# Radiotelemetry Study of Trout Movements in the Delaware Tailwaters and the Beaver Kill: 1995 - 1997

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## ABSTRACT

A total of 111 large brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) were implanted with radiotags in 1995-1996 throughout the West Branch Delaware River, East Branch Delaware River, main Delaware River, and the lower Beaver Kill. These fish were monitored weekly from May, 1995, through November, 1997. Study objectives were to 1) document and determine the extent of trout movement between rivers, 2) determine seasonal movement patterns, 3) compare movement between brown (wild and hatchery) and rainbow trout, and 4) identify critical habitats.

Radiotagged trout were at large for 10 to 892 days with the minimum and maximum total distance traveled being 0 and 127.1 mi, respectively. Rainbow trout were most mobile and hatchery holdover brown trout the least mobile. Four movement types were identified: stationery, temperature related, spawning related, and unknown. Movement between rivers commonly occurred, particularly by Delaware River and lower East Branch trout. Tailwater trout spawned in at least 14 tributaries and Beaver Kill trout in two tributaries.

Trout movement patterns identified in this study indicate that the Delaware Tailwaters (East Branch, West Branch, and Delaware River) should be managed as one system and not three separate rivers. The Beaver Kill, the major tributary to the East Branch, can be managed independently of the Delaware Tailwaters.

## INTRODUCTION

The East Branch of the Delaware River (East Branch) downstream of Pepacton Reservoir, West Branch of the Delaware River (West Branch) downstream of Cannonsville Reservoir, and the Delaware River from Hancock to Callicoon comprise the upper Delaware Tailwaters (Figure 1), a unique trout fishery resource. As management strategies for trout in the Fishery Management Plan for the Delaware Tailwaters (Sanford 1992) have been implemented, their effectiveness has been evaluated through creel census and population estimates. These studies have indicated that trout movements associated with thermal stress, spawning, or other factors may be more important considerations in the management of the tailwater fisheries than previously believed (Sanford, DEC Region 4 Fisheries Office, personal communication).

A 1994 radiotagging feasibility study was conducted on the East Branch to determine if it was practical to obtain useful information on trout movement and their causes. Radio transmitters with temperature monitoring capabilities were surgically implanted into six large brown trout (*Salmo trutta*) between April 25 and May 12. Trout movement was successfully monitored into October when the study ended. Travel distances ranged from 0.4 to 10.9 mi (Unpublished data, Region 4 Files). The temperature monitoring capability of the radiotags enabled identification of a previously unrecognized thermal refugia.

As a result of the success with the 1994 pilot study, the current study was expanded in 1995. The purchase and implantation of 20 radiotags was planned but a $15,000 donation from Trout Unlimited matched with additional equipment and manpower commitments from the Department of Environmental Conservation (DEC) resulted in the opportunity to radiotag and release a total of 50 brown and rainbow (*Oncorhynchus mykiss*) trout throughout the upper Delaware Tailwaters. The expanded study included the Beaver Kill (Figure 1), the largest tributary to the East Branch. Another

50 radiotags were purchased in 1996 to follow up on the results of the 1995 study. Study objectives were to 1) document and determine the extent of movement between rivers, 2) determine seasonal movement patterns, 3) compare movement between brown (wild and hatchery) and rainbow trout and 4) identify critical habitats.

In 1995, tagging commenced March 15 and continued through October 26. In 1996, tagging began March 13 and ended August 12. Monitoring of radiotags on a weekly schedule began May 10, 1995 and continued through December 1, 1997. This report summarizes the results of this monitoring effort.

## STUDY RIVERS

### West Branch Delaware River

The West Branch downstream of Cannonsville Reservoir flows for 17.7 mi before merging with the East Branch to form the Delaware River. The upper 10.2 mi is located entirely in New York while the next 7.5 mi of river forms the boundary between New York and Pennsylvania. At the USGS gage in Hale Eddy (Figure 1), the 10 year (1987-96) average daily flow for this 595 $mi^2$ drainage area was 539, 614, 687, and 488 $ft^3/s$ for June, July, August, and September, respectively. Stream flows and summer water temperatures in the river are largely dependent on water releases from Cannonsville Reservoir. Prior to 1997, the release schedule during normal reservoir storage conditions was as follows: 45 $ft^3/s$ from April 1 through June 14 and August 16 through October 31; 325 $ft^3/s$ from June 15 through August 15; and 33 $ft^3/s$ from November 1 through March 31. In 1997 a three year experimental release schedule was implemented that provides a 160 $ft^3/s$ flow between June 1 and September 15 and 45 $ft^3/s$ for the remainder of the year. Additional releases, usually during the summer months, are often directed by the Delaware River Master to meet minimum flow objectives in the main Delaware River at Montague, New Jersey. Summer water temperatures during normal storage condition years are usually suitable for trout growth and survival throughout the lower West Branch.

The West Branch is a low gradient stream (7.3 ft/mi) characterized by long stretches of flat water broken by moderate flow and riffles around the many islands. Approximately 25% of the river is riffles and 75% pools and runs. Average width is about 200 ft near Deposit and 242 ft near Hancock (Sanford 1993b). Conductivity in 1993 ranged from 51 umhos/cm at Stilesville (Figure 1) to 73 umhos/cm at Balls Eddy (McBride 1995). The river has not been stocked since 1994. The fishery, dominated by brown trout but with some rainbows, is managed with special regulations, either catch and release (1 reach totaling 2.0 mi) or a 12 in minimum size limit with a two fish daily creel limit (2 reaches totaling 14.3 mi). New York City owns and operates the Cannonsville Reservoir and adjacent lands and prohibits fishing in the 1.4 mi reach immediately downstream of the Cannonsville Reservoir dam to the weir at Stilesville.

**East Branch Delaware River**

The lower East Branch downstream of Pepacton Reservoir flows for 32.1 mi before merging with the West Branch to form the Delaware River. The Beaver Kill is the largest tributary and enters the East Branch 17.0 mi below the Pepacton Reservoir dam. Approximately 3 mi upstream of the Beaver Kill at the USGS gage in Harvard (Figure 1), the average 10 year (1987-96) daily flow for this 458 $mi^2$ drainage area was 185, 152, 181, and 252 $ft^3/s$ for June, July, August and September, respectively. Approximately 4 mi downstream of the Beaver Kill at the USGS gage in Fishes Eddy (Figure 1), the 10 year (1987-96) average daily flow for this 784 $mi^2$ drainage area was 600, 527, 436 and 514 $ft^3/s$ for June, July, August and September, respectively. Stream flows and summer water temperatures in the river are influenced by releases from Pepacton Reservoir. The release schedule during normal reservoir storage conditions since 1993 has been 70 $ft^3/s$ in May and September, 95 $ft^3/s$ from June 1 through August 31, and 45 $ft^3/s$ from October 1 through April 30. Summer water temperatures during normal storage condition years are usually suitable for trout growth and survival only in the upper 12.0 mi river reach from Pepacton Reservoir dam to about 4.0 mi below Shinhopple (Figure 1). Warmwater fish species are more common from 4.0 mi below Shinhopple downriver. Strong groundwater infiltration between East Branch and Fishes Eddy (Figure 1) creates summer thermal refugia that sustain localized trout populations on a year round basis (Sanford 1989).

The East Branch is a low gradient stream (6.5 ft/mi) characterized by large stretches of flat water with poor trout habitat. The river is about 40% riffle and 60% pools and runs. Pools containing good trout habitat are scattered. The Beaver Kill contributes significantly to the East Branch. Upstream, the river averages 80 ft wide near Downsville and 135 ft above the confluence at East Branch (Sanford 1993a). Downstream from the Beaver Kill, the average width increases from 202 ft below the confluence at East Branch to 288 ft in Hancock (Sanford 1993a). Conductivity in 1993 ranged from 52 umhos/cm above Corbett (Figure 1) to 75 umhos/cm above Hancock (McBride 1995). Because of the different East Branch thermal characteristics above and below the Beaver Kill, the two reaches are treated separately for this study. The Upper East Branch refers to the East Branch upstream of the Beaver Kill and the Lower East Branch refers to the downstream reach.

Approximately 5,000 brown trout yearlings were stocked annually into three reaches of the East Branch totaling 20.5 mi. In the upper East Branch, approximately 1,500 yearling brown trout were stocked in the 5.1 mi reach from Corbett downstream to 1.5 mi below Shinhopple (Figure 1). The entire 15.4 mi lower East Branch from the Beaver Kill downstream to Hancock (Figure 1) is stocked with approximately 3,400 yearling brown trout. The fishery for brown and rainbow trout is managed with special regulations. During the study period, the 4.6 mi reach from East Branch to Fishs Eddy (Figure 1) could be fished with artificial lures only and only one trout between 12 and 14 in could be creeled. The remaining 26.7 mi has a 12 in minimum size with a two fish daily creel limit. New York City prohibits fishing in the 0.8 mi reach immediately downstream of the Pepacton Reservoir dam.

**Lower Beaver Kill**

The lower Beaver Kill from the Village of Roscoe flows 15.0 mi before entering the East Branch (Figure 1). At the USGS gage in Cooks Falls (Figure 1), the 81 year (1913-96) average daily flow for this 241 $mi^2$ drainage area was 381, 280, 217 and 241 $ft^3/s$ for June, July, August, and September, respectively (Firda et al. 1996). Stream width averages 100 ft near Roscoe and 140 ft at the mouth near East Branch (Sanford 1991). Stream gradient between Roscoe and Horton is 24 ft/mi and 13 ft/mi between Horton and East Branch. Conductivity in the Beaver Kill is around 70 umhos/cm.

Instream trout habitat is generally excellent throughout the Roscoe to Horton reach (Figure 1) with numerous deep pools and riffles comprised largely of pocket water. Downstream of Horton, pools are fewer but larger and provide average trout habitat. The river was stocked with 17,400 brown trout yearlings annually at an average stocking rate of 1,160 fish/mi or 73 fish/acre (17 lb/acre). The brown trout fishery is managed with special regulations, either catch and release (2 reaches totaling 5.1 mi) or a 9 in minimum size limit with a five fish daily creel limit (3 reaches totaling 9.9 mi).

Beaver Kill water temperatures often get warm during the summer. According to Sanford (1991), summer water temperatures are particularly severe in the Beaver Kill downstream of Horton where daily maxima may reach 85°F and daily minima remain above 70°F when nights are unusually warm. In the lower Beaver Kill, thermal refugia which mitigate the effects of high summer water temperatures are considered most prevalent in the 8.0 mi reach from Junction Pool in Roscoe to the Horton area (Sanford 1991). Downstream, generally higher water temperatures in combination with fewer refugia are believed to severely limit trout populations (Sanford 1991). A more recent study suggests that elevated summer water temperature is a major factor limiting trout production throughout the lower Beaver Kill (McBride 1996).

**Delaware River**

The Delaware River, below the confluence of the East and West Branches, flows for 321 mi before entering the Atlantic Ocean. The upper 14.4 mi from Hancock to Long Eddy (Figure 1) is low gradient (4.8 ft/mi) and characterized by long pools connected by short riffle segments. Riverine habitat is about 15 to 20% riffles and 80 to 85% pools and runs. Callicoon, located 27 mi downstream of the East and West Branch confluence, is the downstream limit of the Delaware Tailwater (Sanford 1992). The 10 year (1987-96) average daily flow at Callicoon (Figure 1) in this 1,820 $mi^2$ drainage area was 1610, 1476, 1551, and 1568 $ft^3/mi$ for June, July, August, and September, respectively. Summer water temperatures are strongly influenced by coldwater releases from Cannonsville Reservoir to the West Branch. Release flows from Pepacton Reservoir beginning in the mid to late 1950's and Cannonsville Reservoir beginning in the late 1960's have resulted in water temperatures cooling sufficiently to precipitate a gradual but steady decline in the abundance of warmwater fish populations to their current low levels (Sanford 1990b). The river is wide. A 2.3 mi reach near Lordville averaged 360 ft wide (Sanford 1993b). Conductivity at two sites sampled in 1993 ranged from 65 to 72 umhos/cm (McBride 1995). The upper Delaware is noted for its wild rainbow trout fishery. The river is not stocked and the trout fishery is managed with a 14 in minimum size limit and a one fish daily creel limit.

## METHODS

### Fish Collections

Trout were collected by boat electrofishing and angling. The electrofishing boat was equipped with a 2,500 W Honda generator and a Smith Root variable pulsator was used to rectify AC current to DC and provide 1,061 V at a pulse rate of 60 cycles/s. Amperage to the water was typically 3.1± 0.2 amps. Angling was with artificial lures only.

The radio tag manufacturer recommended that the tag weight (0.4 oz) be no greater than 2% of the weight of the fish or a minimum weight of 1.25 lb. Therefore, 15 to 20 in wild brown and rainbow trout were sought throughout the length of the four study rivers because they generally met the minimum weight requirement of 1.25 lb. Larger fish were avoided because it was felt that these fish were more likely to be creeled when caught. Although wild fish were targeted, some hatchery brown trout were tagged because of the difficulty in capturing large wild fish plus the inability to positively identify holdover hatchery trout in the field. In addition, the difficulty of collecting 15 to 20 in trout resulted in implanting transmitters into five 14.5 - 14.9 in trout: three in 1995 and two in 1996.

Total length and scale samples were taken from all fish. Weights were recorded for most fish. Sex for brown trout was determined primarily from physical appearance and to a lesser extent, the ease of obtaining a scale sample. Female brown trout tend to have a smaller head and jaws than do males. It is often difficult to remove scales from males. Sexing rainbow trout was not as reliable as for brown trout except when prespawned fish were collected.

**Transmitters and receiver**

The study employed 100 Model 2 transmitters manufactured by Advanced Telemetry Systems, Inc (ATS). The 0.4 oz transmitter, powered by a 3-V lithium battery, measured 2.19 in long x 0.5 in in diameter with a 12 in trailing antenna. The transmitters, each operating at a unique frequency between 52.0 and 53.999 MHZ, were preprogrammed to transmit continuously for 10 h and then shut off for 14 h. Tags were activated at 8 AM when Daylight Savings Time (DST) began the first Sunday in April and at 7AM before and after DST. These transmitters also measured water temperature. Each was calibrated individually by ATS to operate most accurately at temperatures of 50°F to 80°F. Battery life was guaranteed for 300 days with at least half expected to transmit up to 500 days. Transmitters were monitored using an ATS Challenger Model R2000 scanning receiver with a 30-55 MHZ loop antenna for ground use. Transmitter frequencies were often entered into the memory of the receiver, especially for missing fish, to continuously scan all preset frequencies as the monitoring agent drove along the four study rivers. As fish were located, the transmitter frequency for a particular fish was then deleted.

**Transmitter implantation**

Trout were anesthetized with tricaine methane sulfonate (MS-222). A scalpel was used to make a 1.0-1.25 in incision into the abdominal cavity just anterior of the pelvic girdle and the transmitter inserted through the incision. The antenna was passed out through a 0.15 in incision between the pelvic girdle and the vent using the shielded needle technique (Ross and Kleiner 1982) and trailed under and behind the fish. A 0.75 in curved needle and nylon or monofilament suture material was used to close the incision with four or five sutures. With experience, the actual surgery took about five minutes to complete. Following surgery, the fish was returned to a slack water area at the capture location where it recovered from anesthesia, regained equilibrium, and eventually swam back into deeper water.

**Monitoring**

Tagged trout were monitored at least once per week from May 10, 1995 through December 1, 1997. Typically, the agent would enter the tag frequency at the last known location for a given fish. If no signal was received, the agent would then enter the tag frequency into the memory of the receiver. The receiver would continuously scan through all frequencies in its memory while the agent drove along the roads adjacent to the river or while parked. As signals were received, the location of the fish was noted and the tag frequency deleted from the receiver's memory. Time permitting, the agent would precisely locate each fish (right bank, left bank, middle of river, etc) to ensure that the fish was alive. The absence of movement over several observations would be an indication that the fish might be dead. In such instances, efforts were made where possible to force the fish to move.

In 1995 and 1996, ambient water temperature at the fish's location was determined by counting the number of transmitter pulses over a 10 second interval (average of three counts). Reference was then made to a calibration chart provided for each transmitter to determine water temperature to the nearest 0.1 °C. The centigrade reading was later converted to Fahrenheit. The agent then measured ambient river temperature in the main current (thalweg) as close to the fish as possible using a calibrated hand-held thermometer. Water temperatures were generally recorded for each encounter but only when temperatures were 50°F or higher.

**Trout movement**

Analysis of trout movement focused primarily on the first year at large from the spring through the following winter with the year divided into four periods as follows: spring (March 1-May 31), summer (June 1-August 31), fall (September 1-November 30) and winter (December 1-February 28). Travel distance included all recorded upstream and downstream moves. When moves occurred between two reporting periods, the distance traveled was split equally between the two.

## RESULTS

One hundred eleven trout, including 77 brown trout (BT) and 34 rainbow trout (RT) were implanted with radio transmitters, 55 in 1995 and 56 in 1996 (Table 1) as follows: 31 (24 BT and 7 RT) in the West Branch (Table 2), 14 (13 BT and 1 RT) in the upper East Branch (Table 3), 18 (10 BT and 8 RT) in the lower East Branch (Table 4), 19 (18 BT and 1 RT) in the lower Beaver Kill (Table 5), and 29 (12 BT and 17 RT) in the Delaware River (Table 6). Although only 100 radiotags were purchased, tags were recovered from 11 trout and re-implanted into other fish. Eighty-seven trout were collected by electrofishing and 24 by angling. Approximate tagging locations of the 55 and 56 trout tagged in 1995 and 1996 are shown in Figures 2 and 3, respectively.

More trout (21 or 38% of the total) were radiotagged in the West Branch than desired in 1995 because of the inability to capture fish in the Delaware River and lower East Branch. In 1996 a concerted and successful effort was made to increase the sample size of radiotagged trout in the Delaware River where the number of radiotagged trout increased from eight in 1995 to 21 in 1996.

Tagged fish ranged in size from 14.5 to 21.1 in (Figure 4) and 1.1 to 4.1 lb. Mean length and weight of brown and rainbow trout tagged in 1995 and 1996 are summarized below:

| Year | Species | Number | Mean Length (in) | Mean Weight (lb) |
|---|---|---|---|---|
| 1995 | Brown trout | 40 | 17.1 | 2.0 |
| 1996 | Brown trout | 37 | 17.4 | 2.0 |
| 1995 | Rainbow trout | 15 | 15.9 | 1.6 |
| 1996 | Rainbow trout | 19 | 16.6 | 1.7 |

Trout were three to five years old, with most either Age 3 or 4 (Figure 4). All rainbow trout radiotagged were wild. Of the 77 brown trout tagged, 54 were wild, 19 were hatchery holdovers, and 4 were of unknown origin (Figure 4). The largest trout tagged was a 21.1 in Age 4 hatchery holdover brown trout (WB-13). The species, size, sex, age, origin, capture method, and location tagged for each radiotagged fish in the West Branch, upper East Branch, lower East Branch, Beaver Kill and the Delaware River are described in Tables 2 to 6, respectively.

Radiotagged fish were at large from 10 to 892 days and traveled up to 127.1 mi total. When the study ended December 1, 1997, 27 trout (16 BT and 11 RT) were still being monitored. The status of the other 84 trout were as follows: 14 fish were creeled, 13 fish had died, 22 fish had failed or dead batteries, and 35 fish were missing. The most likely explanations for missing fish include battery failure, tag failure, animal predation, and failure by anglers to report creeled fish. Two fish, both rainbow trout (BK6-2 and DR-6), disappeared immediately after tagging and were never located again. The movement history for each fish tagged in the West Branch, lower East Branch, upper East Branch, Beaver Kill, and the Delaware River is graphed in Appendices 1-5, respectively.

There was no immediate mortality associated with the collection method or surgical procedure. Two fish, a rainbow trout originally collected by electrofishing and a brown trout originally collected by angling, were subsequently found dead by anglers along the bank 14 to 21 days after being tagged. The rainbow trout (DR-2) was found about 2 mi downstream of its tagging location and the brown trout (EB12-2) was found about 15 mi upstream. Cause of death in both cases was unknown.

**Tagging of Prespawned Rainbow Trout**

Due to the difficulty of collecting 15-20 in trout in the Delaware River during 1995, radiotags were implanted into pre-spawned rainbow trout in 1996. At the time, the response of these fish to electrofishing, handling, anesthetic, surgical procedure or tag implantation was unknown. Although pre-spawned rainbow trout were readily available, only seven fish were initially tagged to minimize potential tag loss. All were sexually mature pre-spawned females.

The surgical procedure was unchanged. More care had to be taken when making the incision into the abdominal cavity to avoid cutting the ovary since the egg filled ovaries completely filled the abdominal cavity. Insertion of the shielded cutting needle to create the exit incision for the trailing antenna did result in puncturing or tearing of the ovary to some unknown extent. The radiotag was than forced into position and held in place while the incision was stitched.

None of the seven tagged pre-spawned fish died and all apparently exhibited normal behavior. Four of the seven rainbow trout were tracked into spawning tributaries 0.1 to 16.6 mi upstream of their tagging location. Based on the survival and behavior of these seven fish, a pre-spawned rainbow trout was tagged in the upper East Branch and West Branch on April 11 and 15, 1996, respectively.

Five of the nine tagged pre-spawned rainbow trout were tracked through the end of the monitoring period, December 1, 1997. The status of the other four fish follows: 1) one fish (DR8-2) was believed creeled around April 16, 1996, from Shehawken Creek shortly after the Pennsylvania trout season opened, and 2) three fish disappeared: one (DR7-2) after August 20, 1996, the second (EB3-2) after May 27, 1997 and the third one (DR4-2) after September 8, 1997.

## MOVEMENT

The observed trout movements were broadly classified into four types: stationary, temperature related, spawning related, and unknown. These movement types are illustrated in Figure 5. The stationary fish remained in the same general area with little movement over extended periods of time. Temperature related moves occurred in concert with rising summer and cooling fall water temperatures. Rising temperatures may trigger movement to thermal refugia and falling temperatures allow fish to return to their home area. Spawning related moves particularly into tributaries occur in the spring by rainbow trout or in the fall by brown trout. Most moves, however, cannot be explained because the underlying cause can not be readily determined from the weekly monitoring effort. Furthermore not all fish respond in the same fashion to a given event. A single fish can also exhibit one or more movement types during the monitoring period. Table 7 summarizes spawning, temperature, and stationery moves by species and brown trout origin for the life of the study by trout tagged in 1995 and 1996.

### Distances Traveled

Total distance traveled which included all recorded upstream and downstream movement by trout varied widely, ranging from 0 to 127.1 mi (Tables 8 and 9). The maximum recorded travel distance by a wild brown trout (DR10-2), hatchery brown trout (DR3-2), and rainbow trout (DR2-2) was 77.3, 60.0 and 127.1 mi and the average total travel distance was 18.8, 13.1, and 31.7 mi, respectively. Only two (DR2-2 and DR4-2) of the 109 trout monitored over the course of the study traveled over 100 mi and both were rainbow trout (Table 9) tagged in the Delaware River. Four trout traveled less than 1.0 mi, two were wild brown trout and two were hatchery brown trout. Approximately two thirds of the wild and hatchery holdover brown trout traveled less than 20 mi and 10 mi, respectively, with almost two thirds (59%) of the rainbow trout traveling 20 mi or more (Tables 8 and 9). Trout can travel relatively long distances in short time periods. The maximum recorded one day travel distance was 5.6 mi upstream by a hatchery holdover brown trout (EB-1). Some radiotagged trout traveled 10.1 to 22.6 mi in three to six days.

Trout tagged in 1996 traveled further than trout tagged in 1995. Hatchery brown trout, wild brown trout, and rainbow trout tagged in 1995 averaged 7.3, 9.5, and 12.8 mi during their first year at large compared to 13.1, 19.3, and 23.2 mi for trout tagged in 1996, respectively (Table 10). Fish tagged in the Delaware River and the lower East Branch generally travel longer distances than those tagged in the West Branch, Beaver Kill, and upper East Branch. Table 10 summarizes average travel distance by brown (hatchery and wild) and rainbow trout for fish tagged in 1995 and 1996 in the five river reaches.

**Movement Between Rivers**

Trout movement between rivers commonly occurred. East Branch trout moved into the Beaver Kill, West Branch, and Delaware River. West Branch trout moved downstream into the Delaware and Delaware River trout moved upstream into the West and East Branches. Beaver Kill trout moved into the East Branch and Willowemoc Creek, the largest tributary to the Beaver Kill. Movement of trout during this first year at large by species, number, and destination for fish radiotagged in 1995 and 1996 are graphically shown in Figure 6 and 7, respectively.

Thirteen (8 BT and 5 RT) of 55 trout tagged in 1995 and 25 (16 BT and 9 RT) of the 56 trout tagged in 1996 moved out of the river tagged into another river on 17 and 31 occasions, respectively. Length of stay ranged from one to 503 days. Many of the trout returned to the river where they were tagged; however 6 fish (5 BT, 1 RT) from 1995 and 10 fish (6 BT, 4 RT) tagged in 1996 did not return. Movements between rivers were greatest during the summer with almost 60% of the moves both years made during this period, and least during the winter. Only two winter inter-river moves were made and both were made by rainbow trout (EB-7 and EB-11) tagged in 1995 (Figure 6 ). Many of the spring and fall inter-river moves were spawning related and included two brown trout in 1995 and three rainbow and five brown trout in 1996.

Trout in the Delaware River and lower East Branch made the most inter-river moves in both 1995 and 1996 with trout in the West Branch and upper East Branch the least. Twelve of the 17 moves in 1995 and 23 of the 31 moves in 1996 were made by trout tagged in the Delaware River and lower East Branch compared to one move in 1995 and 5 moves in 1996 by West Branch and upper East Branch trout. The low frequency of inter-river moves by trout from the West Branch and upper East Branch is probably related to the favorable summer water temperatures that result from the coldwater releases at Cannonsville and Pepacton dams. Summer water temperatures in these two river reaches rarely exceeded 70°F (Table 11). Also, suitable spawning habitat was present in the main stem of both rivers and potential spawning tributaries are more numerous. In the lower East Branch and Delaware River, elevated or stressful summer water temperatures are common (Table 11). Main stem spawning has never been documented in the Delaware River or the lower East Branch.

The inter-river summer movement of trout in 1995 would appear to be related to elevated water temperatures. In 1995, the Delaware River, lower East Branch, and Beaver Kill were very warm as the result of it being the warmest summer since 1953 and tenth driest summer since 1953 (Northeast Regional Climate Center, personal communication). Mean daily summer water temperatures were 70°F or higher on 41 to 51 days and the daily maximum was 75°F or higher on 26 to 38 days on these three rivers (Table 11). Eight of the 10 trout present at the beginning of summer in the Delaware River and lower East Branch moved out of these rivers into either the West Branch or upper East Branch. However, this movement behavior was not observed in the Beaver Kill where 11 (3 of 4 wild, 5 hatchery, and 3 of unknown origin) of the 12 tagged brown trout remained throughout the summer. It is not known why Beaver Kill trout behaved differently than trout in the Delaware River and lower East Branch. In the West Branch and upper East Branch where elevated water temperatures are generally not a problem (Table 11) because of the coldwater releases from Cannonsville and Pepacton Reservoirs, only one (WB-9) of the 28 trout in these two rivers moved out of the river tagged and that move occurred in late August.

The summer of 1996 was wet, the fifth wettest since 1953, with average air temperatures (Northeast Regional Climate Center, personal communication). As a result, summer water temperatures rarely reached elevated levels in the five study rivers except for the Delaware River (Table 11). Despite the relatively cool summer water temperatures, inter-river moves still occurred particularly by trout tagged in the Delaware River and lower East Branch. Unlike 1995 when most of the fish exited these two rivers, many of the fish radiotagged in 1996 remained; 5 of 11 in the lower East Branch and 11 of 18 in the Delaware River. Again, there was relatively little movement of trout out of the Beaver Kill, West Branch and upper East Branch.

## SEASONAL MOVEMENTS

Trout movement occurs throughout the year with the amount of movement varying by species, river tagged, and time of year. Tables 12, 13, and 14 summarizes seasonal mean travel distances including direction of travel by river reach for wild brown trout, hatchery holdover brown trout, and rainbow trout tagged in 1995 and 1996, respectively.

Seasonal movement trends are complicated by several factors: 1) the distribution of tagged fish by river reaches, 2) the relatively small sample size in some river reaches, particularly for rainbow trout and hatchery holdover brown trout, 3) the timing of the tagging, particularly for rainbow trout, 4) the very different summer weather in 1995 (hot and dry) and 1996 (wet) and 5) the long distances traveled by one or two fish. To minimize these factors, the seasonal mean travel distances for all trout and by species and origin regardless of tagging location were summarized in Table 15.

### Trout (General)

The periods of greatest movement for trout in 1995, 1996, and 1997 were fall, summer and spring, respectively (Table 15). Winter is generally the period of least movement. Rainbow trout are generally more mobile than brown trout throughout the year. Wild brown trout are generally more mobile throughout the year than hatchery holdover brown trout.

### Wild Brown Trout

Wild brown trout movement peaked during the fall period in 1995, during the summer period in 1996, and the summer/fall period in 1997 (Table 12). Movement was minimal during the winter period.

In 1995, the seasonal movement of wild brown trout was greatest during the fall for fish in the West Branch and upper East Branch and was probably related to spawning. In the lower East Branch, Delaware River, and the Beaver Kill, trout movements were greatest during the summer, probably in response to the elevated summer water temperatures in these rivers. The seasonal movement of wild brown trout tagged in 1996 differed from those tagged in 1995 (Table 12). In the lower East Branch, wild brown trout were most mobile during the spring period. In the upper East Branch, brown trout were most mobile during the summer but only because two (EB2-2 and EB10-2) of the six fish being monitored moved 22 and 36 mi, respectively. West Branch brown trout were most active in the fall. Although peak movement of wild brown trout in the Beaver Kill and Delaware River also occurred in the fall, the mean summer distances traveled were only slightly less than those recorded for the fall period.

Hatchery Holdover Brown Trout

Holdover hatchery brown trout are generally less mobile than wild brown trout during all seasons of the year (Table 13). Meaningful movement trends are difficult to discern, if they even exist, because of the small number of fish radiotagged in 1995 (9 fish: 5 in the Beaver Kill, 3 in the West Branch and 1 in the lower East Branch) and 1996 (10 fish: 4 in the West Branch, 3 in the Beaver Kill, and 2 in the lower East Branch and 1 in the Delaware River) throughout the four river reaches.

Peak movement of hatchery holdover brown trout tagged in 1995 occurred during the fall period in both 1995 and 1996; movement of fish tagged in 1996 peaked during the summer period in both 1996 and 1997 (Table 13). The least movement typically occurs during the winter period.

The fish tagged in the West Branch in 1995 moved most during the fall while those tagged in 1996 moved most during the summer. Beaver Kill fish tagged in 1995 had peak movements during the summer while those fish tagged in 1996 had similar peak movements during the summer and fall periods.

Rainbow trout

Rainbow trout movement was greatest during the spring and least during the winter (Table 14). This spring movement is clearly spawning related as many of these fish moved to spawning locations and then returned to their pre-spawned tagging locations. Similar movements were not recorded for rainbow trout tagged in 1995 because they were all post spawned fish that had presumably returned or were returning to their pre-spawn location when tagged.

West Branch rainbow trout tagged in 1995 were generally most mobile during that summer and again in 1996. Rainbow trout tagged in 1996 moved most during the spring in both 1996 and 1997. This movement of West Branch rainbow trout radiotagged in 1996 may be biased because the one rainbow trout tagged (WB1-2) was probably a Delaware River fish that was tagged in the West Branch. East Branch rainbow trout tagged in 1995 moved most during the fall period in 1995 and in the spring during 1996. Peak movement of Delaware River rainbow trout tagged in 1995 was very similar during the summer and fall period. These fish apparently moved upriver to thermal refugia as the Delaware River warmed and then returned as water temperatures cooled. The movement of Delaware River rainbow trout tagged in 1996 peaked during the spring that year and in 1997.

**Summer Water Temperature Impacts**

The summer weather over the course of the study covered the extremes. The summers of 1995 and 1997 were hot and/or dry compared to the wet, cool summer in 1996. The 1995 summer was the warmest since 1955 and the 1996 summer was the fifth wettest since 1953 (Northeast Regional Climate Center, personal communication). Elevated summer water temperatures were frequent during 1995 and 1997 on the lower East Branch, Beaver Kill, and Delaware River and generally absent in 1996 (Table 11).

West Branch

Summer water temperatures throughout the West Branch are generally favorable for trout because of the coldwater releases from Cannonsville Reservoir including the River Master directed releases during dry periods. Typically during the summer, the water being released is around 45°F and may warm up to the high 60°F's by the time it merges with the East Branch approximately 17 mi downriver. In 1997, the daily mean water temperature for July at Stilesville (Rm 16.3) and Hancock (RM 1.4) was 45.5°F and 56.3°F, respectively (Butch et. al. 1998). Prior to the increased summer releases, release flows are only 45 $ft^3/s$. During this period of low flow, hot weather can raise water temperature levels into the upper 70°F's, particularly in the lower reaches of the West Branch near Hancock.

Before the onset of the increased summer coldwater release in 1995, a water temperature of 77° was recorded near Hancock (RM 1.4). None of the six radiotagged trout (1 hatchery BT, 4 wild BT, and 1 RT) at large in the West Branch during this period responded to this elevated water temperature. Despite the cold summer water temperatures in the West Branch, 11 of the 12 trout being monitored in 1995 were located in water that averaged 0.1 to 3.9°F cooler than the ambient river temperature. Only one of the 21 brown and rainbow trout tagged in the West Branch exited the river and that move, by a wild brown trout (WB-9), was not correlated with elevated water temperatures.

Only one of the nine West Branch trout radiotagged during 1996 that were present during the summer migrated downstream into the Delaware River. This move by a wild brown trout (WB10-2) was not related to elevated summer water temperatures. None of the eight trout from the 1995 tagging effort, that were located in the West Branch during the summer of 1996, exited the river.

During the 1997 summer monitoring, none of the six radiotagged trout (2 from 1995 and 4 from 1996) still being monitored moved out of the West Branch.

Upper East Branch

Elevated summer water temperatures in the upper East Branch rarely occurred because of the cold water releases from Pepacton Reservoir. There were only six days in 1995, zero days in 1996, and two days in 1997 when mean daily water were 70°F or higher (Table 11). The maximum benefits of the summer coldwater releases from Pepacton Reservoir extend downstream to 4 mi below Shinhopple, a distance of about 12 mi.

All six wild brown trout radiotagged in 1995 being monitored that summer remained in the upper East Branch. Despite the cold summer water temperatures in the upper East Branch, these trout were located in water that averaged 0.4 to 2.4°F cooler than the ambient river temperature. Although two of the seven trout radiotagged in 1996 migrated out of the upper East Branch, neither was related to elevated summer water temperatures. One wild brown trout (EB2-2) migrated downstream into the Beaver Kill where it stayed from June 17 through July 8 before returning to its approximate tagging location in the upper East Branch. Another upper East Branch wild brown trout (EB10-2) was missing after June 10 and found August 14 approximately 36 mi downstream in the Delaware River where it remained. The one radiotagged fish from 1995 remained in the upper East Branch throughout the summer of 1996 as did four of the 1996 radiotagged trout being monitored in 1997.

During the 1994 pilot study on the East Branch, a previously unrecognized thermal refuge was identified at RM 17.9. The water temperature where the radiotagged fish was located was frequently 10-19°F cooler than the ambient river temperature (Unpublished data, Region 4 Fisheries files). During 1995, two radiotagged wild brown trout (EB-5 and EB-6) stayed the summer in this thermal refuge. However, the 1995 water temperature differences were not as pronounced as they were in 1994. The maximum temperature difference was 11°F with the average summer water temperature difference for the two fish being 1.6 to 2.4°F cooler than ambient river temperature. Because of the drought in 1995, the strong groundwater infiltration present in 1994 may have been greatly reduced. None of the trout radiotagged in 1996 utilized this thermal refuge.

Lower East Branch

The summer of 1995 was very warm, and on the lower East Branch, a maximum water temperature of 86.9°F was recorded July 15 at the USGS gage at Fishs Eddy (RM 11.2). A mean daily water temperature of 70° or higher was first recorded June 18. There were six periods, ranging in length from three to 30 days, that totaled 53 days when the mean daily water temperature was 70°F or higher (Table 11). In 1996, elevated summer temperatures were generally absent. In 1997, the lower East Branch was again warm. Unfortunately, the temperature sensor at the Fishs Eddy USGS gage was inoperable from June 9 through August 23.

Six radiotagged trout (3 BT and 3 RT) were present in the lower East Branch as the summer began. Five of the six fish (3 BT and 2 RT) migrated into the upper East Branch (1 hatchery holdover BT and 1 RT) or the Junction Pool (2 wild BT and 1 RT) located at the confluence of the East and West Branches. However, the movement of a hatchery holdover (EB-1) and a wild brown trout (EB-10) were probably not temperature related because the maximum water temperature recorded during this period was 71.6° F. Of the three other migrating fish (2 RT and 1 BT), one rainbow trout (EB-7) moved downstream into Junction Pool during the first period of elevated water temperatures. The water temperature reached a maximum of 78.8° F and the mean daily temperature was 73.4° F on June 19. The second rainbow trout (EB-11) moved upriver to the upper East Branch during either the first or second period of elevated water temperature. During the second period the maximum water temperature reached 80.6° F. The brown trout (EB-12) moved downriver into the West Branch after going through at least four and possibly five or even into the sixth period of elevated water temperatures. It was during this fifth period that the summer maximum of 86.9° F was reached. That same day (July 15), the mean water temperature was 81.5° F. The fish migrating to Junction Pool were all located on the West Branch side of the Delaware River which could be up to 24°F colder than the East Branch side of the Delaware River. The sixth fish, a rainbow trout (EB-9), remained in the lower East Branch throughout the summer. Although this fish remained in an area known to contain thermal refugia, it was frequently located in water warmer than 70°F and as high as 77°F.

During the wet summer of 1996, five fish (3 RT and 2 BT) from the 1995 tagging effort were still being monitored in the lower East Branch. The three rainbow trout remained in the reach between the Beaver Kill and Fishs Eddy (Figure 1). The two brown trout migrated downstream into the Junction Pool. Ten of the 1996 radiotagged trout (5 BT and 5 RT) were monitored through that summer with five fish (3 BT and 2 RT) remaining in the lower East Branch. A brown trout (EB4-2) migrated upstream into the upper East Branch and another (EB5-2) moved downstream into the West Branch. Two rainbow trout (EB14-2 and EB16-2) migrated upstream into the Beaver Kill and another (EB17-2) downstream into the West Branch. However, the one rainbow trout (EB16-2) was only recorded in the Beaver Kill for one day (June 24) when it returned to the lower East Branch for the remainder of the summer.

By the summer, 1997, which was again warm, six fish (3 BT and 3 RT) from the 1996 tagging effort were still being monitored in the lower East Branch. Five of these fish (3 RT and 2 BT) migrated downstream into the Junction Pool. Only a brown trout (EB13-2) remained through July 14 before the signal was lost. The absence of temperature data that year from the USGS Fishs Eddy gage precludes any discussion of movement associated with potential temperature impacts and water temperatures as reported by the radiotags were not recorded. The movement of trout into Junction Pool was completed by June 30.

Delaware River

The summer of 1995 was warm on the Delaware River with the USGS gage at Hankins (RM 56.8) recording a maximum water temperature of 81.5°F on July 15. There were four periods, ranging in length from four to 24 days, totaling 41 days between June 1 and August 31 when the ambient river temperature was 70°F or higher (Table 11). The first 80° F recording was June 20 and the first date the mean water temperature was 70° F or higher occurred June 18. In 1996, which was a wet summer, there were only 18 days when the mean river temperature was 70°F or higher and the maximum water temperature recorded was 76.1° F on August 6 and 7. Although the summer of

1997 was also warm, the frequency of elevated water temperatures was about half those recorded in 1995 (Table 11). The highest water temperature recorded that year was 77.9° F; however, a mean daily temperature of 70° F or higher first occurred June 11.

Three (1 BT and 2 RT) of the four radiotagged trout in the Delaware River present during the summer of 1995 migrated upstream into the West Branch. The brown trout (DR-1) moved after the first period (June 2-9) of elevated river temperature. During that week, the daily mean water temperature was 70° F or higher every day and a maximum temperature of 77° was recorded June 7. The one rainbow trout (DR-4) may have moved at the end of the first period of elevated water temperature (June 2-9) or during the second (June 18-22) period. The other rainbow trout (DR-5) had moved upriver in the early part of the third period (July 13 - Aug 5) of elevated water temperature. The fourth fish, a rainbow trout (DR-7), remained in the Delaware River at RM 57.8 which is about a mile upriver of Hankins (Figure 1). There was no evidence that this fish sought refuge in a thermal refuge for it was located in water that averaged 0.6°F higher than ambient river temperature. On three occasions it was located in water ranging from 79 to 81° F. During the summer of 1996, three of the four Delaware River trout (all RT) from 1995 still being monitored remained in the Delaware River. A fourth fish (DR-4) had migrated into the West Branch in both 1995 and 1996.

Seventeen (8 BT and 9 RT) of the 21 radiotagged trout in 1996 were present in the Delaware River June 1. Four of the brown trout (all wild) and seven of the rainbow trout remained scattered throughout the Delaware River downstream of the Junction Pool. Three wild brown trout and two rainbow trout migrated upstream into the West Branch or the Junction Pool. The fourth brown trout, a hatchery holdover fish (DR3-2), migrated upstream into the lower East Branch. The four brown trout in the Delaware River were located in areas that averaged 2.9°F to 3.4°F cooler than the ambient river temperatures. Five of the seven rainbow trout in the Delaware were in water that averaged 1.5°F to 6.5°F cooler than ambient river temperatures. Two other rainbow trout were located in areas equal to the ambient river temperature.

The summer of 1997 was again warm with 15 trout (8 BT and 7 RT) located in the Delaware River on June 1. Unlike 1995, all these fish remained in the Delaware River. Six brown trout moved into the Junction Pool area with three moving prior to the onset of elevated summer water temperatures. The maximum water temperature recorded during this period was 72.5° F. The other three fish were in Junction Pool by June 16, June 23, and July 1. From June 11-30, there were two periods of elevated water temperatures in which the maximum water temperature recorded in each period was 75.2 and 77.0° F, respectively. Of the two remaining brown trout, one (DR21-2) moved downriver into the Bouchoux Brook thermal refuge by June 21 while the other (DR5-2) was located at RM 65.5 between Lordville and Abe Lord Creek. All seven rainbow trout remained in the Delaware River throughout the summer. Three fish were located in the Junction Pool and Bouchoux Brook thermal refuge at the onset of the summer period beginning June 1 and remained throughout the summer. The other four fish were all located within a 4.6 mi reach between RM 65.5 and 70.1. Fish and ambient river temperatures were not recorded by the monitoring agent in 1997.

Beaver Kill

The summer of 1995 was very warm on the Beaver Kill and a maximum water temperature of 85.1°F was recorded July 15 at the USGS gage at Cooks Falls (RM 9.5). There were eight periods, ranging in length from one to 14 days, totaling 41 days between June 1 and August 31 when the mean daily water temperature was 70°F or higher (Table 11). In 1996, elevated summer water temperatures were generally absent with only one day when the mean daily water temperature was 70°F or higher and the maximum temperature recorded was 75.2° F on August 22. The summer of 1997 was again warm with water temperatures similar to those recorded in 1995 (Table 11). In 1997, a daily mean of 70° F first occurred June 22 and the highest water temperature recorded was 83.3° F on July 15.

In the Beaver Kill, there is a well recognized thermal refuge at the mouth of Horton Brook (RM 7.1). In past years during periods of thermal stress, over 1,000 trout have been observed at this location. An unknown number of trout were congregated at the Horton thermal refuge in both 1995 and 1997. There are smaller, lesser recognizable thermal refugia elsewhere along the Beaver Kill.

Eleven of the 12 Beaver Kill radiotagged brown trout remained in the river during the summer of 1995. A wild brown trout (BK-9) moved into the upper East Branch sometime between June 7 and June 24. From June 19-21, the maximum daily water temperature ranged from 77 to 80°F. Despite the elevated summer water temperatures, five trout (1 wild, 3 hatchery holdovers and 1 of unknown origin) remained in the area tagged. These fish made no movement to seek colder water and were in water at or higher than the ambient river temperature. The average temperature differences ranged from -0.2 to +1.0°F. Two trout (one hatchery holdover and one of unknown origin) utilized the Horton thermal refuge but both these fish (BK-6 and BK-7) were also tagged upstream within 0.5 mi of this refuge area. The water temperature in which the fish were located averaged 5.2 to 5.5°F cooler than the ambient river temperature, with a maximum difference of 10.5°F. None of the four remaining brown trout (2 wild, 1 hatchery holdover and 1 of unknown origin) migrated to spring holes. Two of these fish (BK-3 and BK-11) were located at Ferdons Pool (RM 14.7), one (BK-12) in the Mountain Pool area (RM 11.3) and the fourth (BK-8) was located between RM 2.6 and 3.7. Supposedly, there are thermal refuges in the Mountain Pools but none have been documented in recent years. These four fish were located in water that averaged 1.0 to 1.7°F cooler than ambient river temperatures. These differences were not as pronounced as those recorded at the Horton thermal refuge which suggests that these fish were not located in large spring holes. Unfortunately, most of the 1995 observations were recorded before 10 AM. The temperature differences may or may not have been more pronounced in late afternoon when water temperatures were at or near the maximum for the day.

Elevated summer water temperatures in the Beaver Kill were infrequent in 1996 (Table 11). Three (1 wild and 2 hatchery) of the four brown trout radiotagged that year, and present during the summer period, were generally located in water at or near the ambient river temperature. The mean temperature difference ranged from +0.1°F to -0.4°F. The fourth fish, a wild brown trout (BK3-2), was tagged in the vicinity of Horton Brook and remained in that area. This fish was in water that averaged 1.8°F cooler than the ambient river temperature.

Two Beaver Kill wild brown trout from the 1996 tagging effort were still being monitored during the summer of 1997. One (BK3-2) was located in the Horton thermal refuge and the other (BK2-2) was located at Cairns Pool (RM 13.1) in the early summer and Junction Pool (RM 15.1) in the late summer.

## TROUT SPAWNING

Overall, 43 radiotagged trout (16 RT, 25 BT and 2 hatchery BT) entered 16 different tributaries (Figure 8) where they presumably spawned. This represents a minimum of 47%, 16%, and 11% of the tagged rainbow trout, brown trout, and hatchery holdover brown trout, respectively. These percentages should be considered minimum estimates because not all radiotagged trout were present during their respective spawning seasons; and there is a strong likelihood that the weekly monitoring may have missed some tributary spawning fish. Eight trout (4 BT and 4 RT) were repeat spawners that were tracked into the same tributary over two spawning seasons. Thirty-two (10 RT, 20 BT, and 2 hatchery holdover BT) of the 43 radiotagged trout migrated upstream to a spawning tributary and 11 tagged trout (5 BT and 6 RT) moved downriver.

Rainbow Trout Spawning

Rainbow trout in the Delaware tailwaters are known tributary spawners. To date, no mainstem spawning is known to occur anywhere in the system. Rainbow trout tagged in the Delaware spawned in Delaware River, East Branch, and West Branch tributaries; East Branch rainbow trout spawned in West Branch and East Branch tributaries; and West Branch rainbow trout spawned in West Branch tributaries. Spawning rainbow trout did not ascend the Beaver Kill or any of its tributaries. During the spring of 1996 and 1997, spawning rainbow trout were tracked into six different tributaries (Figure 8). The mean date first monitored in a tributary in 1996 and 1997 was April 13 and April 9, respectively. No rainbow trout were tracked into two different spawning tributaries.

Eight of the 19 rainbow trout (10 from 1995 and 9 from 1996) tracked during the 1996 spring spawning period entered tributaries to spawn. During the 1997 spring spawning period, 12 of the 20 rainbow trout (5 from 1995 and 15 from 1996) being monitored entered tributaries to spawn. Travel distance to the spawning tributaries ranged from 0.1 to 16.6 mi. The number of fish ascending tributaries to spawn should be considered a minimum number because of the time interval between monitoring dates. Since radiotagged trout were generally monitored at weekly intervals, it was possible for fish to ascend a tributary, spawn and then return to the main river within a matter of days. Although radiotagged rainbow trout were recorded as far as 5.2 mi up a tributary, spawning rainbow trout and redds were observed in tributaries within yards of their confluence with one of the study rivers. Fourteen of the 20 trout entering tributaries were located within 0.5 mi of the mouth and 12 trout were monitored in the stream for only one day.

March 21 was the earliest date a rainbow trout (DR9-2) was monitored in a tributary during 1996 or 1997 and June 28 was the latest date. Although the one rainbow trout (DR2-2) was first located in a tributary on June 28, it was missing from April 17 - May 20 and May 22 - June 27, 1996. It is likely that this fish entered the tributary sometime between May 22 and June 27. This late entry into a tributary is probably atypical. The peak period of entry appears to be the last week in March and the first week in April (10 fish) with a secondary peak the last week in April (6 fish). Length of stay averaged 5.6 days and ranged from 1 to 29 days. All but four rainbow trout exited the tributary they had entered by April 30. The four fish that were tracked after April 30 were last monitored in a tributary on May 1, May 3, May 27, and June 28.

The trout season for lower East Branch tributaries and the Delaware River and West Branch, including tributaries, where it forms the boundary for New York and Pennsylvania, opens the first Saturday after April 11 which means that trout season opener will be between April 12 and 18 depending on the year. Nine of the 20 rainbow trout entered tributaries April 12 or later and nine rainbows were still in a tributary after April 18. The delayed opening compared to the New York statewide April 1 trout season opener probably protects about half the spawning rainbow trout in the Delaware tailwaters.

Four of the 11 rainbow trout monitored through two spawning seasons spawned in the same stream both years. For the seven other rainbow trout, six were located in the vicinity of the tributary where they spawned the previous year. Although the one fish in the spring, 1996, was located approximately 10 mi downstream of the tributary it spawned in 1997, it was also missing from March 16 through April 15 which encompasses the early peak spawning period. The data suggests homing for riverine rainbow trout.

Wild Brown Trout Spawning

Brown trout in the Delaware tailwaters spawn in tributaries and/or the main stem of the West Branch and upper East Branch. No main stem spawning has been observed in the Delaware River or the lower East Branch. Brown trout tagged in the Delaware River moved upstream into the West Branch and lower East Branch; East Branch brown trout spawned in the West Branch and Delaware River tributaries. West Branch brown trout remained in the West Branch drainage area. During the fall of 1995, 1996, and 1997, spawning brown trout were tracked into 13 different tributaries (Figure 8). No brown trout was tracked into two different spawning tributaries.

Wild brown trout tracked into the fall of 1995, 1996, and 1997 numbered 24, 30 (9 from 1995 and 21 from 1996) and 12 (all 1996 fish), respectively. The number of fish entering tributaries to spawn in 1995, 1996 and 1997 was 8 (33.3%), 16 (53.3%) and 5 (41.7%), respectively. The number of fish that ascended tributaries to spawn should be considered a minimum number because of the time interval between monitoring dates. During the 1996 spawning season, 8 of the 16 trout were monitored in a tributary for only one day.

During the study, the dates when fish were first recorded in a tributary ranged from September 17 through November 25. The mean date first recorded in a tributary during 1995, 1996, and 1997 was October 9, November 1, and November 10, respectively. The peak period for entering a tributary is highly variable. In 1995, the peak period was the second week in October compared to the last week in October, 1996. The first and last week in November was the peak period for 1997. Length of stay ranged from 1 to 93 days and averaged 10.6 days compared to 5.6 days for rainbow trout. One brown trout (DR15-2) was in a tributary from November 11 through February 11. Tributary spawning brown trout migrated upstream a maximum recorded 7.7 mi but this varied. In 1995, 1996 and 1997, the mean maximum upstream distance in a tributary was 4.6, 0.8, and 1.2 mi, respectively.

Six of eight wild brown trout that entered tributaries to spawn during the fall, 1995, stayed and later died compared to only one (EB5-2) of the 16 tributary spawning brown trout (2 from 1995 and 14 from 1996) in 1996. The reason for the difference in survival between the two years is not clearly known. Age was not a factor since the mean age of dead fish in 1995 and live fish in 1996 was 3.8 and 4.0 years old, respectively. Tagged spawners were mostly female in 1995 (5 of 6 fish) and 1996 (10 of 15 fish) suggesting that the sex of the fish was not a factor. The maximum recorded upstream travel distance and the date first recorded in the tributary could be factors. In 1995, the trout that died averaged 4.6 mi upstream (range was 0.1 to 7.6 mi) compared to only 0.8 mi (range was 0.8 to 2.0 mi) for the live fish in 1996. The only fish (EB-10) known to survive in 1995 migrated 2.6 mi upstream and the only fish (EB5-2) to die in 1996 had migrated 3.0 mi upstream. October 9 was the mean date brown trout were first recorded in a tributary during 1995 compared to November 1 in 1996. The later arrival in 1996 was not due to lack of tributary flow. That summer and fall were unusually wet, flows were high, and fish could have entered tributaries at any time.

Although tributary spawning is important for wild brown trout production throughout the Delaware Tailwaters, main stem spawning in the West Branch from RM 4.7 to 15.9 and in the upper East Branch from RM 17.2 to 31.3 is also very important. Main stem spawning in the upper East

Branch and the West Branch was first documented in 1992 and 1993, respectively (D.K. Sanford, DEC, personal communication).

Hatchery Holdover Brown Trout Spawning

Nine hatchery brown trout were radiotagged in 1995 and 10 in 1996. Five of the hatchery brown trout were tracked into the fall, 1995 and none apparently entered a tributary to spawn. In 1996, 10 fish (3 from 1995 and 7 from 1996) were tracked into the fall and two (1 each for 1995 and 1996) entered a tributary to spawn. Only one (WB3-2) of the four hatchery holdover brown trout (2 each for 1995 and 1996) still being monitored during the fall, 1997, entered a tributary to spawn. Dates first recorded in a tributary were October 23, November 3 and December 24 with length of recorded stay ranging from 1-35 days. One fish (BK7-2) was in a tributary from December 24 through January 27 when the signal was lost. The December 24 entry into a tributary was the latest of any brown trout. For wild brown trout, the latest date entering a tributary was November 25. Hatchery brown trout migrated 0.1 to 2.0 mi upstream to apparently spawn.

Spawning By Trout of Unknown Origin

Four brown trout of unknown origin (3 in the Beaver Kill and 1 in the West Branch) were tagged in 1995 and none in 1996. All four were tracked into the fall and none apparently entered a tributary to spawn. None of these fish were tracked into the fall, 1997.

## OTHER POTENTIAL MOVEMENT TYPES

High Flows

High winter stream flows are unlikely to cause significant movement by trout. Severe flooding throughout the Catskills occurred January 19-20, 1996. Flows in the Beaver Kill, Delaware River, lower East Branch, upper East Branch, and the West Branch peaked at 42,900, 95,600, 53,000, 12,200, and 13,200 $ft^3/s$, respectively (Lumia 1998). These flows were equivalent to a 100 year flood event on the Beaver Kill and lower East Branch, an 80 year flood event on the Delaware, a 40 year flood on the upper East Branch, and a 10 year flood on the West Branch. Thirty-four trout were monitored before and after this 1996 flood event and 25 fish (7 RT and 18 BT:12 wild, 3 hatchery, 3 unknown origin) demonstrated no movement including 10 of 12 in the West Branch, 6 of 8 in the Beaver Kill, 4 of 6 in the Delaware River, 2 of 2 in the upper East Branch and 3 of 6 in the lower East Branch. Seven fish moved downstream 0.1 to 3.5 mi and two moved upstream 0.3 to 0.5 mi. Of the fish that moved downstream, the three rainbow trout averaged 2.3 mi and the four brown trout averaged 0.3 mi.

Seasonal Migration

Only one of the 54 trout (14 RT, 29 BT, 7 hatchery holdover BT, and 4 BT of unknown origin) monitored for more than a year appeared to demonstrate a seasonal migration that was not related to spawning. In both 1995 and 1996, a lower East Branch brown trout (EB-10) moved downriver around June 1 to the Junction Pool area on the Delaware River.

Environmental Movement

The movement of one brown trout (WB-5) in the West Branch during 1995 was probably triggered by an environmental event, a combination of turbid water with low dissolved oxygen. In the West Branch, the high water release requirements in 1995 depleted the high quality hypolimnetic water in Cannonsville Reservoir by late August which resulted in the discharge of lower quality thermocline and epilimnetic water. These releases were turbid with a low dissolved oxygen ($\leq$ 1.0 ppm). One (WB-5) of the two radiotagged brown trout in the 1.4 mi reach between the Stilesville weir dam and Cannonsville Reservoir immediately migrated downstream. Further investigation found that the other brown trout (WB-6), which did not move, was located in a side channel of clear, oxygenated water until September 20 when it began its downstream migration to Sands Creek (RM 1.6). No radiotagged trout were located in this 1.4 mi reach above the Stilesville weir dam in 1997 when turbid and low dissolved oxygen water was again released.

## DISCUSSION

Surgical implantation of radiotags did not appear to affect brown and rainbow trout behavior. A rainbow trout (DR9-2) ascended a tributary to spawn within seven days of being radiotagged. Radiotagged trout were caught by anglers on lures, flies, and bait with one fish in the Beaver Kill caught at least four times. One trout spent an unknown amount of time in an angler's live well before being released. Anglers reported that the fish were healthy and in good condition. Several radiotagged trout were recaptured while concluding other electrofishing studies and these fish were in excellent condition. The only problem noted was that in some fish, the antenna had relocated anteriorly and upward dorsally to a maximum of 0.5 in from where it originally exited the abdominal cavity.

### Movement Types

Trout movement in the Delaware Tailwaters and Beaver Kill were broadly classified into four types: stationary, temperature related, spawning related, and unknown (Figure 5). A single trout can exhibit one or more movement types over a given time period.

There does not appear to be a single temperature threshhold that triggers trout movement during periods of elevated summer water temperatures. Although radiotagged trout were not monitored daily, some trout apparently moved during the first period of potentially stressful elevated water temperatures while others deferred movement until later in the summer after withstanding several periods of elevated water temperatures. Most of the Beaver Kill trout did not seem to respond at all to the warm water temperatures present during the summer of 1995.

Unknown moves are those in which no underlying cause could be conclusively determined which was due primarily to the fact that fish were generally monitored weekly. For example, there are indications that some trout may move in response to rapid increases or decreases in flow resulting from run-off events. Other moves may be the result of changes in environmental conditions, whether man made or natural, that were not recognized. There was one documented move by a brown trout that may have resulted from the low quality turbid discharge from Cannonsville Reservoir in late August, 1995.

Stream trout radiotelemetry studies elsewhere in the United States documented movement types that may have occurred during this study that were unrecognized. Diel movements over a 24 h period have been reported by Clapp et al. (1990), Hildebrand and Kershner (2000), Bunnell et al. (1998), and Boisclair (1992) for brown trout, brook trout (*Salvelinus fontinalis*) and cutthroat trout (*Oncorhynchus clarki*). Large brown trout can range up to 0.8 mi during the course of a 24 h period (Bunnell et al. 1998). Brown trout movement has been associated with feeding and foraging, with peak activity occurring during August on a Michigan trout stream (Clapp et al. 1990). Clapp et al. (1990) also reported that brown trout could relocate their home range up to several times a season.

Seasonal migration of brown trout has been reported by Meyers et al. (1992) with trout moving between summer and winter habitat. Brown and MacKay (1995) reported a similar seasonal migration for cutthroat trout. Except for spawning related moves, only one trout (BT) of the 54 trout that were monitored for over a year demonstrated what might be described as a seasonal migration.

Water Temperature

Summer water temperatures are an important influence to the movement of trout in the Delaware Tailwaters, particularly in years of hot and/or dry summers as experienced in 1993, 1995 and 1997. Trout tend to remain in the West Branch and upper East Branch where summer water temperatures are typically in the 45-65° F range. In the lower East Branch and Delaware River where summer water temperature can often reach into the mid 80° F, trout must move to thermal refugia. Many Delaware River trout move into the West Branch or to the confluence of the Delaware River on the West Branch side of the river. Other fish will seek localized thermal refugia such as the mouth of Bouchoux Brook in the Delaware River. Many lower East Branch trout move upstream into the upper East Branch, downstream into the West Branch or the confluence on the West Branch side of the river. Although Beaver Kill summer water temperatures commonly exceed 80° F, trout tend to remain in this river. Why their behavior differs from that of fish in the Delaware River and lower East Branch is not known.

In addition to their effect on trout movement, elevated water temperatures are a major factor limiting trout production. Outside their preferred temperature range, trout become less efficient at performing life functions, compete less effectively for food and space with better adapted species and are generally less vigorous and more susceptible to disease and predation (Hokanson et al 1977; EPA 1976; and Spotila et al 1979). Brown trout fed to satiation experience maximum growth at 54-59°F and declining growth rates above 64°F (Elliot 1975). In one laboratory test, juvenile brown trout lost weight regardless of the amount of food eaten when the water temperature reached 71°F. Studies with juvenile rainbow trout have shown that growth rates are reduced at temperatures exceeding 66°F and that population biomass can not be maintained when weekly mean temperatures exceed 70°F and temperatures fluctuate daily (Hokanson et al 1977). Thus, elevated summer water temperatures in the Delaware River, lower East Branch, and the Beaver Kill limit trout abundance in these rivers.

When water temperatures in Catskill streams reach the mid to high 70's F, trout generally move into thermal refugia where they typically abandon normal feeding and behavior patterns and become more vulnerable to natural predators, poaching and disease (Sanford 1991). Observations of thermally stressed trout indicate the fish become inactive, presumably minimizing energy expenditures, and rarely leave the thermal refugia even when disturbed. Since forays to acquire food are dramatically reduced, stored reserves must be used to sustain life functions while trout are restricted to refugia. Literature and anecdotal evidence suggest that stressful water temperatures for trout are present when daily means are 70°F or higher or the daily maxima are 75°F or higher. The severity, frequency, and duration of elevated temperature conditions will determine the impact on trout populations.

## MANAGEMENT IMPLICATIONS

Movement of trout between rivers is a common occurrence on the Delaware Tailwaters with most of the moves occurring during the summer months. Thirteen of 55 trout in 1995 and 25 of the 56 trout tagged in 1996 moved out of the river where they were tagged into another river. Length of stay ranged from one day to a permanent relocation. Inter-river moves were greatest by Delaware River and lower East Branch trout and least by West Branch, upper East Branch, and Beaver Kill trout. Although some moves were spawning or temperature related, there were no obvious underlying causes for many moves. During the warm summer of 1995, the moves by Delaware River and lower East Branch trout appeared temperature related but in 1996, many of the radiotagged trout in these two rivers moved despite the general absence of elevated summer water temperatures. Regardless of the reasons for the movement of trout, the amount of movement between rivers demonstrates that the Delaware Tailwaters should be managed as one system rather than as three separate entities. A stream system or drainage basin approach to trout stream management has also been recommended as a result of radiotelemetry studies on trout streams in Michigan and Wisconsin (Clapp, et al 1990 and Meyers et al 1992). The low frequency of movement by Delaware Tailwaters trout into the Beaver Kill and Beaver Kill trout into the East Branch indicates that the Beaver Kill drainage can be managed independently of the Delaware Tailwaters.

A drainage basin approach would suggest that a common set of angling regulations would be warranted throughout the Delaware Tailwaters with respect to size and creel limits. Currently, the Delaware River trout fishery is managed with a 14 in minimum size limit and one fish creel limit compared to the 12 in size and two fish creel limit for the East and West Branches. There is no evidence to suggest that the more restrictive angling regulations have improved trout catch rates on the Delaware River. Prior to implementation of the 14 in and 1 fish regulation in 1995, trout catch rates averaged 0.26 fish/h (range was 0.19 to 0.34 fish/h between 1989 and 1994 compared to 0.24 trout/h (range was 0.19 to 0.34 fish/h) in 1995 and 1999 (McBride in prep). It is recommended that the Delaware River trout regulation be changed to a 12 in size and 2 fish creel limit to standardize trout regulations throughout the Delaware Tailwaters. This regulation change proposal would have to be reviewed and discussed with the Pennsylvania Fish and Boat Commission and the angling public for both states.

The movement of trout out of the Delaware River and lower East Branch during periods of elevated summer water temperatures suggests that implementation of special regulations, such as

"No Kill" to improve angling quality are inappropriate on these two rivers. Trout movement out of the 4.6 mi slot limit (artificials only and only one trout between 12 and 14 in could be creeled) reach between the Beaver Kill and Fishs Eddy on the lower East Branch (Figure 1) in 1995 was a primary reason for discontinuing this special regulation after September 30, 1997.

Elevated summer water temperatures reaching stressful and/or lethal levels are common occurrences on the Delaware River, lower East Branch, and the lower Beaver Kill. Since 1993, every odd year has been hot, dry, or both. During these stressful periods, trout must seek thermal refuges to survive. Many of the Delaware River and lower East Branch trout migrate towards the West Branch or upper East Branch, others must seek out tributaries, springs, or areas of upwelling which can often be identified by the presence of trout concentrations. In the Beaver Kill at the Horton thermal refuge, concentrations of over 1,000 trout have been observed. There is a need to identify and map these refuge areas to ensure resource protection of these critical areas. This effort is currently underway on the Beaver Kill.

The tributary system of the Delaware Tailwaters provides important spawning areas for both brown and rainbow trout. In this study radiotagged trout spawned in at least 14 of the 96 tributaries located with the Tailwater drainage basin. Presumably the other tributaries that are accessible to trout and capable of supporting the various life stages (eggs fry, fingerlings, yearlings, and/or older) are also being utilized as spawning tributaries by mainstem trout. It would be desirable to sample all these streams to update the fisheries information with regards to trout density and biomass, species composition, size and age distribution and the location and types of impassible barriers. This is currently being done throughout the Beaver Kill drainage basin as part of another study. A number of streams in the Beaver Kill watershed that were classified as intermittent or non-trout waters are now inhabited by trout (Unpublished data, Region 4 Fisheries files). This information would be valuable with regards to environmental protection activities and regulatory review of project applications on Tailwater tributaries by both New York and Pennsylvania permitting and resource agencies.

On the 10 tributaries to the West Branch, 39 tributaries to the Delaware River where New York and Pennsylvania share a common boundary plus the 18 tributaries on the lower East Branch, the trout season opens the first Saturday after April 11. This delayed opening compared to the New York statewide April 1 trout season opener probably protects about half the spawning rainbow trout population in the Delaware Tailwater. Delaying the opening of trout season to May 1 on these river reaches would protect about 90% of the rainbow trout spawning population. However, this regulation change is not being recommended because there is no evidence to suggest that the existing season opener is having any adverse impacts.

## ACKNOWLEDGMENTS

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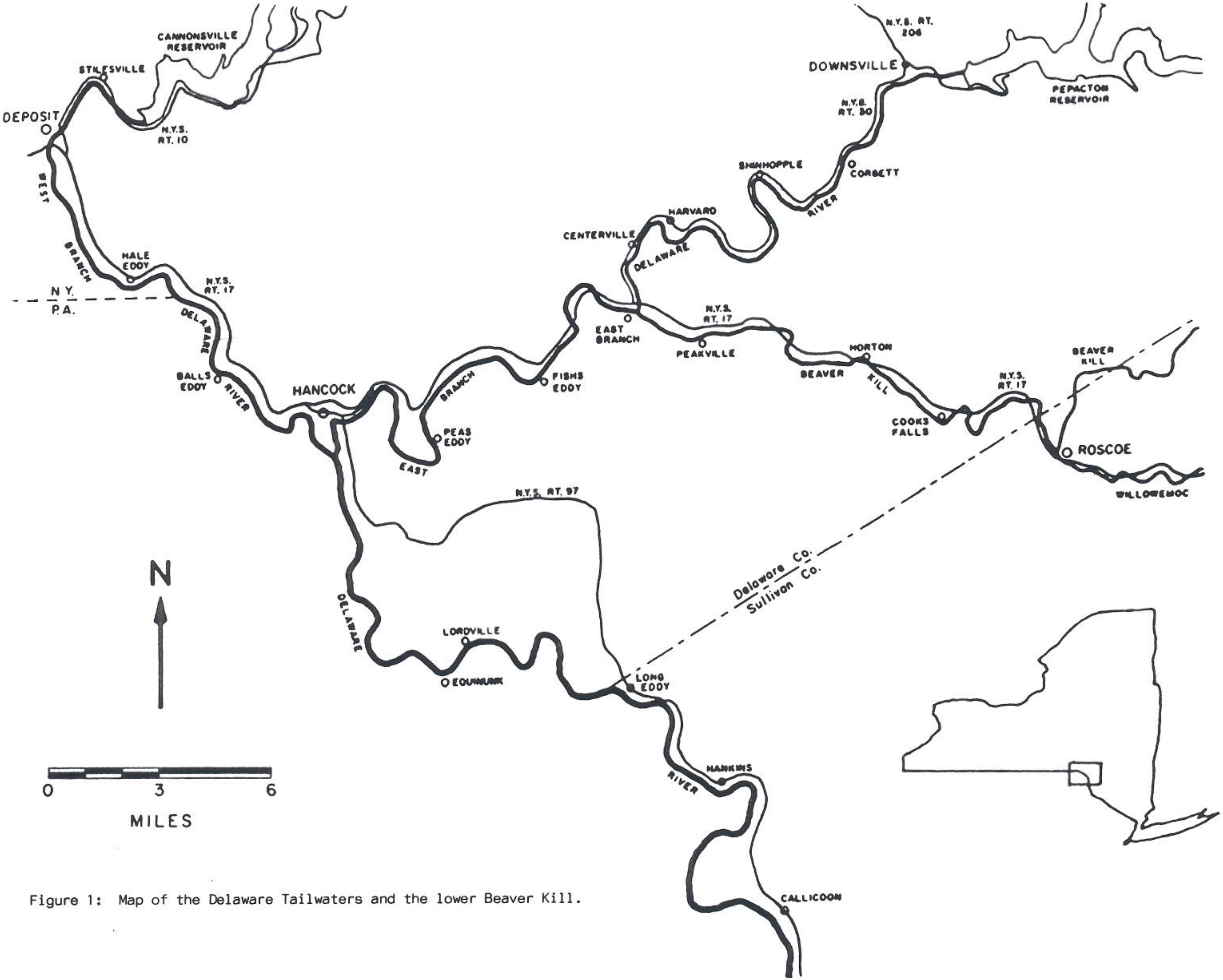



Figure 1: Map of the Delaware Tailwaters and the lower Beaver Kill.

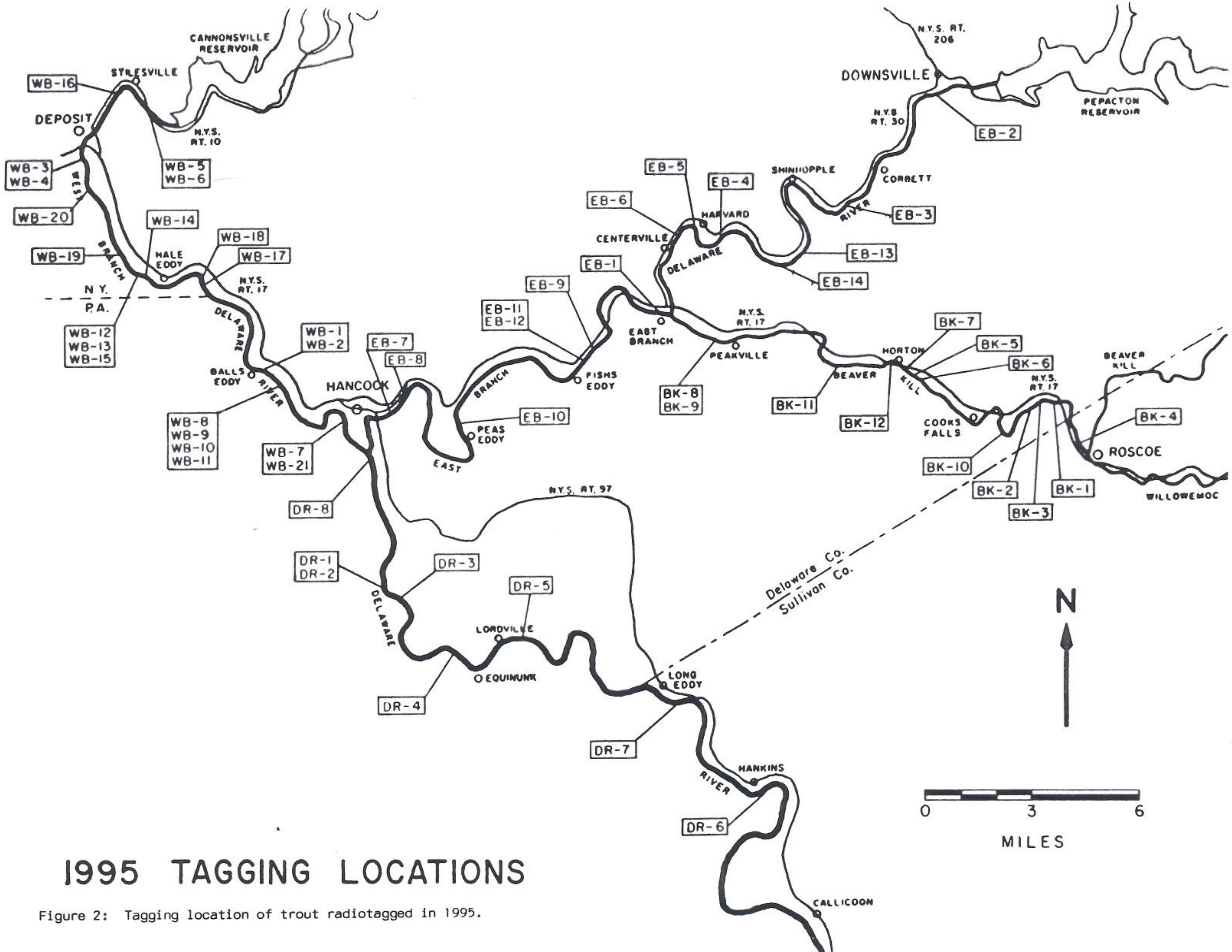



Figure 2: Tagging location of trout radiotagged in 1995.

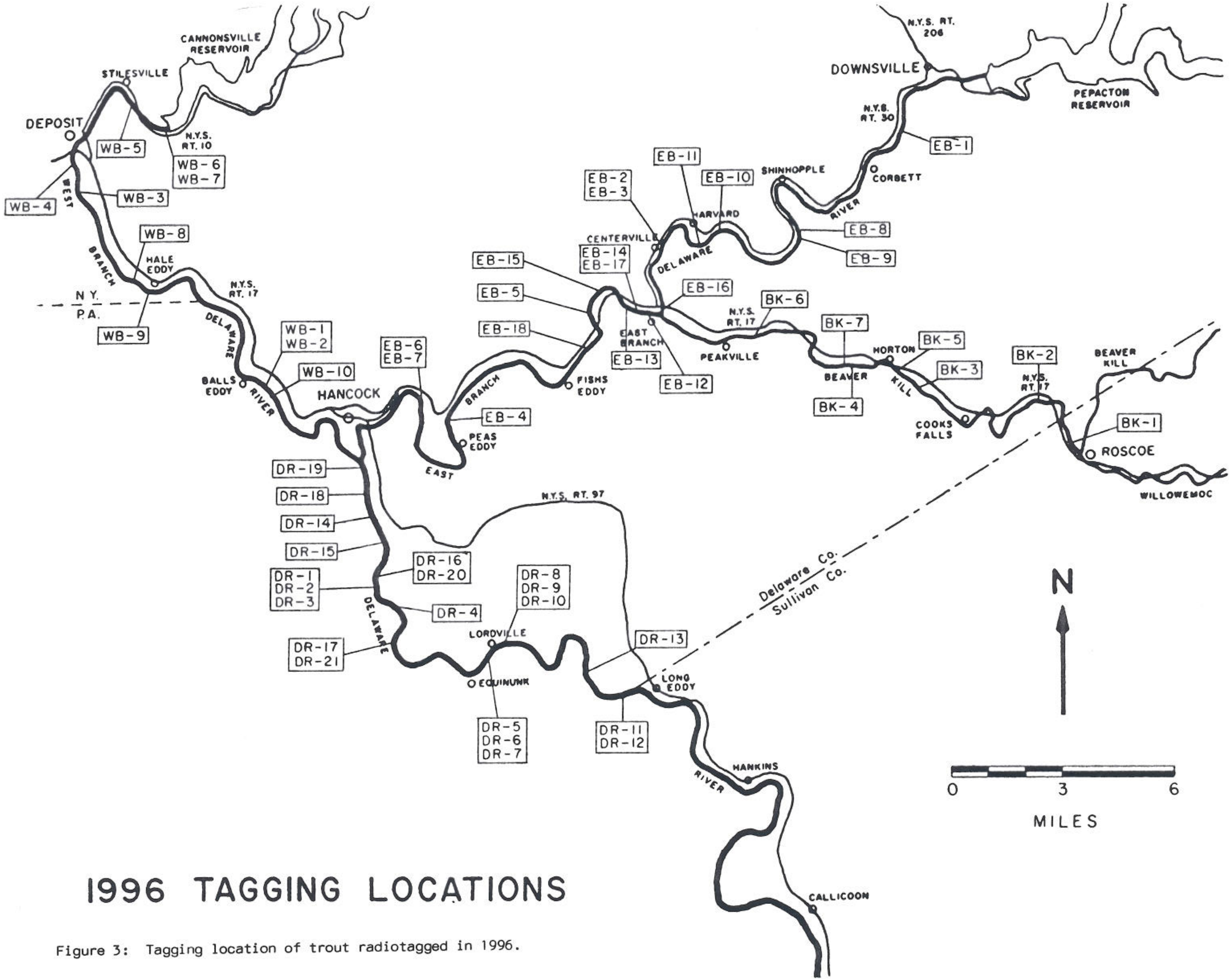



Figure 3: Tagging location of trout radiotagged in 1996.

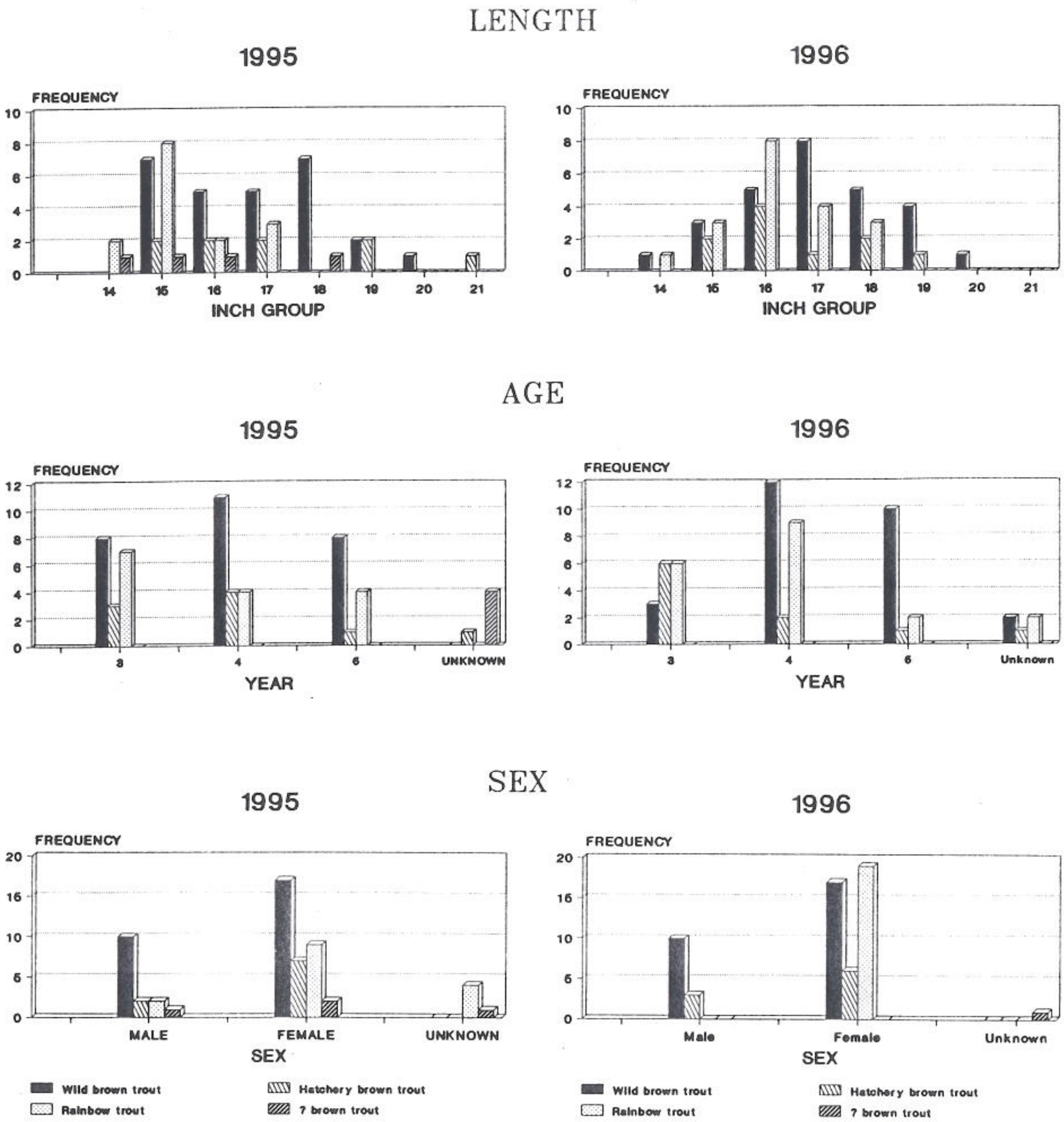



Figure 4: Length, age and sex distribution of trout radiotagged in 1995 and 1996.

# Movement Types

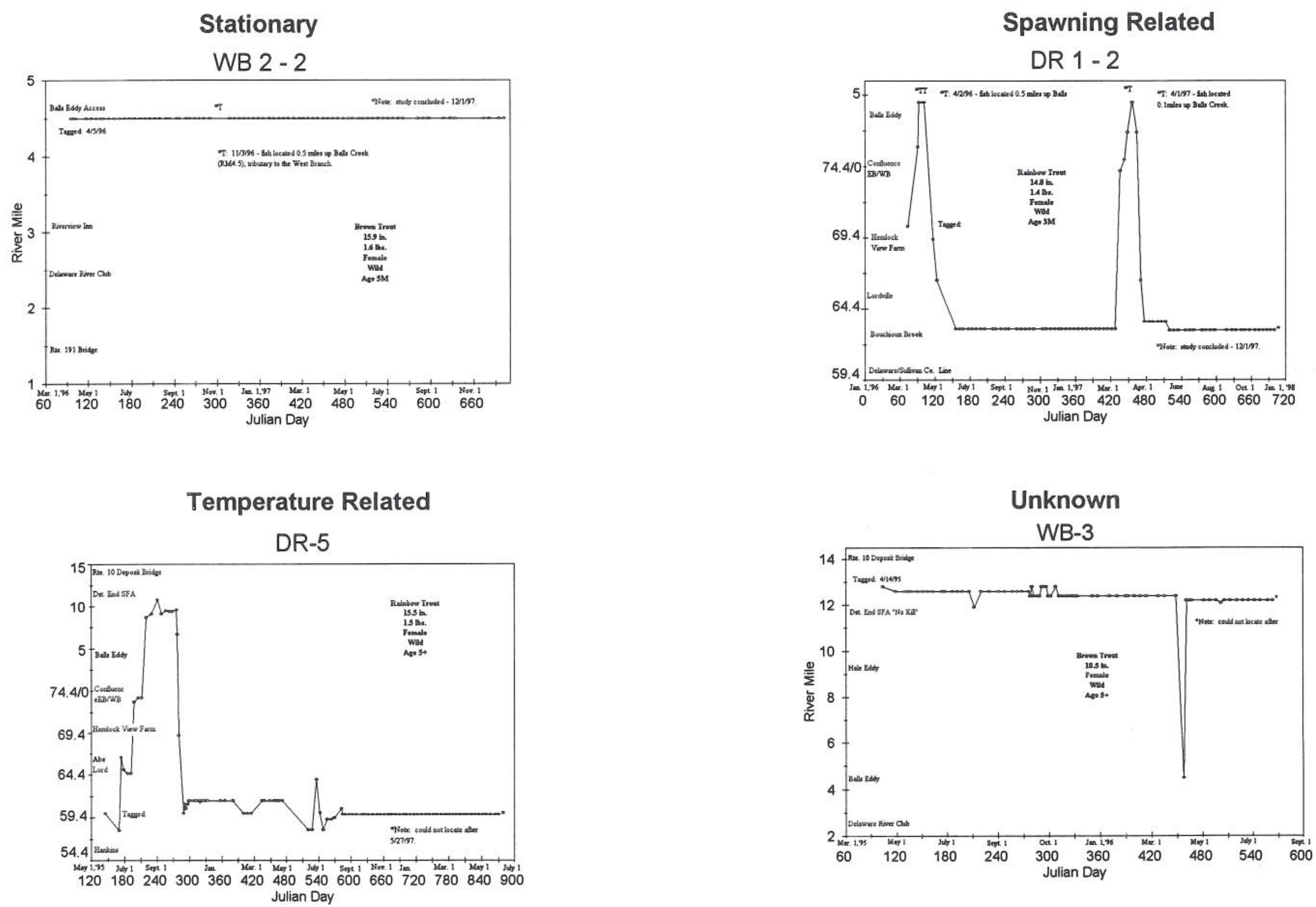



Figure 5: Examples of four types of movement made by radiotagged trout in the Delaware Tailwaters.

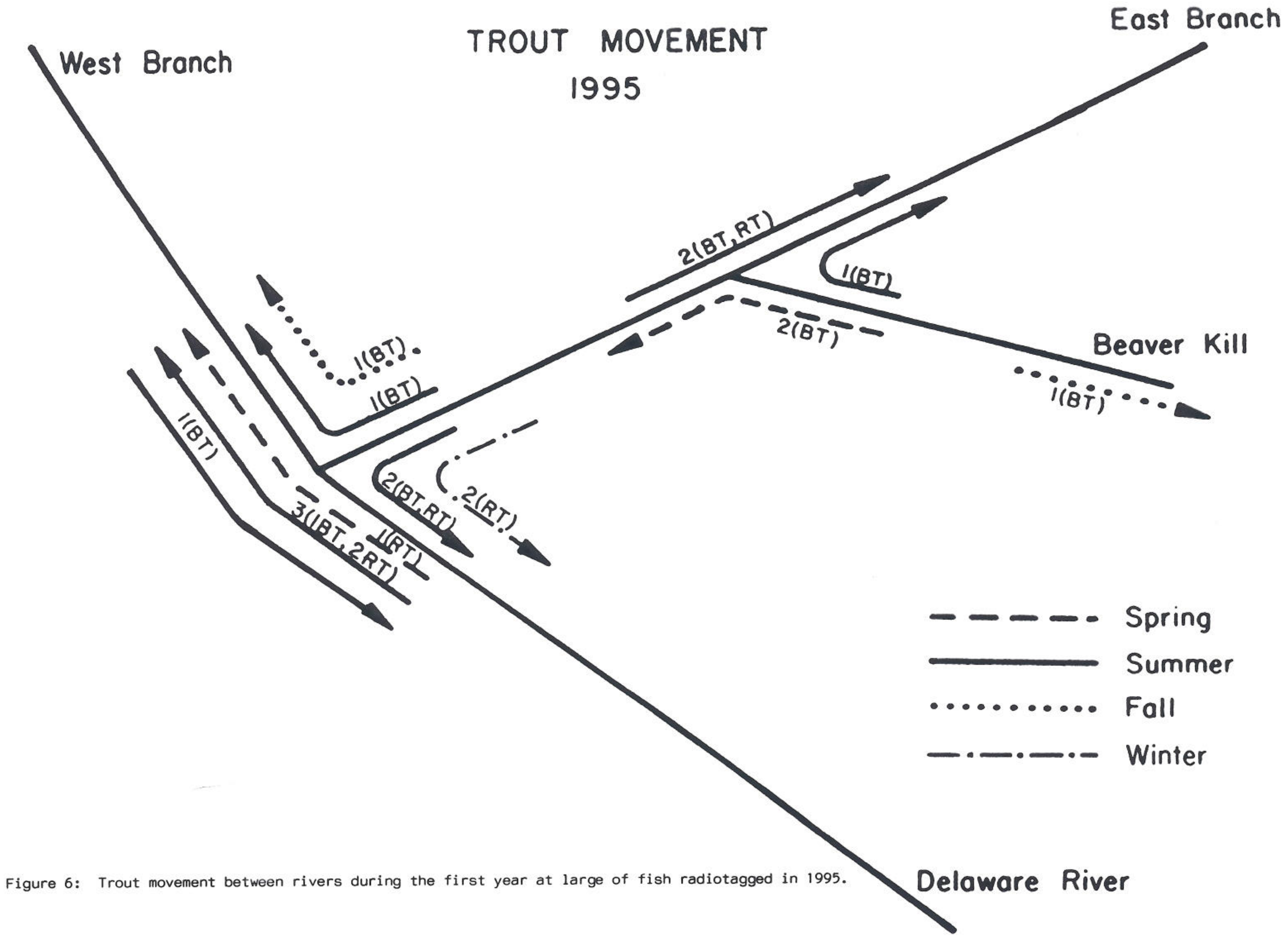



Figure 6: Trout movement between rivers during the first year at large of fish radiotagged in 1995.

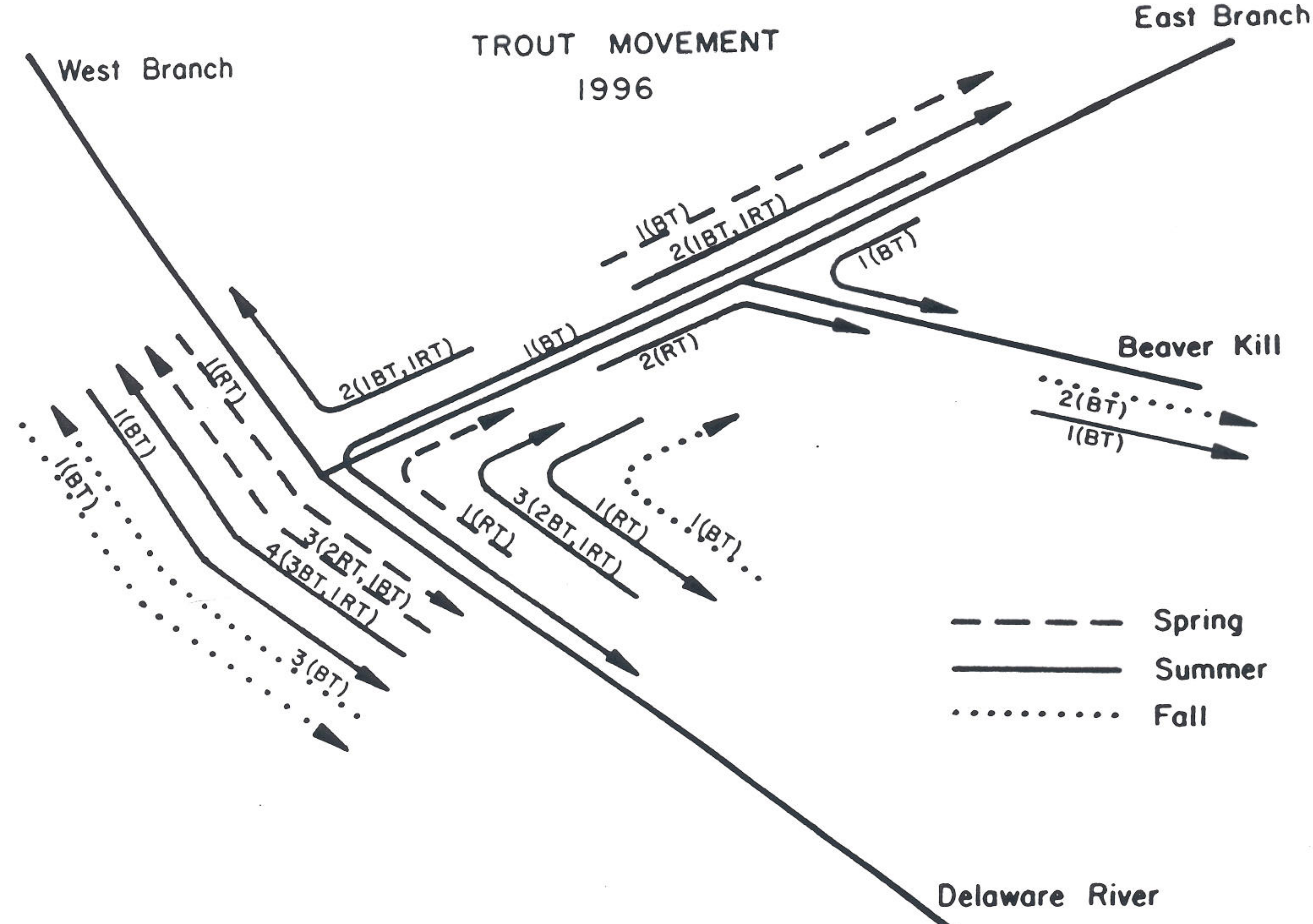
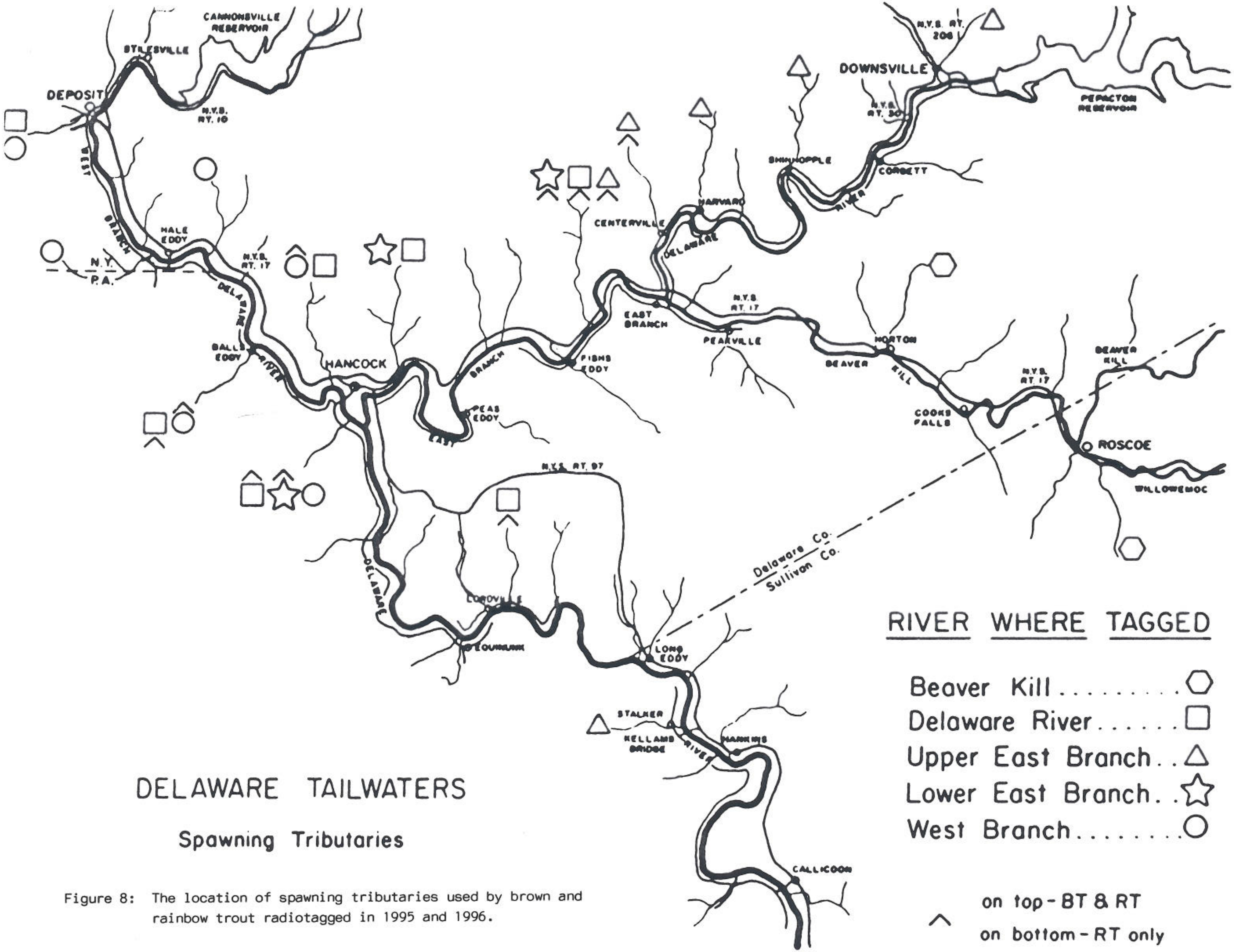



Figure 7: Trout movement between rivers during the first year at large of fish radiotagged in 1996.




DELAWARE TAILWATERS

Spawning Tributaries

Figure 8: The location of spawning tributaries used by brown and rainbow trout radiotagged in 1995 and 1996.

Table 1: Summary of brown and rainbow trout radiotagged in the Delaware Tailwaters and the Beaver Kill during 1995 and 1996.

1995

| | West Branch | Upper East Branch | Lower East Branch | Beaver Kill | Delaware River | Grand Totals |
|---|---|---|---|---|---|---|
| Brown trout | 16 | 7 | 4 | 12 | 1 | 40 |
| Rainbow trout | 5 | 0 | 3 | 0 | 7 | 15 |
| Totals | 21 | 7 | 7 | 12 | 8 | 55 |

1996

| | West Branch | Upper East Branch | Lower East Branch | Beaver Kill | Delaware River | Grand Totals |
|---|---|---|---|---|---|---|
| Brown trout | 8 | 6 | 6 | 6 | 11 | 37 |
| Rainbow trout | 2 | 1 | 5 | 1 | 10 | 19 |
| Totals | 10 | 7 | 11 | 7 | 21 | 56 |

Table 2: Tagging data for radiotagged trout in the West Branch Delaware River, 1995 and 1996.

**WEST BRANCH DELAWARE RIVER**

| Fish Number | Date Tagged | Collection Method[a] | Species[b] | Sex | Length (in) | Weight (Lb) | Age | Origin[c] | Tagging Location |
|---|---|---|---|---|---|---|---|---|---|
| 1995 | | | | | | | | | |
| WB-1 | 4/10 | A | BT | F | 15.0 | - | 3M | H | RM 4.7 |
| WB-2 | 4/10 | A | BT | F | 19.8 | - | 4+ | W | RM 4.7 |
| WB-3 | 4/14 | A | BT | F | 18.5 | - | 5+ | W | RM 12.8 |
| WB-4 | 4/14 | A | BT | F | 18.3 | - | 3+ | W | RM 12.9 |
| WB-5 | 5/5 | A | BT | F | 16.8 | 2.0 | 3+ | H | RM 16.5 |
| WB-6 | 5/5 | A | BT | F | 15.2 | 2.2 | 3M | W | RM 16.5 |
| WB-7 | 5/25 | E | RT | F | 15.7 | 1.4 | 3+ | W | RM 1.4 |
| WB-8 | 6/20 | E | BT | F | 17.2 | 1.7 | 4+ | W | RM 4.6 |
| WB-9 | 6/20 | E | BT | M | 15.9 | 1.7 | 3+ | W | RM 4.6 |
| WB-10 | 6/20 | E | BT | F | 15.2 | 1.1 | 3+ | W | RM 4.4 |
| WB-11 | 6/21 | E | RT | F | 15.8 | 1.6 | 4+ | W | RM 4.1 |
| WB-12 | 6/22 | E | RT | F | 15.9 | 1.7 | 3+ | W | RM 9.8 |
| WB-13 | 6/23 | E | BT | F | 21.1 | 4.1 | 4+ | H | RM 9.8 |
| WB-14 | 6/22 | E | RT | M | 16.0 | 1.6 | 4+ | W | RM 9.4 |
| WB-15 | 6/22 | E | BT | F | 19.1 | 3.5 | 3+ | W | RM 9.8 |
| WB-16 | 7/18 | E | BT | F | 17.6 | 2.4 | 4+ | W | RM 15.8 |
| WB-17 | 7/19 | E | BT | M | 16.6 | 1.6 | 4+ | W | RM 7.9 |
| WB-18 | 7/19 | E | BT | F | 15.8 | 1.2 | 3+ | W | RM 8.0 |
| WB-19 | 7/19 | E | BT | M | 15.3 | 1.4 | 4+ | W | RM 10.6 |
| WB-20 | 7/19 | E | BT | F | 15.5 | 1.6 | - | - | RM 12.2 |
| WB-21 | 10/26 | E | RT | - | 15.1 | 1.2 | 3+ | W | RM 1.4 |
| 1996 | | | | | | | | | |
| WB 1-2 | 4/5 | E | RT | F | 16.0 | 1.6 | 4M | W | RM 4.5 |
| WB 2-2 | 4/5 | E | BT | F | 15.9 | 1.6 | 5M | W | RM 4.5 |
| WB 3-2 | 4/15 | E | BT | M | 18.1 | 2.4 | 3M | H | RM 12.9 |
| WB 4-2 | 4/15 | E | BT | M | 16.6 | 1.7 | 4+ | W | RM 13.2 |
| WB 5-2 | 5/29 | A | BT | - | 16.4 | 1.9 | 3+ | H | RM 16.8 |
| WB 6-2 | 5/30 | A | BT | F | 15.2 | - | 3+ | H | RM 17.2 |
| WB 7-2 | 5/30 | A | BT | F | 15.6 | - | 3+ | H | RM 17.2 |
| WB 8-2 | 6/18 | E | BT | M | 18.5 | 2.3 | 5+ | W | RM 9.7 |
| WB 9-2 | 6/18 | E | RT | F | 16.8 | 1.6 | 3+ | W | RM 9.3 |
| WB 10-2 | 6/20 | E | BT | M | 16.7 | 1.7 | 4+ | W | RM 4.1 |

[a] A=angling
E=boat electrofishing

[b] BT=brown trout
RT=rainbow trout

[c] H=hatchery
W=wild

Table 3: Tagging data for radiotagged trout in the Upper East Branch Delaware River, 1995 and 1996.

**UPPER EAST BRANCH DELAWARE RIVER**
(Upstream of Beaver Kill)
1995

| Fish Number | Date Tagged | Collection Method[a] | Species[b] | Sex | Length (in) | Weight (Lb) | Age | Origin[c] | Tagging Location |
|---|---|---|---|---|---|---|---|---|---|
| EB-2 | 3/20 | E | BT | M | 18.8 | 2.4 | 4M | W | RM 30.5 |
| EB-3 | 3/20 | E | BT | M | 17.1 | 1.5 | 5M | W | RM 26.4 |
| EB-4 | 3/21 | E | BT | M | 20.1 | 2.8 | 5M | W | RM 19.7 |
| EB-5 | 3/21 | E | BT | F | 16.2 | 1.4 | 4M | W | RM 17.9 |
| EB-6 | 3/21 | E | BT | F | 18.3 | 2.2 | 5M | W | RM 17.7 |
| EB-13 | 5/19 | A | BT | F | 18.3 | 2.6 | 4+ | W | RM 21.3 |
| EB-14 | 5/23 | E | BT | F | 17.4 | 2.0 | 3+ | W | RM 20.2 |
| | | | | 1996 | | | | | |
| EB 1-2 | 4/11 | E | BT | F | 16.3 | 1.5 | 4M | W | RM 28.6 |
| EB 2-2 | 4/11 | E | BT | M | 19.6 | 2.6 | - | W | RM 17.1 |
| EB 3-2 | 4/11 | E | RT | F | 15.9 | 1.7 | 4M | W | RM 17.1 |
| EB 8-2 | 5/9 | E | BT | F | 15.9 | 1.9 | 4+ | W | RM 22.4 |
| EB 9-2 | 5/9 | E | BT | M | 19.4 | 3.1 | 4+ | W | RM 22.2 |
| EB 10-2 | 5/9 | E | BT | F | 14.8 | 1.4 | 3+ | W | RM 19.3 |
| EB 11-2 | 5/9 | E | BT | F | 17.8 | 2.2 | 4+ | W | RM 18.9 |

[a] A=angling
E=boat electrofishing

[b] BT=brown trout
RT=rainbow trout

[c] H=hatchery
W=wild

Table 4: Tagging data for radiotagged trout in the Lower East Branch Delaware River, 1995 and 1996.

**LOWER EAST BRANCH DELAWARE RIVER**
(Downstream of Beaver Kill)
1995

| Fish Number | Date Tagged | Collection Method[a] | Species[b] | Sex | Length (in) | Weight (Lb) | Age | Origin[c] | Tagging Location |
|---|---|---|---|---|---|---|---|---|---|
| EB-1 | 3/15 | A | BT | F | 19.4 | 2.6 | 4M | H | RM 15.2 |
| EB-7 | 5/9 | E | RT | F | 15.3 | 1.7 | 3+ | W | RM 1.9 |
| EB-8 | 5/9 | E | BT | F | 15.8 | 1.7 | 4M | W | RM 1.8 |
| EB-9 | 5/15 | E | RT | M | 17.2 | 1.4 | 4M | W | RM 11.8 |
| EB-10 | 5/16 | E | BT | F | 17.6 | 1.9 | 5+ | W | RM 6.5 |
| EB-11 | 5/16 | E | RT | F | 17.0 | 1.8 | 5+ | W | RM 11.6 |
| EB-12 | 5/16 | E | BT | M | 18.0 | 2.0 | 3+ | W | RM 11.6 |
| | | | | 1996 | | | | | |
| EB 4-2 | 4/25 | E | BT | F | 17.3 | 2.0 | 5M | W | RM 6.7 |
| EB 5-2 | 4/25 | E | BT | F | 17.1 | 1.8 | 5+ | W | RM 12.9 |
| EB 6-2 | 4/25 | E | BT | F | 16.1 | 1.9 | 3+ | H | RM 2.8 |
| EB 7-2 | 4/25 | E | BT | M | 17.0 | 1.7 | 4M | W | RM 2.8 |
| EB 12-2 | 5/16 | A | BT | F | 17.6 | 2.2 | 5+ | W | RM 14.8 |
| EB 13-2 | 5/31 | A | BT | F | 16.7 | 1.3 | 3+ | H | RM 14.6 |
| EB 14-2 | 5/31 | A | RT | F | 15.4 | 1.2 | 4+ | W | RM 13.8 |
| EB 15-2 | 6/5 | E | RT | F | 17.1 | 1.6 | 4+ | W | RM 13.8 |
| EB 16-2 | 6/5 | E | RT | F | 16.1 | 1.5 | 4+ | W | RM 15.0 |
| EB 17-2 | 6/5 | E | RT | F | 17.1 | 1.8 | 3+ | W | RM 14.6 |
| EB 18-2 | 8/12 | A | RT | F | 17.1 | 1.5 | 4+ | W | RM 11.9 |

[a] A=angling
E=boat electrofishing

[b] BT=brown trout
RT=rainbow trout

[c] H=hatchery
W=wild

Table 5: Tagging data for radiotagged trout in the Beaver Kill, 1995 and 1996.

**BEAVER KILL**

1995

| Fish Number | Date Tagged | Collection Method[a] | Species[b] | Sex | Length (in) | Weight (Lb) | Age | Origin[c] | Tagging Location |
|---|---|---|---|---|---|---|---|---|---|
| BK-1 | 3/24 | E | BT | F | 16.1 | 1.4 | 5M | W | RM 13.1 |
| BK-2 | 3/24 | E | BT | M | 19.0 | 2.5 | 5+ | H | RM 12.4 |
| BK-3 | 3/24 | E | BT | M | 18.3 | 2.1 | 5M | W | RM 12.4 |
| BK-4 | 3/27 | E | BT | M | 16.1 | 1.5 | - | H | RM 14.7 |
| BK-5 | 3/27 | E | BT | F | 17.2 | 2.0 | 4+ | H | RM 7.7 |
| BK-6 | 3/27 | E | BT | F | 16.1 | 1.6 | - | - | RM 7.7 |
| BK-7 | 3/27 | E | BT | F | 17.4 | 2.1 | 4+ | H | RM 7.4 |
| BK-8 | 4/3 | E | BT | F | 15.1 | 1.4 | 3+ | H | RM 1.0 |
| BK-9 | 4/3 | E | BT | F | 15.6 | 1.5 | 5M | W | RM 1.0 |
| BK-10 | 4/3 | E | BT | M | 18.2 | 1.8 | - | - | RM 11.2 |
| BK-11 | 5/16 | A | BT | F | 14.5 | - | - | - | RM 5.6 |
| BK-12 | 5/23 | A | BT | M | 16.3 | 1.3 | 4+ | W | RM 7.0 |
| | | | | 1996 | | | | | |
| BK 1-2 | 3/19 | E | BT | F | 15.7 | 1.3 | 4M | W | RM 14.7 |
| BK 2-2 | 3/19 | E | BT | F | 18.7 | 1.9 | 5M | W | RM 13.1 |
| BK 3-2 | 4/3 | E | BT | M | 20.1 | 2.2 | 5M | W | RM 7.7 |
| BK 4-2 | 5/8 | A | BT | M | 17.9 | 2.0 | - | H | RM 5.7 |
| BK 5-2 | 5/17 | A | BT | F | 19.4 | 3.0 | 4+ | H | RM 6.6 |
| BK 6-2 | 5/17 | A | RT | F | 18.5 | 2.0 | 5+ | W | RM 2.8 |
| BK 7-2 | 5/18 | A | BT | F | 16.2 | 1.2 | 4+ | H | RM 5.5 |

[a] A=angling
E=boat electrofishing

[b] BT=brown trout
RT=rainbow trout

[c] H=hatchery
W=wild

Table 6: Tagging data for radiotagged trout in the Delaware River, 1995 and 1996.

**DELAWARE RIVER**
**1995**

| Fish Number | Date Tagged | Collection Method[a] | Species[b] | Sex | Length (in) | Weight (Lb) | Age | Origin[c] | Tagging Location |
|---|---|---|---|---|---|---|---|---|---|
| DR-1 | 5/8 | A | BT | M | 16.1 | 1.5 | 4+ | W | RM 70.8 |
| DR-2 | 5/8 | E | RT | F | 17.5 | 1.7 | 4+ | W | RM 70.8 |
| DR-3 | 5/8 | E | RT | F | 15.7 | 1.6 | 5+ | W | RM 70.2 |
| DR-4 | 5/11 | A | RT | - | 15.9 | 1.5 | 5+ | W | RM 66.9 |
| DR-5 | 5/25 | E | RT | F | 15.5 | 1.5 | 5+ | W | RM 64.9 |
| DR-6 | 6/2 | E | RT | F | 14.9 | 1.5 | 3+ | W | RM 55.2 |
| DR-7 | 6/2 | A | RT | F | 16.7 | 2.0 | 3+ | W | RM 59.5 |
| DR-8 | 10/26 | E | RT | - | 14.6 | 1.1 | 3+ | W | RM 74.1 |
| | | | | 1996 | | | | | |
| DR 1-2 | 3/13 | E | RT | F | 14.8 | 1.4 | 3M | W | RM 70.2 |
| DR 2-2 | 3/13 | E | RT | F | 16.2 | 1.5 | 3M | W | RM 70.2 |
| DR 3-2 | 3/13 | E | BT | M | 18.2 | 2.2 | 5M | H | RM 70.2 |
| DR 4-2 | 3/13 | E | RT | F | 16.6 | 1.9 | 4M | W | RM 69.7 |
| DR 5-2 | 3/14 | E | BT | F | 16.9 | 1.8 | 5M | W | RM 65.5 |
| DR 6-2 | 3/14 | E | BT | M | 19.9 | 2.5 | - | W | RM 65.5 |
| DR 7-2 | 3/14 | E | RT | F | 16.3 | 1.7 | - | W | RM 65.5 |
| DR 8-2 | 3/14 | E | RT | F | 18.0 | 2.0 | 4M | W | RM 64.9 |
| DR 9-2 | 3/14 | E | RT | F | 17.6 | 2.0 | 4M | W | RM 64.9 |
| DR 10-2 | 3/14 | E | BT | M | 18.1 | 2.3 | 4M | W | RM 64.9 |
| DR 11-2 | 3/15 | E | RT | F | 18.2 | 2.3 | 5M | W | RM 59.7 |
| DR 12-2 | 3/15 | E | BT | F | 17.3 | 1.7 | 5M | W | RM 59.7 |
| DR 13-2 | 5/15 | E | BT | F | 19.8 | 3.2 | 4+ | W | RM 61.3 |
| DR 14-2 | 5/21 | E | BT | F | 18.7 | 2.1 | 3+ | W | RM 72.5 |
| DR 15-2 | 5/21 | E | BT | F | 16.3 | 1.5 | 4+ | W | RM 71.6 |
| DR 16-2 | 5/21 | E | BT | M | 17.5 | 2.2 | 4+ | W | RM 70.5 |
| DR 17-2 | 5/24 | E | RT | F | 16.3 | 1.5 | 4+ | W | RM 68.5 |
| DR 18-2 | 6/3 | E | BT | F | 18.1 | 2.2 | 3+ | W | RM 73.1 |
| DR 19-2 | 6/11 | E | RT | F | 15.4 | 1.3 | 3+ | W | RM 73.9 |
| DR 20-2 | 6/11 | E | RT | F | 16.2 | 1.6 | 3+ | W | RM 70.6 |
| DR 21-2 | 6/11 | E | BT | F | 17.5 | 2.0 | 5+ | W | RM 68.5 |

[a]A=angling
E=boat electrofishing

[b]BT=brown trout
RT=rainbow trout

[c]H=hatchery
W=wild

Table 7: Summary of movement types for trout radiotagged in 1995 and 1996 by species and brown trout origin for the West Branch, lower East Branch, upper East Branch, Beaver Kill, and Delaware River during the life of the study.

| | 1995 | | | | | 1996 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number Tagged | Number Inter-River Moves | Number Tributary Spawners | Number Elevated Temp Moves | Number Stationary | Number Tagged | Number Inter-River Moves | Number Tributary Spawners | Number Elevated Temp Moves | Number Stationary |
| West Branch | | | | | | | | | | |
| BT[a] | 12 | 1 | 5 | | 8 | 4 | 1 | 3 | 1 | 4 |
| RT | 5 | 1 | 2 | | 3 | 2 | 1 | 1 | | 2 |
| HBT | 3 | | 1 | | 2 | 4 | | 1 | | 2 |
| ?BT | 1 | | | | 1 | | | | | |
| Lower East Branch | | | | | | | | | | |
| BT | 3 | 2 | 1 | 1 | 2 | 4 | 2 | 2 | 1 | 1 |
| RT | 3 | 1 | 1 | 2 | 3 | 5 | 4 | 3 | 4 | 4 |
| HBT | 1 | | | | 1 | 2 | 1 | | 1 | 2 |
| Upper East Branch | | | | | | | | | | |
| BT | 7 | | 2 | | 5 | 6 | 2 | 4 | | 6 |
| RT | | | | | | 1 | | 1 | | 1 |
| Beaver Kill | | | | | | | | | | |
| BT | 4 | 2 | 1 | | 4 | 3 | 1 | 2 | | 3 |
| RT | | | | | | 1 | | | | |
| HBT | 5 | 1 | | | 5 | 3 | 1 | | | 3 |
| ?BT | 3 | | | | 3 | | | | | |
| Delaware River | | | | | | | | | | |
| BT | 1 | 1 | | 1 | 1 | 10 | 7 | 4 | 4 | 8 |
| RT | 7 | 4 | 1 | 2 | 5 | 10 | 5 | 8 | | 8 |
| HBT | | | | | | 1 | 1 | | | 1 |

[a]BT = brown trout; RT = rainbow trout; HBT = holdover hatchery brown trout; ?BT = brown trout of unknown origin

Table 8: Distribution of total recorded travel distances (mi) by trout radiotagged in 1995 for the life of the study on the West Branch, upper East Branch, lower East Branch, Beaver Kill and Delaware River.

| | Number Tagged | TOTAL MILES TRAVELED | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | <1 | 1-2.9 | 3-4.9 | 5-6.9 | 7-9.9 | 10-14.9 | 15-19.9 | 20-24.9 | 25-29.9 | 30-34.9 | Other |
| West Branch | | | | | | | | | | | | |
| BT[a] | 12 | | 1 | | 2 | | 3 | 3 | 1 | | 1 | 56.8 |
| RT | 5 | | | 1 | 1 | 2 | | | 1 | | | |
| HBT | 3 | | 1 | | | | 1 | | 1 | | | |
| ?BT | 1 | | | | | | | 1 | | | | |
| Lower East Branch | | | | | | | | | | | | |
| BT | 3 | | 1 | | | | | | 1 | | 1 | |
| RT | 3 | | | | | | 1 | | | | 1 | 53.2 |
| HBT | 1 | | | | | | | | | | 1 | |
| Upper East Branch | | | | | | | | | | | | |
| BT | 7 | 2 | 1 | 1 | | | 1 | 1 | | 1 | | |
| Beaver Kill | | | | | | | | | | | | |
| BT | 4 | | | 1 | | 1 | 1 | | 1 | | | |
| HBT | 5 | 2 | 1 | | | 1 | 1 | | | | | |
| ?BT | 3 | | | 1 | | | 1 | 1 | | | | |
| Delaware River | | | | | | | | | | | | |
| BT | 1 | | | | | | 1 | | | | | |
| RT[b] | 7 | | 2 | | | | | 1 | 2 | | | 81.5 |

[a]BT = brown trout; RT = rainbow trout; HBT = holdover hatchery brown trout; ?BT = brown trout of unknown origin

[b]One missing since day tagged.

Table 9: Distribution of total recorded travel distances (mi) by trout radiotagged in 1996 for the life of the study on the West Branch, upper East Branch, lower East Branch, Beaver Kill, and Delaware River.

| | Number Tagged | TOTAL MILES TRAVELED <1 | 1-2.9 | 3-4.9 | 5-6.9 | 7-9.9 | 10-14.9 | 15-19.9 | 20-24.9 | 25-29.9 | 30-34.9 | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| West Branch | | | | | | | | | | | | |
| BT[a] | 4 | | 1 | | | 1 | 1 | | | | | 45.0 |
| RT | 2 | | | | | 1 | | | | | | 70.8 |
| HBT | 4 | | | 1 | 2 | 1 | | | | | | |
| Lower East Branch | | | | | | | | | | | | |
| BT | 4 | | | | | | | 2 | 1 | | 1 | |
| RT | 5 | | | 1 | | | | | | 2 | | 48.2, 68.8 |
| HBT | 2 | | | | | 1 | | | | 1 | | |
| Upper East Branch | | | | | | | | | | | | |
| BT | 6 | | | | | 1 | 1 | | 1 | 1 | 1 | 46.0 |
| RT | 1 | | | | | 1 | | | | | | |
| Beaver Kill | | | | | | | | | | | | |
| BT | 3 | | | | | 1 | 2 | | | | | |
| RT[b] | 1 | | | | | | | | | | | |
| HBT | 3 | | 1 | | 1 | | | | | | 1 | |
| Delaware River | | | | | | | | | | | | |
| BT | 10 | | 1 | 1 | 1 | | | 1 | 1 | 1 | 1 | 45.7, 56.2, 77.3 |
| RT | 10 | | | | | 2 | 2 | | | 1 | 1 | 54.6, 57.7, 105.9, 127.1 |
| HBT | 1 | | | | | | | | | | | 60.0 |

[a]BT = brown trout; RT = rainbow trout; HBT = holdover hatchery brown trout; ?BT = brown trout of unknown origin
[b]missing since day tagged.

Table 10: Summary of recorded mean total travel distance (mi) of radiotagged trout tagged in 1995 and 1996 in the West Branch, upper East Branch, lower East Branch, Beaver Kill and Delaware River. Sample size in parentheses.

## LIFE OF STUDY AT LARGE

| | 1995 | | | | 1996 | | | |
|---|---|---|---|---|---|---|---|---|
| | All Trout | Wild Brown Trout | Hatchery Brown Trout | Rainbow Trout | All Trout | Wild Brown Trout | Hatchery Brown Trout | Rainbow Trout |
| West Branch | 15.0(21)[a] | 17.9(12) | 12.2(3) | 9.9(5) | 16.9(10) | 16.8(4) | 5.7(4) | 39.4(2) |
| Upper East Branch | 8.9(7) | 8.9(7) | - | - | 22.2(7) | 24.6(6) | - | 7.5(1) |
| Lower East Branch | 26.9(7) | 18.7(3) | 34.8(1) | 32.5(3) | 26.9(11) | 21.7(4) | 16.9(2) | 35.0(5) |
| Beaver Kill | 8.6(12)[a] | 10.9(4) | 4.7(5) | - | 12.6(6) | 11.9(3) | 12.7(3) | - |
| Delaware River | 23.0(7) | 12.5(1) | - | 24.8(6) | 38.1(21) | 28.8(10) | 60.0(1) | 45.3(10) |
| **Average** | **15.4(54)** | **14.4(27)** | **10.5(9)** | **21.1(14)** | **27.2(55)** | **23.2(27)** | **15.5(10)** | **39.7(18)** |

## FIRST YEAR AT LARGE

| | 1995 | | | | 1996 | | | |
|---|---|---|---|---|---|---|---|---|
| | All Trout | Wild Brown Trout | Hatchery Brown Trout | Rainbow Trout | All Trout | Wild Brown Trout | Hatchery Brown Trout | Rainbow Trout |
| West Branch | 7.6(21)[a] | 9.9(12) | 6.0(3) | 4.0(5) | 10.1(10) | 11.3(4) | 4.9(4) | 17.0(2) |
| Upper East Branch | 6.9(7) | 6.9(7) | - | - | 19.8(7) | 22.3(6) | - | 5.4(1) |
| Lower East Branch | 18.3(7) | 11.2(3) | 32.8(1) | 20.6(3) | 18.0(11) | 20.1(4) | 9.7(2) | 19.7(5) |
| Beaver Kill | 7.1(12)[a] | 10.7(4) | 3.0(5) | - | 10.5(6) | 8.3(3) | 12.6(3) | - |
| Delaware River | 15.7(7) | 12.5(1) | - | 16.2(6) | 27.2(21) | 23.6(10) | 55.0(1) | 28.0(10) |
| **Average** | **9.8(54)** | **9.5(27)** | **7.3(9)** | **12.8(14)** | **19.6(55)** | **19.3(27)** | **13.1(10)** | **23.2(18)** |

[a]Includes brown trout of unknown origin.

Table 11: Summary of summer water temperatures as recorded by USGS gages in the Delaware Tailwaters and the Beaver Kill for 1995, 1996, and 1997.

SUMMER WATER TEMPERATURES

June 1 - August 31

| (River) Location (mile) | Days Daily Mean ≥ 70°F | Days Daily Mean ≥ 75° F | Days Daily Maximum ≥ 75° F |
|---|---|---|---|
| **1995** | | | |
| West Branch (9.3) | 0 | 0 | 3 |
| Upper East Branch (18.0) | 6 | 0 | 4 |
| Lower East Branch (11.2) | 53 | 12 | 38 |
| Beaver Kill (9.8) | 41 | 7 | 36 |
| Delaware River (56.8) | 41 | 8 | 26 |
| **1996** | | | |
| West Branch (9.3) | 0 | 0 | 0 |
| Upper East Branch (18.0) | 0 | 0 | 0 |
| Lower East Branch (11.2) | 0[a] | 0[a] | 0[a] |
| Beaver Kill (9.8) | 1 | 0 | 1 |
| Delaware River (56.8) | 18 | 0 | 6 |
| **1997** | | | |
| West Branch (9.3) | 0[b] | 0[b] | 0[b] |
| Upper East Branch (18.0) | 2 | 0 | 1 |
| Lower East Branch (11.2) | ?[c] | ?[c] | ?[c] |
| Beaver Kill (9.8) | 35[d] | 3[d] | 38[d] |
| Delaware River (56.8) | 21 | 0 | 13 |

[a]No data from July 21 - Aug 31

[b]No data from July 24 - Aug 13

[c]No data from June 9 - Aug 23

[d]No data from June 1 - June 16

Table 12: Summary of seasonal average total (T), upstream (U), downstream (D) travel distance (mi) of Wild Brown Trout radiotagged in the West Branch, Upper East Branch, Lower East Branch, Beaver Kill, and Delaware River in 1995 and 1996. Sample size in parenthesis.

| | Spring[a] 1995 T/U/D | Summer[b] 1995 T/U/D | Fall[c] 1995 T/U/D | Winter[d] 1995-'96 T/U/D | Spring 1996 T/U/D | Summer 1996 T/U/D | Fall 1996 T/U/D | Winter 1996-'97 T/U/D | Spring 1997 T/U/D | Summer 1997 T/U/D | Fall 1997 T/U/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1995 TAGGED FISH** | | | | | | | | | | | |
| West Branch | 0.9/0.4/0.5 (4) | 2.5/1.0/1.6 (12) | 7.0/3.2/3.8 (12) | 0.6/0.2/0.4 (8) | 7.0/3.5/3.5 (7) | 4.0/2.7/1.3 (7) | 2.2/1.1/1.1 (4) | 0/0/0 (3) | 0/0/0 (4) | | |
| Upper East Branch | 1.2/0.9/0.3 (7) | 1.5/1.0/0.5 (6) | 5.5/4.1/1.4 (5) | 1.7/0/1.7 (2) | 3.7/1.4/2.3 (2) | 2.5/1.0/1.5 (2) | 1.1/0.8/0.3 (2) | 0/0/0 (2) | 0/0/0 (2) | | |
| Lower East Branch | 1.4/0/1.4 (3) | 8.1/0.4/7.7 (2) | 5.5/4.1/1.4 (2) | 1.1/0.2/0.9 (2) | 5.6/2.1/3.6 (2) | 5.7/2.8/2.9 (2) | 0/0/0 (1) | 0/0/0 (1) | | | |
| Beaver Kill | 2.2/0.9/1.2 (4) | 6.1/5.3/0.9 (4) | 2.4/0.9/1.5 (4) | 0.1/0.1/0.1 (4) | 1.1/0.5/0.6 (2) | 0.4/0/0.4 (2) | 0/0/0 (1) | 0/0/0 (1) | 0/0/0 (1) | | |
| Delaware River | 0.1/0/0.1 (1) | 12.2/11.7/0.5 (1) | 0.2/0.1/0.1 (1) | 0/0.1/0 (1) | | | | | | | |
| **1996 TAGGED FISH** | | | | | | | | | | | |
| West Branch | | | | | 0/0/0 (2) | 4.5/0.8/3.7 (2) | 6.5/3.9/2.6 (4) | 0.4/0/0.4 (4) | 2.5/0/2.5 (4) | 1.2/0.8/0.4 (4) | 2.4/1.7/0.7 (3) |
| Upper East Branch | | | | | 3.0/2.2/0.8 (6) | 15.1/4.3/10.7 (6) | 4.2/1.7/2.5 (6) | 0/0/0 (6) | 0.2/0.1/0.1 (6) | 1.0/1.0/0 (6) | 1.5/0.3/1.2 (5) |
| Lower East Branch | | | | | 9.2/5.5/3.7 (4) | 8.1/5.3/2.9 (4) | 4.2/2.8/1.5 (2) | 2.7/2.7/0 (1) | 2.8/0/2.8 (1) | 2.7/0/2.7 (1) | 0.8/0.8/0 (1) |
| Beaver Kill | | | | | 2.9/0.6/2.2 (3) | 3.1/1.7/1.4 (3) | 3.4/1.6/1.8 (2) | 0.2/0.2/0 (2) | 0.3/0/0.3 (2) | 3.0/0.3/2.7 (2) | 2.2/0.8/1.4 (2) |
| Delaware River | | | | | 2.9/2.2/0.7 (8) | 13.6/8.8/4.9 (8) | 14.4/6.4/8.0 (7) | 0.6/0.5/0.1 (6) | 1.8/1.0/0.8 (6) | 4.6/3.3/1.2 (5) | 3.6/1.2/2.4 (5) |

a Spring: March 1 - May 31
b Summer: June 1 - August 31
c Fall: Sept. 1 - Nov. 30
d Winter: Dec. 1 - Feb. 28

Table 13: Summary of seasonal average total (T), upstream (U), downstream (D) travel distance (mi) of Hatchery Brown Trout radiotagged in the West Branch, Upper East Branch, Lower East Branch, Beaver Kill, and Delaware River in 1995 and 1996. Sample size in parenthesis.

| | Spring[a] 1995 T/U/D | Summer[b] 1995 T/U/D | Fall[c] 1995 T/U/D | Winter[d] 1995-'96 T/U/D | Spring 1996 T/U/D | Summer 1996 T/U/D | Fall 1996 T/U/D | Winter 1996-'97 T/U/D | Spring 1997 T/U/D | Summer 1997 T/U/D | Fall 1997 T/U/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1995 TAGGED FISH** | | | | | | | | | | | |
| West Branch | 0.9/0.3/0.6 (2) | 2/0.8/1.2 (2) | 5.9/3.5/2.4 (2) | 0.4/0.2/0.2 (2) | 0.7/0.4/0.3 (2) | 3.1/1.7/1.4 (2) | 5.3/2.4/2.9 (2) | 0/0/0 (2) | 0.1/0.1/0 (2) | 0.2/0.2/0 (2) | 0/0/0 (2) |
| Upper East Branch | | | | | | | | | | | |
| Lower East Branch | 0.2/0/0.2 (1) | 12.9/12.7/0.2 (1) | 19.7/3.6/16.1 (1) | 0/0/0 (1) | 2.0/0.8/1.2 (1) | | | | | | |
| Beaver Kill | 0.6/0.1/0.4 (5) | 1.7/1.1/0.5 (5) | 0.5/0.2/0.3 (5) | 0.8/0.3/0.5 (2) | 3.2/1.5/1.7 (1) | 3.1/1.5/1.6 (1) | 2.0/1.3/0.7 (1) | 0/0/0 (1) | | | |
| Delaware River | | | | | | | | | | | |
| **1996 TAGGED FISH** | | | | | | | | | | | |
| West Branch | | | | | 1.0/0.2/0.8 (1) | 3.4/1.7/1.7 (4) | 1.6/0.8/0.8 (3) | 0/0/0 (2) | 0.3/0/0.3 (1) | 0/0/0 (1) | 3.2/1.0/2.2 (1) |
| Upper East Branch | | | | | | | | | | | |
| Lower East Branch | | | | | 0.3/0.2/0.1 (1) | 7.5/6.0/1.5 (2) | 2.1/1.2/1.0 (2) | 0/0/0 (2) | 0.8/0.1/0.7 (2) | 5.3/0/5.3 (2) | 2.3/2.3/0 (1) |
| Beaver Kill | | | | | 0.3/0.1/0.2 (3) | 8.4/5.8/2.6 (2) | 8.2/3.8/4.5 (2) | 1.9/1.9/0 (2) | 0.1/0.1/0 (1) | | |
| Delaware River | | | | | 6.5/2.5/4.0 (1) | 30.6/24.1/6.5 (1) | 17.9/0.5/17.4 (1) | 0/0/0 (1) | 1.8/1.8/0 (1) | 3.2/3.2/0 (1) | 0/0/0 (1) |

a Spring: March 1 - May 31
b Summer: June 1 - August 31
c Fall: Sept. 1 - Nov. 30
d Winter: Dec. 1 - Feb. 28

Table 14: Summary of seasonal average total (T), upstream (U), downstream (D) travel distance (mi) of Rainbow Trout radiotagged in the West Branch, Upper East Branch, Lower East Branch, Beaver Kill, and Delaware River in 1995 and 1996. Sample size in parenthesis.

| | Spring[a] 1995 T/U/D | Summer[b] 1995 T/U/D | Fall[c] 1995 T/U/D | Winter[d] 1995-'96 T/U/D | Spring 1996 T/U/D | Summer 1996 T/U/D | Fall 1996 T/U/D | Winter 1996-'97 T/U/D | Spring 1997 T/U/D | Summer 1997 T/U/D | Fall 1997 T/U/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1995 TAGGED FISH** | | | | | | | | | | | |
| West Branch | 0.1/0/0.1 (1) | 3.4/1.6/1.9 (4) | 1.9/1.1/0.8 (3) | 0.2/0.1/0.1 (3) | 3.8/1.9/1.9 (3) | 8.4/1.0/7.5 (2) | 0.1/0/0.1 (1) | 0/0/0 (1) | 0/0/0 (1) | | |
| Upper East Branch | | | | | | | | | | | |
| Lower East Branch | 1.6/1.2/0.4 (3) | 6.1/4.4/1.8 (3) | 9.6/1.4/8.2 (3) | 3.3/1.1/2.2 (3) | 8.2/4.9/3.3 (3) | 3.5/1.7/1.8 (3) | 0/0/0 (2) | 0/0/0 (2) | 0.3/0.3/0 (2) | | |
| Beaver Kill | | | | | | | | | | | |
| Delaware River | 3.0/2.2/0.8 (4) | 10.1/8.5/1.6 (4) | 10.3/1.5/8.8 (4) | 0.9/0.4/0.5 (4) | 4.8/1.5/3.3 (4) | 7.4/4.3/3.1 (4) | 0/0/0 (3) | 0/0/0 (3) | 0.8/0.3/0.4 (3) | 0.7/0.5/0.2 (1) | 0/0/0 (1) |
| **1996 TAGGED FISH** | | | | | | | | | | | |
| West Branch | | | | | 19.2/0/19.2 (1) | 3.5/0.4/3.2 (2) | 0.4/0.2/0.3 (2) | 4.8/4.8/0 (2) | 21.2/9.3/11.9 (2) | 0/0/0 (2) | 0/0/0 (2) |
| Upper East Branch | | | | | 2.9/1.5/1.4 (1) | 2.5/1.1/1.4 (1) | 0/0/0 (1) | 0/0/0 (1) | 1.8/0.9/0.9 (1) | | |
| Lower East Branch | | | | | | 18.3/8.0/10.3 (5) | 1.3/0.9/0.5 (4) | 0.5/0/0.5 (4) | 10.3/4.2/6.1 (4) | 8.8/0/8.8 (4) | 0/0/0 (2) |
| Beaver Kill | | | | | | | | | | | |
| Delaware River | | | | | 18.9/9.1/9.8 (8) | 9.1/4.7/4.5 (9) | 3.7/2.6/1.1 (8) | 2.4/2.4/0 (7) | 18.8/9.4/9.4 (7) | 5.0/2.7/2.4 (8) | 0.2/0/0.2 (8) |

a Spring: March 1 - May 31
b Summer: June 1 - August 31
c Fall: Sept. 1 - Nov. 30
d Winter: Dec. 1 - Feb. 28

Table 15: Summary of mean total travel distance (mi) by season of radiotagged trout in all rivers combined for 1995 and 1996. The sample size is in parenthesis.

| | 95 Spr[a] | 95 Sum[b] | 95 Fall[c] | 95-96 Win[d] | 96 Spr | 96 Sum | 96 Fall | 96-97 Win | 97 Spr | 97 Sum | 97 Fall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1995 and 1996 Tagged Fish Combined** | | | | | | | | | | | |
| All Trout | 1.5(38) | 4.2(48) | 5.4(46) | 0.7(36) | 5.7(70) | 8.1(79) | 4.3(64) | 0.7(59) | 4.8(52) | 3.4(39) | 1.3(35) |
| Rainbow Trout | 2.1(8) | 6.6(11) | 7.6(10) | 1.4(10) | 11.4(20) | 9.3(26) | 1.7(21) | 1.4(20) | 11.0(20) | 5.1(15) | 0.1(13) |
| Brown Trout | 1.3(30) | 3.5(37) | 4.8(36) | 0.5(26) | 3.5(50) | 7.5(53) | 5.5(43) | 0.4(39) | 0.9(32) | 2.3(24) | 2.0(22) |
| Wild | 1.3(19) | 3.7(25) | 5.5(24) | 0.6(17) | 4.3(36) | 8.0(38) | 6.2(29) | 0.3(26) | 1.1(23) | 2.3(18) | 2.4(16) |
| Hatch | 0.6(8) | 3.1(8) | 4.2(8) | 0.4(5) | 1.5(10) | 7.1(12) | 5.1(11) | 0.4(10) | 0.6(7) | 2.4(6) | 1.1(5) |
| Unknown | 3.4(3) | 3.4(4) | 1.5(4) | 0.1(4) | 0.7(4) | 3.6(3) | 1.0(3) | 0.8(3) | 0(2) | - | 0(1) |
| **1995 Tagged Fish** | | | | | | | | | | | |
| All Trout | 1.5(38) | 4.2(48) | 5.4(46) | 0.7(36) | 4.3(31) | 4.4(28) | 1.3(20) | 0.1(19) | 0.2(14) | 0.3(3) | 0(4) |
| Rainbow Trout | 2.1(8) | 6.6(11) | 7.6(10) | 1.4(10) | 5.5(10) | 6.3(9) | 0(6) | 0(6) | 0.5(6) | 0.7(1) | 0(1) |
| Brown Trout | 1.3(30) | 3.5(37) | 4.8(36) | 0.5(26) | 3.8(21) | 3.4(19) | 1.9(14) | 0.2(13) | 0(8) | 0.2(2) | 0(3) |
| Wild | 1.3(19) | 3.7(25) | 5.5(24) | 0.6(17) | 5.4(13) | 3.5(13) | 1.4(8) | 0(7) | 0(4) | - | - |
| Hatch | 0.6(8) | 3.1(8) | 4.2(8) | 0.4(5) | 1.6(4) | 3.1(3) | 4.2(3) | 0(3) | 0.1(2) | 0.2(2) | 0(2) |
| Unknown | 3.4(3) | 3.4(4) | 1.5(4) | 0.1(4) | 0.7(4) | 3.6(3) | 1.0(3) | 0.8(3) | 0(2) | - | 0(1) |
| **1996 Tagged Fish** | | | | | | | | | | | |
| All Trout | | | | | 6.9(39) | 10.2(51) | 5.6(44) | 1.0(40) | 6.5(38) | 3.6(36) | 1.4(31) |
| Rainbow Trout | | | | | 17.3(10) | 10.8(17) | 2.4(15) | 2.0(14) | 15.5(14) | 5.4(14) | 0.1(12) |
| Brown Trout | | | | | 3.3(29) | 9.8(34) | 7.3(29) | 0.5(26) | 1.2(24) | 2.5(22) | 2.3(19) |
| Wild | | | | | 3.8(23) | 10.3(25) | 8.0(21) | 0.4(19) | 1.3(19) | 2.3(18) | 2.4(16) |
| Hatch | | | | | 1.5(6) | 8.4(9) | 5.4(8) | 0.5(7) | 0.7(5) | 3.5(4) | 1.8(3) |

[a]Spr = March 1 - May 31, [b]Sum = June 1 - Aug 31, [c]Fall = Sept 1 - Nov 30, [d]Win = Dec 1 - Feb 28

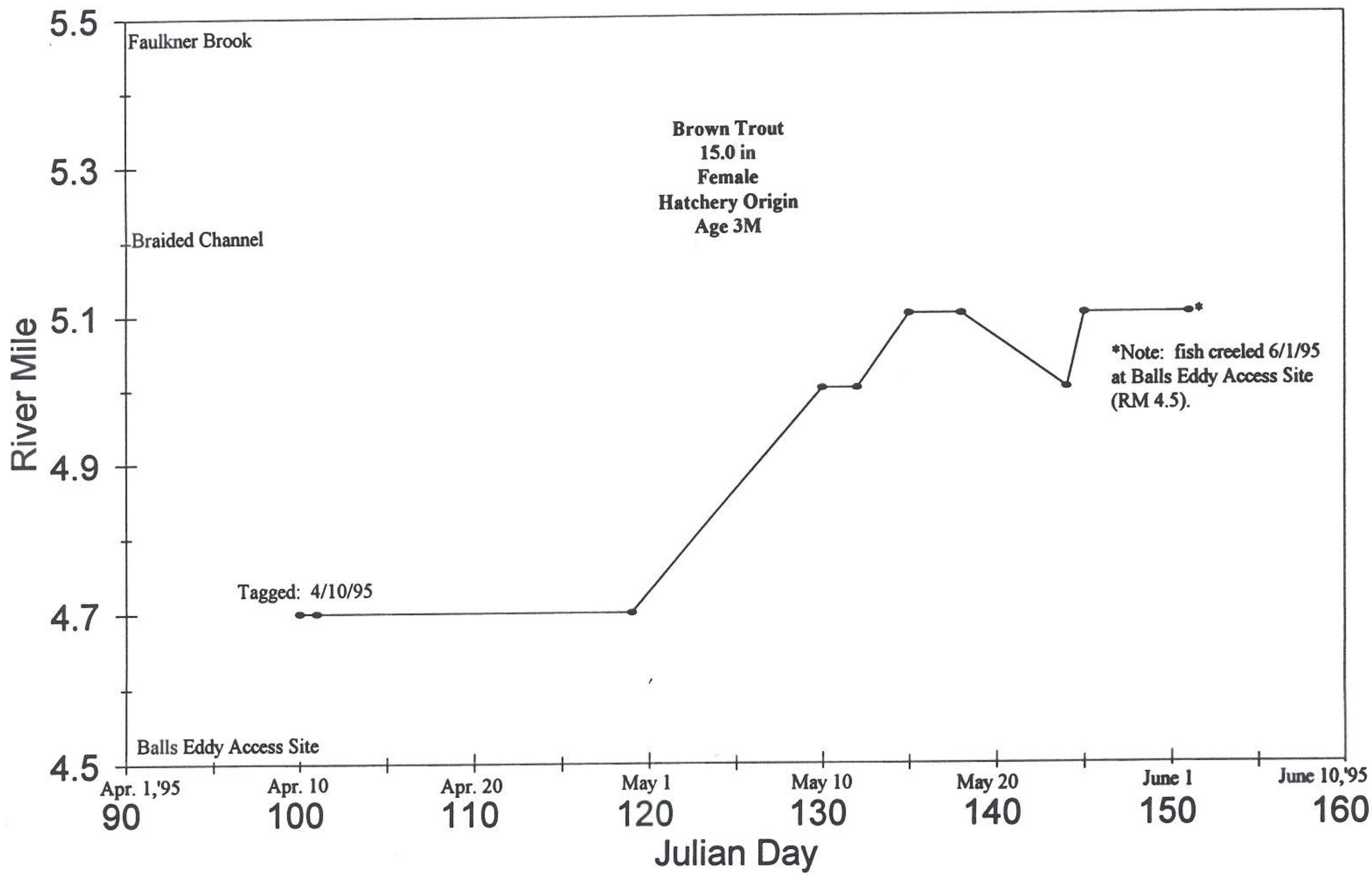
APPRENDIX 1:

WEST BRANCH DELAWARE RIVER

Movement history of each radiotagged trout through December 1, 1997

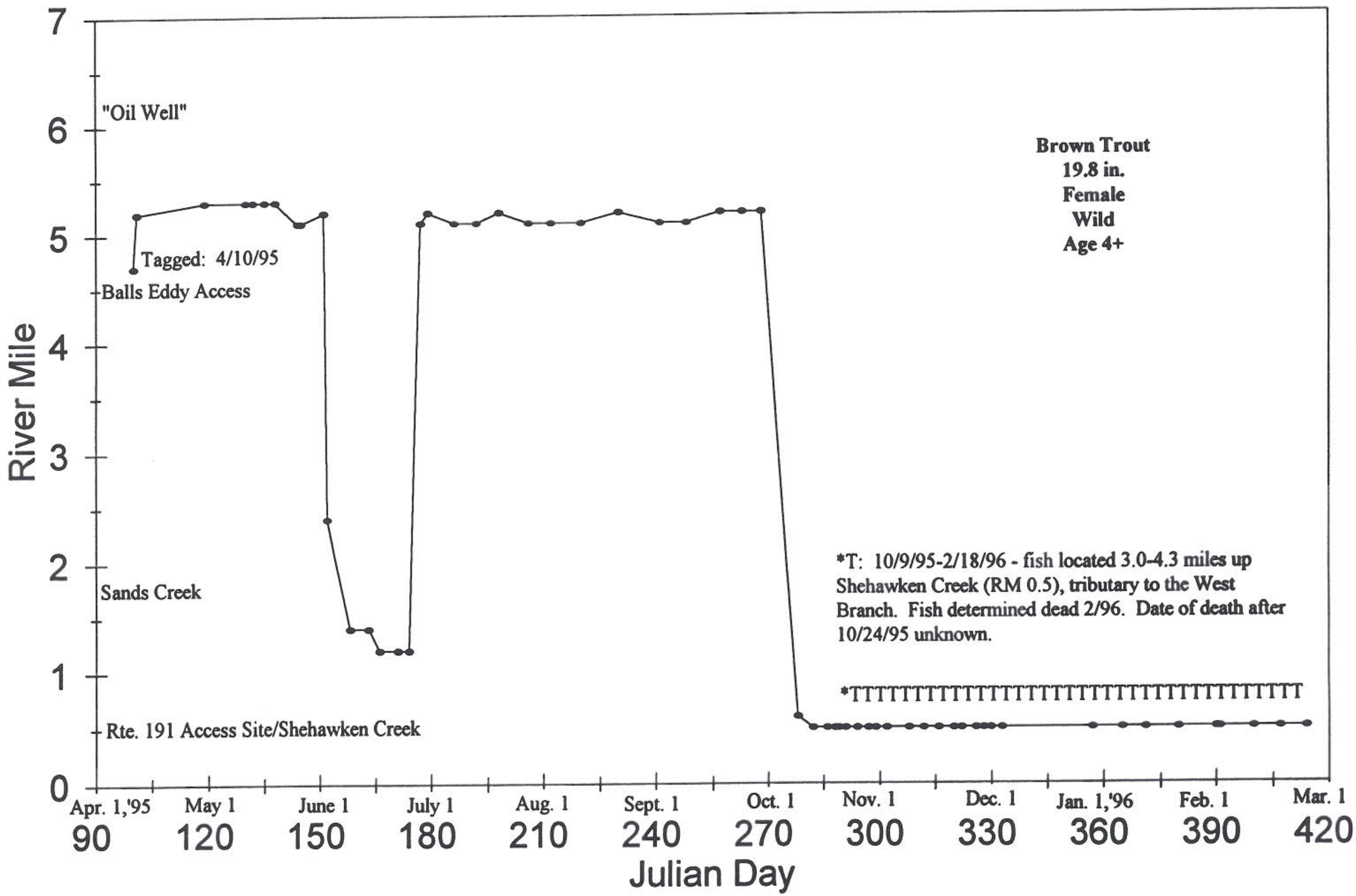
WB 1 to WB 21 : Tagged 1995
WB 1-2 to WB 10-2: Tagged 1996

# WB-1



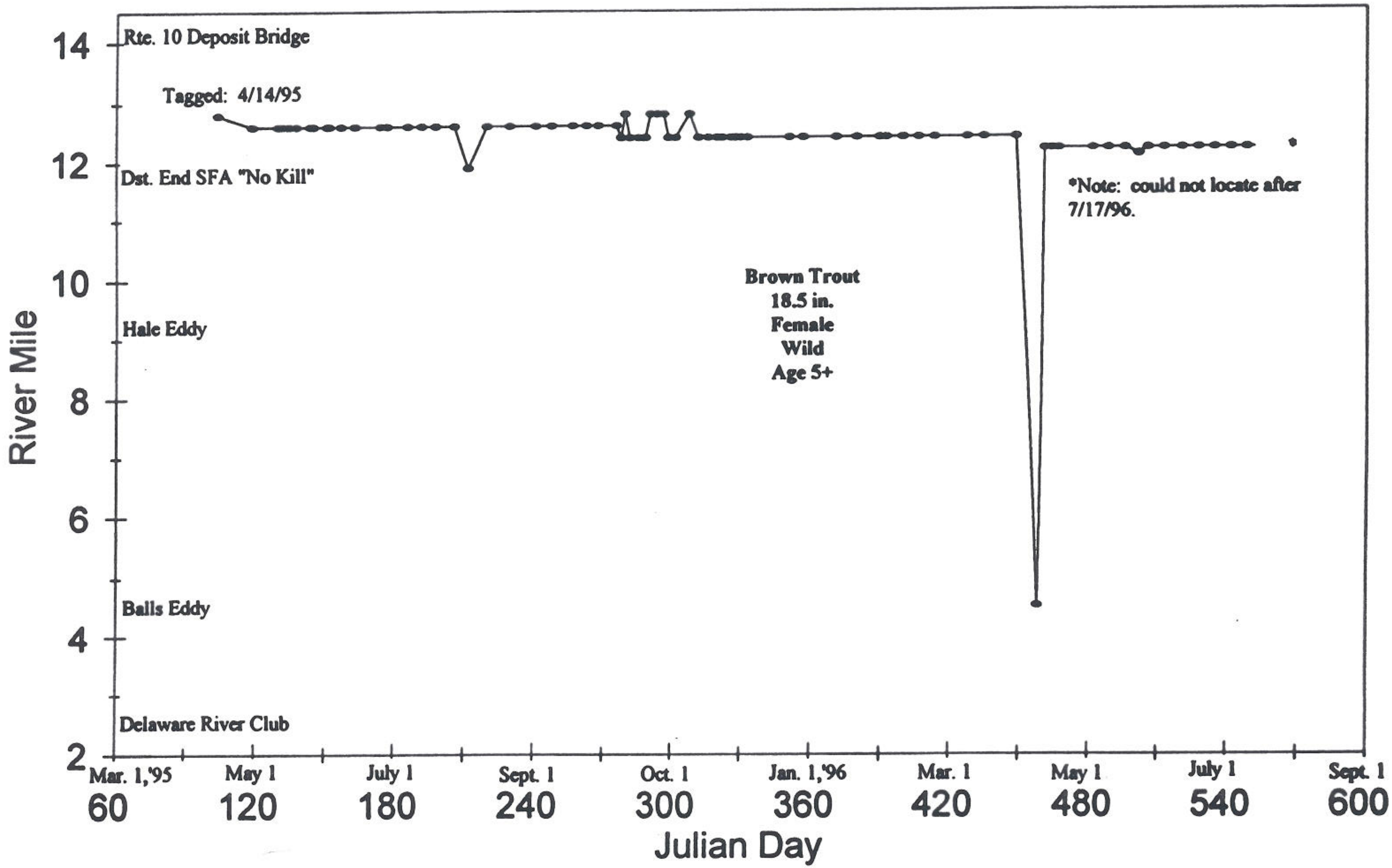
Faulkner Brook
Braided Channel
Balls Eddy Access Site
Brown Trout
15.0 in
Female
Hatchery Origin
Age 3M
Tagged: 4/10/95
*Note: fish creeled 6/1/95
at Balls Eddy Access Site
(RM 4.5).
River Mile
5.5
5.3
5.1
4.9
4.7
4.5
Apr. 1,'95
Apr. 10
Apr. 20
May 1
May 10
May 20
June 1
June 10,'95
90
100
110
120
130
140
150
160
Julian Day

# WB-2

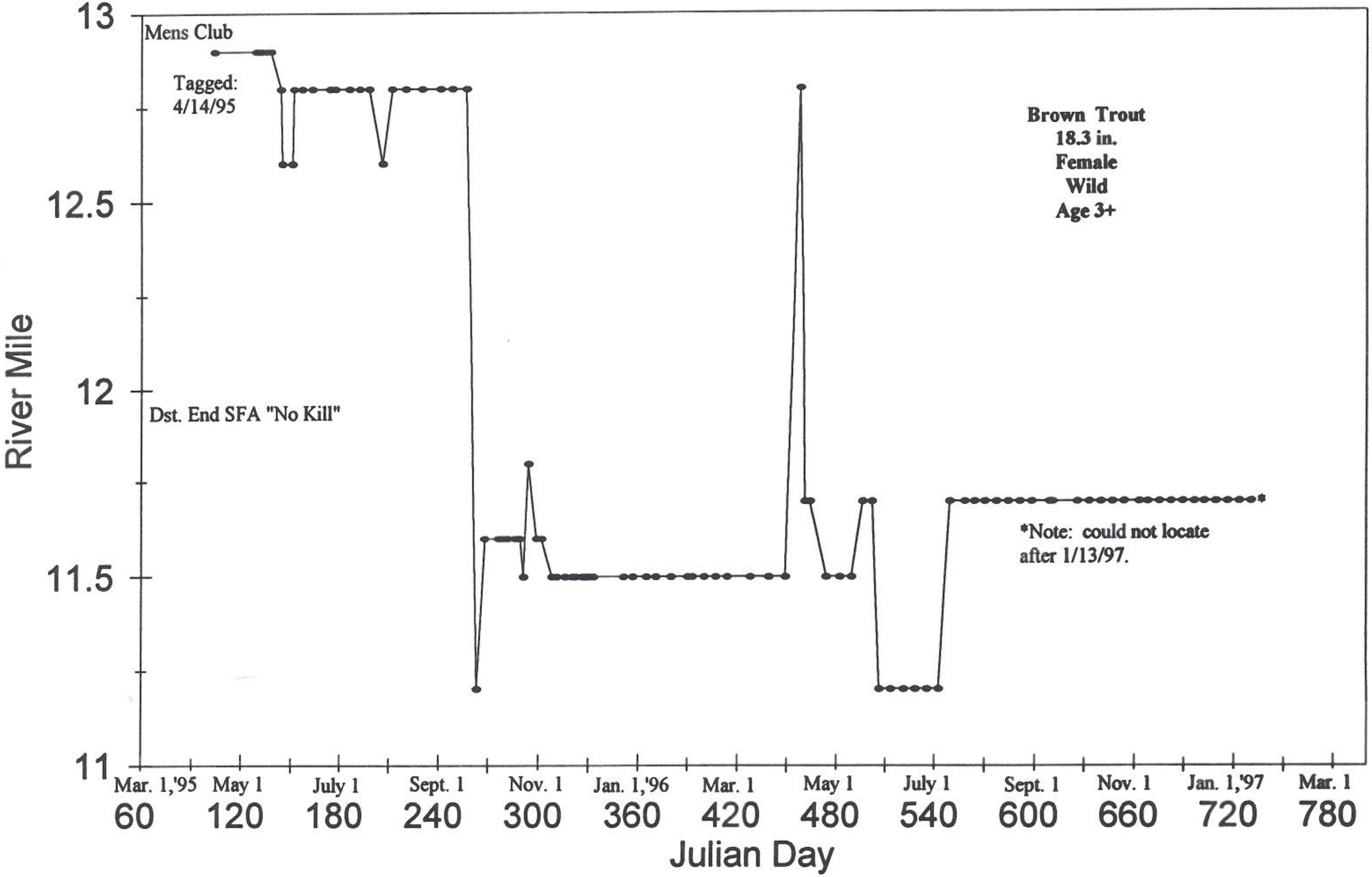


River Mile
7
6
5
4
3
2
1
0
"Oil Well"
Tagged: 4/10/95
Balls Eddy Access
Sands Creek
Rte. 191 Access Site/Shehawken Creek
Brown Trout
19.8 in.
Female
Wild
Age 4+
*T: 10/9/95-2/18/96 - fish located 3.0-4.3 miles up Shehawken Creek (RM 0.5), tributary to the West Branch. Fish determined dead 2/96. Date of death after 10/24/95 unknown.
*TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
Apr. 1,'95
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'96
Feb. 1
Mar. 1
90
120
150
180
210
240
270
300
330
360
390
420
Julian Day

# WB-3

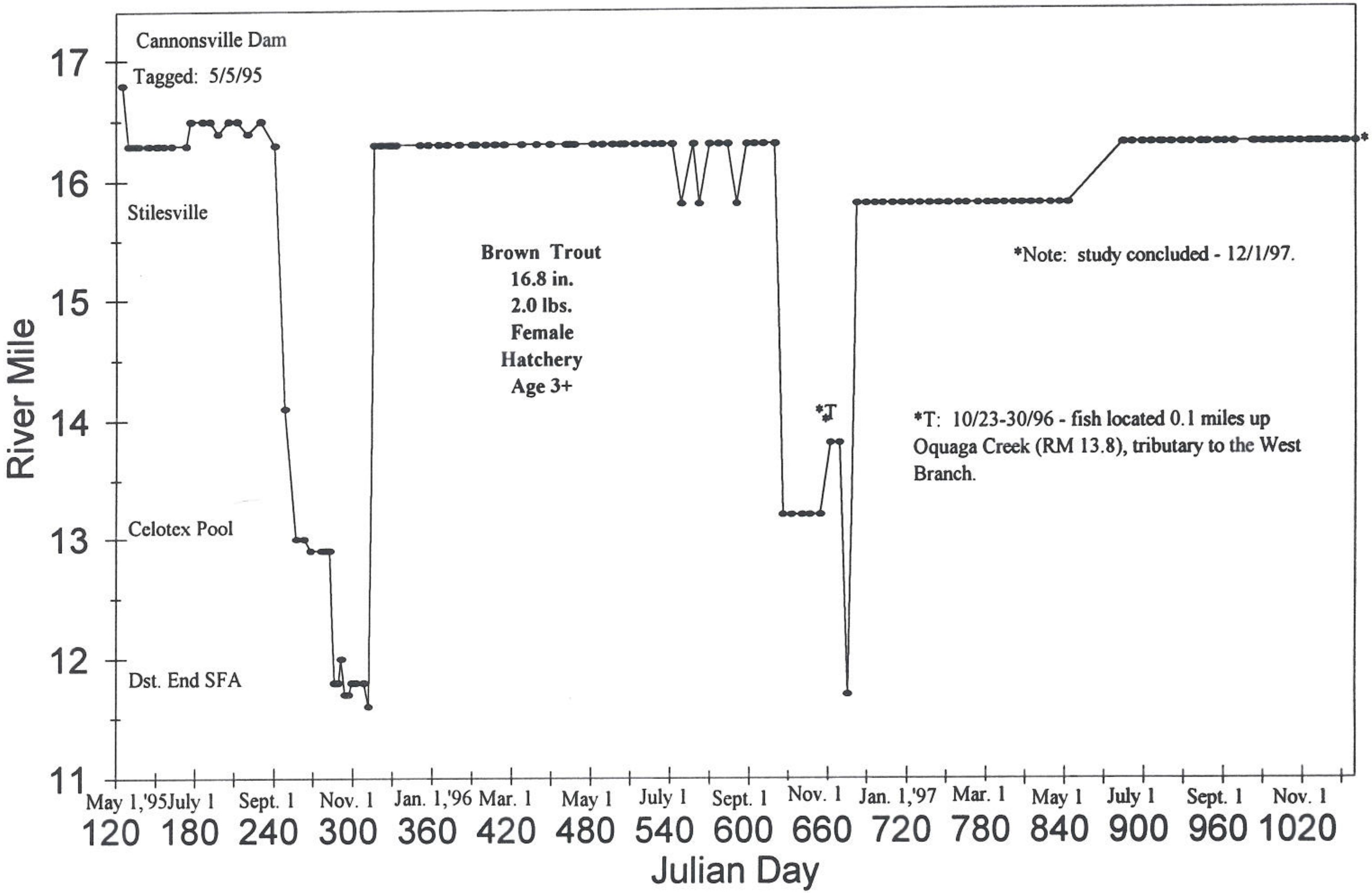

Rte. 10 Deposit Bridge
Tagged: 4/14/95
Dst. End SFA "No Kill"
Hale Eddy
Balls Eddy
Delaware River Club
Brown Trout
18.5 in.
Female
Wild
Age 5+
*Note: could not locate after 7/17/96.
River Mile
14
12
10
8
6
4
2
Mar. 1,'95
May 1
July 1
Sept. 1
Oct. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
60
120
180
240
300
360
420
480
540
600
Julian Day

# WB-4



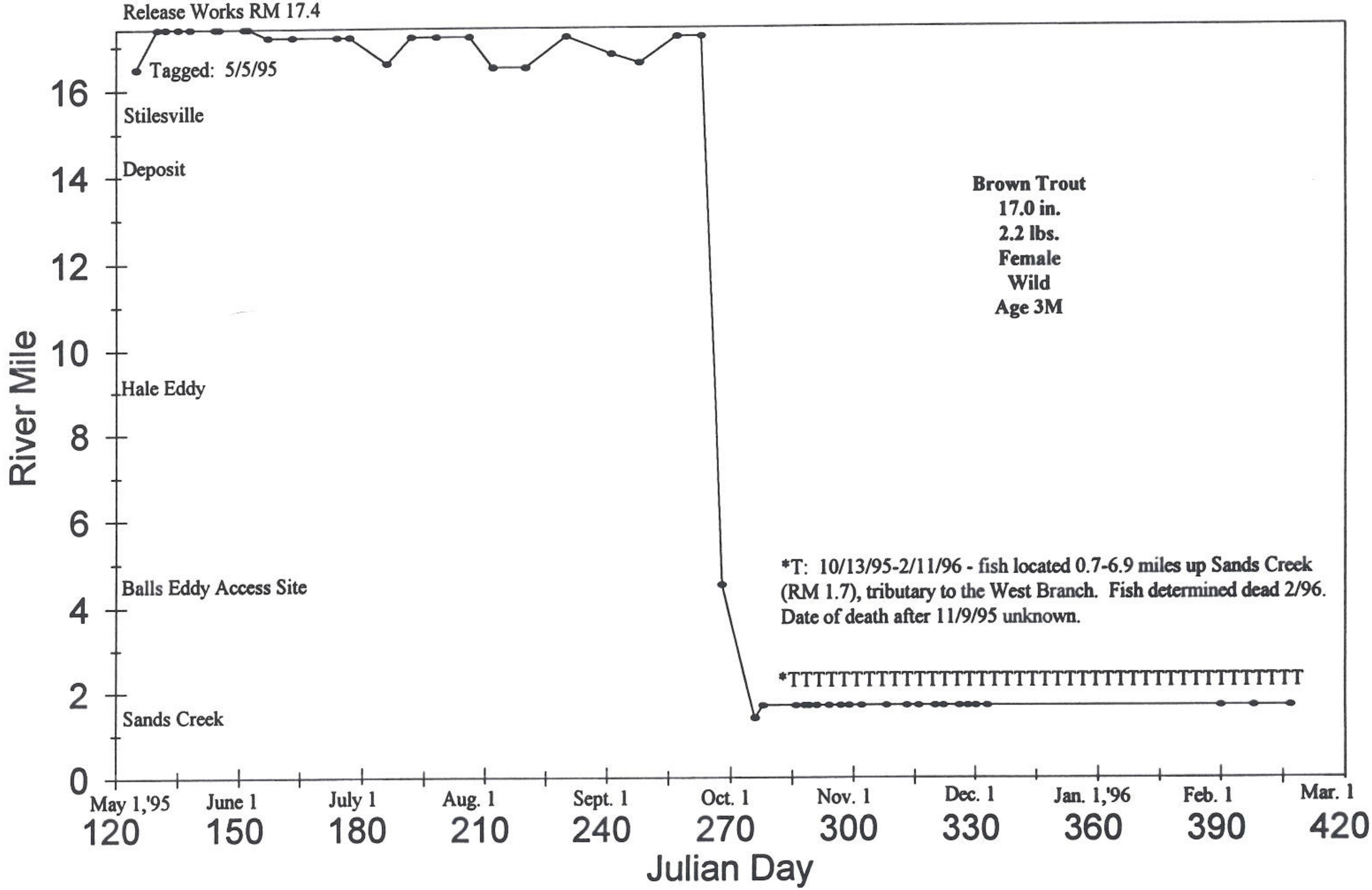
River Mile
13
12.5
12
11.5
11
Mens Club
Tagged:
4/14/95
Dst. End SFA "No Kill"
Brown Trout
18.3 in.
Female
Wild
Age 3+
*Note: could not locate
after 1/13/97.
Mar. 1,'95 May 1 July 1 Sept. 1 Nov. 1 Jan. 1,'96 Mar. 1 May 1 July 1 Sept. 1 Nov. 1 Jan. 1,'97 Mar. 1
60 120 180 240 300 360 420 480 540 600 660 720 780
Julian Day

# WB - 5



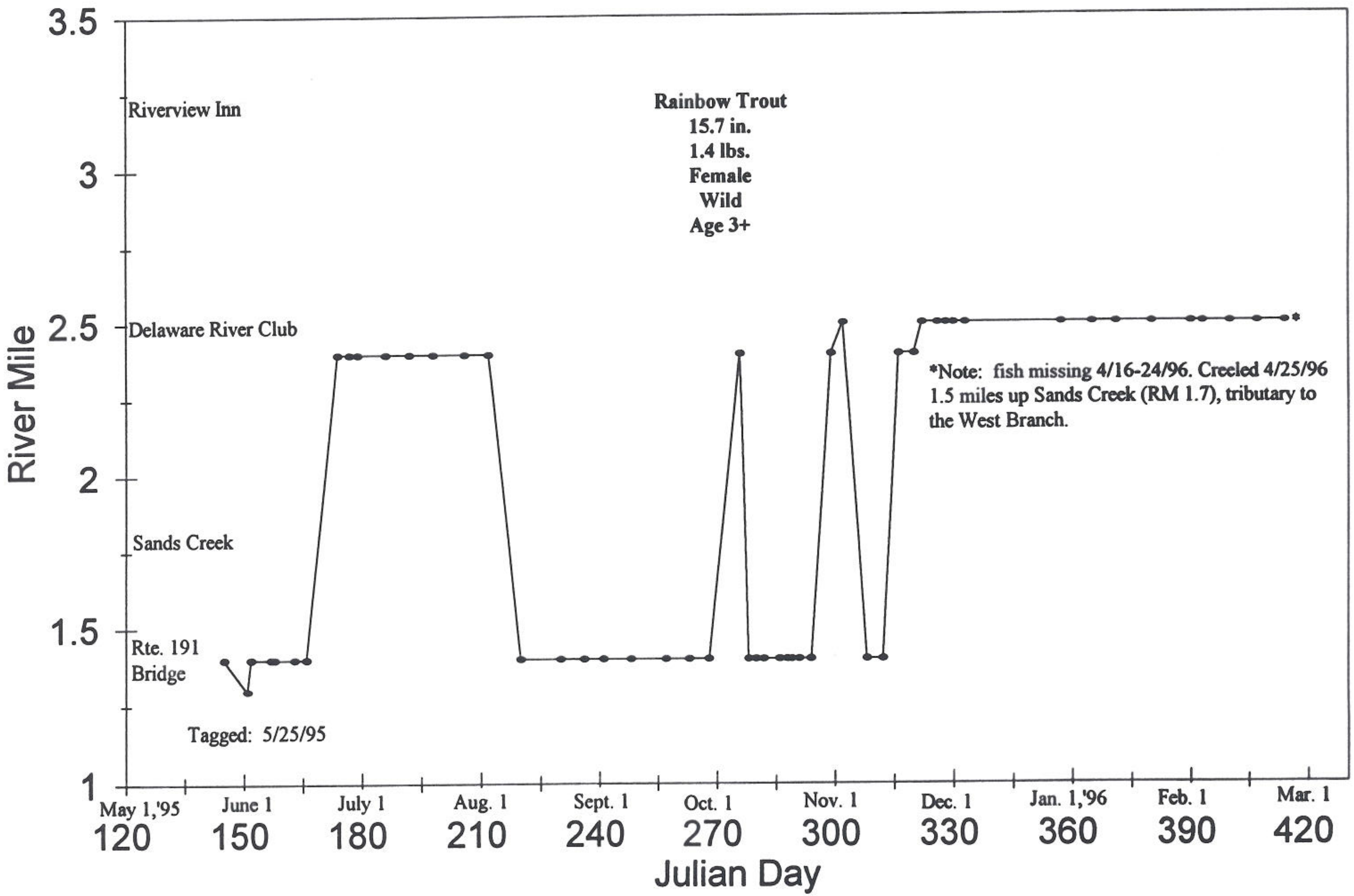
Cannonsville Dam
Tagged: 5/5/95
Stilesville
Celotex Pool
Dst. End SFA
Brown Trout
16.8 in.
2.0 lbs.
Female
Hatchery
Age 3+
*T
*Note: study concluded - 12/1/97.
*T: 10/23-30/96 - fish located 0.1 miles up Oquaga Creek (RM 13.8), tributary to the West Branch.
River Mile
17
16
15
14
13
12
11
May 1,'95 July 1 Sept. 1 Nov. 1 Jan. 1,'96 Mar. 1 May 1 July 1 Sept. 1 Nov. 1 Jan. 1,'97 Mar. 1 May 1 July 1 Sept. 1 Nov. 1
120 180 240 300 360 420 480 540 600 660 720 780 840 900 960 1020
Julian Day

# WB-6



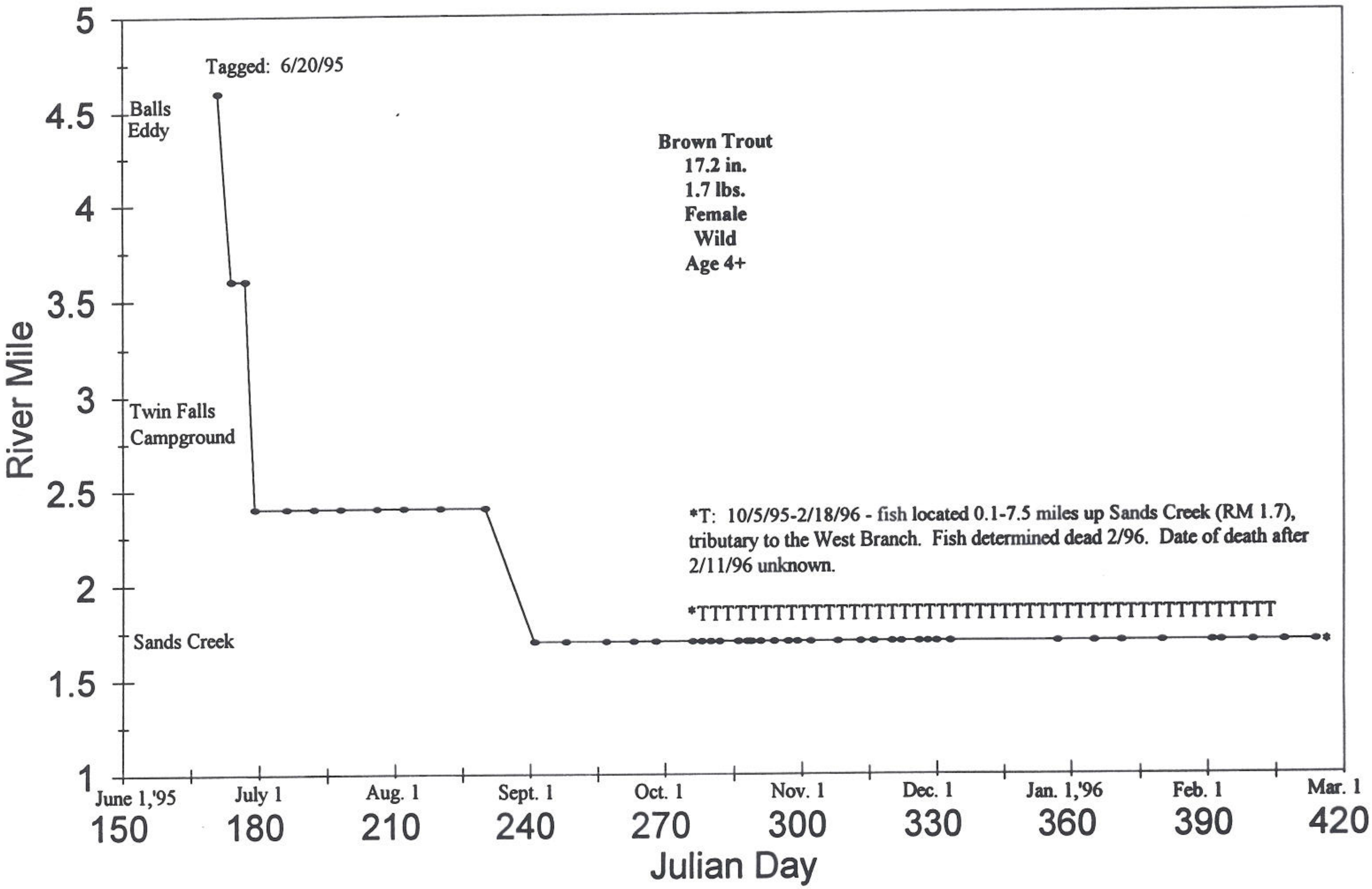
Release Works RM 17.4
Tagged: 5/5/95
Stilesville
Deposit
Hale Eddy
Balls Eddy Access Site
Sands Creek
Brown Trout
17.0 in.
2.2 lbs.
Female
Wild
Age 3M
*T: 10/13/95-2/11/96 - fish located 0.7-6.9 miles up Sands Creek (RM 1.7), tributary to the West Branch. Fish determined dead 2/96. Date of death after 11/9/95 unknown.
*TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
River Mile
0
2
4
6
8
10
12
14
16
May 1,'95
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'96
Feb. 1
Mar. 1
120
150
180
210
240
270
300
330
360
390
420
Julian Day

# WB-7



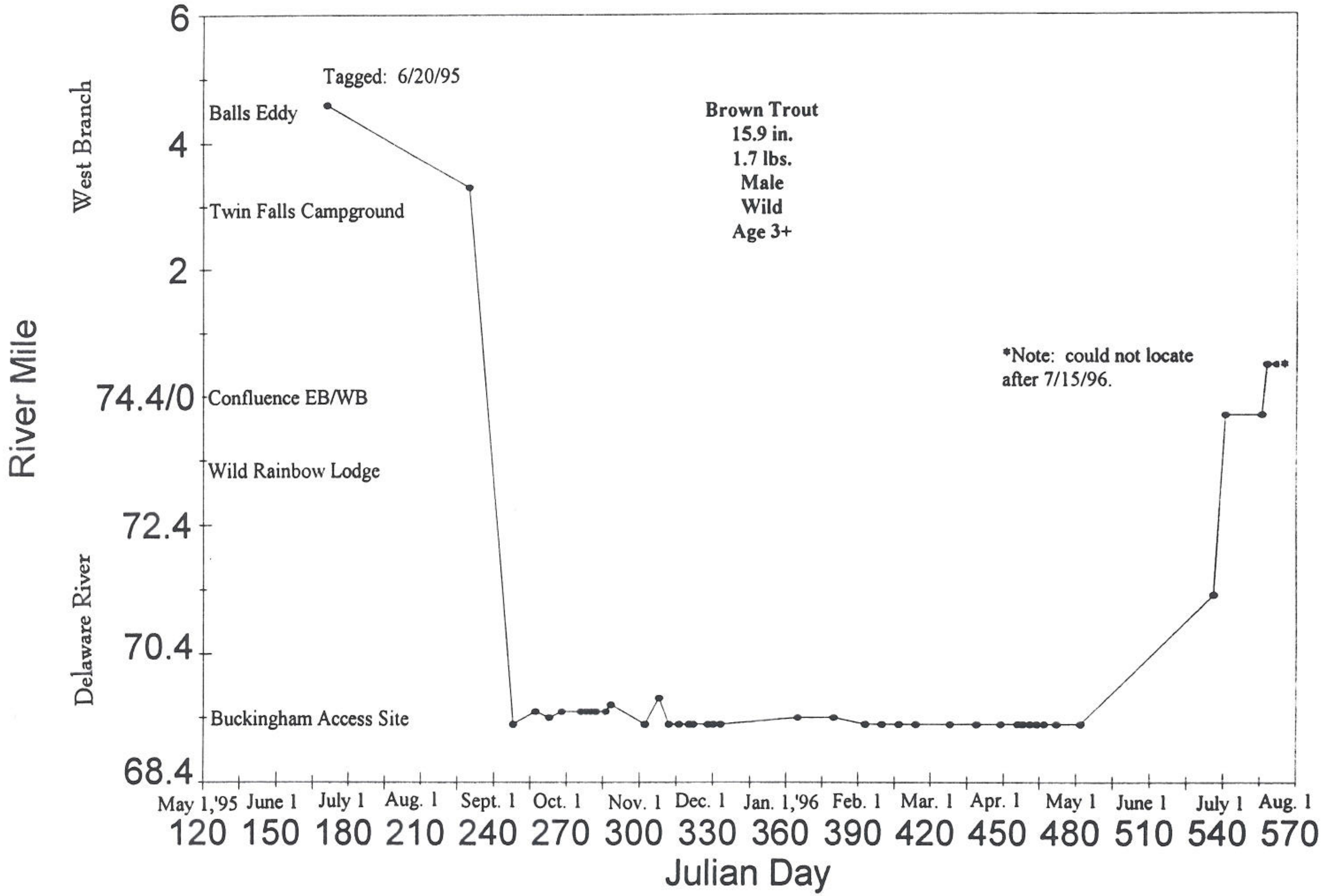
Rainbow Trout
15.7 in.
1.4 lbs.
Female
Wild
Age 3+
Riverview Inn
Delaware River Club
Sands Creek
Rte. 191
Bridge
Tagged: 5/25/95
*Note: fish missing 4/16-24/96. Creeled 4/25/96 1.5 miles up Sands Creek (RM 1.7), tributary to the West Branch.
River Mile
3.5
3
2.5
2
1.5
1
May 1,'95
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'96
Feb. 1
Mar. 1
120
150
180
210
240
270
300
330
360
390
420
Julian Day

# WB-8



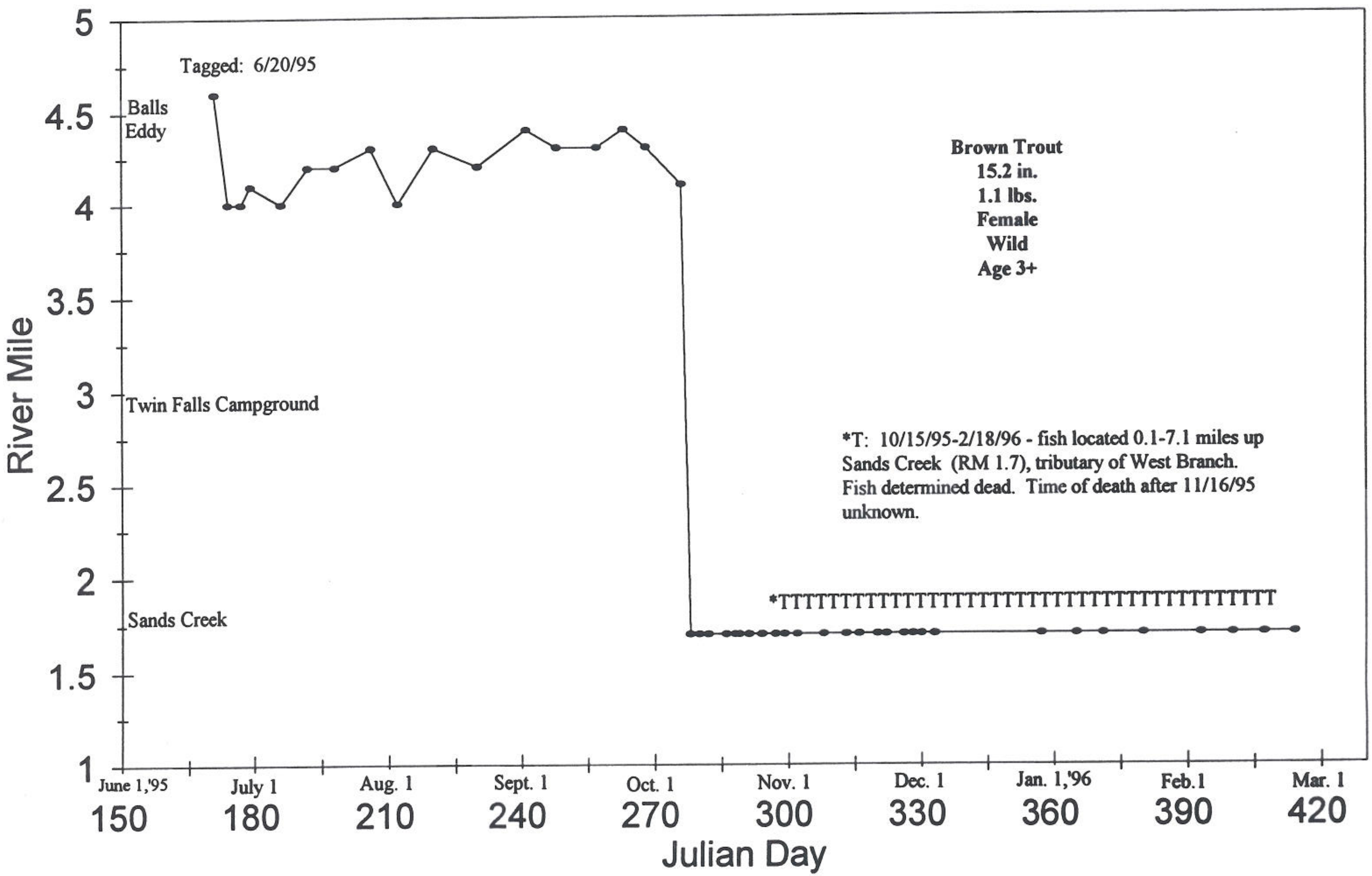
River Mile
5
4.5
4
3.5
3
2.5
2
1.5
1
Balls Eddy
Twin Falls Campground
Sands Creek
Tagged: 6/20/95
Brown Trout
17.2 in.
1.7 lbs.
Female
Wild
Age 4+
*T: 10/5/95-2/18/96 - fish located 0.1-7.5 miles up Sands Creek (RM 1.7), tributary to the West Branch. Fish determined dead 2/96. Date of death after 2/11/96 unknown.
*TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
June 1,'95
150
July 1
180
Aug. 1
210
Sept. 1
240
Oct. 1
270
Nov. 1
300
Dec. 1
330
Jan. 1,'96
360
Feb. 1
390
Mar. 1
420
Julian Day

# WB-9



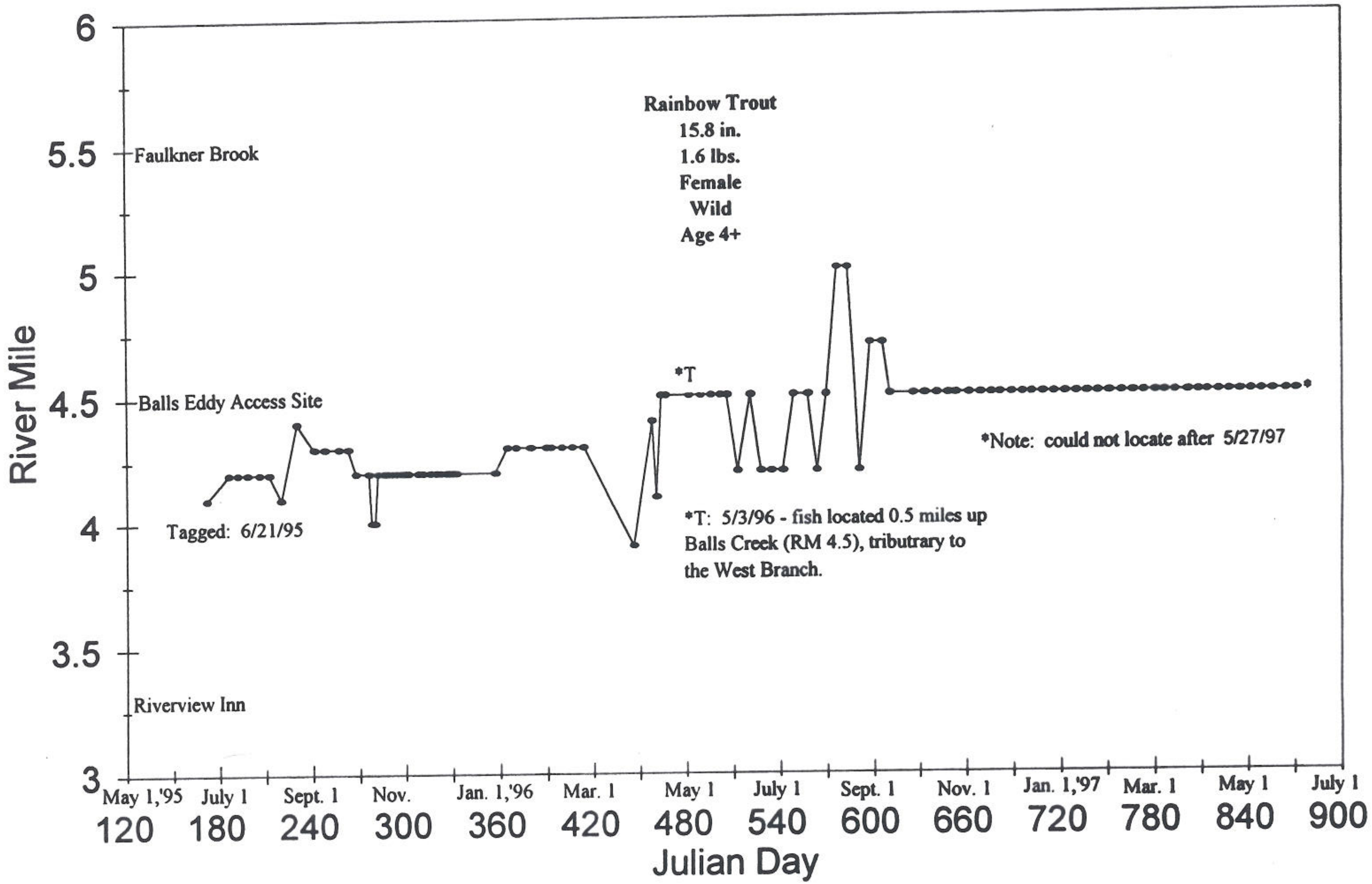
Tagged: 6/20/95
Balls Eddy
Twin Falls Campground
Confluence EB/WB
Wild Rainbow Lodge
Buckingham Access Site
Brown Trout
15.9 in.
1.7 lbs.
Male
Wild
Age 3+
*Note: could not locate after 7/15/96.
River Mile
West Branch
Delaware River
6
4
2
74.4/0
72.4
70.4
68.4
May 1,'95 June 1 July 1 Aug. 1 Sept. 1 Oct. 1 Nov. 1 Dec. 1 Jan. 1,'96 Feb. 1 Mar. 1 Apr. 1 May 1 June 1 July 1 Aug. 1
120 150 180 210 240 270 300 330 360 390 420 450 480 510 540 570
Julian Day

# WB-10



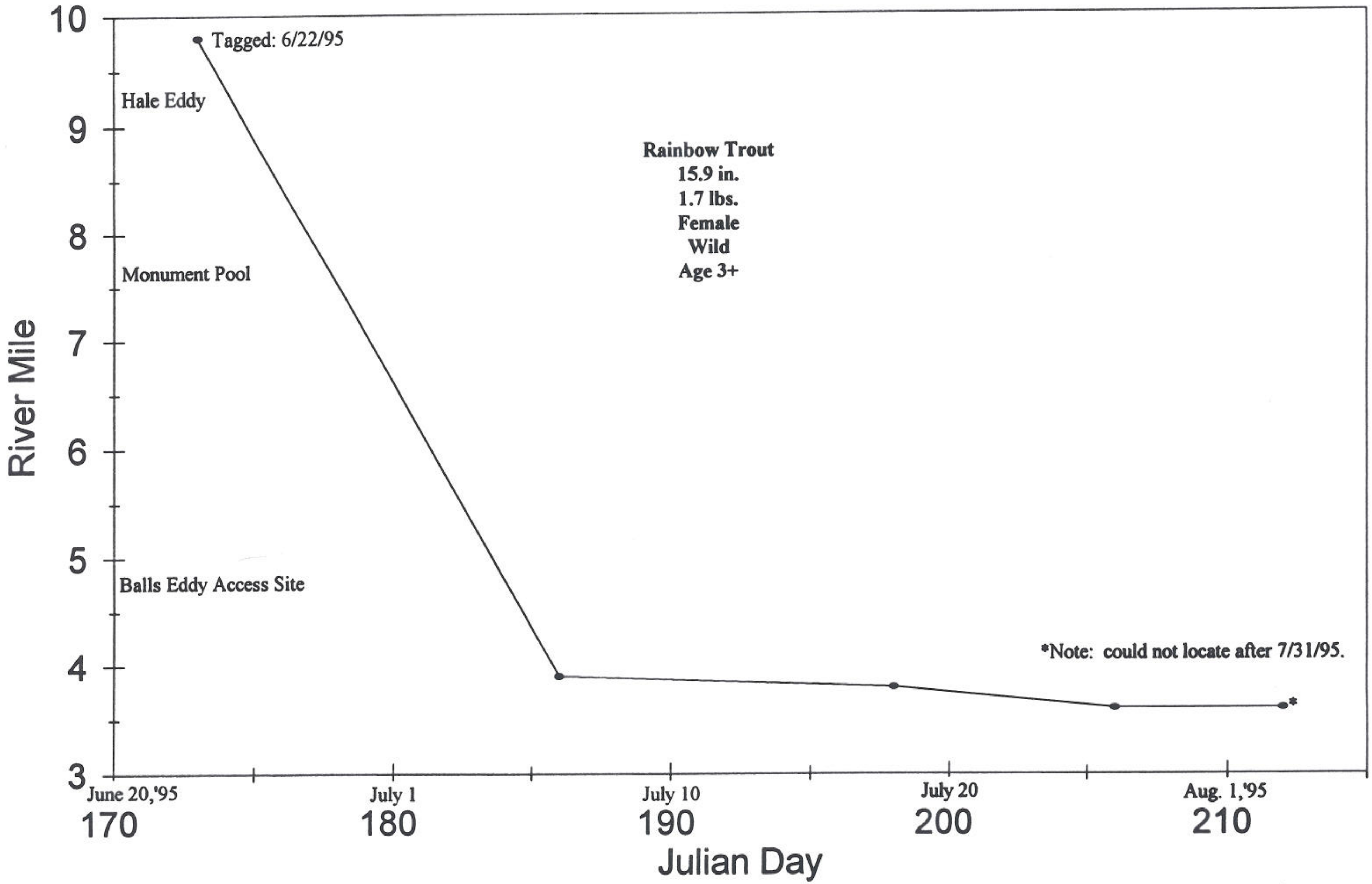
River Mile
5
4.5
4
3.5
3
2.5
2
1.5
1
Tagged: 6/20/95
Balls Eddy
Twin Falls Campground
Sands Creek
Brown Trout
15.2 in.
1.1 lbs.
Female
Wild
Age 3+
*T: 10/15/95-2/18/96 - fish located 0.1-7.1 miles up Sands Creek (RM 1.7), tributary of West Branch. Fish determined dead. Time of death after 11/16/95 unknown.
*TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
June 1,'95
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'96
Feb.1
Mar. 1
150
180
210
240
270
300
330
360
390
420
Julian Day

# WB-11



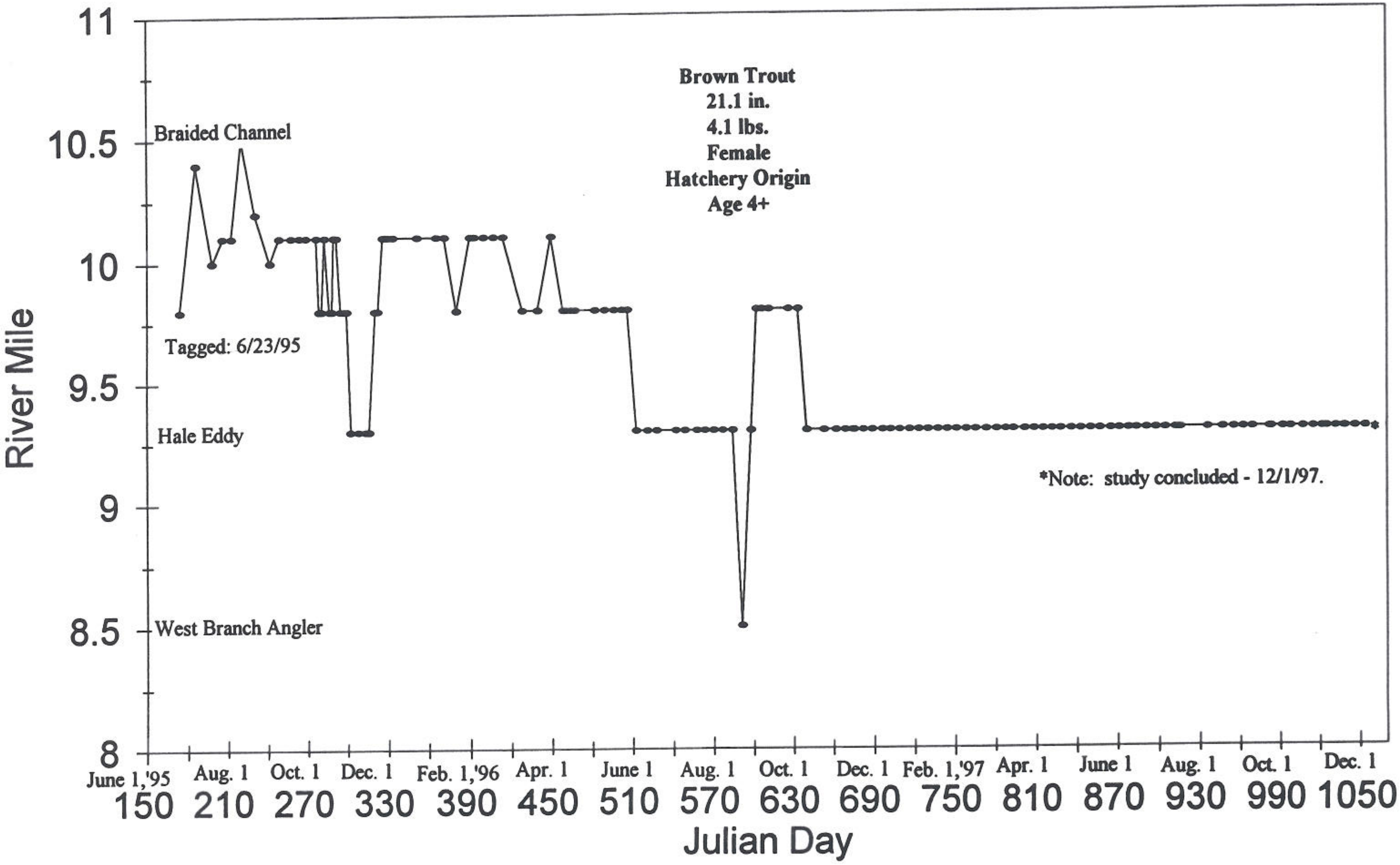
Rainbow Trout
15.8 in.
1.6 lbs.
Female
Wild
Age 4+
River Mile
6
5.5
5
4.5
4
3.5
3
Faulkner Brook
Balls Eddy Access Site
Riverview Inn
Tagged: 6/21/95
*T
*T: 5/3/96 - fish located 0.5 miles up Balls Creek (RM 4.5), tributary to the West Branch.
*Note: could not locate after 5/27/97
May 1,'95
July 1
Sept. 1
Nov.
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
120
180
240
300
360
420
480
540
600
660
720
780
840
900
Julian Day

# WB-12

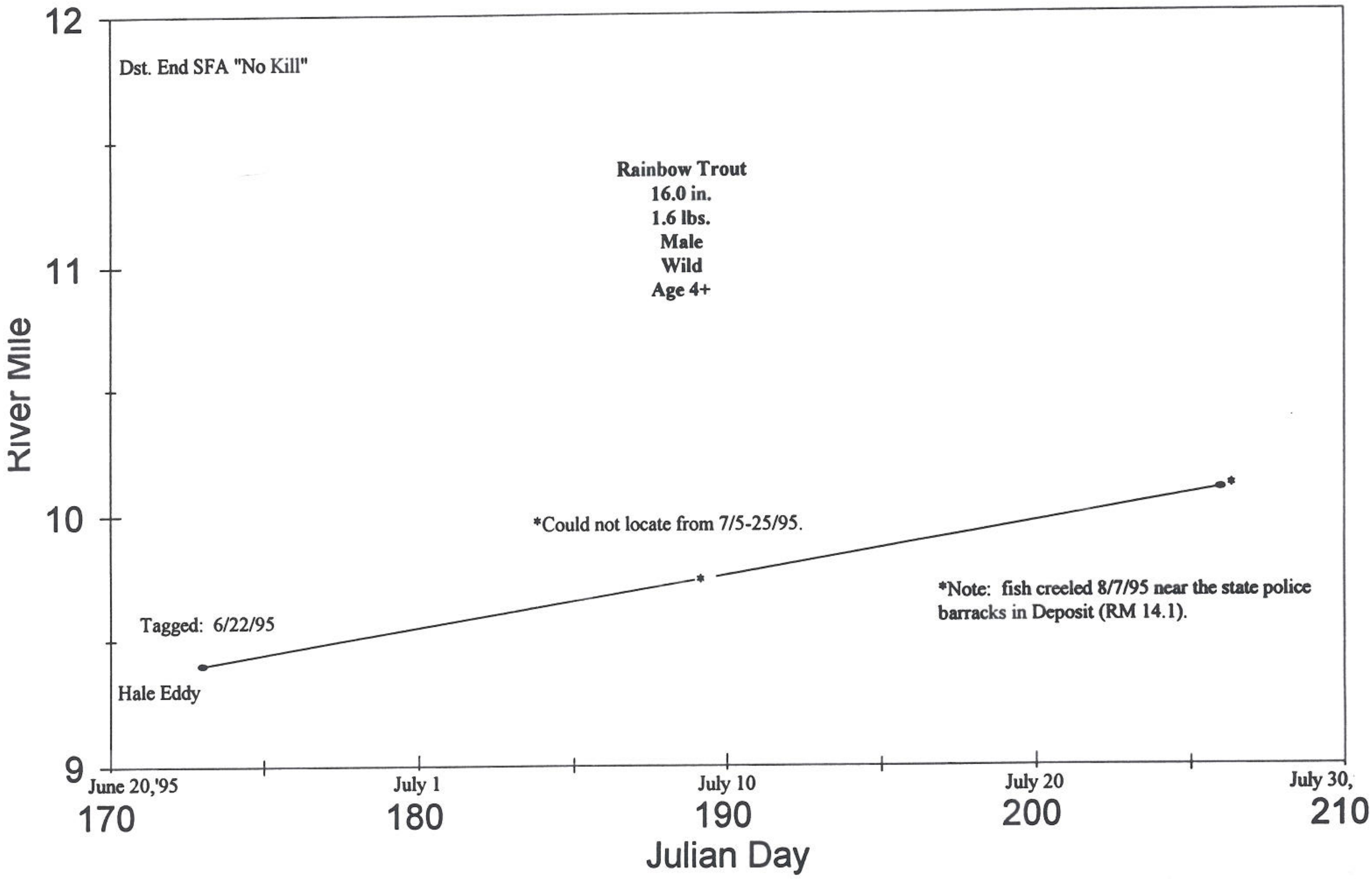


River Mile
10
9
8
7
6
5
4
3
Tagged: 6/22/95
Hale Eddy
Monument Pool
Balls Eddy Access Site
Rainbow Trout
15.9 in.
1.7 lbs.
Female
Wild
Age 3+
*Note: could not locate after 7/31/95.
*
June 20,'95
July 1
July 10
July 20
Aug. 1,'95
170
180
190
200
210
Julian Day

# WB-13

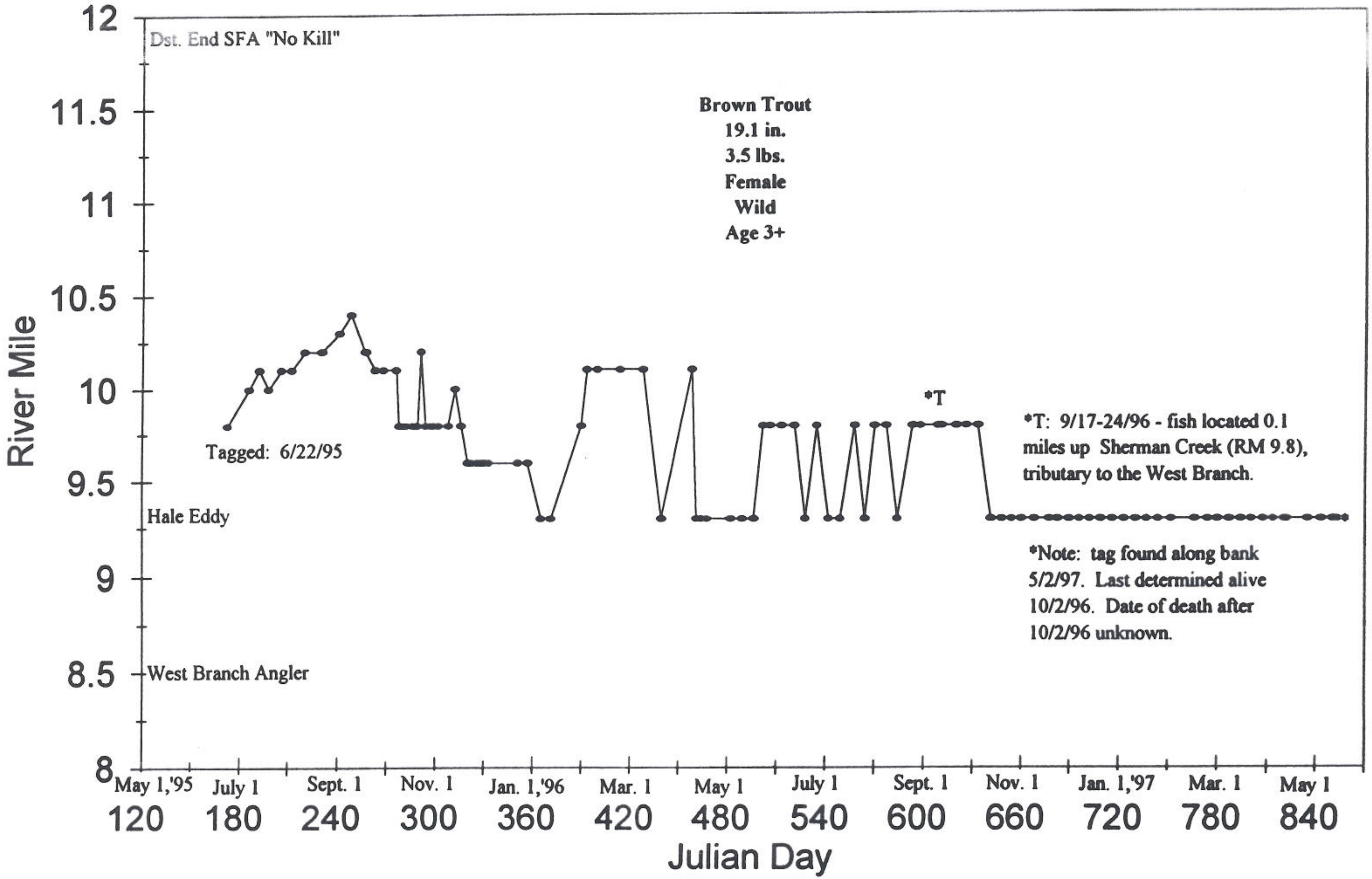

River Mile
11
10.5
10
9.5
9
8.5
8
Braided Channel
Tagged: 6/23/95
Hale Eddy
West Branch Angler
Brown Trout
21.1 in.
4.1 lbs.
Female
Hatchery Origin
Age 4+
*Note: study concluded - 12/1/97.
June 1,'95
Aug. 1
Oct. 1
Dec. 1
Feb. 1,'96
Apr. 1
June 1
Aug. 1
Oct. 1
Dec. 1
Feb. 1,'97
Apr. 1
June 1
Aug. 1
Oct. 1
Dec. 1
150
210
270
330
390
450
510
570
630
690
750
810
870
930
990
1050
Julian Day

# WB-14



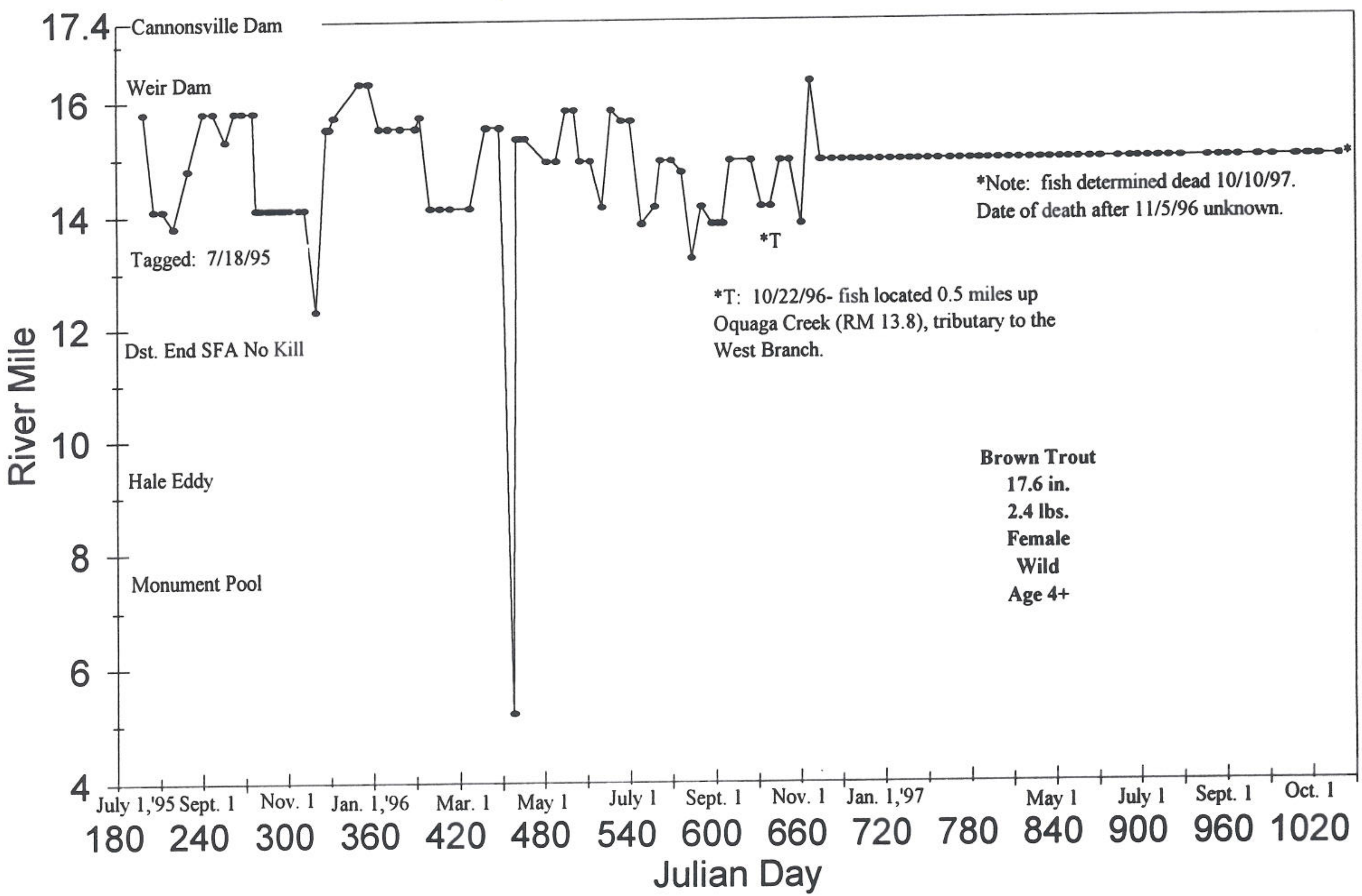
River Mile
12
11
10
9
Dst. End SFA "No Kill"
Rainbow Trout
16.0 in.
1.6 lbs.
Male
Wild
Age 4+
*Could not locate from 7/5-25/95.
*Note: fish creeled 8/7/95 near the state police barracks in Deposit (RM 14.1).
Tagged: 6/22/95
Hale Eddy
June 20,'95
July 1
July 10
July 20
July 30,
170
180
190
200
210
Julian Day

# WB-15

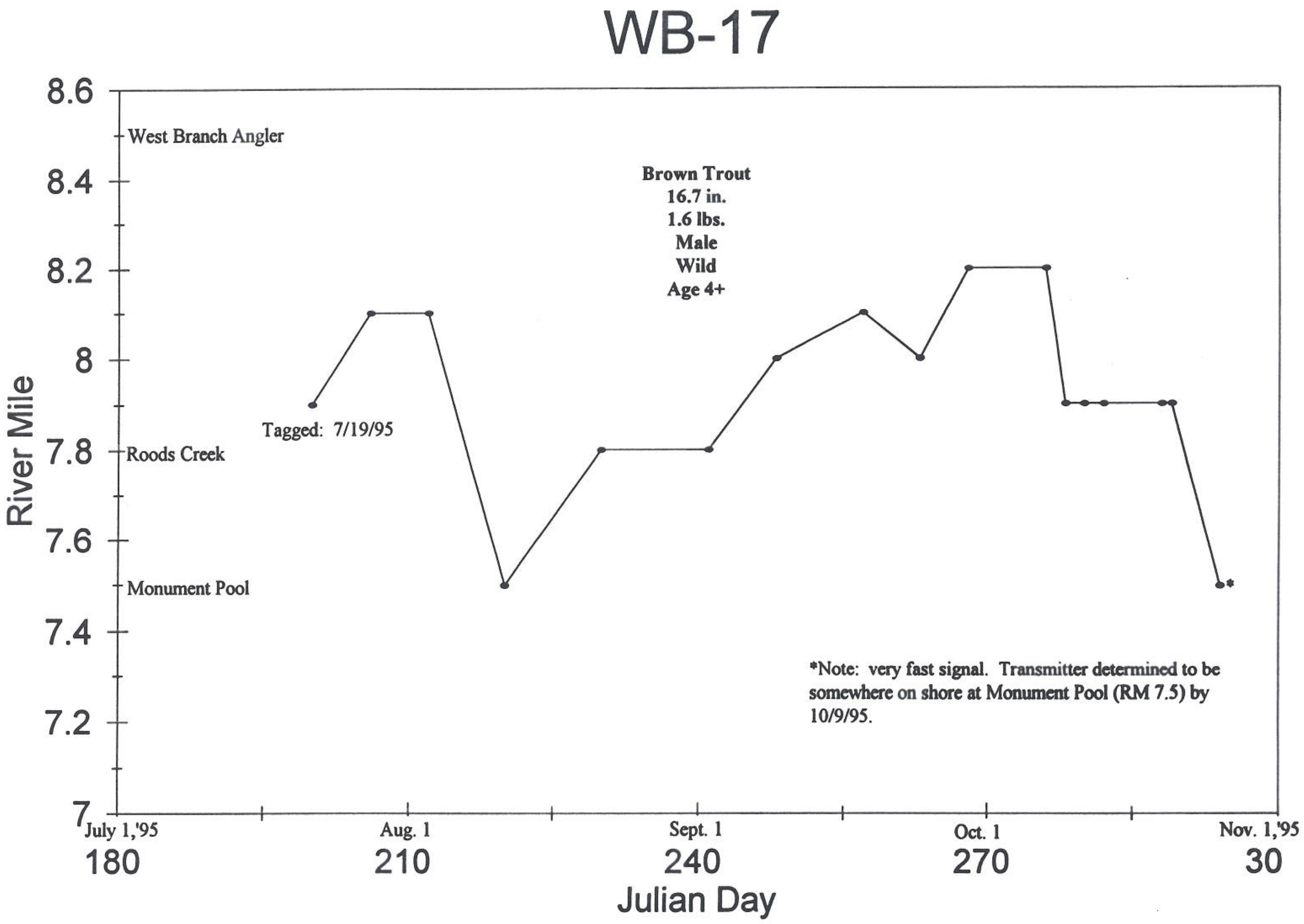


River Mile
12
11.5
11
10.5
10
9.5
9
8.5
8
Dst. End SFA "No Kill"
Hale Eddy
West Branch Angler
Brown Trout
19.1 in.
3.5 lbs.
Female
Wild
Age 3+
Tagged: 6/22/95
*T
*T: 9/17-24/96 - fish located 0.1 miles up Sherman Creek (RM 9.8), tributary to the West Branch.
*Note: tag found along bank 5/2/97. Last determined alive 10/2/96. Date of death after 10/2/96 unknown.
May 1,'95
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
120
180
240
300
360
420
480
540
600
660
720
780
840
Julian Day

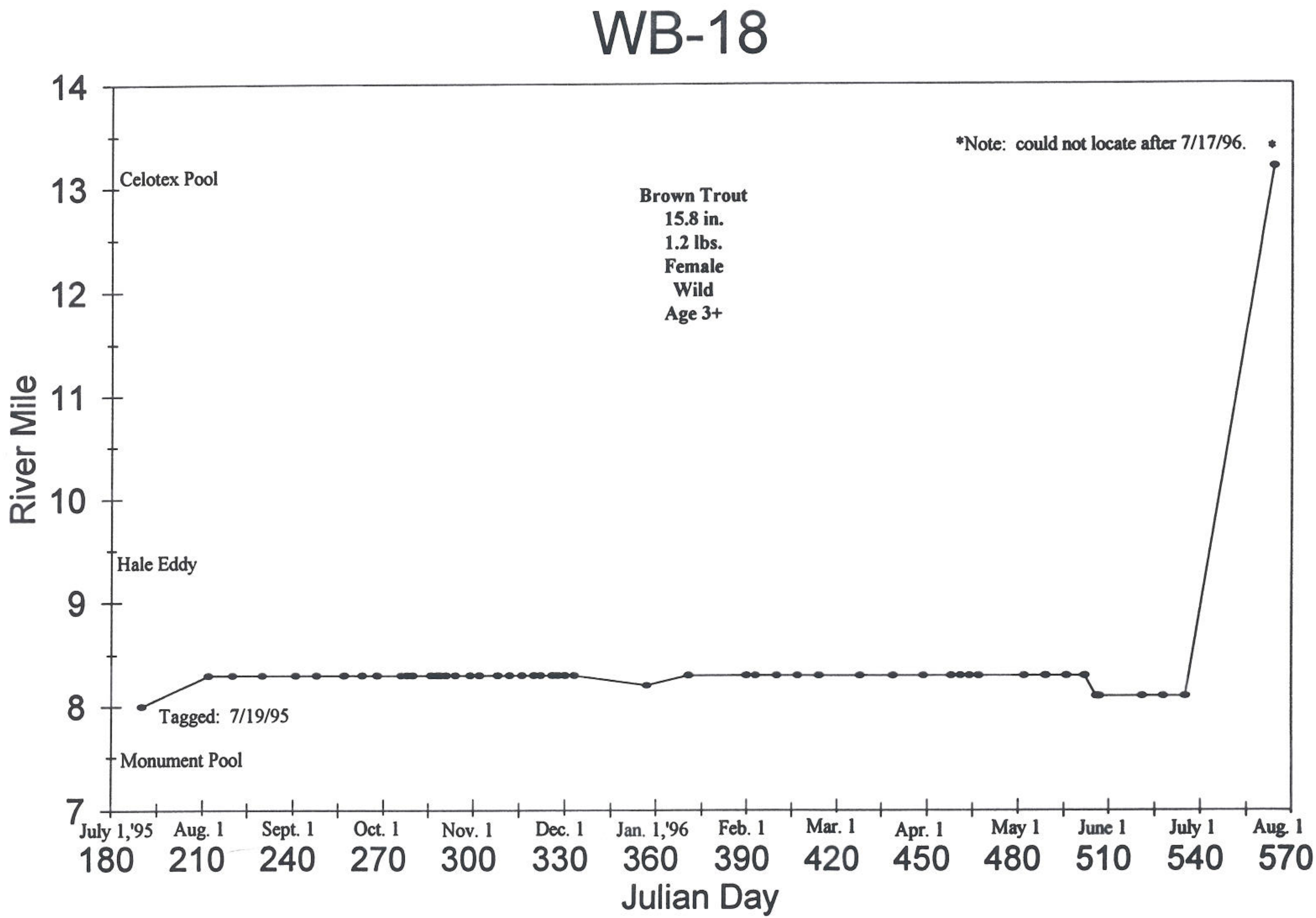
# WB-16



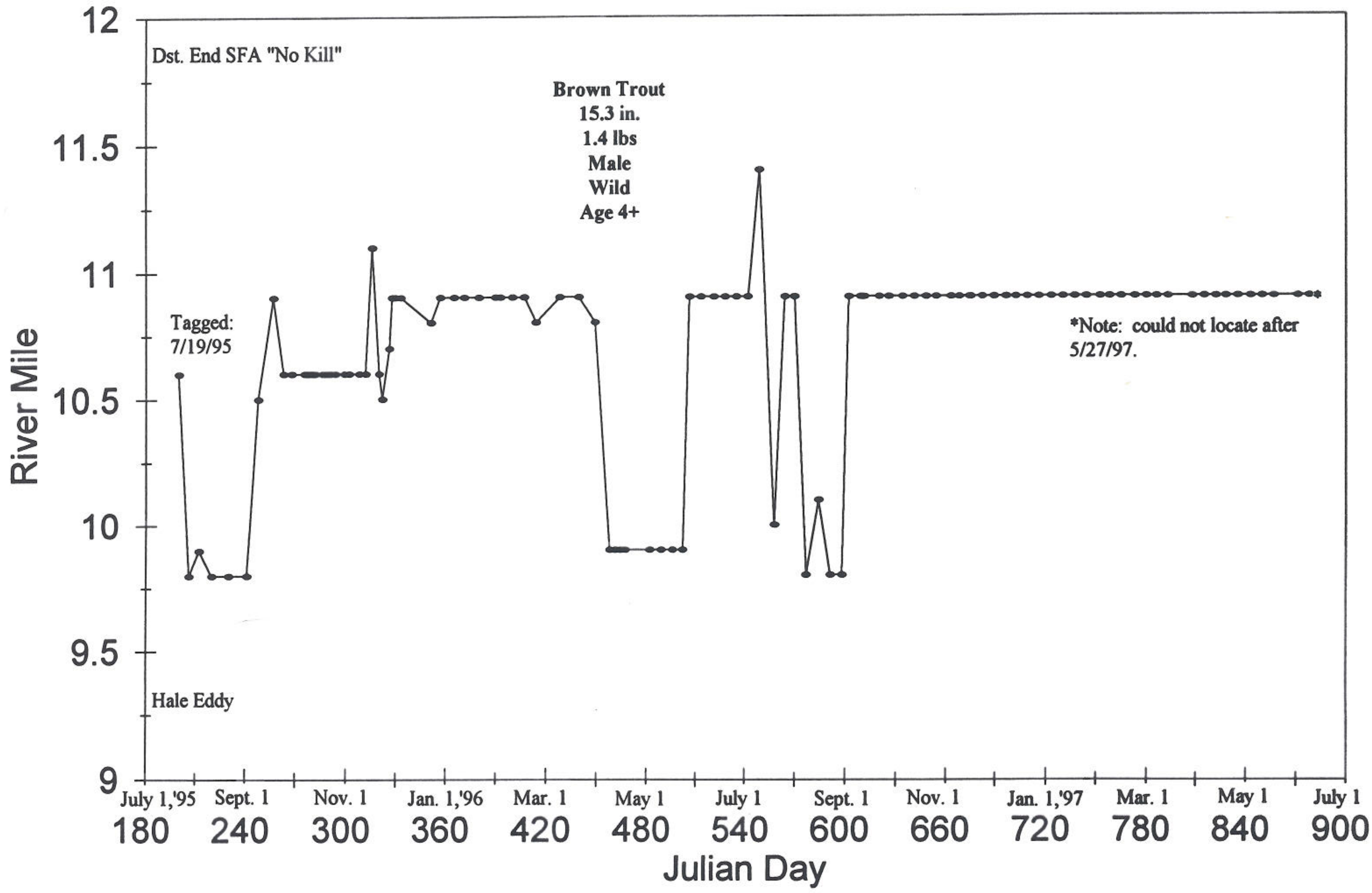
River Mile
17.4
16
14
12
10
8
6
4
Cannonsville Dam
Weir Dam
Tagged: 7/18/95
Dst. End SFA No Kill
Hale Eddy
Monument Pool
*T
*T: 10/22/96- fish located 0.5 miles up Oquaga Creek (RM 13.8), tributary to the West Branch.
*Note: fish determined dead 10/10/97. Date of death after 11/5/96 unknown.
Brown Trout
17.6 in.
2.4 lbs.
Female
Wild
Age 4+
July 1,'95
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
May 1
July 1
Sept. 1
Oct. 1
180
240
300
360
420
480
540
600
660
720
780
840
900
960
1020
Julian Day



WB-17
River Mile
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
West Branch Angler
Roods Creek
Monument Pool
Brown Trout
16.7 in.
1.6 lbs.
Male
Wild
Age 4+
Tagged: 7/19/95
*Note: very fast signal. Transmitter determined to be somewhere on shore at Monument Pool (RM 7.5) by 10/9/95.
July 1,'95
Aug. 1
Sept. 1
Oct. 1
Nov. 1,'95
180
210
240
270
30
Julian Day

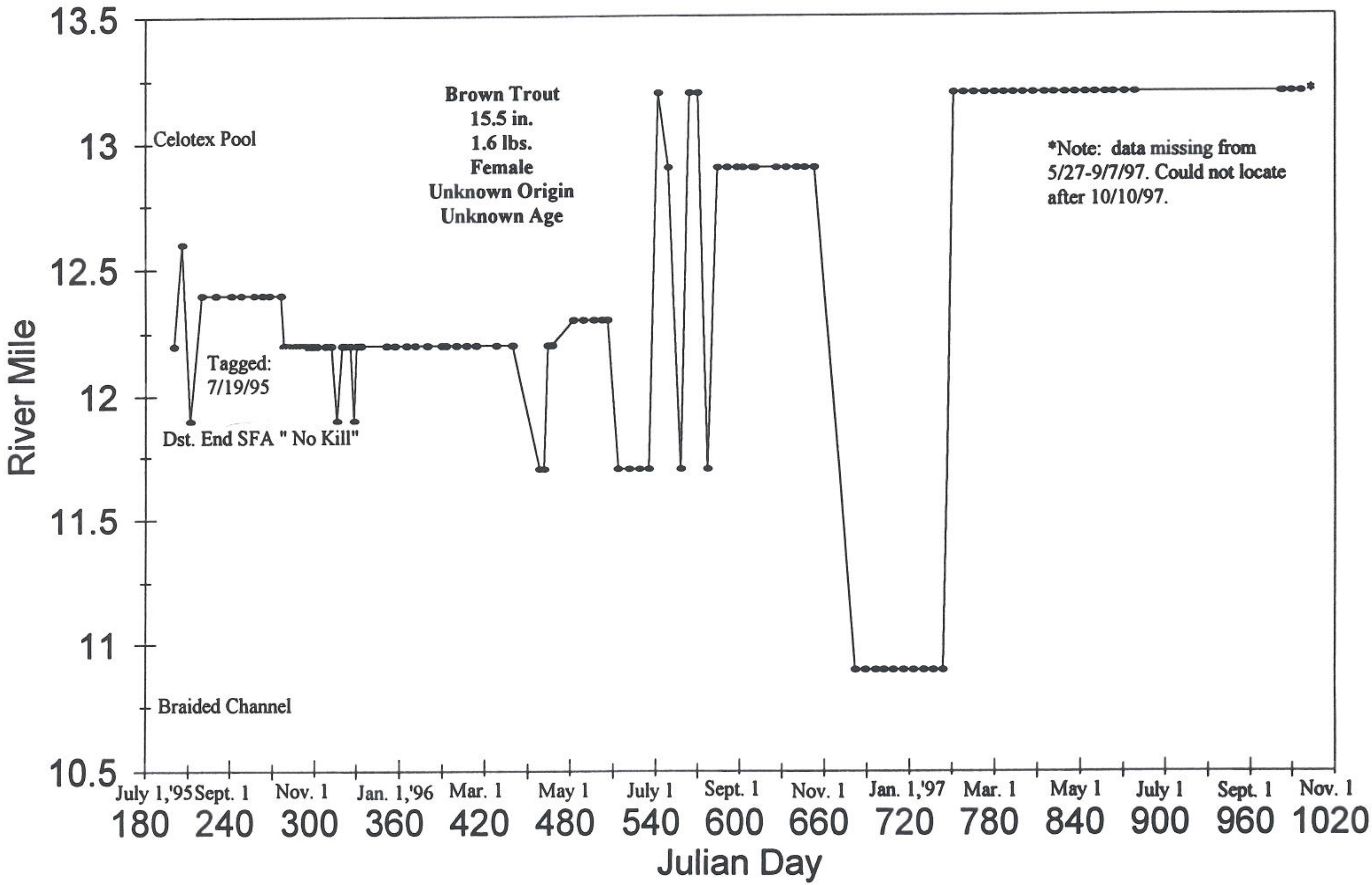

WB-18
River Mile
14
13
12
11
10
9
8
7
Celotex Pool
Hale Eddy
Monument Pool
Tagged: 7/19/95
Brown Trout
15.8 in.
1.2 lbs.
Female
Wild
Age 3+
*Note: could not locate after 7/17/96.
*
July 1,'95
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'96
Feb. 1
Mar. 1
Apr. 1
May 1
June 1
July 1
Aug. 1
180
210
240
270
300
330
360
390
420
450
480
510
540
570
Julian Day

# WB-19



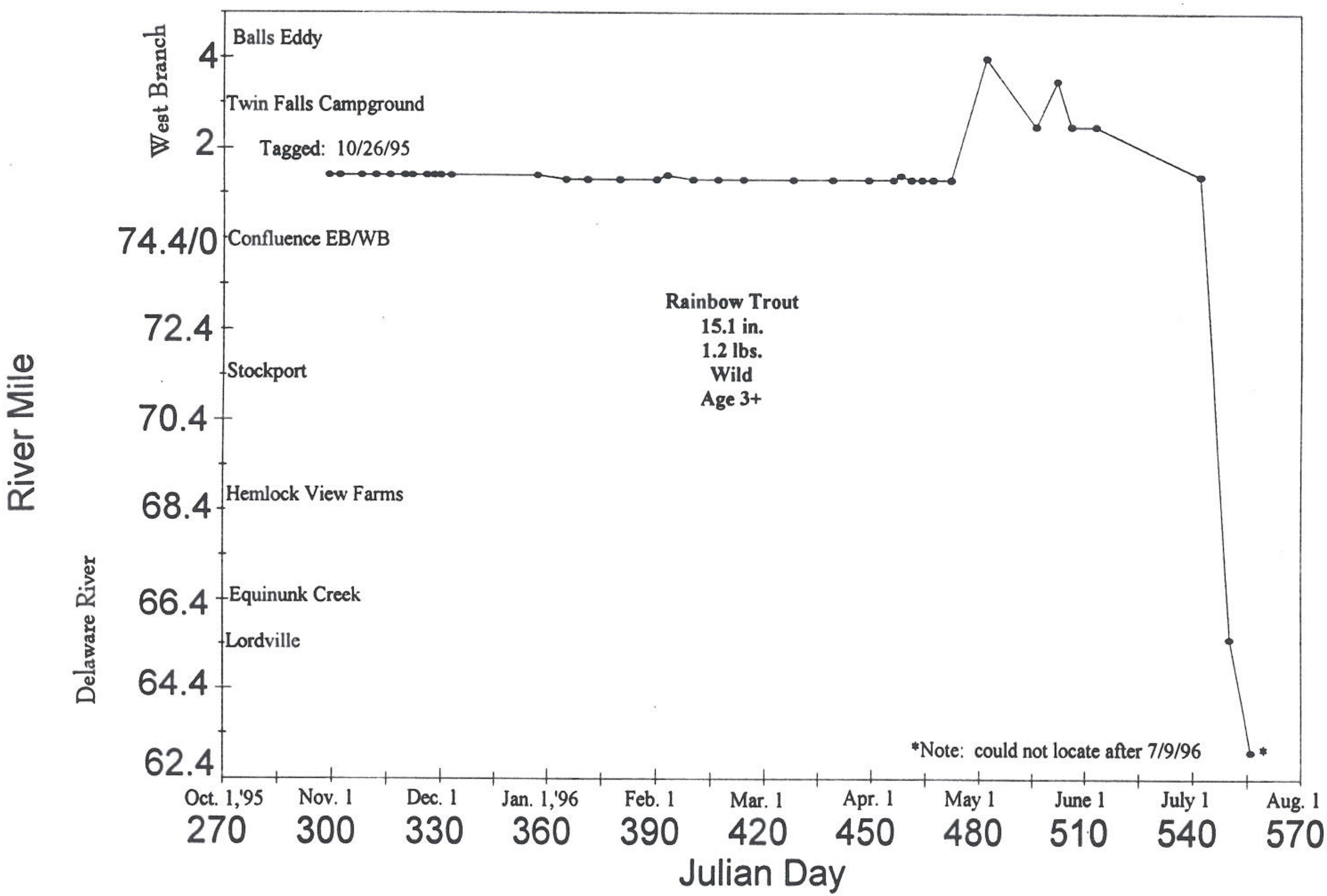
Dst. End SFA "No Kill"
Brown Trout
15.3 in.
1.4 lbs
Male
Wild
Age 4+
Tagged:
7/19/95
*Note: could not locate after
5/27/97.
Hale Eddy
River Mile
12
11.5
11
10.5
10
9.5
9
July 1,'95
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
180
240
300
360
420
480
540
600
660
720
780
840
900
Julian Day

# WB-20



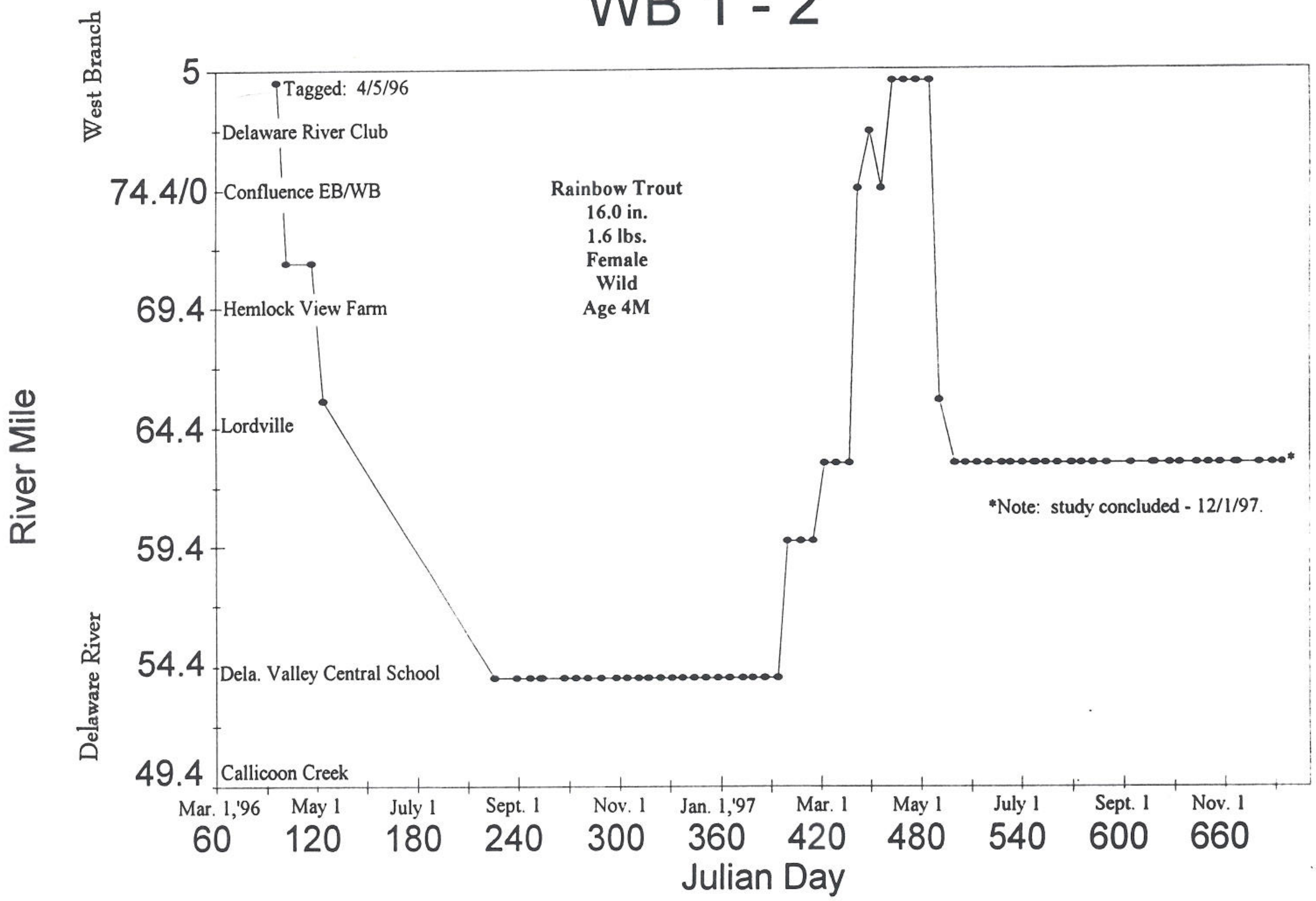
River Mile
13.5
13
12.5
12
11.5
11
10.5
Celotex Pool
Braided Channel
Brown Trout
15.5 in.
1.6 lbs.
Female
Unknown Origin
Unknown Age
Tagged:
7/19/95
Dst. End SFA " No Kill"
*Note: data missing from
5/27-9/7/97. Could not locate
after 10/10/97.
July 1,'95 Sept. 1 Nov. 1 Jan. 1,'96 Mar. 1 May 1 July 1 Sept. 1 Nov. 1 Jan. 1,'97 Mar. 1 May 1 July 1 Sept. 1 Nov. 1
180 240 300 360 420 480 540 600 660 720 780 840 900 960 1020
Julian Day

# WB-21

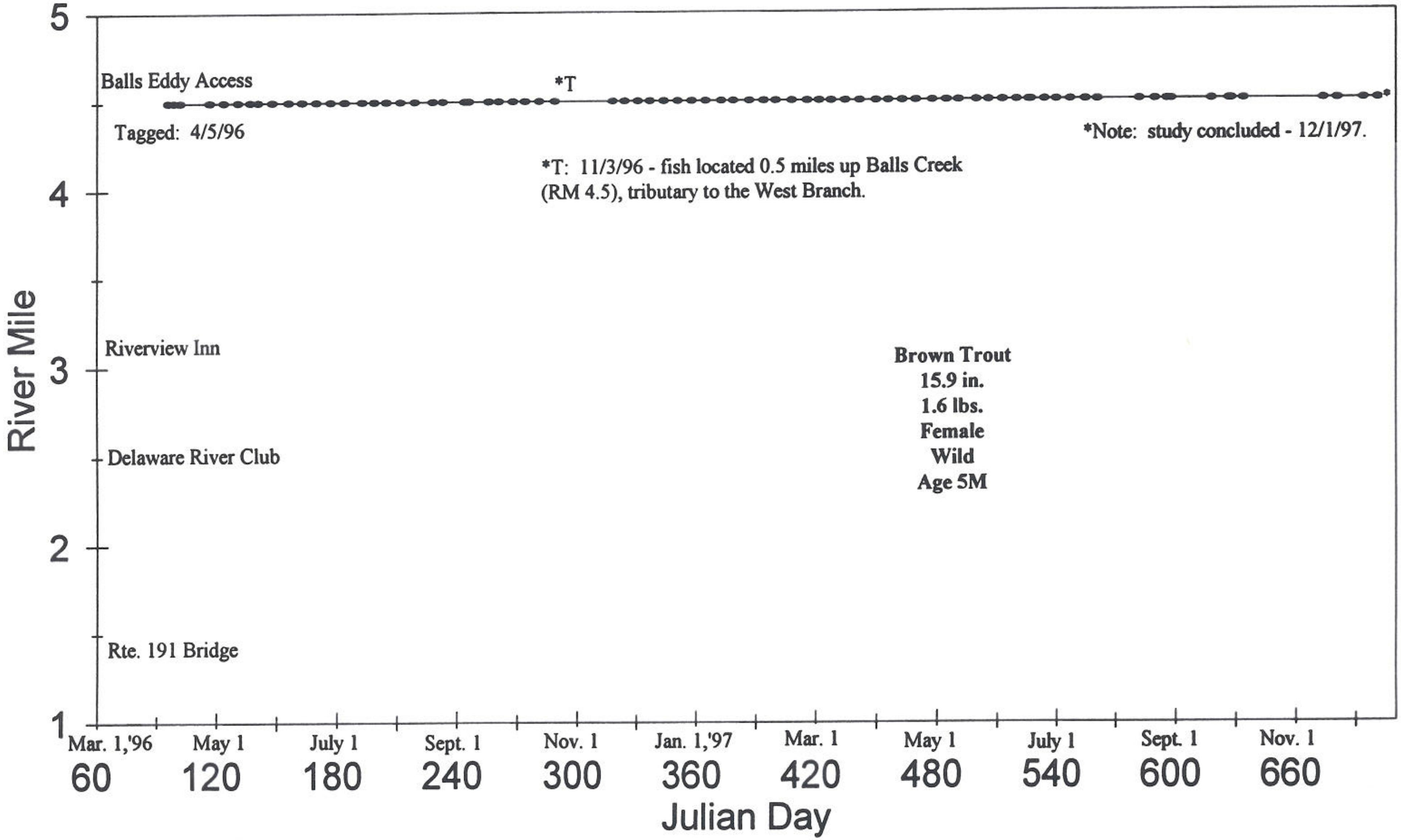


West Branch
Balls Eddy
Twin Falls Campground
Tagged: 10/26/95
Confluence EB/WB
Stockport
Hemlock View Farms
Equinunk Creek
Lordville
Delaware River
River Mile
4
2
74.4/0
72.4
70.4
68.4
66.4
64.4
62.4
Rainbow Trout
15.1 in.
1.2 lbs.
Wild
Age 3+
*Note: could not locate after 7/9/96
Oct. 1,'95
Nov. 1
Dec. 1
Jan. 1,'96
Feb. 1
Mar. 1
Apr. 1
May 1
June 1
July 1
Aug. 1
270
300
330
360
390
420
450
480
510
540
570
Julian Day

# WB 1 - 2

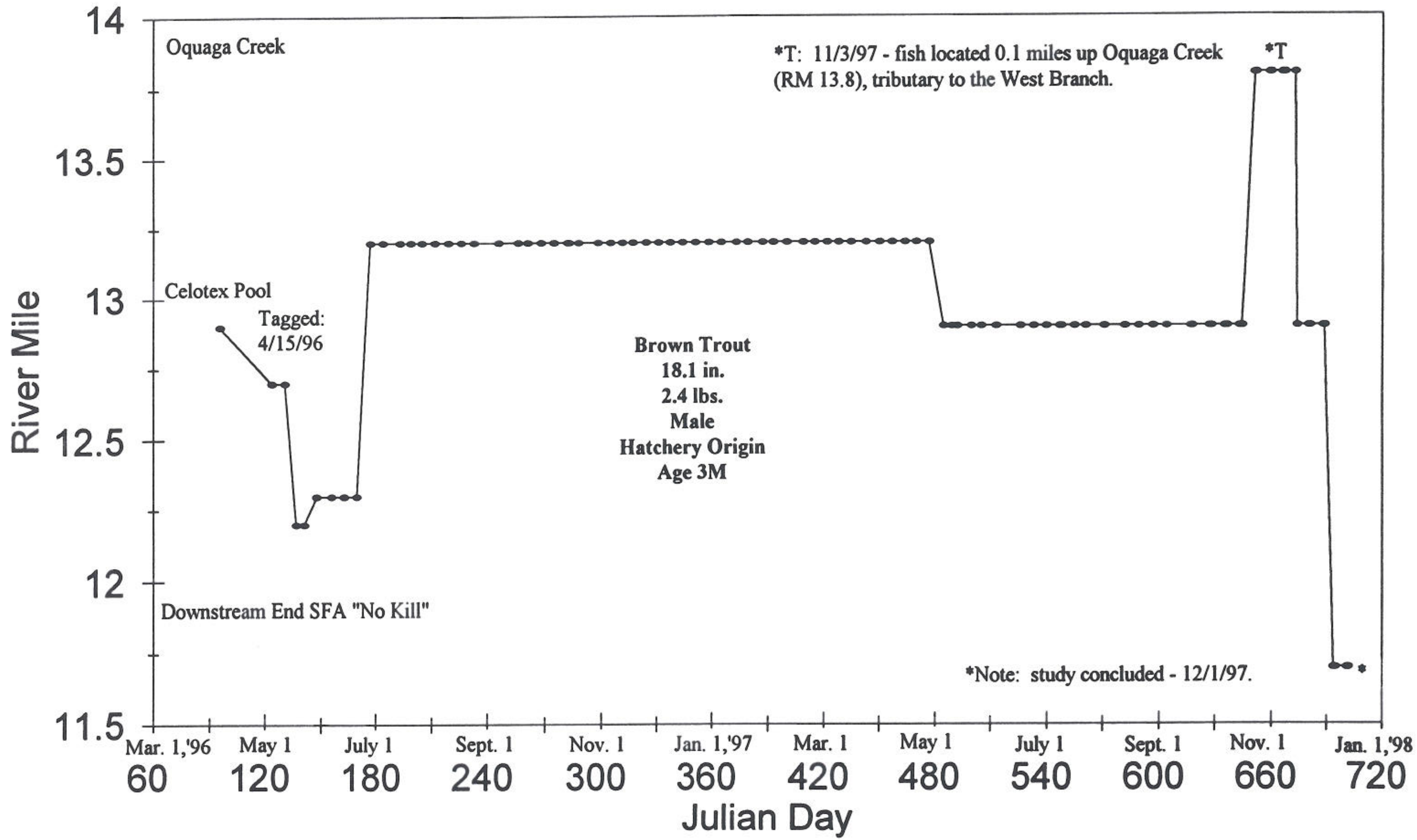

West Branch
Delaware River
River Mile
5
74.4/0
69.4
64.4
59.4
54.4
49.4
Tagged: 4/5/96
Delaware River Club
Confluence EB/WB
Hemlock View Farm
Lordville
Dela. Valley Central School
Callicoon Creek
Rainbow Trout
16.0 in.
1.6 lbs.
Female
Wild
Age 4M
*Note: study concluded - 12/1/97.
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
60
120
180
240
300
360
420
480
540
600
660
Julian Day

# WB 2 - 2



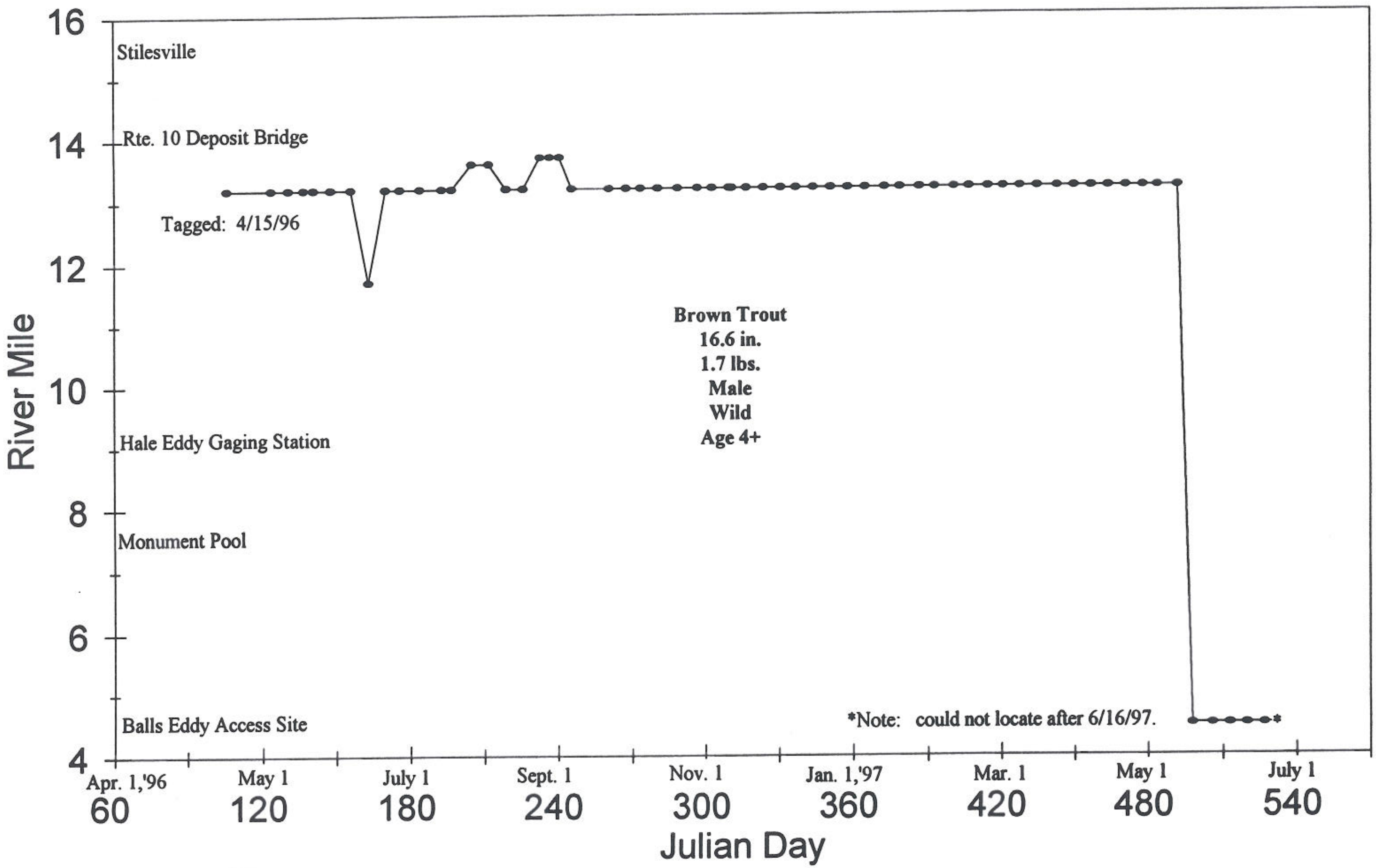
River Mile
5
4
3
2
1
Balls Eddy Access
Tagged: 4/5/96
*T
*T: 11/3/96 - fish located 0.5 miles up Balls Creek (RM 4.5), tributary to the West Branch.
*Note: study concluded - 12/1/97.
Riverview Inn
Delaware River Club
Rte. 191 Bridge
Brown Trout
15.9 in.
1.6 lbs.
Female
Wild
Age 5M
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
60
120
180
240
300
360
420
480
540
600
660
Julian Day

# WB 3 - 2



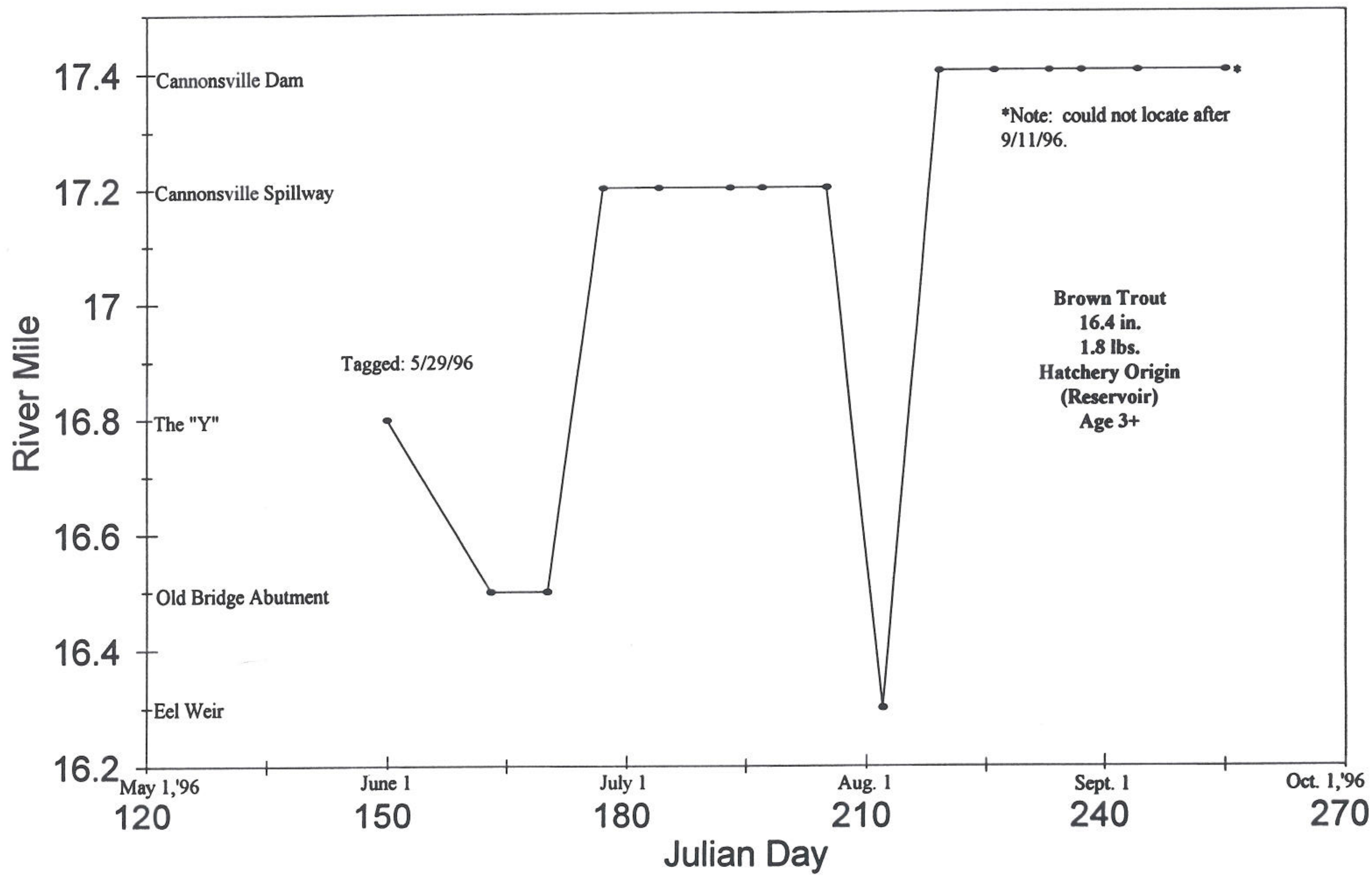
14
13.5
13
12.5
12
11.5
River Mile
Oquaga Creek
Celotex Pool
Tagged:
4/15/96
Downstream End SFA "No Kill"
Brown Trout
18.1 in.
2.4 lbs.
Male
Hatchery Origin
Age 3M
*T: 11/3/97 - fish located 0.1 miles up Oquaga Creek
(RM 13.8), tributary to the West Branch.
*T
*Note: study concluded - 12/1/97.
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# WB 4 - 2



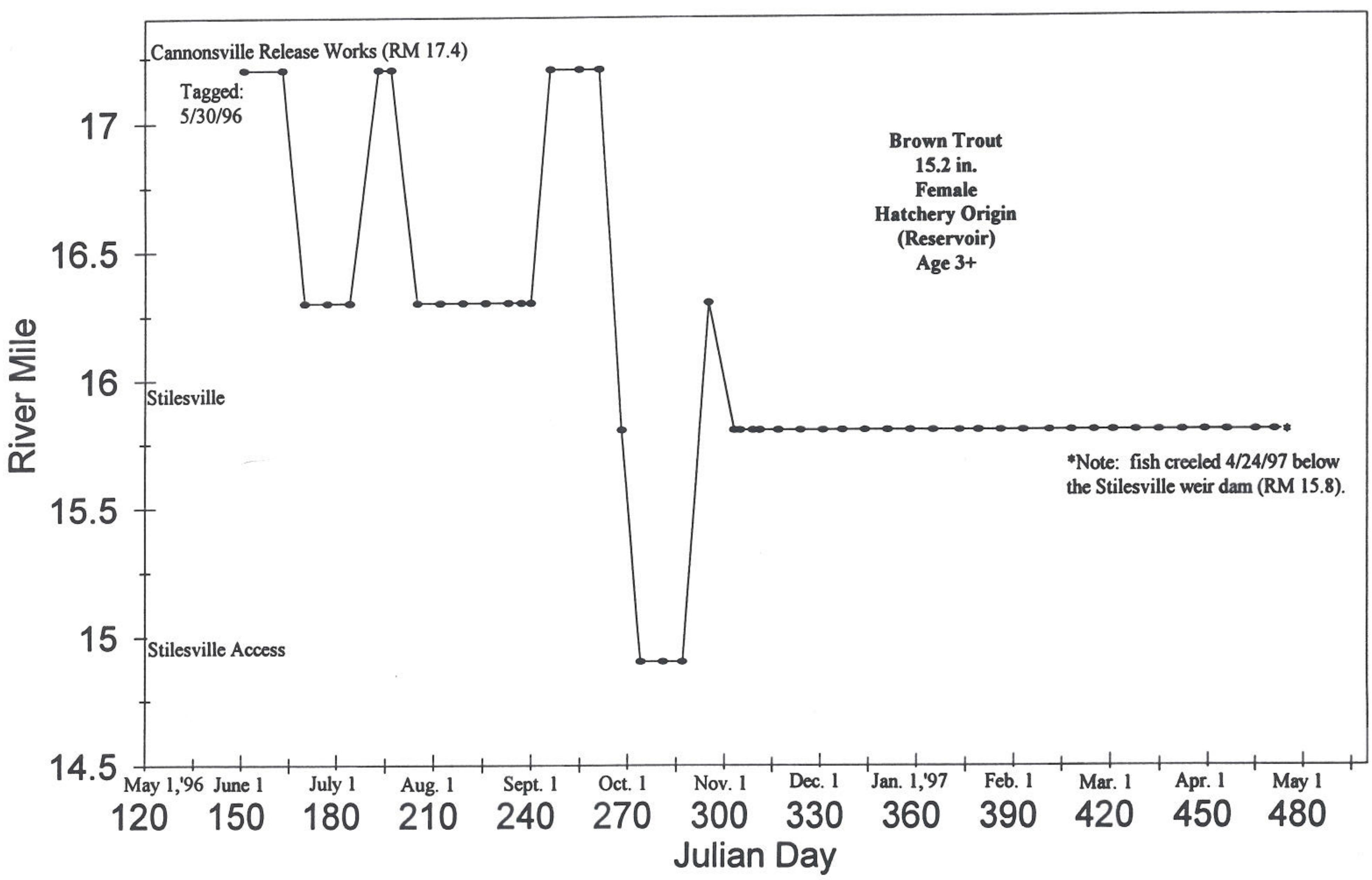
16
14
12
10
8
6
4
River Mile
Stilesville
Rte. 10 Deposit Bridge
Tagged: 4/15/96
Hale Eddy Gaging Station
Monument Pool
Balls Eddy Access Site
Brown Trout
16.6 in.
1.7 lbs.
Male
Wild
Age 4+
*Note: could not locate after 6/16/97.
Apr. 1,'96
60
May 1
120
July 1
180
Sept. 1
240
Nov. 1
300
Jan. 1,'97
360
Mar. 1
420
May 1
480
July 1
540
Julian Day

# WB 5 - 2

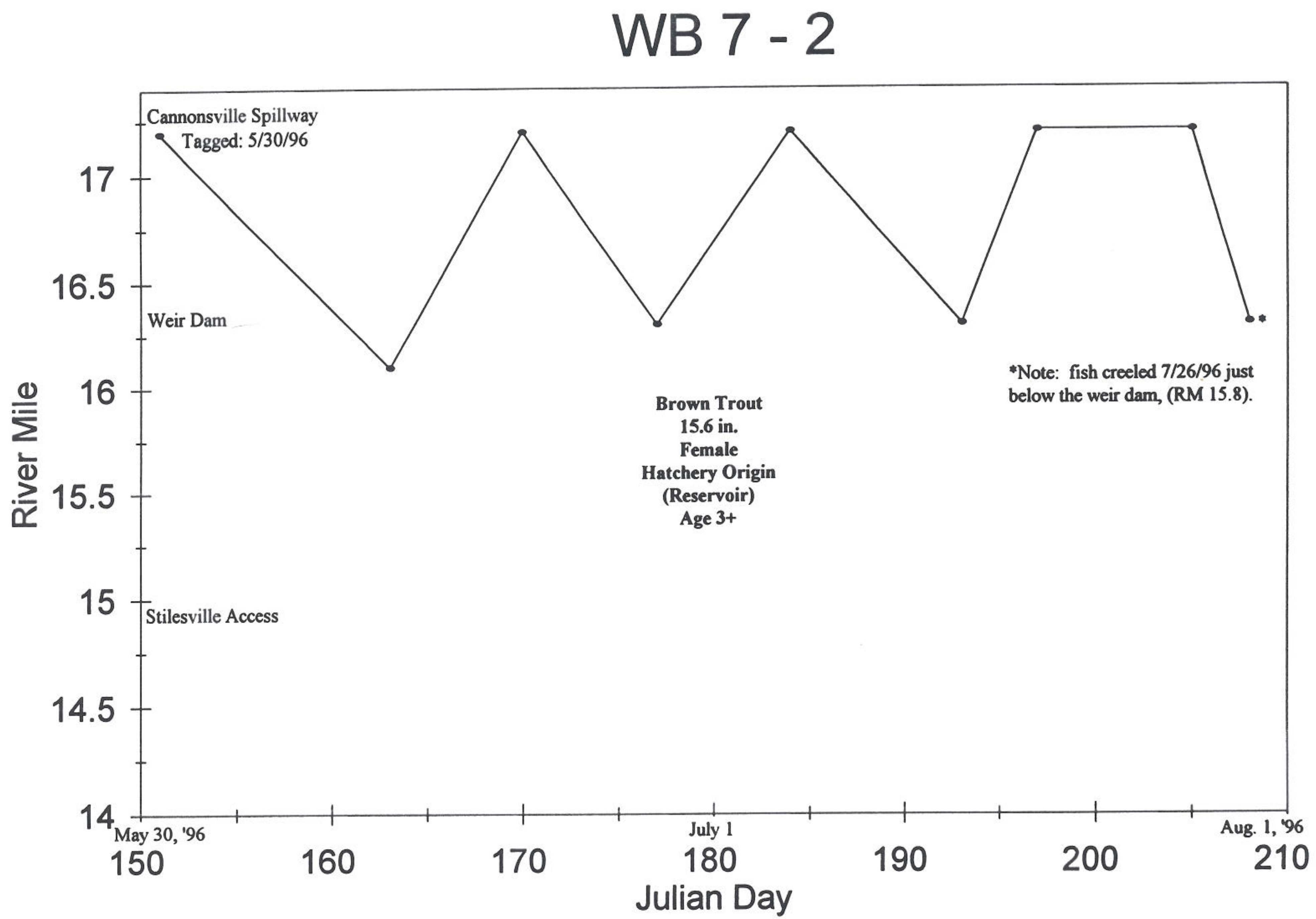


River Mile
17.4
17.2
17
16.8
16.6
16.4
16.2
Cannonsville Dam
Cannonsville Spillway
The "Y"
Old Bridge Abutment
Eel Weir
Tagged: 5/29/96
*Note: could not locate after 9/11/96.
Brown Trout
16.4 in.
1.8 lbs.
Hatchery Origin
(Reservoir)
Age 3+
May 1,'96
June 1
July 1
Aug. 1
Sept. 1
Oct. 1,'96
120
150
180
210
240
270
Julian Day

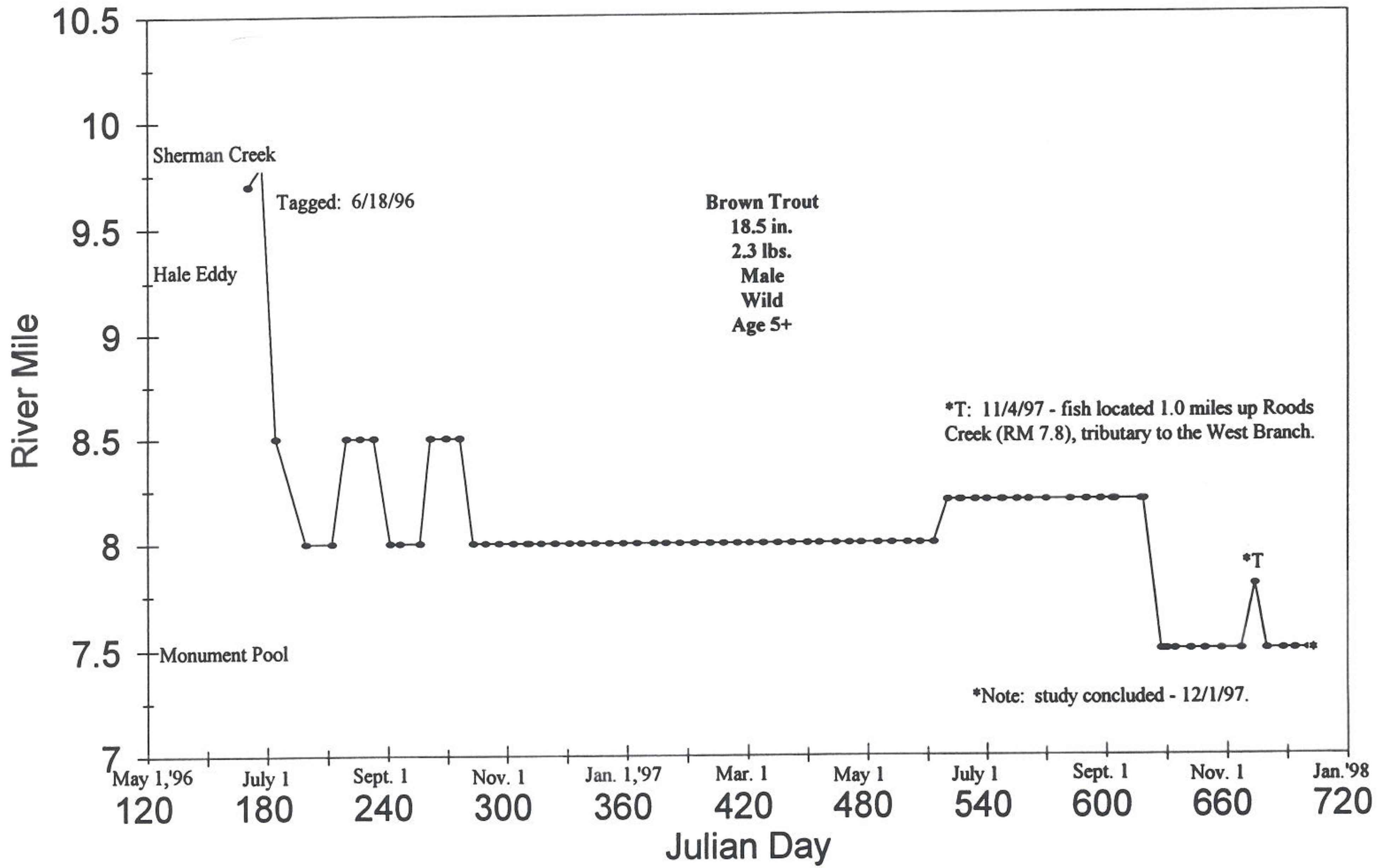
# WB 6 - 2



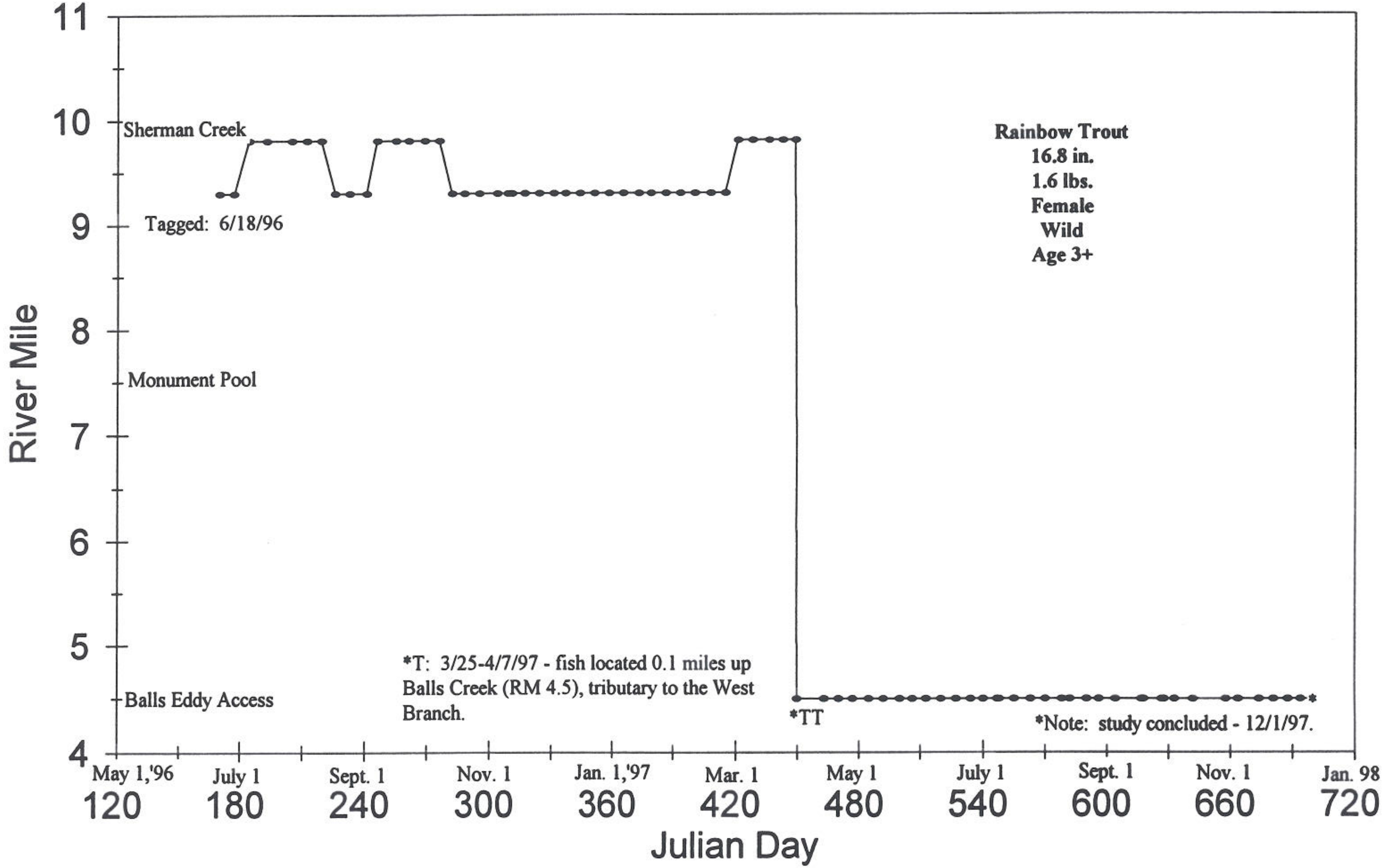
Cannonsville Release Works (RM 17.4)
Tagged:
5/30/96
Stilesville
Stilesville Access
Brown Trout
15.2 in.
Female
Hatchery Origin
(Reservoir)
Age 3+
*Note: fish creeled 4/24/97 below
the Stilesville weir dam (RM 15.8).
River Mile
17
16.5
16
15.5
15
14.5
May 1,'96
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'97
Feb. 1
Mar. 1
Apr. 1
May 1
120
150
180
210
240
270
300
330
360
390
420
450
480
Julian Day


WB 7 - 2
River Mile
17
16.5
16
15.5
15
14.5
14
Julian Day
150
160
170
180
190
200
210
May 30, '96
July 1
Aug. 1, '96
Cannonsville Spillway
Tagged: 5/30/96
Weir Dam
Stilesville Access
Brown Trout
15.6 in.
Female
Hatchery Origin
(Reservoir)
Age 3+
*Note: fish creeled 7/26/96 just
below the weir dam, (RM 15.8).

# WB 8 - 2

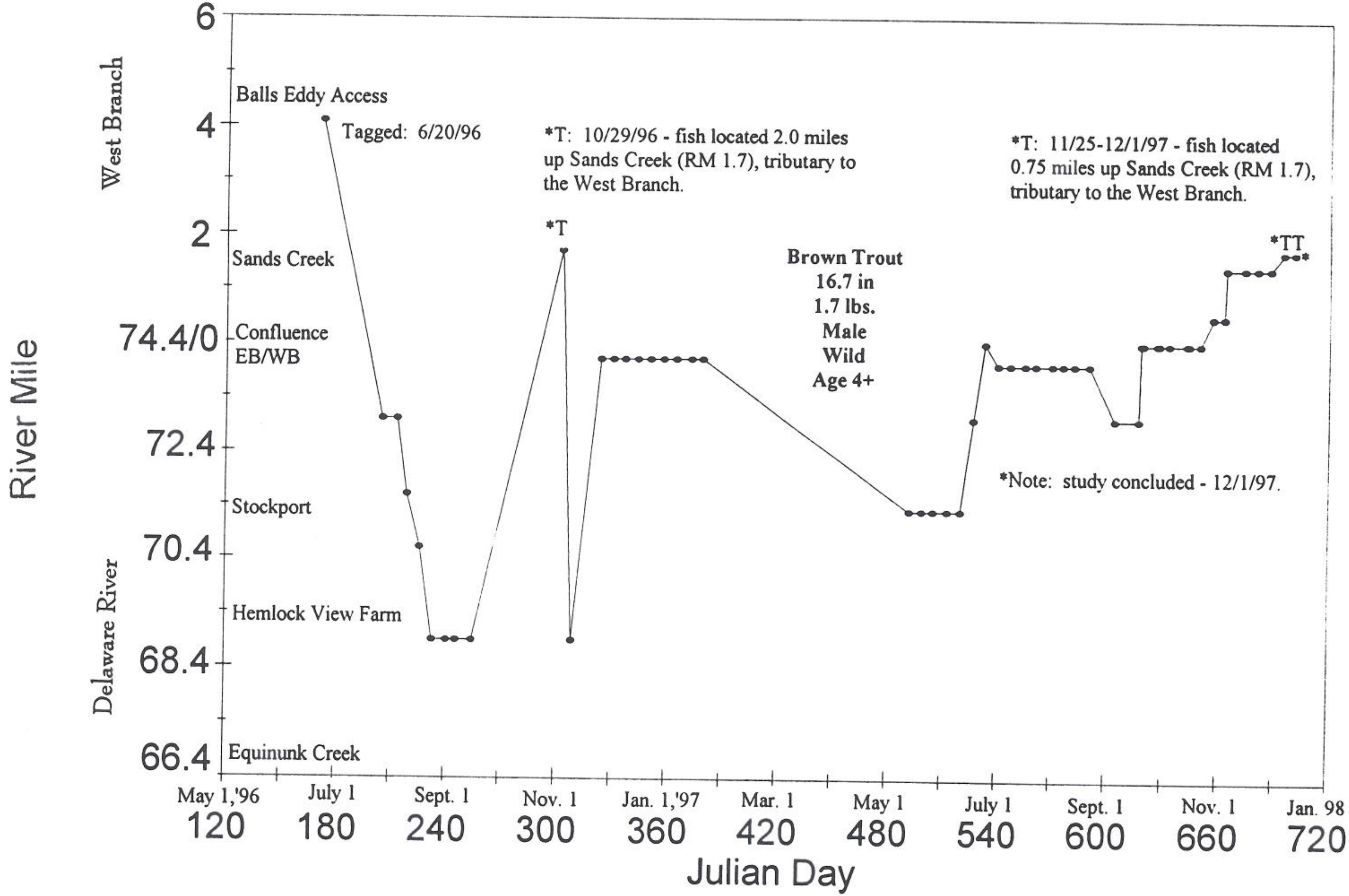

River Mile
10.5
10
9.5
9
8.5
8
7.5
7
Sherman Creek
Tagged: 6/18/96
Hale Eddy
Monument Pool
Brown Trout
18.5 in.
2.3 lbs.
Male
Wild
Age 5+
*T: 11/4/97 - fish located 1.0 miles up Roods Creek (RM 7.8), tributary to the West Branch.
*T
*Note: study concluded - 12/1/97.
May 1,'96
120
July 1
180
Sept. 1
240
Nov. 1
300
Jan. 1,'97
360
Mar. 1
420
May 1
480
July 1
540
Sept. 1
600
Nov. 1
660
Jan.'98
720
Julian Day

# WB 9 - 2



River Mile
11
10
9
8
7
6
5
4
Sherman Creek
Tagged: 6/18/96
Monument Pool
Balls Eddy Access
Rainbow Trout
16.8 in.
1.6 lbs.
Female
Wild
Age 3+
*T: 3/25-4/7/97 - fish located 0.1 miles up Balls Creek (RM 4.5), tributary to the West Branch.
*TT
*Note: study concluded - 12/1/97.
May 1,'96
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# WB 10 -2



River Mile
West Branch
Delaware River
6
4
2
74.4/0
72.4
70.4
68.4
66.4
Balls Eddy Access
Tagged: 6/20/96
Sands Creek
Confluence
EB/WB
Stockport
Hemlock View Farm
Equinunk Creek
*T: 10/29/96 - fish located 2.0 miles up Sands Creek (RM 1.7), tributary to the West Branch.
*T
Brown Trout
16.7 in
1.7 lbs.
Male
Wild
Age 4+
*T: 11/25-12/1/97 - fish located 0.75 miles up Sands Creek (RM 1.7), tributary to the West Branch.
*TT
*
*Note: study concluded - 12/1/97.
May 1,'96
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
120
180
240
300
360
420
480
540
600
660
720
Julian Day

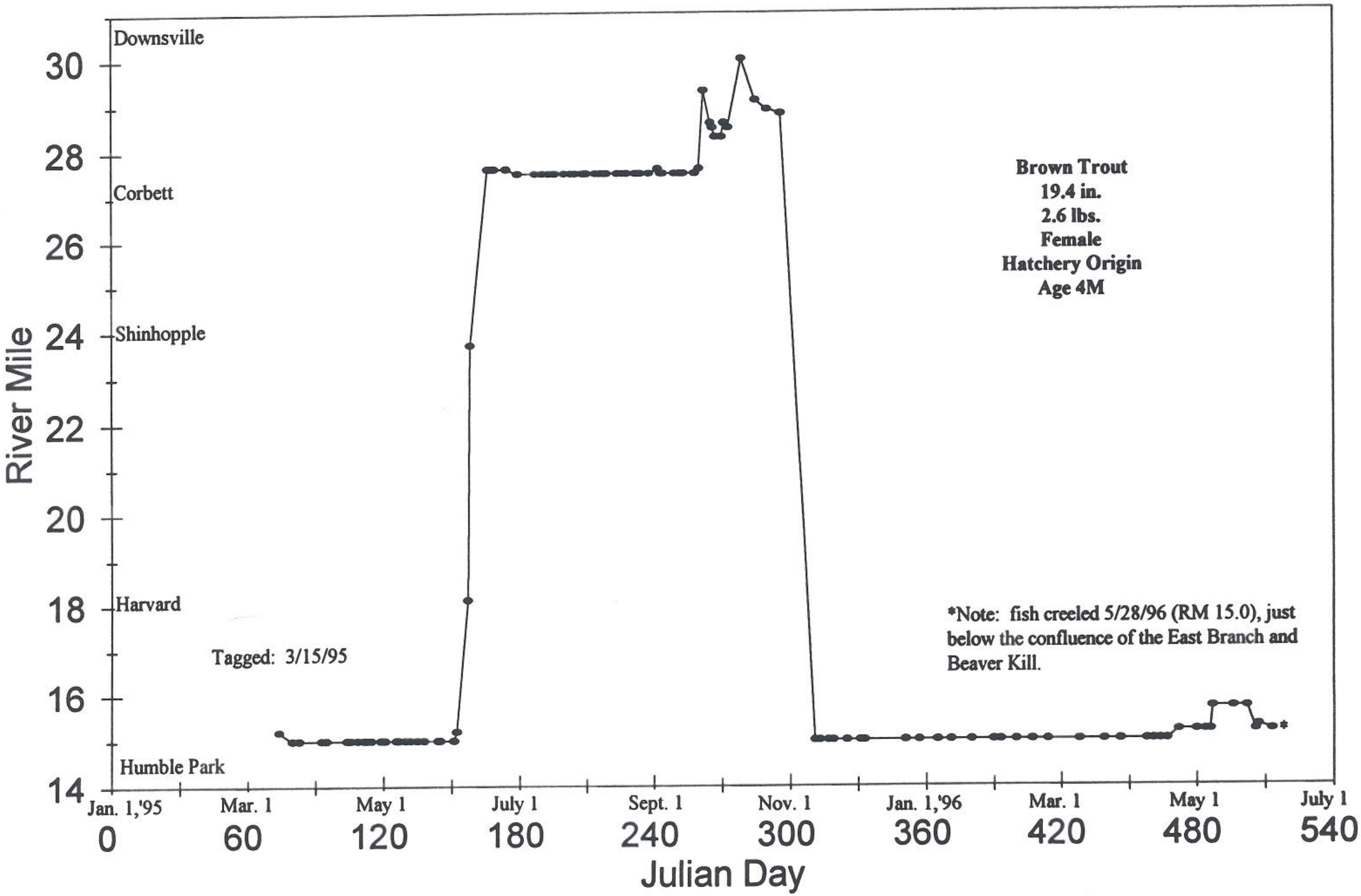
APPENDIX 2:

LOWER EAST BRANCH DELAWARE RIVER

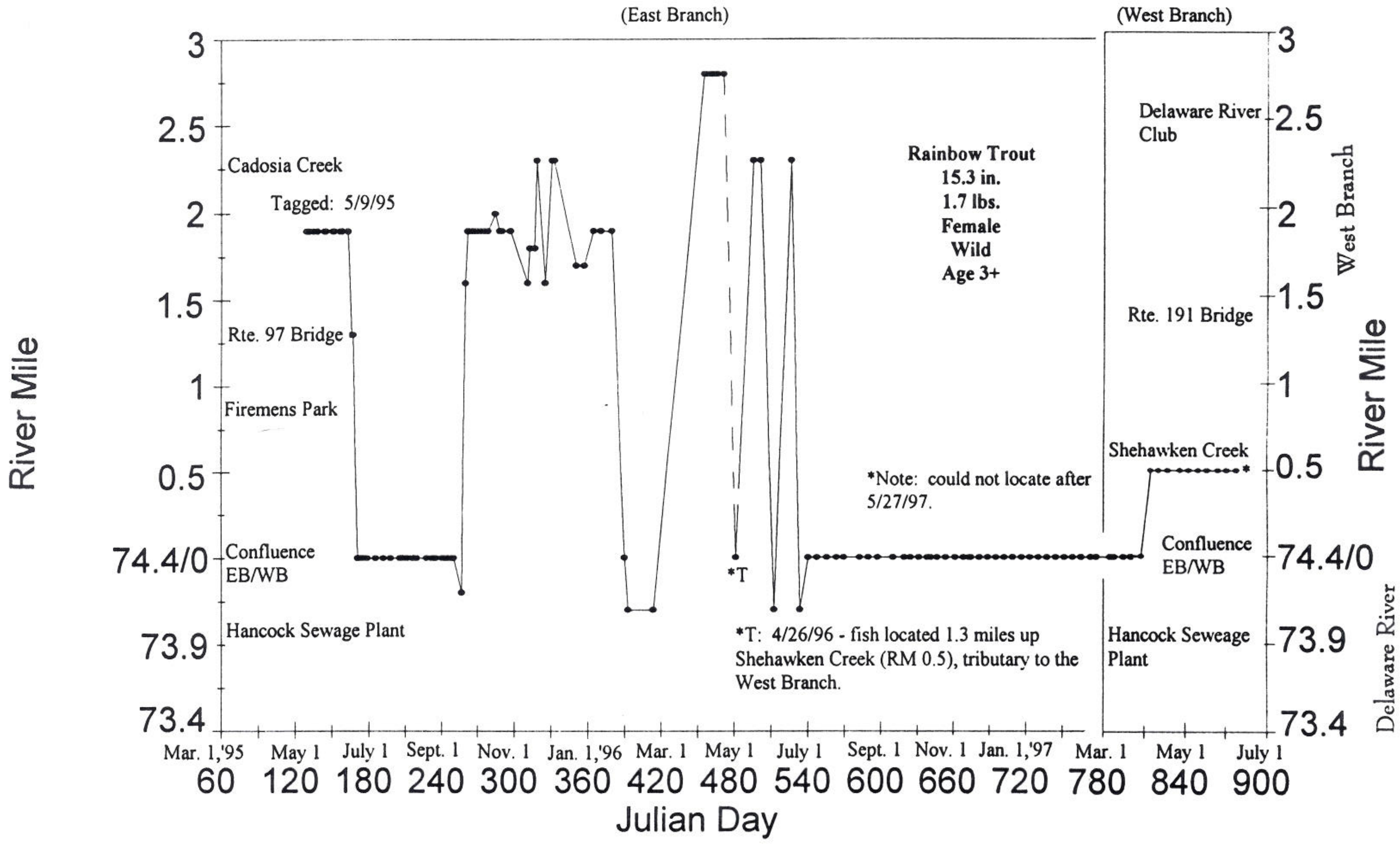
Movement history of each radiotagged trout through December 1, 1997

EB 1, EB 7 to EB 12 : Tagged 1995
EB 4-2 to EB 7-2; EB 12-2 to EB 18-2: Tagged 1996

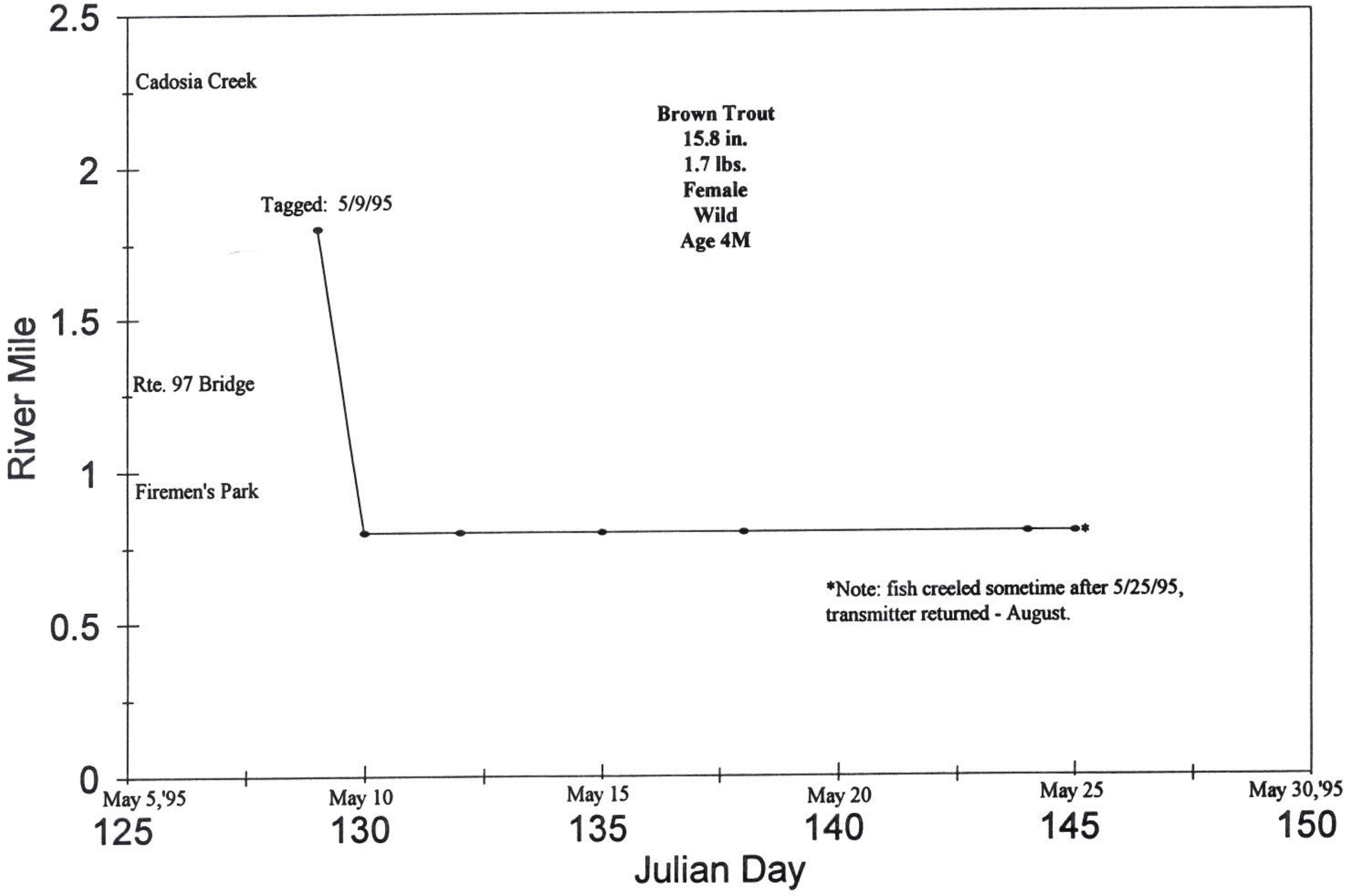
# EB-1


Downsville
Corbett
Shinhopple
Harvard
Humble Park
River Mile
30
28
26
24
22
20
18
16
14
Tagged: 3/15/95
Brown Trout
19.4 in.
2.6 lbs.
Female
Hatchery Origin
Age 4M
*Note: fish creeled 5/28/96 (RM 15.0), just below the confluence of the East Branch and Beaver Kill.
Jan. 1,'95
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
0
60
120
180
240
300
360
420
480
540
Julian Day

# EB-7

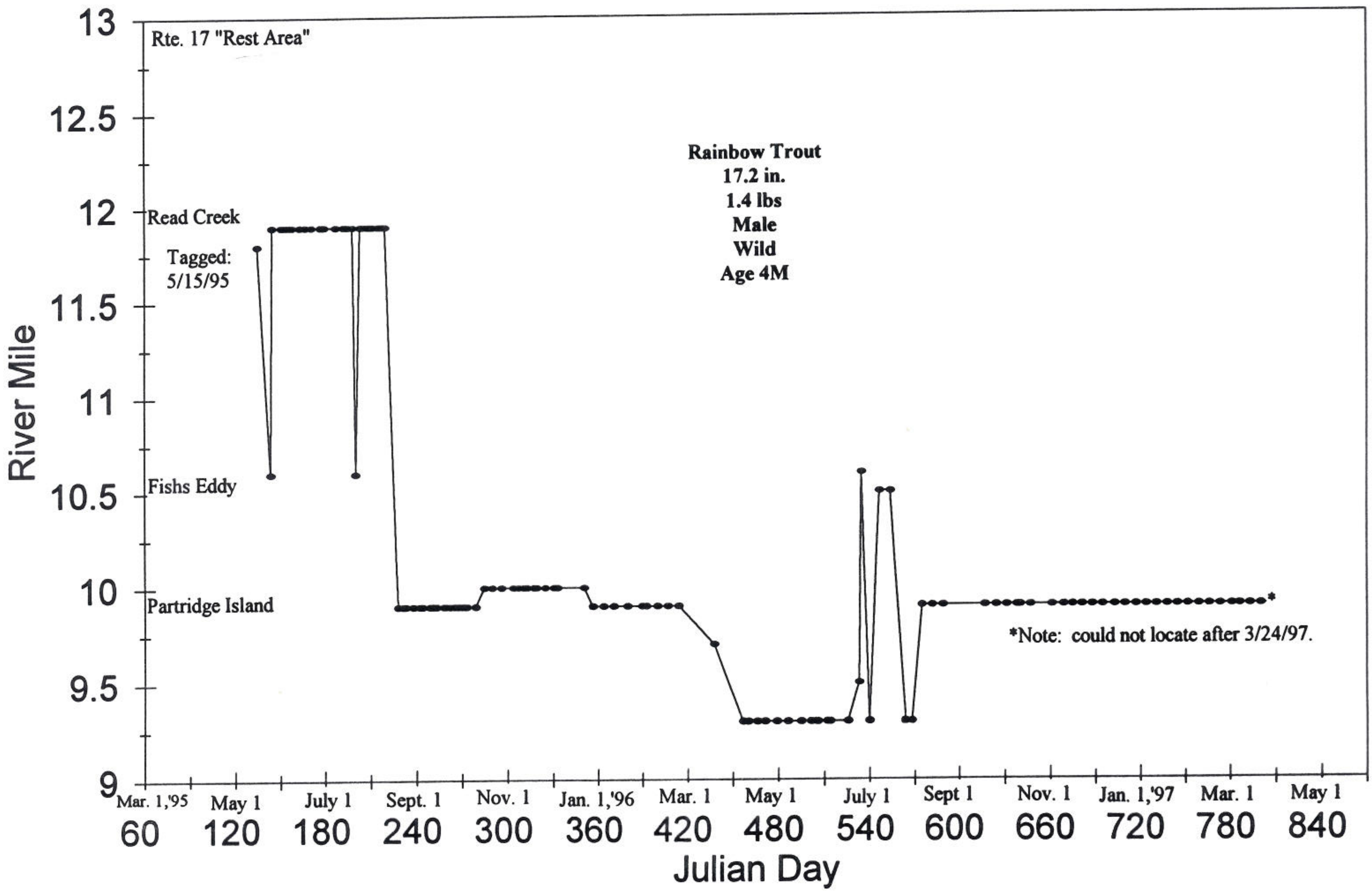

(East Branch)
(West Branch)
River Mile
3
2.5
2
1.5
1
0.5
74.4/0
73.9
73.4
Cadosia Creek
Tagged: 5/9/95
Rte. 97 Bridge
Firemens Park
Confluence EB/WB
Hancock Sewage Plant
*T
Rainbow Trout
15.3 in.
1.7 lbs.
Female
Wild
Age 3+
*Note: could not locate after 5/27/97.
*T: 4/26/96 - fish located 1.3 miles up Shehawken Creek (RM 0.5), tributary to the West Branch.
Delaware River Club
Rte. 191 Bridge
Shehawken Creek
Confluence EB/WB
Hancock Seweage Plant
West Branch
Delaware River
Mar. 1,'95
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
60
120
180
240
300
360
420
480
540
600
660
720
780
840
900
Julian Day

# EB-8



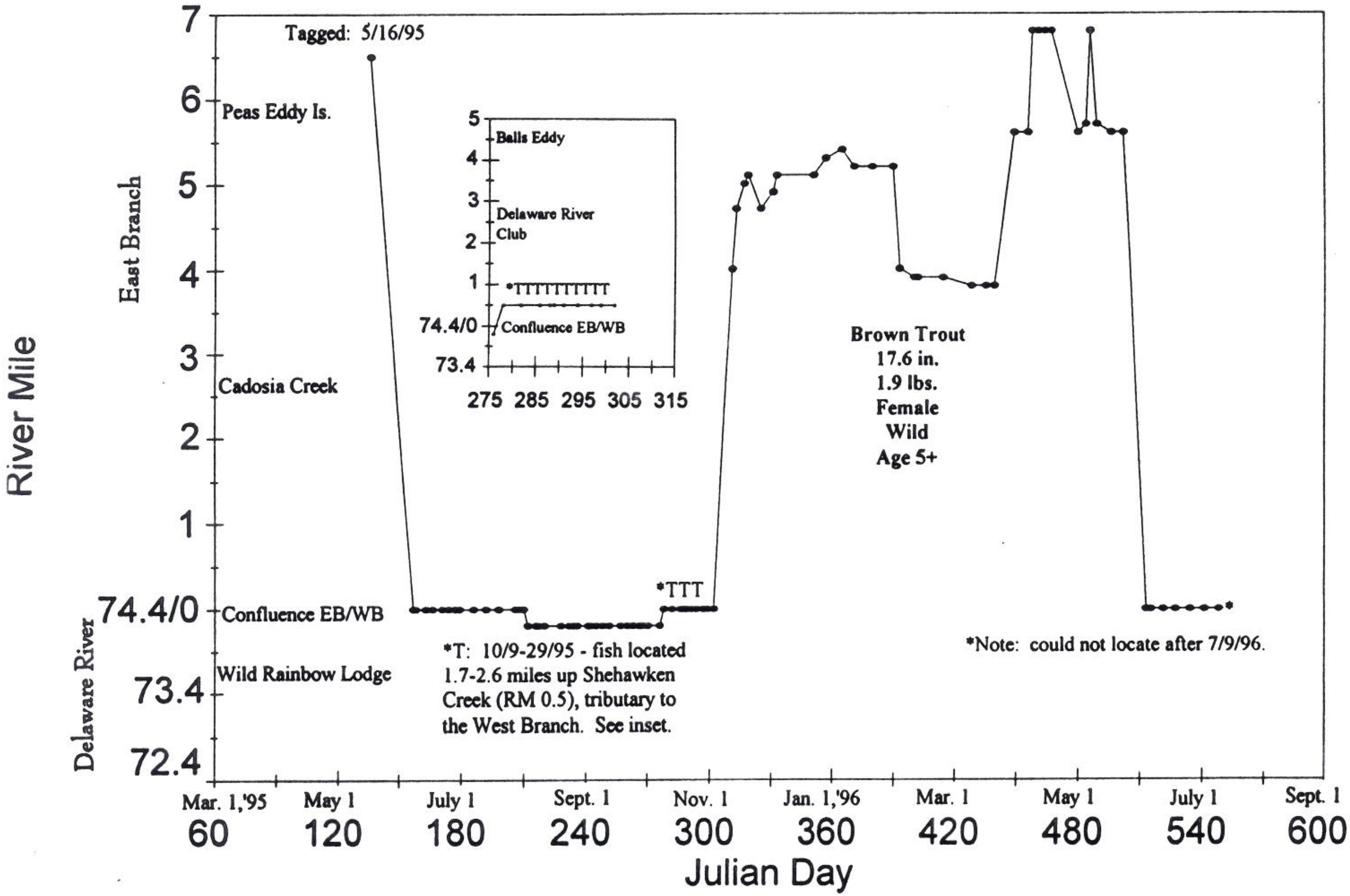
River Mile
2.5
2
1.5
1
0.5
0
Cadosia Creek
Rte. 97 Bridge
Firemen's Park
Tagged: 5/9/95
Brown Trout
15.8 in.
1.7 lbs.
Female
Wild
Age 4M
*Note: fish creeled sometime after 5/25/95,
transmitter returned - August.
May 5,'95
125
May 10
130
May 15
135
May 20
140
May 25
145
May 30,'95
150
Julian Day

# EB-9



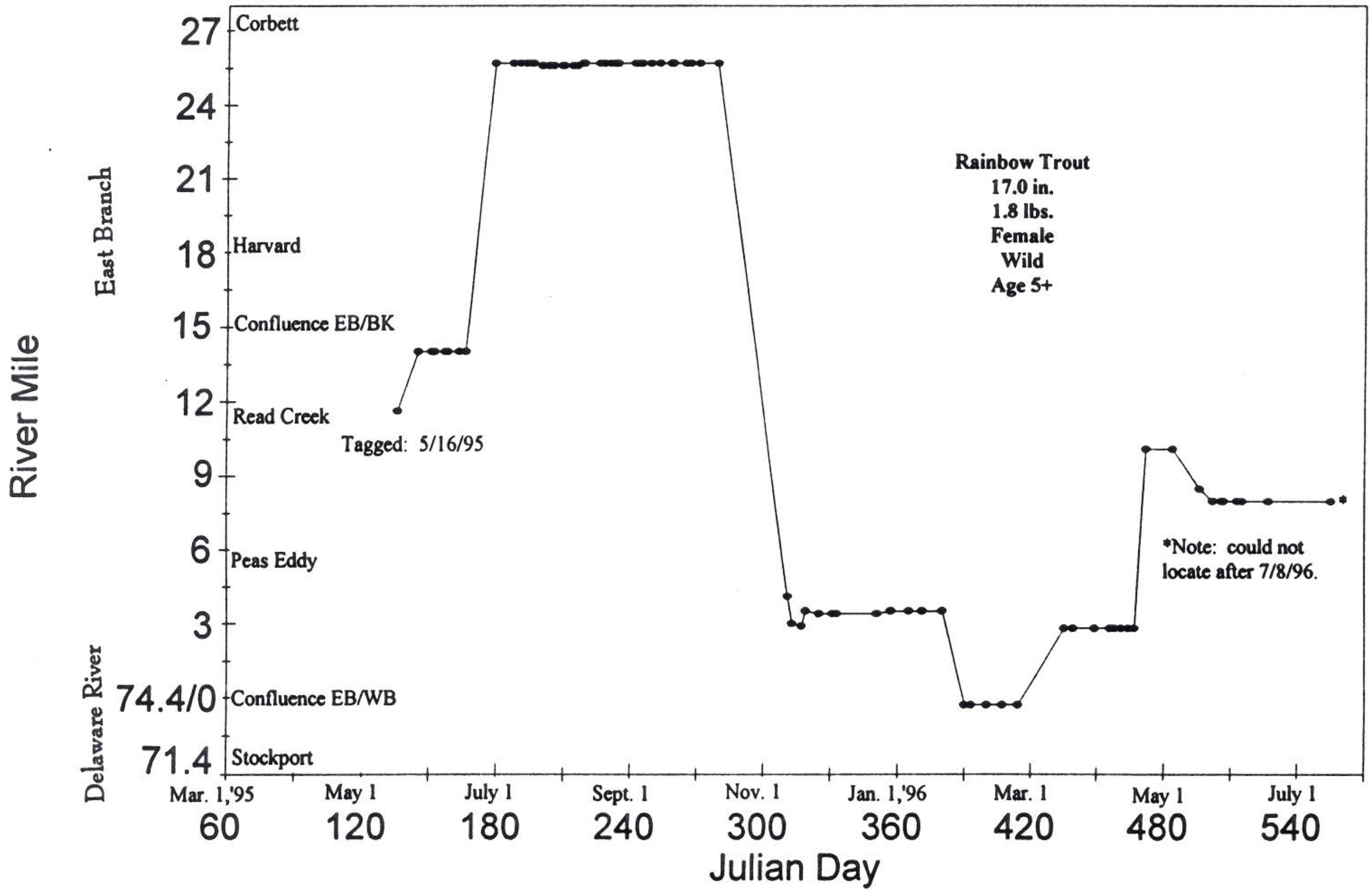
Rte. 17 "Rest Area"
Read Creek
Tagged:
5/15/95
Fishs Eddy
Partridge Island
Rainbow Trout
17.2 in.
1.4 lbs
Male
Wild
Age 4M
*Note: could not locate after 3/24/97.
River Mile
13
12.5
12
11.5
11
10.5
10
9.5
9
Mar. 1,'95
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
60
120
180
240
300
360
420
480
540
600
660
720
780
840
Julian Day

# EB-10



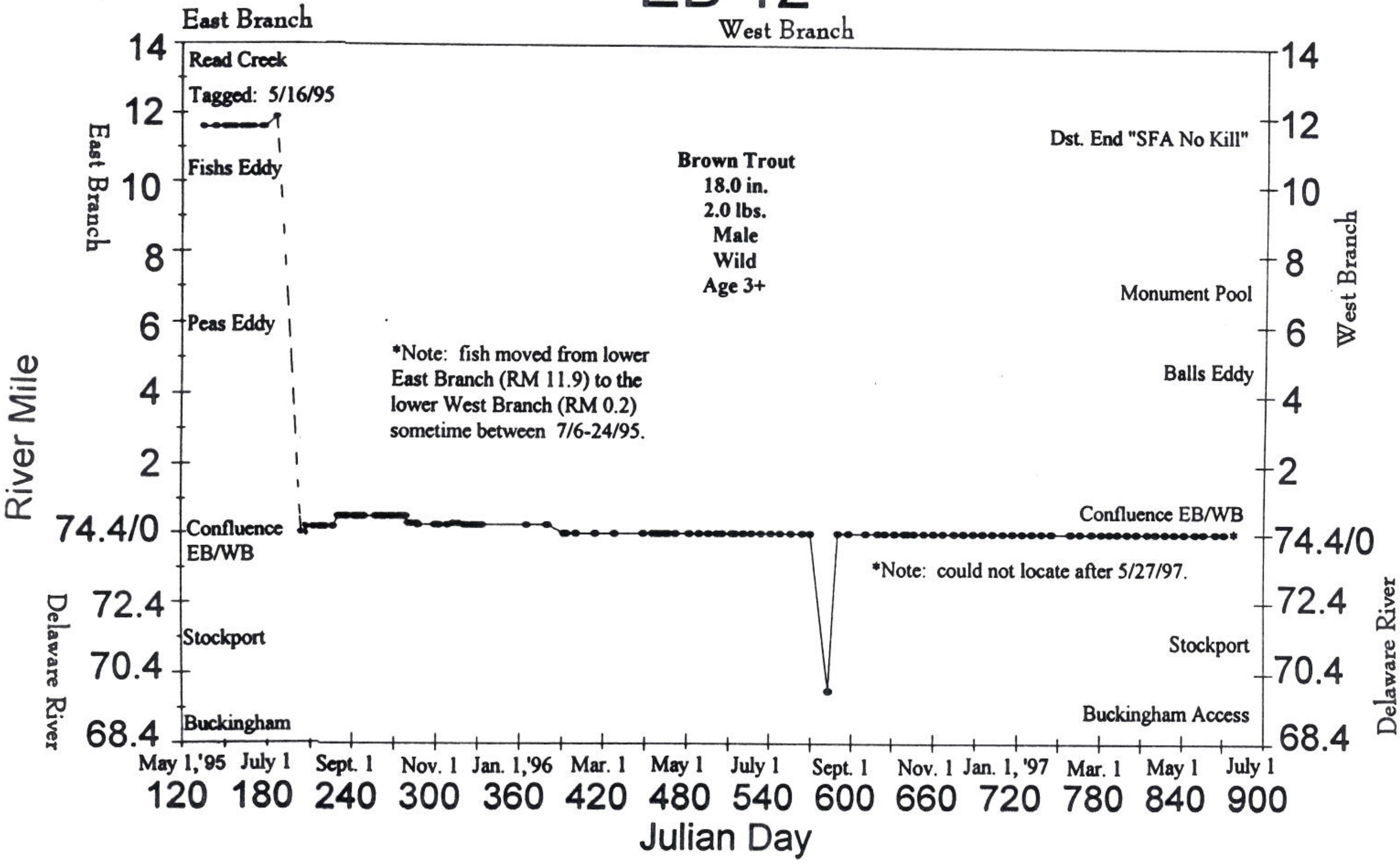
River Mile
East Branch
Delaware River
7
6
5
4
3
2
1
74.4/0
73.4
72.4
Tagged: 5/16/95
Peas Eddy Is.
Cadosia Creek
Confluence EB/WB
Wild Rainbow Lodge
Balls Eddy
Delaware River Club
Confluence EB/WB
*TTTTTTTTTT
275 285 295 305 315
*TTT
*T: 10/9-29/95 - fish located 1.7-2.6 miles up Shehawken Creek (RM 0.5), tributary to the West Branch. See inset.
Brown Trout
17.6 in.
1.9 lbs.
Female
Wild
Age 5+
*Note: could not locate after 7/9/96.
Mar. 1,'95
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
60
120
180
240
300
360
420
480
540
600
Julian Day

# EB-11

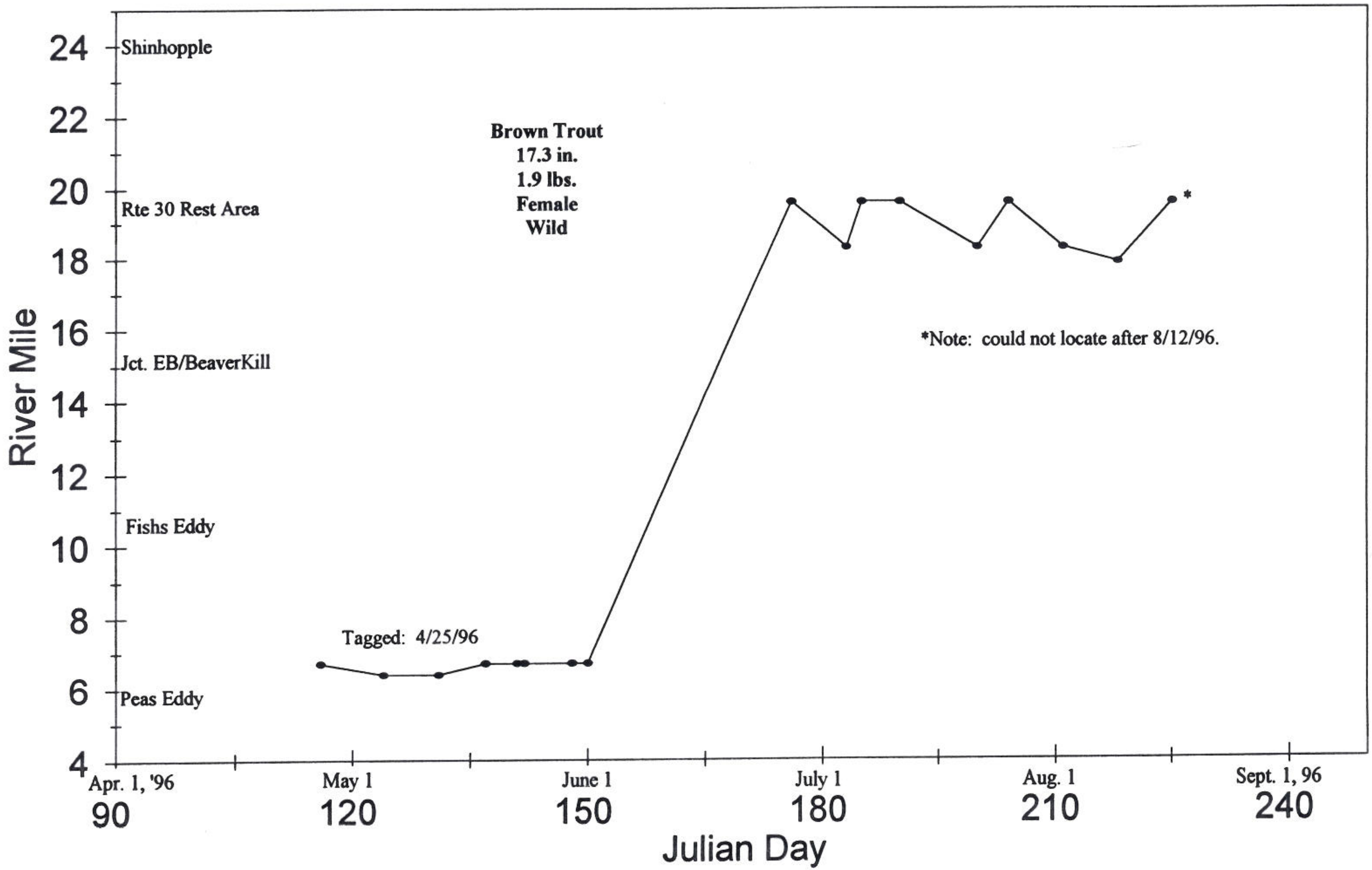


River Mile
East Branch
Delaware River
27
24
21
18
15
12
9
6
3
74.4/0
71.4
Corbett
Harvard
Confluence EB/BK
Read Creek
Peas Eddy
Confluence EB/WB
Stockport
Tagged: 5/16/95
Rainbow Trout
17.0 in.
1.8 lbs.
Female
Wild
Age 5+
*Note: could not locate after 7/8/96.
Mar. 1,'95
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
60
120
180
240
300
360
420
480
540
Julian Day

# EB 12

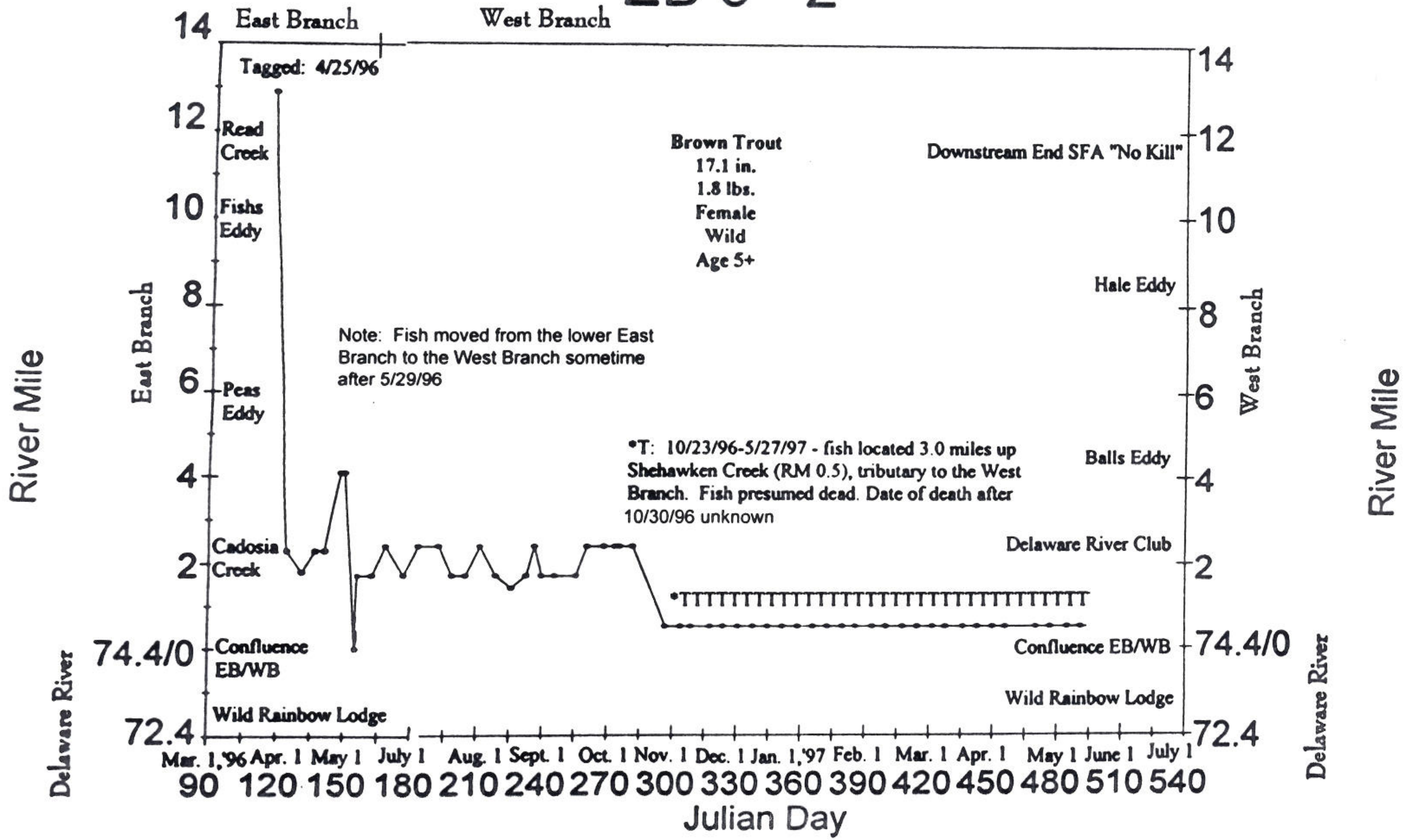

East Branch
West Branch
Read Creek
Tagged: 5/16/95
Fishs Eddy
Peas Eddy
Confluence EB/WB
Stockport
Buckingham
Brown Trout
18.0 in.
2.0 lbs.
Male
Wild
Age 3+
*Note: fish moved from lower East Branch (RM 11.9) to the lower West Branch (RM 0.2) sometime between 7/6-24/95.
Dst. End "SFA No Kill"
Monument Pool
Balls Eddy
Confluence EB/WB
*Note: could not locate after 5/27/97.
Stockport
Buckingham Access
River Mile
East Branch
Delaware River
West Branch
Delaware River
14
12
10
8
6
4
2
74.4/0
72.4
70.4
68.4
May 1,'95 July 1 Sept. 1 Nov. 1 Jan. 1,'96 Mar. 1 May 1 July 1 Sept. 1 Nov. 1 Jan. 1, '97 Mar. 1 May 1 July 1
120 180 240 300 360 420 480 540 600 660 720 780 840 900
Julian Day

# EB 4 - 2

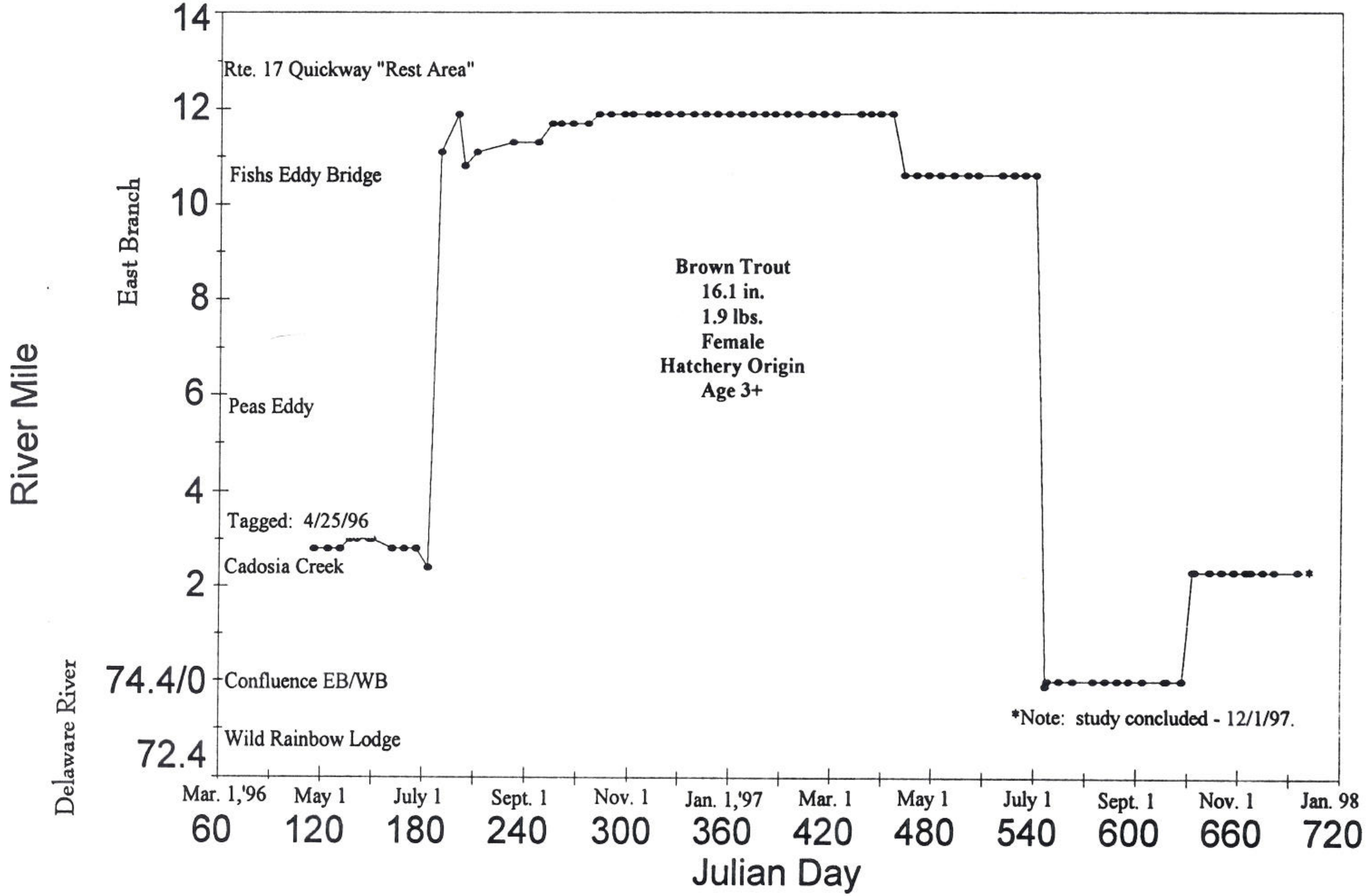


River Mile
24
22
20
18
16
14
12
10
8
6
4
Shinhopple
Rte 30 Rest Area
Jct. EB/BeaverKill
Fishs Eddy
Peas Eddy
Brown Trout
17.3 in.
1.9 lbs.
Female
Wild
Tagged: 4/25/96
*
*Note: could not locate after 8/12/96.
Apr. 1, '96
May 1
June 1
July 1
Aug. 1
Sept. 1, 96
90
120
150
180
210
240
Julian Day

# EB 5 - 2

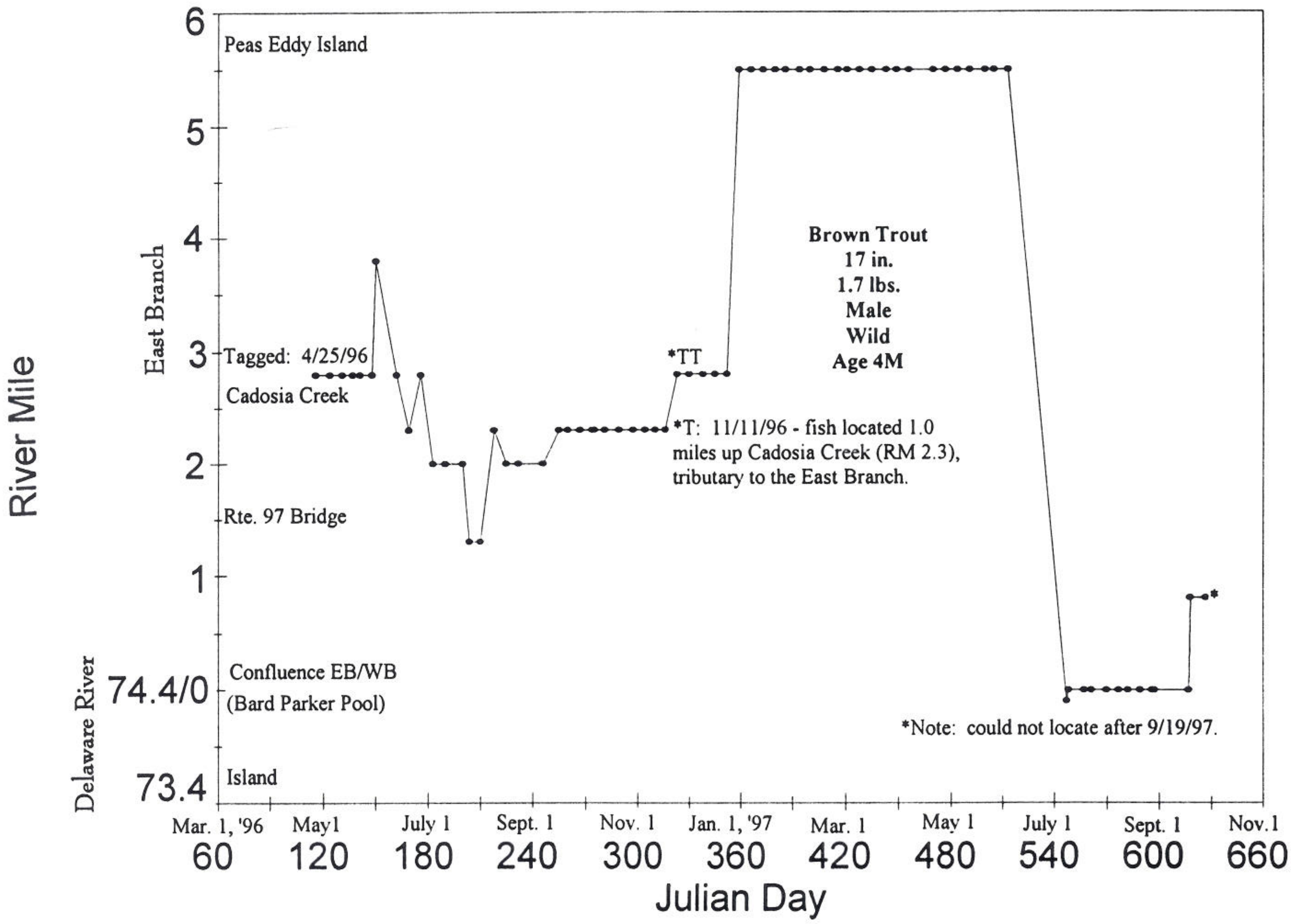

East Branch
West Branch
Tagged: 4/25/96
Read Creek
Fishs Eddy
Peas Eddy
Cadosia Creek
Confluence EB/WB
Wild Rainbow Lodge
Brown Trout
17.1 in.
1.8 lbs.
Female
Wild
Age 5+
Downstream End SFA "No Kill"
Hale Eddy
Balls Eddy
Delaware River Club
Confluence EB/WB
Wild Rainbow Lodge
Note: Fish moved from the lower East Branch to the West Branch sometime after 5/29/96
*T: 10/23/96-5/27/97 - fish located 3.0 miles up Shehawken Creek (RM 0.5), tributary to the West Branch. Fish presumed dead. Date of death after 10/30/96 unknown
River Mile
East Branch
Delaware River
West Branch
14
12
10
8
6
4
2
74.4/0
72.4
Mar. 1,'96 Apr. 1 May 1 July 1 Aug. 1 Sept. 1 Oct. 1 Nov. 1 Dec. 1 Jan. 1,'97 Feb. 1 Mar. 1 Apr. 1 May 1 June 1 July 1
90 120 150 180 210 240 270 300 330 360 390 420 450 480 510 540
Julian Day

# EB 6 - 2



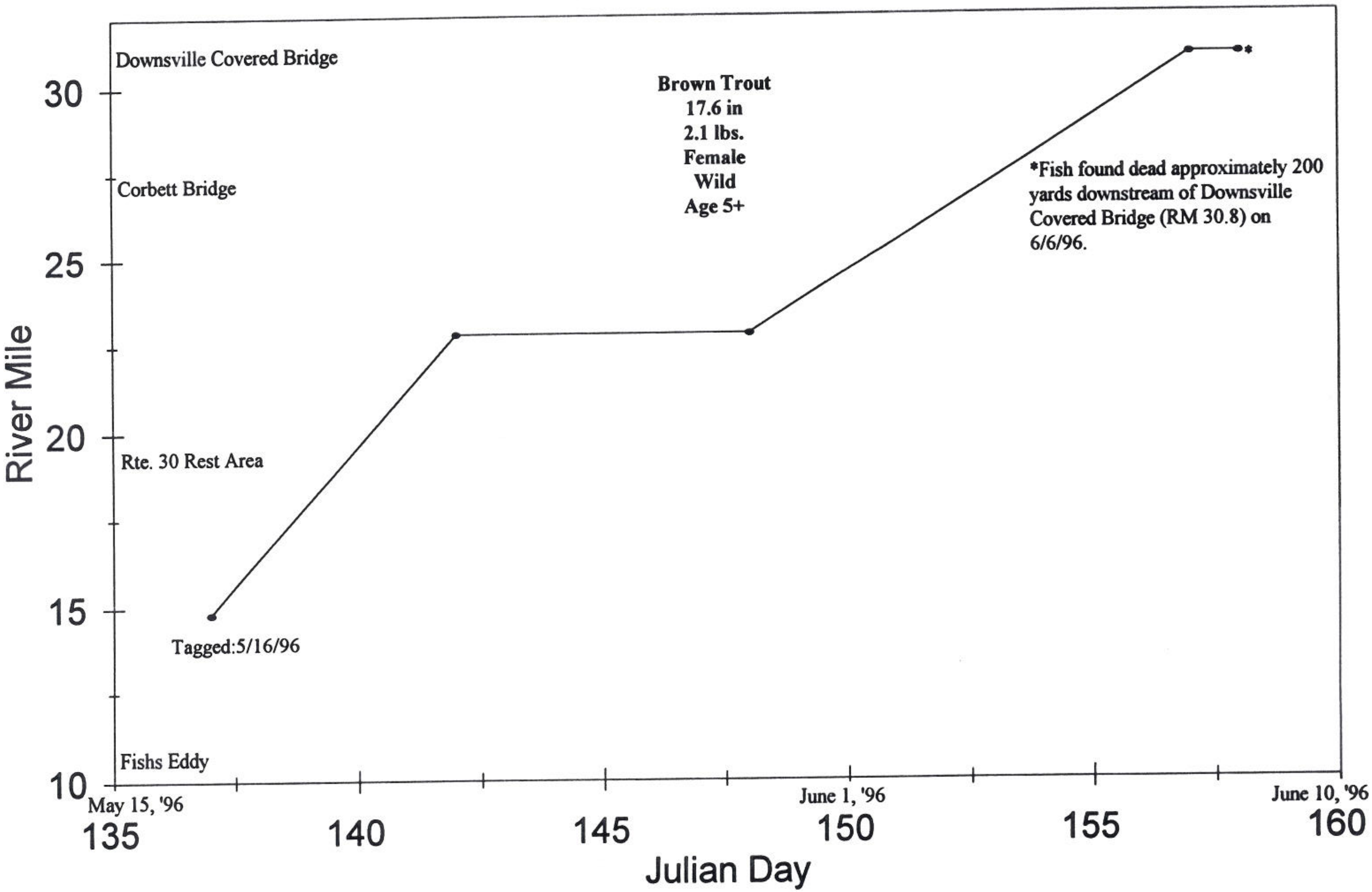
River Mile
East Branch
Delaware River
14
12
10
8
6
4
2
74.4/0
72.4
Rte. 17 Quickway "Rest Area"
Fishs Eddy Bridge
Peas Eddy
Tagged: 4/25/96
Cadosia Creek
Confluence EB/WB
Wild Rainbow Lodge
Brown Trout
16.1 in.
1.9 lbs.
Female
Hatchery Origin
Age 3+
*Note: study concluded - 12/1/97.
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# EB 7 - 2



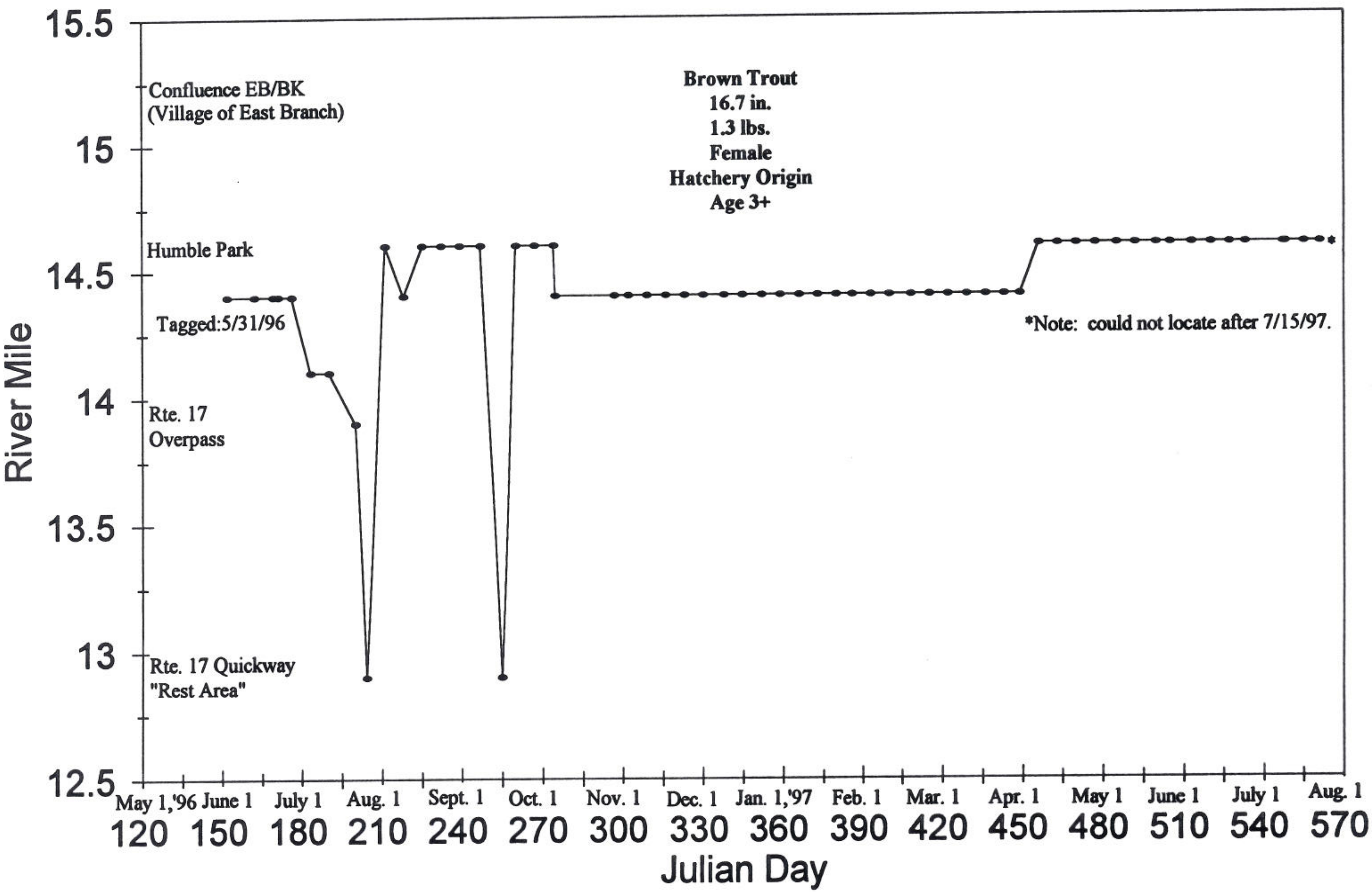
River Mile
East Branch
Delaware River
6
5
4
3
2
1
74.4/0
73.4
Peas Eddy Island
Tagged: 4/25/96
Cadosia Creek
Rte. 97 Bridge
Confluence EB/WB
(Bard Parker Pool)
Island
*TT
*T: 11/11/96 - fish located 1.0 miles up Cadosia Creek (RM 2.3), tributary to the East Branch.
Brown Trout
17 in.
1.7 lbs.
Male
Wild
Age 4M
*Note: could not locate after 9/19/97.
Mar. 1, '96
May1
July 1
Sept. 1
Nov. 1
Jan. 1, '97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
60
120
180
240
300
360
420
480
540
600
660
Julian Day

# EB 12 - 2



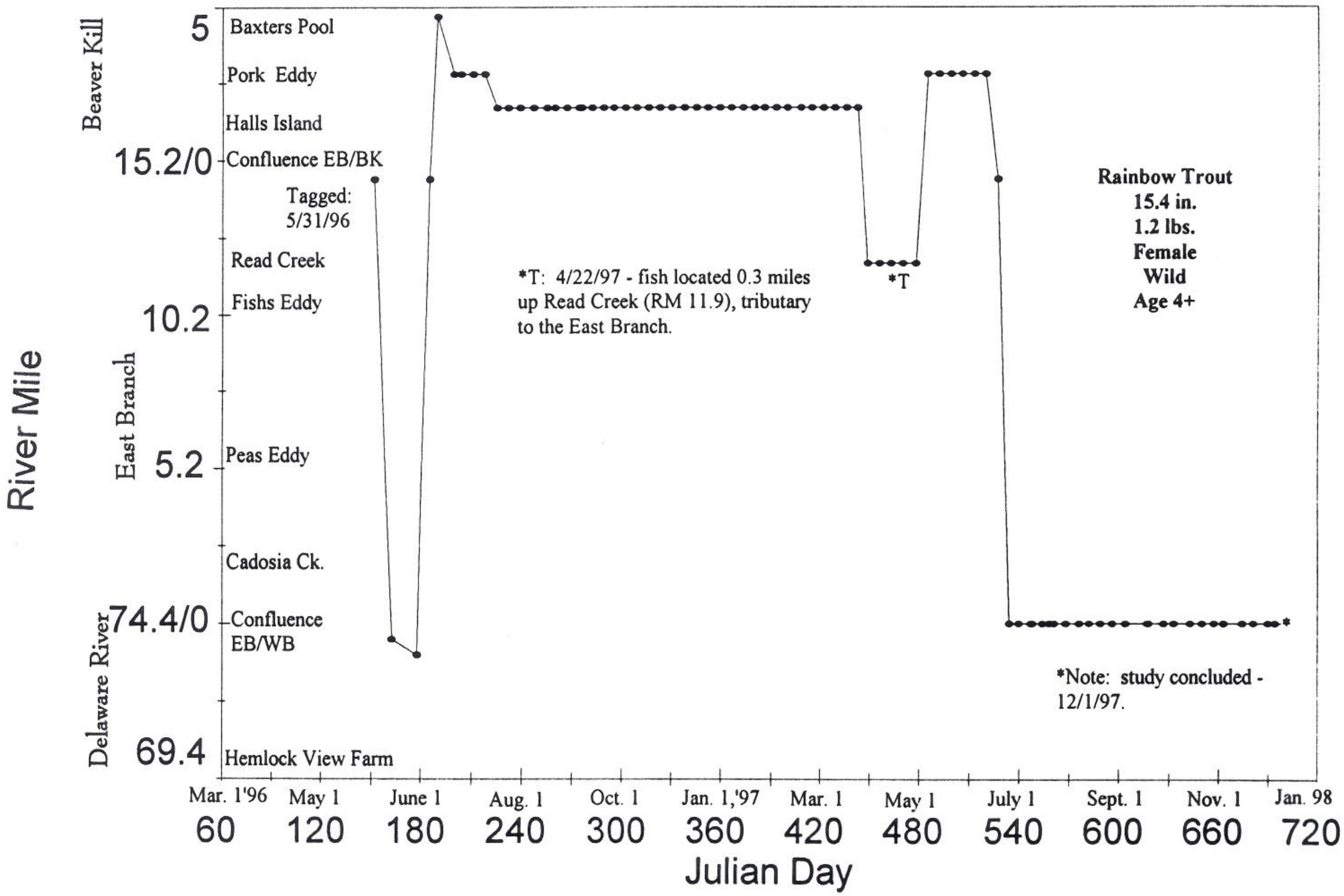
Downsville Covered Bridge
Corbett Bridge
Rte. 30 Rest Area
Fishs Eddy
Brown Trout
17.6 in
2.1 lbs.
Female
Wild
Age 5+
Tagged:5/16/96
*Fish found dead approximately 200 yards downstream of Downsville Covered Bridge (RM 30.8) on 6/6/96.
River Mile
30
25
20
15
10
May 15, '96
June 1, '96
June 10, '96
135
140
145
150
155
160
Julian Day

# EB 13 -2

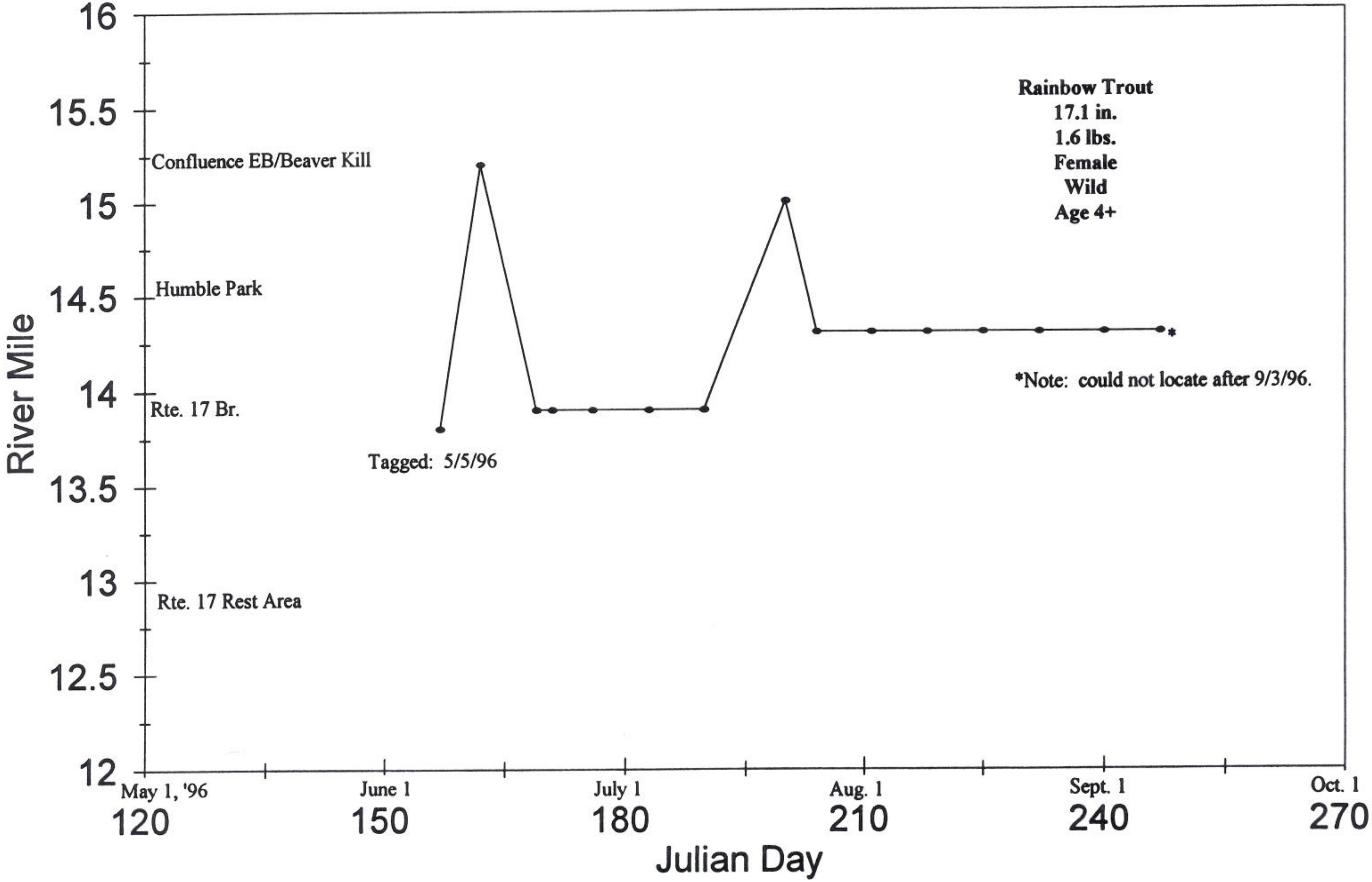


15.5
15
14.5
14
13.5
13
12.5
River Mile
Confluence EB/BK
(Village of East Branch)
Humble Park
Tagged:5/31/96
Rte. 17
Overpass
Rte. 17 Quickway
"Rest Area"
Brown Trout
16.7 in.
1.3 lbs.
Female
Hatchery Origin
Age 3+
*Note: could not locate after 7/15/97.
May 1,'96 June 1 July 1 Aug. 1 Sept. 1 Oct. 1 Nov. 1 Dec. 1 Jan. 1,'97 Feb. 1 Mar. 1 Apr. 1 May 1 June 1 July 1 Aug. 1
120 150 180 210 240 270 300 330 360 390 420 450 480 510 540 570
Julian Day

# EB 14 - 2

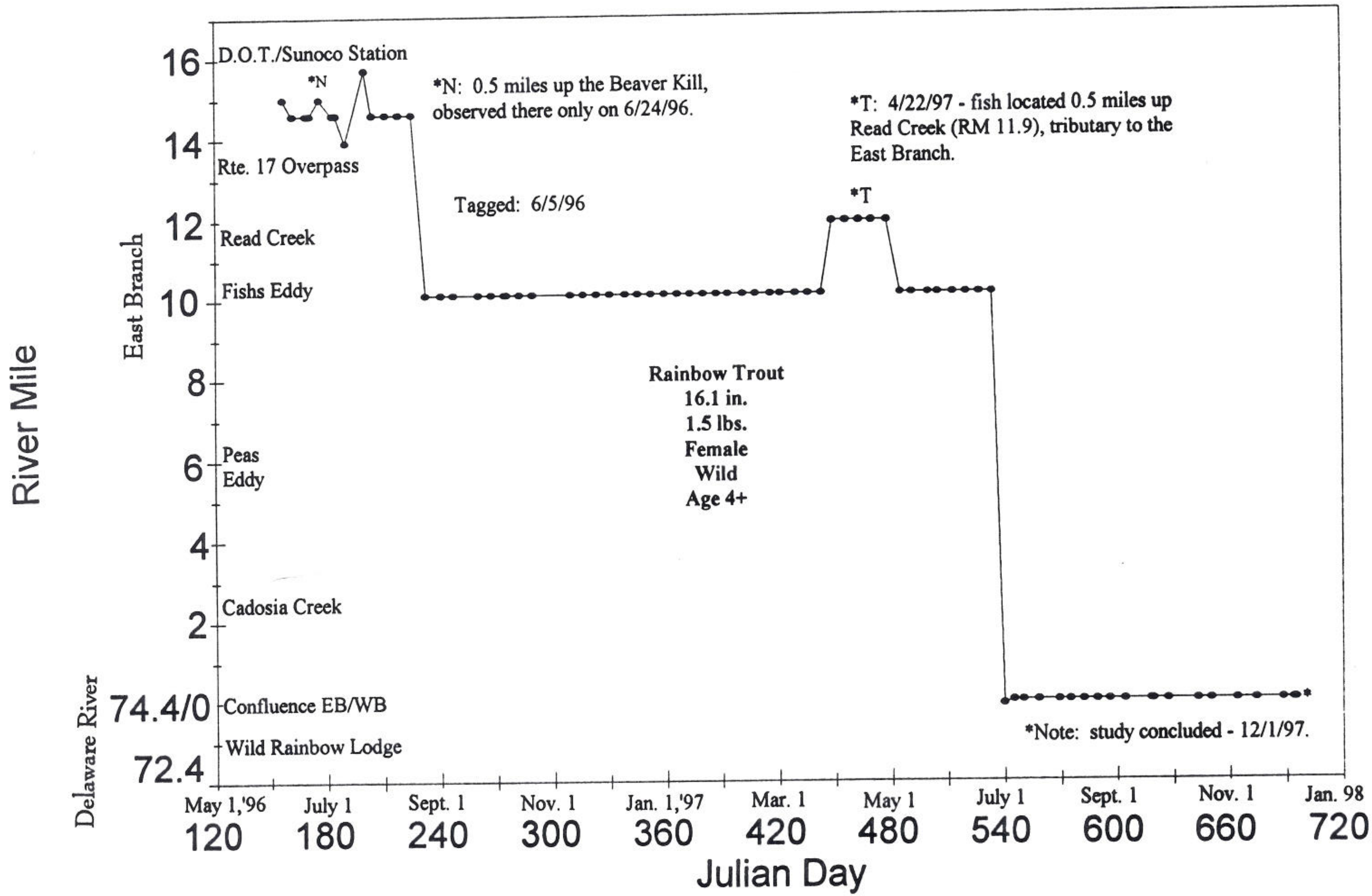

River Mile
Beaver Kill
East Branch
Delaware River
5
15.2/0
10.2
5.2
74.4/0
69.4
Baxters Pool
Pork Eddy
Halls Island
Confluence EB/BK
Tagged: 5/31/96
Read Creek
Fishs Eddy
Peas Eddy
Cadosia Ck.
Confluence EB/WB
Hemlock View Farm
*T: 4/22/97 - fish located 0.3 miles up Read Creek (RM 11.9), tributary to the East Branch.
*T
Rainbow Trout
15.4 in.
1.2 lbs.
Female
Wild
Age 4+
*Note: study concluded - 12/1/97.
Mar. 1'96
May 1
June 1
Aug. 1
Oct. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

## EB 15 - 2



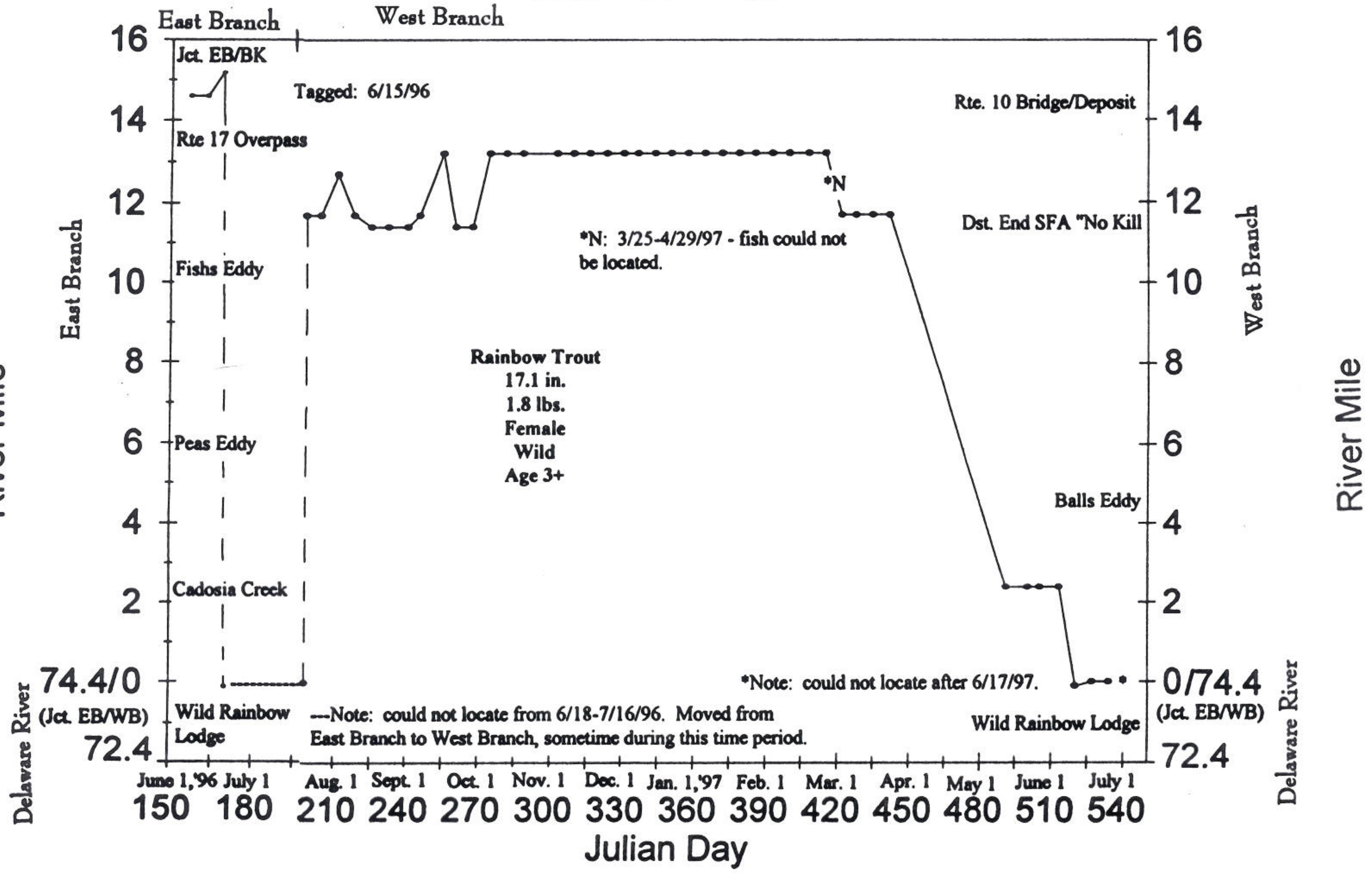
River Mile
16
15.5
15
14.5
14
13.5
13
12.5
12
Confluence EB/Beaver Kill
Humble Park
Rte. 17 Br.
Rte. 17 Rest Area
Tagged: 5/5/96
Rainbow Trout
17.1 in.
1.6 lbs.
Female
Wild
Age 4+
*Note: could not locate after 9/3/96.
May 1, '96
120
June 1
150
July 1
180
Aug. 1
210
Sept. 1
240
Oct. 1
270
Julian Day

# EB 16 - 2



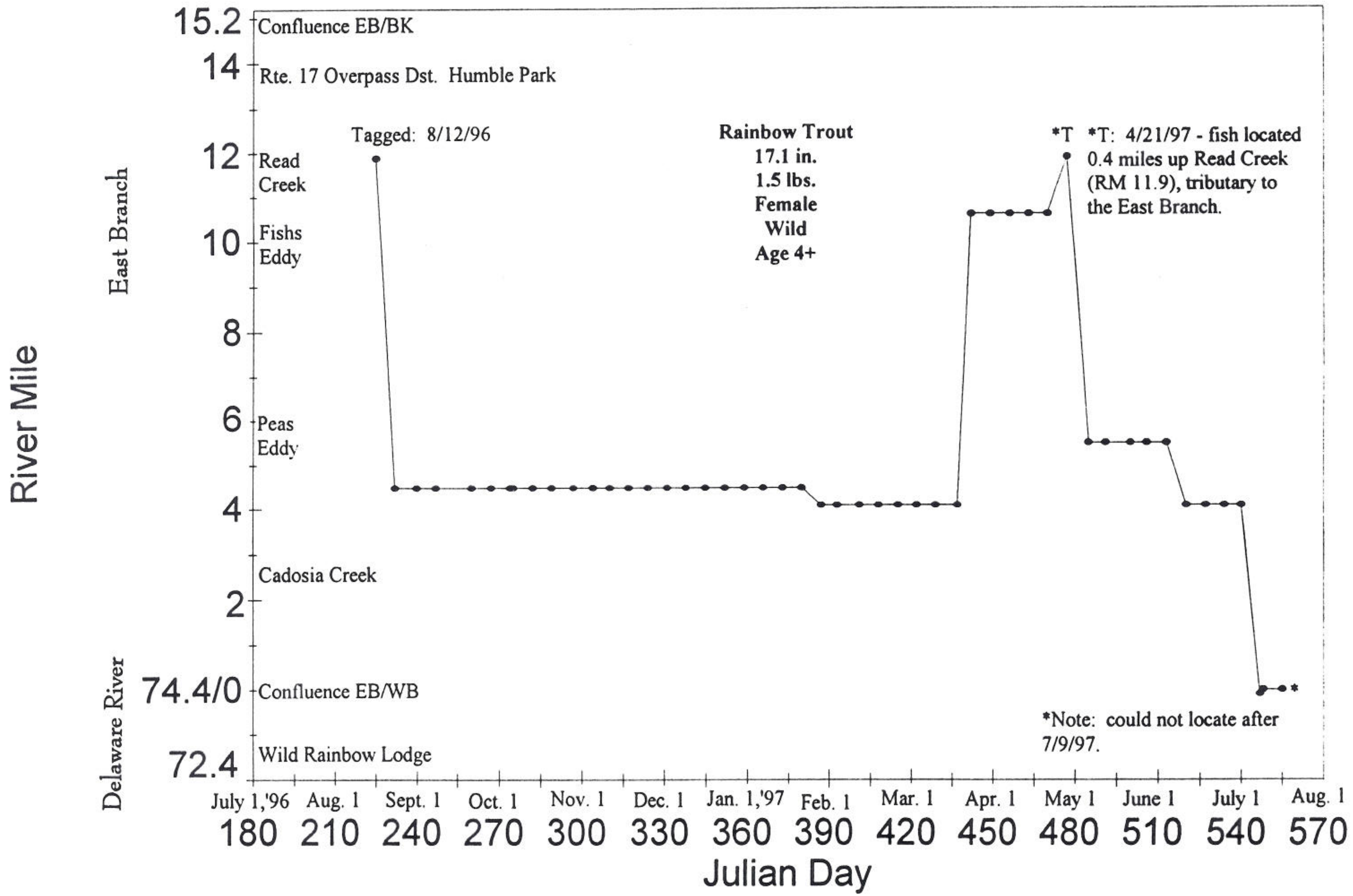
River Mile
East Branch
Delaware River
16
14
12
10
8
6
4
2
74.4/0
72.4
D.O.T./Sunoco Station
*N
Rte. 17 Overpass
Read Creek
Fishs Eddy
Peas
Eddy
Cadosia Creek
Confluence EB/WB
Wild Rainbow Lodge
*N: 0.5 miles up the Beaver Kill, observed there only on 6/24/96.
Tagged: 6/5/96
*T
*T: 4/22/97 - fish located 0.5 miles up Read Creek (RM 11.9), tributary to the East Branch.
Rainbow Trout
16.1 in.
1.5 lbs.
Female
Wild
Age 4+
*Note: study concluded - 12/1/97.
May 1,'96
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# EB 17 - 2



East Branch
West Branch
Jct. EB/BK
Tagged: 6/15/96
Rte 17 Overpass
Rte. 10 Bridge/Deposit
*N
Dst. End SFA "No Kill
*N: 3/25-4/29/97 - fish could not be located.
Fishs Eddy
Rainbow Trout
17.1 in.
1.8 lbs.
Female
Wild
Age 3+
Peas Eddy
Balls Eddy
Cadosia Creek
*Note: could not locate after 6/17/97.
Wild Rainbow Lodge
---Note: could not locate from 6/18-7/16/96. Moved from East Branch to West Branch, sometime during this time period.
Wild Rainbow Lodge
River Mile
East Branch
West Branch
River Mile
16
14
12
10
8
6
4
2
74.4/0
(Jct. EB/WB)
72.4
0/74.4
(Jct. EB/WB)
Delaware River
Delaware River
June 1,'96 July 1 Aug. 1 Sept. 1 Oct. 1 Nov. 1 Dec. 1 Jan. 1,'97 Feb. 1 Mar. 1 Apr. 1 May 1 June 1 July 1
150 180 210 240 270 300 330 360 390 420 450 480 510 540
Julian Day

# EB 18 - 2



River Mile
East Branch
Delaware River
15.2
14
12
10
8
6
4
2
74.4/0
72.4
Confluence EB/BK
Rte. 17 Overpass Dst. Humble Park
Read Creek
Fishs Eddy
Peas Eddy
Cadosia Creek
Confluence EB/WB
Wild Rainbow Lodge
Tagged: 8/12/96
Rainbow Trout
17.1 in.
1.5 lbs.
Female
Wild
Age 4+
*T
*T: 4/21/97 - fish located 0.4 miles up Read Creek (RM 11.9), tributary to the East Branch.
*Note: could not locate after 7/9/97.
July 1,'96
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'97
Feb. 1
Mar. 1
Apr. 1
May 1
June 1
July 1
Aug. 1
180
210
240
270
300
330
360
390
420
450
480
510
540
570
Julian Day

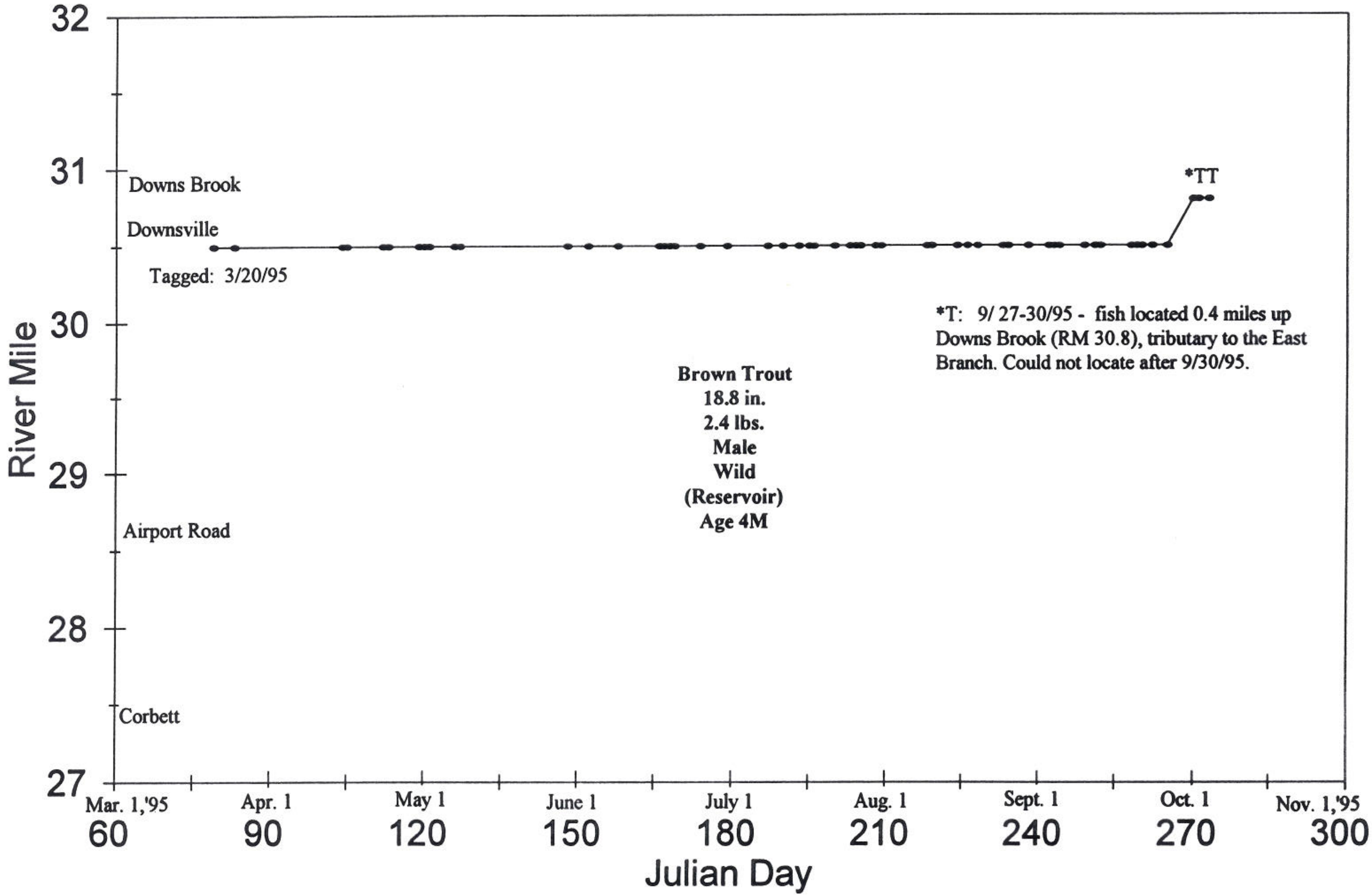
APPENDIX 3:

UPPER EAST BRANCH DELAWARE RIVER

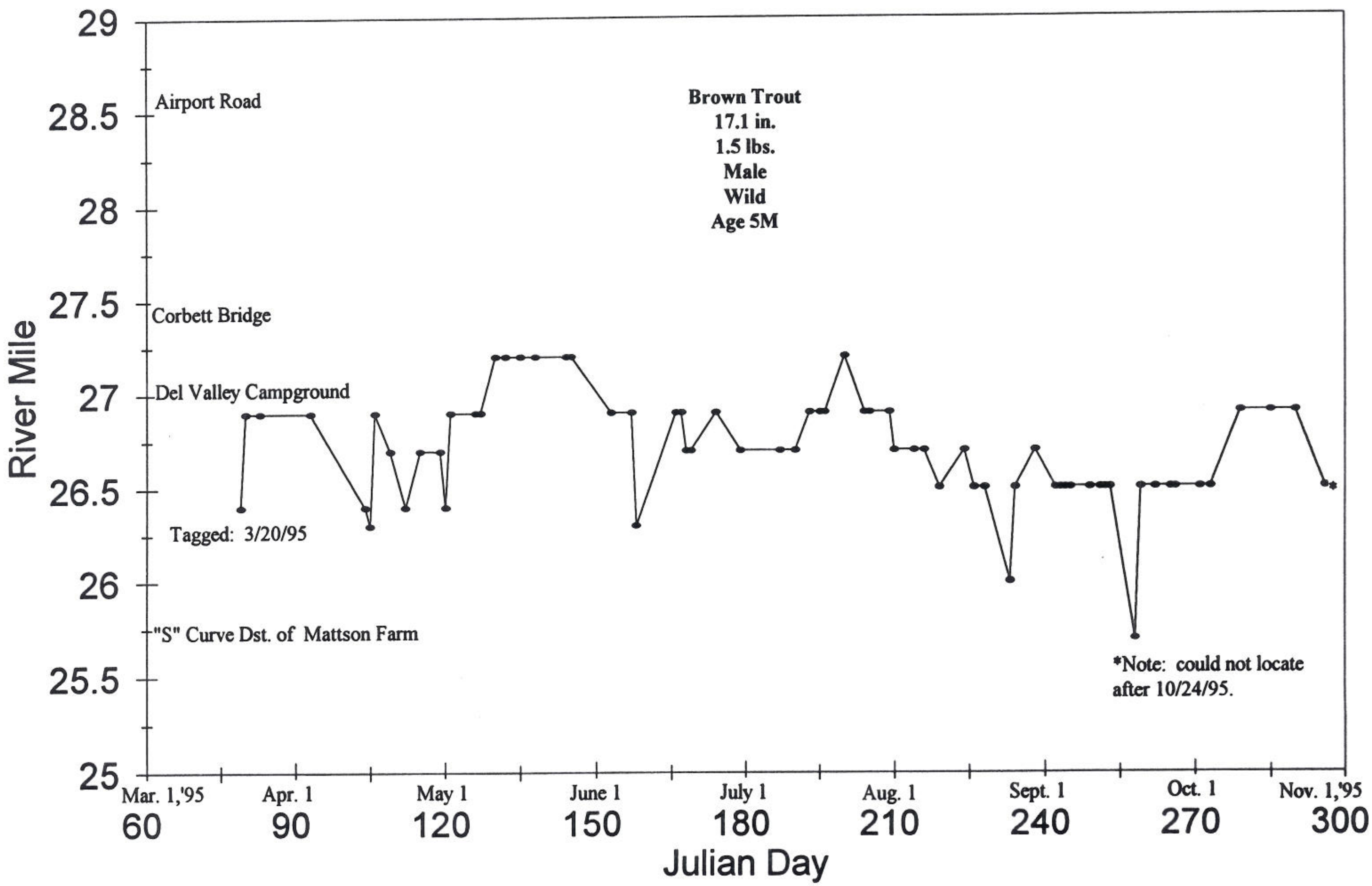
Movement history of each radiotagged trout through December 1, 1997

EB 2 to EB 6; EB 13 to EB 14 : Tagged 1995
EB 1-2 to EB 3-2; EB 8-2 to EB 11-2: Tagged 1996

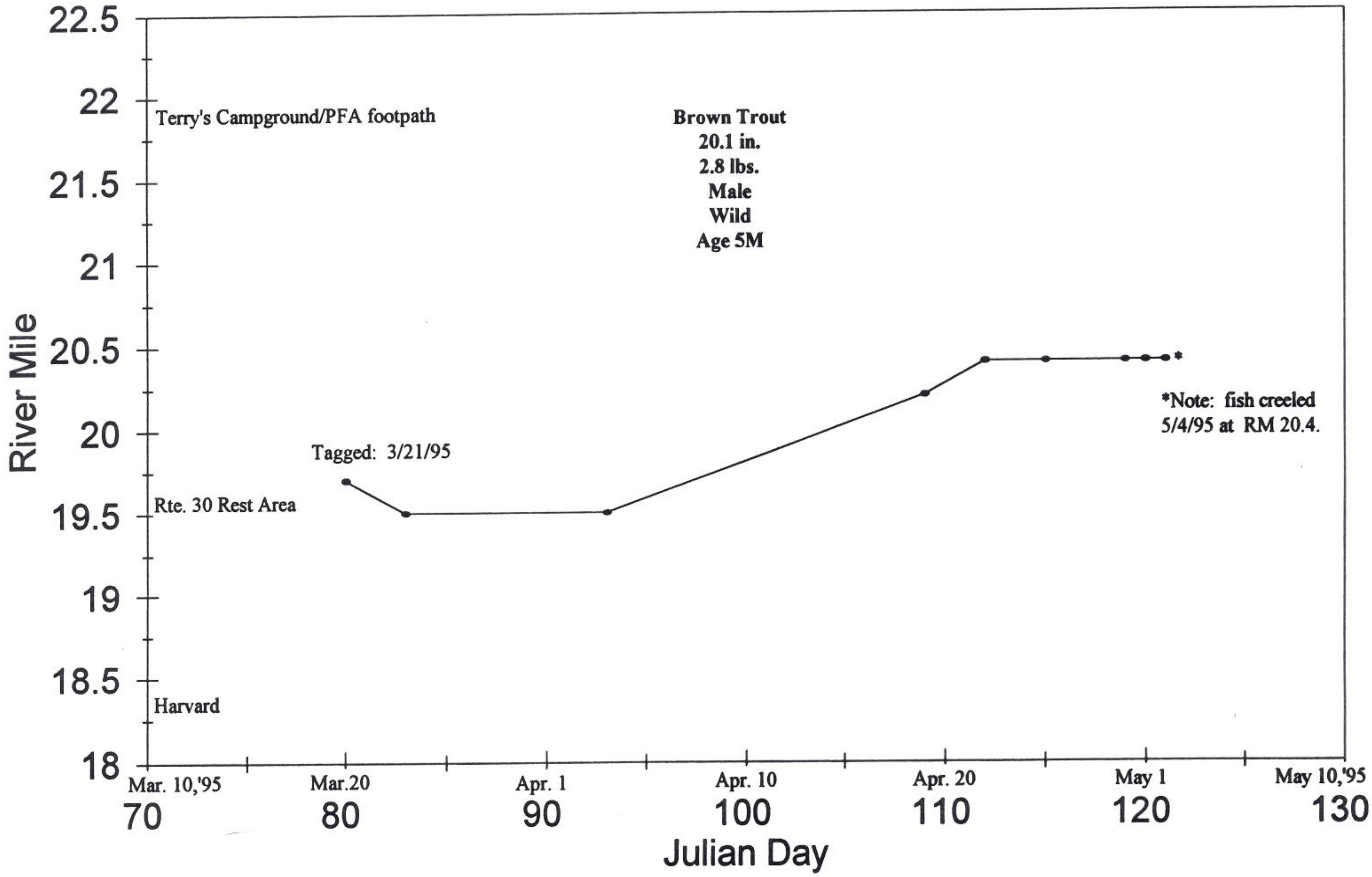
# EB-2


River Mile
32
31
30
29
28
27
Downs Brook
Downsville
Tagged: 3/20/95
Airport Road
Corbett
*TT
*T: 9/ 27-30/95 - fish located 0.4 miles up Downs Brook (RM 30.8), tributary to the East Branch. Could not locate after 9/30/95.
Brown Trout
18.8 in.
2.4 lbs.
Male
Wild
(Reservoir)
Age 4M
Mar. 1,'95
60
Apr. 1
90
May 1
120
June 1
150
July 1
180
Aug. 1
210
Sept. 1
240
Oct. 1
270
Nov. 1,'95
300
Julian Day

# EB-3

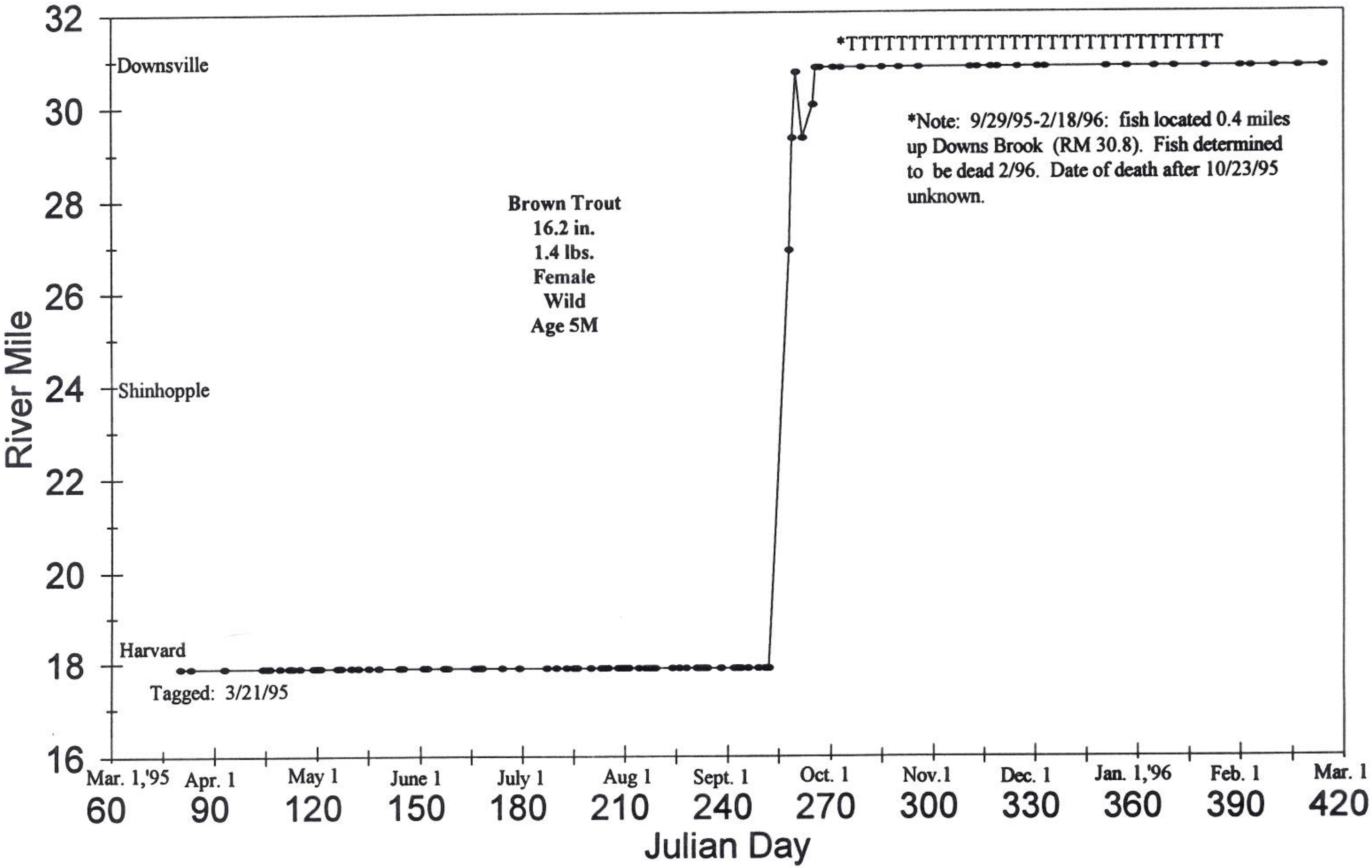

Brown Trout
17.1 in.
1.5 lbs.
Male
Wild
Age 5M
Airport Road
Corbett Bridge
Del Valley Campground
Tagged: 3/20/95
"S" Curve Dst. of Mattson Farm
*Note: could not locate after 10/24/95.
River Mile
29
28.5
28
27.5
27
26.5
26
25.5
25
Mar. 1,'95
Apr. 1
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1,'95
60
90
120
150
180
210
240
270
300
Julian Day

# EB-4



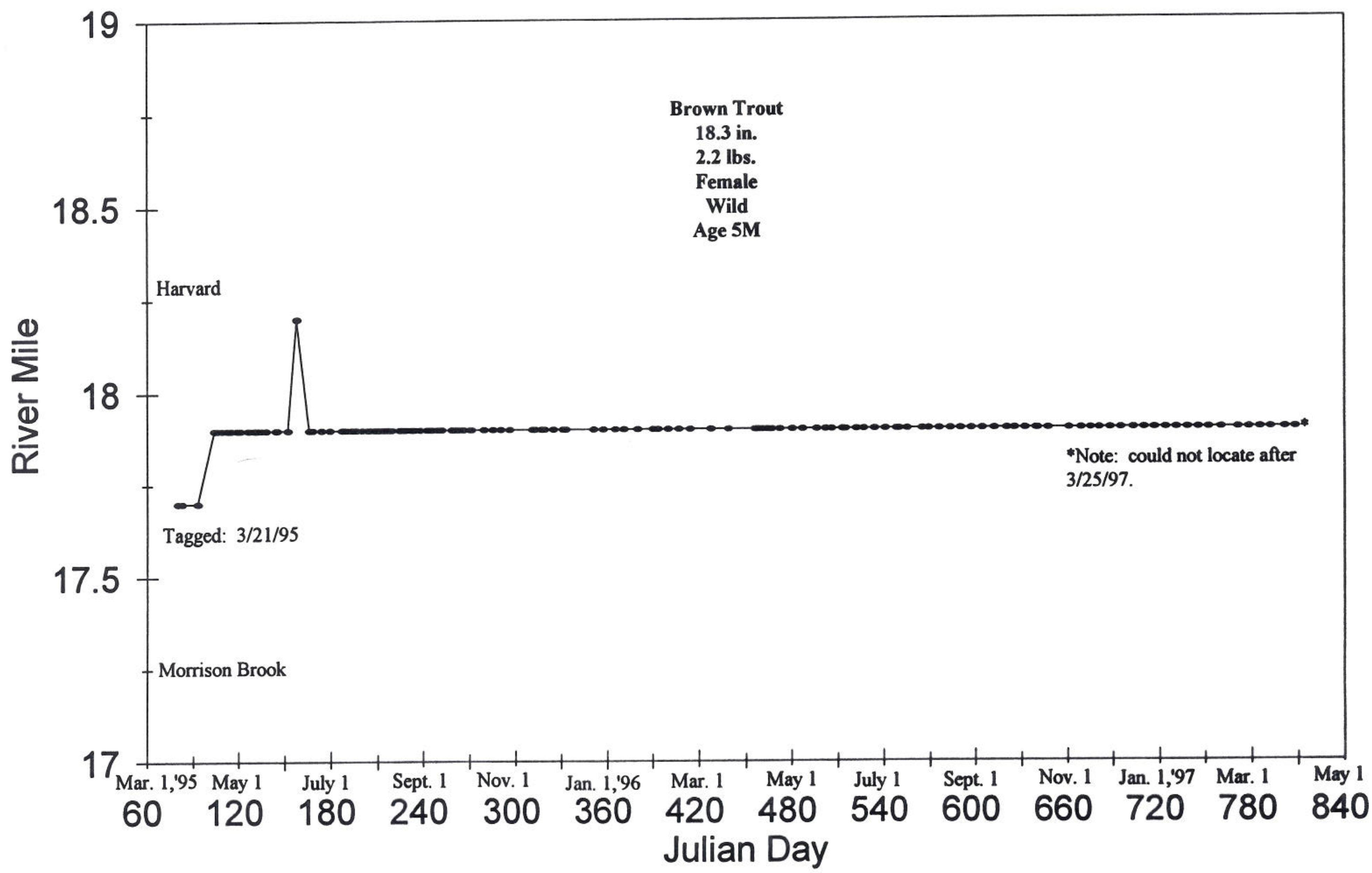
River Mile
22.5
22
21.5
21
20.5
20
19.5
19
18.5
18
Terry's Campground/PFA footpath
Rte. 30 Rest Area
Harvard
Brown Trout
20.1 in.
2.8 lbs.
Male
Wild
Age 5M
Tagged: 3/21/95
*Note: fish creeled
5/4/95 at RM 20.4.
Mar. 10,'95
Mar.20
Apr. 1
Apr. 10
Apr. 20
May 1
May 10,'95
70
80
90
100
110
120
130
Julian Day

# EB-5



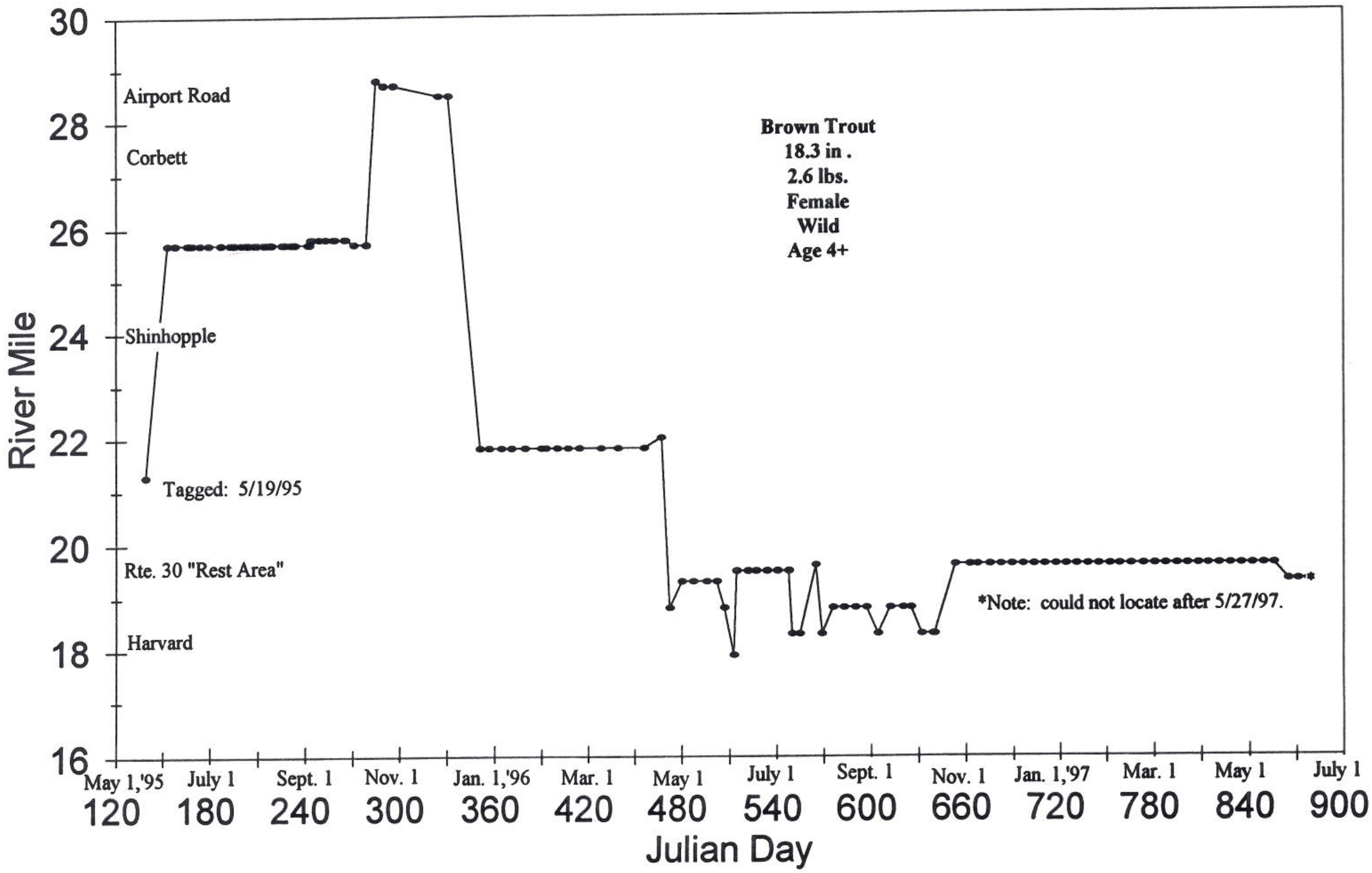
River Mile
32
30
28
26
24
22
20
18
16
Downsville
Shinhopple
Harvard
Tagged: 3/21/95
Brown Trout
16.2 in.
1.4 lbs.
Female
Wild
Age 5M
*TTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
*Note: 9/29/95-2/18/96: fish located 0.4 miles up Downs Brook (RM 30.8). Fish determined to be dead 2/96. Date of death after 10/23/95 unknown.
Mar. 1,'95
Apr. 1
May 1
June 1
July 1
Aug 1
Sept. 1
Oct. 1
Nov.1
Dec. 1
Jan. 1,'96
Feb. 1
Mar. 1
60
90
120
150
180
210
240
270
300
330
360
390
420
Julian Day

# EB-6



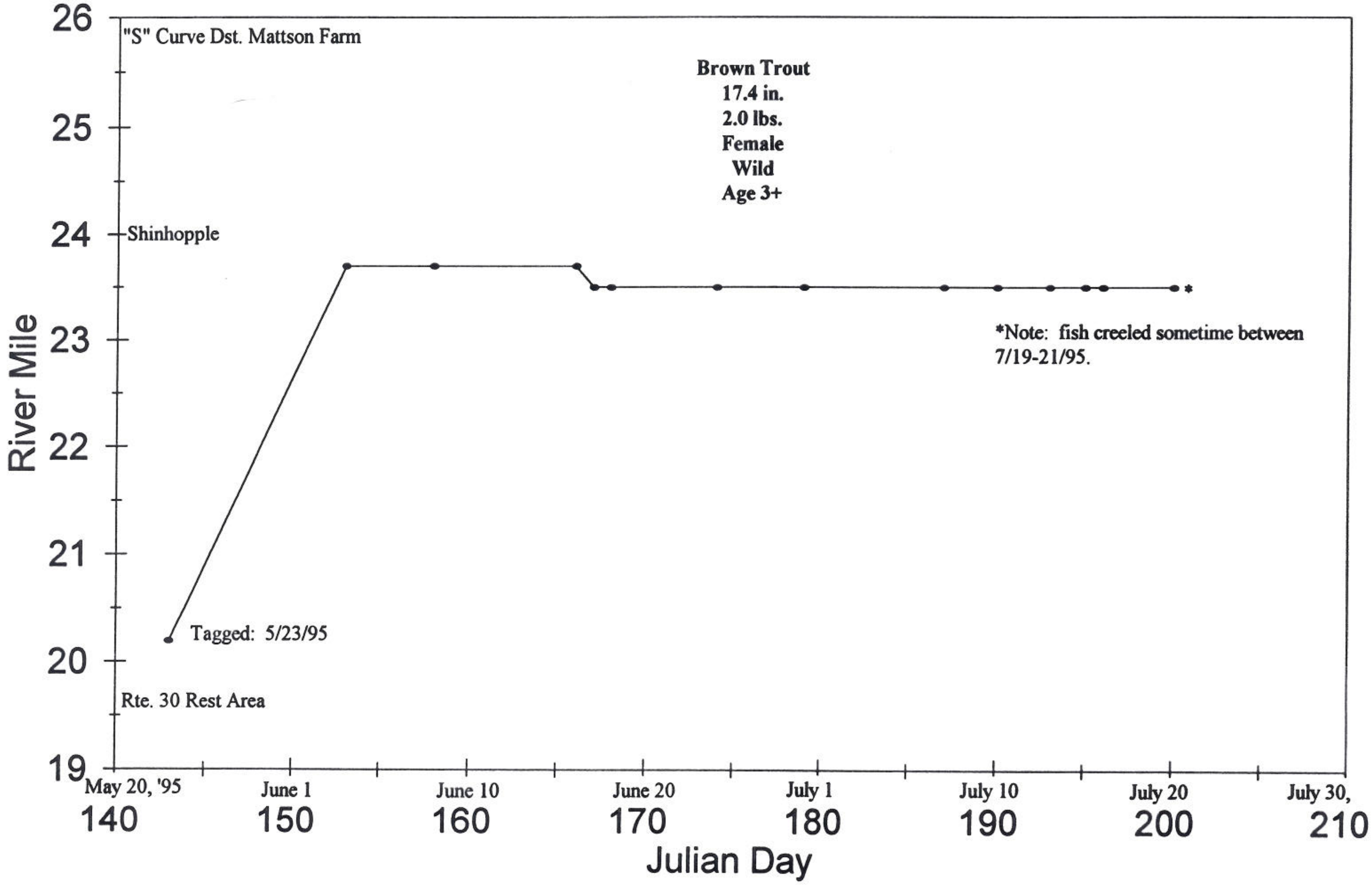
Brown Trout
18.3 in.
2.2 lbs.
Female
Wild
Age 5M
Harvard
Tagged: 3/21/95
Morrison Brook
*Note: could not locate after 3/25/97.
River Mile
19
18.5
18
17.5
17
Mar. 1,'95 May 1 July 1 Sept. 1 Nov. 1 Jan. 1,'96 Mar. 1 May 1 July 1 Sept. 1 Nov. 1 Jan. 1,'97 Mar. 1 May 1
60 120 180 240 300 360 420 480 540 600 660 720 780 840
Julian Day

# EB-13



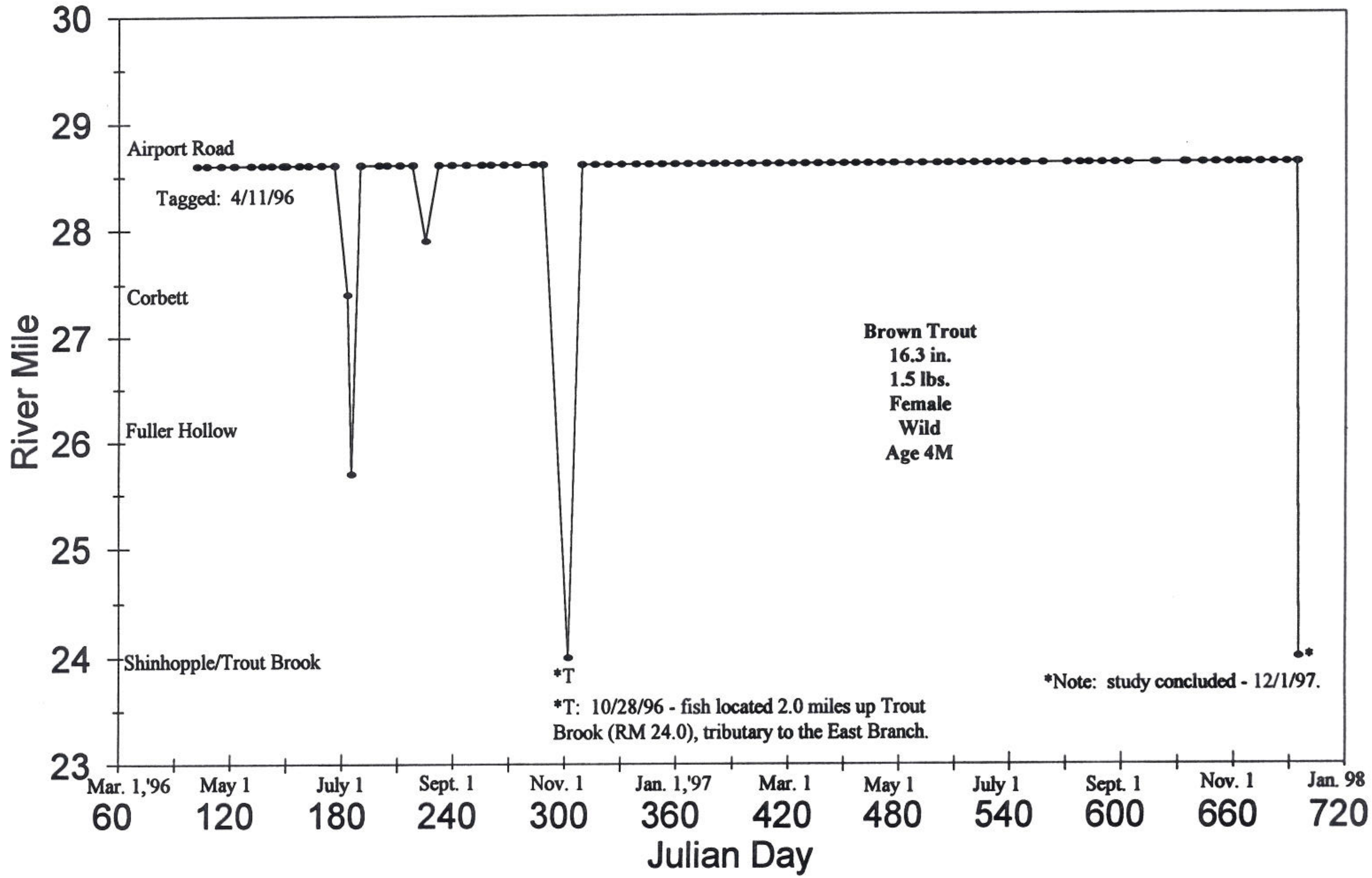
30
28
26
24
22
20
18
16
River Mile
Airport Road
Corbett
Shinhopple
Tagged: 5/19/95
Rte. 30 "Rest Area"
Harvard
Brown Trout
18.3 in .
2.6 lbs.
Female
Wild
Age 4+
*Note: could not locate after 5/27/97.
May 1,'95
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
120
180
240
300
360
420
480
540
600
660
720
780
840
900
Julian Day

# EB-14

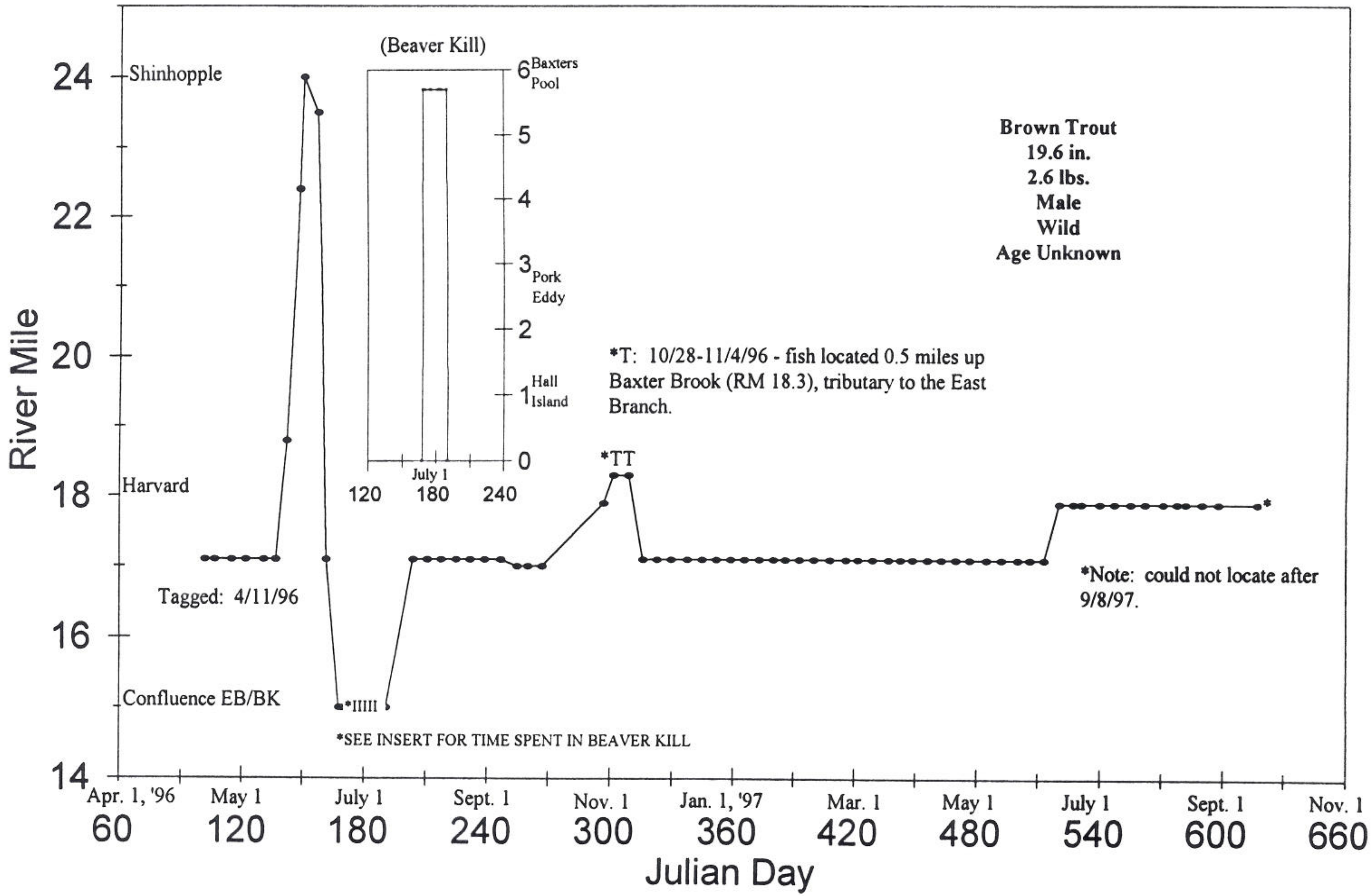


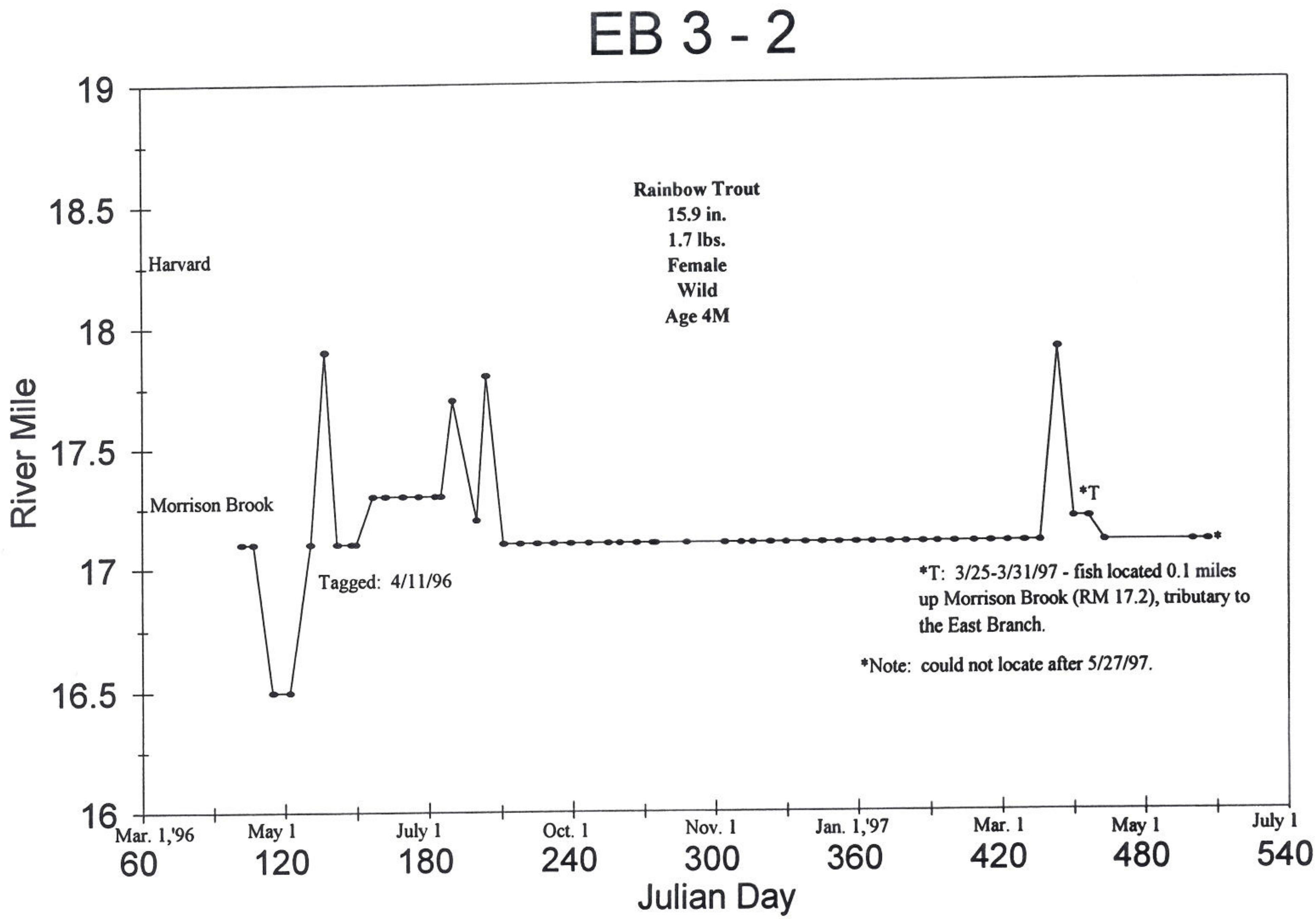
"S" Curve Dst. Mattson Farm
Brown Trout
17.4 in.
2.0 lbs.
Female
Wild
Age 3+
Shinhopple
*Note: fish creeled sometime between 7/19-21/95.
Tagged: 5/23/95
Rte. 30 Rest Area
River Mile
26
25
24
23
22
21
20
19
May 20, '95
June 1
June 10
June 20
July 1
July 10
July 20
July 30,
140
150
160
170
180
190
200
210
Julian Day

# EB 1 - 2


30
29
28
27
26
25
24
23
River Mile
Airport Road
Tagged: 4/11/96
Corbett
Fuller Hollow
Shinhopple/Trout Brook
*T
*T: 10/28/96 - fish located 2.0 miles up Trout Brook (RM 24.0), tributary to the East Branch.
Brown Trout
16.3 in.
1.5 lbs.
Female
Wild
Age 4M
*Note: study concluded - 12/1/97.
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

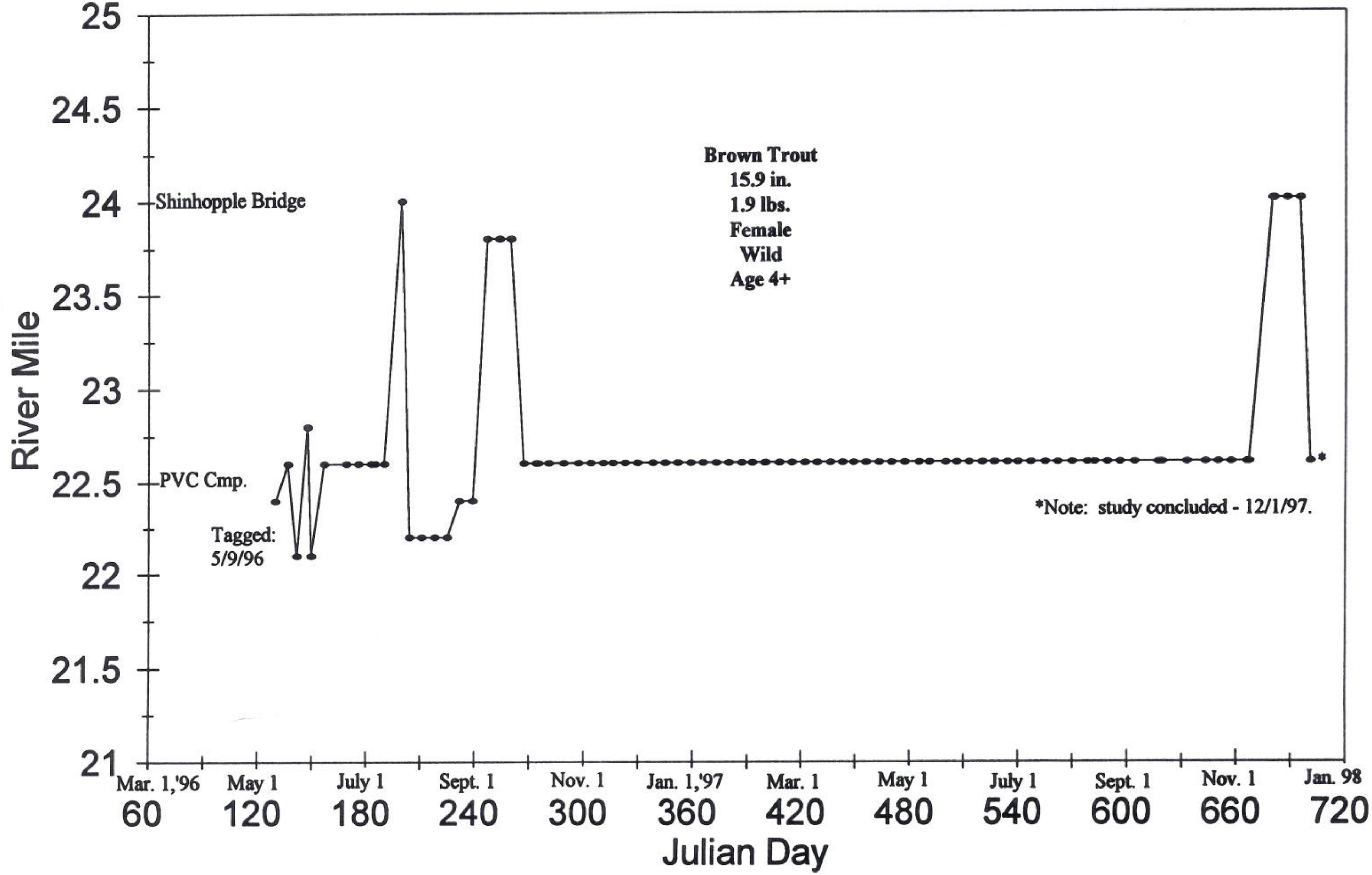
# EB 2 - 2


River Mile
24
22
20
18
16
14
Shinhopple
Harvard
Confluence EB/BK
Tagged: 4/11/96
(Beaver Kill)
6 Baxters Pool
5
4
3 Pork Eddy
2
1 Hall Island
0
120
July 1
180
240
*IIIII
*SEE INSERT FOR TIME SPENT IN BEAVER KILL
*TT
*T: 10/28-11/4/96 - fish located 0.5 miles up Baxter Brook (RM 18.3), tributary to the East Branch.
Brown Trout
19.6 in.
2.6 lbs.
Male
Wild
Age Unknown
*Note: could not locate after 9/8/97.
Apr. 1, '96
60
May 1
120
July 1
180
Sept. 1
240
Nov. 1
300
Jan. 1, '97
360
Mar. 1
420
May 1
480
July 1
540
Sept. 1
600
Nov. 1
660
Julian Day



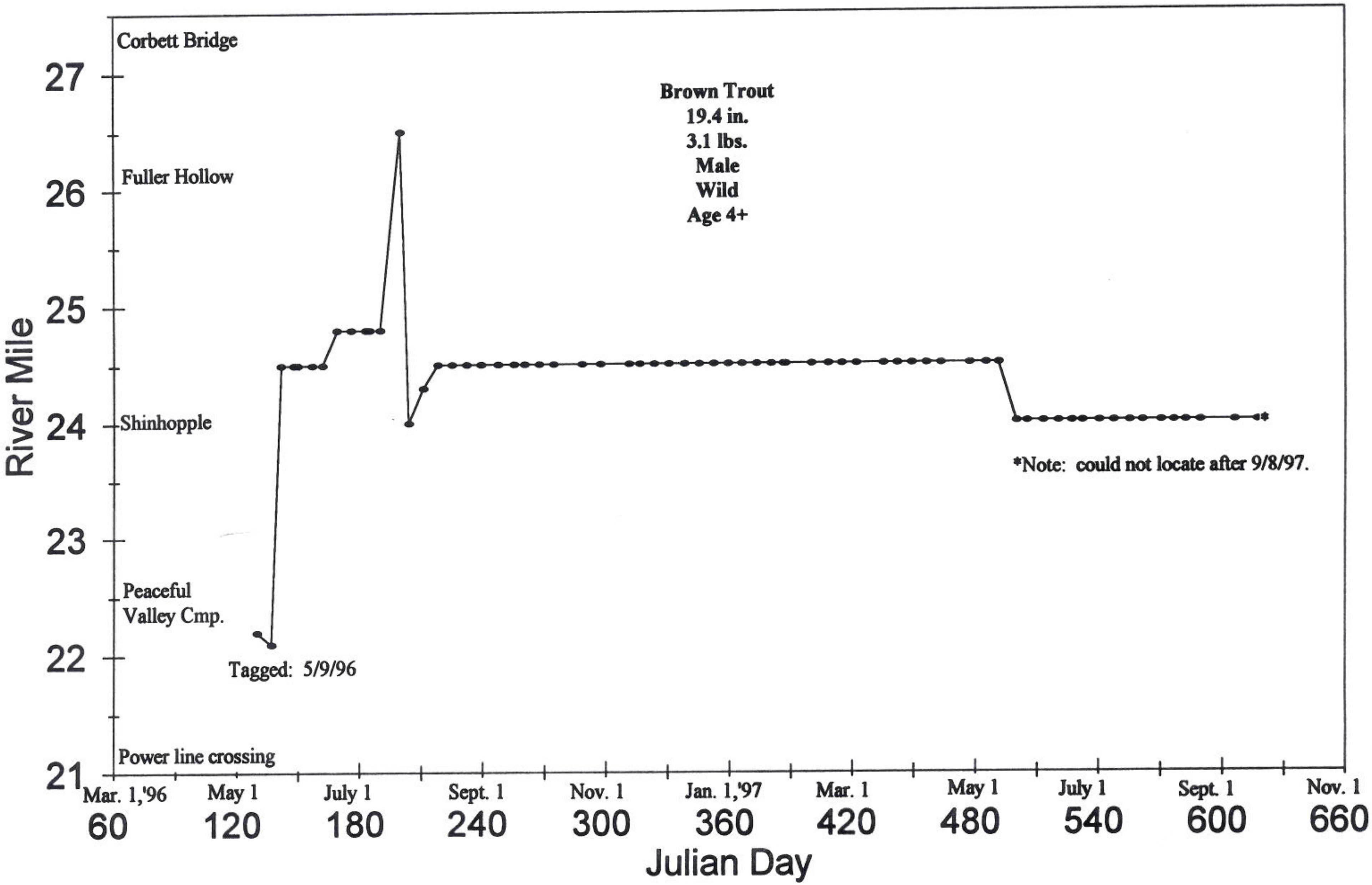
EB 3 - 2
River Mile
19
18.5
18
17.5
17
16.5
16
Harvard
Morrison Brook
Rainbow Trout
15.9 in.
1.7 lbs.
Female
Wild
Age 4M
Tagged: 4/11/96
*T
*T: 3/25-3/31/97 - fish located 0.1 miles up Morrison Brook (RM 17.2), tributary to the East Branch.
*Note: could not locate after 5/27/97.
Mar. 1,'96
May 1
July 1
Oct. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
60
120
180
240
300
360
420
480
540
Julian Day

# EB 8 - 2



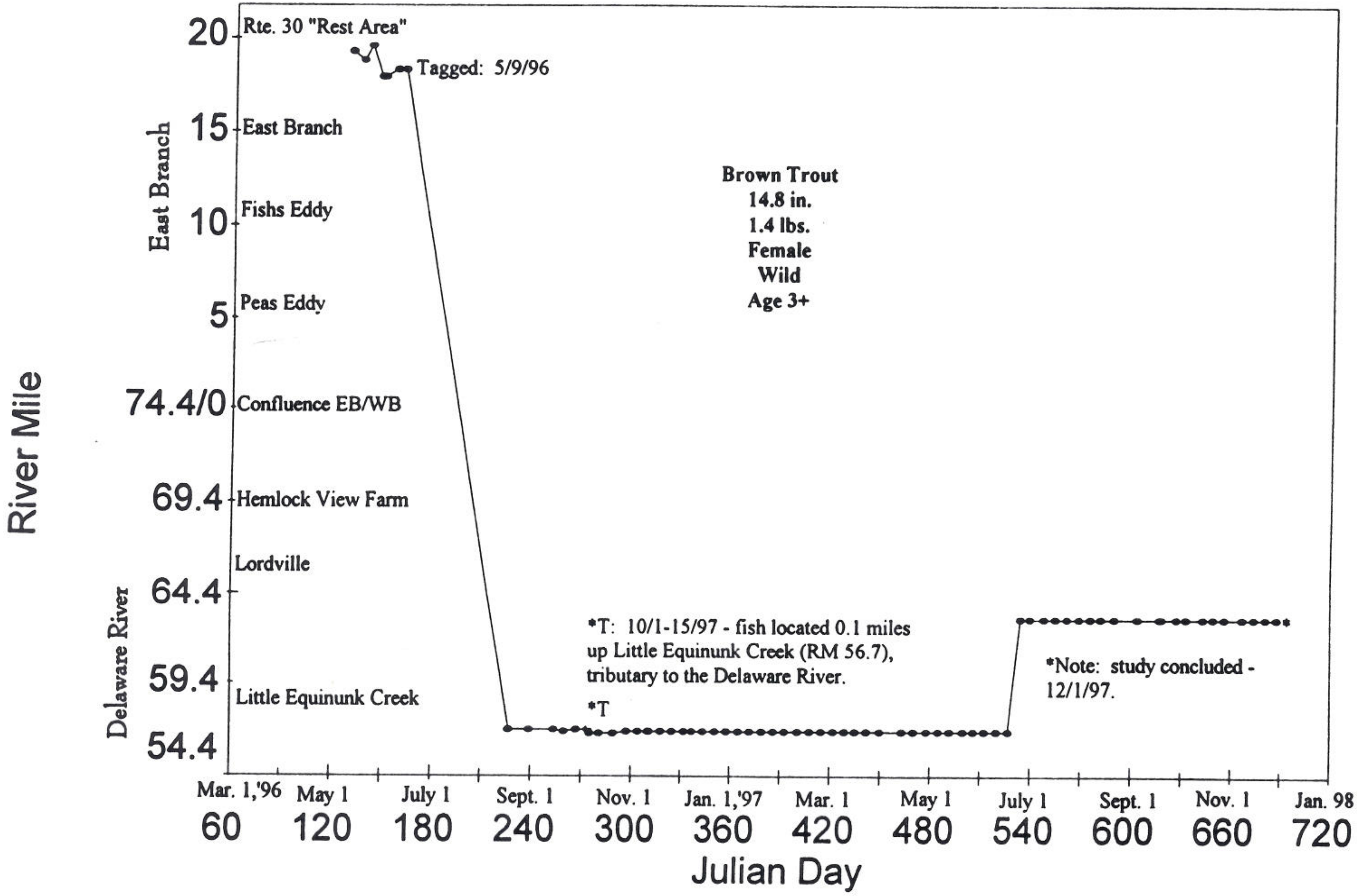
River Mile
25
24.5
24
23.5
23
22.5
22
21.5
21
Shinhopple Bridge
PVC Cmp.
Tagged:
5/9/96
Brown Trout
15.9 in.
1.9 lbs.
Female
Wild
Age 4+
*Note: study concluded - 12/1/97.
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# EB 9 - 2



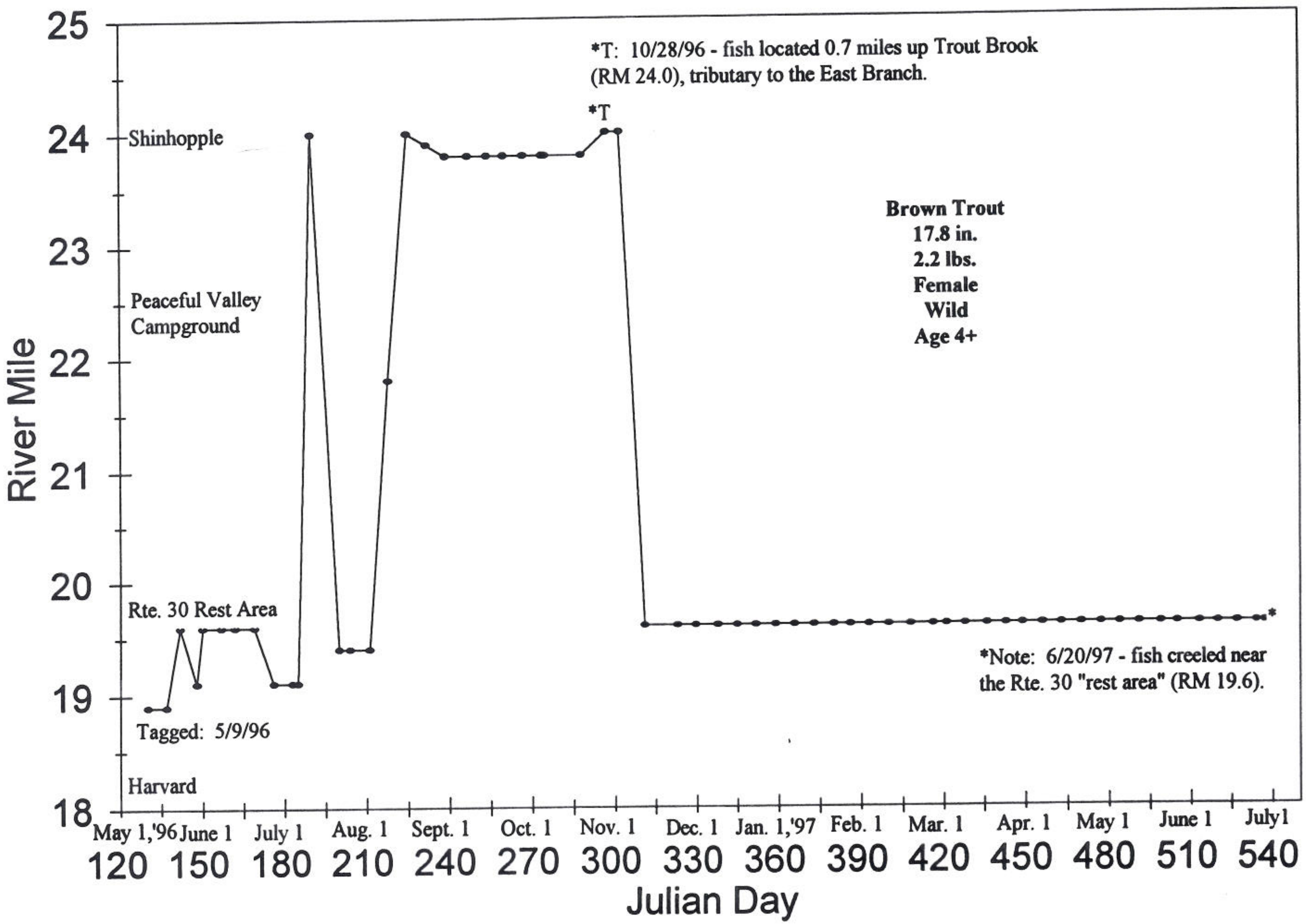
Corbett Bridge
Fuller Hollow
Shinhopple
Peaceful
Valley Cmp.
Power line crossing
Brown Trout
19.4 in.
3.1 lbs.
Male
Wild
Age 4+
Tagged: 5/9/96
*Note: could not locate after 9/8/97.
River Mile
27
26
25
24
23
22
21
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
60
120
180
240
300
360
420
480
540
600
660
Julian Day

# EB 10 - 2



River Mile
East Branch
Delaware River
20
15
10
5
74.4/0
69.4
64.4
59.4
54.4
Rte. 30 "Rest Area"
Tagged: 5/9/96
East Branch
Fishs Eddy
Peas Eddy
Confluence EB/WB
Hemlock View Farm
Lordville
Little Equinunk Creek
Brown Trout
14.8 in.
1.4 lbs.
Female
Wild
Age 3+
*T: 10/1-15/97 - fish located 0.1 miles up Little Equinunk Creek (RM 56.7), tributary to the Delaware River.
*T
*Note: study concluded - 12/1/97.
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# EB 11 - 2



*T: 10/28/96 - fish located 0.7 miles up Trout Brook
(RM 24.0), tributary to the East Branch.
*T
Shinhopple
Peaceful Valley
Campground
Rte. 30 Rest Area
Tagged: 5/9/96
Harvard
Brown Trout
17.8 in.
2.2 lbs.
Female
Wild
Age 4+
*Note: 6/20/97 - fish creeled near
the Rte. 30 "rest area" (RM 19.6).
*
River Mile
25
24
23
22
21
20
19
18
May 1,'96
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'97
Feb. 1
Mar. 1
Apr. 1
May 1
June 1
July 1
120
150
180
210
240
270
300
330
360
390
420
450
480
510
540
Julian Day

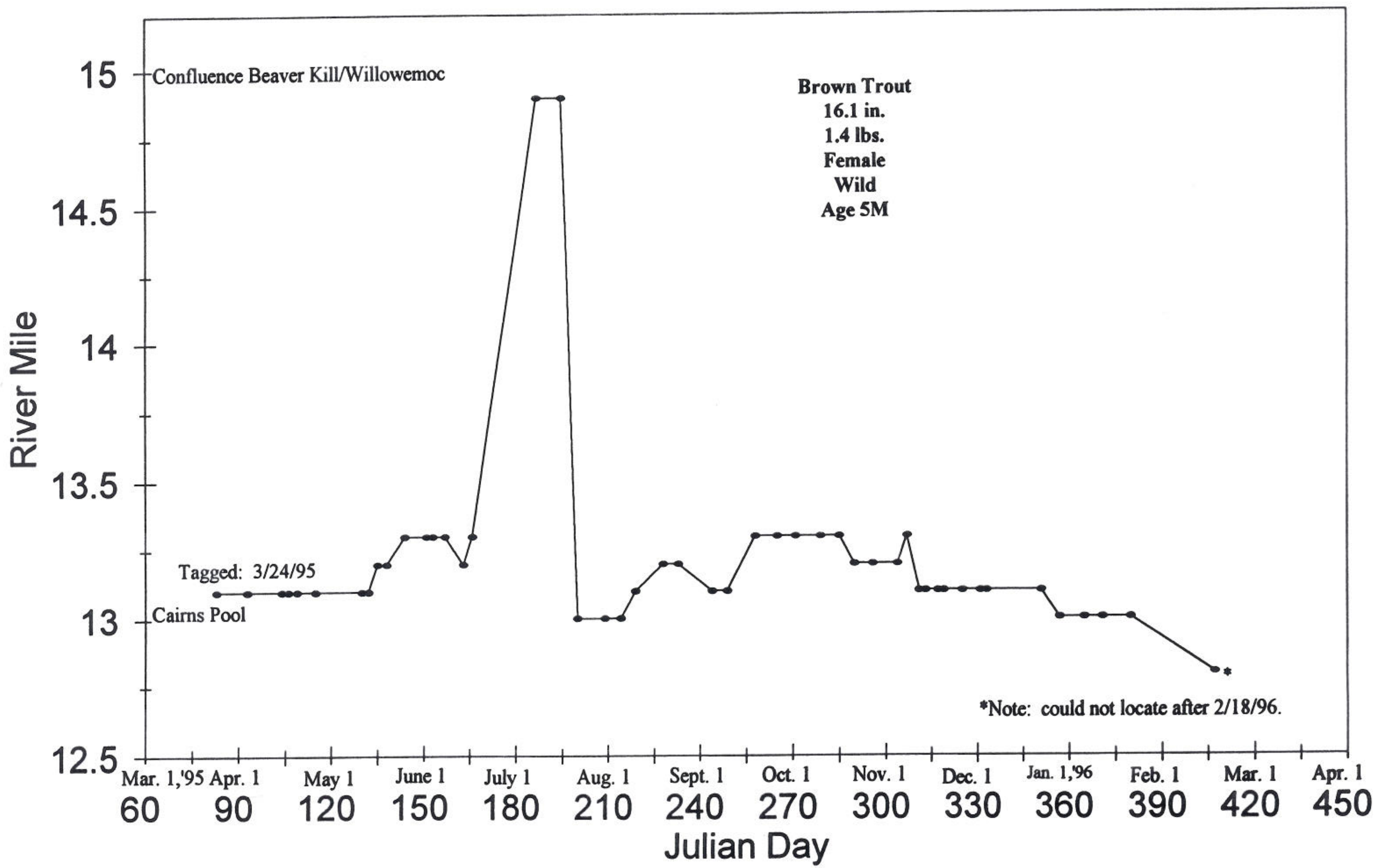
APPENDIX 4:

BEAVER KILL

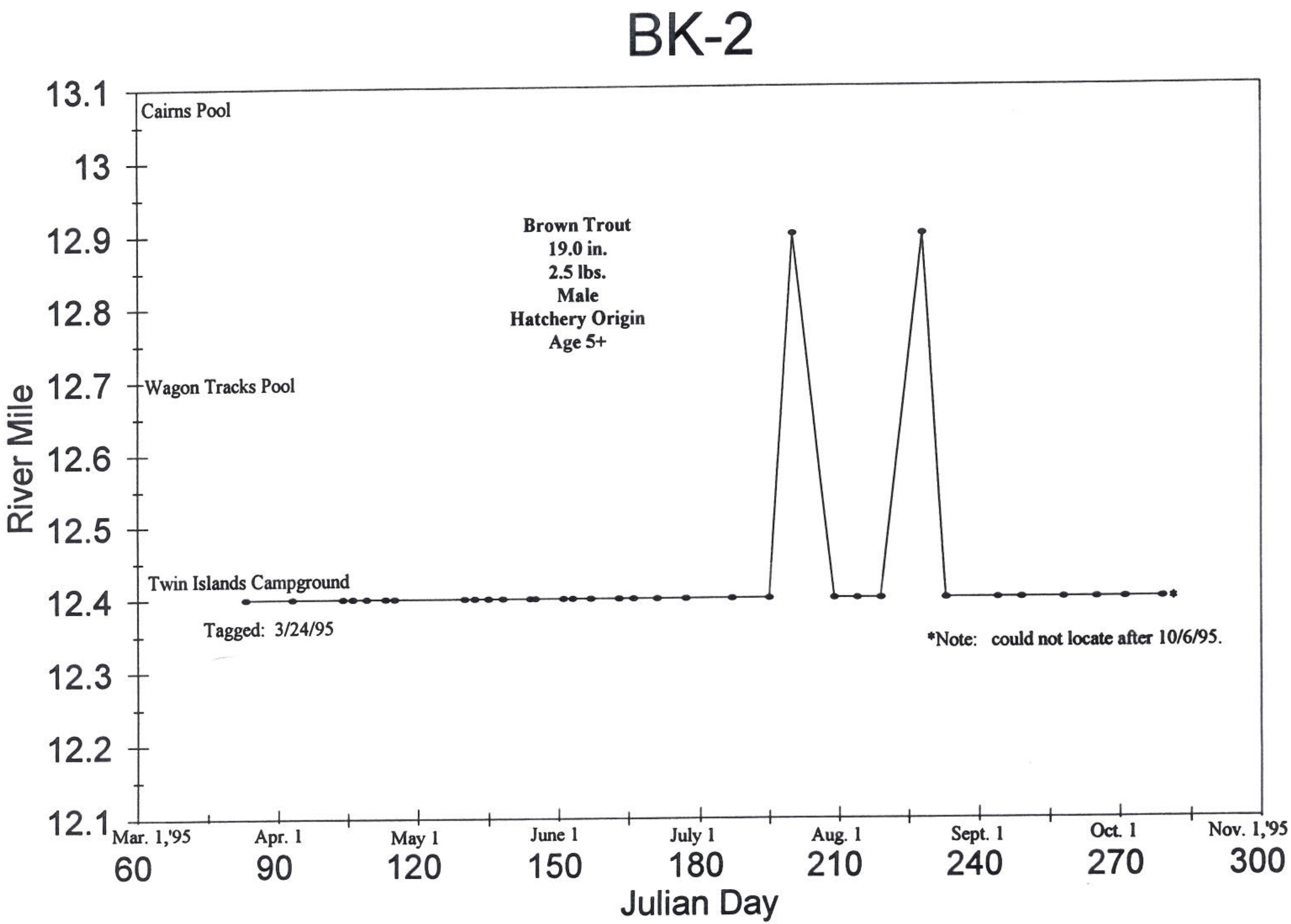
Movement history of each radiotagged trout through December 1, 1997

BK 1 to BK 12 : Tagged 1995
BK 1-2 to BK 7-2: Tagged 1996

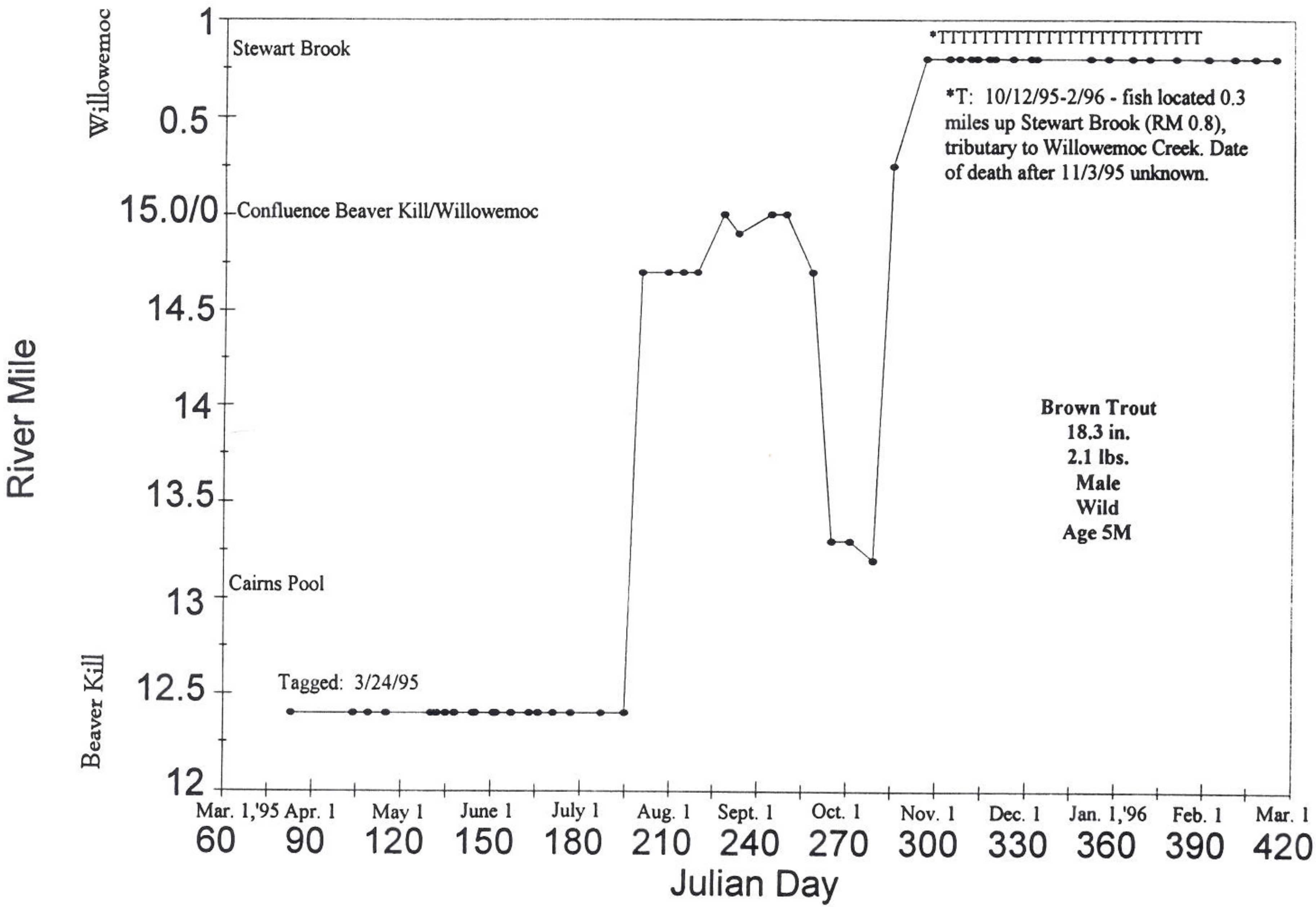
# BK-1



Confluence Beaver Kill/Willowemoc
Brown Trout
16.1 in.
1.4 lbs.
Female
Wild
Age 5M
Tagged: 3/24/95
Cairns Pool
*Note: could not locate after 2/18/96.
River Mile
15
14.5
14
13.5
13
12.5
Mar. 1,'95 Apr. 1
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'96
Feb. 1
Mar. 1
Apr. 1
60
90
120
150
180
210
240
270
300
330
360
390
420
450
Julian Day

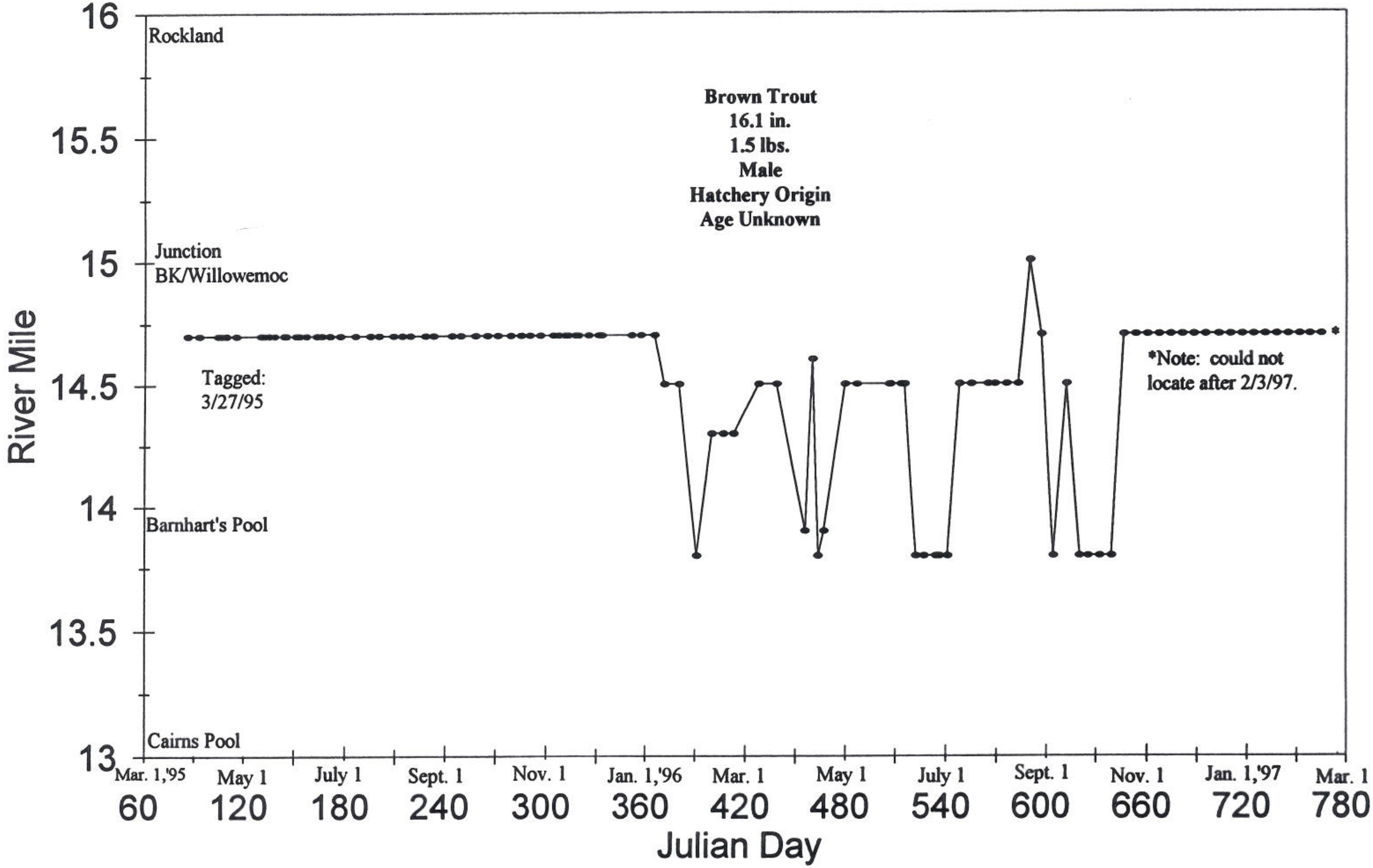

BK-2
River Mile
13.1
13
12.9
12.8
12.7
12.6
12.5
12.4
12.3
12.2
12.1
Cairns Pool
Wagon Tracks Pool
Twin Islands Campground
Tagged: 3/24/95
Brown Trout
19.0 in.
2.5 lbs.
Male
Hatchery Origin
Age 5+
*Note: could not locate after 10/6/95.
Mar. 1,'95
Apr. 1
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1,'95
60
90
120
150
180
210
240
270
300
Julian Day

# BK-3



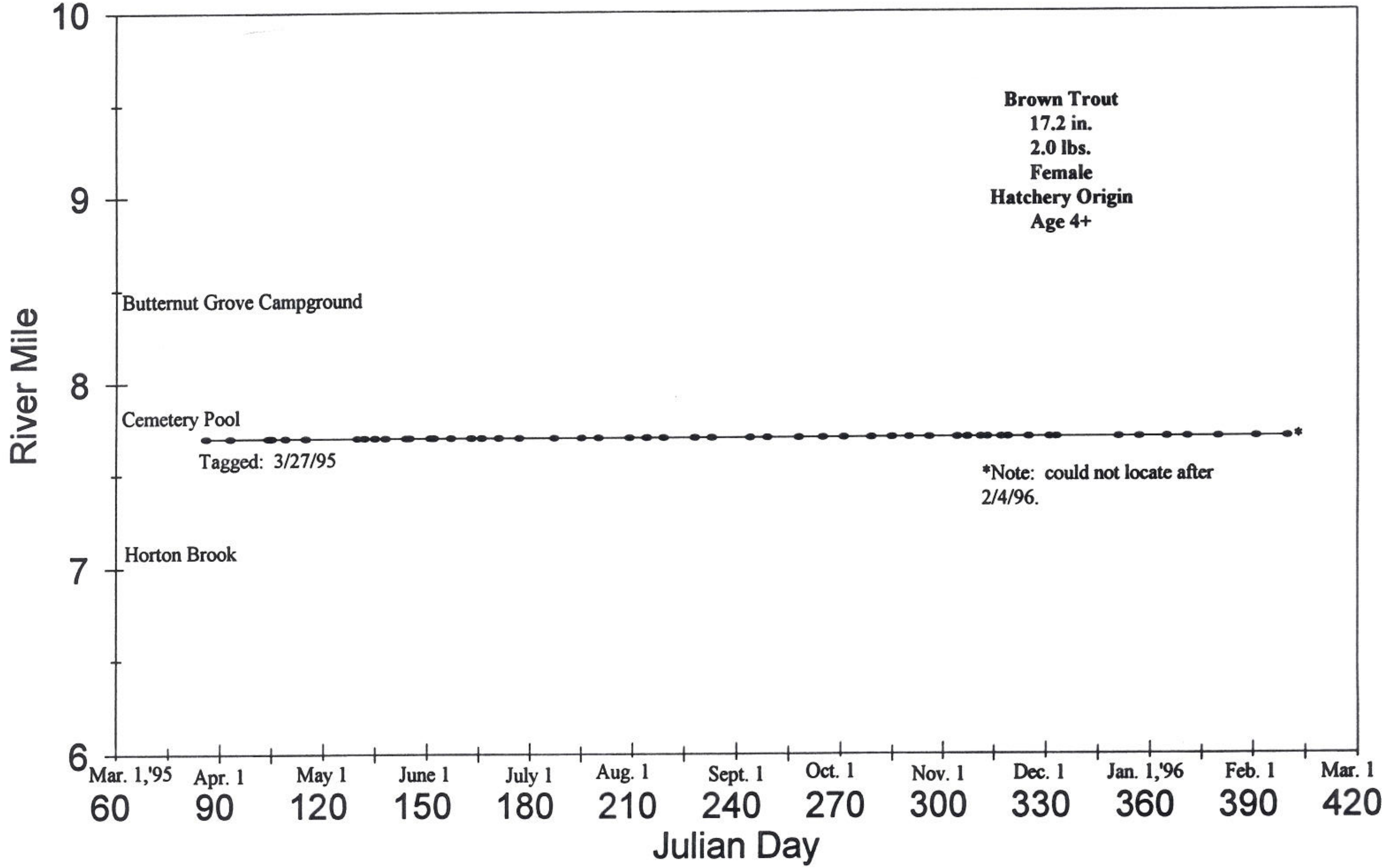
River Mile
Willowemoc
Beaver Kill
1
0.5
15.0/0
14.5
14
13.5
13
12.5
12
Stewart Brook
Confluence Beaver Kill/Willowemoc
Cairns Pool
Tagged: 3/24/95
*TTTTTTTTTTTTTTTTTTTTTTTTTTT
*T: 10/12/95-2/96 - fish located 0.3 miles up Stewart Brook (RM 0.8), tributary to Willowemoc Creek. Date of death after 11/3/95 unknown.
Brown Trout
18.3 in.
2.1 lbs.
Male
Wild
Age 5M
Mar. 1,'95 Apr. 1 May 1 June 1 July 1 Aug. 1 Sept. 1 Oct. 1 Nov. 1 Dec. 1 Jan. 1,'96 Feb. 1 Mar. 1
60 90 120 150 180 210 240 270 300 330 360 390 420
Julian Day

# BK-4



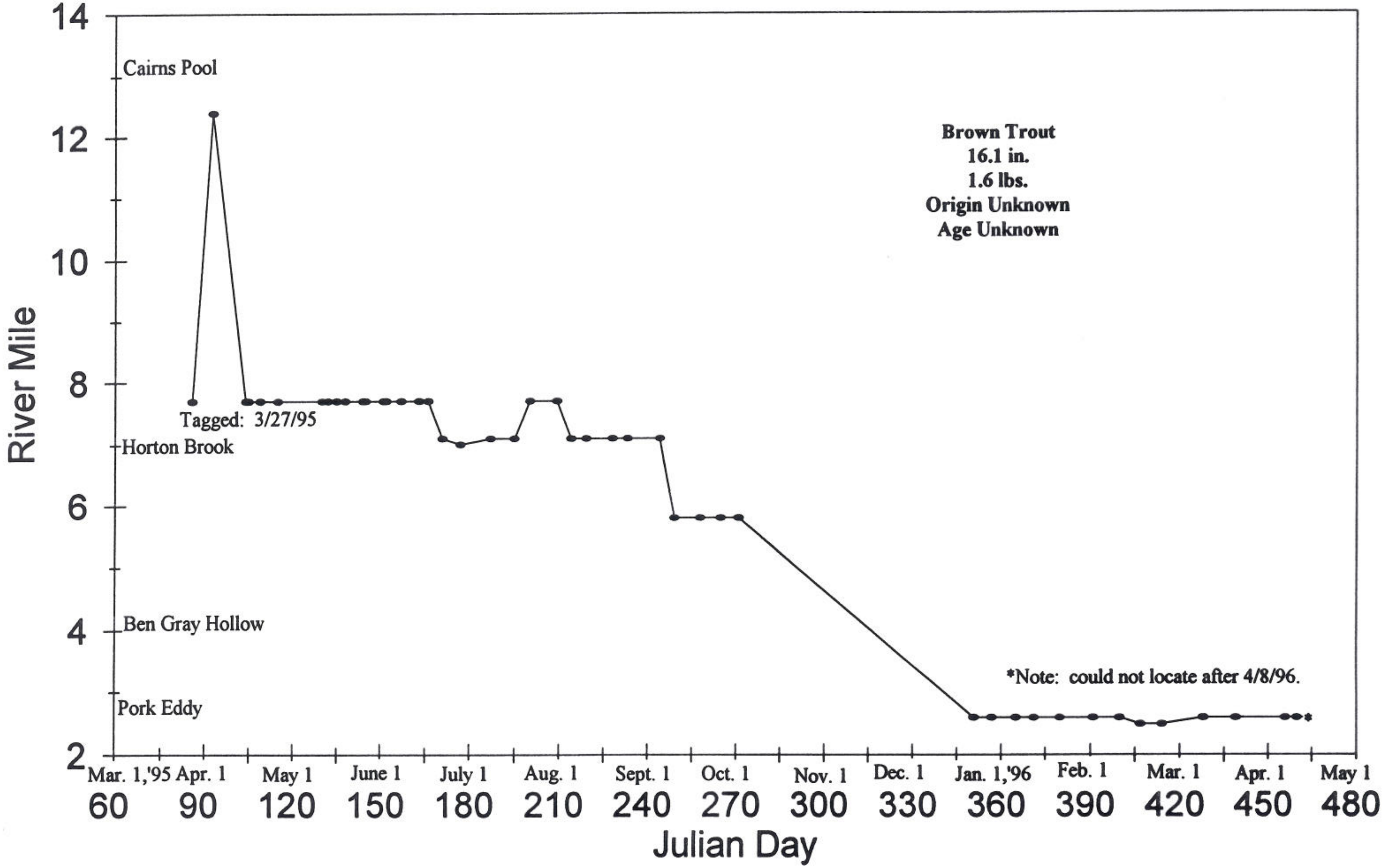
River Mile
16
15.5
15
14.5
14
13.5
13
Rockland
Junction
BK/Willowemoc
Barnhart's Pool
Cairns Pool
Tagged:
3/27/95
Brown Trout
16.1 in.
1.5 lbs.
Male
Hatchery Origin
Age Unknown
*Note: could not
locate after 2/3/97.
Mar. 1,'95
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
60
120
180
240
300
360
420
480
540
600
660
720
780
Julian Day

# BK-5



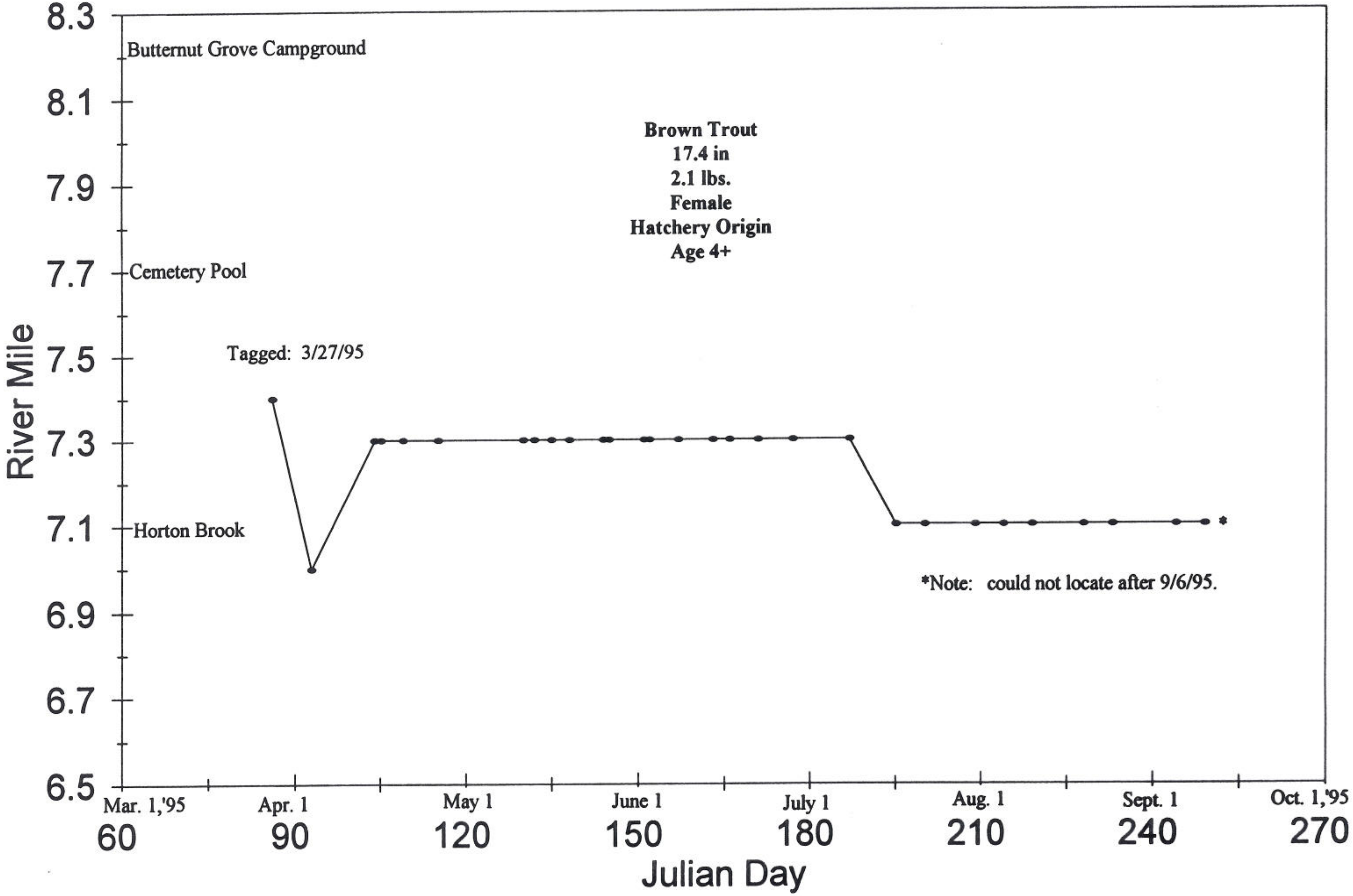
Brown Trout
17.2 in.
2.0 lbs.
Female
Hatchery Origin
Age 4+
Butternut Grove Campground
Cemetery Pool
Horton Brook
Tagged: 3/27/95
*Note: could not locate after 2/4/96.
River Mile
10
9
8
7
6
Mar. 1,'95
Apr. 1
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'96
Feb. 1
Mar. 1
60
90
120
150
180
210
240
270
300
330
360
390
420
Julian Day

# BK-6



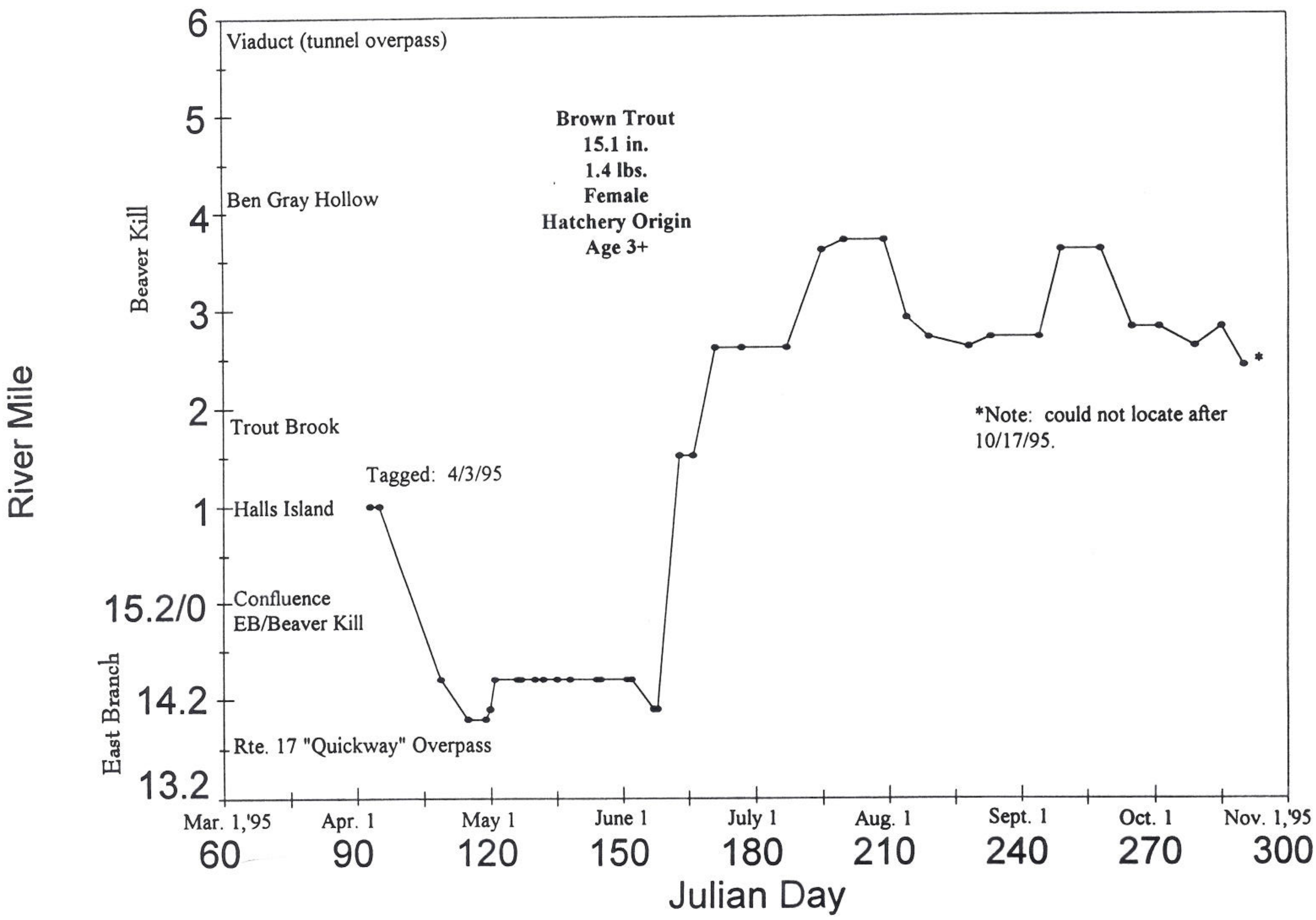
River Mile
14
12
10
8
6
4
2
Cairns Pool
Horton Brook
Ben Gray Hollow
Pork Eddy
Tagged: 3/27/95
Brown Trout
16.1 in.
1.6 lbs.
Origin Unknown
Age Unknown
*Note: could not locate after 4/8/96.
Mar. 1,'95 Apr. 1 May 1 June 1 July 1 Aug. 1 Sept. 1 Oct. 1 Nov. 1 Dec. 1 Jan. 1,'96 Feb. 1 Mar. 1 Apr. 1 May 1
60 90 120 150 180 210 240 270 300 330 360 390 420 450 480
Julian Day

# BK-7

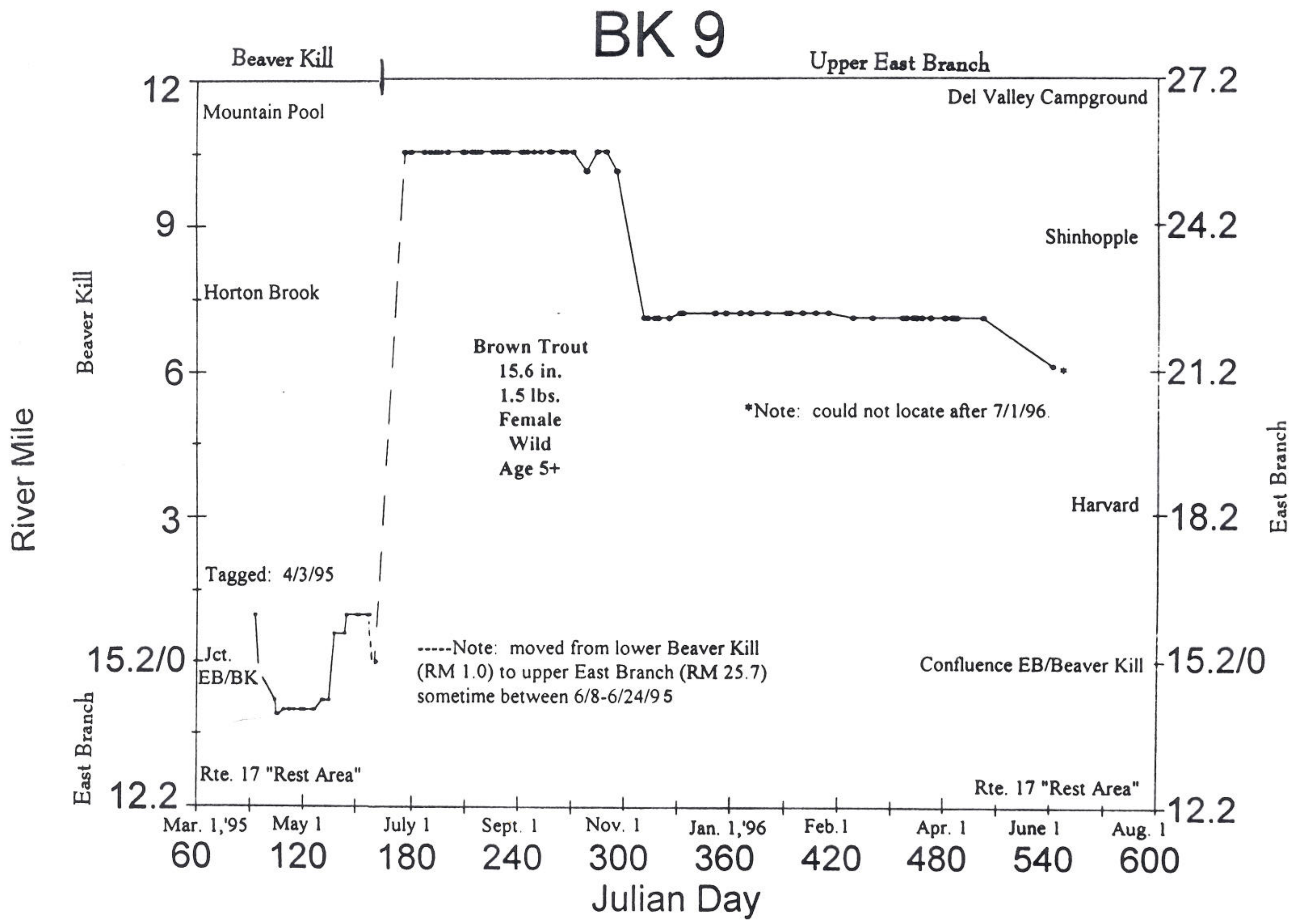


8.3
8.1
7.9
7.7
7.5
7.3
7.1
6.9
6.7
6.5
River Mile
Butternut Grove Campground
Cemetery Pool
Horton Brook
Tagged: 3/27/95
Brown Trout
17.4 in
2.1 lbs.
Female
Hatchery Origin
Age 4+
*Note: could not locate after 9/6/95.
Mar. 1,'95
Apr. 1
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1,'95
60
90
120
150
180
210
240
270
Julian Day

# BK-8

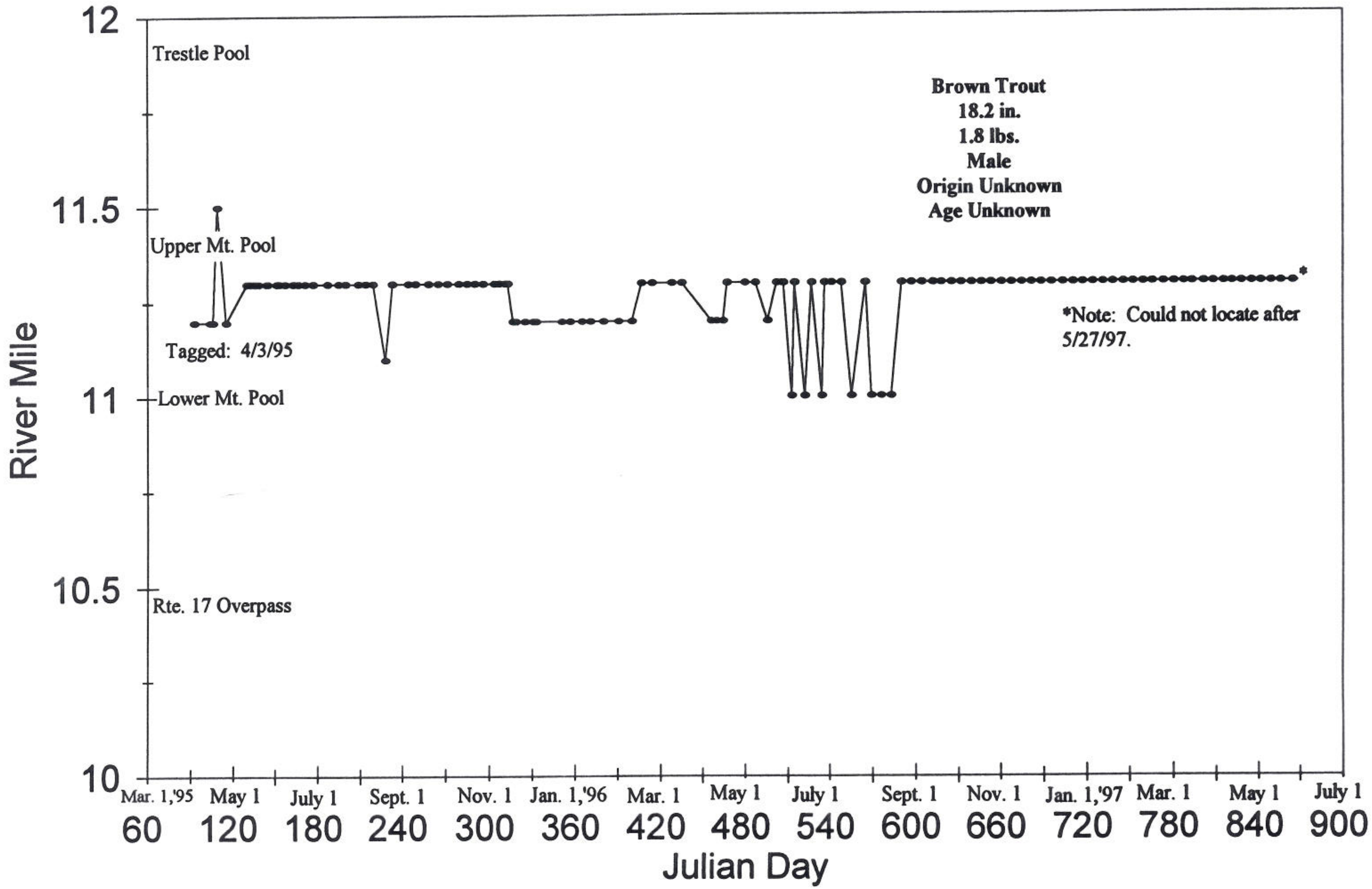


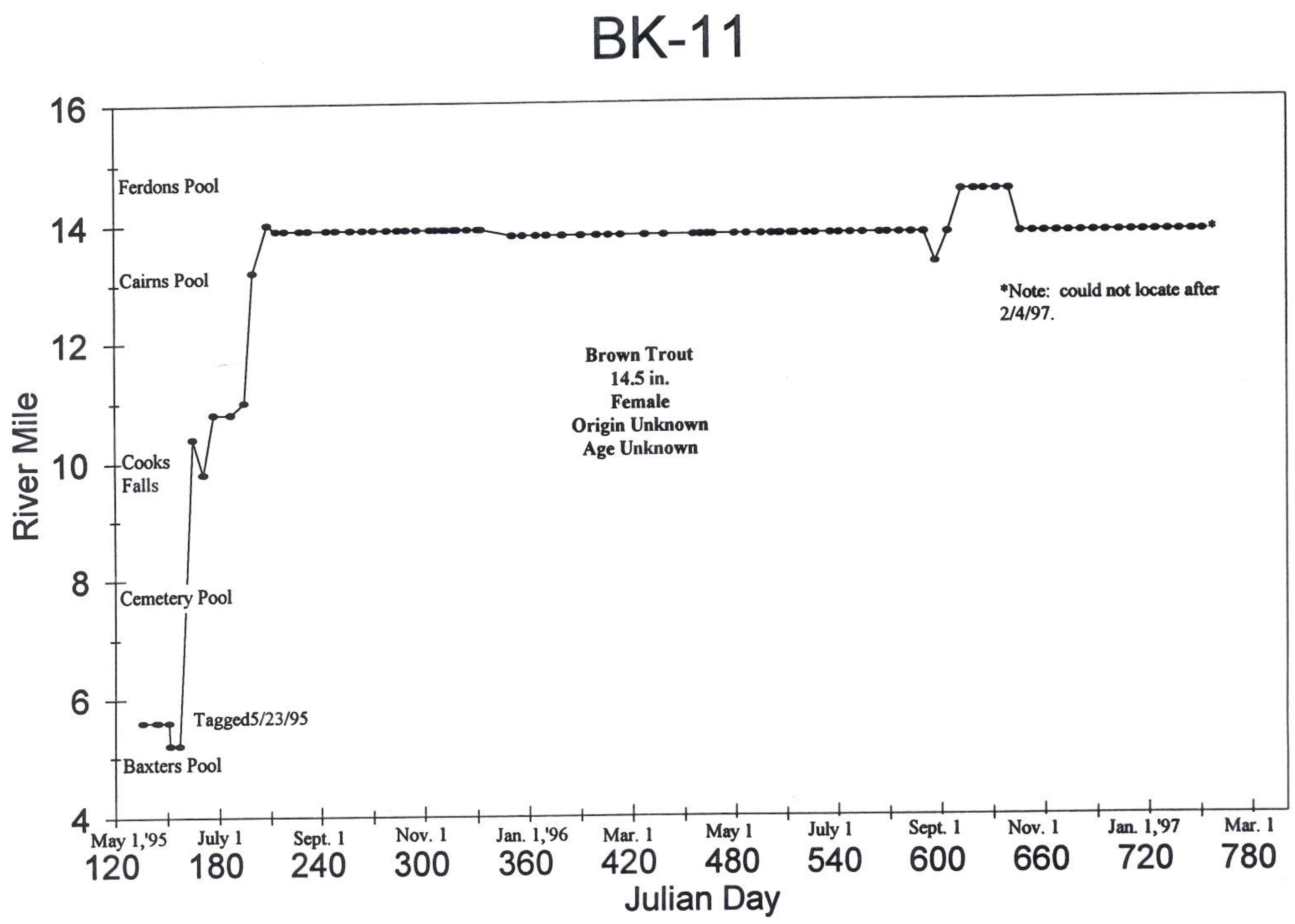
Viaduct (tunnel overpass)
Ben Gray Hollow
Trout Brook
Halls Island
Confluence
EB/Beaver Kill
Rte. 17 "Quickway" Overpass
Brown Trout
15.1 in.
1.4 lbs.
Female
Hatchery Origin
Age 3+
Tagged: 4/3/95
*Note: could not locate after 10/17/95.
River Mile
Beaver Kill
East Branch
6
5
4
3
2
1
15.2/0
14.2
13.2
Mar. 1,'95
Apr. 1
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1,'95
60
90
120
150
180
210
240
270
300
Julian Day



BK 9
Beaver Kill
Upper East Branch
River Mile
Beaver Kill
East Branch
East Branch
12
9
6
3
15.2/0
12.2
27.2
24.2
21.2
18.2
15.2/0
12.2
Mountain Pool
Horton Brook
Tagged: 4/3/95
Jct. EB/BK
Rte. 17 "Rest Area"
Del Valley Campground
Shinhopple
Harvard
Confluence EB/Beaver Kill
Rte. 17 "Rest Area"
Brown Trout
15.6 in.
1.5 lbs.
Female
Wild
Age 5+
*Note: could not locate after 7/1/96.
-----Note: moved from lower Beaver Kill (RM 1.0) to upper East Branch (RM 25.7) sometime between 6/8-6/24/95
Mar. 1,'95
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Feb. 1
Apr. 1
June 1
Aug. 1
60
120
180
240
300
360
420
480
540
600
Julian Day

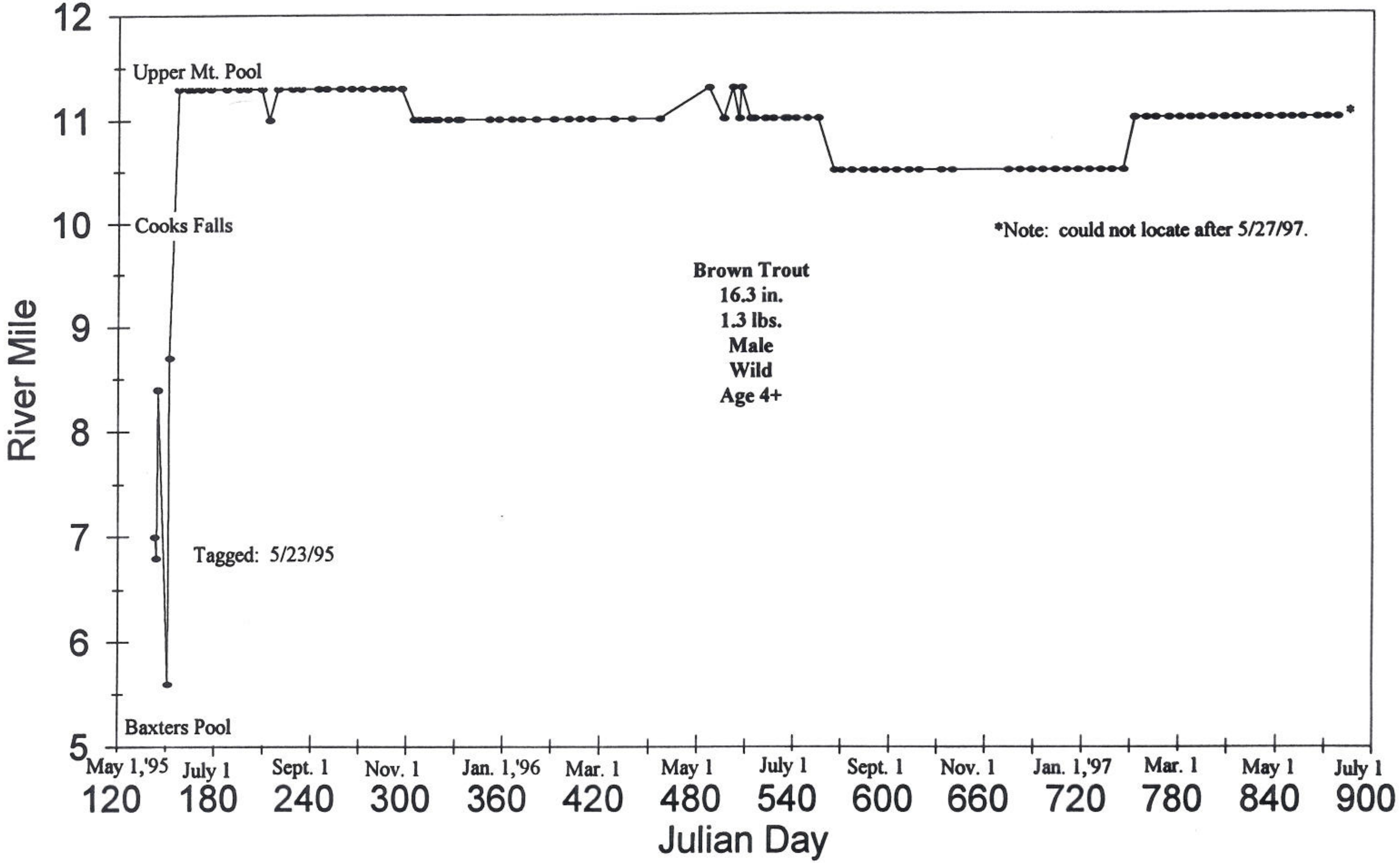
# BK-10


River Mile
12
11.5
11
10.5
10
Trestle Pool
Upper Mt. Pool
Tagged: 4/3/95
Lower Mt. Pool
Rte. 17 Overpass
Brown Trout
18.2 in.
1.8 lbs.
Male
Origin Unknown
Age Unknown
*Note: Could not locate after 5/27/97.
Mar. 1,'95
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
60
120
180
240
300
360
420
480
540
600
660
720
780
840
900
Julian Day



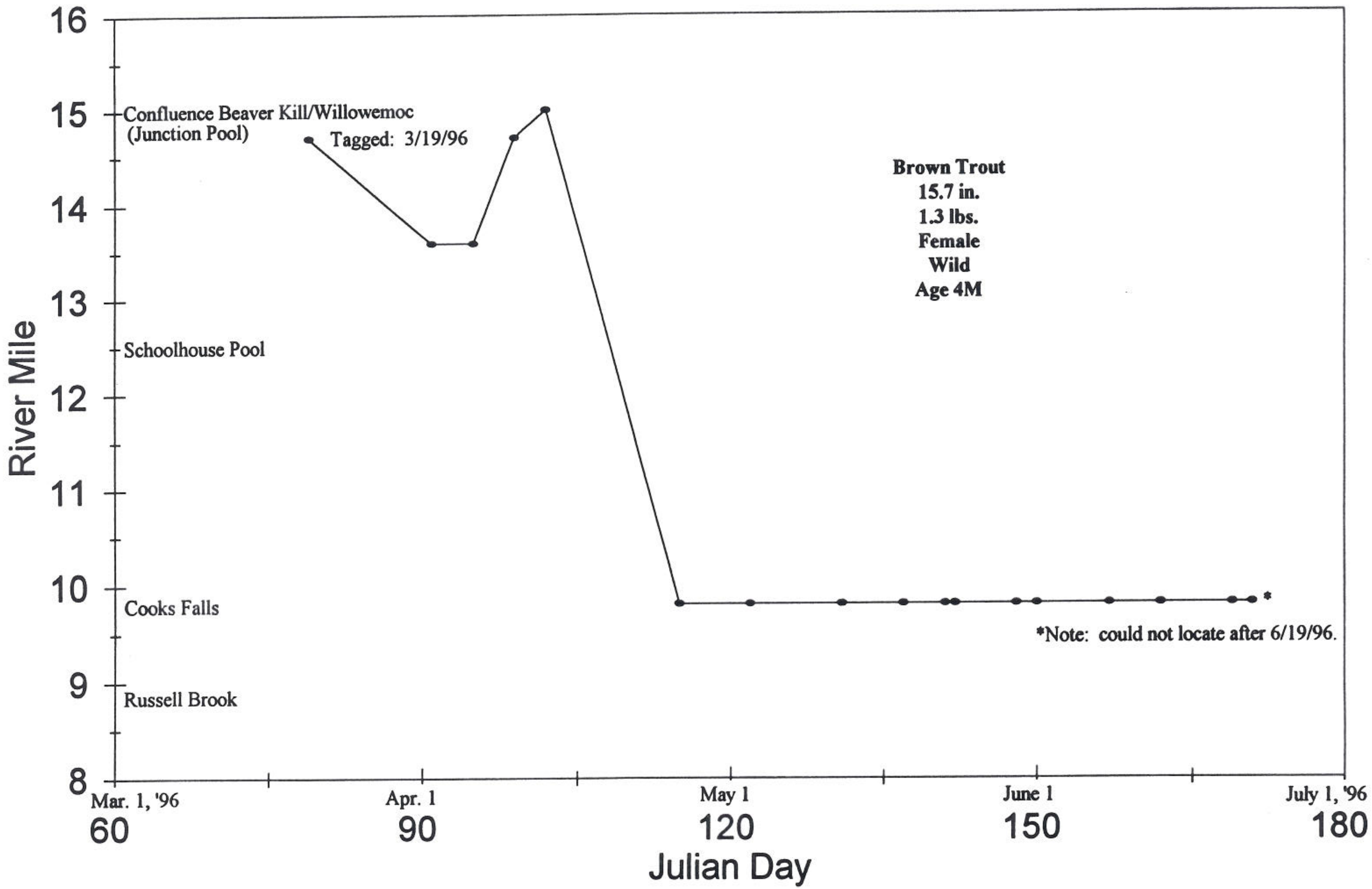
BK-11
River Mile
16
14
12
10
8
6
4
Ferdons Pool
Cairns Pool
Cooks Falls
Cemetery Pool
Tagged5/23/95
Baxters Pool
Brown Trout
14.5 in.
Female
Origin Unknown
Age Unknown
*Note: could not locate after 2/4/97.
May 1,'95
120
July 1
180
Sept. 1
240
Nov. 1
300
Jan. 1,'96
360
Mar. 1
420
May 1
480
July 1
540
Sept. 1
600
Nov. 1
660
Jan. 1,'97
720
Mar. 1
780
Julian Day

# BK-12



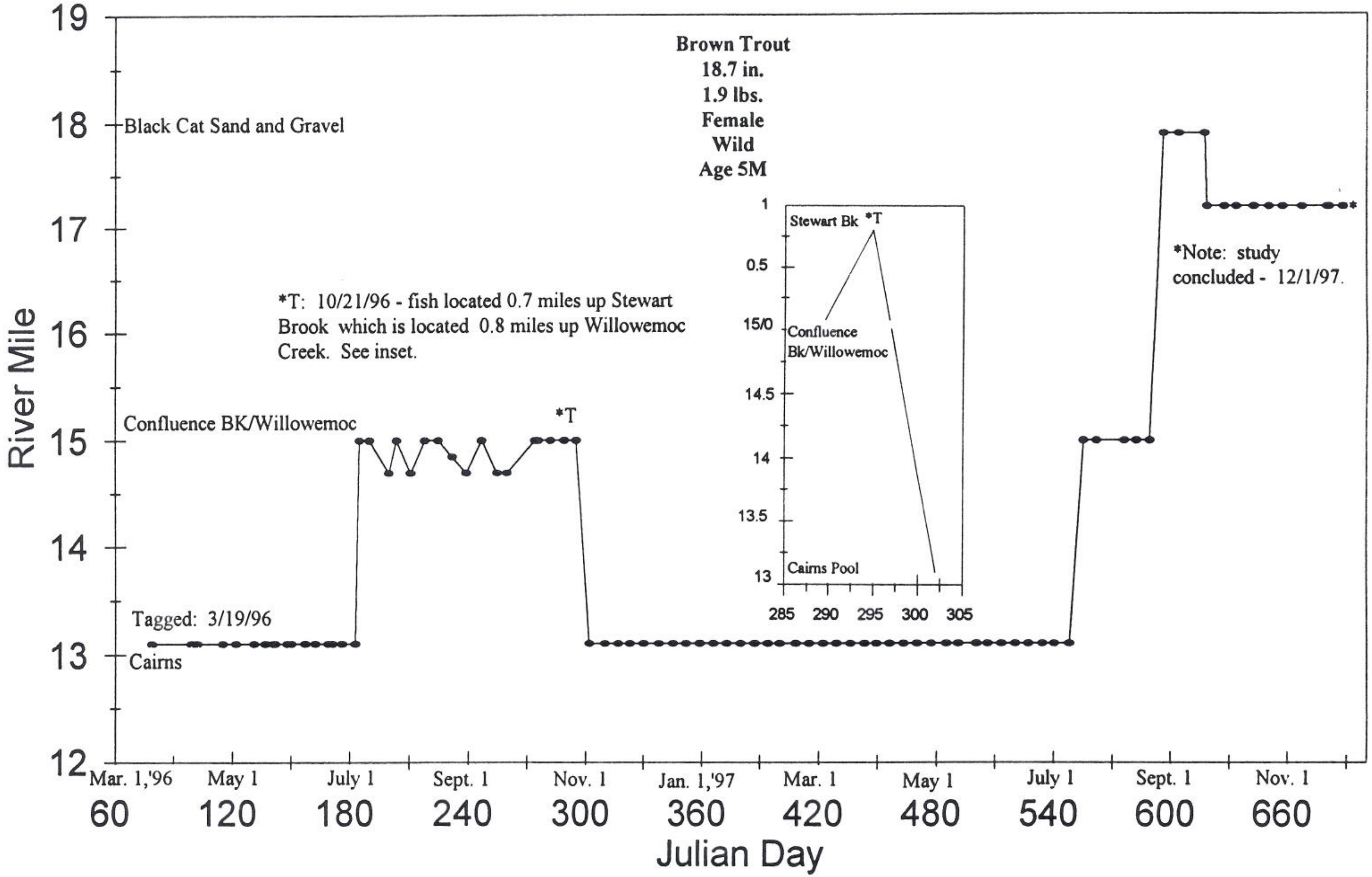
River Mile
12
11
10
9
8
7
6
5
Upper Mt. Pool
Cooks Falls
Baxters Pool
Tagged: 5/23/95
Brown Trout
16.3 in.
1.3 lbs.
Male
Wild
Age 4+
*Note: could not locate after 5/27/97.
May 1,'95
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
120
180
240
300
360
420
480
540
600
660
720
780
840
900
Julian Day

# BK 1 - 2



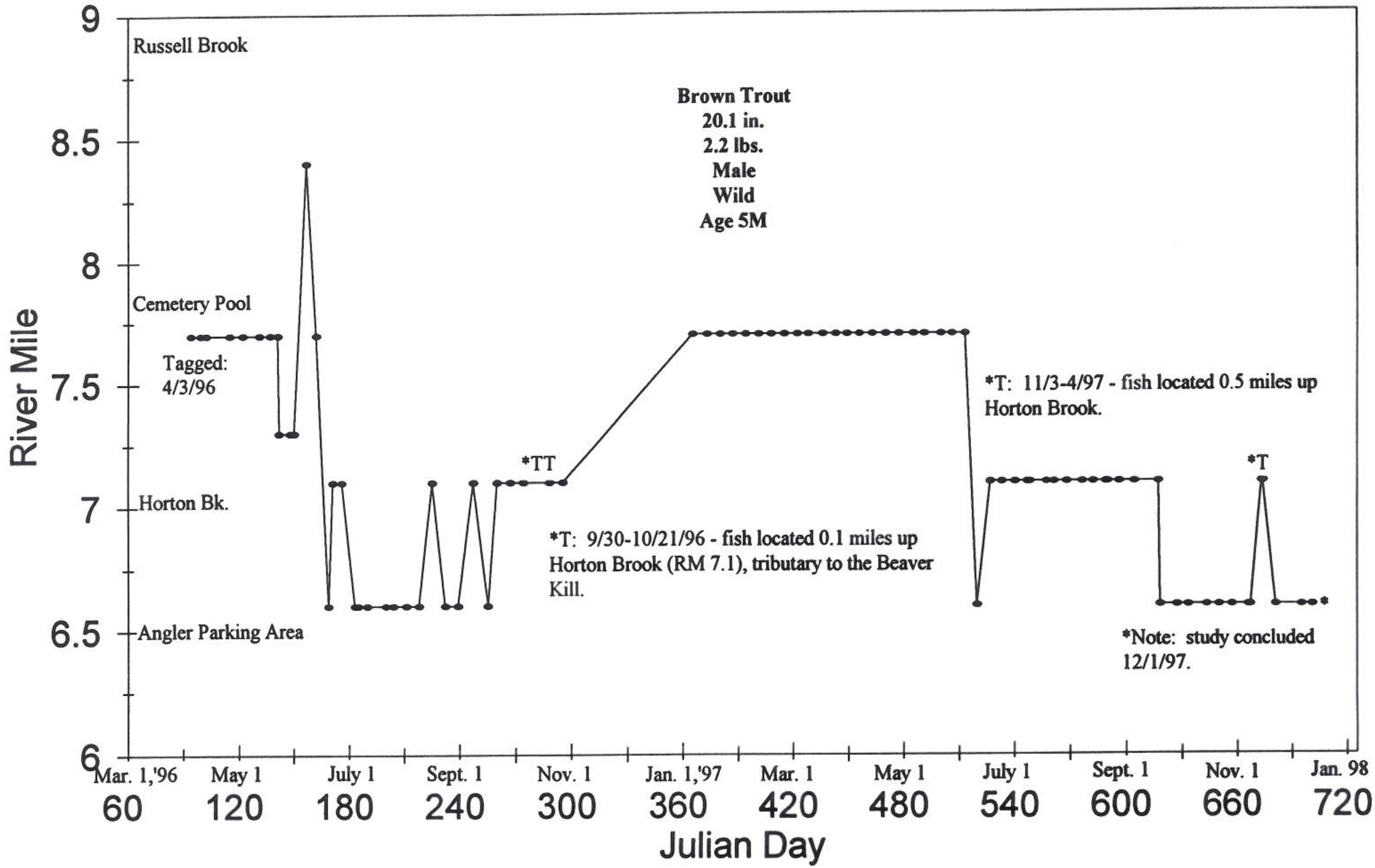
River Mile
16
15
14
13
12
11
10
9
8
Confluence Beaver Kill/Willowemoc
(Junction Pool)
Tagged: 3/19/96
Schoolhouse Pool
Cooks Falls
Russell Brook
Brown Trout
15.7 in.
1.3 lbs.
Female
Wild
Age 4M
*
*Note: could not locate after 6/19/96.
Mar. 1, '96
60
Apr. 1
90
May 1
120
June 1
150
July 1, '96
180
Julian Day

# BK 2 - 2



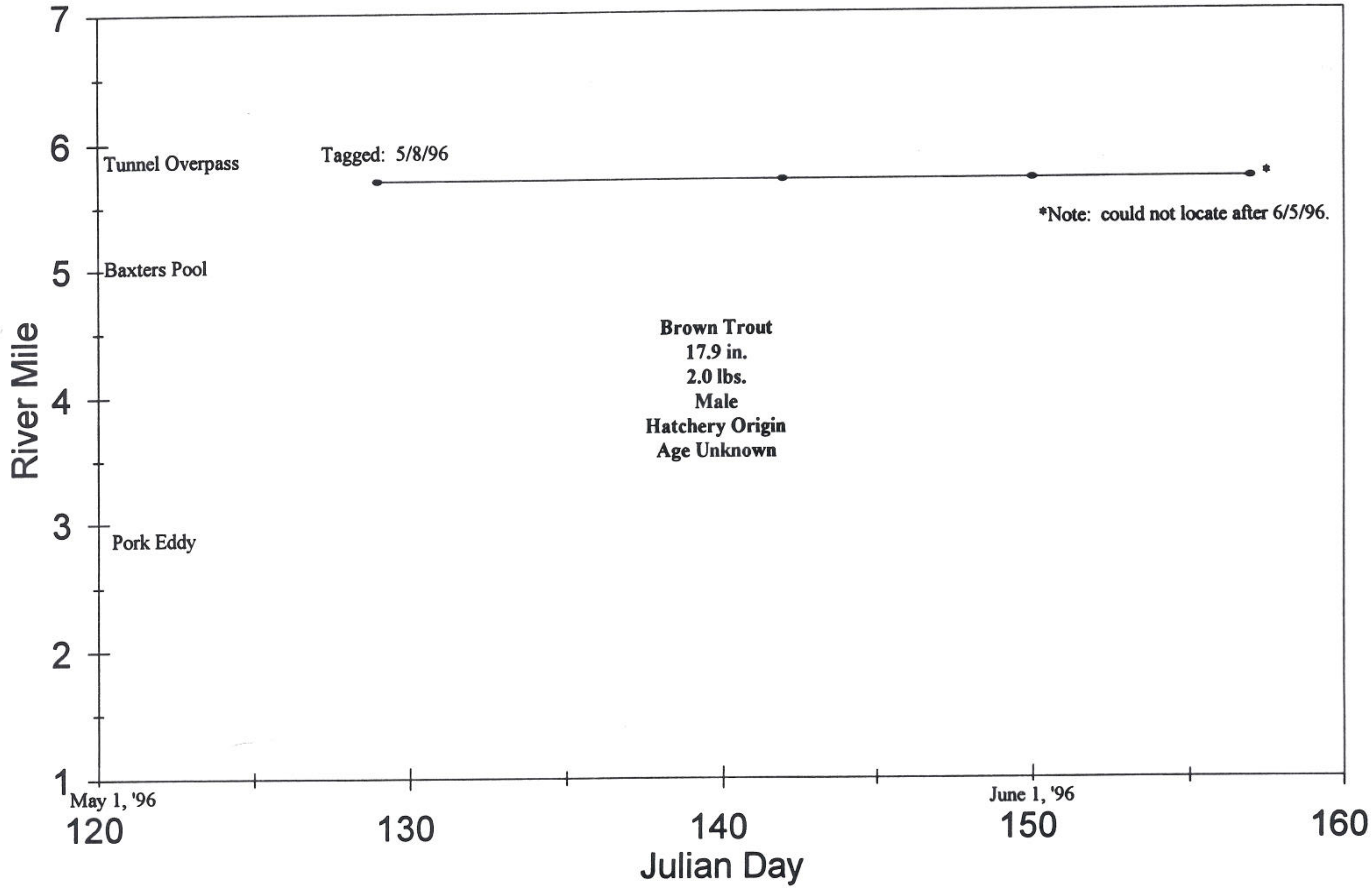
Brown Trout
18.7 in.
1.9 lbs.
Female
Wild
Age 5M
Black Cat Sand and Gravel
*T: 10/21/96 - fish located 0.7 miles up Stewart Brook which is located 0.8 miles up Willowemoc Creek. See inset.
Confluence BK/Willowemoc
*T
Tagged: 3/19/96
Cairns
Stewart Bk *T
Confluence Bk/Willowemoc
Cairns Pool
*Note: study concluded - 12/1/97.
River Mile
Julian Day
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1

# BK 3 - 2



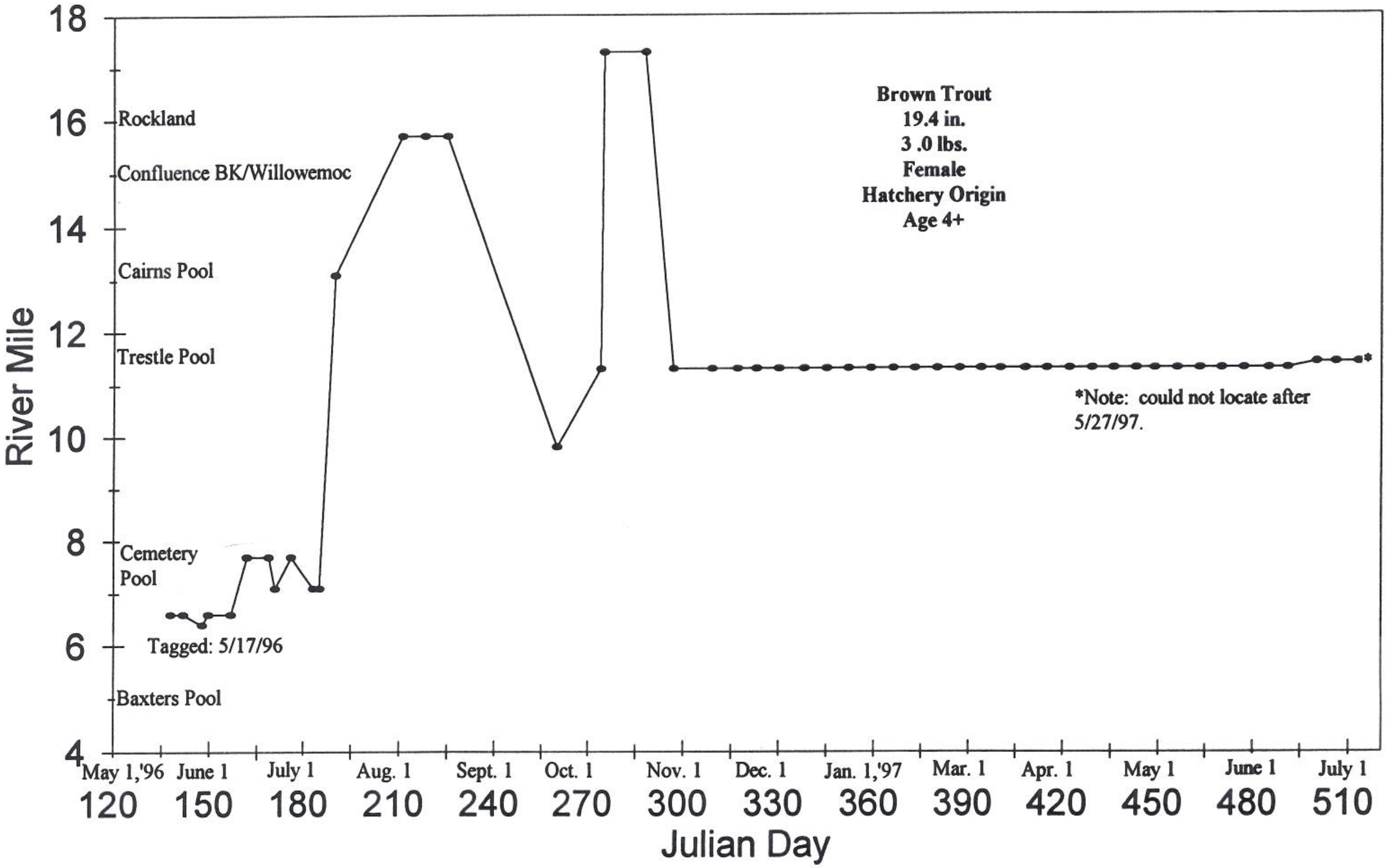
Brown Trout
20.1 in.
2.2 lbs.
Male
Wild
Age 5M
Russell Brook
Cemetery Pool
Tagged: 4/3/96
Horton Bk.
Angler Parking Area
*TT
*T: 9/30-10/21/96 - fish located 0.1 miles up Horton Brook (RM 7.1), tributary to the Beaver Kill.
*T: 11/3-4/97 - fish located 0.5 miles up Horton Brook.
*T
*Note: study concluded 12/1/97.
River Mile
9
8.5
8
7.5
7
6.5
6
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# BK 4 - 2



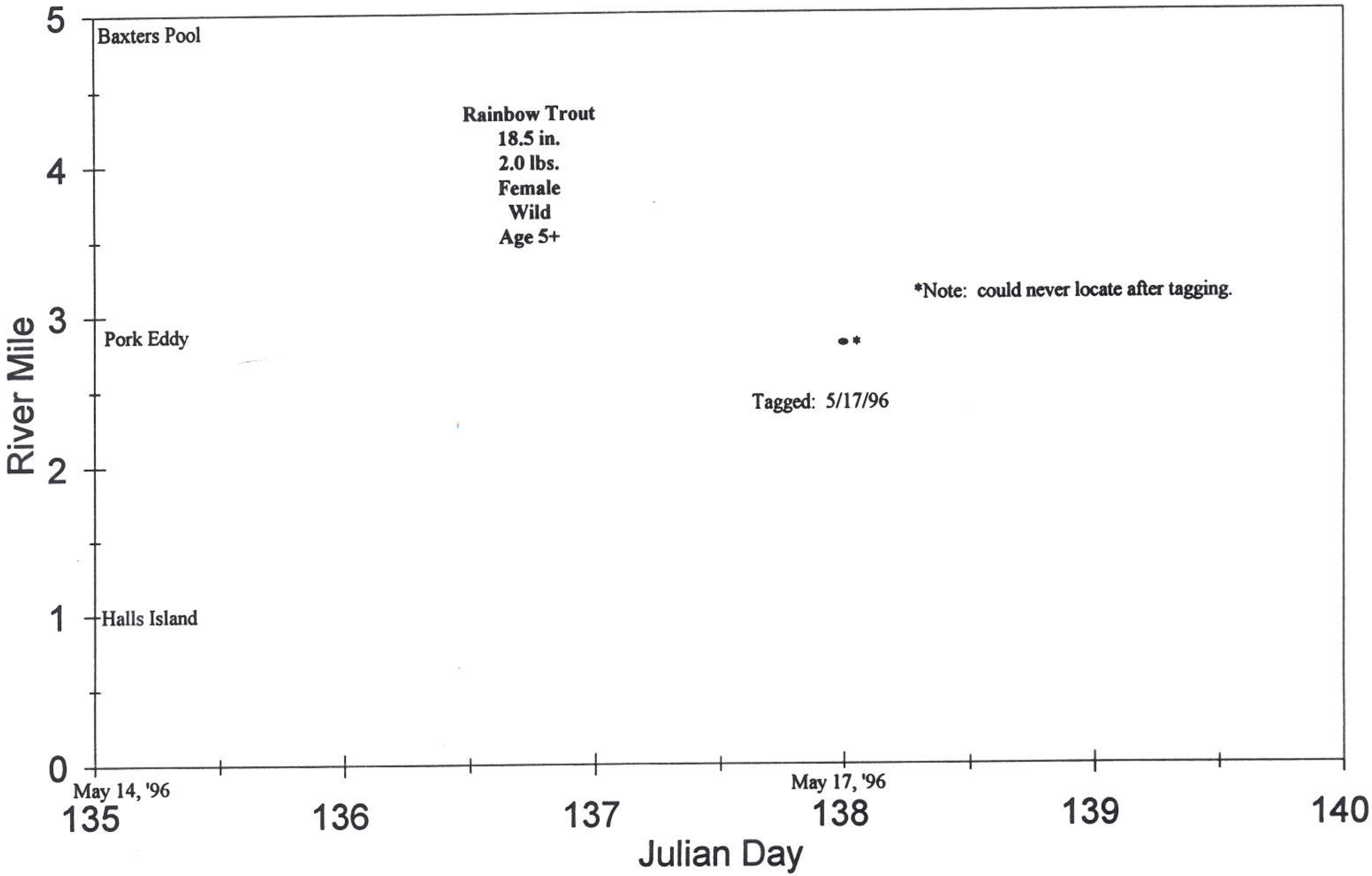
7
6
5
4
3
2
1
River Mile
Tunnel Overpass
Baxters Pool
Pork Eddy
Tagged: 5/8/96
*
*Note: could not locate after 6/5/96.
Brown Trout
17.9 in.
2.0 lbs.
Male
Hatchery Origin
Age Unknown
May 1, '96
June 1, '96
120
130
140
150
160
Julian Day

# BK 5 - 2



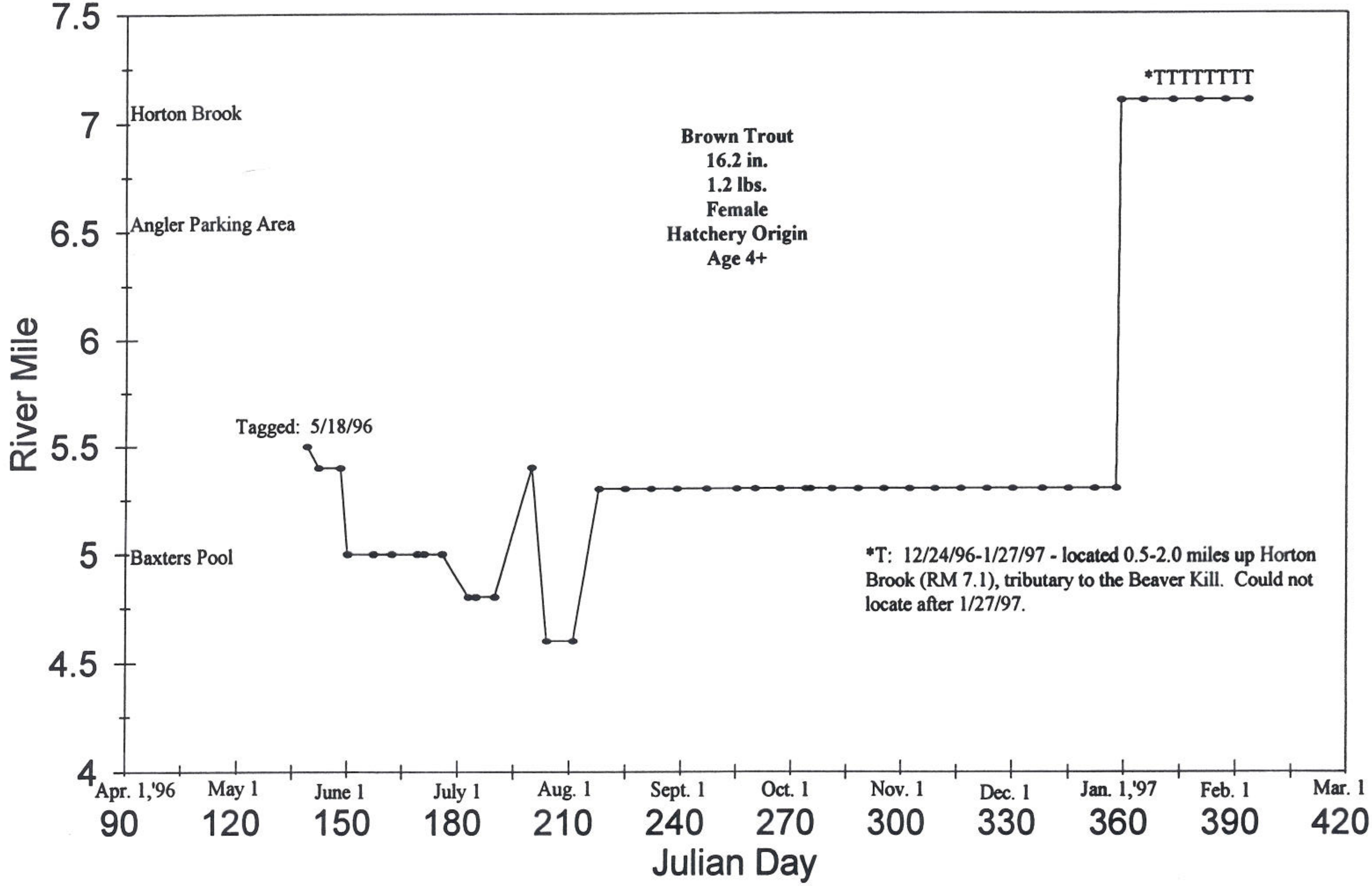
River Mile
18
16
14
12
10
8
6
4
Rockland
Confluence BK/Willowemoc
Cairns Pool
Trestle Pool
Cemetery Pool
Tagged: 5/17/96
Baxters Pool
Brown Trout
19.4 in.
3 .0 lbs.
Female
Hatchery Origin
Age 4+
*Note: could not locate after 5/27/97.
May 1,'96
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'97
Mar. 1
Apr. 1
May 1
June 1
July 1
120
150
180
210
240
270
300
330
360
390
420
450
480
510
Julian Day

# BK 6 - 2



Baxters Pool
Rainbow Trout
18.5 in.
2.0 lbs.
Female
Wild
Age 5+
*Note: could never locate after tagging.
Pork Eddy
Tagged: 5/17/96
Halls Island
River Mile
5
4
3
2
1
0
May 14, '96
May 17, '96
135
136
137
138
139
140
Julian Day

# BK 7 - 2



River Mile
7.5
7
6.5
6
5.5
5
4.5
4
Horton Brook
Angler Parking Area
Baxters Pool
Tagged: 5/18/96
Brown Trout
16.2 in.
1.2 lbs.
Female
Hatchery Origin
Age 4+
*TTTTTTTT
*T: 12/24/96-1/27/97 - located 0.5-2.0 miles up Horton Brook (RM 7.1), tributary to the Beaver Kill. Could not locate after 1/27/97.
Apr. 1,'96
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'97
Feb. 1
Mar. 1
90
120
150
180
210
240
270
300
330
360
390
420
Julian Day

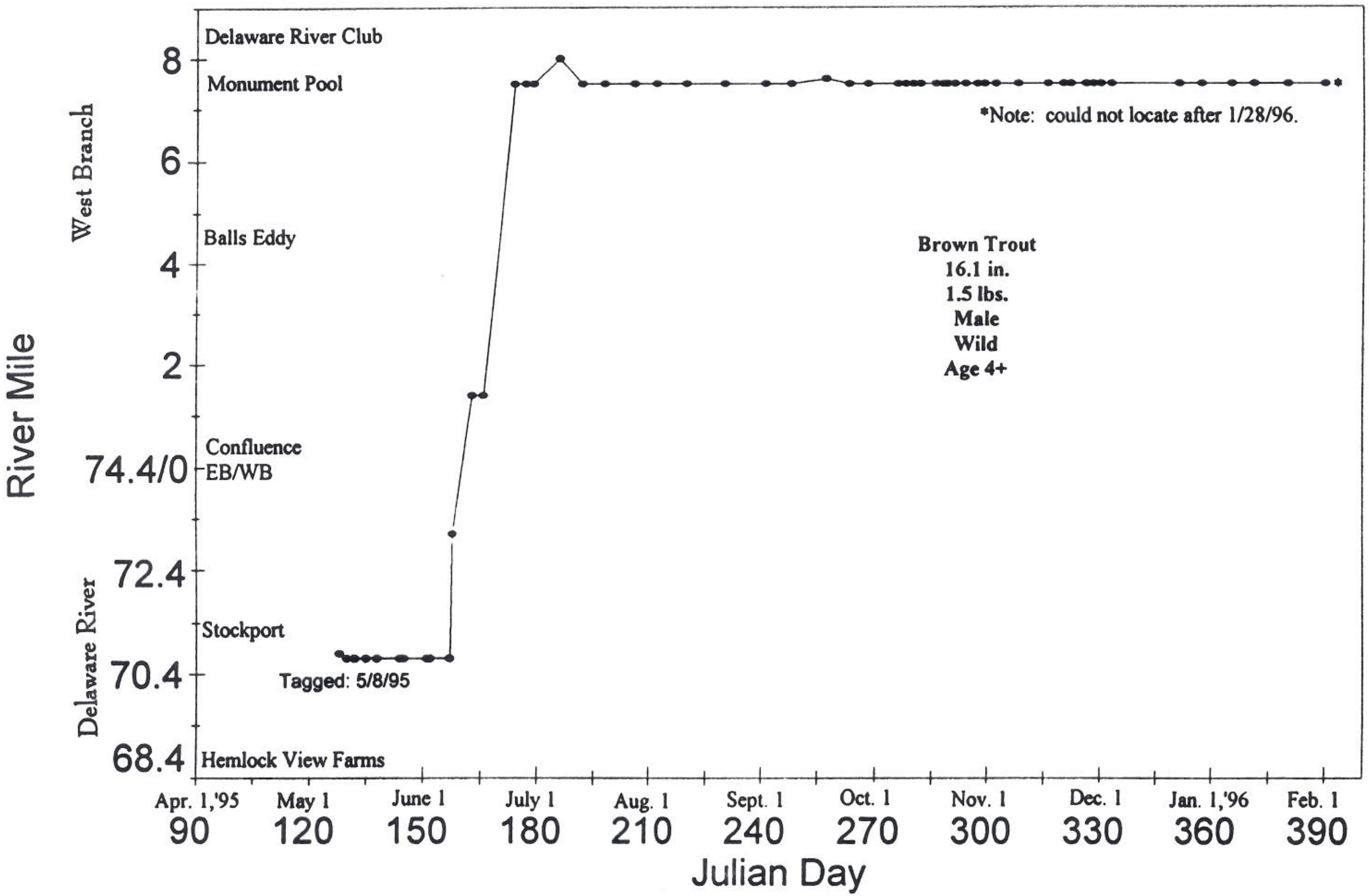
APPENDIX 5:

DELAWARE RIVER

Movement history of each radiotagged trout through December 1, 1997

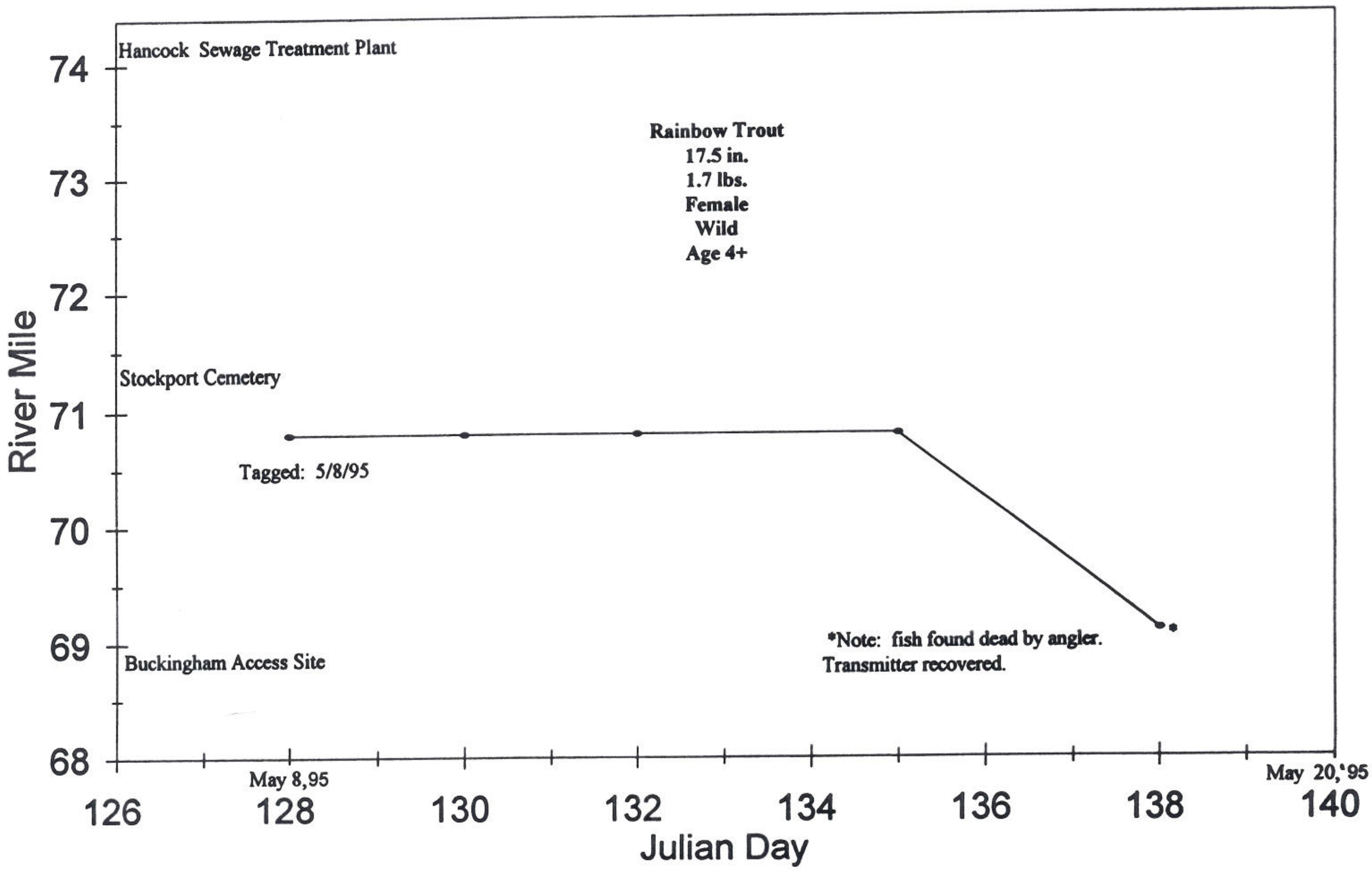
DR 1 to DR 8 : Tagged 1995
DR 1-2 to DR 21-2: Tagged 1996

# DR-1



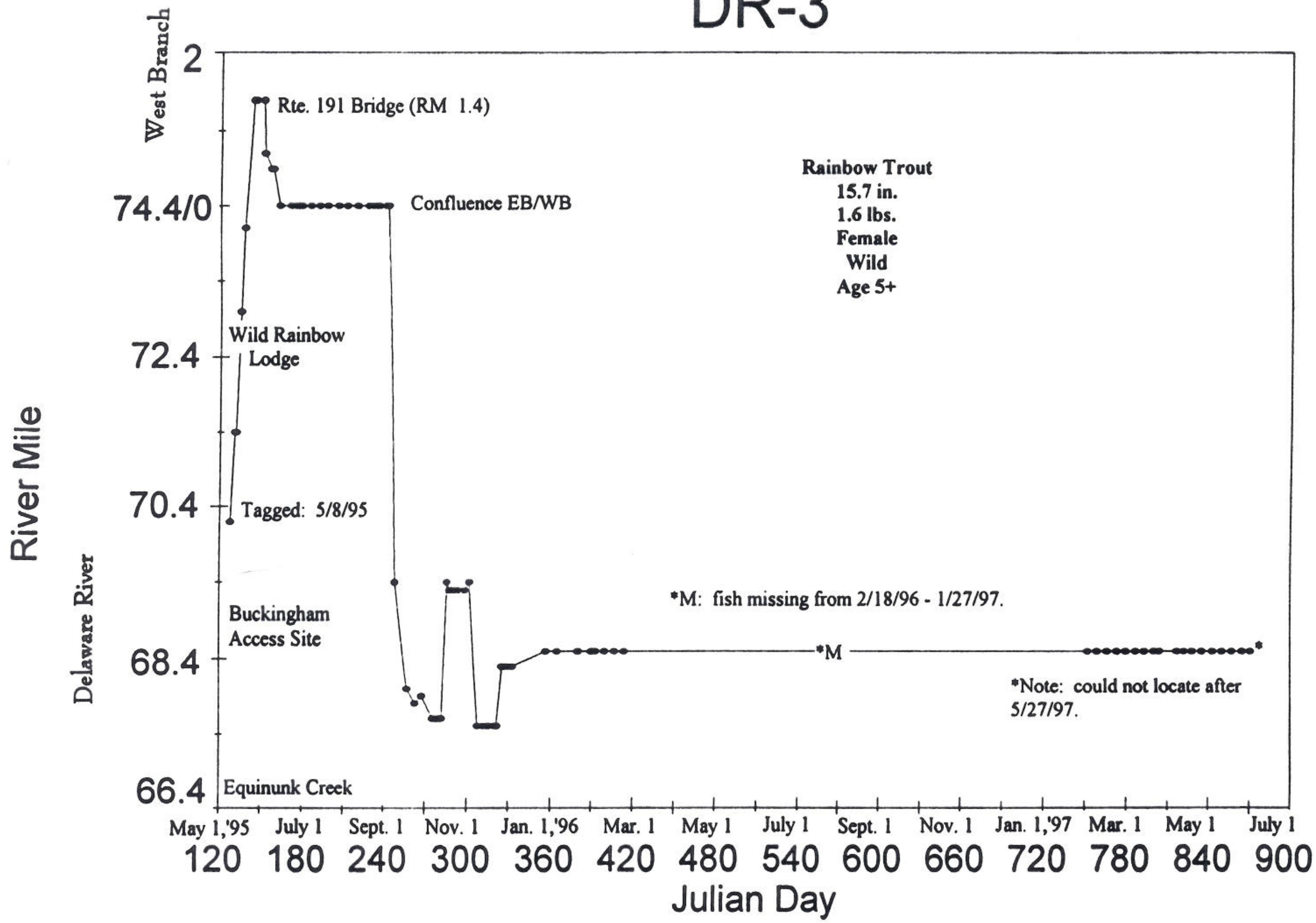
Delaware River Club
Monument Pool
Balls Eddy
Confluence
EB/WB
Stockport
Hemlock View Farms
Tagged: 5/8/95
*Note: could not locate after 1/28/96.
Brown Trout
16.1 in.
1.5 lbs.
Male
Wild
Age 4+
River Mile
West Branch
Delaware River
8
6
4
2
74.4/0
72.4
70.4
68.4
Apr. 1,'95
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1,'96
Feb. 1
90
120
150
180
210
240
270
300
330
360
390
Julian Day

# DR-2



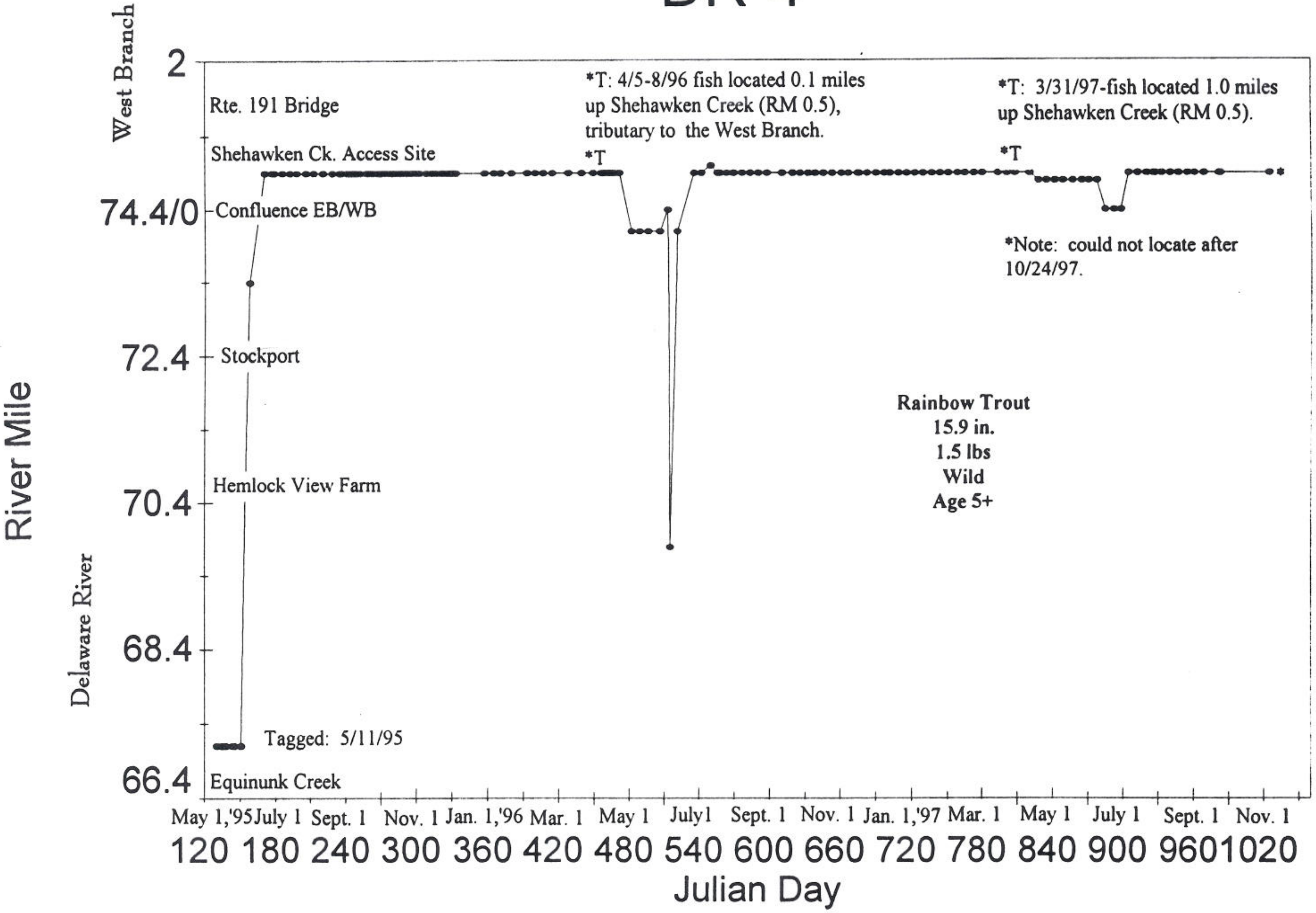
Hancock Sewage Treatment Plant
Stockport Cemetery
Buckingham Access Site
Rainbow Trout
17.5 in.
1.7 lbs.
Female
Wild
Age 4+
Tagged: 5/8/95
*Note: fish found dead by angler.
Transmitter recovered.
River Mile
74
73
72
71
70
69
68
May 8,95
May 20,'95
126
128
130
132
134
136
138
140
Julian Day

# DR-3



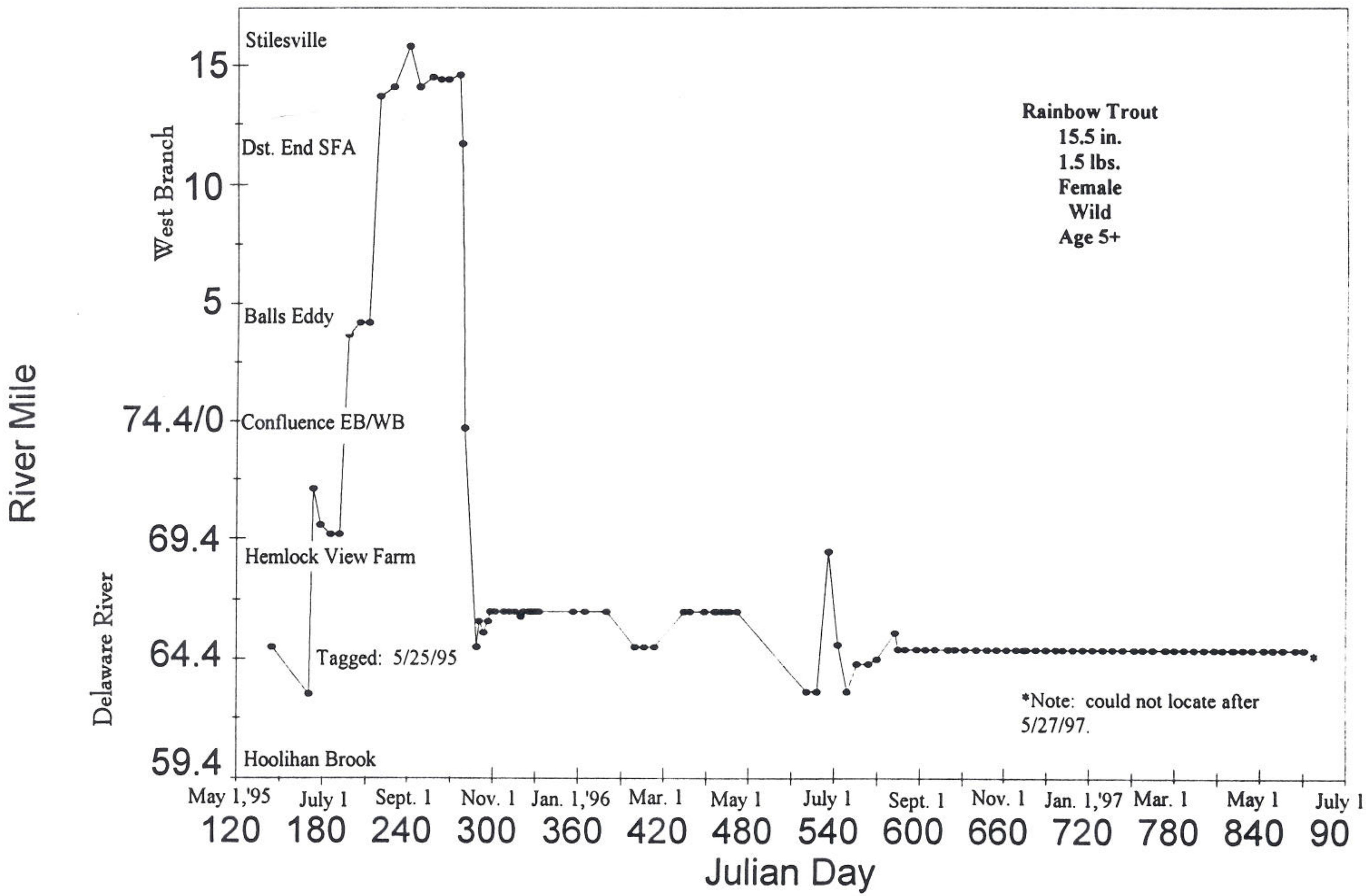
West Branch
2
Rte. 191 Bridge (RM 1.4)
Rainbow Trout
15.7 in.
1.6 lbs.
Female
Wild
Age 5+
74.4/0
Confluence EB/WB
Wild Rainbow
Lodge
72.4
River Mile
70.4
Tagged: 5/8/95
Delaware River
*M: fish missing from 2/18/96 - 1/27/97.
Buckingham
Access Site
68.4
*M
*
*Note: could not locate after
5/27/97.
66.4
Equinunk Creek
May 1,'95
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
120
180
240
300
360
420
480
540
600
660
720
780
840
900
Julian Day

# DR-4

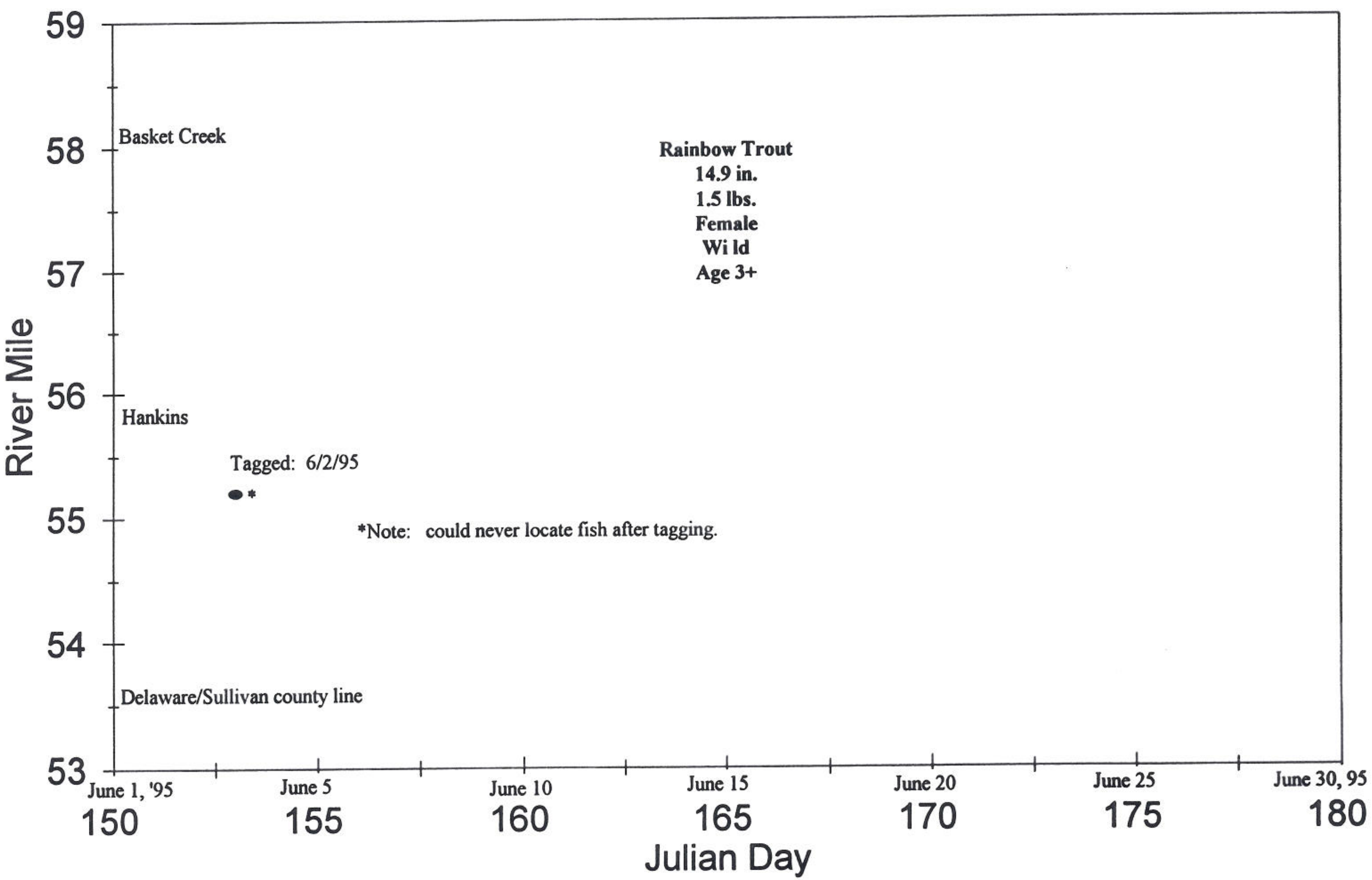


West Branch
2
Rte. 191 Bridge
Shehawken Ck. Access Site
74.4/0
Confluence EB/WB
72.4
Stockport
70.4
Hemlock View Farm
68.4
Delaware River
Tagged: 5/11/95
66.4
Equinunk Creek
River Mile
*T: 4/5-8/96 fish located 0.1 miles up Shehawken Creek (RM 0.5), tributary to the West Branch.
*T
*T: 3/31/97-fish located 1.0 miles up Shehawken Creek (RM 0.5).
*T
*Note: could not locate after 10/24/97.
Rainbow Trout
15.9 in.
1.5 lbs
Wild
Age 5+
May 1,'95 July 1 Sept. 1 Nov. 1 Jan. 1,'96 Mar. 1 May 1 July1 Sept. 1 Nov. 1 Jan. 1,'97 Mar. 1 May 1 July 1 Sept. 1 Nov. 1
120 180 240 300 360 420 480 540 600 660 720 780 840 900 9601020
Julian Day

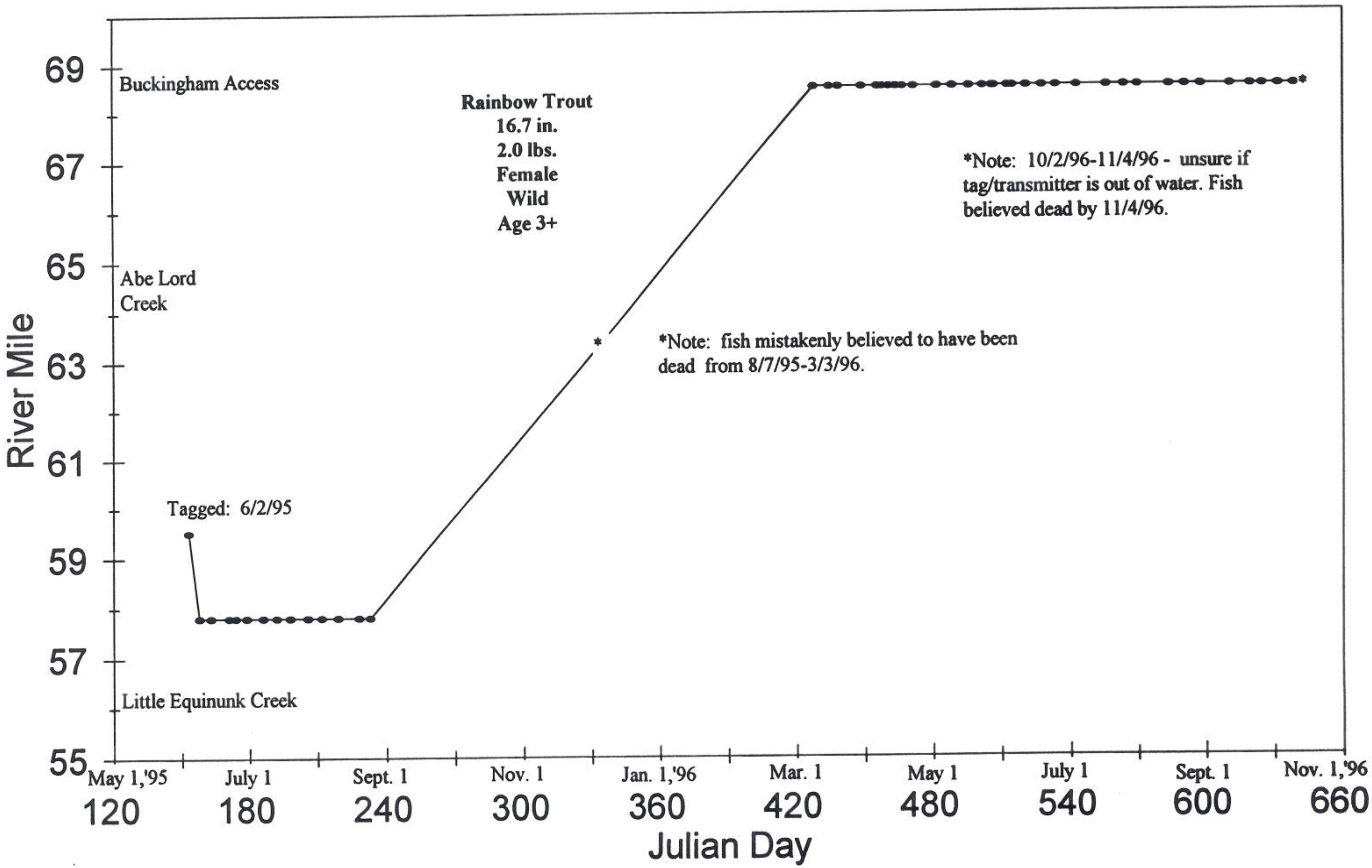
# DR-5


Stilesville
Dst. End SFA
Balls Eddy
Confluence EB/WB
Hemlock View Farm
Tagged: 5/25/95
Hoolihan Brook
Rainbow Trout
15.5 in.
1.5 lbs.
Female
Wild
Age 5+
*Note: could not locate after 5/27/97.
River Mile
West Branch
Delaware River
15
10
5
74.4/0
69.4
64.4
59.4
May 1,'95
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
120
180
240
300
360
420
480
540
600
660
720
780
840
90
Julian Day

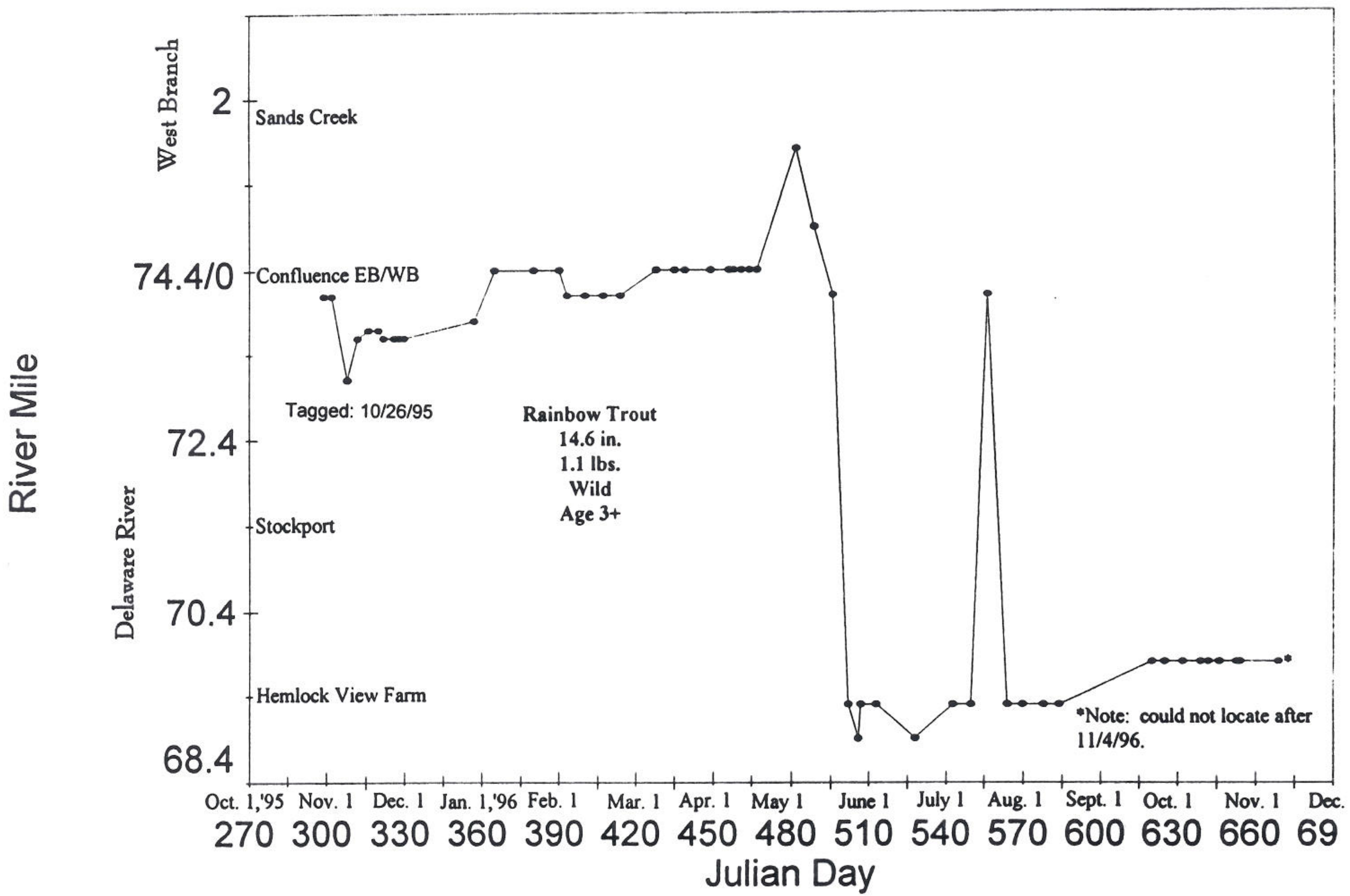
# DR-6


River Mile
59
58
57
56
55
54
53
Basket Creek
Hankins
Delaware/Sullivan county line
Tagged: 6/2/95
*
*Note: could never locate fish after tagging.
Rainbow Trout
14.9 in.
1.5 lbs.
Female
Wi ld
Age 3+
June 1, '95
June 5
June 10
June 15
June 20
June 25
June 30, 95
150
155
160
165
170
175
180
Julian Day

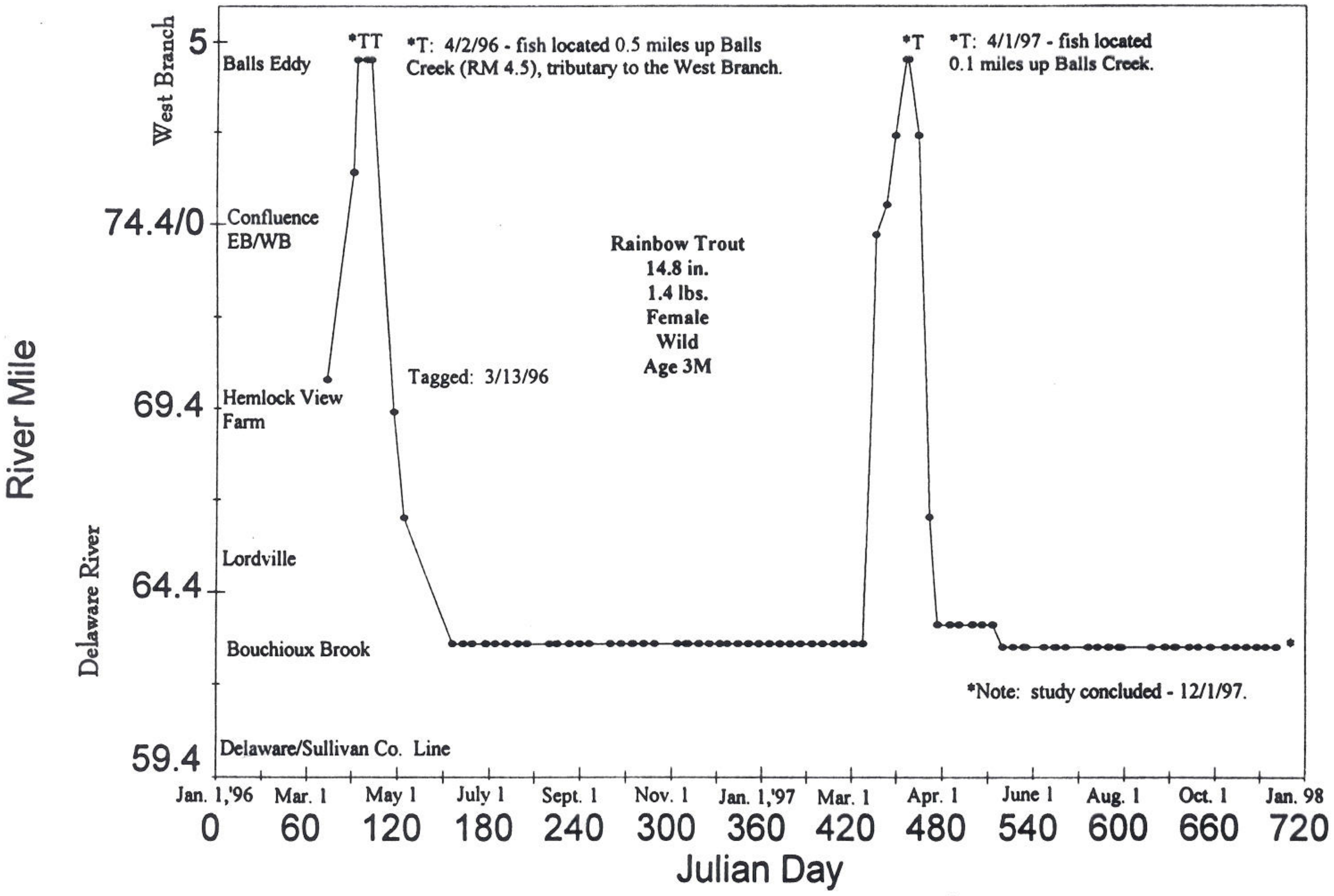
# DR-7


River Mile
69
67
65
63
61
59
57
55
Buckingham Access
Abe Lord Creek
Little Equinunk Creek
Tagged: 6/2/95
Rainbow Trout
16.7 in.
2.0 lbs.
Female
Wild
Age 3+
*Note: fish mistakenly believed to have been dead from 8/7/95-3/3/96.
*Note: 10/2/96-11/4/96 - unsure if tag/transmitter is out of water. Fish believed dead by 11/4/96.
May 1,'95
July 1
Sept. 1
Nov. 1
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1,'96
120
180
240
300
360
420
480
540
600
660
Julian Day

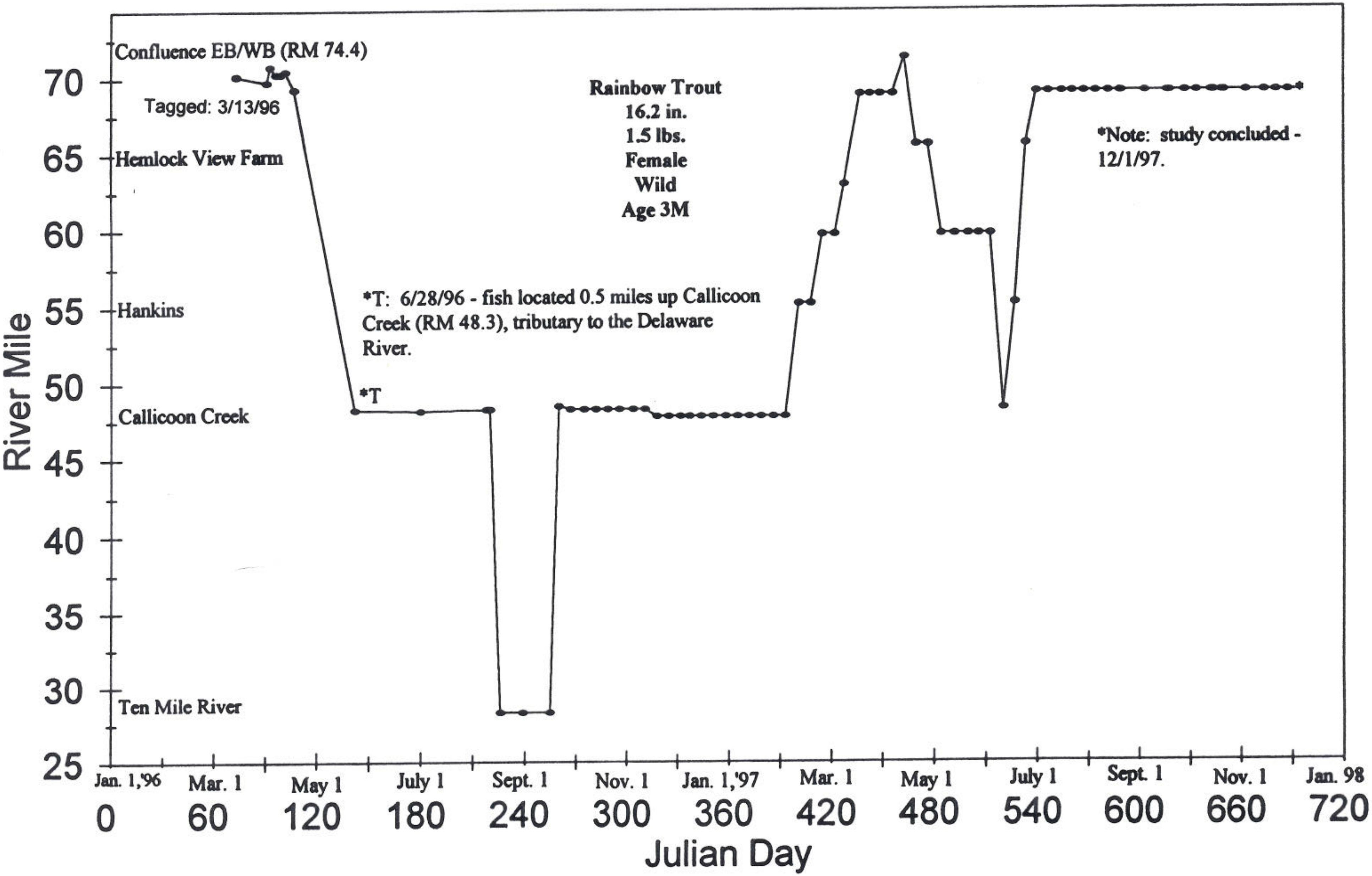
# DR-8


River Mile
West Branch
Delaware River
2
74.4/0
72.4
70.4
68.4
Sands Creek
Confluence EB/WB
Stockport
Hemlock View Farm
Tagged: 10/26/95
Rainbow Trout
14.6 in.
1.1 lbs.
Wild
Age 3+
*Note: could not locate after 11/4/96.
Oct. 1,'95 Nov. 1 Dec. 1 Jan. 1,'96 Feb. 1 Mar. 1 Apr. 1 May 1 June 1 July 1 Aug. 1 Sept. 1 Oct. 1 Nov. 1 Dec.
270 300 330 360 390 420 450 480 510 540 570 600 630 660 69
Julian Day

# DR 1 - 2

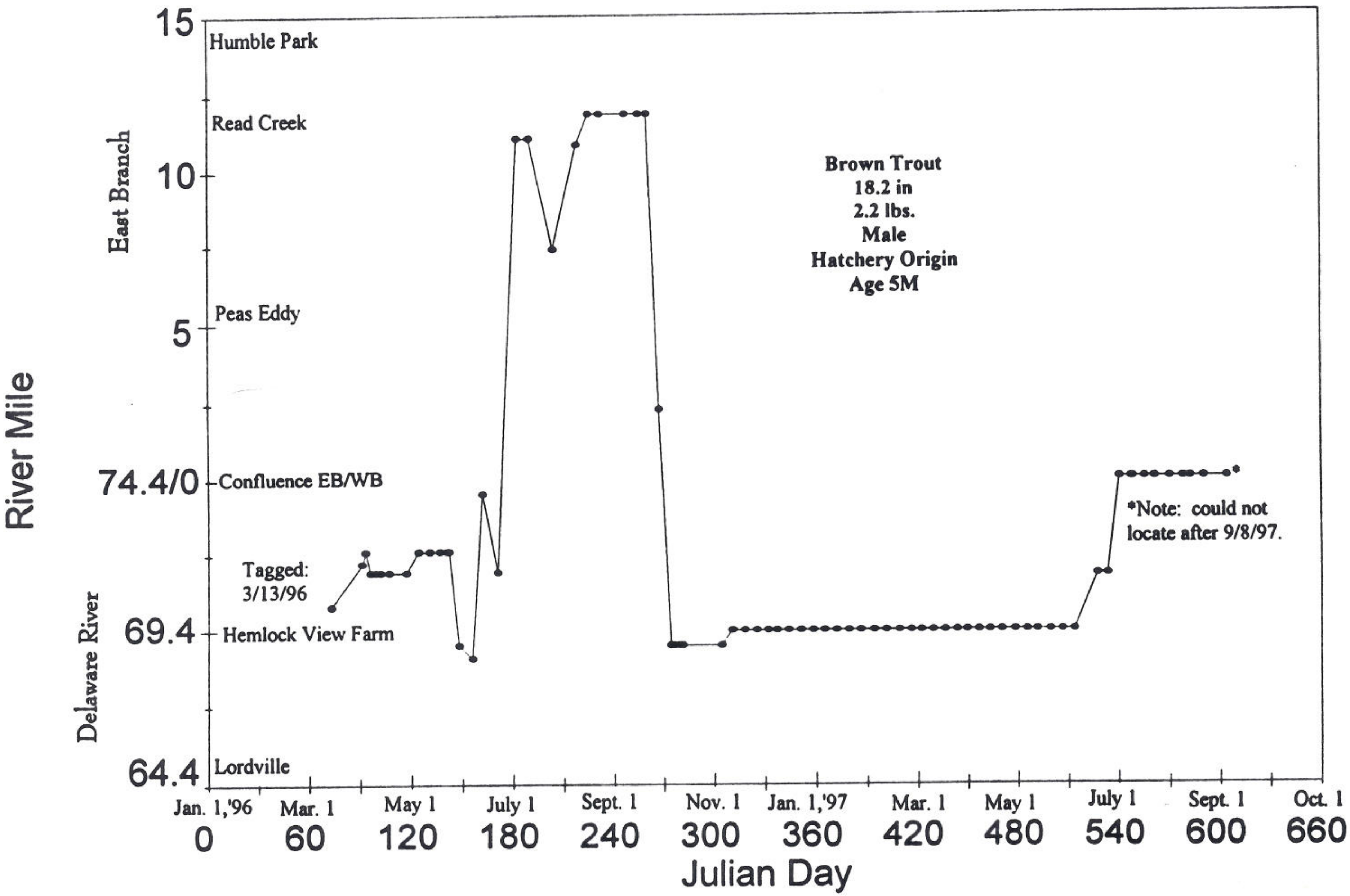

West Branch
Delaware River
River Mile
5
74.4/0
69.4
64.4
59.4
Balls Eddy
Confluence EB/WB
Hemlock View Farm
Lordville
Bouchioux Brook
Delaware/Sullivan Co. Line
*TT
*T: 4/2/96 - fish located 0.5 miles up Balls Creek (RM 4.5), tributary to the West Branch.
*T
*T: 4/1/97 - fish located 0.1 miles up Balls Creek.
Tagged: 3/13/96
Rainbow Trout
14.8 in.
1.4 lbs.
Female
Wild
Age 3M
*Note: study concluded - 12/1/97.
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
Apr. 1
June 1
Aug. 1
Oct. 1
Jan. 98
0
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 2 - 2



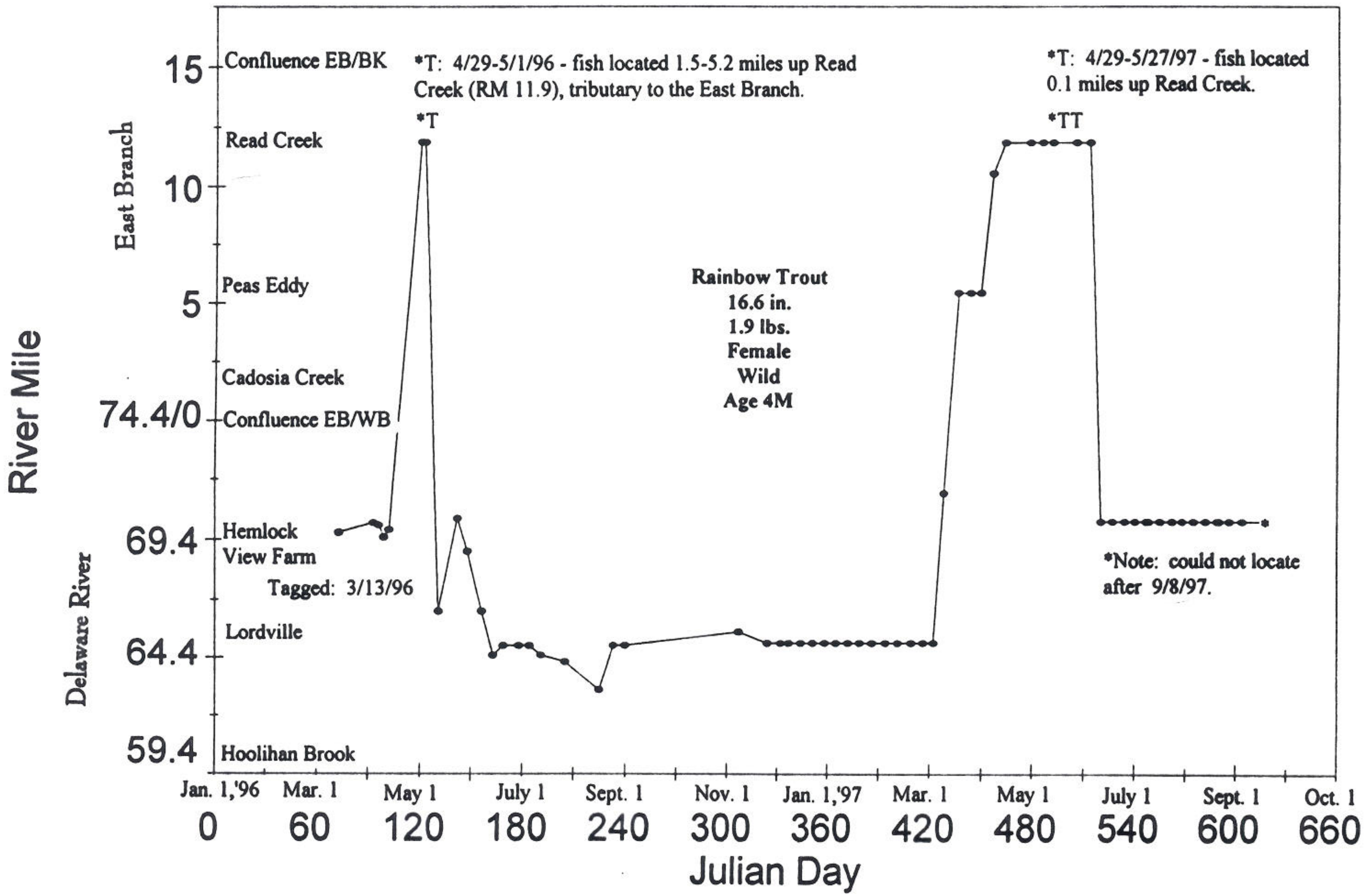
Confluence EB/WB (RM 74.4)
Tagged: 3/13/96
Hemlock View Farm
Hankins
Callicoon Creek
Ten Mile River
Rainbow Trout
16.2 in.
1.5 lbs.
Female
Wild
Age 3M
*T: 6/28/96 - fish located 0.5 miles up Callicoon Creek (RM 48.3), tributary to the Delaware River.
*T
*Note: study concluded - 12/1/97.
River Mile
70
65
60
55
50
45
40
35
30
25
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
0
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 3 - 2



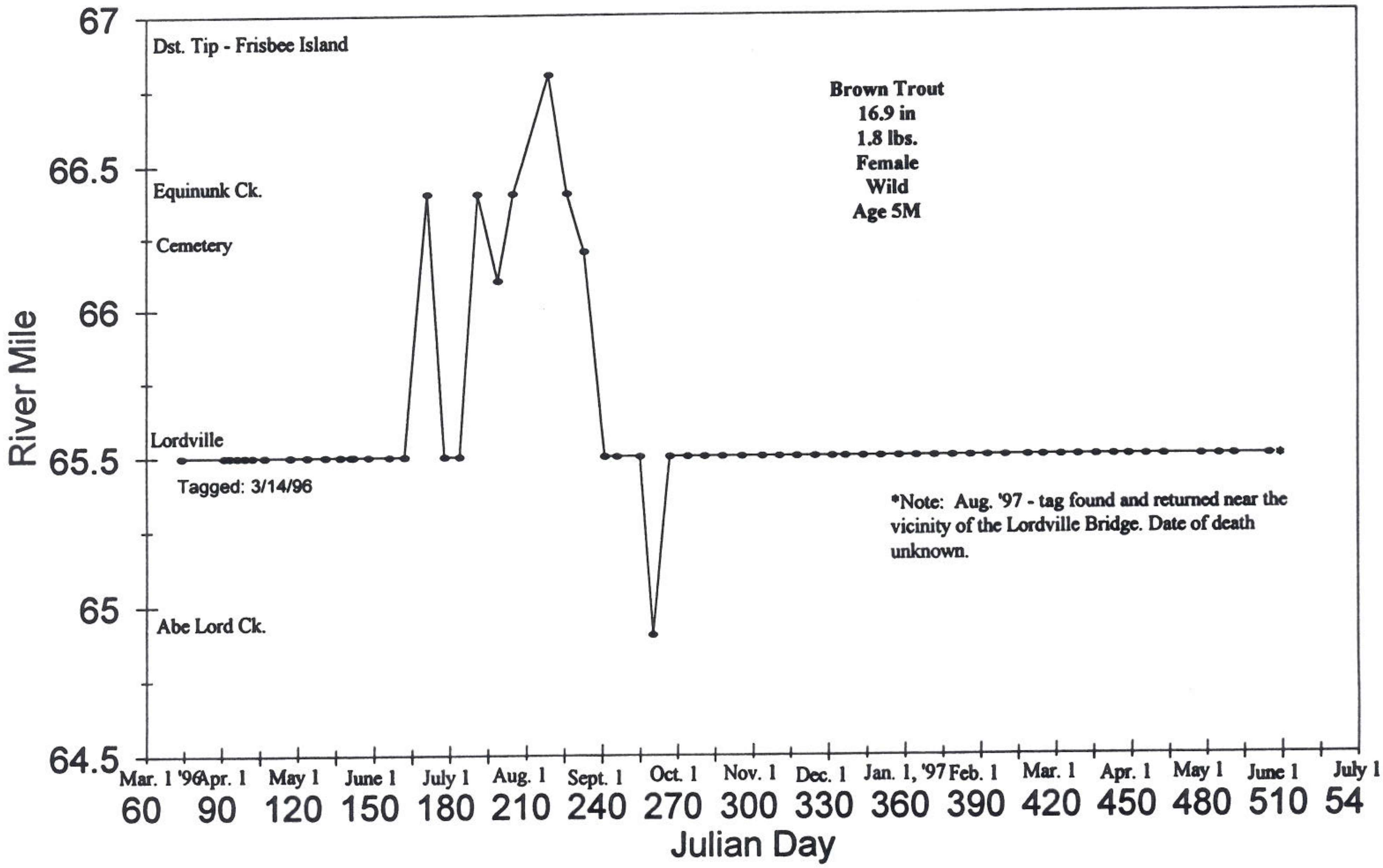
River Mile
East Branch
Delaware River
15
10
5
74.4/0
69.4
64.4
Humble Park
Read Creek
Peas Eddy
Confluence EB/WB
Tagged:
3/13/96
Hemlock View Farm
Lordville
Brown Trout
18.2 in
2.2 lbs.
Male
Hatchery Origin
Age 5M
*Note: could not
locate after 9/8/97.
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Oct. 1
0
60
120
180
240
300
360
420
480
540
600
660
Julian Day

# DR 4 - 2

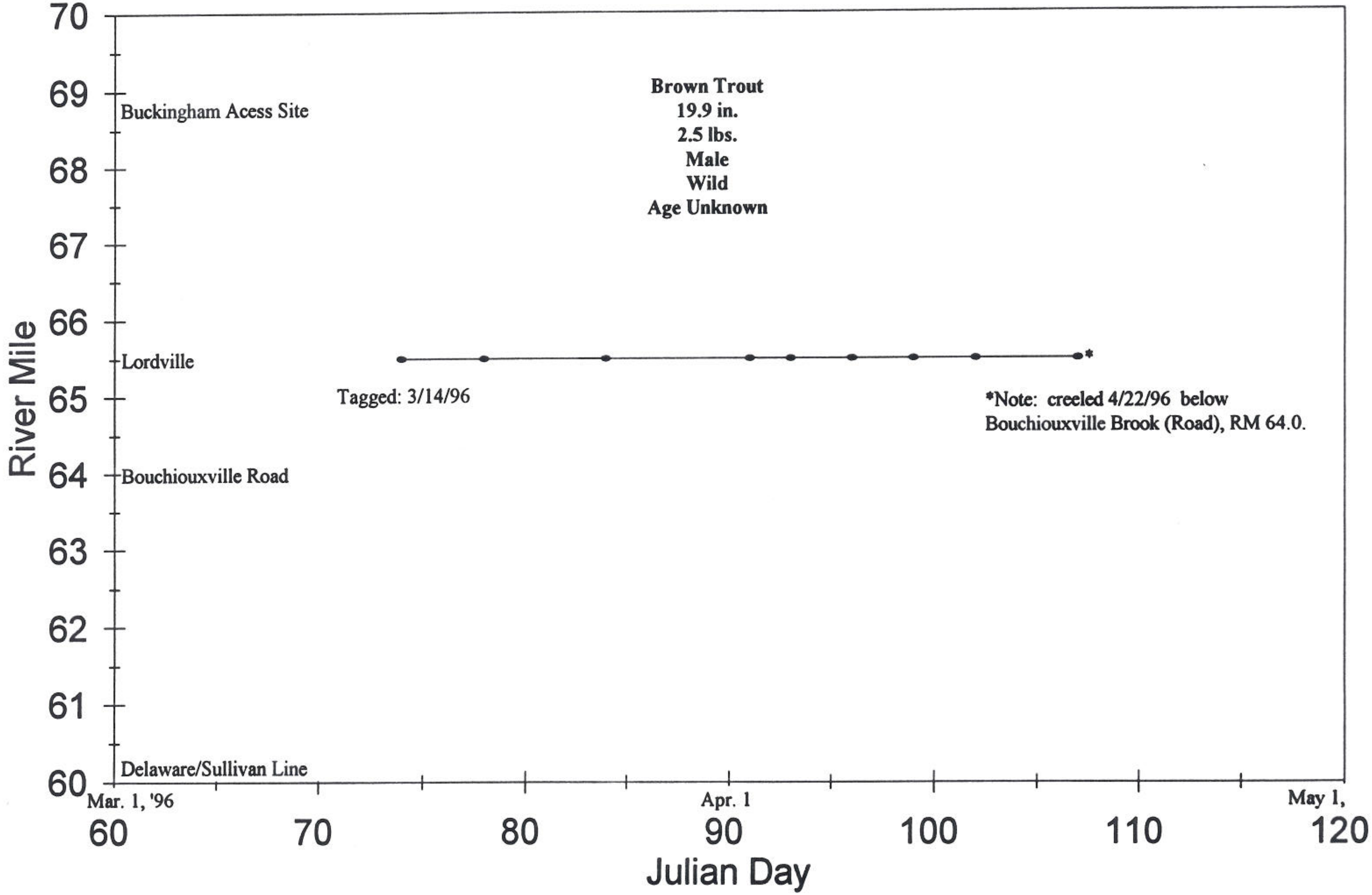


River Mile
East Branch
Delaware River
15
10
5
74.4/0
69.4
64.4
59.4
Confluence EB/BK
Read Creek
Peas Eddy
Cadosia Creek
Confluence EB/WB
Hemlock
View Farm
Tagged: 3/13/96
Lordville
Hoolihan Brook
*T: 4/29-5/1/96 - fish located 1.5-5.2 miles up Read Creek (RM 11.9), tributary to the East Branch.
*T
Rainbow Trout
16.6 in.
1.9 lbs.
Female
Wild
Age 4M
*T: 4/29-5/27/97 - fish located 0.1 miles up Read Creek.
*TT
*Note: could not locate after 9/8/97.
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Oct. 1
0
60
120
180
240
300
360
420
480
540
600
660
Julian Day

# DR 5 - 2

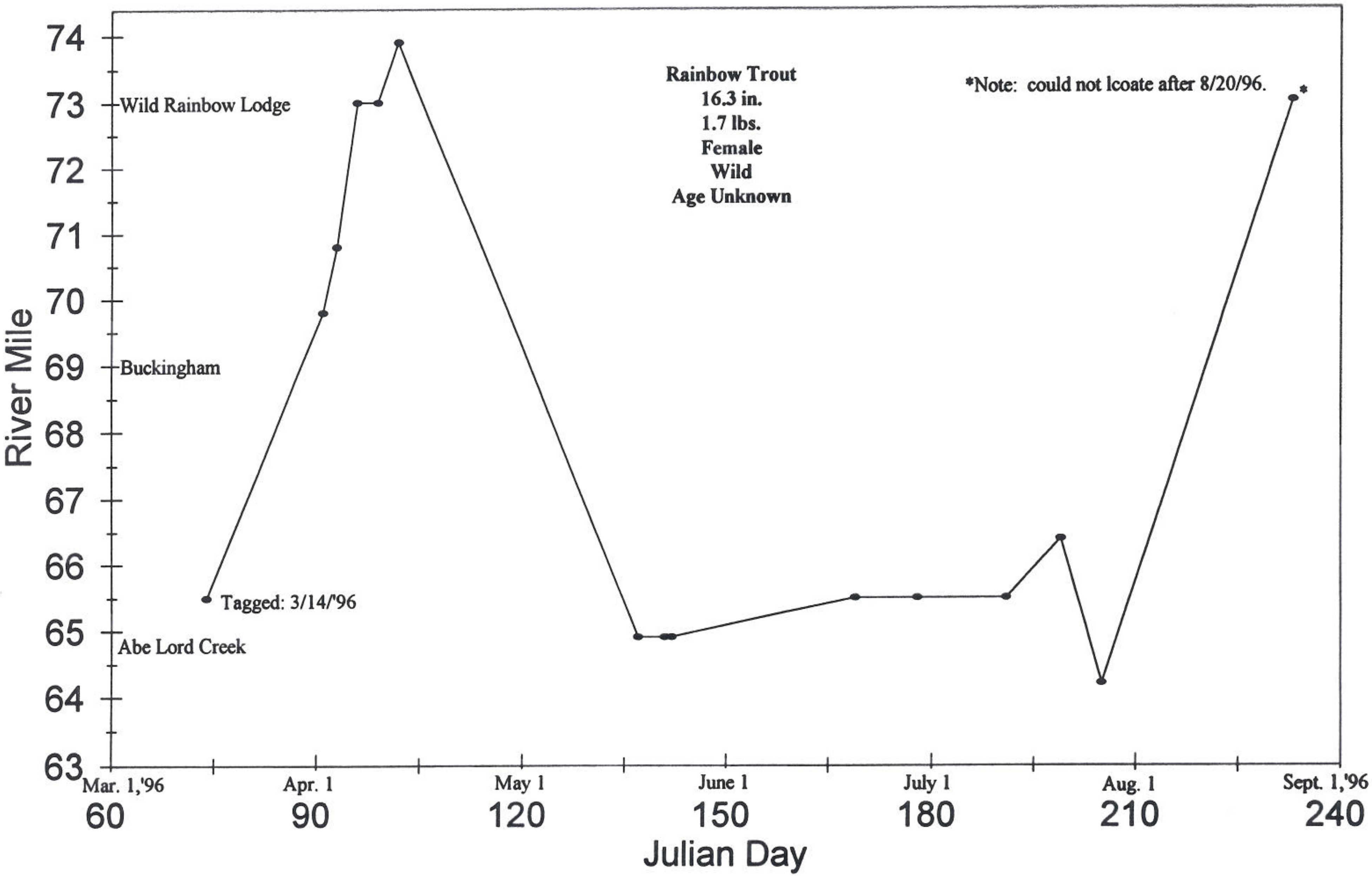

Dst. Tip - Frisbee Island
Equinunk Ck.
Cemetery
Lordville
Tagged: 3/14/96
Abe Lord Ck.
Brown Trout
16.9 in
1.8 lbs.
Female
Wild
Age 5M
*Note: Aug. '97 - tag found and returned near the vicinity of the Lordville Bridge. Date of death unknown.
River Mile
67
66.5
66
65.5
65
64.5
Mar. 1 '96
Apr. 1
May 1
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1
Dec. 1
Jan. 1, '97
Feb. 1
Mar. 1
Apr. 1
May 1
June 1
July 1
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
510
54
Julian Day

# DR 6 - 2

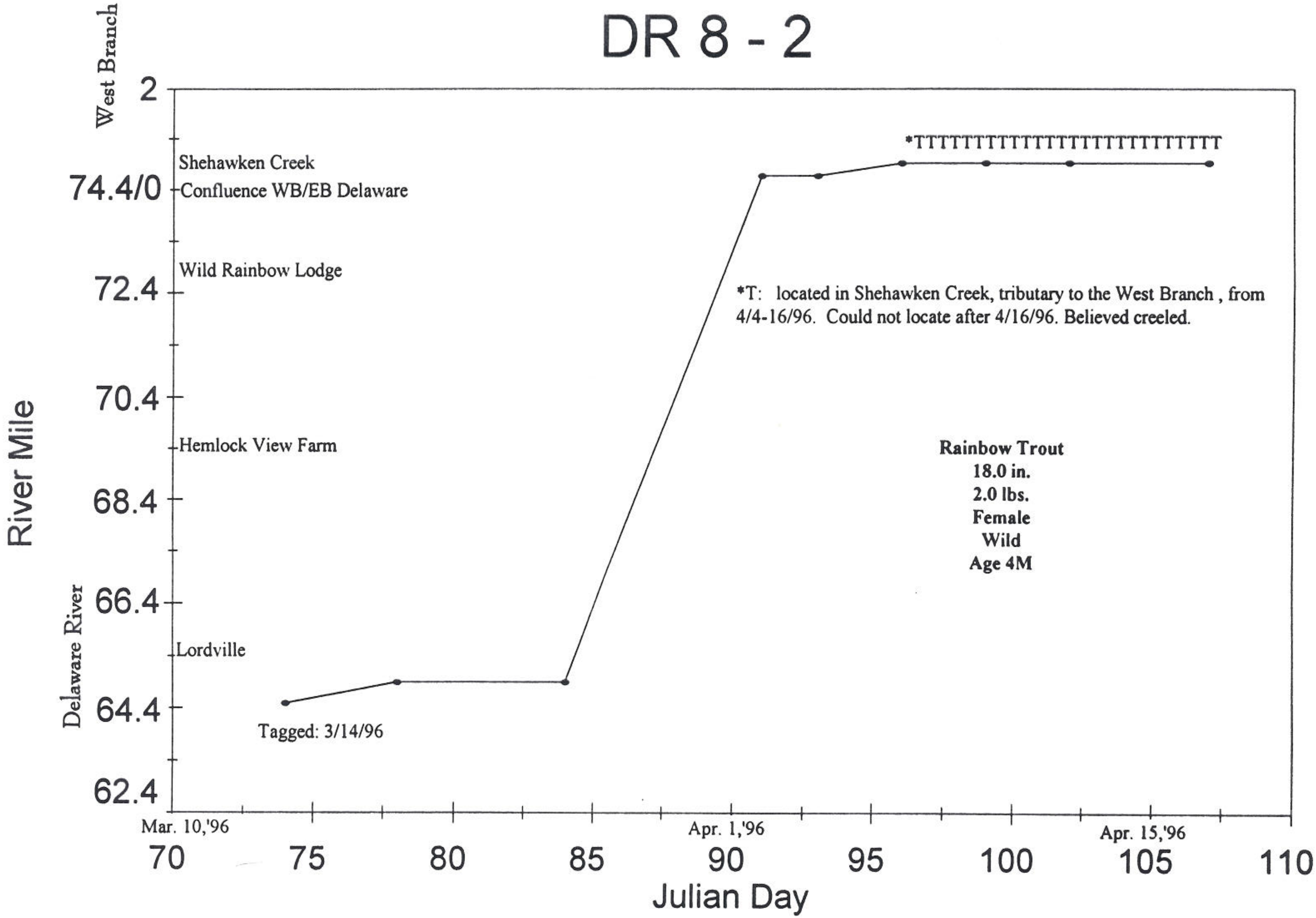


Brown Trout
19.9 in.
2.5 lbs.
Male
Wild
Age Unknown
Buckingham Acess Site
Lordville
Bouchiouxville Road
Delaware/Sullivan Line
Tagged: 3/14/96
*Note: creeled 4/22/96 below
Bouchiouxville Brook (Road), RM 64.0.
River Mile
70
69
68
67
66
65
64
63
62
61
60
Mar. 1, '96
Apr. 1
May 1,
60
70
80
90
100
110
120
Julian Day

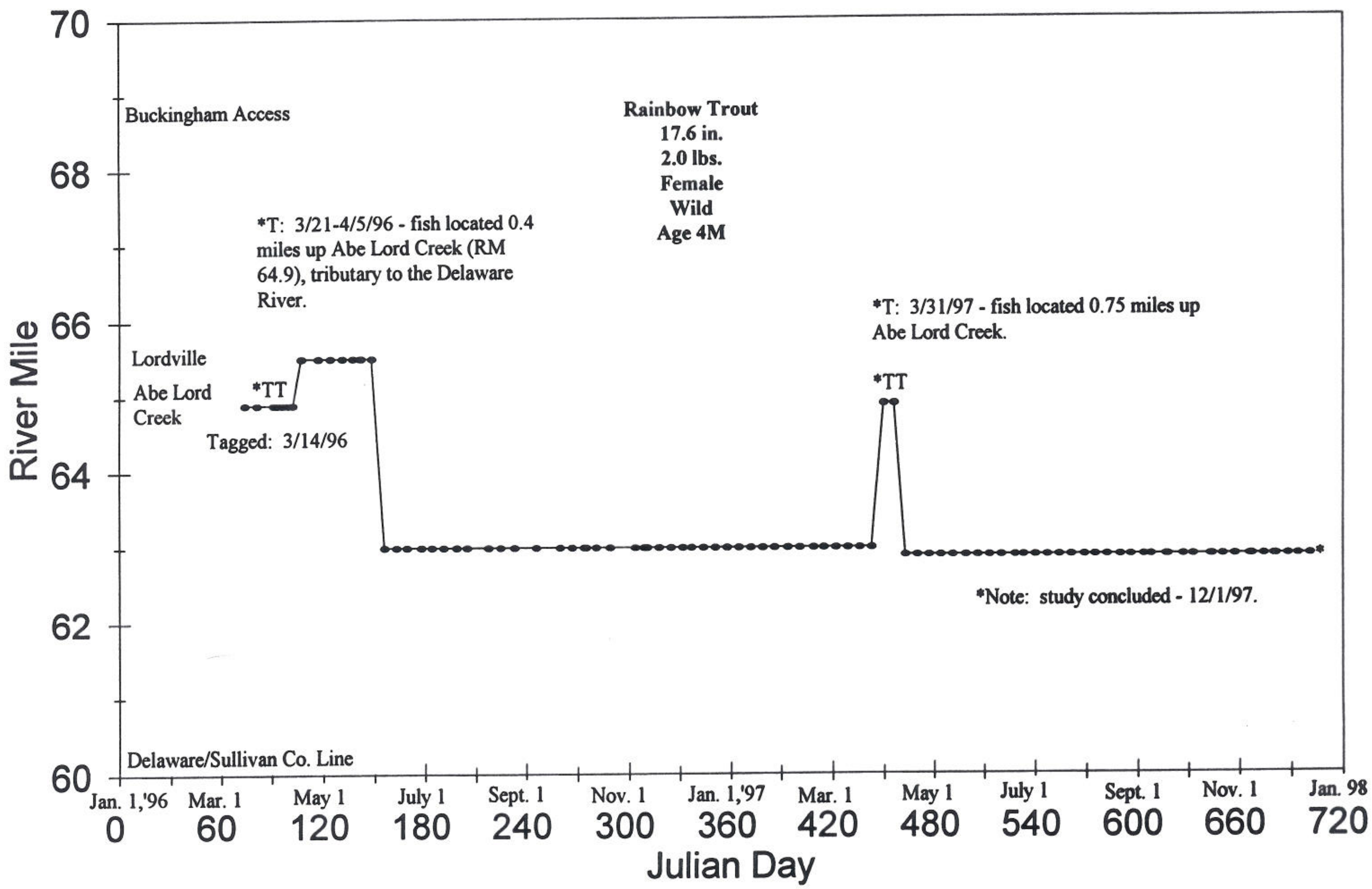
# DR 7 - 2


Rainbow Trout
16.3 in.
1.7 lbs.
Female
Wild
Age Unknown
*Note: could not lcoate after 8/20/96.
Wild Rainbow Lodge
Buckingham
Abe Lord Creek
Tagged: 3/14/'96
River Mile
74
73
72
71
70
69
68
67
66
65
64
63
Mar. 1,'96
Apr. 1
May 1
June 1
July 1
Aug. 1
Sept. 1,'96
60
90
120
150
180
210
240
Julian Day

# DR 8 - 2

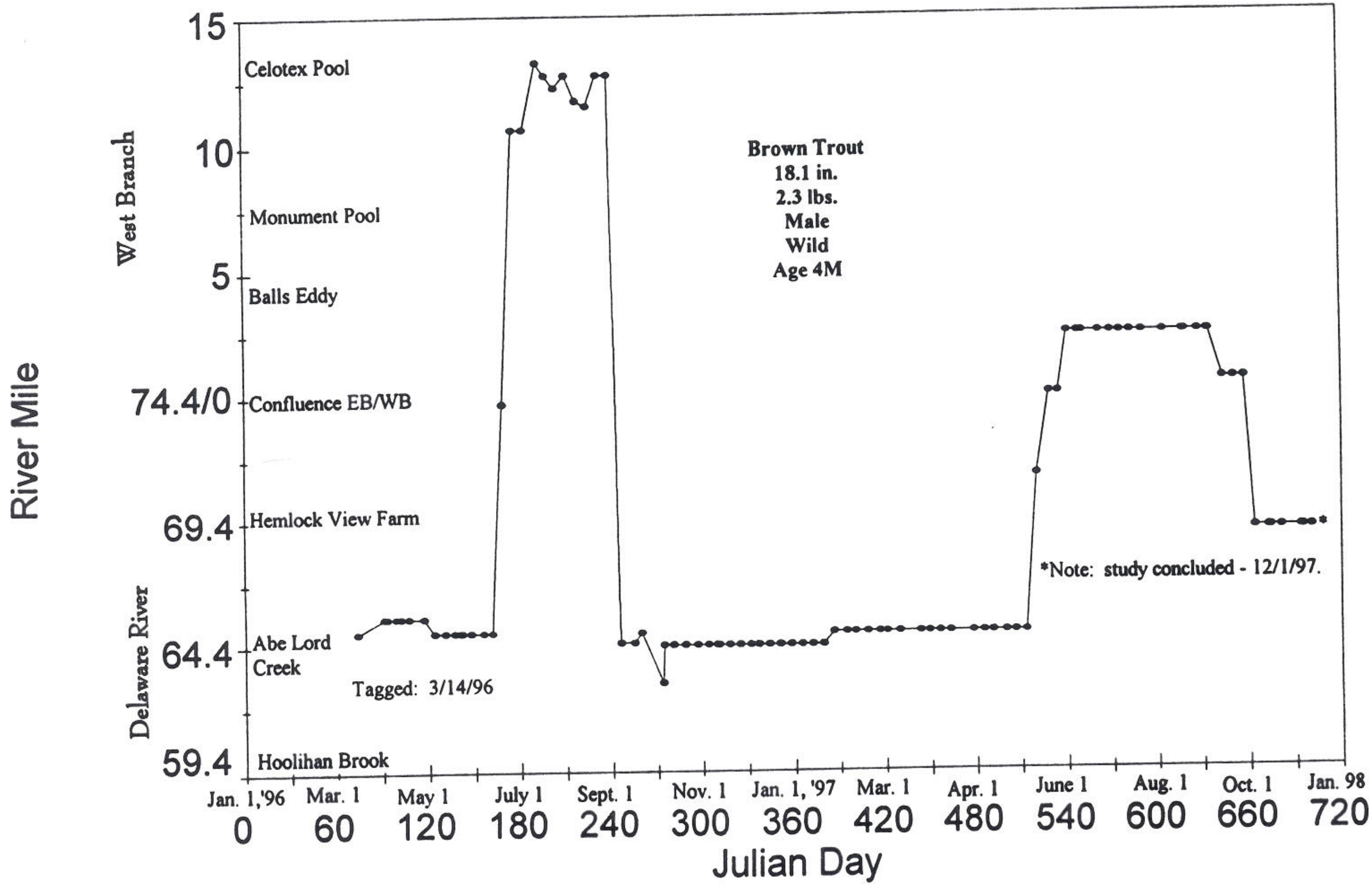

West Branch
Delaware River
River Mile
2
74.4/0
72.4
70.4
68.4
66.4
64.4
62.4
Shehawken Creek
Confluence WB/EB Delaware
Wild Rainbow Lodge
Hemlock View Farm
Lordville
Tagged: 3/14/96
*TTTTTTTTTTTTTTTTTTTTTTTTTTT
*T: located in Shehawken Creek, tributary to the West Branch , from 4/4-16/96. Could not locate after 4/16/96. Believed creeled.
Rainbow Trout
18.0 in.
2.0 lbs.
Female
Wild
Age 4M
Mar. 10,'96
Apr. 1,'96
Apr. 15,'96
70
75
80
85
90
95
100
105
110
Julian Day

# DR 9 - 2



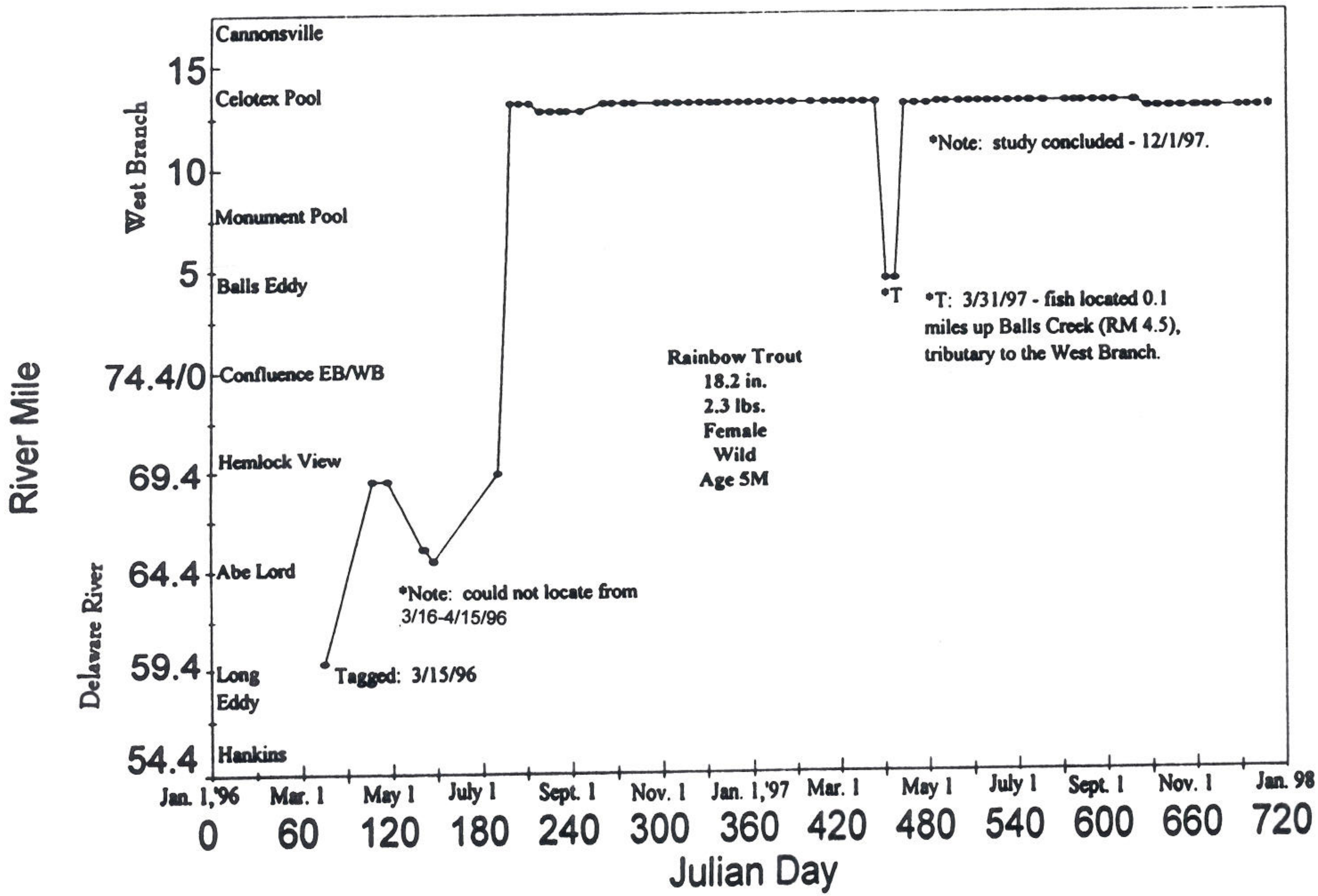
River Mile
70
68
66
64
62
60
Buckingham Access
Lordville
Abe Lord Creek
Delaware/Sullivan Co. Line
*T: 3/21-4/5/96 - fish located 0.4 miles up Abe Lord Creek (RM 64.9), tributary to the Delaware River.
*TT
Tagged: 3/14/96
Rainbow Trout
17.6 in.
2.0 lbs.
Female
Wild
Age 4M
*T: 3/31/97 - fish located 0.75 miles up Abe Lord Creek.
*TT
*Note: study concluded - 12/1/97.
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
0
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 10 - 2



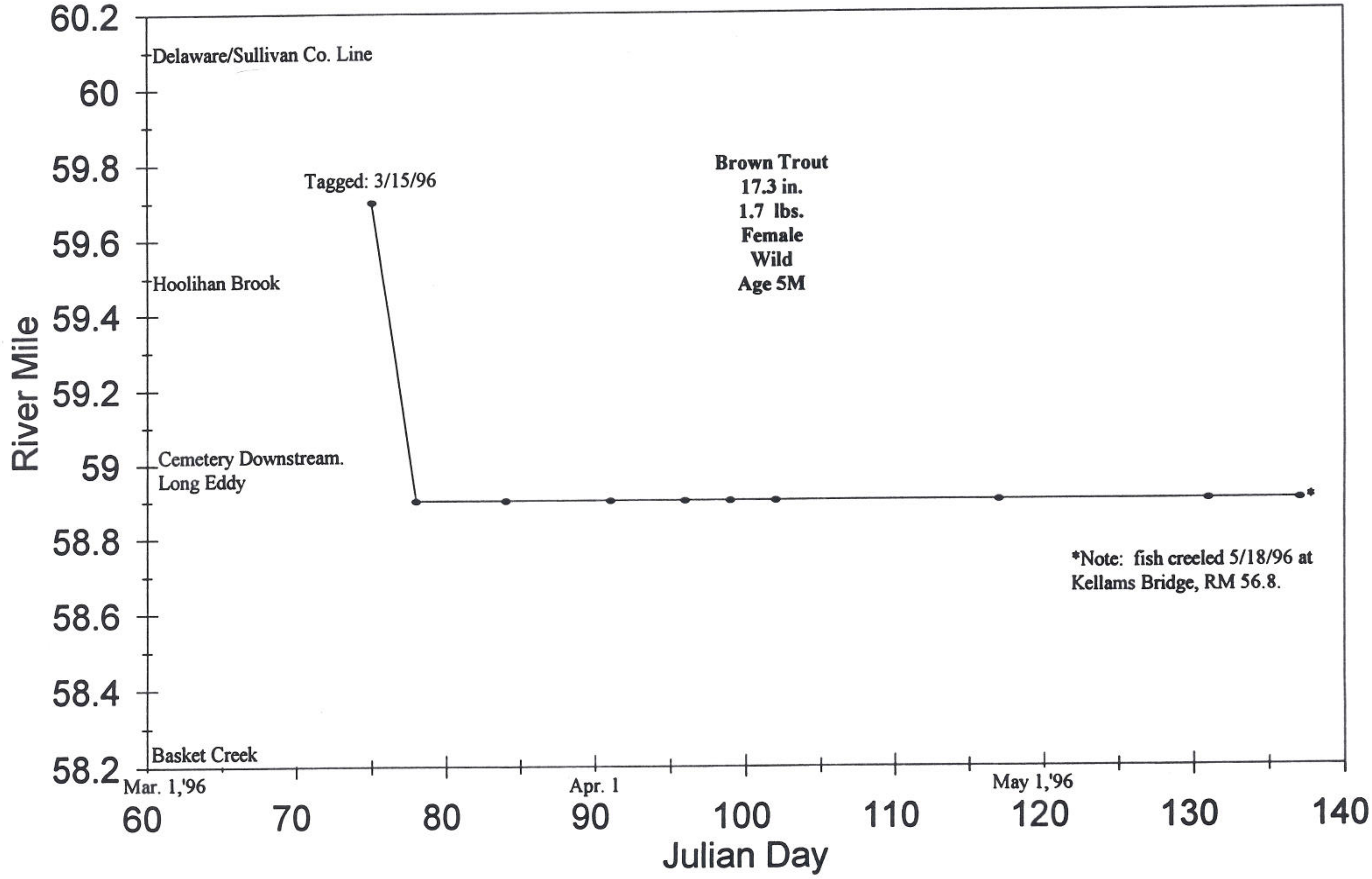
River Mile
West Branch
Delaware River
15
10
5
74.4/0
69.4
64.4
59.4
Celotex Pool
Monument Pool
Balls Eddy
Confluence EB/WB
Hemlock View Farm
Abe Lord Creek
Hoolihan Brook
Tagged: 3/14/96
Brown Trout
18.1 in.
2.3 lbs.
Male
Wild
Age 4M
*Note: study concluded - 12/1/97.
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1, '97
Mar. 1
Apr. 1
June 1
Aug. 1
Oct. 1
Jan. 98
0
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 11 - 2



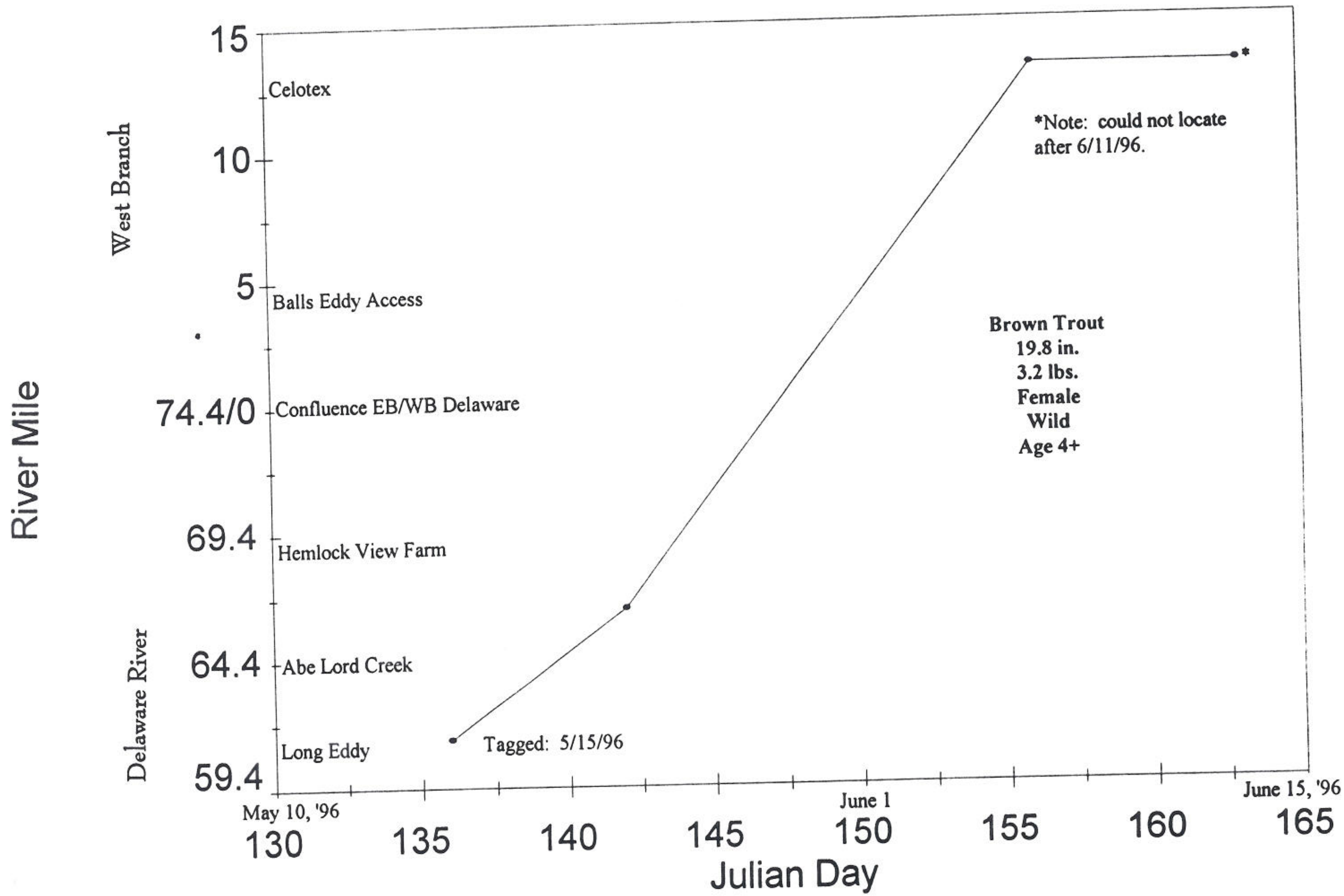
Cannonsville
Celotex Pool
Monument Pool
Balls Eddy
Confluence EB/WB
Hemlock View
Abe Lord
Long Eddy
Hankins
15
10
5
74.4/0
69.4
64.4
59.4
54.4
West Branch
Delaware River
River Mile
*Note: study concluded - 12/1/97.
*T
*T: 3/31/97 - fish located 0.1 miles up Balls Creek (RM 4.5), tributary to the West Branch.
Rainbow Trout
18.2 in.
2.3 lbs.
Female
Wild
Age 5M
*Note: could not locate from 3/16-4/15/96
Tagged: 3/15/96
Jan. 1,'96
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
0
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 12 - 2



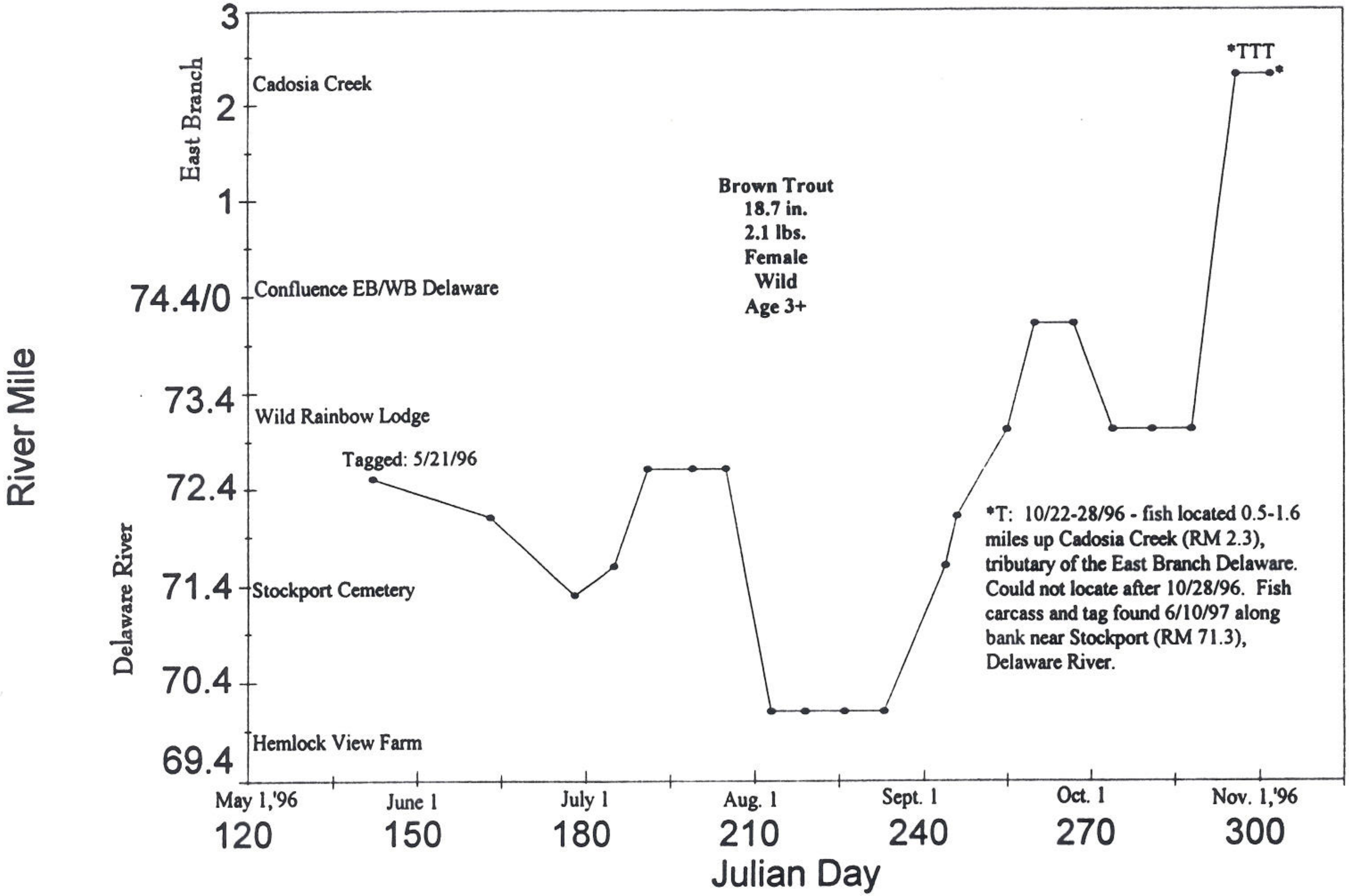
River Mile
60.2
60
59.8
59.6
59.4
59.2
59
58.8
58.6
58.4
58.2
Delaware/Sullivan Co. Line
Hoolihan Brook
Cemetery Downstream.
Long Eddy
Basket Creek
Tagged: 3/15/96
Brown Trout
17.3 in.
1.7 lbs.
Female
Wild
Age 5M
*Note: fish creeled 5/18/96 at
Kellams Bridge, RM 56.8.
Mar. 1,'96
Apr. 1
May 1,'96
60
70
80
90
100
110
120
130
140
Julian Day

# DR 13 - 2



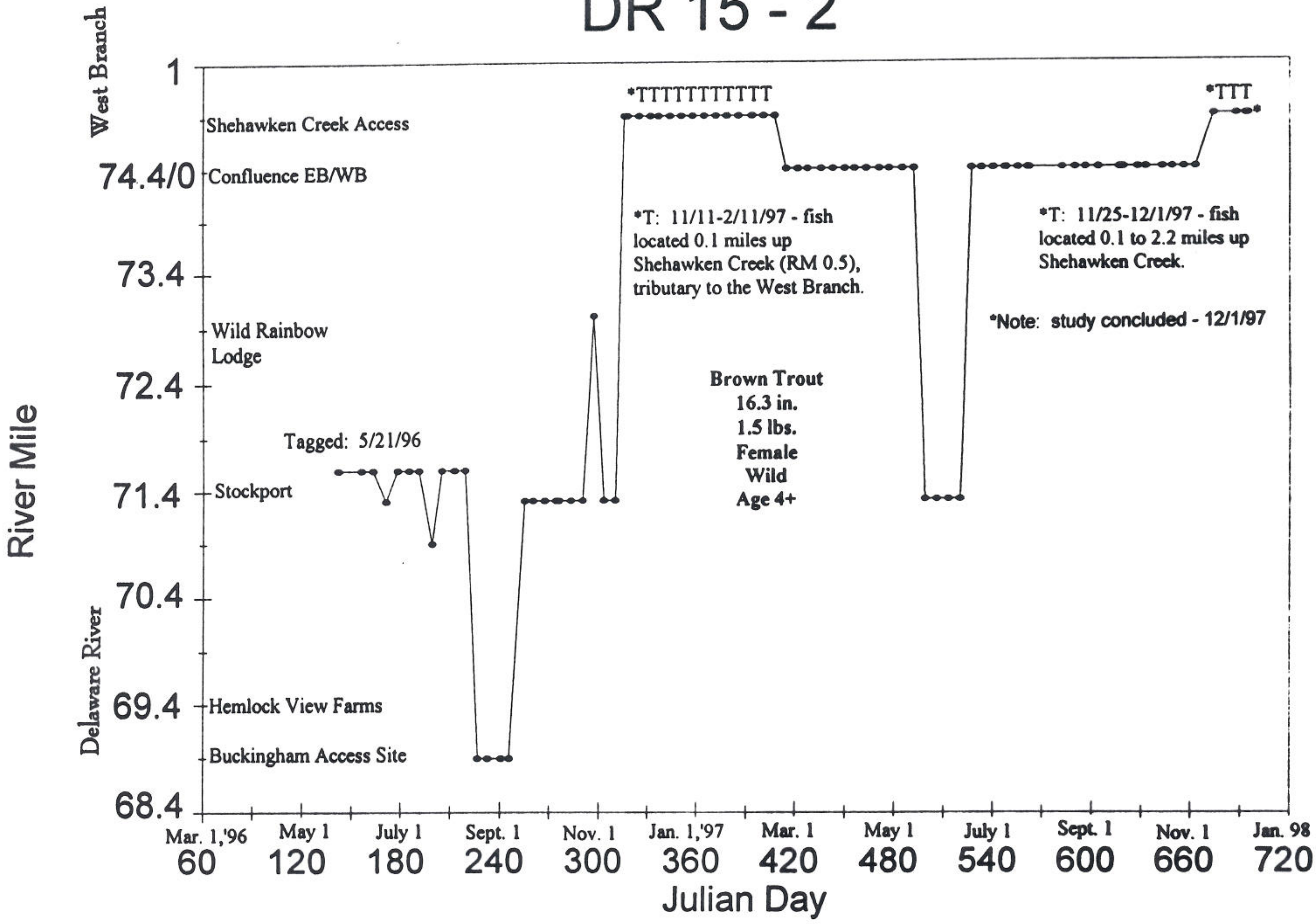
River Mile
West Branch
Delaware River
15
10
5
74.4/0
69.4
64.4
59.4
Celotex
Balls Eddy Access
Confluence EB/WB Delaware
Hemlock View Farm
Abe Lord Creek
Long Eddy
Tagged: 5/15/96
*Note: could not locate
after 6/11/96.
Brown Trout
19.8 in.
3.2 lbs.
Female
Wild
Age 4+
May 10, '96
June 1
June 15, '96
130
135
140
145
150
155
160
165
Julian Day

# DR 14 - 2

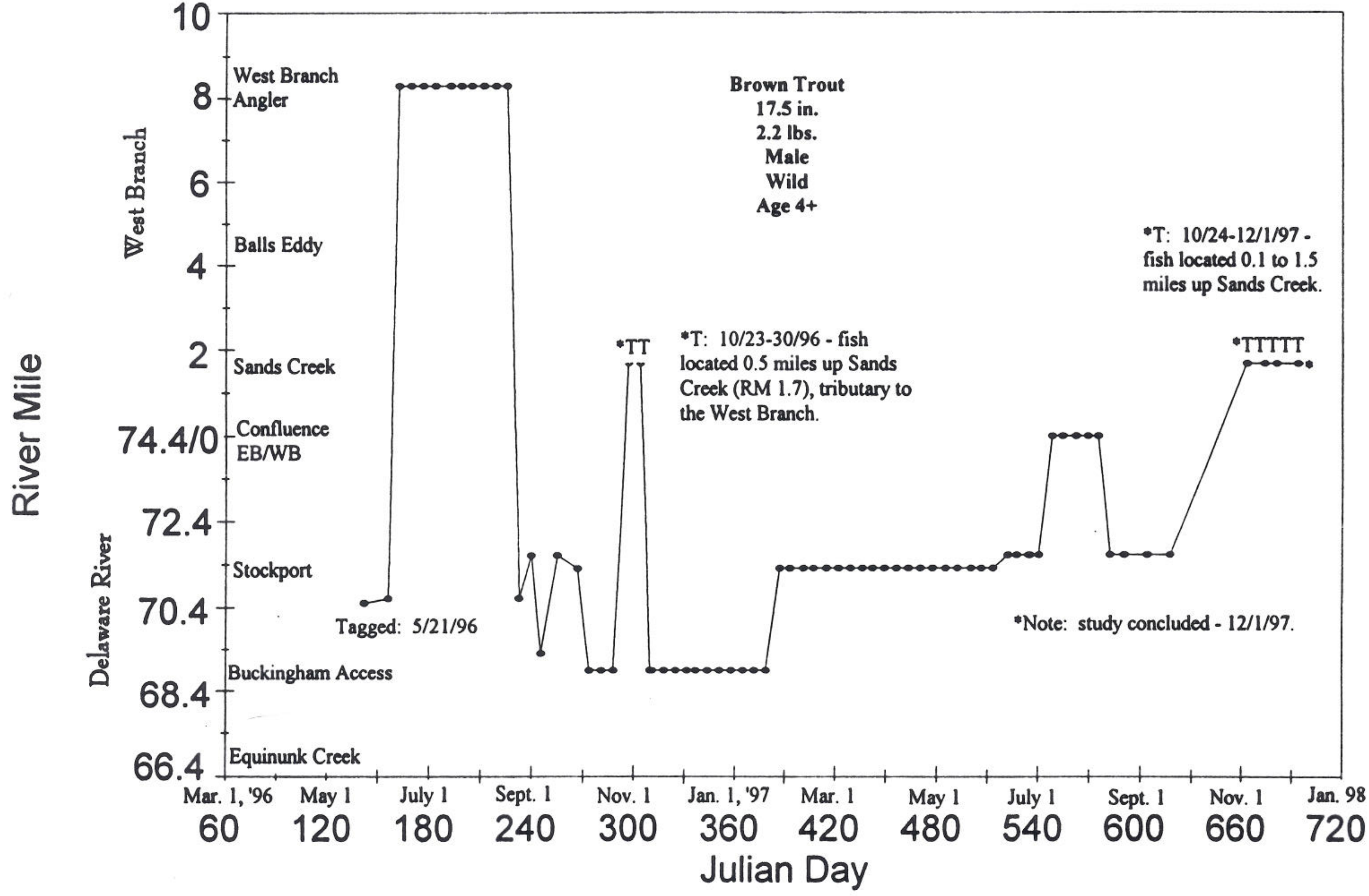


River Mile
East Branch
Delaware River
3
2
1
74.4/0
73.4
72.4
71.4
70.4
69.4
Cadosia Creek
Confluence EB/WB Delaware
Wild Rainbow Lodge
Stockport Cemetery
Hemlock View Farm
Tagged: 5/21/96
Brown Trout
18.7 in.
2.1 lbs.
Female
Wild
Age 3+
*TTT
*
*T: 10/22-28/96 - fish located 0.5-1.6 miles up Cadosia Creek (RM 2.3), tributary of the East Branch Delaware. Could not locate after 10/28/96. Fish carcass and tag found 6/10/97 along bank near Stockport (RM 71.3), Delaware River.
May 1,'96
June 1
July 1
Aug. 1
Sept. 1
Oct. 1
Nov. 1,'96
120
150
180
210
240
270
300
Julian Day

# DR 15 - 2

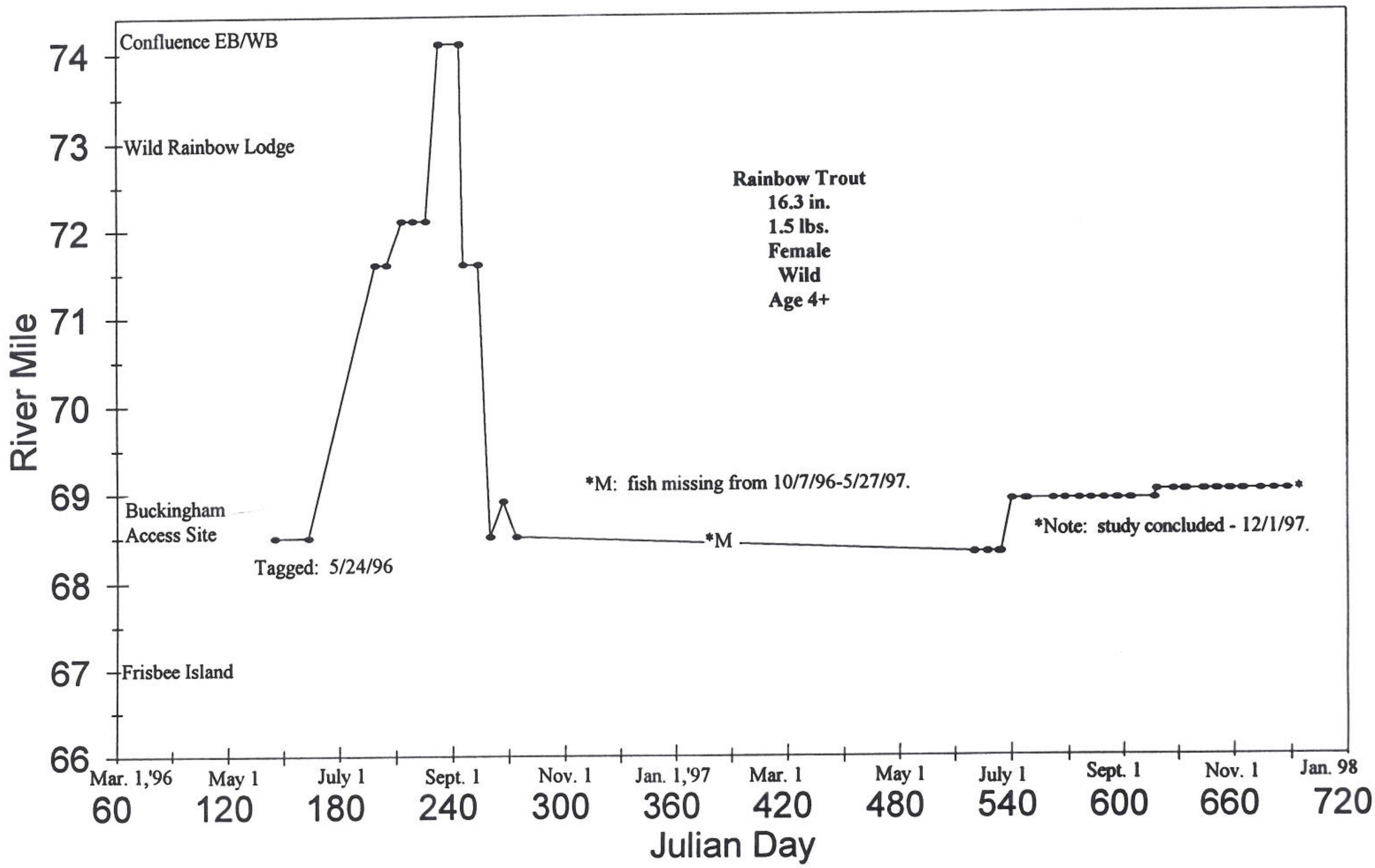

West Branch
1
Shehawken Creek Access
74.4/0
Confluence EB/WB
73.4
Wild Rainbow Lodge
72.4
Tagged: 5/21/96
71.4
Stockport
70.4
69.4
Hemlock View Farms
Buckingham Access Site
68.4
Delaware River
River Mile
*TTTTTTTTTTT
*T: 11/11-2/11/97 - fish located 0.1 miles up Shehawken Creek (RM 0.5), tributary to the West Branch.
Brown Trout
16.3 in.
1.5 lbs.
Female
Wild
Age 4+
*TTT
*T: 11/25-12/1/97 - fish located 0.1 to 2.2 miles up Shehawken Creek.
*Note: study concluded - 12/1/97
Mar. 1,'96 60
May 1 120
July 1 180
Sept. 1 240
Nov. 1 300
Jan. 1,'97 360
Mar. 1 420
May 1 480
July 1 540
Sept. 1 600
Nov. 1 660
Jan. 98 720
Julian Day

# DR 16 - 2



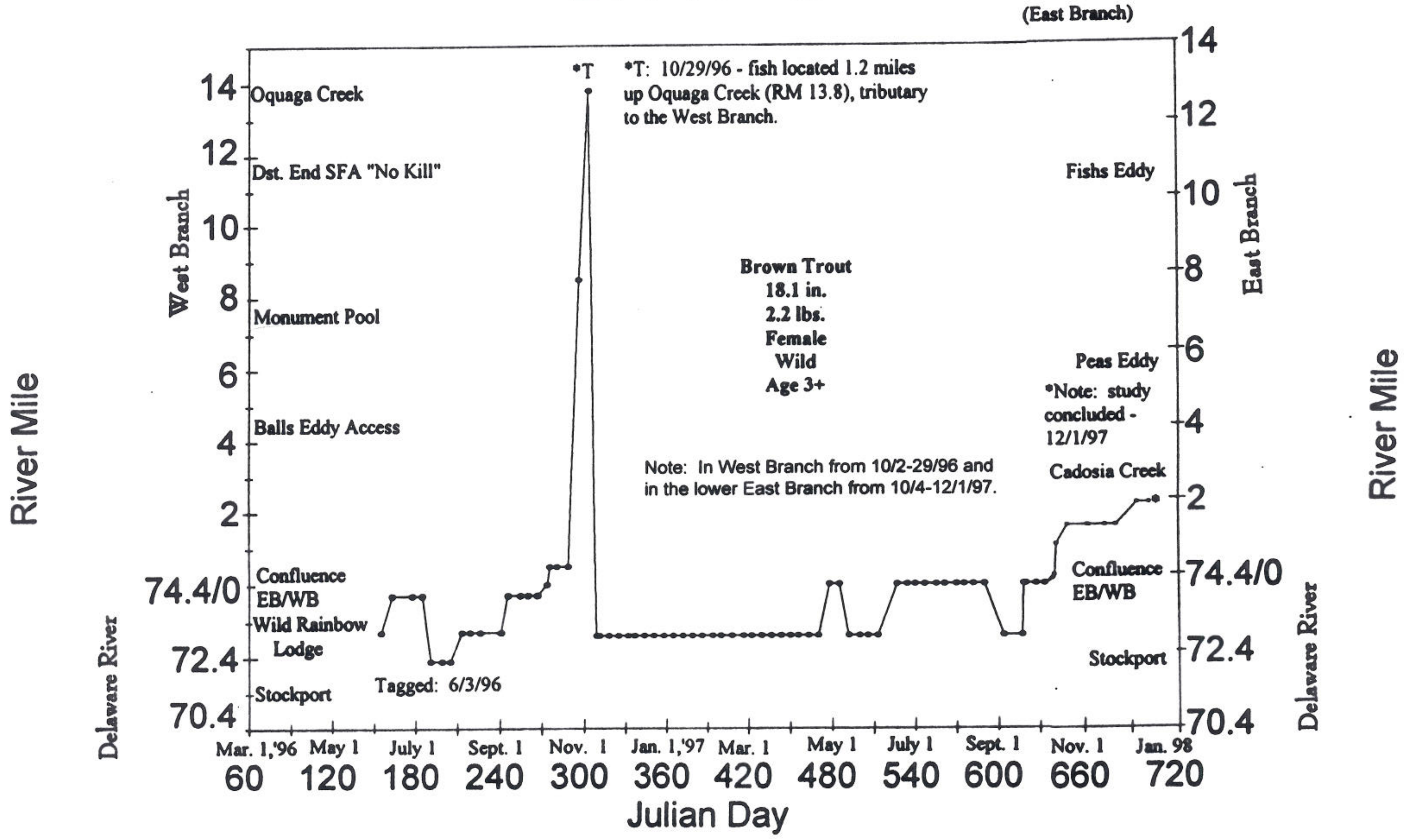
River Mile
West Branch
Delaware River
10
8
6
4
2
74.4/0
72.4
70.4
68.4
66.4
West Branch Angler
Balls Eddy
Sands Creek
Confluence EB/WB
Stockport
Buckingham Access
Equinunk Creek
Brown Trout
17.5 in.
2.2 lbs.
Male
Wild
Age 4+
Tagged: 5/21/96
*TT
*T: 10/23-30/96 - fish located 0.5 miles up Sands Creek (RM 1.7), tributary to the West Branch.
*TTTTT
*T: 10/24-12/1/97 - fish located 0.1 to 1.5 miles up Sands Creek.
*Note: study concluded - 12/1/97.
Mar. 1, '96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1, '97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 17 - 2



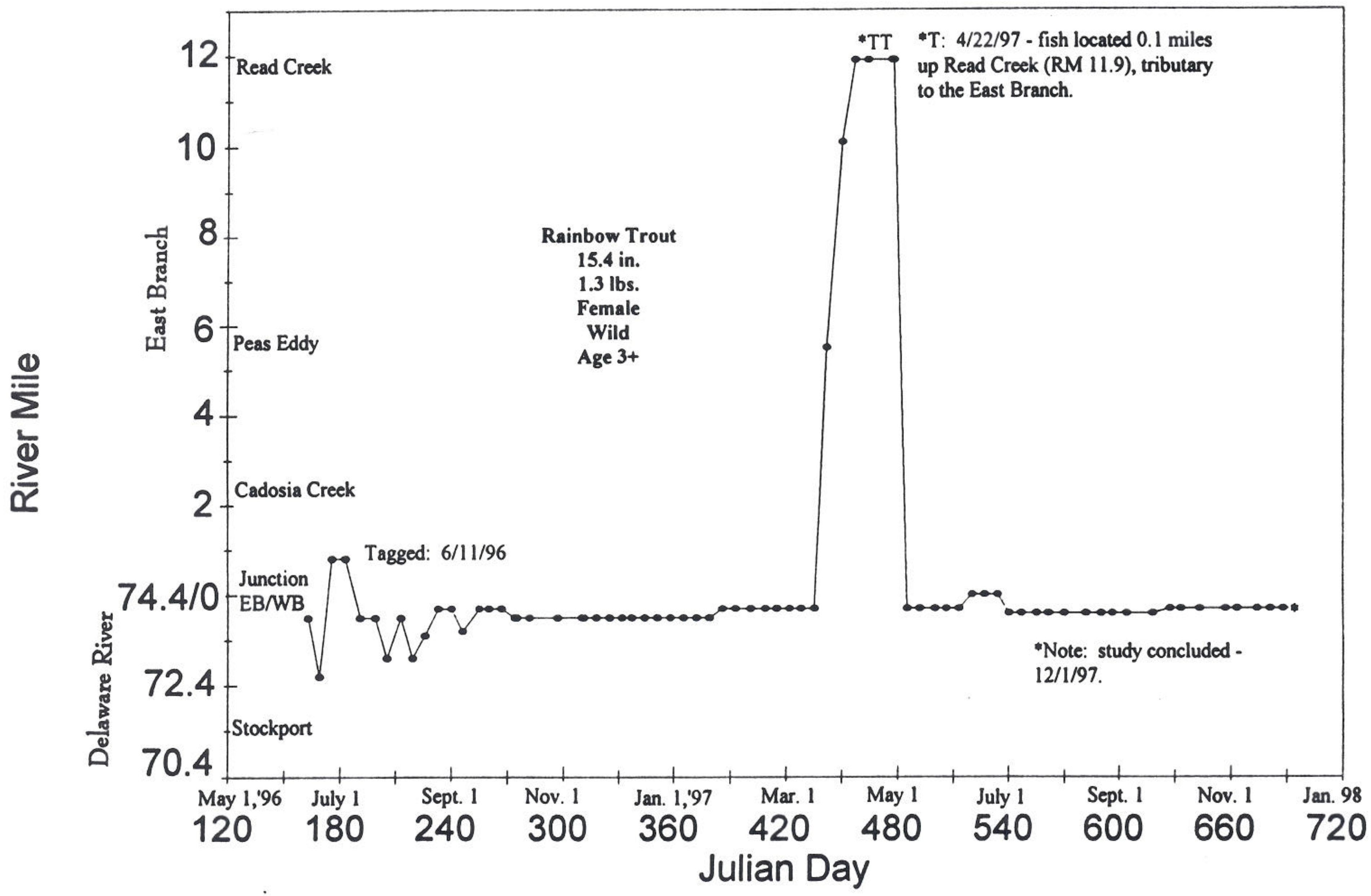
Confluence EB/WB
Wild Rainbow Lodge
Buckingham Access Site
Frisbee Island
Tagged: 5/24/96
Rainbow Trout
16.3 in.
1.5 lbs.
Female
Wild
Age 4+
*M: fish missing from 10/7/96-5/27/97.
*M
*Note: study concluded - 12/1/97.
River Mile
74
73
72
71
70
69
68
67
66
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 18 - 2



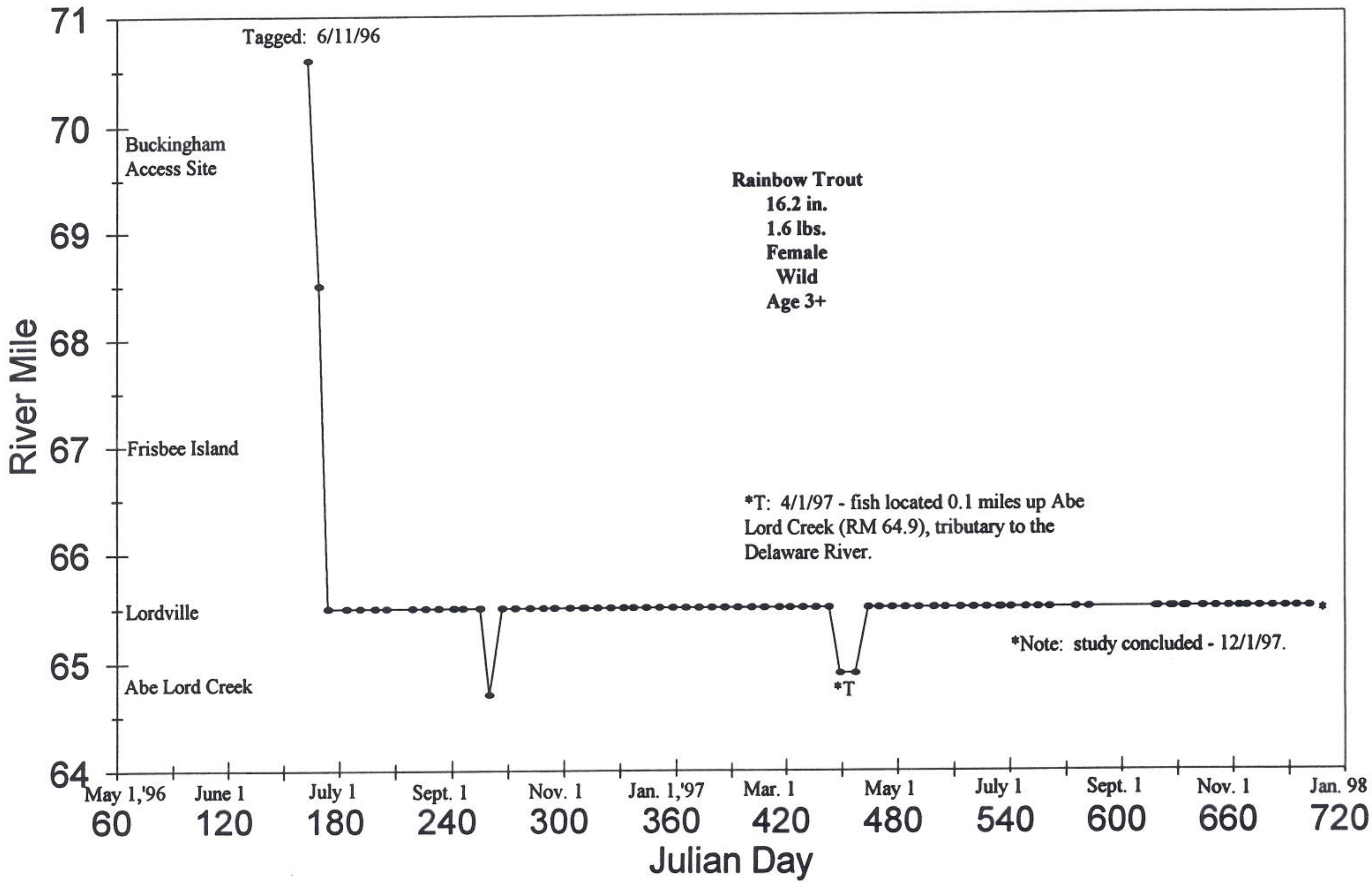
(East Branch)
*T
*T: 10/29/96 - fish located 1.2 miles up Oquaga Creek (RM 13.8), tributary to the West Branch.
Oquaga Creek
Dst. End SFA "No Kill"
Monument Pool
Balls Eddy Access
Confluence EB/WB
Wild Rainbow Lodge
Stockport
Tagged: 6/3/96
Brown Trout
18.1 in.
2.2 lbs.
Female
Wild
Age 3+
Note: In West Branch from 10/2-29/96 and in the lower East Branch from 10/4-12/1/97.
Fishs Eddy
Peas Eddy
*Note: study concluded - 12/1/97
Cadosia Creek
Confluence EB/WB
Stockport
River Mile
West Branch
Delaware River
East Branch
14
12
10
8
6
4
2
74.4/0
72.4
70.4
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 19 - 2



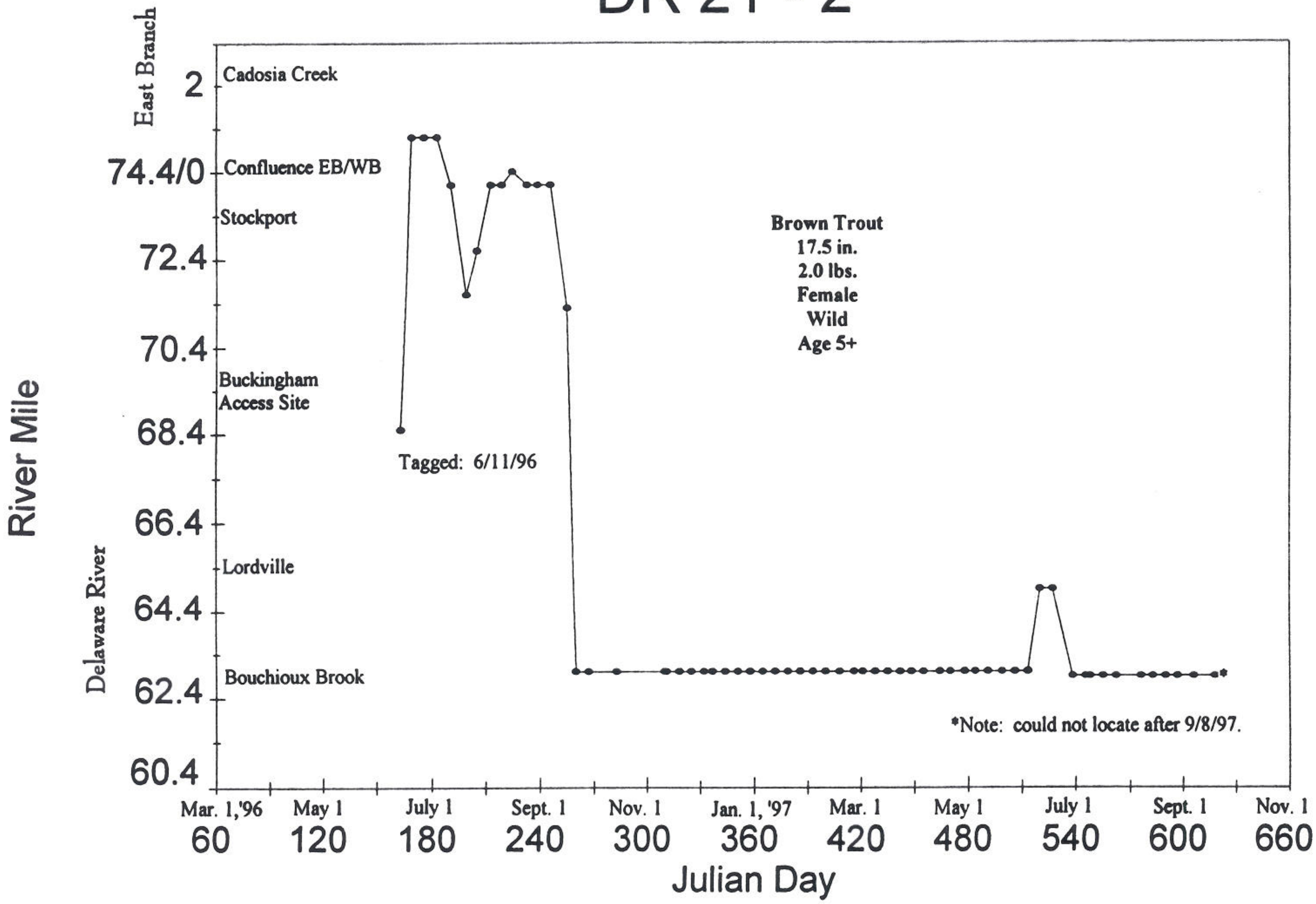
River Mile
East Branch
Delaware River
12
10
8
6
4
2
74.4/0
72.4
70.4
Read Creek
Peas Eddy
Cadosia Creek
Junction
EB/WB
Stockport
Tagged: 6/11/96
Rainbow Trout
15.4 in.
1.3 lbs.
Female
Wild
Age 3+
*TT
*T: 4/22/97 - fish located 0.1 miles up Read Creek (RM 11.9), tributary to the East Branch.
*Note: study concluded - 12/1/97.
May 1,'96
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 20 - 2



Tagged: 6/11/96
Buckingham Access Site
Frisbee Island
Lordville
Abe Lord Creek
Rainbow Trout
16.2 in.
1.6 lbs.
Female
Wild
Age 3+
*T: 4/1/97 - fish located 0.1 miles up Abe Lord Creek (RM 64.9), tributary to the Delaware River.
*T
*Note: study concluded - 12/1/97.
River Mile
71
70
69
68
67
66
65
64
May 1,'96
June 1
July 1
Sept. 1
Nov. 1
Jan. 1,'97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
Jan. 98
60
120
180
240
300
360
420
480
540
600
660
720
Julian Day

# DR 21 - 2


East Branch
Delaware River
River Mile
2
74.4/0
72.4
70.4
68.4
66.4
64.4
62.4
60.4
Cadosia Creek
Confluence EB/WB
Stockport
Buckingham
Access Site
Lordville
Bouchioux Brook
Tagged: 6/11/96
Brown Trout
17.5 in.
2.0 lbs.
Female
Wild
Age 5+
*Note: could not locate after 9/8/97.
Mar. 1,'96
May 1
July 1
Sept. 1
Nov. 1
Jan. 1, '97
Mar. 1
May 1
July 1
Sept. 1
Nov. 1
60
120
180
240
300
360
420
480
540
600
660
Julian Day