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TENNESSEE VALLEY AUTHORITY
WATER RESOURCES DIVISION

MELTON HILL

AN OVERVIEW OF RESERVOIR
CONDITIONS AND USES

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This work was funded by federal appropriations to the Tennessee Valley Authority (TVA) for water resources management. This is one in a series of reports being prepared by TVA for reservoir users interested in the conditions of TVA reservoirs. It was developed from the most recent reports, publications, and data available, as well as from interviews with water resource professionals in various federal, state, and local agencies. Your comments and suggestions on these reports can help us better meet the information needs of reservoir users. Comments, suggestions, and requests for additional copies of the report should be directed to:

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RESERVOIR PURPOSE AND OPERATION

Melton Hill Dam is located on the Clinch River, a major tributary to the Tennessee River, at Clinch River mile (CRM) 23.1. The dam, which is located in Roane and Loudon counties, Tennessee, was closed May 1, 1963. In addition to its primary operation purposes of navigation and hydroelectric power generation, Melton Hill Dam is also operated with consideration for water supply, recreation, and aquatic habitat.

It has two hydropower turbines with a total generating capacity of 72 megawatts, which represents about 2 percent of the total hydropower capacity of the TVA system. Although releases from Melton Hill Dam generally range from no discharge to the maximum turbine capacity of 20,000 cubic feet per second (cfs) the long-term average discharge is 5,270 cfs. Because releases are timed to meet peak power demands, daily releases vary with the season (discharges are greater in winter and summer). The figure below shows the effect of peak power demand releases on reservoir elevation.

Melton Hill is TVA's only tributary dam which has a navigation lock, allowing travel between Melton Hill and Watts Bar reservoirs. An 11-foot navigation channel is maintained to CRM 61.4 (about 2 miles above the city of Clinton).

Melton Hill is termed a "run-of-the-river reservoir" because it has a small storage capacity. Therefore, there is no large seasonal fluctuation of the water level for flood storage capacity or for maintenance of downstream navigation requirements. The average annual water level fluctuation is about 5 feet compared to 32 feet for Norris Reservoir just upstream.

Special operations are scheduled to accommodate specific needs such as repair and maintenance of the dam and powerhouse, special recreational activities, and water resource studies. Semi-monthly drawdowns to minimum pool (el. 790) for two days are scheduled for January-March and October-December to control Eurasian watermilfoil growth. Releases are also scheduled to maintain desired velocity and elevations at the Melton Hill Rowing Course in Oak Ridge, Tennessee.

MELTON HILL RESERVOIR Headwater Elevation

DESCRIPTION OF WATERSHED AND RESERVOIR

Watershed Characteristics

Melton Hill Reservoir receives drainage from 3,343 square miles in the Clinch and Powell River basins of Virginia and Tennessee. Drainage from 2,912 square miles of the watershed is controlled by Norris Dam, located 56.7 river miles upstream of Melton Hill Dam. The remaining 431 square miles are uncontrolled drainage which flow directly into the reservoir.

The climate of the area is characterized by warm, humid summers and cool winters. Mean annual temperature is about 58°F, with a January average of 38°F and a July average of 77°F. Mean annual precipitation is about 49 inches, a little less than the Tennessee Valley average of 51 inches. During the drought of 1984-1988, annual precipitation was 20 to 25 percent less than the annual average. Runoff averages about 20 inches per year, with the majority occurring during the winter and spring. In summer and fall, it is not unusual for unregulated streams to go dry, especially during drought periods.

The primary land uses in the four-county area (Anderson, Knox, Loudon, and Roane counties) are forest land (primarily oak-hickory) and agricultural land consisting of mostly small farms (less than 100 acres). Most of the past and present mining activities, which include crushed limestone and dolomite, marble, iron ore, and zinc, are located in Anderson County. Limited amounts of natural gas and oil have been produced in the area. Urban development is limited in the local drainage area. Most of the city of Knoxville and about half of the city of Oak Ridge are outside the watershed boundary.

Shoreline Characteristics

There are 173 miles of shoreline around Melton Hill Reservoir. Of the 102 miles which are privately owned (about half by the Department of Energy), 19 miles have been developed. Development is expected to increase in the 1990s primarily due to improved access and population growth in both Knoxville and Oak Ridge. The Department of Energy controls the right bank from the dam to Solway Bridge and it is restricted for public use. In addition to moderate residential development, there has been some commercial and recreational development on the remaining shoreline. TVA's Bull Run Fossil Plant reservation, located on the left bank of the reservoir, stretches from CRM 46.6 to 48.8. Lands suitable for industrial development have been identified in the Blockhouse Valley area, but local opposition along the right bank has precluded such development. Beginning at CRM 59, other industrial lands have been sold at Carden Farm and Eagle Bend. Several industries, primarily manufacturers, are located in the Eagle Bend area.

Reservoir Characteristics

Melton Hill Reservoir covers portions of four Tennessee counties, namely Anderson, Knox, Roane, and Loudon counties. Most of the reservoir lies within Anderson County. The reservoir is relatively narrow (maximum width of 0.8 miles at full pool) and meandering, with several small embayments. Principal physical characteristics of the reservoir are summarized below.

Principal features of Melton Hill Reservoir

Feature	Measurement
Location of Dam, Clinch River mile	23.1
Dam closure, year	1963
Maximum height of dam, feet	84
Length of dam, feet	1020
Depth of outlet, feet	46
Navigation lock size, feet	75 x 400
Location of Reservoir, Clinch River miles	23.1-67.1
Drainage area above dam, square miles	3343
Uncontrolled drainage below Norris Dam	431
Normal maximum surface elevation, feet	795
Surface area, acres	5690
Volume, acre-feet	120,000
Maximum depth, feet	61
Average depth, feet	21.1
Length, miles	44
Shoreline length, miles	173
Normal minimum surface elevation, feet	790
Surface area, acres	4570
Volume, acre-feet	94,100
Average depth, feet	20.7
Useful controlled storage volume, acre-feet (el. 795-790)	31,900
Average annual residence time, days*	12.5

*Based on normal maximum elevation of 795 and average yearly flow

WATER QUALITY CONDITIONS

Temperature and Dissolved Oxygen

Cold water from deep within Norris Reservoir produces a different temperature pattern in Melton Hill Reservoir compared to other nearby reservoirs. The cold water from Norris results in unusually cold temperatures in Melton Hill from late spring to early fall and higher temperatures from late fall to early winter. In summer, main channel temperatures may be 30°F colder than those expected in nearby streams and embayments. For example, water temperatures of about 84°F have been observed in shallow regions where there is little flow, while at the same time temperatures in the main river areas of the reservoir reach about 57°F. The thermal stratification (layering) of the reservoir tends to be weak and of short duration.

Under average flow conditions, warming of the reservoir from Bull Run Fossil Plant discharges tends to be confined to the upper 10 feet of the reservoir, near the opposite bank, downstream from the plant. When there is little flow, water temperatures may increase upstream of the plant and to greater depths.

Chemical Characteristics

The waters of Melton Hill Reservoir are slightly alkaline, moderately hard, and well-buffered to a typical pH of 7.7. Total hardness averages 105 mg/l CaCO₃. The average total alkalinity is 90 mg/l CaCO₃. Secchi depths average 6 feet.

Nutrient concentrations in Melton Hill are relatively high for nitrogen forms and relatively low for phosphorus forms. Mean nitrate-N and ammonia-N concentrations have been reported to be 423 micrograms/l and 17 micrograms/l, respectively. Concentrations of total phosphorus generally average 0.016 mg/l at the forebay. Phosphorus is the limiting nutrient in Melton Hill. Based on an average chlorophyll-a concentration of 5.7 micrograms/l at the forebay, Melton Hill is generally considered to be moderately productive (mesotrophic).

Trace Inorganics, Organics, and Radionuclides

The waters of Melton Hill Reservoir have been analyzed for trace inorganic compounds, organic compounds, and radionuclides in several studies. Several compounds have been detected in the water, although the levels are believed to be within standards. A recent study, which evaluated historical data, identified three toxic inorganics (mercury, selenium, and arsenic) and two toxic organics (chlordane and 4,6-Dinitro-ortho-cresol) as needing further monitoring.

Bacteriological Water Quality

Bacteriological quality of water used for swimming or other primary contact recreation is normally evaluated by measuring its concentration of fecal coliform bacteria. Although fecal coliforms in lake waters are not normally pathogenic (disease-producing) themselves, they are a useful indicator of the potential for presence of pathogens. The state of Tennessee criteria for waters suitable for body contact recreation state that the geometric mean fecal coliform concentration of at least ten samples collected over a 30-day period should not exceed 200 organisms per 100 milliliters, and that the concentration in any single sample should not exceed 1,000 organisms per 100 milliliters.

TVA began sampling Melton Hill in 1989 as a part of an ongoing bacteriological survey of recreation sites. In the 1989 survey, the monthly mean concentrations at all four boat ramp sites (Melton Hill Dam, Carbide Park, Solway Bridge, and Oak Ridge Park) exceeded the state criteria for monthly samples. Six samples also exceeded the state criterion for individual samples. Because of the very high rainfall and runoff conditions during the 1989 survey, Melton Hill was surveyed again in 1990 during more normal conditions. A comparison of 1989 and 1990 data indicates that bacteriological water quality of Melton Hill worsens during rainfall conditions. In 1990 all of the sites met the state criterion for monthly mean concentrations; however, elevated counts in single samples at Solway Bridge and Melton Hill Dam in 1990 suggest that runoff is not the only condition influencing bacteriological water quality in the reservoir. Two tributaries, Beaver Creek and Bullrun Creek, were also sampled during September 1990. It appeared that the poor bacteriological water quality of these two tributary streams had little impact on the main body of the reservoir, at least during base flows.

Water Quality of Reservoir Releases

Historically, measurements of dissolved oxygen in releases from Melton Hill Dam have averaged 8.7 mg/l. They vary seasonally, with higher concentrations occurring in the winter and lower concentrations in the summer months. On average the minimum DO rarely drops below 4.9 mg/l, but values as low as 2.5 mg/l have been recorded. However, only 2 percent of all recorded measurements were below 5.0 mg/l. Temperature of releases averages 59°F but varies seasonally as well. Neither average DO concentrations nor temperatures have changed significantly over the period of record.

AQUATIC BIOLOGICAL CONDITIONS

Aquatic Plants

Eurasian watermilfoil, the only abundant aquatic plant in Melton Hill Reservoir, occupied approximately 3 to 4 percent of the reservoir between 1985 and 1989, and about 2 percent in 1990. Control of this plant is accomplished primarily by water level fluctuations. Two 5-ft drawdowns of one or two days duration scheduled each month from October-March have reduced colonies of milfoil in the middle section of the reservoir, allowing maintenance herbicidal treatment to keep most of the reservoir at low plant densities. In 1989, there were 81 acre treatments; in 1990, 42 acre treatments; and in 1991, 27 acre treatments. Acre treatments include areas that are treated more than once per year. These are areas that yield the greatest social and economic benefits from aquatic plant control and include shoreline adjacent to development, subdivisions, TVA's Bull Run Fossil Plant, and public recreation sites.

An experiment was conducted in 1984-1987 using sterile grass carp to control milfoil in an enclosed embayment at Freels Bend in Melton Hill Reservoir. Although the grass carp were effective in controlling milfoil from the embayment, there are no plans to stock them in the reservoir.

Freshwater Mussels

Fifteen species of freshwater mussels, in addition to the Asian clam (*Corbicula fluminea*) are present in Melton Hill Reservoir. Except for the floater (*Anodonta grandis*), which inhabits mud substrate found in impounded rivers, populations are very small. The most recent surveys generally produced only one live specimen per species. Seven species of mussels are present in the Norris Dam tailwater, but none is abundant. Twelve mussel species were reported in low numbers in Melton Hill tailwater, including one live federally listed species *Lampsilis abrupta*.

Benthic Macroinvertebrates

Prior to 1991 reservoir-wide sampling for benthic macroinvertebrates (small, bottom-dwelling invertebrates which are an important food item for fish) had not occurred in Melton Hill Reservoir. Thus, little information is known about the densities of these organisms. Since 1991 as part of TVA's Vital Signs monitoring program, samples are being taken annually from the upper, middle, and lower sections of the reservoir. Results of these surveys will be used to help determine the overall health of the reservoir and document changes in water quality.

Benthic invertebrates have been sampled nearly every year in the Norris tailwater since 1973 to determine available food to support a put-grow-take trout fishery and to evaluate the effect of improved dissolved oxygen and minimum flow. A limited benthic invertebrate community in the Norris tailwater was dominated by midges, sow buds, scuds, and blackflies prior to improvement in tailwater dissolved oxygen and minimum flow. A modest improvement in diversity and densities of organisms has occurred since the minimum flow and aeration was implemented in 1984. Some species that did not occur in the uppermost tailwater moved into this section from further downstream. Caddisflies, crayfish, and snails were significantly more abundant in 1985 than in previous years. Greater number of mayflies and stoneflies occurred also, but the differences were not significant. An experimental transplant of snails, mayflies, and caddisflies in 1985 into the Norris Dam tailwater was largely unsuccessful, with the possible exception in the lower end of the tailwater of a steadily increasing mayfly population. Apart from this response the benthic community is not greatly changed from pre- to post-tailwater enhancement. Rather, it

continues to compare to stressed populations in other tailwaters characterized by poor water quality.

Fish

Species Composition

Sixty-one fish species and one introduced hybrid have been taken in cove rotenone samples in Melton Hill Reservoir, including 16 native game fish and three introduced game fish (northern pike, striped bass, and white bass x striped bass hybrid). Three additional introduced game fish not taken in cove samples that occur in the reservoir or tailwater include muskellunge, brown trout, and rainbow trout. Yellow perch, which was introduced into the upper Hiwassee River impoundments in the mid 1950s, has extended its range into Melton Hill Reservoir. Sunfish (especially bluegill, redbreast, and warmouth) are the dominant game fish in the reservoir followed by black bass and crappie. Twenty-two species of rough fish are dominated by carp, freshwater drum, smallmouth buffalo, and quillback carpsucker. Nineteen species of forage fish are dominated by threadfin and gizzard shad. An important trout fishery exists at the upper end of Melton Hill Reservoir in the 13-mile tailwater of Norris Dam.

Compared to 18 other mainstem and tributary reservoirs on the Tennessee River system, Melton Hill ranked seventh in total fish weight per acre, based on 46 cove rotenone samples taken between 1964 and 1987 (see table on following page). Game fish ranked eighteenth in weight per acre among the 19 reservoirs, while rough fish ranked second, and forage fish eleventh. This comparison does not include the trout fishery in Norris Dam tailwater, since these fish are not taken in reservoir cove samples. Game fish accounted for only 6.8 percent of total weight of fish in Melton Hill Reservoir. Rough and forage fish accounted for 51.1 and 42.2 percent, respectively (see figure on following page). Compared to the other mainstem and tributary reservoirs, Melton Hill Reservoir had the lowest percentage by weight game fish, the highest percentage rough fish (along with Douglas Reservoir), and below average percentage forage fish.

Effect of Discharge from Norris Dam on Fish Reproduction and Growth

High discharge rates from Norris Dam lower water temperatures significantly in Melton Hill Reservoir during spring and summer, the period critical to successful spawning of fish. Discharge rate was found to be significantly related to abundance of young-of-the-year (YOY) fish in Melton Hill cove rotenone surveys during the period 1972 through 1982. High water discharge during spring and early summer resulted in significantly fewer YOY in summer cove samples than in low-flow years. Similarly, most families of larval fish, especially shad and sunfish/bass, were more abundant during low-flow years compared to high-flow years. Also, lower numbers of young fish available as prey were observed to reduce growth rate of one-year-old largemouth bass. Yearling bass grew significantly faster during years of low releases than during years of high releases.

**Comparison of biomass (lbs/acre) of game versus rough and forage fish
in Melton Hill Reservoir with 18 other mainstem and tributary reservoirs
on the Tennessee River from all cove rotenone samples from 1947 to 1989.**

Reservoir	Inclusive Dates	Game	Rough	Forage	Total
Cherokee	1949-1989	69	113	607	789
Wheeler	1949-1989	110	205	361	676
Pickwick	1949-1987	54	115	217	386
Boone	1953-1983	51	58	245	354
Wilson	1949-1983	53	132	149	334
Kentucky	1949-1982	33	112	156	301
Melton Hill	1964-1987	20	152	126	298
Guntersville	1949-1988	68	82	141	291
South Holston	1951-1985	58	62	161	281
Fort Loudoun	1949-1984	43	79	157	279
Chickamauga	1947-1989	48	78	137	263
Watts Bar	1949-1986	28	115	89	232
Douglas	1949-1983	47	103	53	203
Nickajack	1972-1981	91	41	88	220
Norris	1949-1989	31	27	108	166
Fort Patrick Henry	1954-1985	19	69	57	145
Watauga	1949-1984	44	38	57	139
Fontana	1949-1984	35	30	32	97
Chatuge	1953-1980	42	9	7	58

**Percentage of game versus rough and forage fish in Melton Hill Reservoir
based on number and weight of fish
from 46 cove rotenone samples between 1964-1987.**

WATER SUPPLY INTAKES

North Anderson County Utility District
 Clinton Utility Board
 Clinton Utility Board
 Anderson County Utility Board
 TVA Bull Run Fossil Plant
 West Knox Utility District
 U.S. Department of Energy
 West Knox Utility District

MUNICIPAL & DOMESTIC WASTEWATER TREATMENT FACILITIES

North Anderson County Utility District
 Lake City
 Clinton No. 3
 Clinton No. 1
 Oak Ridge East

INDUSTRIAL WASTEWATER DISCHARGES

JJ Mining Company
 Sprague Electric Company
 Modine Manufacturing Company
 FMC Corporation
 Armstrong Rubber
 Bush Brothers, Clinton
 TVA Bull Run Fossil Plant
 Oak Ridge Y 12 Plant

CAMPBELL CO

NORRIS LAKE

NORRIS DAM

Clinton

South Clinton

ANDERSON CO
KNOX CO

LEGEND

- RIVER MILE
- RECREATION CONSERVATION
- TVA Land
- DOE Land
- Public Parks
- BOAT LAUNCHING RAMP

+ 30

Current Assessment of the Fish Populations

The following assessment of the fish populations in Melton Hill Reservoir is based on surveys conducted by TWRA and TVA in 1990, interviews with individuals who regularly fish the reservoir, and information from other recent studies. TWRA has not done a creel survey on Melton Hill Reservoir in recent years; therefore, the only data available to describe fishing success during this time are results of a weekly bass tournament held out of the middle portion of the reservoir (results presented later in this report).

Black Bass - The most recent cove rotenone sample on Melton Hill Reservoir (1987) produced 4.9 lb/acre of largemouth bass, less than 0.1 lb/acre of smallmouth bass, and no spotted bass. TWRA's 1990 spring electrofishing survey yielded 92 percent largemouth bass, 7 percent smallmouth bass and 2 percent spotted bass of 429 black bass sampled. Catch per unit effort (CPUE) was 102.1 bass per hour and ranged from 77.8 in the upper half of the reservoir to 154.0 in the lower half. Good numbers of largemouth bass were found in all size classes up to 14 inches, and 12 percent of fish were over 15 inches. Relative weight (Wr) for all bass combined was 83, below the 100 plus-or-minus 5 value that is desired.

TVA's 1990 fall fish community assessment showed CPUE of largemouth bass (12.2 fish per hour) was similar to the 1990 average for Norris, Melton Hill, Ft. Loudoun, and Tellico Reservoirs (15.1). CPUE of smallmouth bass (8.4) was similar to the average for these reservoirs (8.0), and spotted bass was uncommon (0.4 fish per hour). Relative weights of smallmouth and largemouth bass in the fall sample were somewhat less than expected based on comparisons with historical data from TVA storage impoundments. Thirty-eight percent of smallmouth bass were quality size (>11 inches). Fifteen percent were preferred size (>13.8 inches), and four percent were memorable size (>17 inches). No trophy size (>20 inches) fish were taken. Fifty-two percent of largemouth bass were quality size (>11.8 inches), and 19 percent were preferred (>15 inches). No memorable (>20 inches) or trophy size (>24.8 inches) fish were taken.

Sunfish - Bluegill, the dominant sunfish (64.6 fish per hour), was considerably less abundant in TVA's 1990 fish community assessment than the 183 fish per hour average for Norris, Melton Hill, Ft. Loudoun, and Tellico reservoirs. Nineteen percent of bluegill were quality size (> 5.9 inches). No preferred, memorable, or trophy size individuals were taken. Redbreast sunfish (1.6 fish per hour) was also much less abundant than the average for the four reservoirs (11.2). Redear sunfish was uncommon (0.6 fish per hour) but similar in abundance to the average of the four reservoirs (0.5). Other game fish were rarely collected in the electrofishing samples.

Catfish - Ninety-two percent of channel catfish were quality size (> 6.1 inches). Nineteen percent were preferred size (>24 inches). Four percent were memorable size (>28 inches) and no trophy size fish were captured.

Forage Fish - Gizzard and threadfin shad were considerably less abundant (190 and 214 fish per hour, respectively) than the average for the four reservoirs (423 and 506). These two species comprised 61 percent of the total number of fish captured by electrofishing and gill netting in TVA's fall fish community assessment.

Fish Health Assessment

Twenty-two adult largemouth bass (>10 inches) from Melton Hill Reservoir were autopsied during TVA's fall 1990 fish health assessments. Fifteen were captured by electrofishing from the mid-reservoir station and seven from the lower, or forebay, station. No largemouth bass were

captured from the upper station. Fifteen external and internal parameters are considered in determining the overall condition of the fish. Values for all the parameters are used to arrive at a single fish health assessment index (FHA), which can be compared to other reservoirs and between years for the same reservoir. The FHA value is inversely related to the health of the fish. Thus, a fish with a relatively high index is in poorer health than a fish with a lower index. This procedure is not a diagnostic tool to identify causes of problems. Rather, it is a way to identify if problems exist and if further study is warranted.

Bass from the mid-reservoir station of Melton Hill had an overall index of 87. This was the highest index (poorest health) for all mid-reservoir stations assessed. Most frequently occurring anomalies involved the spleen, kidney, liver, and leucocrit. By contrast, bass from the lower end (forebay) of the reservoir had a lower FHA (31) than the average index for all forebay stations (50.0), indicating that fish from this area of Melton Hill Reservoir were in relatively good health. However it should be noted that this sample contained fewer and smaller fish than was desired. In 1991, the FHA value was 45 in the mid-reservoir station, ranking seventh best among 19 reservoirs and 51 in the forebay station, ranking third best among 15 reservoirs.

Northern Pike Experimental Stocking

Northern pike is a large, non-native, coolwater predator that was experimentally introduced in Melton Hill Reservoir in the early 1980s. Four stockings included 2,000 yearlings in 1980, 120,000 fingerlings in 1982, 9,700 yearlings in 1985, and 9,000 yearlings in 1986. TVA and TWRA conducted a cooperative evaluation of the stocking. Relatively unsuccessful initial results were attributed to small number of yearlings in 1980 and heavy predation on the 1982 fingerlings. An evaluation in 1987 of the 1985 and 1986 stockings resulted in the following conclusions:

- ❖ Survival and growth of yearling pike were good with growth exceeding that of pike in other southern reservoirs.
- ❖ Impacts on resident predators were undetected.
- ❖ Condition of largemouth bass was not affected.
- ❖ Reproduction was not documented
- ❖ Return rates to the fishermen were excellent.
- ❖ Eighty-five (85) percent of fishermen polled favored stocking pike (although some fishermen prefer the muskellunge, believing that northern pike drive the bass out of their habitat).

The evaluation further concluded that northern pike survive and grow adequately to provide a substantial fishery in Melton Hill; however, establishment of a self-sustaining population is unlikely. A stocking rate of 5,000 yearlings per year would maintain an adequate northern pike fishery in the reservoir. Although TWRA recommends continued stocking of northern pike, low priority and lack of funding have precluded additional stocking since 1986.

In August 1990, TWRA stocked 505 8- to 10-inch Ohio River muskellunge, also in the pike family, in Melton Hill Reservoir. The minimum size limit for both the northern pike and the muskellunge is 30 inches, and the creel limit is one fish per day. Muskellunge are expected to attain the 30-inch size limit in three to four years.

Bass Tournament Results

A weekly 3 1/2 hour bass tournament has been held on Melton Hill Reservoir at Solway boat ramp since 1983. Tournaments begin the first Monday in April and end on the second Monday in September. Average number of participants has ranged from 28 in 1985 to 41 in 1990 (data from

1986 and 1987 were not available). A club-imposed minimum size limit on bass weighed during the tournaments is 12 inches. The standard 10-fish creel limit established by TWRA was used until 1990 when the club reduced it to seven fish. Approximately 98 percent of the bass taken are largemouth bass, and most of the fishing is done in the middle portion of the reservoir.

Average catch rate (number of pounds of bass caught per person per tournament) was 1.2 pounds for the seven years for which data were available. Average catch increased from 0.9 pounds in the first three years (1983-1985) to 1.7 pounds in the past four years (1988-1991). This increase was expected based on results of electrofishing surveys conducted by TWRA in recent years. The warmest months of the year were more productive, although the differences were not great.

Norris Tailwater Trout Fishery and Aquatic Habitat Improvements

TVA's Reservoir Releases Improvement Program was initiated in 1980 to address low dissolved oxygen, minimum flow, and other water quality problems associated with reservoir discharges. Modification at Norris Dam and tailwater included the addition of hub baffles to the turbine and installation of a flow reregulation weir downstream of the dam.

A second generation of bolt-on, streamlined hub baffles are installed each year on both hydro units prior to the low-DO period. At the most efficient wicket gate opening, dissolved oxygen is increased in the tailrace on the order of 2.5 to 3.0 mg/l when the incoming concentration is 1 mg/l or less. Unit efficiency with the baffles and aeration is reduced less than 0.5 percent and unit capacity is reduced less than 1 MW.

A flow reregulation weir was constructed between October 1983 and May 1984 two miles downstream of Norris Dam. The weir has two sections, one on either side of Hibbs Island. The west section is 157 ft. long and the east section is 250 ft. long. Both sections are 5.0 ft. high and constructed of gabions (layers of wire baskets filled with rocks). Discharge is controlled by 54 1-ft. diameter steel pipes located near the bottom of the weir. Twenty of the pipes have float-activated controls that open as the water level drops, maintaining a constant minimum discharge of 200 cfs. Channel storage behind the weir is adequate to maintain 200 cfs discharge on a normal day of peaking, with no off-peak pulses required. Modifications to the weir since it was installed have included an extension to the downstream edge to eliminate a standing wave and a concrete cap to prevent erosion of the gabions.

Rainbow trout were first stocked in the Norris Dam tailwater in 1936 to replace the warmwater fishery that was eliminated by the coldwater releases from Norris Dam. From 1950 to 1970 trout were periodically stocked by the Tennessee Game and Fish Commission. A cooperative fishery management project between TVA, TWRA, and the U.S. Fish and Wildlife Service (USFWS) was conducted from 1971 through 1977, which included stocking and studies to evaluate conditions limiting development of the fishery. TWRA continues to stock the tailwater with 160,000 to 240,000 catchable and fingerling rainbow and up 20,000 brown trout per year. Brown trout stocking was initiated in 1980 to establish a trophy fishery. Fish raised at the USFWS Dale Hollow hatchery and TWRA's Buffalo Springs hatchery are stocked on numerous occasions at several tailwater locations throughout the year.

Estimated total fishermen visits per year in Norris tailwater more than doubled five years after full implementation of aeration and minimum flow measures. Average visits per year during 1980 through 1983 were 26,000 compared to 56,000 in 1988, the last year fishermen were creelied. Assuming an average fishing trip lasts three hours, total estimated fishing pressure on Norris tailwater in 1988 was 169,000 hours.

Since 1988, fishermen counts have been made by TVA's public safety personnel three times per day in the accessible part of the tailwater. Numbers of fishermen in fiscal year 1989 increased over the record number in 1988 (see figure below). Somewhat of a decline in 1990 was a result of nearly continuous generation of one unit from April through November. Increased fishing pressure in recent years is probably due to several factors, including: TVA's and TWRA's efforts to increase public awareness of the fishery; provision of more stable, aesthetically pleasing "fishable" waters resulting from maintenance of a minimum flow; improved access at the weir site; better access to flow conditions in the tailwater; presence of a trophy fishery for brown trout; and a general increase in recreational fishing. A recently developed access to the river at CRM 70.0 has increased the accessible fishing area of the tailwater and will likely result in increased total fishing effort.

Monthly total fishermen counts at Norris tailwater for fiscal years 1988-1990.

Average annual number of trout harvested during 13 years between 1973 and 1987 was 24,205 and ranged from 11,538 in 1974 to 42,032 in 1986. Increased harvest in the years after tailwater enhancement is apparent from the figure which follows.

The total number and weight (pounds) of trout harvested from Norris Tailwater during 1973-1977 and 1980-1987.

Melton Hill Tailwater Fishery

The Melton Hill tailwater fishery consists principally of striped bass and white bass. During late summer, adult striped bass and striped bass x white bass hybrids prefer the cooler Clinch arm (Melton Hill tailwater) over the warmer, less-oxygenated main body of Watts Bar Reservoir. Several striped bass guides work Watts Bar reservoir, and the Clinch arm supports a good fishery year-round. Forty-pound striped bass are not uncommon in the creel. Striped bass x white bass hybrid also contribute to the Melton Hill tailwater fishery, but are less important than striped bass and white bass.

Sauger abundance below Melton Hill Dam decreased after around 1983 to the point where few people fished for them. However, a large increase in sauger fishing occurred during winter 1990 through spring 1991 despite a precautionary advisory in effect that restricts amount to be consumed to 1.2 pounds per month.

The tailwater does not support a good crappie or bass fishery. Fishing for catfish has declined since a precautionary advisory was placed on them. Studies by ORNL on contaminants in aquatic organisms in Melton Hill tailwater and its tributaries that drain DOE facilities are ongoing and are not summarized in this report. A more thorough treatment of these investigations will be presented in the status report on Watts Bar Reservoir.

Fish Flesh Analysis

TVA, in cooperation with TWRA and Tennessee Department of Environment and Conservation (TDEC), conducts fish tissue analyses throughout the Valley to determine concentrations of contaminants that are potentially harmful to humans. Advisories on fish consumption are the responsibility of TDEC and are established in cooperation with all agencies that participate in fish flesh studies. Advisories for Tennessee waters consist of two types, limited consumption (precautionary) and no consumption. TDEC published a pamphlet for the public in January 1991 providing specific locations where advisories are in effect and general information on the subject of advisories and contaminants in fish. Individuals with questions about advisories are invited to call the TDEC Division of Water Pollution Control central office in Nashville at (615) 741-6623 or field offices in other major Tennessee cities.

Currently a no-consumption advisory for catfish is in effect for all of Melton Hill. This advisory exists because of concentrations of PCBs in fish collected since 1987 as part of studies conducted by TVA, TWRA, TDEC, and ORNL. A no-consumption advisory for striped bass and a precautionary advisory for catfish and sauger are currently in effect for the Melton Hill tailwater. The precautionary advisory states that children, pregnant women, and nursing mothers should not consume these fish, and all other persons should limit consumption to 1.2 pounds per month.

STATUS OF RESERVOIR USES

In Tennessee there are seven officially designated use classifications for regulating water quality in the state. They include: domestic water supply, industrial water supply, fish and aquatic life, recreation, irrigation, livestock watering and wildlife, and navigation. Other uses exist which are not specifically recognized as designated uses. They include providing fish for human consumption, providing habitat for sensitive threatened or endangered species, and providing capacity to assimilate wastewater discharges.

Water Supply

The 15 surface water intakes located on Melton Hill Reservoir - seven public, five private, and three industrial/commercial supply systems-withdraw an average 634.2 million gallons of water per day (mgd). TVA's Bull Run Fossil Plant withdrawals constitute nearly 95 percent of the water withdrawn. The average daily withdrawal for domestic use is about 13 mgd, serving a population of about 128,000. Refer to centerfold map.

Fish and Aquatic Life

Overall, the fishery in Melton Hill Reservoir is relatively poor compared to nearby reservoirs and is believed to be significantly influenced by cold water discharges from Norris Dam. Sunfish are the dominant game fish followed by black bass and crappie. Potential for a put-grow-take fishery for northern pike has been demonstrated. A no-consumption advisory exists in the reservoir for catfish and precautionary advisories exist in the Melton Hill tailwater for catfish and sauger due to elevated PCB levels in these fish. Improvements in dissolved oxygen and minimum flow have contributed to the development of an important put-grow-take rainbow and brown trout fishery in the upper end of Melton Hill Reservoir in the 13 mile tailwater of Norris Dam.

Recreation

Melton Hill Reservoir receives an estimated 200,000 visitors per year at developed recreation sites along its shore. Shoreline activities include camping, hiking, picnicking, sight-seeing, nature-watching, sunbathing, and fishing. On-reservoir uses include fishing, waterfowl hunting, boating, water skiing, and swimming. Refer to centerfold map.

Irrigation, Livestock Watering and Wildlife

There are no existing permits for agricultural water use on Melton Hill Reservoir.

Navigation

Although Melton Hill has a navigation lock, there are no active commercial terminals on the reservoir. Navigation is limited mostly to recreational boating.

Wastewater Assimilation

There are several municipal, domestic, and industrial wastewater treatment plants in the Melton Hill Reservoir area. Some facilities discharge to the reservoir while others discharge to tributary streams. Refer to centerfold map.

SOURCES OF ADDITIONAL INFORMATION

Written Reports

- Ahlstedt, S. A. 1984. *Twentieth century changes in the freshwater mussel fauna of the Clinch River (Tennessee and Virginia)*. Master's Thesis. University of Tennessee, Knoxville. Reprinted by Tennessee Wildlife Resources Agency, Nashville. 102 pp.
- Burns, E. R., A. L. Bates, and D. H. Webb. 1990. *Aquatic Plant Management Program - Current Status and Seasonal Workplan*. Water Resources, Tennessee Valley Authority, Muscle Shoals, Alabama.
- Butkus, S. R. 1990. *Evaluation of the Water Quality in the Releases from Thirty Dams in the Tennessee River Valley*. Water Resources, Tennessee Valley Authority, Report No. TVA/WR/WQ--90/17.
- Fehring, J. P. 1991. *Reservoir Monitoring--1990 Bacteriological Conditions in the Tennessee Valley, Second Annual Report*. Water Resources, Tennessee Valley Authority, Report No. TVA/WR/WQ--91/11.
- Hickman, G. D. and K. W. Hevel. 1986. "Effect of a hypolimnetic discharge on reproductive success and growth of warmwater fish in a downstream impoundment." In: *Reservoir Fisheries Management - Strategies for the 80's*. Proceedings of a symposium, Lexington, Kentucky, G. E. Hall, Technical Editor and M. J. Van Den Avyle, managing editor, Reservoir Committee, Southern Division, American Fisheries Society.
- Peterson, D. C. 1991. *Annual Reservoir Report, 1990, Melton Hill Reservoir*. Fisheries Report 91-10. Tennessee Wildlife Resources Agency. Region IV. 46 pp.
- Tomljanovich, D. A., J. W. Strunk, and L. B. Oxendine. 1992. *Water Resources Review: Melton Hill Reservoir-1992*. Tennessee Valley Authority, Division of Water Resources. TVA/WR--92/18.
- Yeager, B. L., W. M. Seawell, C. M. Alexander, D. M. Hill, and R. Wallus. 1987. *Effects of aeration and minimum flow enhancement on the biota of Norris tailwater*. Tennessee Valley Authority, Office of Natural Resources and Economic Development. TVA/ONRED/AWR 87/41. 90 pp.

Agencies and Organizations

The Tennessee Department of Environment and Conservation determines water use classifications and standards, and regulates water supply intakes and wastewater discharges. It also regulates solid and hazardous wastes and air quality.

Tennessee Department of Environment and Conservation
Knoxville Basin Office
2700 Middlebrook Pike
Knoxville, Tennessee 37921
(615) 594-6444 or 594-6035

The **Tennessee Valley Authority** Water Resources Division manages the daily operation of Melton Hill Reservoir, periodically monitors and assesses water quality and aquatic life resources, and develops plans for protecting and enhancing water resources. The Land Resources Division manages TVA lands along the reservoirs and regulates shoreline activities such as dredging and construction of seawalls and docks.

Tennessee Valley Authority
Water Resources Division
Evans Building
Room 1W 141A
Knoxville, Tennessee 37902-1499
(615) 632-6770

Tennessee Valley Authority
Eastern Land Resources District Office
2611 West Andrew Johnson Highway
Morristown, Tennessee 37814
(615) 587-5600 or 632-3791

The **Tennessee Wildlife Resources Agency** is responsible for fish and game regulations, fish habitat enhancement, fish stocking, boating regulations, and boat launching ramps.

Tennessee Wildlife Resources Agency
6032 West Andrew Johnson Highway
Talbott, Tennessee 37877
(615) 587-7037

**DATE
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10/29/93

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