

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Water Standards and Facility Regulation

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TITLE: Policy and Procedure for Evaluating Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers.

EFFECTIVE DATE: April 12, 2008

AUTHORITY: Federal Safe Drinking Water Act of 1974, P.L. 93-523. Federal Water Pollution Control Act (33 U.S.C.A. §§ 1251 – 1376). Pennsylvania Sewage Facilities Act (35 P.S. §§ 750.1 – 750.20). Pennsylvania Clean Streams Law (35 P.S. §§ 691.1 – 691.801). Pennsylvania Code, Title 25, Environmental Protection, Chapters 71(Sewage Facilities Planning), 91 (General Provisions), 92 (NPDES Permitting, Monitoring and Compliance).

POLICY: Whenever wastewater is discharged to an intermittent or ephemeral stream, a drainage channel or swale, or a storm sewer, the potential for public health effects, nuisance conditions, groundwater pollution, impact on designated uses in surface waters, and trespass must be considered.

PURPOSE: To provide guidance for evaluating proposals involving wastewater discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers.

APPLICABILITY: This technical guidance applies to all wastewater dischargers in the Commonwealth of Pennsylvania required to obtain an NPDES permit.

DISCLAIMER: The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

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I. Introduction

This document provides guidance on evaluating and permitting wastewater discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers. The guidance also applies to man-made surface water drainage systems. Whenever wastewater is discharged to an intermittent or ephemeral stream, a drainage channel or swale, or a storm sewer, the potential for public health effects, nuisance conditions, groundwater pollution, impact on designated uses in surface waters, and trespass must be considered. This guidance supersedes all other policies and procedures, memoranda, letters, or guidance for evaluating discharges to drainage channels and swales, and other man-made conveyance systems described in the guidance.

This guidance applies to any proposed discharge from any new or expanded facility or activity, to a receiving watercourse with little or no natural surface water flow under most conditions. This includes proposed new or expanded discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers. If successful, the end result of this process will be an NPDES permit for the discharge of treated wastewater. If the proposed discharge is for the purpose of wastewater treatment and reuse, a different guidance applies -- *Reuse of Treated Wastewater Guidance Manual*, DEP ID: 362-0300-009. If the proposed discharge is for the purpose of land application of treated wastewater, a different guidance applies -- *Manual for Land Application of Treated Sewage and Industrial Wastewater*, DEP ID: 362-2000-009. It is possible that an application may involve more than one of these programs, such as would be the case if the portions of the wastewater are to be treated or disposed under different programs. In this case, the requirements of all applicable programs must be satisfied.

A wastewater discharge to an intermittent or ephemeral stream, drainage channel or swale, storm sewer, or any other situation involving a dry or nearly dry channel, presents significant challenges to meeting surface water quality standards. There is little or no assimilative capacity available, and such discharges should be considered only as a last resort. If it is feasible to discharge to an existing treatment works which has adequate capacity, or if it is feasible to discharge the effluent from the proposed treatment works to a stream where assimilative capacity exists, a discharge of wastewater to a dry or nearly dry drainage channel should not be considered.

II. Regulatory Requirements

The Pennsylvania Clean Streams Law prohibits the discharge of any substance to the waters of the Commonwealth if the discharge will or is likely to create a nuisance, or if it is detrimental to public health or livestock, wild animals, birds, fish, or other aquatic life. 25 Pa. Code Chapter 93 establishes general and specific water quality criteria, and defines protected and statewide water uses, that must be protected in surface water. Public water supply uses of groundwater must be maintained within the levels established in the Primary Drinking Water Standards of the Federal Safe Drinking Water Act unless specifically protected at more restrictive levels by DEP. Other requirements regarding the siting, design, and operation of wastewater discharges also apply.

III. Definitions

The following words and terms, when used in this document, have the following meanings, unless the text indicates otherwise:

Drainage channel - A trench dug into the earth, for the purpose of conveying overland stormwater runoff away from a site or area. A drainage channel may be open or covered (i.e., a culvert).

Drainage swale - A natural topologic depression that collects overland stormwater runoff, and conveys it away from a site or area.

Ephemeral stream - A reach of stream that flows only during and for short periods following precipitation, and flows in low areas that may or may not have a well-defined channel. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Some commonly used names for ephemeral streams include: stormwater channel, drain, swale, gully, hollow, saddle, and routinely and incorrectly as “dry streams.” The term is often used interchangeably with intermittent stream but the difference is in length of time of continuous flow (less than one month per year for ephemeral streams).

Facility or activity - Any NPDES point source or any other facility or activity including land or appurtenances thereto that is subject to regulation under the NPDES Program.

Individual sewage system - A system of piping, tanks or other facilities serving a single lot and collecting and disposing of sewage in whole or in part into the soil or into waters of this Commonwealth or by means of conveyance to another site for final disposal.

Intermittent stream - A reach of stream that flows only during wet periods of the year (30% - 90% of the time) and flows in a continuous well-defined channel. During dry periods, especially in summer months, intermittent streams may be reduced to a trickle of water which makes it appear dry, when in fact there is water flowing through the stream bottom or “substrate”. This is usually caused by the seasonal changes of the local soil water table or during periods of long-term drought.

MCL - Maximum contaminant level - The maximum permissible level of a contaminant in water which is delivered to a user of a public water system, and includes the primary and secondary MCLs established under the Federal Safe Drinking Water Act, and MCLs adopted under the Pennsylvania Safe Drinking Water Act. The term refers to the numerical value and the means of determining compliance with that value, and does not refer to EPA applications to specific types of public water systems or sources.

Onlot sewage system - A sewage system which uses a system of piping, tanks or other facilities for collecting, treating and disposing of sewage into a soil absorption area or spray field or by retention in a retaining tank.

Perennial stream - A body of water in a channel that flows throughout a majority of the year in a defined channel and is capable, in the absence of pollution, drought or man-made stream disturbances, of supporting a benthic macroinvertebrate community that is composed of two or more recognizable taxonomic groups of organisms, large enough to be seen by the unaided eye

and can be retained by a U.S. Standard No. 30 sieve (28 meshes per inch, 0.595 mm openings) and live at least part of their life cycles within or upon available substrates in a body of water or water transport system. A perennial stream can have Q_{7-10} flow of zero. For the purposes of this document, a perennial stream includes lakes and ponds.

Point of first surface water use - The first downstream point where the stream is capable of supporting existing or designated uses as defined in Chapter 93.

SFTF - Small flow treatment facility - An individual or community sewerage system designed to adequately treat sewage flows not greater than 2,000 gpd for final disposal using a stream discharge or other disposal methods approved by the Department.

Surface waters - Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries, excluding water at facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds and constructed wetlands used as part of a wastewater treatment process.

WQBEL - Water quality-based effluent limit - An effluent limit produced based on the maximum capacity of the receiving water to assimilate pollutants while still meeting surface water quality criteria and protected uses.

IV. Potential Effects of Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers.

Discharges of wastewater to intermittent and ephemeral streams, drainage channels and swales, and storm sewers present significant challenges to meeting surface water quality criteria and designated uses in surface water for a number of reasons. There is little or no assimilative capacity available. Discharge flows that exceed the natural conveyance capacity of the channel or swale can result in progressive scour of the channel, unstable side slopes, and consequent degrading of the channel and transport of sediment downstream. High proportions of wastewater compared to natural stream flow may demand an impracticable level of wastewater treatment in order to meet Chapter 93 surface water quality criteria and protected uses, and typical methods used to produce WQBELs may not always be adequately protective under these conditions. It may be unclear where exactly surface water quality criteria should be applied, and where designated uses must be achieved, especially if the discharge will create a new, man-made watercourse. In order to satisfy all applicable regulatory requirements, all surface water quality standards (including those developed or applied under Chapter 16) that are designed to protect human health are applicable in all surface waters. All surface water quality standards that are designed to protect aquatic life are applicable at the point of first surface water use, and all points downstream.

Depending on the proximity of the discharge to the surface water, discharges of wastewater to intermittent and ephemeral streams, drainage channels and swales, and storm sewers also may present a significant threat to groundwater quality. As is the case with wastewater discharges to a surface stream, pollutants entering groundwater tend to become diluted down gradient due to dispersion. Unlike stream flow, which is largely turbulent, groundwater flow is nearly always laminar. Where stream dilution results from macroscopic dispersion, groundwater dilution results as contamination diffuses around individual grains of soil. Where stream flow velocities are measured in terms of feet per second, groundwater flow velocities are measured in terms of

feet per day or feet per year. The major difference in the dispersion and ultimate dilution of pollutants added to both systems is time. The average residence time for groundwater might be on the order of many years, whereas the comparable residence time for surface water can be measured in hours or days. Rapid assimilation of pollutants by groundwater is not feasible.

Since groundwater flow is laminar, pollutants in groundwater tend to move slowly down gradient in a plume with limited lateral and vertical dispersion. The existing groundwater flow path can be altered by groundwater withdrawals. A pumping well causes a cone of depression to form in the water table at the point of removal. The permeability of the aquifer controls the shape of the resultant cone of depression. For wells drilled in slowly permeable materials, the cone of depression that forms at the pumping well is deep and steep-sided but limited in area. Consequently, pollutants may not be drawn into the pumping well even when the source is relatively close. For wells drilled in highly permeable materials, the cone at the pumping well is shallow but may extend for extensive distances from the pumping center. Therefore, pollutants can be drawn from sources which are relatively far away. High permeability materials are often found in flood plain sediments, alluvial channel and outwash deposits, and other terrain having unconsolidated material.

Pollutants are not readily assimilated once a wastewater enters groundwater and can remain as a long term influence on water quality. Some ionic species (anions) move through the soils directly to the water table with little or no change in concentration. Considering the above and the fact that most drainage swales readily transmit wastewater to groundwater, all wastewater discharges to drainage swales should be considered as potential direct discharges to groundwater. When an existing or potential groundwater use is within the dispersion plume created by a wastewater discharge to groundwater, discharge limits must be sufficient to protect the groundwater use.

As previously noted, this guidance applies when the intended result of the process will be an NPDES permit for a surface water discharge. The basis for the permit effluent limit for any pollutant contained in the proposed discharge could be based on the need to protect groundwater, the need to protect surface water, or to fulfill a technology-based or advanced treatment requirement. The effluent limit issued in the NPDES permit will be the most stringent of those produced for these purposes.

Other issues that must be considered are those related to nuisance and trespass. A public nuisance is an unreasonable interference with a right common to the general public, and circumstances that constitute a public nuisance are, among other things, conduct that is forbidden by statute or ordinance, or conduct that interferes with public peace. A public nuisance claim could exist from the discharge itself. The Pennsylvania Supreme Court has held that it is a public nuisance to discharge sewage on to the property of others without permission and cause malodors and impair the value of that land, Freedman v. Borough of West Hazelton, 146 A. 564 (Pa. 1929). A private nuisance is an unreasonable invasion of another's interest in the private use and enjoyment of his or her land. Pennsylvania law requires both a physical presence and injury. Discharging treated wastewater to a dry swale and across others' properties could be an unreasonable interference with that property owner's use and enjoyment. While not the only demonstration of injury, odors, spoiling or scouring land, perpetual wetness, or prevention of use are possible injuries.

Trespass is any physical entry upon the surface of another's land. In order to prove trespass, one need only demonstrate that there is an unauthorized entry on the property. Flooding or just the overflowing of water alone can constitute trespass in some occasions. The entry of treated wastewater onto someone's property could reasonably constitute a trespass.

V. Prerequisites

These prerequisites apply to any new or expanding facility or activity that involves a discharge to a receiving watercourse with little or no natural surface water flow under most conditions. This includes any proposed new or expanding discharge to an intermittent or ephemeral stream, drainage channel, swale, or storm sewer.

- A. New wastewater discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers where the first perennial stream that will be impacted by the discharge flow is designated as High Quality (HQ) or Exceptional Value (EV) under Chapter 93, must meet the requirements of § 93.4c to protect the existing quality of the HQ or EV Stream.
- B. All water quality standards, including general and specific surface water quality criteria and protected uses in Chapter 93, and those developed or applied under Chapter 16, must be met for the full length of any natural or man-made watercourse. As an exception to this, surface water quality criteria and protected uses designed to protect aquatic life apply at the point of first surface water use, and all points downstream. Specific substances to be controlled in all surface waters include, but are not limited to, floating materials, oil, grease, scum and substances that produce color, tastes, odors, turbidity or settle to form deposits. These nuisance conditions must be controlled in any surface water, natural or man-made, as per Chapter 93.
- C. Avoidance Criteria. Discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers should not be permitted unless no other feasible options are available. Routing the discharge to an existing treatment works with sufficient capacity is the best option and should be required unless the applicant can demonstrate that this is cost prohibitive. The second best option is to move the discharge to a point on a perennial stream with significant assimilative capacity, using a discharge pipe or other enclosed conveyance. The regional permit engineer should determine if such an option is feasible and if there is a significant water quality benefit. As a guideline and subject to regional discretion, including the determination whether or not a significant water quality benefit will be attained, these criteria should be applied when determining whether it is feasible to move the point of discharge:
 1. For proposed discharges of 2000 to 10,000 gallons per day, the Department considers that moving the discharge point up to 250 feet at a minimum, is feasible. The feasibility of moving the discharge point greater distances should be evaluated by the applicant.
 2. For proposed discharges of greater than 10,000 gallons per day, the Department considers that moving the discharge point up to 500 feet at a minimum, is feasible. The feasibility of moving the discharge point greater distances should be evaluated by the applicant.

SFTFs are exempt from any requirements related to these avoidance criteria.

- D. Channel Conveyance Analysis. The permittee must demonstrate that expected velocities in the stream, channel, swale, or sewer will neither exceed the conveyance capacity of the channel, nor result in progressive scour of the channel bottom or sides. This will be accomplished using standard engineering principles and practices as they apply to open channel flow, and consider surface runoff as well as the facility discharge flow. In addition to this demonstration and as a guideline, velocities in the stream, channel, swale, or sewer should not exceed 2 feet per second unless the channel has been improved or stabilized to assure the stability of the channel. A Professional Engineer registered in Pennsylvania must seal the analysis report. Documentation of this analysis may be submitted with the application for a permit, with the NOI for coverage under a general permit, or by any other means approved by the responsible regional planner or permit engineer. SFTFs are exempt from the requirement for a channel conveyance analysis.
- E. Equalization. New wastewater discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers, should be equalized as required to avoid surges of flow through the channel. Equalization of the discharge flow should be required as an integral part of the design of Sequenced Batch Reactors (SBRs) or other batch-type facilities or operations. Equalization of other types of treatment facilities may be required in order to limit velocities in the channel to an acceptable range. SFTFs are exempt from the requirement for equalization.
- F. Advanced Treatment Requirements. For discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers, a high degree of treatment is required to compensate for the lack of available assimilative capacity and to minimize the potential for nuisance conditions. Effluent limits will be determined by the regional permit engineer on a case-by-case basis, but for discharges of treated sewage and similar oxygen-consuming wastes, effluent limits should include and be at least as stringent as these, or equivalent:

CBOD₅ - 10 mg/L as a monthly average;
TSS - 10 mg/L as a monthly average;
Total N - 5 mg/L as a monthly average;
Dissolved oxygen - minimum 6 mg/L at all times;
Phosphorus – 0.5 mg/L as a monthly average.

All discharges of treated sewage require effective disinfection sufficient to meet Chapter 93 bacteria criteria at the point of discharge. Seasonal adjustments should not be applied to effluent limits based on the advanced treatment requirements contained in this guidance. As an additional requirement for discharges of treated sewage, sand filters or equivalent are required in all cases. The Department will determine if alternative proposed treatment technologies are at least equivalent to sand filters.

SFTFs are exempt from the advanced treatment requirements listed in this guidance. However, the technology-based treatment requirements contained in the *Small Flow Treatment Facilities Manual*, DEP-ID 362-0300-002, are fully applicable for SFTFs.

For wastewater discharges other than discharges of treated sewage and similar oxygen-consuming wastes, no additional treatment requirements are applicable under this guidance. However, federal ELGs are still applicable, and other technology-based requirements may be applied consistent with regional requirements.

- G. Easements Required. Applicants must acquire express easements from affected property owners, over whose property the proposed discharge could flow prior to the point where the discharge will intersect the first perennial stream, for the flow of wastewater across their property. These express easements must be filed in the county courthouse and attached to the property deeds for the properties. Copies of the registered, deeded easements should be submitted with the Planning Module for New Land Development for discharges of treated sewage, or with the Permit Application for discharges for industrial wastewater. The easements must cover all affected property between the proposed discharge point and the point where the discharge flow will intersect a perennial stream.

As an exception to this requirement, easements may not be required for a SFTF. The guidance contained in *Sewage Facilities Planning Module, Component 3s, Small Flow Treatment Facilities*, DEP-ID 3800-FM-WSFR0353s will apply for SFTFs. In general, easements will be required for projects proposing new construction of a SFTF. For projects proposing repair of existing onlot systems, documentation that potentially impacted property owners have received prior notification of the project usually will suffice.

- H. Connection Provision. The NPDES permit that is issued should contain a provision that requires the permittee to connect to a municipal conveyance and treatment system, should this option become available during the term of the permit. Use of the existing facility should be terminated consistent with applicable public health and environmental standards.

VI. Implementation

A. Planning

1. When a wastewater discharge requiring sewage facilities (Act 537) planning is proposed to an intermittent or ephemeral stream, a drainage channel or swale, or a storm sewer, the appropriate Sewage Facilities Planning Module will be used to assure that the proposed facility and documentation is consistent with applicable requirements.
2. As a minimum, the sewage facilities planning module will include:
 - a) Documentation that the soils are not suitable for the installation of an individual or community onlot sewage disposal system.
 - b) A copy of the most recent 7 1/2" topographic map (or other map acceptable to the Department) with the location of the wastewater discharge accurately marked, and the exact latitude/longitude of the discharge point.

- c) Identification on a map acceptable to the department, of all existing or potential groundwater uses within 200 feet of the proposed discharge point and for 200 feet on both sides of the dry channel downstream from the proposed discharge point to the point where perennial stream conditions exist.
 - d) Hydrogeologic studies, as required.
 - e) Documentation that easements have been obtained from all downstream property owners between the proposed discharge point and the point where perennial stream conditions exist.
 - f) Wastewater discharge rate and proposed effluent quality, including any seasonal variations.
 - g) The channel conveyance analysis.
3. Where a treated industrial wastewater (IW) discharge is proposed and sewage facilities' planning is not required, this same information should be submitted as part of the permit application package. For IW discharges, review of the planning documents must be coordinated by the responsible permit engineer or other regional staff.

B. Evaluation and Permitting

- 1. The responsible regional hydrogeologist will review the preliminary information considering, at a minimum, the variables shown in Appendix A. Based upon the review, the hydrogeologist will determine whether local groundwater uses may be adversely impacted by the proposed discharge. If the hydrogeologist determines that more information is necessary, he or she may request that the discharger perform a detailed hydrologic review. Additional information for the detailed review should include detailed definitions of the mixing zone, buffer zone, and existing and potential groundwater uses that may be affected. After reviewing these data, the hydrogeologist will make a determination whether groundwater uses will be adversely affected, and if necessary, the Department may require monitoring of existing uses.
- 2. If the hydrogeologist determines that the discharge may adversely impact groundwater use, applicable human health-related criteria should be imposed at the point of discharge. If an MCL has been promulgated for the pollutant of concern, the effluent limit should be set equal to the MCL value. If no MCL has been promulgated for the pollutant of concern, the effluent limit should be set equal to the human health-based criterion developed specifically for groundwater protection by the Bureau of Water Standards and Facility Regulation. These criteria will follow the guidelines for surface water criteria development, but with exposure conditions set to more accurately assess groundwater. Specifically, these include drinking water consumption of 2 L/d by a 70 kg person, and with an overall 10^{-6} lifetime risk management level (no fish consumption component will be applicable). If the hydrogeologist determines that groundwater uses will not be

adversely impacted by a wastewater discharge, final treatment requirements and effluent limits will not be governed by the requirement to protect groundwater.

3. The responsible water pollution biologist will evaluate the preliminary information and determine the point of first surface water use using the guidance provided in Appendix B.
4. Based on the determinations and input of the hydrogeologist and the biologist, the NPDES permit engineer will determine appropriate permit limits. For each pollutant and as applicable, the final permit limit will be the most stringent of those produced to protect groundwater, BDT, or the WQBEL evaluated at the point of first surface water use. WQBELs will be produced using PENTOXSD or equivalent for toxics and other substances, including disinfection byproducts; WQM 7.0 for CBOD₅, ammonia, and dissolved oxygen; and TRC_CALC for total residual chlorine, if applicable. If the design stream flow is zero or nearly zero, WQBELs for most pollutants, including toxics and ammonia, will be at or close to the criteria value. This is unavoidable under these unfavorable conditions.

Appendix A
Variables Which Should Be Considered
When Evaluating Effects on Groundwater

- A. Type of Discharge
 - 1. Drainage Swale
 - 2. Artificially Constructed Drainage Ditch
- B. Relationship of Channel to Groundwater Flow
- C. Depth to Water Table (seasonal variations)
- D. Physical Characteristics which Control Groundwater Flow
 - 1. Fractures
 - 2. Solution Channels
 - 3. Bedding Features
 - 4. Structure
- E. Rock Characteristics
 - 1. Physical (consolidated, unconsolidated, texture, etc.)
 - 2. Chemical (mineralogy, weathering, etc.)
- F. Background Groundwater Quality/Quantity
- G. Groundwater Use Characteristics - Downgradient Users, Spring and Well Locations, Volumes of Groundwater Pumped, Estimated Cones of Depression, Influence of Pumping on Groundwater Flow Direction for Both Existing and Potential Users
- H. Existing or Potential Dispersion Plume Characteristics
- I. Site Runoff Characteristics - Expected Quality, Flow Characteristics, Volumes, Frequencies
- J. Effluent
 - 1. Volume
 - 2. Quality (chemistry)
 - 3. Location of Discharge
- K. Distance to Perennial Receiving Stream
- L. Downstream Characteristics - Flow Characteristics, Volume, Quality
- M. Other Discharges to Channel and Receiving Stream Which Might Influence Quality

Appendix B

Point of First Surface Water Use Determination

The point of first surface water use establishes where Chapter 93 Water Quality Standards, including criteria developed and applied under Chapter 16, must be attained. It represents the location where continuous stream flow may be available for treated waste assimilation, and a determination usually should be limited to well defined stream channels in which flow usually occurs. The presence of flowing water, however, may not be sufficient evidence to conclude that an aquatic use occurs or is possible at a particular point. Intermittent flows may preclude the establishment of aquatic uses and additional analyses may be required to identify these situations and to determine the point at which a stream supports a use.

There are no published hard and fast rules for these types of determinations. The determination of the point of first stream use is subjective to some extent and based on the analyses of certain physical and chemical characteristics. The time to conduct stream channel surveys to determine the point of first surface water use should be left to the discretion of the biologist but, as a guideline, usually should be performed from November through April.

This appendix provides general guidance. It is not all inclusive and should not preclude evaluation of factors which are not listed. The intent is to distinguish between perennial streams, ephemeral streams, drainage channels, drainage swales, and “wet weather” types of flowing waters.

1. Biological Considerations

a. Macroinvertebrate Community

Indicators of Perennial Flow: Evidence of a diverse community which includes species which have relatively long aquatic life stages (Megaloptera, clams, and some Plecoptera and Ephemeroptera).

Indicators of Intermittent Flows: Low diversities, absence of fall emergence forms, dominance of forms with short aquatic life states (Baetis, chironomids, Simulium).

Cautions: Some invertebrates can compensate for intermittent dry periods (i.e. eggs which can withstand desiccation); some streams have interstitial flows which support diverse “subterranean type” macroinvertebrate communities.

b. Fish

Indicators of Perennial Flow: Diverse community composed of adults, juveniles in intermediate stages include forage and predator types.

Indicators of Intermittent Flow: Low diversity or dominance by one age group, absence of predators.

Caution: Fish are mobile and can move in and out of an area with relative ease as flow or other conditions become unsuitable.

c. Macrophytes

The presence of rooted aquatic plants is a possible indicator of perennial flows. However, due to the influence of other physical factors on macrophyte growth (i.e., substrate, canopy, stream velocities), the absence of macrophytes is not an indicator of intermittent conditions.

2. Physical Considerations

There are no generally applicable rules for consideration of physical factors, such as channel width and depth or substrate composition, that are relative to this subject other than the suitability of these to support an aquatic community. However, consultation with a geologist can yield valuable information on stream flow potentials based on geological factors in the region.

3. Other Factors

Existence of Ponds or Impoundments: Streams with a pond or an impoundment generally have flows throughout the year.

Topographical Maps: The depiction of a stream as intermittent (dashed line) or perennial (unbroken line) on a topographical map is generally based on some reliable historical data.

Knowledge of Area: This can be from personal experience or information from local residents or sportsmen who are familiar with the area.

4. Summary

It is best to consider all, or as many as possible, of the above factors in making a first use determination. Professional judgment tempered with experience is currently the best tool available for making a stream use determination.