# Position Paper

## Fish and Boat Commission Review of Water Allocation Permits

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The staff of the Division of Environmental Services (DES) of the Pennsylvania Fish and Boat Commission (PFBC) reviews water allocation permit applications for the Department of Environmental Resources (DER), Bureau of Water Resources Management (BWRM). The purpose of this paper is to outline DES's methods for determining appropriate conservation releases to protect downstream aquatic resources and to outline the components for a Memorandum of Understanding between the PFBC and DER in this area.

The comments in this paper relate to DES reviews of water allocation permits which are currently outstanding as well as future permits submitted prior to the time that the new DER conservation release guidelines were developed. Based on considerations which will be outlined below, the PFBC priority must currently be placed on the development of a memorandum of understanding with DER concerning these reviews, and the resolution of pending appeals of the Mahanoy Township (WA-251C) and Harrisburg Authority (WA-53B) water allocation permits. In the interim, the guidelines described below are proposed as the DES position on conservation releases related to water allocation permit applications. Specific questions related to these guidelines, as well as information requests for data from PFBC files related to DER review, should be directed to Leroy Young of DES (814-359-5133) on a case-by-case basis.

In recent years, DES has made recommendations on conservation releases downstream of dams and diversions based generally on the Tennant instream flow determination method. Work by people such as Tennant (1975) and Thomas Wesche (1973) has shown that as flows decline below 25-30% of the average daily flow (ADF), stream habitat is lost at a rapidly accelerating rate. Wesche (1973), in work on Wyoming trout streams, noted that the greatest rate of decrease in hydrologic parameters, water surface area, and available trout cover, occurred between 25% ADF and 12.5% ADF, and as a general rule-of-thumb, at least 30% ADF is needed to maintain stream fisheries (Wesche 1976 as cited by Sport Fishing Institute 1976).

Tennant's method is based on extensive work in 21 states over a period of more than 17 years, with much of the early work in waters of the eastern U.S. including streams in New England, New Jersey and Ohio (Camp, Dresser & McKee 1986). Besides the wide geographical distribution of Tennant's streams, a wide range in morphological stream types was also evaluated ranging from high gradient brooks to large, low gradient rivers (Tennant 1975).

Camp, Dresser and McKee cited numerous authors whose work generally verified Tennant's earlier observations in the streams of such states as Wyoming, Nebraska, Montana, Georgia, Alabama, Florida, West Virginia, Oklahoma and Colorado (Joy et al 1981; Nelson 1980: Orth and Maughan 1982; Prewitt and Carlson 1979: Wesche 1973: Wood and Whelan 1962). Camp, Dresser and McKee's (1986) extensive review of twenty-four instream flow

methodologies, including the $Q_{7-10}$ method, resulted in a recommendation of the Tennant Method as "the best minimum, instream flow estimation method for statewide application for the following reasons:"

1. It is an office method that is easy and inexpensive to apply.

2. It has enjoyed widespread use for many years and is considered to be reliable.

3. It ties flow in a river or stream to both the health of the aquatic community and to recreational uses.

4. It provides for several MIF management levels, specifying flows that range from excellent/outstanding for aquatic life to flows capable of assuring short-term survival. This flexibility is very important to a water resources management program.

5. It is based on field observations of eastern and western streams carried out over many years. The Tennant Method reflects much more development effort than do other office methods, such as the New England Method and the Wetted Perimeter Method.

Raleigh (1982), in a U.S. Fish and Wildlife Service publication entitled Habitat Suitability Index Models: Brook Trout, stated that flows under 25% ADF are considered poor for maintaining good quality trout habitat, while flows greater than or equal to 55% ADF provided optimum habitat suitability. Similar information was provided by Raleigh et al (1986) for brown trout and Raleigh et al (1984) for rainbow trout. More recent work by the South Carolina Wildlife and Maine Resources Department (Bulak and Jobsis 1989) on 10 South Carolina stream segments has resulted in recommendations that conservation releases equal to 20% ADF are required in that state during low flow months of July through November, with higher flows (30-60% ADF) required at other times of the year.

Orth and Leonard (1990) compared state-of-the-art Instream Flow Incremental Methodology derived flow requirements for nine warmwater fish species in four Virginia streams to requirements determined by the Tennant, Aquatic Base Flow and $Q_{7-10}$ methods. Interestingly, instream flow recommendations based on 25% ADF would have fallen very close to the optimum flows determined by the IFIM study, while $Q_{7-10}$ flows fell in the range of about 20-50% of the optimum, depending on the stream.

Annear and Cander (1984) evaluated relative bias of the following instream flow determination methods for 13 different streams: Tennant method, wetted perimeter, habitat retention models and physical habitat simulation (PHABSIM) which is the major element of the IFIM method. They concluded that the Tennant 30% ADF method proved to be one of the least biased methods in the study, and consequently "this method may provide a generally safe starting point for developing instream flow recommendations". Furthermore, they found that recommendations based on 10% ADF "were consistently among the lowest of all

methods in the study" and the use of such flows "suggested a high risk of underestimating instream flow needs for trout."

In Pennsylvania, the $Q_{7-10}$ flow generally falls below the 10% ADF level. Recent work on Connoquenessing Creek and Thorn Run in Butler County, Pennsylvania has shown that flows based on 20-25% ADF guidelines would provide much greater habitat protection than flows based on a $Q_{7-10}$ approach. In fact, in that study, $Q_{7-10}$ flows would provide less than 25% of the optimum habitat levels for two indicator fish species during the typical low flow months of the year. Flows of about 20% ADF would provide from about 65% to over 90% of the optimum habitat levels on Connoquenessing Creek during these same periods, compared to about 50 to near 100% of the optimum habitat levels on Thorn Run (Kleinschmidt Associates 1992).

Compared to the many studies which have been done to determine the effects of instream flow on fish habitat, studies of the effects of flows on fish biomass have been few. Nevertheless, a study by Wolff et al (1990) on Douglas Creek, Wyoming, demonstrated a four to six-fold increase in brown trout standing crop that resulted in a 10.3 km (6.4 mile) reach downstream of Rob Roy Dam when minimum flows were increased from 1.0 cfs (3% ADF) to 5.5 cfs (18% ADF). The PFBC conducted a stream survey on October 17, 1991 on Roaring Run in Centre County. Electrofishing was conducted upstream and downstream of the State College Borough Water Authority's Shinglehouse Gap Reservoir (Young 1991). This reservoir had been off-line since 1988 due to Giardia contamination. Brook trout biomass was estimated at 60 kg/ha upstream of the reservoir compared to 30 kg/ha and 2.5 kg/ha at two sites downstream. By comparison, a July 5, 1989 PFBC survey downstream of the reservoir, the first year after the reservoir had gone off-line, yielded only two fish, both in the 75-99 mm length group. These data suggest significant recovery in the population had occurred when stream flows had returned to natural levels.

The PFBC believes the above information provides substantial support for the conservation release recommendations of 20-25% ADF which DES has typically made on water allocation permits. On occasion the PFBC has recommended flows on the order of the $Q_{7-10}$, but only in cases where water quality is degraded, there is little or no fish life, or $Q_{7-10}$ flows are relatively high, such as on limestone streams. Otherwise, releases based on the $Q_{7-10}$ flow are not protective of fish habitat and there is no literature support known to DES for such flows. To the contrary, it is stated in the previously cited Camp, Dresser and McKee (1986) report that the $Q_{7-10}$ method is not recommended since:

1. The 7Q10 is zero for some streams.

2. From the standpoint of volume of flow, the 7Q10 is not directly related to aquatic life protection goals.

3. Discharge permits for wastewater treatment plants are typically based on the 7Q10 and for this reason the 7Q10 is presumed to protect aquatic life. This presumption notwithstanding, the 7Q10 does not

ensure aquatic life protection because pollutant discharges may continue unabated even if streamflow drops below the 7Q10. Furthermore, the 7Q10 is typically less than the flow that would be prescribed by the Tennant method for short-term survival of aquatic life.

4. Since there is no direct relationship between the 7Q10 and goals for aquatic life protection, multiples of the 7Q10 also are not directly related to aquatic life protection goals."

For the above reasons, DES believes that basing conservation releases on such flows will degrade the waters of the Commonwealth.

The recommendations DES has made in the past have generally not been supported by BWRM. The February 22, 1991 adjudication of the Western Pennsylvania Water Company and Armco Advanced Material Corporation appeals of Water Allocation Permit WA-153D (EHB Docket No. 88-325-E) stated in part:

> If . . . BWRM must rely on DER Bureau of Water Quality Management (BWQM) and the PFC, because of their respective areas of expertise, for recommendations as to conservation release requirements to protect water quality and the aquatic community, then BWRM is bound by those recommendations absent evidence of errors in the recommendation and data to support them. Under these circumstances, BWRM is incompetent to do any balancing, and balancing based on competitive pressures is exactly the arbitrary action DER is to avoid.

The Department has continued to disregard DES comments relative to conservation releases, and little effort has been made to negotiate alternative releases based on instream flow studies or other considerations prior to permit issuance. Recent examples include permits issued on March 22, 1991 to the Borough of Lewistown; August 23, 1991 to the Blairsville Municipal Authority; and July 22, 1991 to the Mahanoy Township Authority. Furthermore, in several recent permit actions (eg. Permits WA-473A issued on January 31, 1992 to the State College Borough Water Authority, and WA-53B issued on February 26, 1992 to the Harrisburg Authority) where alternative water supplies were obviously available, releases were authorized which were lower than those recommended, yet little alternative analysis was provided to justify such a lower release.

Because of the current stalemate in positions regarding conservation releases, DES is very reluctant to expend what in the past has been considerable amounts of staff time on review of individual permit applications. Many times these reviews have involved field studies and lengthy file reviews, but little obvious benefit has been afforded the resource as a result. DES is encouraged that BWRM is now making efforts to coordinate statewide instream flow studies to evaluate the Chapter 105 conservation release guidelines. However, the interim guidelines BWRM had proposed, such as the so called "draft rate method" and "seasonal $Q_{7-10}$ method", were never presented to DES in a format suitable for critical review and neither approach appears to be based on any defensible rationale related to aquatic habitat protection. Therefore, to agree to the use of such formulae at this time runs the risk of

agreeing to the continued arbitrary degradation of instream habitat. For these reasons, DES suggests use of the following guidelines on conservation releases related to water allocation permit reviews:

PFBC Guidelines:

A. 25% ADF on all streams with reproducing trout populations or on streams designated for special protection (EV and HQ in Chapter 93).

B. 20% ADF on all streams not included in A and not degraded by acid mine drainage.

C. 15% ADF on acid mine drainage impaired streams, but in which some aquatic life exists.

D. $Q_{7-10}$ on severely degraded streams or on limestone streams where the $Q_{7-10}$ exceeds 25% ADF.

Special Conditions: It is DES's proposal that the above releases be stipulated, or inflow, whichever is less, as a general rule-of-thumb. However, under certain circumstances, lower releases than these may be acceptable. These circumstances include:

1. An appropriate instream flow study demonstrates that lower releases will provide the same level of aquatic habitat protection.

2. Public fishing is permitted in a reservoir and the above releases are determined to be detrimental to fisheries management efforts in the lake.

3. In the case of an existing supply, it can be demonstrated that no alternative exists.

4. When the withdrawal is minimal in comparison to natural stream flows. DES defines minimal as approximating 10% of the $Q_{7-10}$.

BWRM should refer to the above guidelines in its review of all outstanding and future permits, until such time as new guidelines are developed as the result of the planned statewide instream flow studies. DES will be happy to review and comment on any instream flow study proposals or reports which are developed as part of a permit application. DES will also be willing to participate in any negotiations which may be pursued for conflict resolution related to conservation releases or other pertinent issues. Finally, for information purposes, DES requests that permit applications continue to be forwarded as in the past, as well as any permits which are issued.

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