

Big Lake National Wildlife Refuge

Annual Water Management Plan

Calendar Year 1991

A. WATER SURFACE ELEVATIONS FOR CALENDAR YEAR 1991

Maximum elevation permissible: Uncontrollable

Flowline elevation of lowest drain structure: 230 msl

Elevation of general pool bottom 230 msl (not borrow pit bottom)

A.1 Water Surface Elevations for 1991 Showing Elevations at the Beginning of the Month and Peak Readings for that Month.

<u>Date</u>		<u>Water Surface Elevations</u>		
		<u>Lake Pool</u>	<u>Ditch 1</u>	<u>Ditch #1</u>
January	1	238.2 (01) 238.2	241.1 (08) 241.5	238.5 (02) 238.6
February	1	233.5 (08) 233.9	236.1 (07) 239.0	233.8 (08) 238.7
March	1	233.2 (26) 234.4	234.8 (24) 241.3	234.4 (25) 238.0
April	1	233.7 (16) 235.2	235.0 (16) 240.0	235.0 (16) 239.7
May	1	234.0 (02) 234.1	238.4 (01) 238.4	237.1 (17) 237.5
June	1	233.4 (14) 233.8	235.3 (14) 237.8	235.2 (13) 237.0
July	1	233.4 (05) 233.5	234.5 (03) 234.8	234.5 (03) 234.8
August	1	233.4 (05) 233.5	234.7 (05) 235.3	234.7 (04) 235.2

September	1	233.5	234.5	234.5
		(04) 233.6	(25) 235.2	(10) 234.5
October	1	233.5	235.0	234.5
		(31) 233.7	(31) 239.2	(31) 235.6
November	1	233.7	238.2	237.4
		(26) 234.8	(21) 240.6	(21) 239.7
December	1	234.0	236.5	234.4
		(9) 234.2	(4) 239.5	(5) 239.2

A.2 Effects of Past Year's Water Level on the Ecology of Big Lake.

1. Water Supply

The 2,000 square mile watershed area of the Missouri Bootheel provided adequate water supplies during the year. The water was delivered to the head of Big Lake by way of four major drainage ditches.

As long as incoming flows were 236.5 mean sea level (msl) or less, the refuge could manipulate its water control structures to create inflows of good quality water. Once the inflows were above 235.5 msl the refuge was mandated to operate the structures in the automatic mode.

The refuge was subjected to flood elevations eight of the twelve months in 1991. A total of eleven inches of rainfall was received during April and the year's total rainfall amounted to 52.61 inches. Virtually every month except September yielded more than an inch of rain. Water quality was affected by the high turbid waters which occurred at frequent intervals during 1991. During much of the year, the refuge was subjected to flood waters or poor water quality which forced refuge personnel to divert water around the refuge.

2. Effects of Water Levels on Habitat and Wildlife

Since the Army Corps of Engineers completed the new water control structures in 1979, constant flow of turbid water through the refuge can now be altered. The refuge is still subjected to heavy turbid flows

however. With the increased channelling and improved drainage above the refuge, the floods seem to occur at a faster rate and more often (primarily due to the bottle neck characteristics of the system, which occurs at the refuge's north boundary).

Drift accumulation during these flood periods continue to be a problem both at the refuge's newly installed drift barrier and in the refuge's main artery (ditch 1). During and following each flood, drift removal operations were a must and many man hours were spent during the year removing drift to protect the integrity of the refuge's water management capabilities.

The higher elevations experienced during the year were received with mixed feelings. The higher water flooded standing crops on the refuge and made them available to visiting waterfowl in the fall and winter months. On the other hand higher water always pushes resident species to the refuge's levee system which offers them little in the way of food or cover. Timing of the spring floods interfered with the crappie spawn and subsequently with fishing success. It also delayed the refuge's farming activities.

Several informal and one formal meeting between the U.S. Fish and Wildlife Service (FWS), the Army Corps of Engineers (CORPS), Little River Drainage District (LRDD) and other users of the watershed system were held during the year to address newly proposed water management practices (related to flood levels). The proposal was designed to divert more flows around the refuge at a faster rate than was previously allowed by diverting water through the refuge, and thereby reducing the amount of debris and silt entering the ecosystem of the refuge. A less than optimal experimental operation was agreed to for 1991 by all parties, and data was collected during key flood periods. A new agreement with specific elevations was eventually settled upon and became effective January 1, 1992. The new flood stage elevations are to be monitored to assess the new plans effectiveness.

B. WATER SURFACE ELEVATIONS FOR PROGRAM YEAR 1992

BIG LAKE

Maximum elevation permissible: Uncontrollable

Flowline elevation of lowest drain structure: 230.0 msl

Elevation of general pool bottom: 230.0 msl (not borrow pit bottom)

B.1. Planned Elevation for 1991. 1992?

DATE	WATER SURFACE ELEVATION		
	<u>Lake Pool</u>	<u>Ditch 1</u>	<u>Ditch 81</u>
January	233.5	236.0	234.3
February	233.5	234.5	234.3
March	233.5	234.5	234.3
April	233.5	234.5	234.3
May	233.5	234.5	234.3
June	233.5	234.5	234.3
July	233.5	234.5	234.3
August	233.5	234.5	234.3
September 1	233.5	234.5	234.3
15	233.5	235.0	234.3
October 1	233.5	235.0	234.3
15	233.5	236.0	234.3
November	233.5	236.0	234.3
(10 days prior to waterfowl season)	233.5	239.0	234.3
December	233.5	236.0	234.3

B.2 A Statement of Objectives for the Proposed 1992 Levels.

1. Water levels in Big Lake will be maintained between 233.3 msl and 233.8 msl throughout the year when incoming flows permit. Depending upon inflow water quality, a continued flow through the refuge will be attempted to maintain the above levels and provide the best possible quality water.
2. The south 81 control structure and the Diversion Control Structure will normally remain in automatic mode to maintain a level of 234.3. The northend structure will be operated manually (depending upon water levels and quality) to provide continued flow into the refuge. The mid-lake control structure will be opened or closed depending upon the refuge's need for inflow and water quality availability. South floodway dam (a stoplog type structure used to maintain the refuge's pool) will normally have all its stoplogs in place.
3. Water control structures regulating the head water into and around Big Lake Refuge are the keys to flood control and have specific operation and maintenance guidelines. A new water management agreement, which changes the water management regime and water control structure operation, will be in effect for 1992. The five principle benefactors of the structure operation have agreed to the following water management guidelines, but these guidelines are subject to change pending any unforeseen developments such as vital maintenance requirements or other emergency situations.
 - a. When water quality is adequate, flows will be regulated through the structures into the refuge to maintain the pool level in Big Lake (233.3 - 233.8 msl). Flows into the refuge are designed to cycle nutrients, stimulate fishing, displace silt laden water and inhibit ice formation.
 - b. Water levels above the Northend/Diversion Control Structure will be brought to 235.0 msl by Sept. 15 if sufficient inflows exist. That level plus or minus .5 ft. with a goal of 235.0 will be maintained to allow the initial intake of water into the Arkansas Game and Fish Commission's Big Lake Public Hunting Area.

- c. Water levels in Ditch 28 above the North Dam will be brought up to 236 msl by October 15 and maintained at that level (plus or minus .5 ft. with a goal of 236 msl) to allow flooding of Big Lake WMA for public waterfowl hunting.
 - d. Water levels in the State Line Ditch and Ditch 28 will be brought up to 239 msl beginning 10 days prior to the Missouri/Arkansas waterfowl seasons and will be maintained at that level (plus or minus .5 ft. with a goal of 239 msl) until a sufficient period has occurred for Missouri and Arkansas to provide maximum water into the Hornersville Swamp WMA and Big Lake WMA respectively (approximately 10 days). Although the new water management agreement calls for 239 msl water levels, current structures and levees are not capable of holding these water levels except during flood conditions. It is anticipated that the Missouri Stateline Joint Venture Project will address these structure and levee limitations at some time in the future. Water levels will then be lowered to 3.c. above and maintained throughout the Arkansas and Missouri waterfowl hunting seasons. On the day after the last season, water levels will be managed in accordance with 3.a. above.
4. The Arkansas Game and Fish Commission's Mallard Lake will be dewatered into Ditch 28 in late spring (May-June) to repair levees, construct boat ramps, and improve fish spawning areas. The additional flow into the refuge will be insignificant from a water level management standpoint, but the fish released into the refuge, especially crappie, is a benefit for the refuge fishery. After repair work is completed, water will be pumped from Ditch 28 into Mallard Lake. Pumping will be closely coordinated between the Arkansas Fisheries Division and the refuge manager to insure that sufficient inflows are provided to the State and that the pumping operation does not alter the water level or water quality in the refuge.

5. The Arkansas Fisheries Division and/or the Big Lake Public Hunting Area manager may elect to divert water from Ditch 28 into the management area for the purpose of improving fishing or for maintenance projects during the year. The inflows are to be closely coordinated with the refuge manager and intake structures will be regulated to prevent any interruption in the water management goals of Big Lake Refuge. The outlet structures of the management area shall be maintained at an elevation of not less than 233.3 (the same elevation as the top of Big Lake Floodway Dam below Highway 18) while flows are being diverted through the area.
6. Structure maintenance and unexpected internal drainage system maintenance may cause a deviation from the normal scheme of operations during the year. Should the circumstances call for such deviation, every effort will be made to inform all effected parties of the system before proceeding. Circumstances beyond the refuges control such as temporary equipment failure and/or malfunctions that might cause deviation from the norm will be attended to as expeditiously as possible.
7. Water levels in the Mud-Slough/Baker Island moist soil unit will be managed as follows:
 - a. Dewatering operations will begin as soon as possible following spring floods and the threat thereof has subsided. Pumping operations will begin no later than June 1 to dewater the unit. The unit will be dewatered as quickly and as early as possible to facilitate the drying of the unit. Dry conditions will allow the unit to be disked to control woody brush encroachment and will allow a seeding operation with a sufficient growing season for the selected crop (millet, milo, corn, etc.).
 - b. September 15 will be the target date to begin adding water back to the moist soil unit. Existing lake conditions in regard to natural plant production and water quantity could postpone the reflooding of the unit until October 1. By manipulating stoplogs on the 24" culvert located on the unit's southeast levee, water may be taken into the unit. The unit will be flooded gradually to allow maximum waterfowl utilization of the units production.