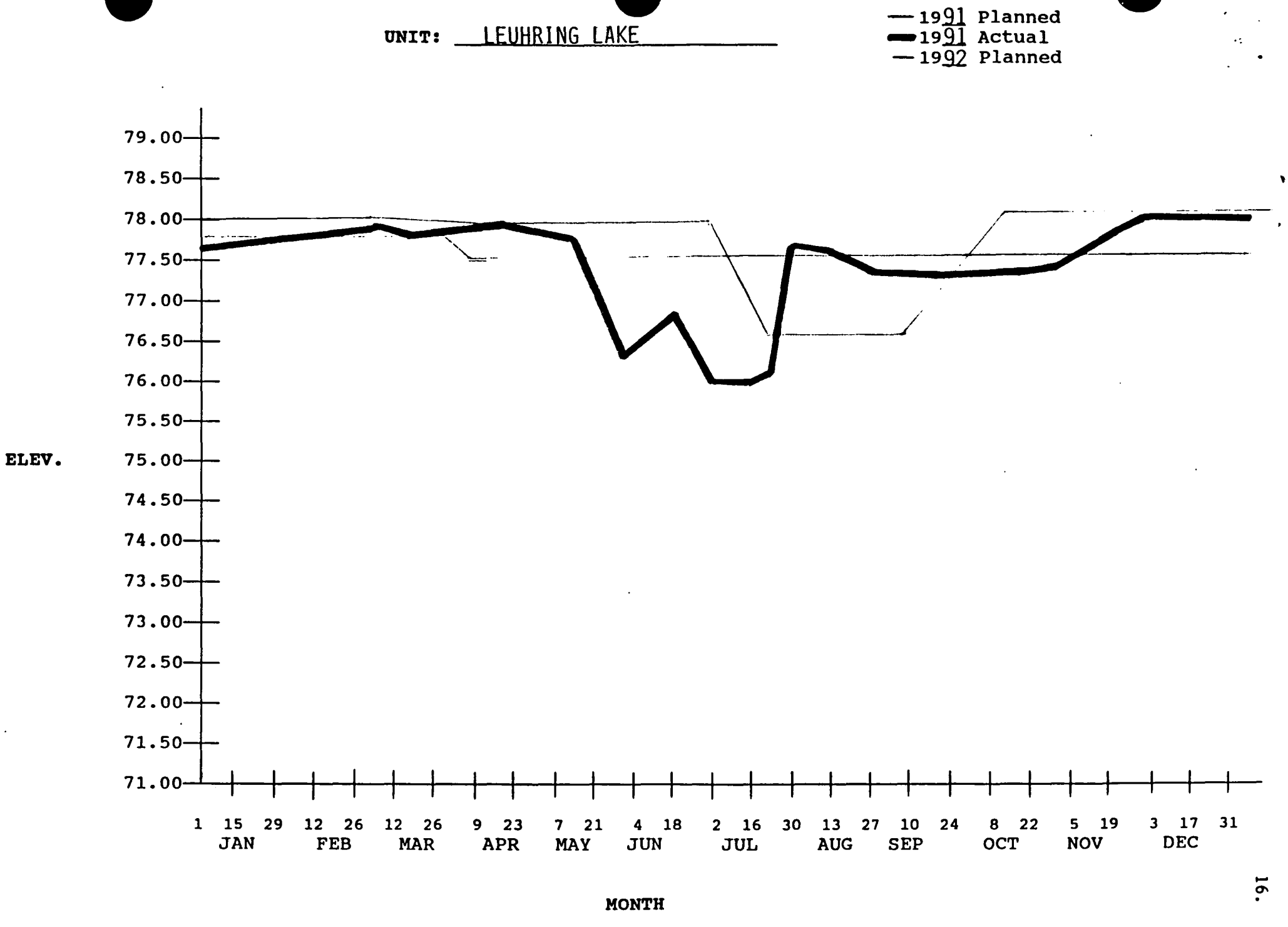
Waterfowl use was much lower compared to other units adjacent to Leuhring. What ducks were seen were almost all dabblers. Canada goose and coot use was very low also. Only one blue-winged teal brood was observed in 1991.

1992 Water Level Objectives

Water levels will be held high most of 1992 in an attempt to further stress the cattail and because the Main Pool and teal may be drawn down for winter carp treatments.

Water will be held at 77.75 - 78.00 until the beginning of July at which time water will be gradually dropped to 76.50 throughout July and August. This will allow some moist soil development if the potential is there. If levels drop below 76.50, water should be pumped into this unit. In mid-September, the water should be brought up by 77.50 and then to 78.00 by mid-October. If fall rains are not sufficient enough to raise the levels pumping should be done.

UNIT: LEUHRING LAKE



I-2

Acres: 50
Maximum elevation: 80.00
Flowline elevation of lowest structure: 72.75
Elevation of general pool: 75.50

1991 Habitat Conditions

The proposed water levels for 1990 & 1991 both called for a drop in the water level to 76.50 at some time during the year. It was not accomplished in 1990 and minimally accomplished in 1991. The water level was supposed to be dropped right after ice out in 1991 to 76.50, but did not reach that level until August 12. In mid-September, the level was to be brought up to 77.50, but the level continued to drop to 76.30 to the end of October. Water levels started to rise with the fall rain, but were only at 77.34 by ice-up.

Except for one large area of open water this unit is a solid stand of cattail. Judging by the waterfowl use, the sago pondweed development in the open water is in fair condition.

Waterfowl use in I-2 for 1991 was consistent but low. Except for a group of 110 mallards in July, large groups of birds do not gather on this unit. Diving ducks use was 53% of all duck use and the divers were mainly seen only in the early spring and late fall. Canada goose and coot use was low with a small number of geese only seen during migration. No waterfowl broods were observed this year.

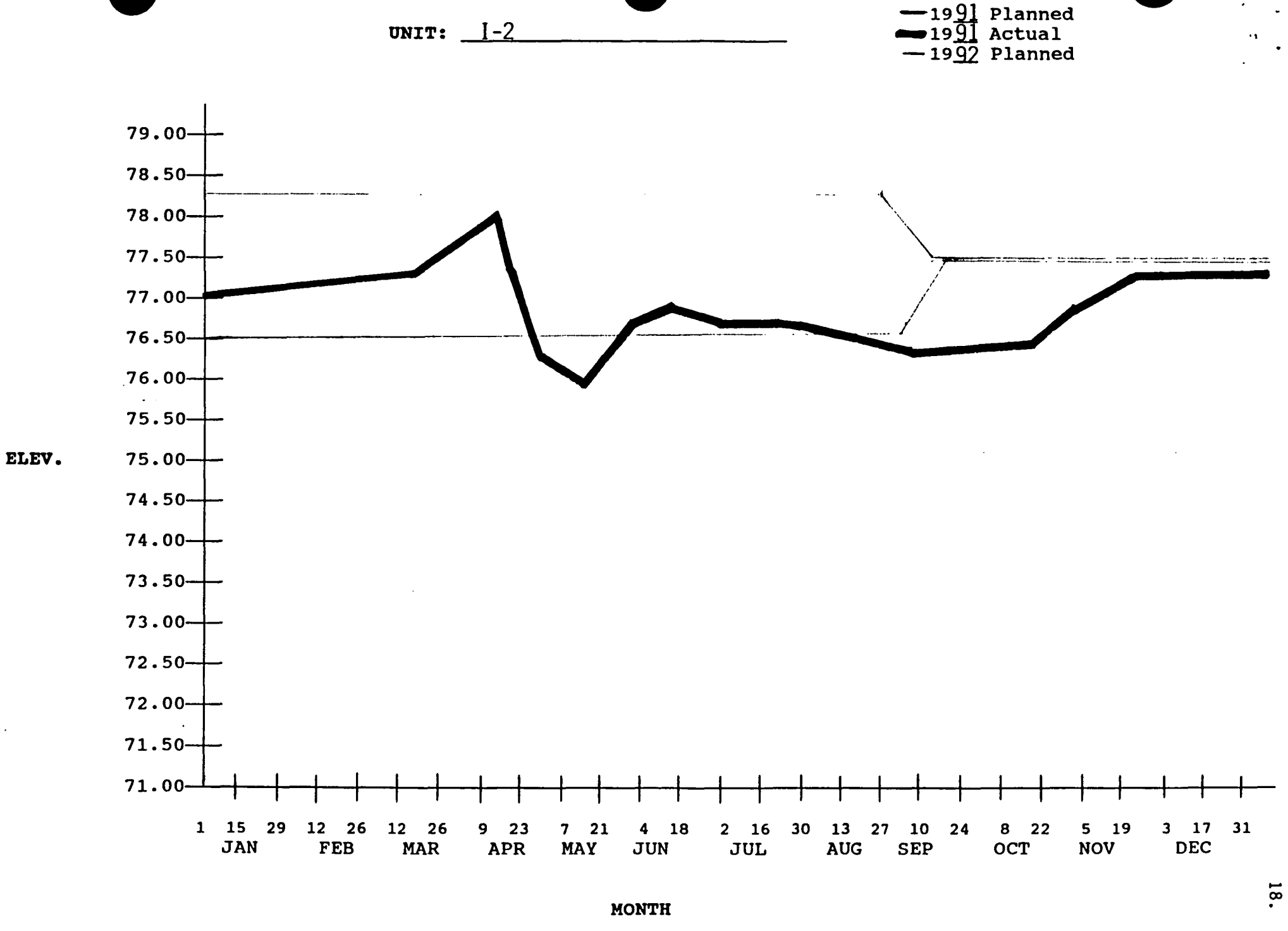
1992 Water Level Objectives

The water level in I-2 will be held high this year to encourage over-water nesting, stress dense cattail stands, and to retain water in the event that it be needed to re-flood I-3 & I-4 after construction or I-5 to alleviate botulism potential.

A level of 78.00 - 78.50 will be maintained until the end of August. At that time, the extra water will be released to drop to a level of 77.50. This will make the sago pondweed tubers more available for the fall migration and will re-flood I-3, 4, & 5 if needed.

Eventually the screwgate on this unit will need to be replaced. A new water control structure should be planned in 1992.

UNIT: 1-2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MONTH

I-3 & I-4

Acres: 150
Maximum elevation: 80.00
Flowline elevation of lowest structure: 72.75
Elevation of general pool bottom: 75.50

1991 Habitat Conditions

I-3 and I-4 were planned to be held at 78.00 in 1990 and 1991. In 1991 these units raised to 78.62 during the spring rains. The gate was opened in April to let the excess out and closed May 17 at 77.54. Water rose again in June to 78.07 but then dropped to 77.50 by October. Fall rains brought the level up to 78.58 before freeze-up.

I-3 has a solid stand of cattail with few areas of open water. Shrubs are starting to invade the north side and purple loosestrife is a problem in both units. These units also do not have very good water level control. Water to be drained off has to go through Stoney Island pool and water to raise the levels comes from I-2 or direct rainfall. I-3 and I-4 have small watersheds.

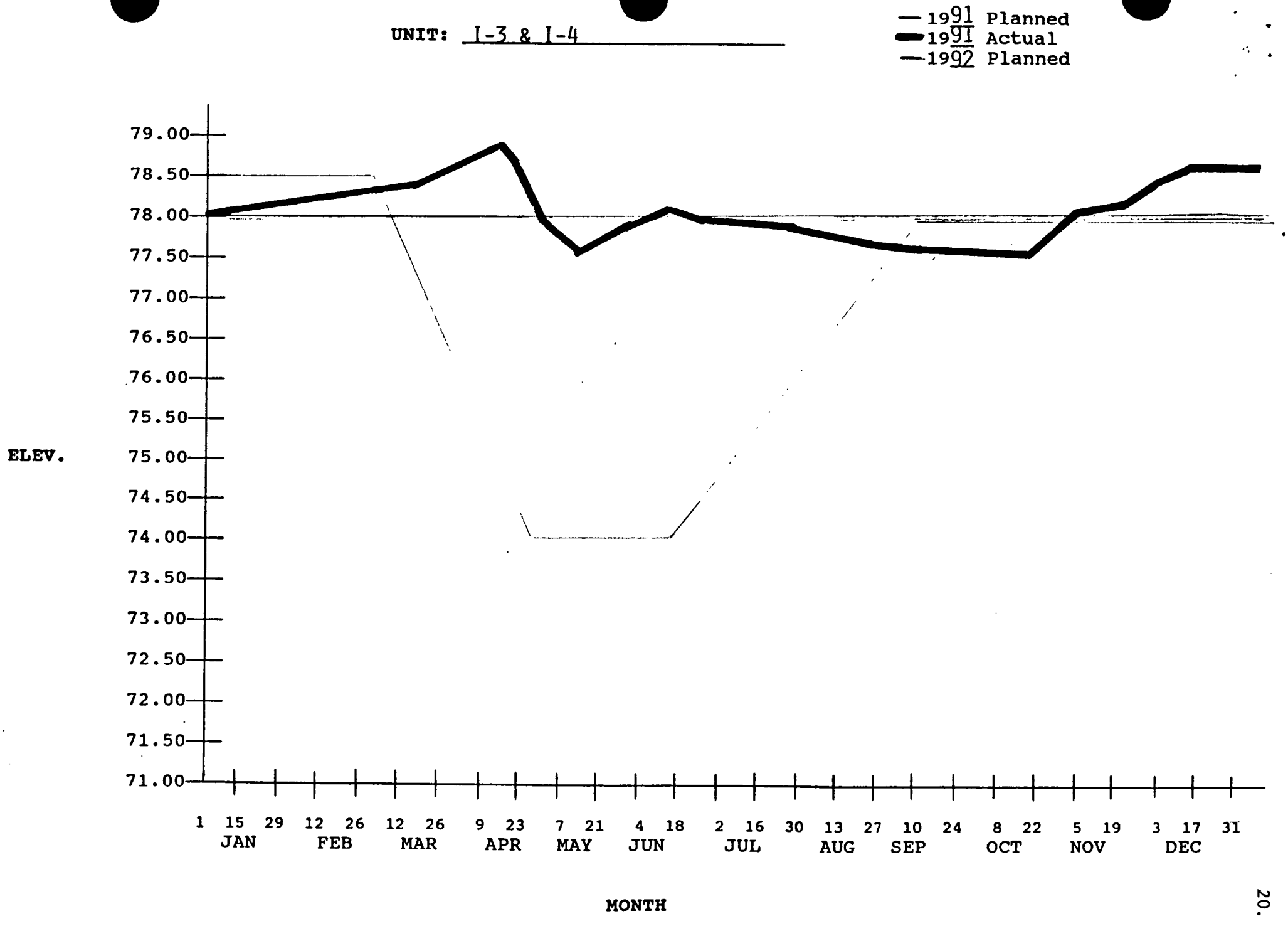
The waterfowl survey route does not include much of these units and what it does cover of I-3 does not have much open water. The use that was found was low (mainly on I-4) and almost all was by dabbling ducks. No coot use was seen in 1991 and there was very low use by Canada geese. Also, no broods were observed in 1991.

1992 Water Level Objectives

The water levels in these units will be brought down in early spring to 74.00 along with Stoney Island. Water will remain drawn down until construction of the auto tour route is complete and some mowing or disking of the units done. As soon as those are complete the units should be reflooded with a target level of at least 78.00. Water may be obtained from I-2 if available, otherwise it will have to be reflooded with Stoney.

Once the auto tour route is established these units will also be used for interpretive as well as habitat. A more intensive management plan should be initiated for these units.

UNIT: I-3 & I-4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JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH

I-5

Acres: 30
Maximum elevation: 80.00
Flowline elevation of lowest structure: unknown
Elevation of general pool bottom: 75.50

1991 Habitat Conditions

This unit has a target low of only 78.00 since 1989 due to botulism potential. In 1991, the low was in September at 77.27. At that level extensive mudflats are exposed on the northern end. A few of the higher spots have grown up to reed canary grass, but moist soil development was good on those spots also. Fall rains raised the level to 78.41 by freeze-up.

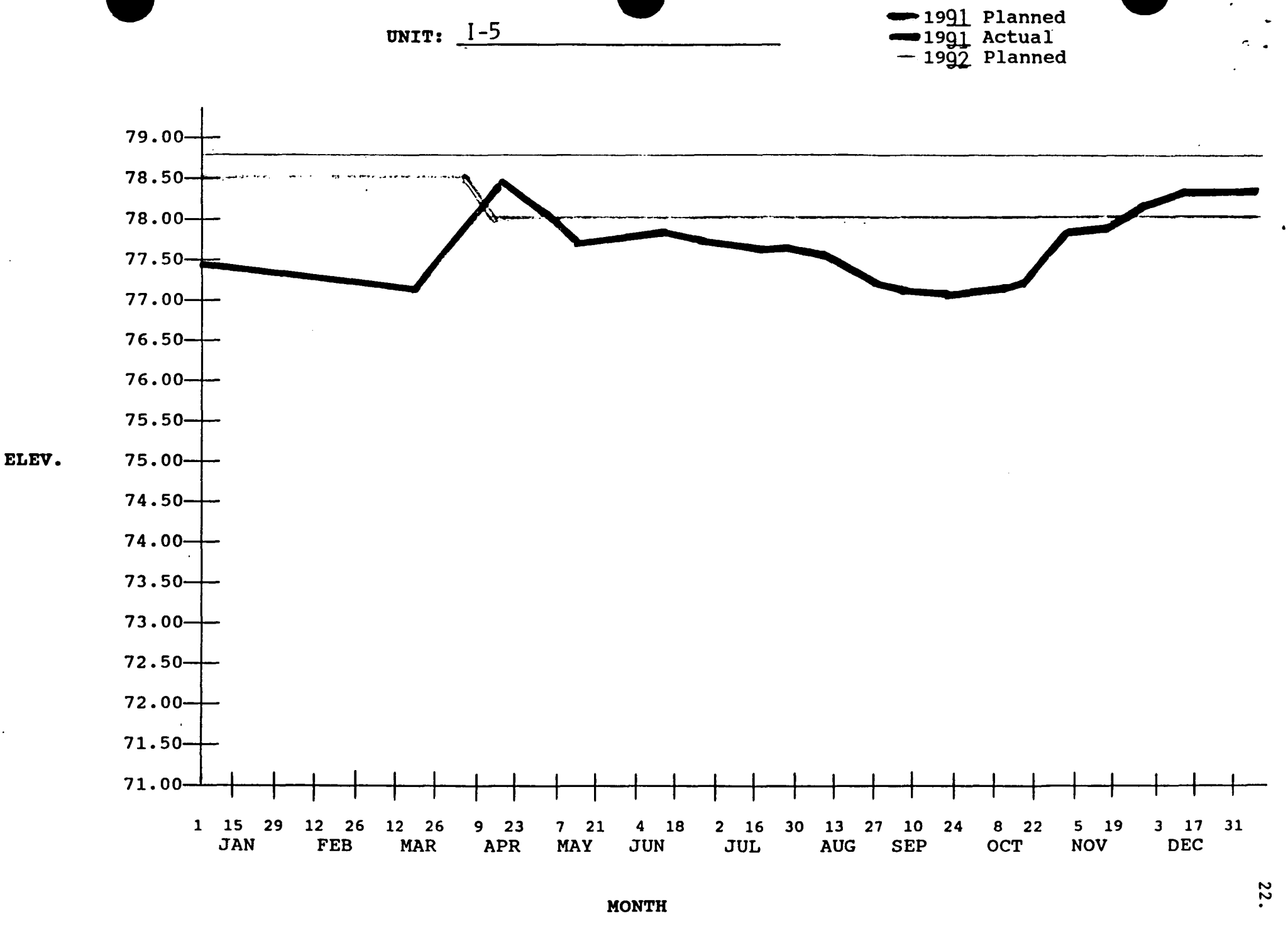
I-5 had high use by waterfowl, 88% by dabbling ducks, mainly mallards in the summer, green-winged teal in the spring and fall, and wigeon in fall. Wood ducks also loafed in large numbers in the southern half of the unit. Canada geese used the unit heavily during migration, sitting on the ice in the late fall. However, brood use was low. Only one wood duck and one blue-winged teal brood were observed. Coot use was also low.

Shorebirds also used the mudflats that were exposed in the late summer. Unfortunately, because of botulism danger, the habitat for shorebird use cannot be managed for their benefit.

1992 Water Level Objectives

In 1992 the water level will be maintained as high as possible. This may make the areas with moist soil development available for spring migrating ducks and help reduce the botulism potential in the fall. If there is excess water in the fall, it can be used to help reflood I-3 and I-4. However, if water levels drop below 77.40 in late August or September, water should be pumped from I-4 into I-5.

UNIT: I-5


1991 Planned
1991 Actual
1992 Planned
79.00
78.50
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ELEV.
1 15 29 12 26 12 26 9 23 7 21 4 18 2 16 30 13 27 10 24 8 22 5 19 3 17 31
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH

I-7

Acres: 20
Maximum elevation: 82.00
Flowline elevation of lowest structure: 75.32
Elevation of general pool bottom: unknown

1991 Habitat Conditions

Since construction of this impoundment the water has been planned to be held at 81.00 - 81.50 in an attempt to choke out cattail, willow, and dogwood. However, since this unit has a small watershed, it has not maintained water long enough into the summer to kill out any vegetation.

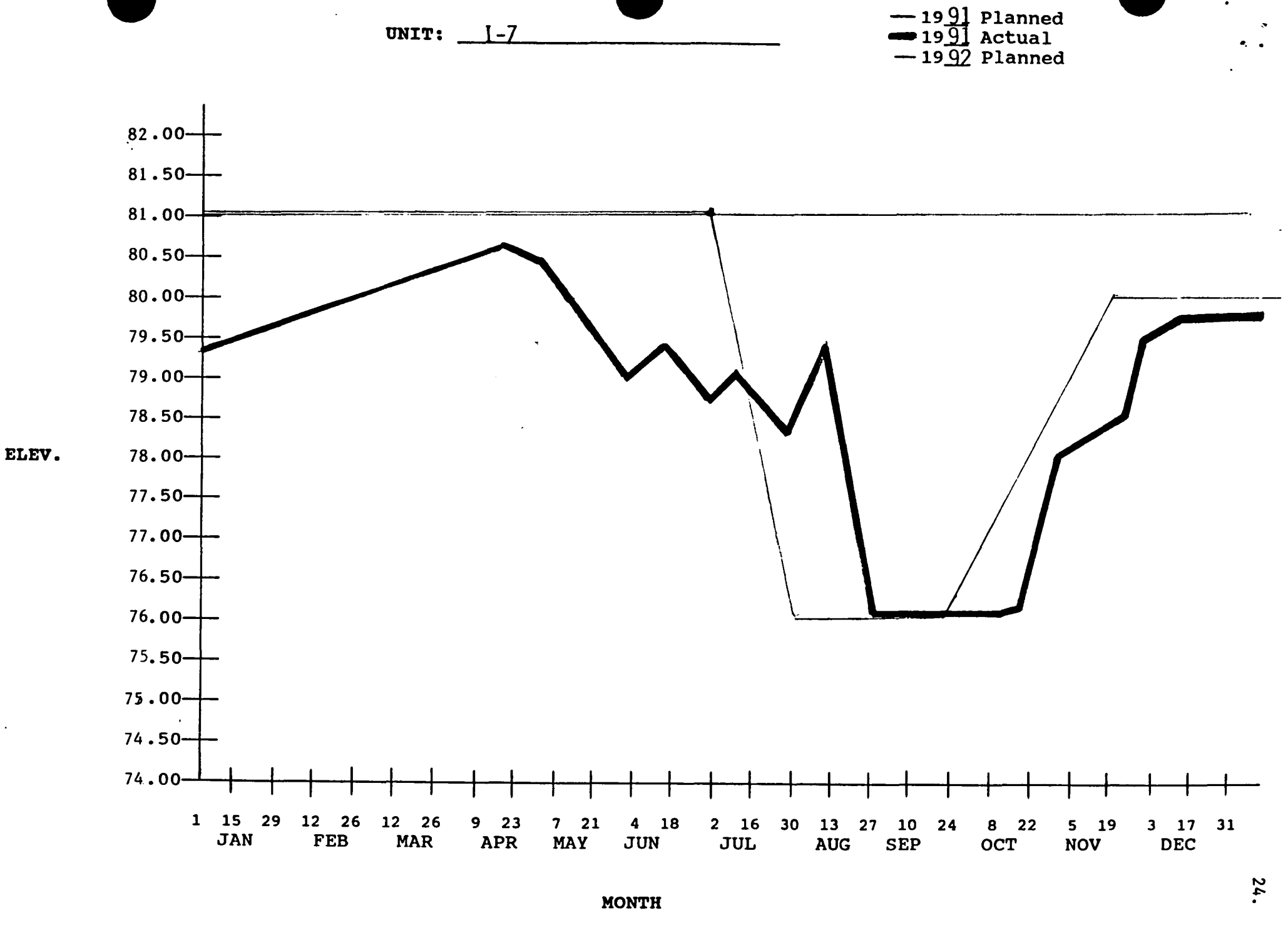
In 1991, water stayed fairly high through mid-August with the rains from June and July. The water level was 79.30 on August 12, but by August 29 the unit was dry. Fall rains returned the water level to 79.75 by winter freeze-up.

I-7 was not part of the formal waterfowl survey, but an occasional mallard or blue-winged teal pair were seen on the unit.

1992 Water Level Objectives

Water will be maintained at the high level for the spring of 1991 for use as a pair pond. The first week of July the boards will be pulled and the unit will be allowed to dry out. At that time, the woody vegetation will be mowed, bulldozed, and/or disked to set back the succession of this unit. This will allow for moist soil production in the future years. After the unit is disturbed, the unit will be allowed to reflood with the fall rains.

UNIT: 1-7


1991 Planned
1991 Actual
1992 Planned
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ELEV.
1 15 29 12 26 12 26 9 23 7 21 4 18 2 16 30 13 27 10 24 8 22 5 19 3 17 31
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH

I-8

Acres: 90
Maximum elevation: 79.00
Flowline elevation of lowest structure: 72.75
Elevation of general pool bottom: 74.50

1991 Habitat Conditions

This unit was planned to be maintained at 77.50 through the year starting mid-April. The water level did get to 78.47 in June and water levels were dropped to 77.60 before the screwgate was closed. By the end of July the level started to drop, reaching 77.36 by mid-September. Fall rains returned the level to 78.18 by ice-up.

I-8 has a small amount of open water; it is mainly dominated by cattail with some willow intrusion. It also has a purple loosestrife problem. Unfortunately, the screwgate water control structure has been in poor condition for the last few years and water control has been difficult.

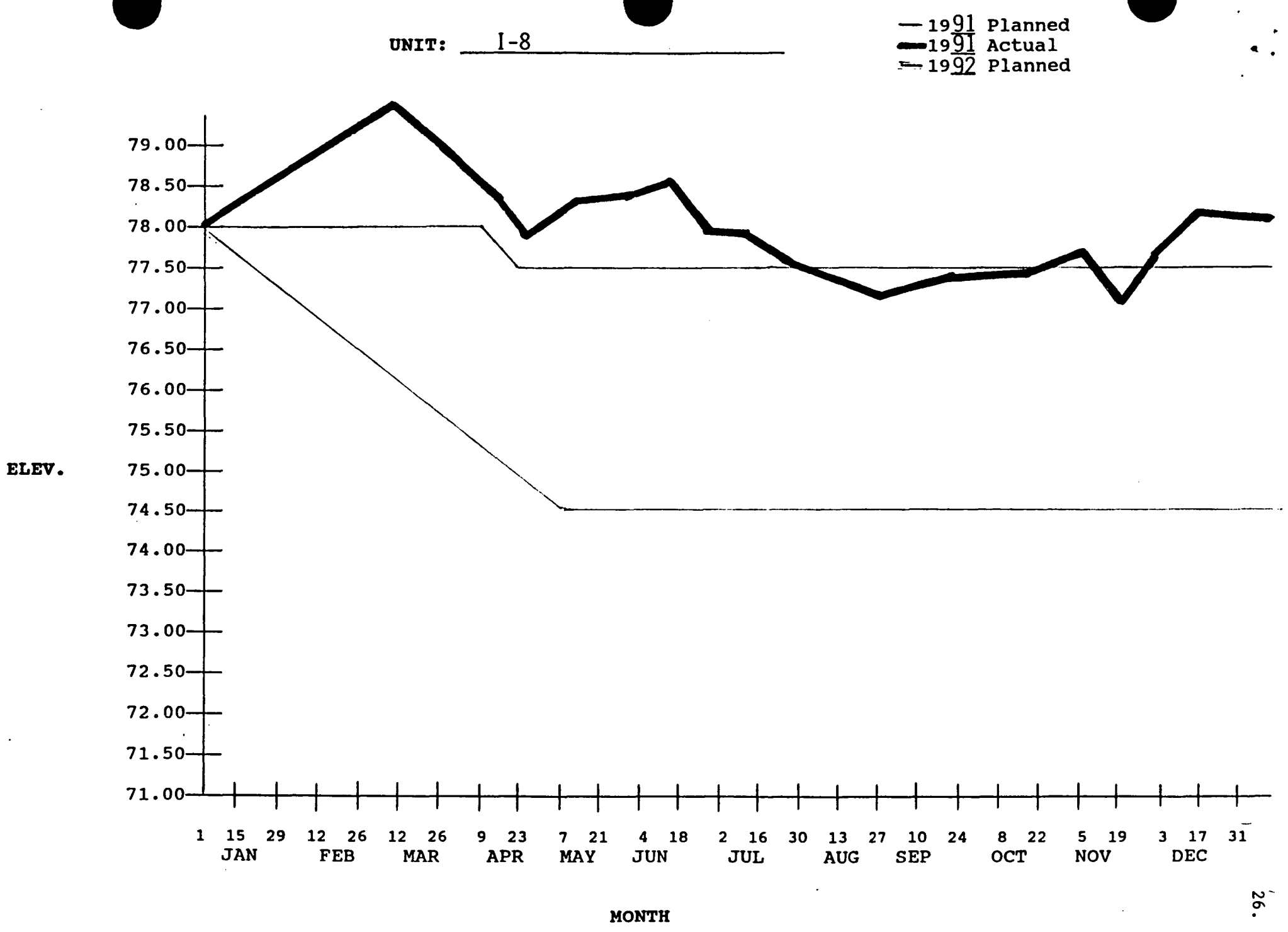
Use in this unit was low in 1991. It seems to be used mainly for loafing with little use for feeding. Only one brood of blue-winged teal was observed this year. I-8 also has very low Canada goose and coot use.

1992 Water Level Objectives

This unit will have a new water control structure installed in 1992, therefore the water levels will be drawn down just prior to construction. If installation of the control structures is delayed until late summer than water will be held for the spring. Since the water will be drawn down for construction, it will remain drawn down for a winter carp kill.

If the unit dries out sufficiently in the late summer, mowing or disking should be attempted to help set back the cattail and willow.

UNIT: I-8


1991 Planned
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71.00
ELEV.
1 15 29 12 26 12 26 9 23 7 21 4 18 2 16 30 13 27 10 24 8 22 5 19 3 17 31
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH

I-9

Acres: 550
Maximum elevation: 79.00
Flowline elevation of lowest structure: 72.75
Elevation of general pool bottom: 74.00

1991 Habitat Conditions

Water levels were to be maintained at 76.75 during 1991 starting mid-April. Once again, the June rains raised the water level to well above the targeted level at 77.63. The screw gate was opened until June 28. Water levels ranged from 77.20 down to 76.65 until fall rains brought the level to 77.16 at freeze-up.

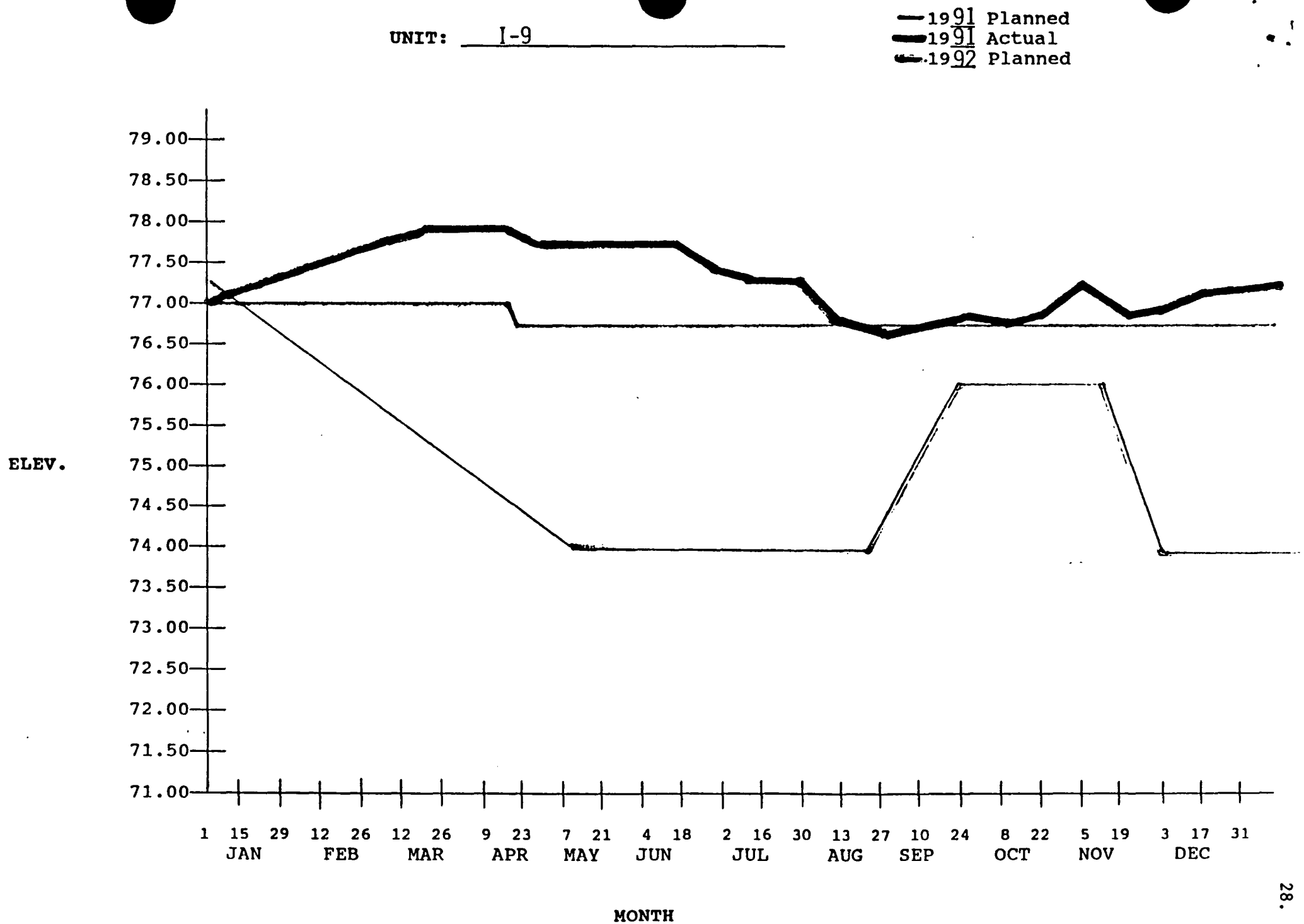
I-9 provides a good interspersion of open water to cattail and can provide good beds of sago pondweed. Unfortunately, the health of the sago pondweed has not been monitored in the last couple years.

Waterfowl use in this unit was good in 1991. Seventeen percent of those ducks were divers. Canada goose use was also very high all year. However, coot use was low. Several broods of Canada geese were seen, as were broods of mallards, wood ducks, and redheads. Of all the units that had good waterfowl use, I-9 was the only one that did not have use by wigeons or shovelers.

1992 Water Level Objectives

This unit will have a water control structure installed in conjunction with I-8 in 1992. Like I-8, water levels will be drawn down just prior to construction, leaving water up for spring if construction is delayed until late summer. Unlike I-8, once construction is complete, water will be put back onto I-9 so any moist soil development will be available for fall migration. A level no higher than 76.00 should be maintained for the fall. Once waterfowl use decreases substantially, than the water will be drawn down again for a carp kill.

UNIT: I-9


1991 Planned
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ELEV.
1 15 29 12 26 12 26 9 23 7 21 4 18 2 16 30 13 27 10 24 8 22 5 19 3 17 31
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH

I-10

Acres: 50
Maximum elevation: 78.00
Flowline elevation of lowest structure: unknown
Elevation of general pool bottom: 74.50

1991 Habitat Conditions

The water level for this unit was to be held at 77.50 for the year. The water control structure was not opened during 1991, so water levels were allowed to fluctuate naturally. Spring rains had the level at 77.86 and the water did not drop below 77.50 until July 15. The lowest level of the year was 76.60 on August 29. Fall rains raised the water to 77.38 in November. The water level was 77.2 at freeze-up.

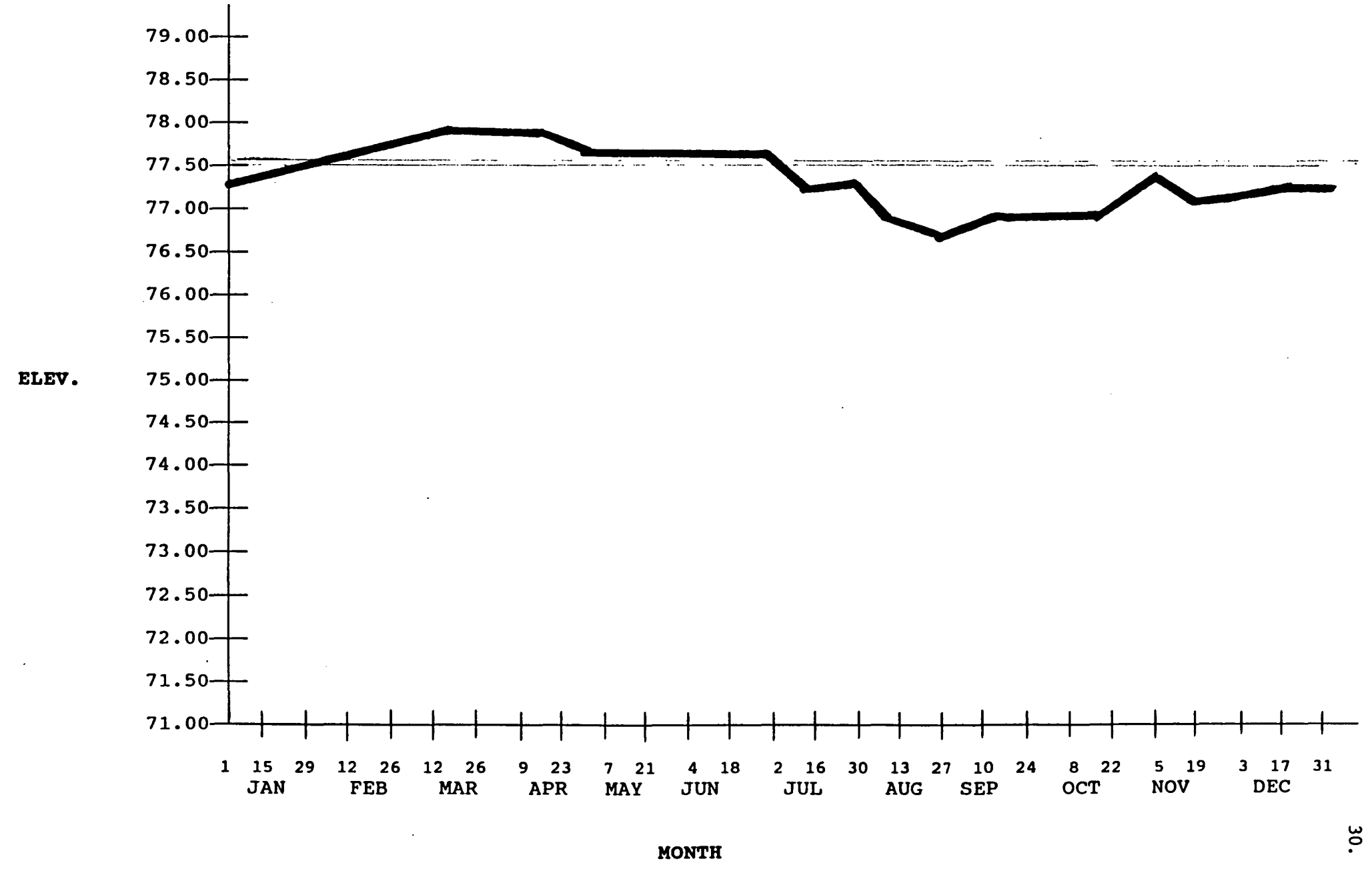
This unit also had a good ratio of cattails to open water. Unfortunately, the amount of moist soil or aquatic development was not monitored in 1991.

Waterfowl use in this pool is very good by dabblers (only 1% of use is by diving ducks). Over 200 mallards were seen for several weeks in August and September in the 6 acres of open water included in the waterfowl survey. Several broods of mallards and blue-winged teal were also observed. However, this unit had low use of Canada geese and no use by coots.

1992 Water Level Objectives

Due to the fact that I-8 and I-9 will be lowered for construction, I-10 will not have water drawn down. Water levels will be allowed to fluctuate naturally around 77.50, leaving water available in that corner of the refuge.

UNIT: I-10


1991 Planned
1991 Actual
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ELEV.
1 15 29 12 26 12 26 9 23 7 21 4 18 2 16 30 13 27 10 24 8 22 5 19 3 17 31
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH

Luebke Marsh

Acres: 15
Maximum elevation: 79.00
Flowline elevation of lowest structure: 75.50
Elevation of general pool bottom: 75.00

1991 Habitat Conditions

The plan for 1991 called for the water level to be dropped from 78.00 down to 76.00 in April and maintained at that level the remainder of the year. The water level started the year at 77.42 and rose to 78.26 in April. Boards were not pulled out of the water control structure until July and were replaced in August at a level of 76.80. This was the lowest the water level got to this year. Fall rains raised the level to 77.80 in November and the level was down to 77.22 by freeze-up.

Waterfowl use was low in 1991 and consisted mainly of mallards and blue-winged teal. Two broods of mallards and one brood of redheads were observed. No coots used this unit nor did many Canada geese.

1992 Water Level Objectives

Due to construction of I-8 and I-9, this unit also will be held at high pool of 78.00 and allowed to fluctuate naturally. If water is high enough, perhaps the outer ring of cattail can be stressed some.

UNIT: LUEBKE MARSH