Wetland Buffer Delineation Method

Maurice River, New Jersey

October
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State of New Jersey, Department of Environmental Protection
Division of Coastal Resource, CN 401, Trenton, New Jersey 08625

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BUFFER DELINEATION METHOD

ABSTRACT

A buffer delineation method has been developed to protect tidal and non-tidal wetlands in the coastal zone of New Jersey. This study is based on existing information, and identifies appropriate buffer widths to maintain the quality of water entering wetlands. It relies on both field and in-house data that can be objectively evaluated.

The delineation method considers potential water quality impacts and mitigating factors to determine optimum buffer width. Buffering capability is determined based on a combined, case-by-case evaluation of slope, vegetation, and soil characteristics adjacent to the wetland. Impacts of low, moderate, and high intensity development are evaluated based on type of development and impervious coverage. The method also identifies situations in which a buffer width is automatically assigned based on conditions that warrant special consideration. The method was successfully tested for replicability and reasonableness under a variety of wetland and development scenarios.

In New Jersey, the possible range of buffer widths varies depending on the type of wetland: the maximum width of buffers for tidal and non-tidal wetlands, and the minimum buffer width for non-tidal wetlands have been set by law and policy. A User's Guide to the buffer delineation method was developed to ensure that derived buffer widths comply with current state law and policy.

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Draft Wetland Buffer Delineation Method

Division of Coastal Resources

New Jersey Department of Environmental Protection

INTRODUCTION

In response to its recognition of the value and the fragile nature of its wetlands, the State of New Jersey has promulgated laws and policies to limit the degradation of this resource. The NJ Coastal Resources and Development Wetlands Buffer Policy (N.J.A.C. 7:1E-3.27) requires that the need for a buffer be determined within 300 feet of wetlands and within the drainage area of wetlands. The NJ Freshwater Wetlands Protection Act (1987) establishes a buffer of 75-150 feet for wetlands of exceptional resource value (i.e., wetlands that discharge into FW-1 waters and FW-2 Trout Production waters and their tributaries, or that provide documented habitat for threatened or endangered species) and 25-50 feet for wetlands of intermediate resource value (i.e., wetlands that are not of exceptional resource value, and are not isolated wetlands, man-made drainage ditches, swales, or detention facilities).

These requirements essentially establish a maximum and minimum width for wetland buffers. For salt marshes and freshwater tidal wetlands, the maximum buffer width is 300 feet (no minimum width is specified or implied). For non-tidal wetlands (other than those in the Hackensack Meadowlands and the Pinelands, which are regulated by area-specific agencies), the maximum buffer width is either 150 feet or 50 feet, with corresponding minimum widths of 75 and 25 feet, respectively, for the exceptional and intermediate wetland types described above. Given that these ranges of potential buffer widths must be applied, a uniform and predictable method is needed to select an appropriate width within these ranges on a case-by-case basis.

This Buffer Delineation Method has been developed to determine appropriate buffer widths in coastal New Jersey, and consists of two sections.

Section 1 is the Technical Basis document, which describes the information sources and assumptions used to develop the method. It does not impose either minimum or maximum buffer widths, but instead relies on available information to determine buffer widths that respond to site-specific circumstances.

Section 2 of this document is the actual method that will be used in New Jersey. Section 2 contains data sources and procedures to assist users in determining buffer widths. It also applies existing legal and policy limits to the buffer widths derived in Section 1.

A draft version of the method was applied to 4 projects hypothetically sited near 20 wetlands (2 projects per wetland). The method provided here incorporates technical revisions found to be appropriate based on this application. Specific guidance on how to apply the method, based on this experience, is incorporated into Section 2. A status report on the lessons learned during application of the method and the specific results of that application is provided as Appendix A to this document.

Development of this buffer delineation method was originally planned as the next step to follow a study by Rutgers University concerning the impacts of human disturbance upon wetlands relative to buffer width. The Rutgers study (Shisler, 1987) included a survey of buffer requirements and policies in various jurisdictions. An update of that survey is provided as Appendix B to this document.

OBJECTIVES AND LIMITATIONS

The objective of this study was to develop a reliable and replicable method that can be used to determine appropriate buffer widths. The primary basis for buffer width determination is the protection of the quality of water entering wetlands (although other considerations are included as special cases). The method was based on existing information, and was designed for use in the coastal zone on New Jersey.

Because the method is based on soil conditions typically found in the coastal zone, it should not be used indiscriminantly in other parts of New Jersey, or outside of New Jersey. Additionally, while the method includes some special cases where concerns other than water quality are addressed, the user is cautioned to consider all wetland functions when determining an appropriate buffer width. There are likely to be situations in which a wider buffer is needed than is necessary for water quality protection alone.

SECTION 1

Technical Basis

SECTION 1

TECHNICAL BASIS

WETLAND BUFFER DELINEATION METHOD

1.1 Background

Wetlands are a valuable environmental resource for many reasons. They provide a myriad of values and functions that are beneficial to society and essential to the maintenance of ecosystem quality. A primary value of wetlands is their ability to maintain water quality, an important function that can have implications for human health, recreational enjoyment, and habitat quality. Wetland soils break down or bind many pollutants, improving water quality in the aquatic system. Wetlands also detain water from flooding events, mitigating impacts to downstream development. Economic benefits are provided by wetlands associated with fisheries or used for timber harvesting and fur-bearer trapping. Wetlands also provide habitat for a diversity of biota, including a significant number of unique, threatened, and endangered species (Roman and Good, 1983).

Wetland capacity for nutrient removal and retention is limited. Because of this limited capacity, many wetlands are becoming degraded by the significant influx of pollutants carried in runoff from development, agriculture, and other land uses. Surface runoff from developed areas carries a variety of pollutants from numerous sources. Heavy metals (e.g., lead, cadmium, copper, and zinc) are prevalent pollutants in developed areas where they, along with hydrocarbons (gasoline and motor oil), salts, and other particulates, accumulate on roads and parking lots. Nutrients and pesticides are applied to lawns and gardens; bacteria and nutrients may be released by on-site wastewater disposal or animal wastes; and sediments may be released by disturbed land surfaces (Sartor et al., 1974; FHWA, 1981; US EPA, 1983; US EPA, 1984). These pollutants, typically referred to as nonpoint source pollutants, are carried in rainwater into surface runoff or groundwater, either of which finds its way into wetlands. In some cases, rainwater is collected in storm drains and discharged directly into or adjacent to wetlands.

Both soluble and insoluble pollutants can be carried by surface flow into wetlands. Insoluble pollutants (sediment, particulates, insoluble forms of phosphates and metals) may settle out of the flow if the velocity is insufficient to keep them suspended, or they may be deposited as surface flow infiltrates into the soil column. Soluble pollutants will travel directly to the wetland in surface or subsurface flows, unless they are transformed or bound to soil particles before they can reach the wetland. In subsurface flows, the concentrations of these pollutants may be diluted to levels that will have less of an immediate impact to the wetland system, although long-term impacts may occur.

A recent study by Ehrenfeld and Schneider documented elevated levels of chloride, ortho-phosphate, and ammonium in wetlands in the vicinity of residential development in the New Jersey Pinelands. In addition, water table fluctuations were greater in those wetlands compared to wetlands not in the vicinity of development. Elevated lead levels were found in wetlands that received direct input of roadway runoff via storm drains (Ehrenfeld and Schneider, 1987). These types of impacts can affect water quality maintenance, wildlife habitat, and other functions of wetlands.

One method for protecting wetlands from degradation is to provide a vegetated area, or buffer, around the wetland. The width of the buffer needed is directly related to the wetland functions being protected and the buffer functions being provided. Like wetlands, wetland buffers provide a variety of functions, any or all of which could be used as a basis for determining appropriate width. Buffers provide for the removal, reduction, or dilution of sediments, nutrients, and potentially toxic materials carried in the surface and subsurface runoff entering wetlands (Karr and Schlosser, 1977; Clark, 1977). Wetland buffers also minimize the potential for direct human disturbance to wetlands (Shisler, 1987), maintain an area of transitional habitat between aquatic and upland communities, and provide riparian wildlife habitat (Budd et al., 1987). Like wetlands, buffers can reduce stormwater runoff from developed areas and serve to moderate the hydrologic changes in wetlands that can result from nearby development (Wong and McCuen, 1982).

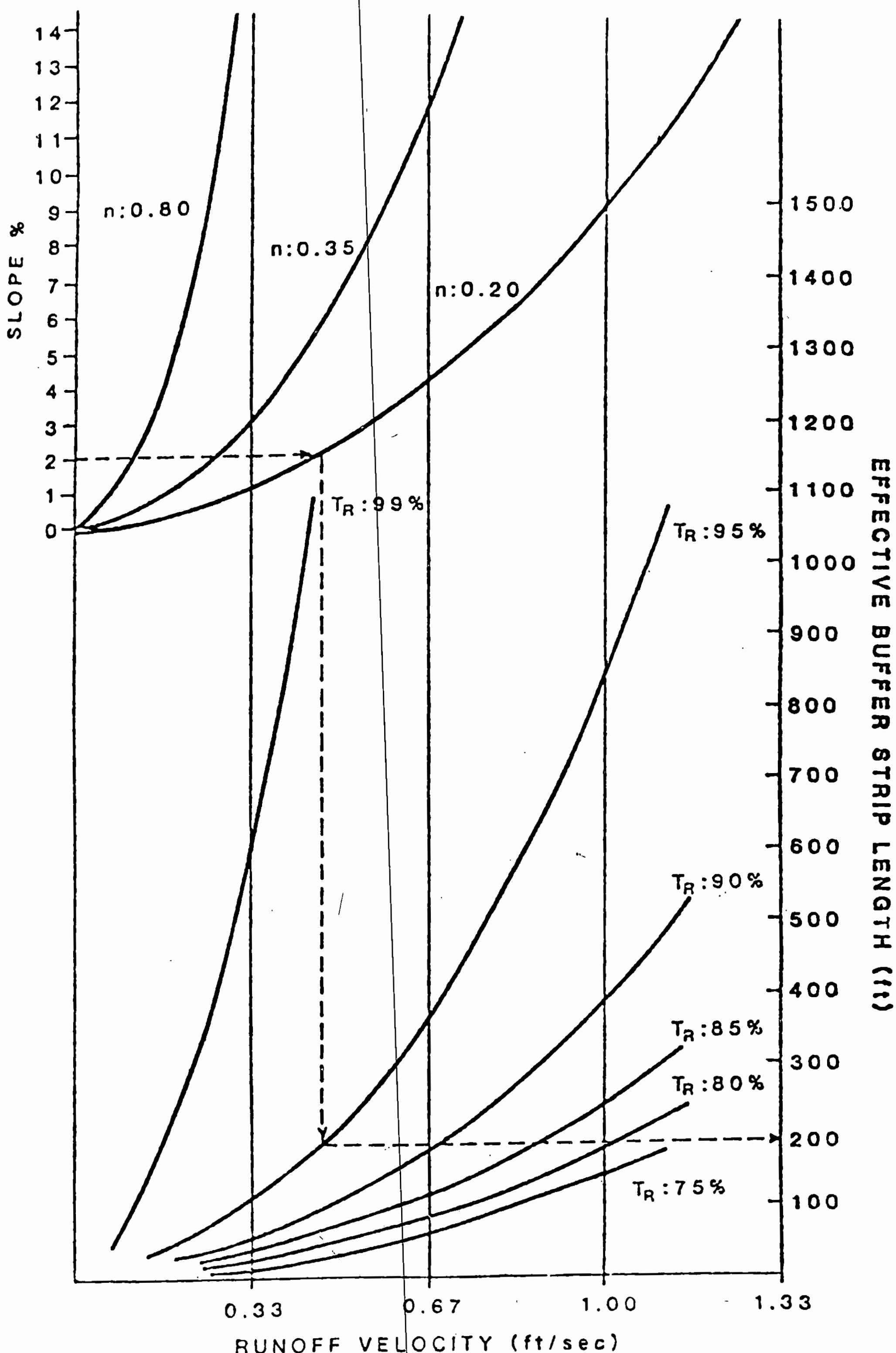
This study has been designed to determine, based on existing information, appropriate buffer widths to protect the quality of water entering wetlands. The objective was to develop a method that was reliable and that was responsive to actual environmental conditions encountered in coastal New Jersey.

The ability of a buffer to renovate water quality is primarily dependent on three factors: vegetation cover, soil characteristics, and slope (Thurow et al., 1975; Wong and McCuen, 1982). While empirical data are available to demonstrate buffer widths needed under specific circumstances to remove specific pollutants, a predictive tool is needed that will provide a buffer width that responds to a variety of conditions. Such a tool has been developed based on results derived from the buffer width model prepared by Wong and McCuen (1982). Their model has been described as "the most comprehensive analysis of the relationship among these variables [those listed above] in affecting the efficiency of buffer strips" (Palfrey and Bradley, no date).

The Wong and McCuen model was developed to establish design criteria for vegetative buffer strips for runoff and sediment control at various trap efficiencies. Wong and McCuen note that the design for a buffer is a function of both stormwater management policy and physical site conditions. Desired trap efficiencies are a policy decision that defines the required length of the buffer. The model incorporates a modified version of Manning's Equation (Equation 1) to graph the relationships among several factors, including the roughness coefficient of vegetation, slope, runoff velocity, sediment trap efficiency, sediment particle size, and buffer width. This graphic representation of Manning's equation is shown in Figure 1.1-1.

<u>Equation 1</u>: $V_m = \frac{1.49}{n} R_s^{2/3} S^{1/2}$,

where V_m is the mean velocity in feet per second, n is Manning's roughness coefficient, R_s is the spacing hydraulic radius in feet, and S is the buffer strip slope in feet/feet.



From: Wong and McCuen, 1982

Figure 1.1-1. Effective Buffer Length Determination for Various Trap Efficiencies (Tp)

Wong & McCuen found that the rate of sedimentation is particularly dependent on the type of vegetative cover and the sediment particle size. For instance, to attain 90 percent sediment removal on a 5 percent slope, the necessary buffer size nearly doubles when comparing forested vs. medium grassed, and medium grassed vs. light grassed buffers. Particle size is a factor determining settling velocity: the greater the particle size, the higher the settling velocity and trap efficiency (i.e., more sediment is trapped when the size of sediment particles is larger). The buffer width also varies greatly depending on the sediment trap efficiency desired. For example, up to 75 percent trap efficiency is attained at relatively small buffer widths. Above 75 percent, the incremental increases needed to increase trap efficiency are larger, and above 90 percent, the incremental increases needed are substantial. For example, a herbaceous (light grassed) buffer on a 2 percent slope would require a 100-foot buffer for a 90 percent trap efficiency, whereas an additional 100 and 1000, feet would be required for trap efficiencies of 95 and 99 percent, respectively.

The Wong and McCuen Vegetative Buffer Strip Model has been adapted for application in Coastal New Jersey. The model requires information on vegetation, slope, sediment particle size, and level of sediment removal (i.e., the trap efficiency) desired. In addition, modifications have been introduced to more accurately reflect additional variables that affect how nonpoint source pollution occurs. These modifications, and the assumptions made for inputs to the Wong and McCuen model, are described below.

The model itself requires sediment particle size as an input. A "coarse silt" particle size was selected as the particle size representative of sediments in coastal New Jersey. Soils within coastal New Jersey are typically identified as sand, loamy sand, sandy loam, and sandy clay loam (infrequent). Given that these are primarily coarse textured (i.e., high sand content) soils, a relatively large particle size (.034 - .05 mm) was selected to reflect the sediment that would occur in runoff from these soils. While a sand particle (.05 - 1.0 mm) is larger than a silt particle (.002 - .05 mm), a silt was selected as an intermediate size to reflect both the sand and clay (less than .002 mm) content found in loamy soils in coastal

New Jersey. Sandy clay loams, for instance, may contain between 20 percent and 35 percent clay. These soils have the highest clay content that would be expected in coastal New Jersey. Given that at least 40 percent of the composition of a sandy loam is sand, the coarser limit of a silt, or "coarse silt", was selected. If the model were to be used outside of coastal New Jersey, buffer sizes would typically need to be be greater to achieve a trap efficiency comparable to that in coastal New Jersey. This conclusion is based on the prevalence of finer textured soils outside of the coastal zone. A greater percentage of small particles would be expected to occur in runoff, and these do not settle out as quickly as large particles.

A trap (i.e., sediment removal) efficiency of 90 percent was selected as appropriate for protecting wetlands. Below 90 percent, insufficient protection may be afforded to wetlands, and above that number, extremely wide buffers would be required. However, as discussed below, additional protection is provided in situations where the total amount of sediment entering the buffer may be higher.)

The Wong and McCuen model addresses three types of vegetative covers that can be planted in buffers: light grass, medium grass, and forest. These categories were assumed to be comparable in trap efficiency to three types of vegetative cover found to occur naturally in potential buffers: herbaceous, scrub-shrub, and forest. This assumption is reasonable because sediment trap efficiency is related to such vegetation characteristics as height (Parley and Bradley, no date), root system depth, top growth branching, and resistance to flooding (Karr and Schlosser, 1977). The gradient of effectiveness predicted by Wong and McCuen, when changing from light grass to medium grass to forest, should be similar to the gradient that would occur in the field when going from herbaceous cover (i.e., under 12 inches) to scrub-shrub/tall herbaceous cover to forested cover.

The impact of a development has been incorporated by extending the buffer width to reflect increased impact potential. Increased impact will be reflected by an increased sediment load to the buffer. Large sediment loads have the potential to form a berm whose sediments may later be carried with runoff during a storm event. Therefore, additional buffer width is provided to protect the wetland against such an event. Buffer widths derived using the Wong and McCuen model (1982) have been multiplied by estimated coefficients that reflect the need for additional width to accommodate increasing sediment loads. The coefficients estimated for use in this method to account for low, low to moderate, moderate to high, and high impact potentials are 1.0, 1.2, 1.35, and 1.5, respectively.

The Wong and McCuen model relies on sediment transport as an indicator of pollutant transport in surface runoff. The model assigns a buffer width based on the width of land necessary to trap the majority of sediment contained in surface runoff. Sediment transport is a reasonable basis for a buffer delineation model for several reasons. Sediment is a major pollutant in aquatic systems. Trapping sediment within the buffer is therefore important to the maintenance of water quality in the wetland. Additionally, many pollutants, including heavy metals, hydrocarbons, pesticides, and phosphates, adsorb to sediments, depending on the clay content of the sediment. Therefore, as sediment is trapped within the buffer, absorbed pollutants are also trapped.

The Wong and McCuen model does not consider control of soluble pollutants (e.g., nitrates; soluble metals) whose transport is related to soil properties and subsurface flow conditions. To account for these factors, a modification to the model has been introduced that increases the buffer width, when appropriate, based on soil properties such as soil drainage, organic content, and cation exchange capacity. Subsurface pollutant transport is specifically addressed by creating special provisions in cases where such transport may be significant (e.g., where soils are excessively permeable, or where on-site septic systems will be used).

In recognition of the fact that water quality maintenance is not the sole determinant of wetland value, other considerations are incorporated as special cases in which specified buffer widths are automatically assigned.

For example, direct human disturbance (Shisler, 1987) was included as a factor for selecting buffer widths to preserve the habitats of threatened and endangered species.

The method provided in this document has been designed to determine buffer widths for three types of wetlands in Coastal New Jersey: salt marsh, freshwater tidal marsh, and palustrine hardwood swamp. Salt marshes in New Jersey are the vast, flat meadowlands found from the bay side of the coastal barrier islands to the mainland, dominated by Spartina and Distichlis species. They are intersected by meandering tidal creeks and are subject to high salt concentrations ranging between 5 parts of salt per 1000 parts of water (5 ppt) to 30 ppt (Carlson and Fowler, 1980; Tiner, 1985). Freshwater tidal marshes occur along tidal freshwater rivers and may extend slightly above the mean high tide mark. Salt concentrations are typically less than 0.5 ppt. In New Jersey, these wetlands are typically dominated by emergent vegetation, including narrow- leaved cattail, water smartweed, wild rice, spadder dock, and arrow arum (Tiner, 1985). Palustrine hardwood swamps are freshwater non-tidal forested wetlands typically dominated by red maple, sweet gum, black gum, sweet pepperbush, and southern arrowwood (Tiner, 1985). Although the method may give consistent results for other wetland types, or wetlands in other parts of New Jersey, it should first be applied in a variety of situations in these other locations. This will help to determine whether additional modifications are needed to reflect circumstances that do not typically occur near coastal wetlands.

Caution should be exercised when relying on this method alone to apply buffers that are very wide. The science of predicting effective buffer widths is young, and the Wong and McCuen model has had only limited field verification. While some empirical data are available, most studies are not sufficiently broad to allow application of results to other locations. Nevertheless, available data indicate that the model may be inaccurate in cases where very wide buffers are recommended. For example, Trimble and Sartz (1957), measured sediment movement on forested slopes as high as 45 percent, and did not identify transport distances in excess of 140 feet. Similarly, Broderson (1973) found that the a buffer width of 50 to 75 feet was sufficient to control natural debris and sediment accumulation in streams, although a buffer width of up to 200 feet was needed to control sediment flows under extreme conditions such as exposed soil and steep slope. The actual effectiveness of varying buffer widths in protecting wetlands is currently being studied in New Jersey by R.E. Good, J.G. Ehrenfeld, C.T. Roman, and D.C. Hayes, as well as in other locations throughout the country. Until the results of these studies are available and can be used to verify this method, the method described in this document should be considered as an interim tool for use until further data are available.

1.2 Buffer Delineation Method

The buffer delineation method is summarized in Figure 1.2-1. The first step in using the model consists of reviewing the Special Cases, which may result in an actual buffer width or in a specified minimum buffer width. The Special Cases address situations where potential impacts are especially high, the wetland is especially sensitive, or other factors are important in the determination of an appropriate buffer width. The procedure for applying the Special Cases is summarized in Figure 1.2-2.

If a Special Case does not apply to the development project, the user must follow the buffer delineation procedure, summarized in Figure 1.2-3. The procedure is based on the premise that buffer width should be based on the amount of pollutants (i.e., the impact) that may be generated by a proposed development and on the capability of the buffer to remove those pollutants. These two components are incorporated into the overall determination of buffer width.

The procedure looks at project impact on a site-specific and watershed basis. Pollutant removal capacity of the buffer is initially evaluated based on predicted relationships among several variables (e.g., slope, soils, vegetation). These values are considered concurrently with project impact to

Figure 1.2-1. Summary of the Buffer Delineation Method

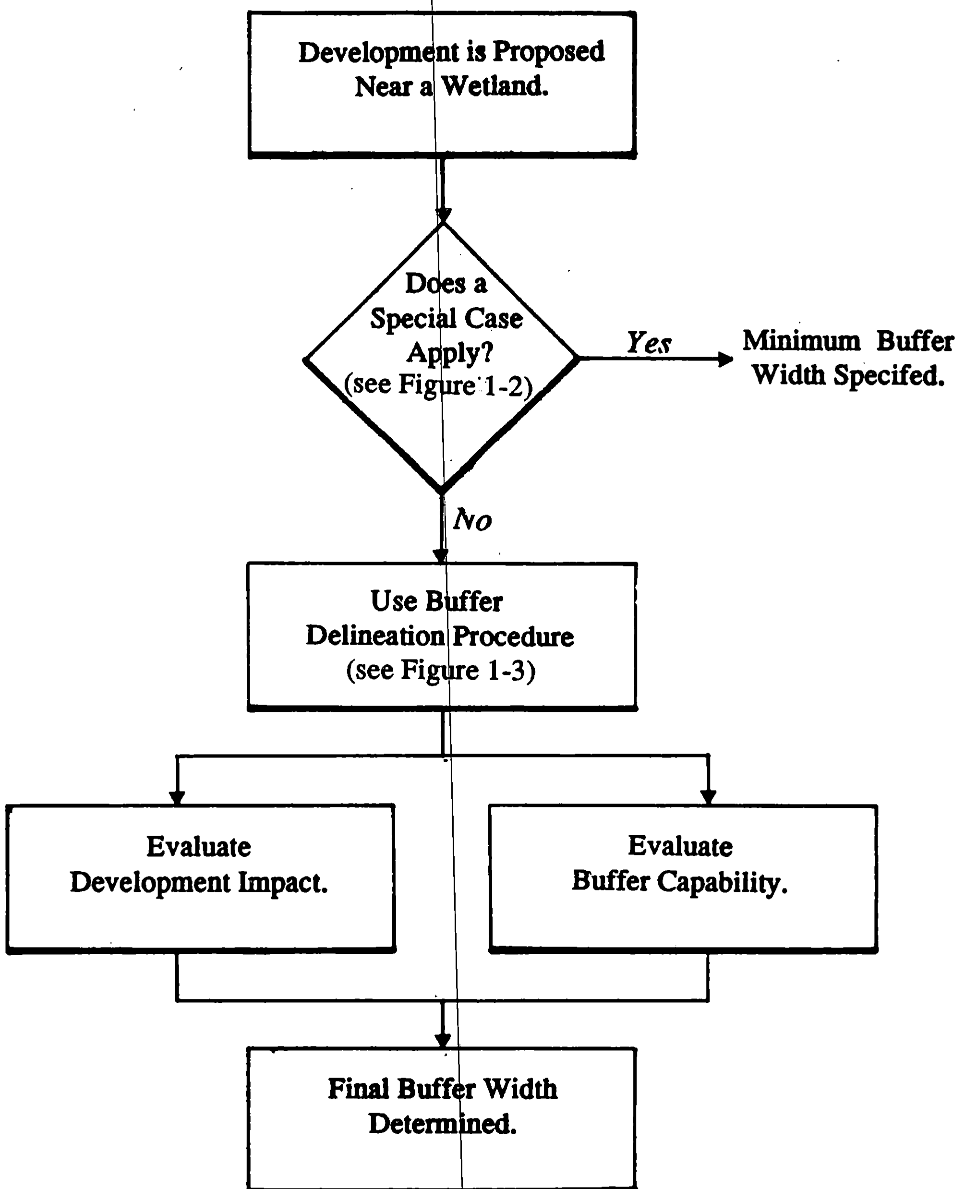


Figure 1.2-2. Procedure for Applying the Special Cases

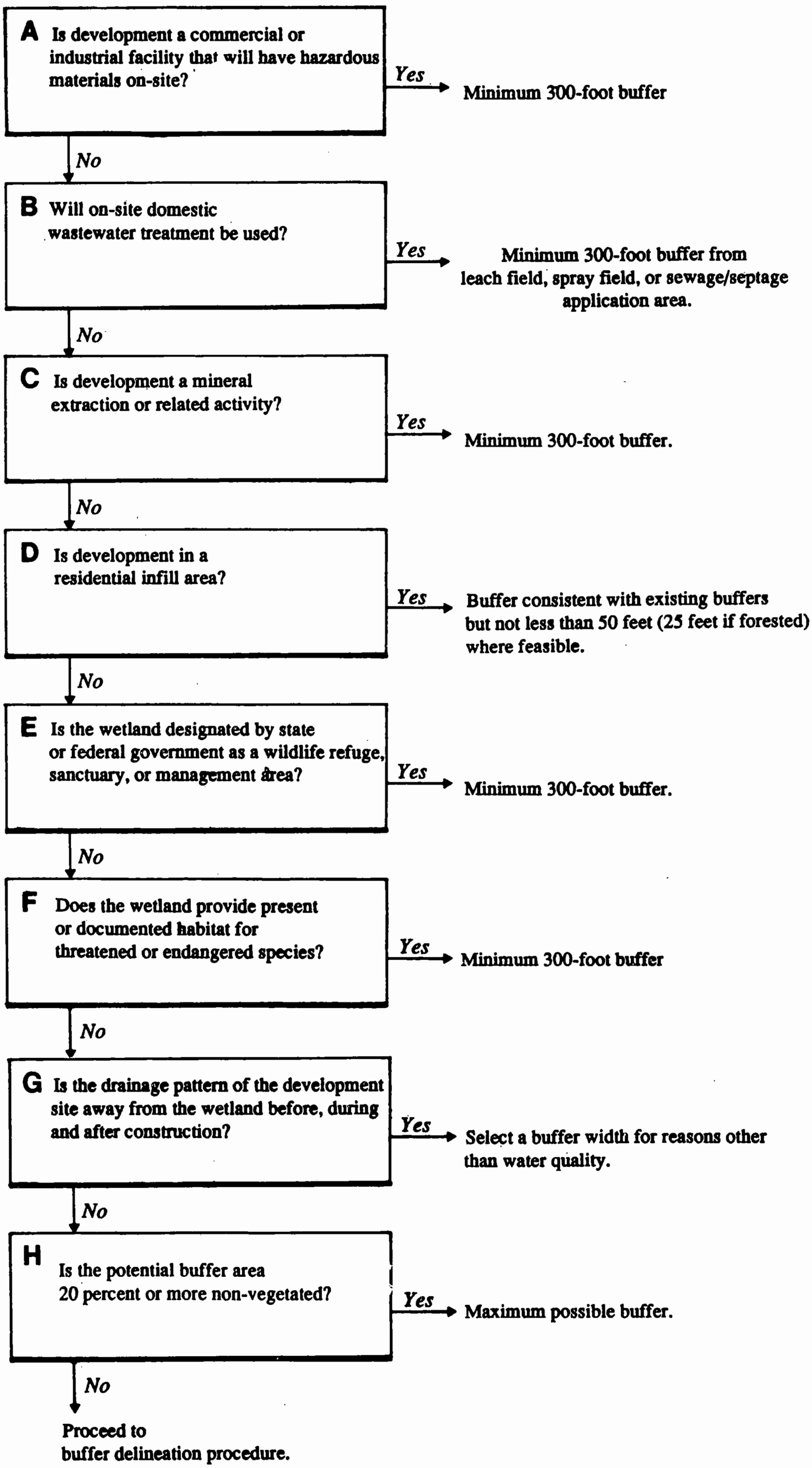
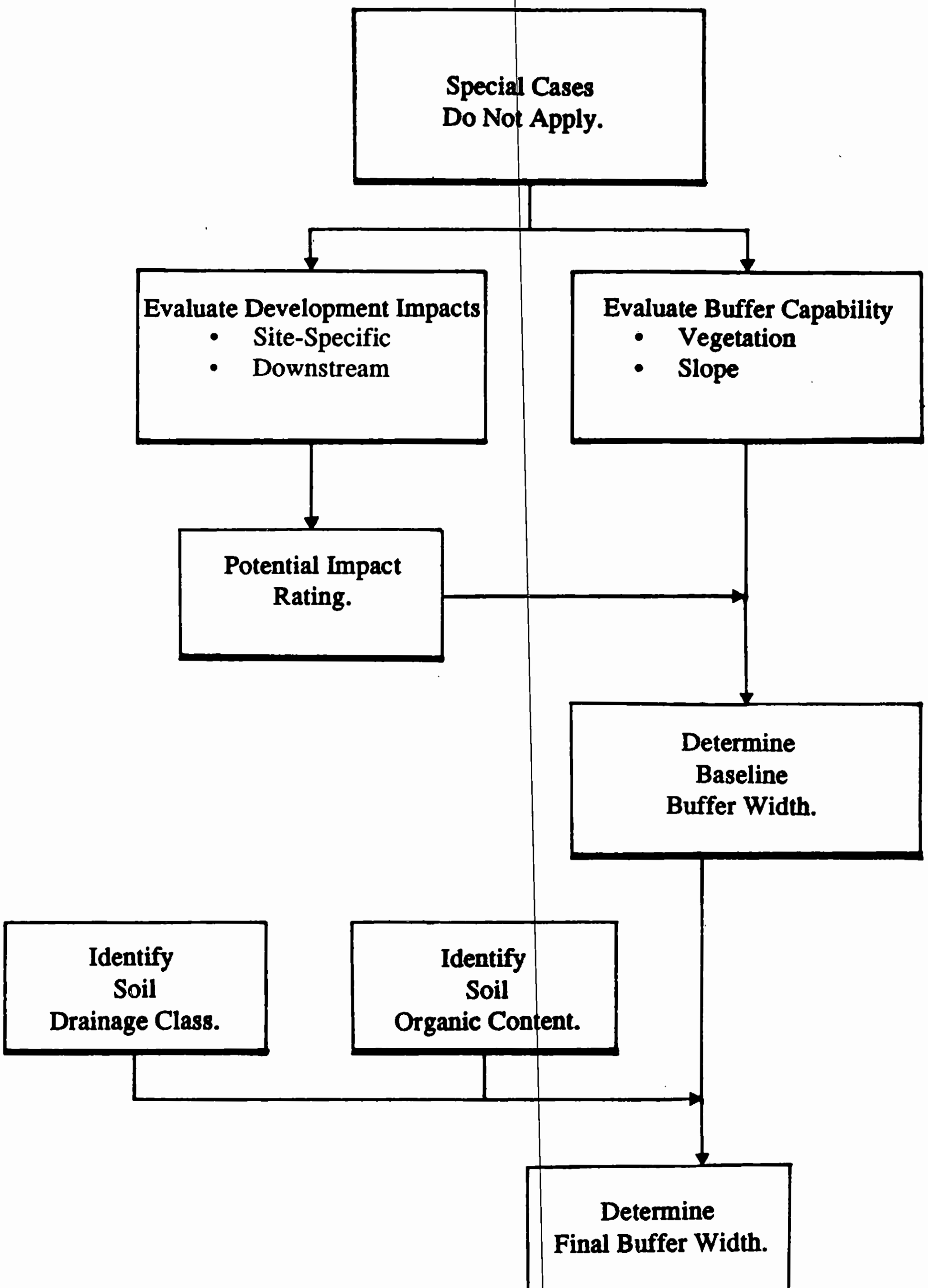


Figure 1.2-3. Buffer Delineation Procedure



determine a baseline buffer width. The baseline buffer width may be increased in the final step, based on consideration of surface water/groundwater flow relations and soil adsorption potential.

1.2.1 PART I - SPECIAL CASES

Certain situations that arise during buffer delineation warrant special consideration. These situations largely fall into one of two basic categories: (1) the planned activity is known to have a very high potential for water quality impacts, or (2) the wetland is or is associated with an especially significant or sensitive resource that merits special consideration. In either case, the buffer width is based on the factors most relevant to the circumstances, and it may include consideration of human disturbance, habitat protection, or other factors in addition to water quality protection.

A. Commercial/Industrial Facilities That May Release Hazardous Materials

A minimum buffer of 300 feet should be maintained between the wetland boundary and any commercial or industrial facility that will be engaged in operations involving the generation, manufacture, refining, transportation, treatment, storage, handling, or disposal of hazardous substances or hazardous wastes.

Hazardous substances are those elements and compounds, including petroleum products, defined as such by DEP in Appendix A of N.J.A.C. 7:1E. Hazardous wastes are those required to be reported on a waste manifest form pursuant to N.J.A.C. 7:26-7.4, designated as a hazardous waste pursuant to N.J.A.C. 7:26-8, or otherwise provided by law.

Basis: The potential for release of hazardous materials, both accidental and intentional, is very high. Regulatory actions at the federal and state levels (e.g., "Superfund," the NJ Environmental Cleanup Responsibility Act, the NJ Underground Storage Tanks Law, and the NJ Solid and Hazardous Waste Management Regulations) have focused attention on the need to exercise extreme caution when handling these materials. Nevertheless, accidents are inevitable, and the potential impacts of these materials on wetlands and other downstream users can be very high. No actual data exist that address the optimum buffer for all hazardous materials; the mobility and environmental fate of each substance varies. Therefore, common sense must be used to determine an appropriate buffer width.

Ideally, hazardous materials should be kept as far as possible from wetlands and other aquatic systems that may facilitate off-site transport. However, in light of the precedent set by existing New Jersey policy regarding coastal wetlands, a buffer of no less that 300 feet should be maintained between the wetland boundary and the facility under review.

The following SIC major groups would typically be required to maintain a minimum 300-foot buffer:

SIC	Industry Category
22	Textile Mill Products
23	Apparel
24	Lumber & Wood Products
25	Furniture & Fixtures
26	Paper & Allied Products
27	Printing, Publishing & Allied Industries
28	Chemicals & Allied Products
29	Petroleum Refining & Related Industries
30	Rubber & Miscellaneous Plastics Products
31	Leather & Leather Products
32	Stone, Clay, Glass & Concrete Products
33	Primary Metal Industries
34	Fabricated Metal Products
35	Machinery
36	Electrical & Electronic Machinery
37	Transportation Equipment
38	Measuring Analyzing & Controlling Instruments, Photographic, Medical & Optical Goods
39	Miscellaneous Manufacturing Industries
46	Pipelines
47	Transportation Services
48	Communications
49	Utilities (Electric, Gas, Sewer)
51	Nondurable Goods Wholesaling
55	Automotive Dealers and Gasoline Service Stations
76	Miscellaneous Repair Services

Note: SIC numbers contain 4 digits with the first two numbers signifying major groups as listed above.

If an applicant of a proposed facility within one of these major groups can demonstrate that hazardous substances or wastes will not occur on the site, he or she may be granted an exemption from this special case, and instead be subject to the buffer delineation method (Part II of this method). The applicant must provide to DEP sufficient process description(s), including feedstocks, byproducts, and wastes, to enable DEP to determine that hazardous materials and wastes will not occur on the site.

B. On-Site Domestic Wastewater Treatment

A minimum buffer of 300 feet should be maintained between the wetland boundary and the septic leach field, spray field, or sewage/septage application area of an on-site wastewater treatment system.

Basis: Use of on-site wastewater treatment systems results in release of nitrate to the groundwater, which may flow into nearby wetlands. Nitrate is diluted during transport, and flow distance (i.e., buffer width) should be based on ensuring that sufficient dilution occurs to prevent excessive wetland impacts. Available data indicate that typically 300 or more feet of separation is appropriate (Clark, 1977; Harlukowicz and Ahlert, 1978; Walker et al., 1973) to ensure adequate dilution of nitrate, which can have a significant impact on wetlands. Therefore, a buffer of at least 300 feet should be maintained.

It should be noted that this distance between the wetland and the leach field, spray field, or sewage/septage application area is recommended to allow for the dilution of nitrate; much of the nitrate in subsurface flows will eventually reach the wetland (Harlukowicz and Ahlert, 1978). However, the effects of nitrate on the wetland will be less drastic at lower concentrations. If the applicant can demonstrate that a smaller distance will provide sufficient nitrate dilution to prevent impacts, the buffer width may be adjusted accordingly. Such a case can be made by determining the background nitrate level by sampling, then demonstrating that there will be no significant increase in nitrate concentration at the lower boundary of the buffer through use of an appropriate dilution model (e.g., Rogers, Golden & Halpern, 1987).

C. Mineral Extraction

The maximum allowable buffer should be maintained between any sand, gravel, or other mineral extraction activity and the boundary of wetlands.

Basis: Mineral extraction is defined here as any mining or quarrying of metals or nonmetallic minerals. By their very nature, these mineral extraction activities are environmentally disruptive. Both vegetation and soil must be removed, which causes alterations in local hydrologic patterns. Hydrologic changes may include alterations in water table configuration and increased surface runoff. These changes in turn can alter the wetland hydrologic regime (i.e., annual and seasonal water table levels). In addition, increased runoff is associated with increased sediment transport into the wetland. For these reasons, a buffer of at least 300 feet should be maintained (Roman and Good, 1985).

D. Infill-Type Residential Development

For residential infill, the buffer assigned should be compatible with adjacent and nearby existing buffers, but in no case less than 50 feet (25 feet, if forested), where feasible.

Basis: Residential infill represents an efficient land use pattern in terms of overall environmental impact. In general, the incremental impact caused by construction in a developed area is less than would be caused by new construction in a relatively undeveloped situation. For example, less clearing for connector roads or installation of other types of infrastructure is likely to be needed. It is appropriate to allow less of a buffer to encourage this pattern of development, provided that none of the conditions described in the previous Special Cases have been met.

A minimum buffer of 50 feet is desirable to protect salt or brackish marshes due to the sensitivity and significant productivity of these wetlands. In these and other wetlands, a 50-foot buffer will limit water quality impacts to varying degrees. However, near some bulkheaded wetlands (e.g., man-made lagoons), a 50-foot buffer may not be feasible, and a narrower buffer may be necessary. This situation is likely to occur in other infill areas as well.

If the area adjacent to the wetland is forested, a minimum 25-foot buffer will do much to protect water quality.

To determine if a proposed residential development is considered infill, all of the following conditions must be met:

1. The upland area in close proximity to the project is predominantly developed (i.e., at least 75 percent of the land surrounding the proposed project, excluding wetlands, is developed). "Developed" is defined here as any long-term alteration in the landscape associated with residential, commercial, or industrial use.

2. The maximum lot size of adjacent development does not exceed 1 acre.

3. Lots have direct access to a paved public road.

4. Lots are serviced by a municipal wastewater treatment system.

E. Wildlife Refuges, Management Areas, and Sanctuaries

A minimum buffer of 300 feet should be maintained between the boundary of wetlands designated by the state or federal government as a wildlife refuge, wildlife management area, or wildlife sanctuary, and the area permanently disturbed by development.

Basis: Areas designated by the federal or state government as wildlife refuges, management areas, or sanctuaries are designated as such to preserve open spaces and wilderness areas for recreational enjoyment and wildlife protection. These areas are recognized by the government as areas deserving of preservation based on the biological and cultural values they possess. As New Jersey continues to develop, opportunities for acquiring large tracts of natural land decline. Therefore, the need to protect those lands already acquired is becoming more immediate. While in many cases water quality may be maintained by smaller buffers, a 300-foot buffer is provided since the integrity of public lands is also dependent upon limiting noise and air pollution and limiting direct human disturbance. Additionally, many species associated with wetlands are reliant on transitional upland (ecotone) areas for meeting their biological requirements. Therefore, buffers are needed to maintain wetland water quality, provide "edge" habitat, limit noise and air pollution, and prevent direct human disturbance.

A study prepared by Joseph Shisler recommends that buffer widths of between 100 and 150 feet, depending on wetland class, be provided to protect the wetland from human disturbance (Shisler, 1987). However, this width would not provide protection to species within the buffer itself. Based on the opinions of several wildlife biologists, corridors for general wildlife protection of up to 300 feet on either side of a stream are necessary to provide required habitat elements (Leedy et al., 1978). Therefore, a minimum buffer width of 300 feet should be provided for all wetlands designated for wildlife protection.

F. Habitat of Threatened and Endangered Species

A minimum buffer width of 300 feet should be maintained between the boundary of wetlands designated as providing habitat for threatened or endangered species, and the area permanently disturbed by development.

Basis: By definition, the future existence of these species is questionable. Special protection measures are needed to ensure that their habitats are not altered, and the conditions they require for biological functions are not disrupted. Protection of wetland water quality may insure that wetland habitats are not altered. However, many threatened and endangered species are sensitive to other development-related factors such as noise and air pollution and direct human disturbance. Additionally, many species associated with wetlands are reliant on transitional upland areas for meeting their biological requirements. Therefore, as discussed under Special Case E, buffers are needed to maintain wetland water quality, provide "edge" habitat, limit noise and air pollution, and prevent direct human disturbance.

In the absence of information on species-specific needs, and in recognition of the precariousness of the existence of these species, it is reasonable to expect a high level of confidence that these species and their habitats will be protected. Therefore, a minimum buffer width of 300 feet should be provided for all wetlands in which threatened and endangered species occur.

The allowable buffer width can be reduced if the applicant can demonstrate, with the concurrence of the NJDEP Natural Heritage Program, that a narrower buffer will provide adequate protection for the species of concern. However, if such a demonstration is made, the buffer must be no less than that required for water quality protection alone. In other words, Part II of this model must be used to determine an appropriate buffer width, and the wider of the two widths (one based on species protection and one based on water quality protection) must be applied.

G. Projects that Do Not Drain to Wetlands

If the natural drainage pattern of the proposed development site is (and will be) away from the wetland before, during and after construction, no buffer is needed.

Basis: If the proposed project does not have a high potential to cause impacts (Special Case A, B, or C), and if the wetland is not especially sensitive (E or F), the project would typically go to the next part of the method, which derives buffer widths based on factors related to runoff drainage. If, however, drainage can be shown to flow away from the wetland before, during, and after construction, the next part of the method will not apply to the project. In other words, a buffer is not needed to protect wetland water quality. Other buffer functions (such as water temperature control, human disturbance control, and wildlife habitat) should be evaluated to determine an appropriate buffer width.

H. Non-Vegetated Buffers

If the potential area is composed of 20 percent or more unvegetated or impervious surface, the maximum possible buffer should be maintained between the wetland boundary and the area permanently disturbed by development.

Basis: Unvegetated and impervious surfaces are significantly less effective than vegetated surfaces in removing sediment from runoff. While it is difficult to predict the actual widths needed, some indication is provided by considering the roughness coefficients of various surface conditions. Trees, which are most effective at removing sediment, have a roughness coefficient of 0.80, while grasses, the least effective vegetation form, have a roughness coefficient of 0.20 (or 1/4 that for trees). Based on Wong and McCuen (1982), at a 5 percent slope and 90 percent trap efficiency, buffers in forest cover should be 45 feet wide and grassed buffers should be 225 feet wide. Bare earth has a roughness coefficient of 0.035 (1/25 that for trees, and about 1/5 that for grasses), while concrete has a roughness coefficient of 0.01 (Jarrett, N.D.). These coefficients cannot be incorporated into the Wong and McCuen model because the model includes a hydraulic spacing factor, which does not apply to non-vegetated conditions. However, one can assume that, based on the comparisons between roughness coefficients, non-vegetated buffers would need to be extremely wide to remove sediments. The precise width needed would depend on the amounts and locations of unvegetated and vegetated areas with respect to the drainage pattern.

1.2.2 BUFFER DELINEATION PROCEDURE

If none of the Special Cases apply, the user should follow the Buffer Delineation Procedure to determine the appropriate buffer width. First, determine the potential for development impacts. Development impacts will then be used to determine the buffer width.

1.2.2.1 Development Impacts

This method of evaluating potential impacts consists of evaluating both site-specific and potential downstream impacts of the proposed project. In the next two sections, points are assigned to reflect each type of impact. A composite index of impact potential (the Potential Impact Rating) is then derived by averaging these two values. The Potential Impact Rating will be used in determining the buffer width (i.e., other factors being equal, the greater the impact potential, the wider the buffer that will be needed to reduce that impact).

A. Potential for Site-Specific Wetland Impacts

The generation of pollutants and the potential for those pollutants to flow into wetlands is greatly increased as residential development density increases. Therefore, percent impervious surface of developed land is used as a simple indicator of potential for site-specific impacts to occur. In the following rating system, points are assigned based on this potential for impacts.

To the extent that commercial and industrial sites have activities similar to residential areas (e.g., vehicular use, landscaping) they will have, at a minimum, the same general types of pollutants as residential areas. These pollutants can include metals, salts, nutrients, pesticides, and organic compounds (LIRPB, 1984). The quantities of some pollutants, such as metals, organics and salts, are likely to be higher due to the greater amount of impervious surface typically associated with these areas. This provides a greater opportunity for site runoff that can transport pollutants, and often accommodates a greater volume of traffic (and thus associated pollutants). In addition, industrial sites have the potential to release other pollutants via spills, aerial deposition, and on-site storage and disposal practices. The list of potential pollutants will vary on a site by site basis. For these reasons, commercial and industrial uses are rated as having high or high to moderate impact potential (and are assigned a higher point value) in the following rating system.

SCORE

High Potential for Site-Specific Impacts 3

The proposed residential development has ≥40% impervious surface in the developed area; or, the proposed development is nonresidential with ≥40% of the total upland site area proposed to be occupied by permanent development.

High to Moderate Potential for Site-Specific Impacts 2.5

The proposed residential development has 30-39% impervious surface in the developed area; or, the proposed development is nonresidential with <40% of the total upland site area proposed to be occupied by permanent development.

Moderate Potential for Site-Specific Impacts. 2.0

The proposed residential development on the site has 20-29% impervious surface in the developed area.

Moderate to Low Potential for Site-Specific Impacts 1.5

The proposed residential development has 10-19% impervious surface in the developed area.

Low Potential for Site-Specific Impacts 1.0

The proposed residential development has less than 10% impervious surface in the developed area.

Note: Developed area is defined as the area occupied by long-term alterations of the landscape, including lawns and landscaped areas. In wooded developments, the developed area is defined as the area within a boundary that can be drawn to encompass all constructed and otherwise altered areas of the site.

B. Potential for Downstream Impacts

When wetlands are hydrologically linked to other surface water bodies, the potential exists for wetland contaminants to be transported downstream where they can affect environmentally sensitive species or areas. Impacts to isolated wetlands may also have watershed-wide impacts if those wetlands are part of, or are adjacent to, environmentally sensitive areas. The presence of a public water supply, designated open space or natural area (including but not limited to wildlife management areas, state forests, parks, and recreation areas), or resident and/or breeding population of threatened or endangered species is used as an indicator of potential for watershed-wide impacts. (Note: This evaluation is more comprehensive than Special Case E as it considers open space areas designated locally and privately, and open space areas that do not include the subject wetland although they may be hydrologically linked to it.)

SCORE

High Potential for Significant Downstream Impacts 3

The wetland adjacent to the proposed development site is associated with a stream or water course and: (1) The Delaware River or estuarine/marine waters (i.e., bays, harbors, ocean) are within 1 mile downstream from the project site; or (2) within 1 mile downstream of the development site there is an intake for a public water supply, or any part of an environmentally sensitive open space/natural area, or resident and/or breeding populations of threatened or endangered wetland plant or animal species; or (3) the wetland is isolated from a streamwater course, and a portion of the wetland or upland area immediately adjacent to the isolated wetland is an environmentally sensitive open space/natural area.

Moderate Potential for Significant Downstream Impacts 2

The wetland adjacent to the proposed development site is associated with a stream or water course and: (1) The Delaware River or estuarine/marine waters are between 1 mile and 2 miles downstream from the project site; or (2) between 1 mile and 2 miles downstream of the development site there is an intake for a public water supply, or any part of an environmentally sensitive open space/natural area, or resident and/or breeding populations of threatened or endangered wetland plant or animal species.

Low Potential for Significant Watershed-Wide Impacts 1

All other wetlands.

Notes: 1) Environmentally sensitive open space/natural areas are defined as wildlife management areas, natural areas, parks, forests, or recreation areas that are managed by federal, state, or county agencies principally for resource protection purposes; or areas managed and maintained as above, by recognized environmental conservation organizations (i.e., The Nature

Conservancy, The New Jersey Conservation Foundation, etc.); or other deed-restricted conservation lands, managed and maintained for resource protection purposes.

2) Distance downstream should be measured as the distance along the actual stream course.

3) If more than one land or water use or rare species category is downstream, the evaluator should assign the highest score that applies.

C. Potential Impact Rating

Site-specific and downstream impacts are equally important concerns when evaluating development proposals. Therefore, the two scores derived for these categories should be averaged to derive a rating of the potential for impacts to be generated by the proposed project. The following scale provides the potential impact ratings to be applied to average scores:

Average Score	Potential Impact Rating
3.0 - 2.6	High
2.5 - 2.1	Medium to High
2.0 - 1.6	Low to Medium
1.5 - 1.0	Low

1.2.2.2 Buffer Capability

In this section, buffer width is determined based on the magnitude of the impact (as determined in the previous section) and the physical ability of the buffer to manage sediment and nutrient loads. Characteristics of vegetation and slope must be identified to determine the baseline buffer width. Soil characteristics are needed to determine the final buffer width.

Determine Cover Type. The predominant vegetation type found in the potential buffer area should be selected based on the following definitions:

Herbaceous - land dominated (more than 2/3) by herbaceous species with an average height of less than 12 inches.

Scrub-Shrub - land dominated (more than 2/3) either by herbaceous species with an average height of greater than 12 inches, shrub species with an average height of less than 20 feet, or a combination of both.

Forest - land dominated (more than 2/3) by trees with an average height of greater than 20 feet.

If the potential buffer area is partially unvegetated or impervious, the percentage of nonvegetated surface should be noted.

Determine Slope. Within the appropriate vegetation type, select the buffer slope. To provide administrative ease and to address "worst case" situations, the steepest slope within the buffer should be selected. The distance over which slope should be measured is the maximum buffer width applicable for the wetland.

1.2.2.3 Baseline Buffer Width

The buffer width corresponding to the vegetation, slope, and development impact identified for the proposed project should be found on Figure 1.2-4. If part (but less than 20 percent) of the potential buffer area is nonvegetated, double the percent of nonvegetated area, then increase the width derived from Figure 1.2-4 by this percent. For example, if the buffer area is 10 percent nonvegetated, the width derived from Figure 1.2-4 should be increased by 20 percent to compensate for the ineffectiveness of the non-vegetated area.

The baseline buffer width will be further evaluated in the next step.

Figure 1.2-4. Baseline Buffer Widths for Wetlands

DEVELOPMENT IMPACT

COVER TYPE	SLOPE (%)	Low	Low-Moderate	Moderate-High	High
Herbaceous	1	60	70	80	90
	2	100	120	132	150
	3	150	180	205	225
	4	190	230	260	285
	5	225	270	305	340
	6	250	300	340	375
	7	290	350	390	435
	8	345	415	465	520
	9	375	450	505	565
	10	430	515	580	645
	>10	Add 4 feet for every additional 1% slope over 10%			
Scrub-Shrub	1	30	35	40	45
	2	50	60	70	75
	3	60	70	80	90
	4	70	85	95	105
	5	90	110	120	135
	6	100	120	135	150
	7	125	150	170	190
	8	130	155	175	195
	9	150	180	205	225
	10	160	190	215	240
	>10	Add 4 feet for every additional 1% slope over 10%			
Forest	1	25	30	35	40
	2	30	35	40	45
	3	35	40	50	55
	4	45	55	60	70
	5	45	55	60	70
	6	45	55	60	70
	7	45	55	60	70
	8	50	60	70	75
	9	50	60	70	75
	10	50	60	70	75
	>10	Add 4 feet for every additional 1% slope over 10%			

Derived from Wong and McCuen (1982).

1.2.2.4 Final Buffer Width

After determining the appropriate baseline buffer width from Figure 1.2-4, the user should refer to Figure 1.2-5 to determine whether the baseline width should be increased.

Figure 1.2-5

Additional Buffer Width Based on Soil Adsorption and Drainage

Soil Drainage Class	Organic Content High	Medium	Low
Somewhat Excessively or Excessively Drained	30 ft.	30 ft.	30 ft.
Well Drained	20 ft.	20 ft.	20 ft.
Moderately Well Drained	0 ft.	10 ft.	20 ft.
Somewhat Poorly Drained	10 ft.	10 ft.	20 ft.
Poorly Drained	20 ft.	20 ft.	30 ft.

Instructions to the user: The indicated width should be added to the buffer width derived from Figure 1.2-4.

Basis: The relationship between clay content and organic matter in the determination of cation exchange capacity (CEC, i.e., the ability of cations to adsorb to soils) is incorporated into the values provided in Figure 1.2-5. Also incorporated into Figure 1.2-5 is consideration of the effect of soil drainage on pollutant transport. Soil properties promoting the retention of one particular type of pollutant may in fact promote transport of other pollutant types. For instance, while an excessively well drained soil will expeditiously infiltrate runoff, thereby reducing transport of particulates to wetlands, these soils are typically sandy and have little to no clay content, which reduces their ability to adsorb soluble pollutants such as soluble phosphates. In other words, very well drained soils may provide inadequate renovation of soluble pollutants, and rapid infiltration of soluble pollutants into the soil (without soil adsorption) does not preclude the pollutants from reaching the wetland through subsurface migration. On the other hand, a somewhat poorly drained soil typically characterized as having a higher clay content can adsorb pollutants better than one with a lower clay content, but during runoff-generating events will carry these pollutants to the wetland more quickly.

To account for these inherent tradeoffs between soil adsorption and soil drainage, Figure 1.2-5 was developed in the following way. Values were assigned to each cell of the matrix (i.e., Figure 1.2-5) to reflect its relative CEC as predicted based on the relative contributions of organic and clay content (Foth, 1978). For this purpose, soil drainage class was assumed to correspond approximately to soil clay content. A second value was assigned to each cell of the matrix to reflect its drainage class only (the highest value was assigned to moderately drained soils, considered to represent the optimal condition for soil adsorption to occur. Decreasing values were assigned toward either extreme. (Poorly drained soils were not assigned values since these soils are typically found in wetlands.) The two values (reflecting CEC and drainage) were multiplied together, and the products were grouped into numerical subsets. For example, soils with both a high potential CEC and moderate drainage had the highest rating and require no additional buffer width. Excessively drained soil with low CEC have a high potential to transmit pollutants via subsurface flow, and therefore require a wider buffer.

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SECTION 2

User's Guide

SECTION 2

USERS' GUIDE

WETLAND BUFFER DELINEATION METHOD

This delineation method is to be used to determine buffer widths for wetlands located near developments proposed in coastal New Jersey. Specifically, the method should be used for:

Proposed development within the drainage area of, and no more than 300 feet from, tidal wetlands (use Section 2.1);

Proposed development within 150 feet of nontidal wetlands of exceptional resource value (use Section 2.2.); and

Proposed development within 50 feet of nontidal wetlands of intermediate resource value (use Section 2.3).

The method should be used for three specific types of wetlands in coastal New Jersey: salt marsh, tidal freshwater, and palustrine hardwood. Salt marshes in New Jersey are the vast, flat meadowlands found from the bay side of the coastal barrier islands to the mainland, dominated by Spartina and Distichlis species. They are intersected by meandering tidal creeks and are subject to high salt concentrations ranging between 5 parts of salt per 1000 parts of water (5 ppt) to 30 ppt. Freshwater tidal marshes occur along tidal freshwater rivers and may extend slightly above the mean high tide mark (Tiner, 1985). Salt concentrations are typically less than 0.5 ppt. Palustrine hardwood swamps are freshwater non-tidal forested wetlands typically dominated by red maple, sweet gum, black gum, sweet pepperbush, and southern arrowwood.

2.1

Tidal Wetlands

2.1 Buffer Delineation Method For Tidal Wetlands

Users' Guide

The procedure for using this wetland buffer method is summarized in Figure 2.1-1. The first step in using the method consists of reviewing the Special Cases, which may result in an actual buffer width or in a specified minimum buffer width. The procedure for applying the Special Cases is summarized in Figure 2.1-2.

If a Special Case does not apply to the development project, proceed to the buffer delineation method, summarized in Figure 2.1-3. The method is based on the premise that buffer width should be based on the amount of pollutants (i.e., the impact) that may be generated by a proposed development and on the capability of the buffer to remove those pollutants. These two components are incorporated into the overall determination of buffer width.

2.1.1 SPECIAL CASES

A. Commercial/Industrial Facilities That May Release Hazardous Materials

A minimum buffer of 300 feet should be maintained between the wetland boundary and any commercial or industrial facility that will be engaged in operations involving the generation, manufacture, refining, transportation, treatment, storage, handling, or disposal of hazardous substances or hazardous wastes.

Hazardous substances are those elements and compounds, including petroleum products, defined as such by DEP in Appendix A of N.J.A.C. 7:1E. Hazardous wastes are those required to be reported on a waste manifest form pursuant to N.J.A.C. 7:26-7.4, designated as a hazardous waste pursuant to N.J.A.C. 7:26-8, or otherwise provided by law.

Figure 2.1-1 Summary of the Buffer Delineation Method

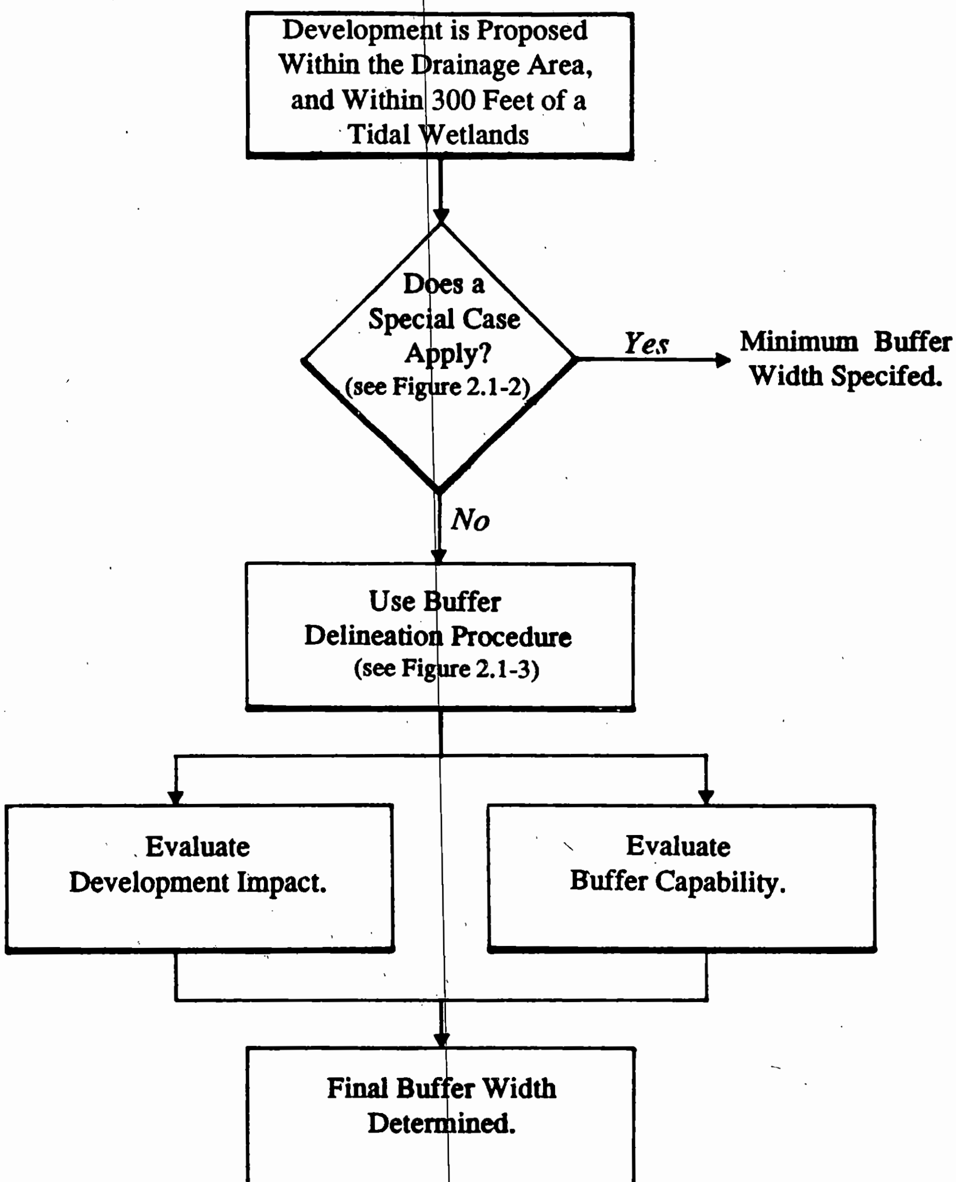


Figure 2.1-2. Procedure for Applying the Special Cases to Tidal Wetlands

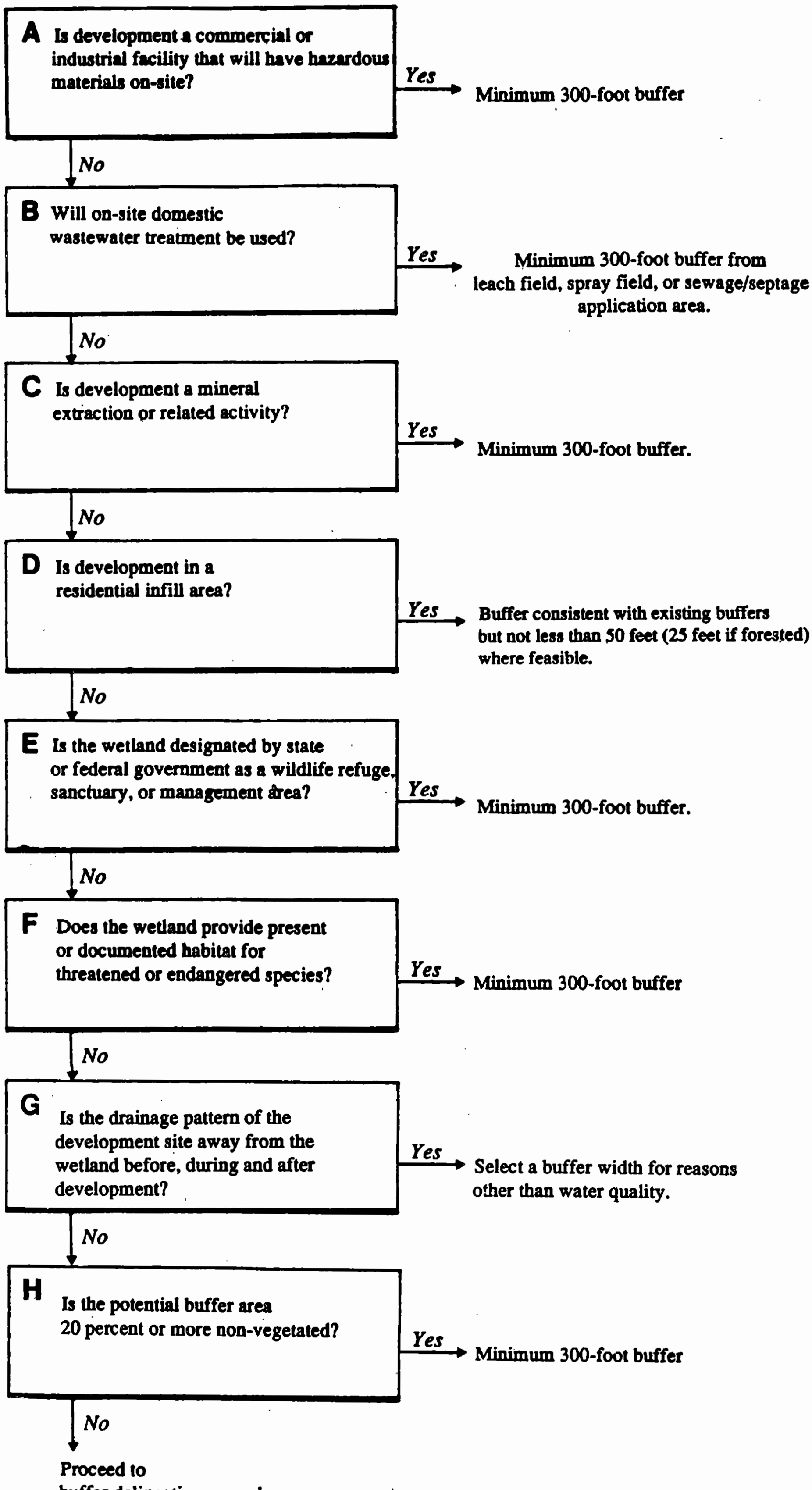
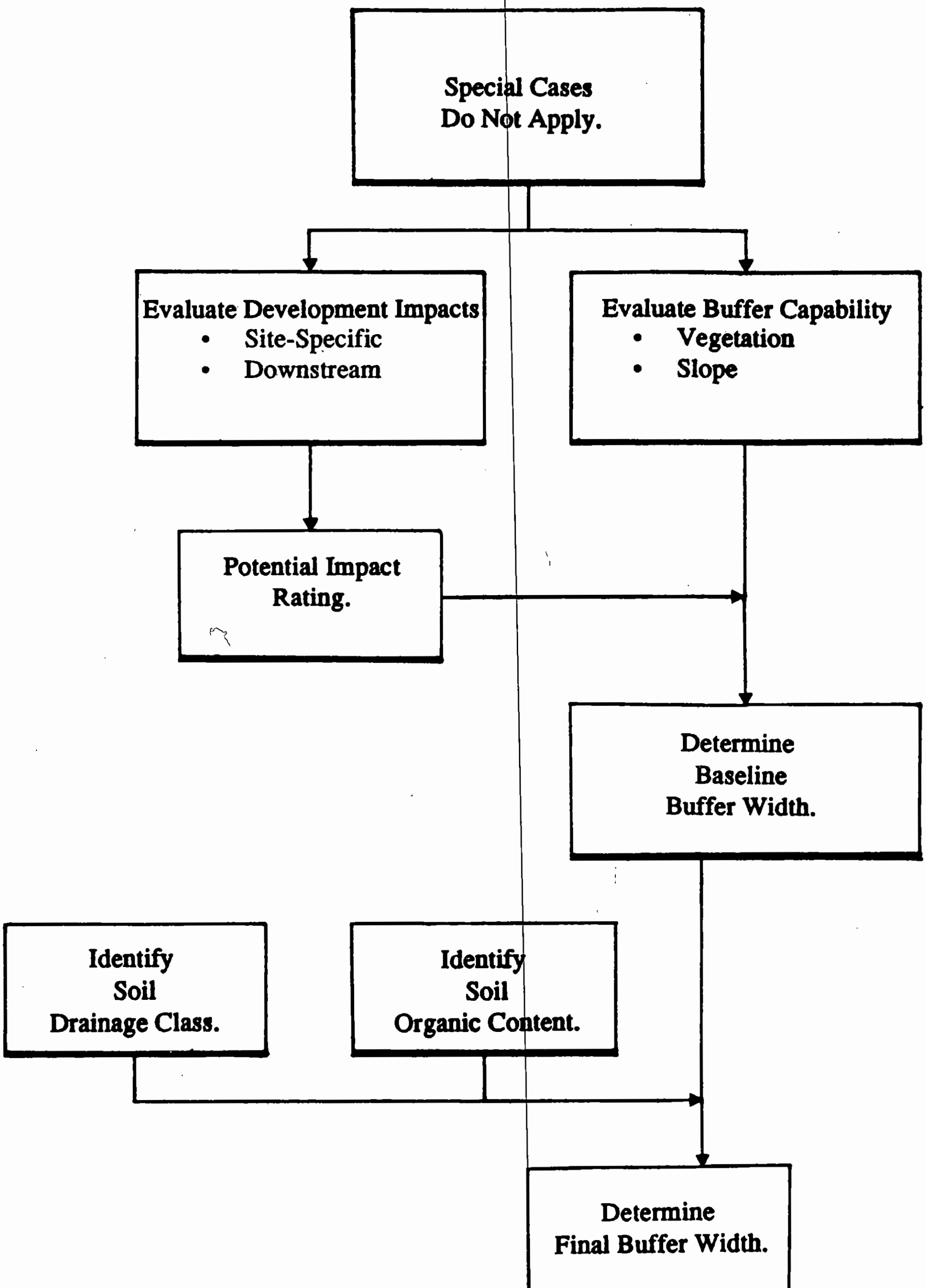


Figure 2.1-3. Buffer Delineation Procedure



Data source: This information may be obtained from the developer directly or from an EIS or building plan.

The following SIC major groups would typically be required to maintain a minimum 300-foot buffer:

SIC	Industry Category	SIC	Industry Category
22	Textile Mill Products	34	Fabricated Metal Products
23	Apparel	35	Machinery
24	Lumber & Wood Products	36	Electrical & Electronic Machinery
25	Furniture & Fixtures	37	Transportation Equipment
26	Paper & Allied Products	38	Measuring Analyzing & Controlling Instruments, Photographic, Medical & Optical Goods
27	Printing, Publishing & Allied Industries	39	Miscellaneous Manufacturing Industries
28	Chemicals & Allied Products	46	Pipelines
29	Petroleum Refining & Related Industries	47	Transportation Services
30	Rubber & Miscellaneous Plastics Products	48	Communications
31	Leather & Leather Products	49	Utilities (Electric, Gas, Sewer)
32	Stone, Clay, Glass & Concrete Products	51	Nondurable Goods Wholesaling
33	Primary Metal Industries	55	Automotive Dealers and Gasoline Service Stations
		76	Miscellaneous Repair Services

Note: SIC numbers contain 4 digits with the first two numbers signifying major groups as listed above.

If an applicant of a proposed facility within one of these major groups can demonstrate that hazardous substances or wastes will not occur on the site, he or she may be granted an exemption from this special case, and instead be subject to the buffer delineation procedure (Section 2.1.2 of this method). The applicant must provide to DEP sufficient process description(s), including feedstocks, byproducts, and wastes, to enable DEP to determine that hazardous materials and wastes will not occur on the site.

B. On-Site Domestic Wastewater Treatment

A minimum buffer of 300 feet should be maintained between the wetland boundary and the septic leach field, spray field, or sewage/septage application area of an on-site wastewater treatment system.

Data source: This information is obtained from the site plan or EIS, if available.

Procedure for data application: A 300-foot wide band (i.e., the minimum buffer width required by this special case) should be drawn around the perimeter of the wetland. If the on-site domestic wastewater treatment system intercepts a point within the 300-foot band, this special case is applicable.

This distance between the wetland and the leach field, spray field, or sewage/septage application area is recommended to allow for the dilution of nitrate. If the applicant can demonstrate that a smaller distance will provide sufficient nitrate dilution to prevent impacts, the buffer width may be adjusted accordingly. Such a case can be made by determining the background nitrate level by sampling, then demonstrating that there will be no significant increase in nitrate concentration at the lower boundary of the buffer through use of an appropriate dilution model (e.g., Rogers, Golden & Halpern, 1987).

C. Mineral Extraction

A 300-foot buffer should be maintained between any sand, gravel, or other mineral extraction activity and the boundary of wetlands.

Mineral extraction is defined here as any mining or quarrying of metals or nonmetallic minerals.

Data source: The designation of such a project is readily obtained from the developer or site plans.

D. Infill-Type Residential Development

For residential infill, the buffer assigned should be compatible with adjacent and nearby existing buffers, but in no case less than 50 feet (25 feet, if forested), where feasible.

To determine if a proposed residential development is considered infill, all of the following conditions must be met:

1. The upland area in close proximity to the project is predominantly developed (i.e., at least 75 percent of the land surrounding the proposed project, excluding wetlands, is developed).

   The upland area in close proximity to the project refers to land within a radial distance from the perimeter of the project area equal to the longest linear dimension of the project site.

   Developed is defined here as any long-term alteration in the landscape associated with residential, commercial, or industrial use.

2. The maximum lot size of adjacent development does not exceed 1 acre.

3. Lots have direct access to a paved public road.

4. Lots are serviced by a municipal wastewater treatment system.

If these conditions apply, determine adjacent and nearby existing buffer widths (if any). A minimum buffer of 50 feet is desirable to protect salt or brackish marshes due to the sensitivity and significant productivity of these wetlands. In these and other wetlands, a 50-foot buffer will limit water quality inpacts to varying degrees. However, near some bulkheaded wetlands (e.g., man-made lagoons), a 50-foot buffer may not be feasible, and a narrower buffer may be necessary. This situation is likely to occur in other infill areas as well.

If the area adjacent to the wetland is forested, a minimum 25-foot buffer will do much to protect water quality.

Data source: Aerial photographs (available from DCR), plus site plans.

Procedures for data application: Determination of 75% development is based on visual inspection.

Determination of lot acreage is based on information shown on project site plans (where coverage extends to existing development) or on aerial photographs.

The most up-to-date aerial photographs should be used. Field surveys should be conducted where feasible. Applicants wishing to provide a buffer under this special case should provide the information needed to support the necessary findings.

E. Wildlife Refuges, Management Areas, and Sanctuaries

A minimum buffer of 300 feet should be maintained between the boundary of wetlands designated by the state or federal government as a wildlife refuge, wildlife management area, or wildlife sanctuary, and the area permanently disturbed by development.

Data source: USGS topographic maps; DEP Environmental Information Inventory prepared by the Division of Parks and Forestry. Applicants should be asked to provide this information with their submittals.

Procedure for data application: The location of the wetland(s) of concern should be identified on both the USGS and DEP inventory maps to determine whether this special case applies. The entire wetland, including the portion adjacent to the project, need not be designated as a refuge, management area, etc. for this special case to be applicable.

F. Habitat of Threatened and Endangered Species

A 300-foot buffer should be maintained between the boundary of wetlands designated as providing habitat for threatened or endangered species, and the area permanently disturbed by development.

Data source: NJ DEP Natural Heritage Program

Procedure for data application: Delineate wetland and project sites on NWI quadrangles and send to the NJ DEP Natural Heritage Program (NHP) for its identification of documented occurrence of threatened or endangered species within or adjacent to the wetland.

The 300-foot buffer width can be reduced if the applicant can demonstrate, with the concurrence of the NJDEP Natural Heritage Program, that a narrower buffer will provide adequate protection for the species of concern. However, if such a demonstration is made, the buffer must be no less than that required for water quality protection alone. In other words, Section 2.1.2 of this model must be used to determine an appropriate buffer width, and the wider of the two widths (one based on species protection and one based on water quality protection) must be applied.

G. Non-Vegetated Buffers

A minimum buffer of 300 feet should be maintained between the wetland boundary and the area permanently disturbed by development if the potential buffer area is composed of 20 percent or more unvegetated or impervious surface.

Data source: Aerial photographs (available from DCR), plus site plans.

Procedure for data application: Determination of 20% impervious or unvegetated surface is based on visual inspection.

The most up-to-date aerial photographs should be used. Field surveys should be conducted where feasible.

2.1.2 BUFFER DELINEATION PROCEDURE

If none of the Special Cases apply, use this part of the method to determine the appropriate buffer width. First, evaluate the potential for development impacts. This information will then be used to determine the buffer width.

2.1.2.1 Development Impacts

A. Potential for Site-Specific Wetland Impacts

SCORE

High Potential for Site-Specific Impacts 3

The proposed residential development has ≥40% impervious surface in the developed area; or, the proposed development is nonresidential with ≥40% of the total upland site area proposed to be occupied by permanent development.

High to Moderate Potential for Site-Specific Impacts 2.5

The proposed residential development has 30-39% impervious surface in the developed area; or, the proposed development is nonresidential with <40% of the total upland site area proposed to be occupied by permanent development.

Moderate Potential for Site-Specific Impacts. 2.0

The proposed residential development on the site has 20-29% impervious surface in the developed area.

Moderate to Low Potential for Site-Specific Impacts 1.5

The proposed residential development has 10-19% impervious surface in the developed area.

Low Potential for Site-Specific Impacts 1.0

The proposed residential development has less than 10% impervious surface in the developed area.

Note: Developed area is defined as the area occupied by long-term alterations of the landscape, including lawns and landscaped areas. In wooded developments, the developed area is defined as the area within a boundary that can be drawn to encompass all constructed and otherwise altered areas of the site.

Data source: Project application or other documentation supporting the application. Where not provided, approximate percent impervious surface can be estimated. However, if the estimated percentage does not clearly fall within one of the specified ranges, the total developed area and total impervious area should be measured with a planimeter.

Procedure for data application: Percent impervious surface is calculated as a percent of that area that would be permanently disturbed for development.

B. Potential for Downstream Impacts

SCORE

High Potential for Significant Downstream Impacts................3

The wetland adjacent to the proposed development site is associated with a stream or water course and: (1) The Delaware River or estuarine/marine waters (i.e., bays, harbors, ocean) are within 1 mile downstream from the project site; or (2) within 1 mile downstream of the development site there is a public water supply intake, or any part of an environmentally sensitive open space/natural area, or resident and/or breeding population(s) of threatened or endangered plant or animal species; or (3) the wetland is isolated from a streamwater course, and a portion of the wetland or upland area immediately adjacent to the isolated wetland is an environmentally sensitive open space/natural area.

Moderate Potential for Significant Downstream Impacts............2

The wetland adjacent to the proposed development site is associated with a stream or water course and: (1) The Delaware River or estuarine/marine waters are between 1 mile and 2 miles downstream from the project site; or (2) between 1 mile and 2 miles downstream of the development site there is a public water supply intake, or any part of an environmentally sensitive open space/natural area, or resident and/or breeding population(s) of threatened or endangered plant or animal species.

Low Potential for Significant Downstream Impacts.................1

All other wetlands.

Notes - 1) Environmentally sensitive open space/natural areas are defined as wildlife management areas, natural areas, parks, forests, or recreation areas that are managed by federal, state, or county agencies principally for resource protection purposes; or areas managed and maintained as above, by recognized environmental conservation organizations (i.e., The Nature Conservancy, The New Jersey Conservation Foundation, etc.); or other deed-restricted conservation lands, managed and maintained for resource protection purposes.

2) Distance downstream should be measured as the distance along the actual stream course.

3) If more than one land or water use or rare species category is downstream, the evaluator should assign the highest score that applies.

Data sources:

(a) Public water supply intakes are identified in the NJ DEP Environmental Information Inventory prepared by the Division of Water Resources, Planning and Standards.

(b) Documented threatened and endangered species habitats are available through the NJ DEP Natural Heritage Program.

(c) Sensitive open spaces/natural areas are identified by consulting USGS topographic maps and the DEP Environmental Information Inventory prepared by the Division of Parks and Forestry. Information in the inventory report is presented on reduced topographic maps. County, municipal and privately owned protection areas should be requested from the applicant.

Procedure for data application: To evaluate downstream impacts, review USGS topographic maps first for clarification of 1-mile and 2-mile downstream limits, since NJDEP inventory maps are at a much smaller scale. Then transfer these limits onto the inventory maps. Note public water intakes along the stream corridor within these limits.

Sensitive open spaces/natural areas identified within 2 miles downstream of the project site must border the water channel within the 2 mile zone to be included for consideration as a downstream impact.

To identify rare species habitats, highlight the water channel (up to 2 miles downstream) associated with the wetland of concern on an NWI map. Also highlight wetlands adjacent to this defined portion of the stream, and provide the map to the Natural Heritage Program (NHP) for their review. The NHP should identify threatened and endangered species habitats located in these areas.

C. Potential Impact Rating

Site-specific and downstream impacts are equally important concerns when evaluating development proposals. Therefore, the two scores derived for these categories should be averaged to derive a rating of the potential for impacts to be generated by the proposed project. The following scale provides the potential impact ratings to be applied to average scores:

Average Score	Potential Impact Rating
3.0 - 2.6	High
2.5 - 2.1	Moderate to High
2.0 - 1.6	Low to Moderate
1.5 - 1.0	Low

2.1.2.2 Buffer Capability

In this section, buffer width is determined based on the magnitude of the impact (as determined in the previous section) and the physical ability of the buffer to manage sediment and nutrient loads.

Delineate Buffer Evaluation Area. Delineate the area within which buffer characteristics will be evaluated.

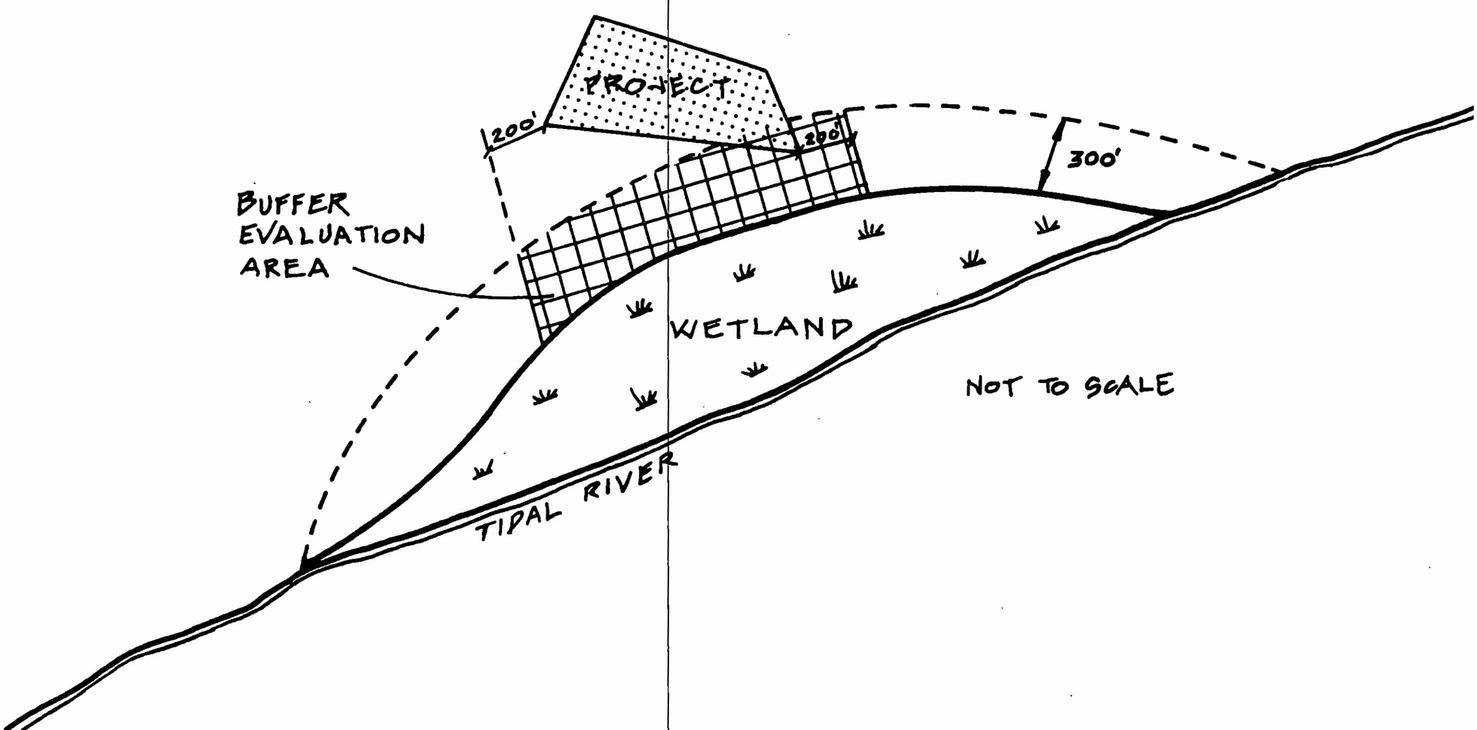
Data Source: Site plans with delineated wetlands; aerial photographs.

Procedure for data application: Draw a 300-foot wide buffer around the upland edge of the wetland. To concentrate the evaluation on that area of the buffer that would be most impacted by the project, the buffer evaluation area is limited to that area defined by lines extended 200 feet from each outermost limit of the project site, drawn parallel to the wetland, then extended to the wetland at a right angle to the first line (see Figure 2.1-4). If the post-project drainage area can be easily identified, the buffer evaluation area will be the actual post-project drainage area that occurs within the land area defined by this method. If the post-project drainage area is not easily delineated, the buffer evaluation area will be the entire land area within the boundary drawn as described above.

In situations where a project is within 300 feet of a tidal wetland and also within 150 feet of a non-tidal wetland of exceptional resource value or within 50 feet of a non-tidal wetland of intermediate resource value, two buffer evaluation areas (one for each wetland) should be delineated and evaluated independently. Use Section 2.2 (Buffer Delineation Method for Non-Tidal Wetlands of Exceptional Resource Value) or Section 2.3 (Buffer Delineation Method for Non-Tidal Wetlands of Intermediate Resource Value) of this document as appropriate for instructions on delineating the buffer evaluation area for these wetlands. After obtaining buffer widths for both wetlands, the buffer extending far enough to satisfy the legal requirements of both wetlands should be selected.

A corollary to this approach may be necessary for situations in which a proposed development has been granted a permit for actions in a non-tidal wetland, and this wetland is associated with a tidal wetland. It is recommended that impacts to adjacent wetlands (other than the wetland in which the action will occur) be evaluated during the permit review process. At that time, appropriate protection or mitigation measures can be identified and imposed as permit conditions.

Figure 2.1-4
Procedure for Defining the Buffer Evaluation Area for Tidal Wetlands



Determine Cover Type. The predominant vegetation type found in the potential buffer area should be selected based on the following definitions:

Herbaceous - land dominated (more than 2/3) by herbaceous species with an average height of less than 12 inches.

Scrub-Shrub - land dominated (more than 2/3) either by herbaceous species with an average height of greater than 12 inches, shrub species with an average height of less than 20 feet, or a combination of both.

Forest - land dominated (more than 2/3) by trees with an average height of greater than 20 feet.

If the potential buffer area is partially unvegetated or impervious, the percentage of non-vegetatd surface should be noted.

Data source: Cover type within the buffer area is primarily determined from 1" = 200′ scale aerial photography (DCR). Results should be field verified.

Procedure for data application: Identify cover types and their relative percent composition within the evaluated buffer area. Use field survey results to differentiate areas of taller grasses from those of shorter grasses, and to verify the identification of existing cover types.

When field verification of each cover type appearing on the aerial is not feasible, the user should make estimates in favor of the worst case condition. For example, where it is difficult to assess whether a land cover is comprised of tall grasses or short grasses, short grasses should be assumed, since they are less effective at controlling sedimentation.

Determine Slope. Within the appropriate vegetation type, select the buffer slope. The steepest slope within the buffer should be selected.

Data source: Site plans (preferred), or USGS topographic maps if no more accurate source is available. Applicants should be encouraged to provide sites plans showing minimum contour interval distances, especially where topography is highly variable.

Procedure for data application: In those cases where site topography within the buffer is in a continually downgradient pattern from the project to the wetland, the distance over which slope is measured is the width of the buffer evaluation area. In those cases where topography is variable (e.g., depressions and higher elevation areas are within the midregion of the buffer), slope is defined as the steepest slope found over the widest continually downgradient area within the buffer evaluation area.

2.1.2.3 Baseline Buffer Width

The buffer width corresponding to the vegetation, slope, and development impact identified for the proposed project should be found on Figure 2.1-5.

Where no cover type predominates, estimate the percent coverage of each vegetation type (as a percentage of total vegetated area), and continue with the method on the basis of that vegetation type to derive appropriate baseline buffer widths (Note: Use Figure 1-4 in the Technical Basis document if you are using this approach). Multiply each buffer width by the percent coverage of the vegetation type on which that buffer width was based. Add the results to obtain the actual baseline buffer width. The following example is provided for clarification:

Example: Whale Creek salt marsh

Forest - 10% Herbaceous - 35% Shrub - 55%

Baseline buffer widths from Figure 4:

forest @ 6% slope = 70 feet
herbaceous @ 6% = 375 feet
shrub @ 6% = 150 feet

Figure 2.1-5
Buffer Widths for Sediment Control in Tidal Wetlands

DEVELOPMENT IMPACT

COVER TYPE	SLOPE (%)	Low	Low-Moderate	Moderate-High	High
Herbaceous	1	60	70	80	90
	2	100	120	132	150
	3	150	180	205	225
	4	190	230	260	285
	5	225	270		
	6	250			
	7	290			
	8				
	9		300 FT.		
	10				
	>10				
Scrub-Shrub	1	30	35	40	45
	2	50	60	70	75
	3	60	70	80	90
	4	70	85	95	105
	5	90	110	120	135
	6	100	120	135	150
	7	125	150	170	190
	8	130	155	175	195
	9	150	180	205	225
	10	160	190	215	240
	>10	Add 4 feet for every additional 1% slope over 10%.			
Forest	1	25	30	35	40
	2	30	35	40	45
	3	35	40	50	55
	4	45	55	60	70
	5	45	55	60	70
	6	45	55	60	70
	7	45	55	60	70
	8	50	60	70	75
	9	50	60	70	75
	10	50	60	70	75
	>10	Add 4 feet for every additional 1% slope over 10%.			

Derived from Wong and McCuen (1982)

Forest - 10% x 70 ft = 7 ft

Herbaceous - 35% x 375 ft = 131.25 ft

Shrub - 55% x 150 ft = 82.5 ft

Baseline buffer width:

7 ft + 131.25 ft + 82.5 ft = 220.75 ft; rounded off to the nearest foot = 221 feet.

If part (but less than 20 percent) of the potential buffer area is non-vegetated, double the percent of nonvegetated area, then increase the width derived from Figure 1-4 by this percent. For example, if the buffer area is 10 percent nonvegetated, the width derived from Figure 1-4 should be increased by 20 percent to compensate for the ineffectiveness of the nonvegetated area.

This baseline buffer width will be further evaluated in the next step.

2.1.2.4 Final Buffer Width

After determining the appropriate baseline buffer width from Figure 2.1-5, the user must evaluate buffer soil(s) to determine the final buffer width using Figure 2.1-6.

Soils. Determine the drainage class and organic content of soils found in the evaluated buffer area.

Data source: Soils within the buffer area may be found in Soil Conservation Service (SCS) County Soil Surveys, site plans or EIS's. Information for each soil class regarding drainage class and organic matter content is obtained from SCS County Soil Surveys. Because soil descriptions are often County specific, the correct county soil survey should always be used.

Procedure for data application: Identify those soils occurring within the buffer evaluation area. If this information is not available on the site plans, an overlay, enlarged to scale, from the soil survey should be used.

Figure 2.1-6

Additional Buffer Width Based on Soil Adsorption and Drainage

Soil Drainage Class	Organic Content: High	Organic Content: Medium	Organic Content: Low
Somewhat Excessively or Excessively Drained	30 ft.	30 ft.	30 ft.
Well Drained	20 ft.	20 ft.	20 ft.
Moderately Well Drained	0 ft.	10 ft.	20 ft.
Somewhat Poorly Drained	10 ft.	10 ft.	20 ft.
Poorly Drained	20 ft.	20 ft.	30 ft.

Instructions to the user: The indicated width should be added to the buffer width derived from Figure 2.1-5. If the final width is greater than 300 feet, the required buffer should be 300 feet.

If several soil types occur in the buffer evaluation area, follow the following procedure:

Note soil drainage class, organic content, and approximate percent coverage for each soil type. Where both drainage and organic content descriptions are identical for two or more encountered soil classes, combine percent coverages of these areas. Use Figure 2.1-6 of the buffer delineation method to identify additional feet to be added to baseline buffer width for each type (or group) of soil. Average these distances in the following manner. For each soil type or group, multiply percent coverage by additional buffer distance (derived from Figure 2.1-6 of the method). Then add respective products to determine additional buffer width. An example is provided on the following page.

Example:

Soil A: well-drained, low organic content, 20% coverage

Soil B: somewhat poorly drained, high organic content, 50% coverage

Soil C: moderately well drained, medium organic content, 10% coverage

Soil D: somewhat poorly drained, high organic content, 20% coverage

From Figure 2.1-6:

Soil A - 20 ft

Soil B - 10 ft

Soil C - 10 ft

Soil D - 10 ft

Since both Soil B and Soil D have identical descriptions, the percent coverage is combined; 50% + 20% = 70%.

Soil A - 20% x 20 ft = 4 ft

Soil C - 10% x 10 ft = 1 ft

Soil B + D - 70% x 10 ft = 7.0 ft

Additional feet to be added to base buffer width:

4 ft + 1 ft + 7.0 ft = 12 ft

Where organic matter content is not explicit in soil descriptions found in the soil surveys, and if the applicant has not provided this information based on standard laboratory testing, assume the following: excessively well-drained, well drained, and moderately well-drained soils have low organic matter content. Somewhat poorly drained soils have moderate organic matter content and poorly drained soils have high organic matter content.

2.2

Non-Tidal Wetlands of Exceptional Resource Value

2.2 Buffer Delineation Method

for

Non-Tidal Wetlands of Exceptional Resource Value

User's Guide

In coastal New Jersey, all non-tidal wetlands of exceptional resource value should have a 150 foot buffer.

The 150-foot buffer width can be reduced if the applicant has demonstrated, with the concurrence of the NJDEP Natural Heritage Program, that a narrower buffer will provide adequate protection for the species of concern. However, if such a demonstration is made, the buffer must be no less than that required for water quality protection alone. In other words, the Buffer Delineation Procedure must be used to determine an appropriate buffer width, and the wider of the two widths (one based on species protection and one based on water quality protection) must be applied. The exception to this requirement of using the Buffer Delineation Procedure is the situation where the natural drainage pattern of the proposed development site is (and will be) away from the wetland before, during and after construction. In this situation, if none of the special cases described below applies, the buffer can be reduced as determined by the Natural Heritage Program, but to a width no less than 75 feet.

2.2.1 SPECIAL CASES

A reduction in buffer width should not be considered if one of the following Special Cases apply. These Special Cases are summarized in Figure 2.2-1.

A. The project is a commercial or industrial facility that will be engaged in operations involving the generation, manufacture, refining, transportation, treatment, storage, handling, or disposal of hazardous substances or hazardous wastes. This information may be obtained from the developer directly or from an EIS or building plan.

Figure 2.2-1. Procedure for Applying the Special Cases to Non-Tidal Wetlands of Exceptional Resource Value

A Is development a commercial or industrial facility that will have hazardous materials on-site?
Yes → No less than 150-foot buffer.
No ↓

B Will on-site domestic wastewater treatment be used?
Yes → No less than 150-foot buffer from leach field, spray field, or sewage/ septage application area.
No ↓

C Is development a mineral extraction or related activity?
Yes → No less than 150-foot buffer.
No ↓

D Is the wetland designated by state or federal government as a wildlife refuge, sanctuary, or management area?
Yes → No less than 150-foot buffer.
No ↓

E Is the drainage pattern of the development site away from the wetland before, during and after construction?
Yes → Apply a buffer width recommended by the NJDEP Natural Heritage Program.
No ↓

F Is the potential buffer area 20 percent or more non-vegetated?
Yes → No less than 150-foot buffer.
No ↓

Proceed to buffer delineation procedure.

B. A septic leach field, spray field, or sewage/septage application area of an on-site wastewater treatment system will be located within 300 feet of the wetland.

C. The project involves any mining or quarrying of metals or nonmetallic minerals within 300 feet of the wetland.

D. The wetland has been designated by the state or federal government as a wildlife refuge, wildlife management area, or wildlife sanctuary. This information is available from USGS topographic maps, and the DEP Environmental Information Inventory prepared by the Division of Parks and Forestry.

E. The potential buffer area is composed of 20 percent or more unvegetated or impervious surface.

2.2.2 BUFFER DELINEATION PROCEDURE

If the applicant has demonstrated, with the concurrence of the NJDEP Natural Heritage Program, that a narrower buffer will provide adequate protection for the species of concern, and if none of the Special Cases apply, use this part of the method to determine the appropriate buffer width. First, evaluate the potential for development impacts. This information will then be used to determine the buffer width.

2.2.2.1 Development Impacts

A. Potential for Site-Specific Wetland Impacts

SCORE

High Potential for Site-Specific Impacts 3

The proposed residential development has $\geq$40% impervious surface in the developed area; or, the proposed development is nonresidential with ≥40% of the total upland site area proposed to be occupied by permanent development.

High to Moderate Potential for Site-Specific Impacts 2.5

The proposed residential development has 30-39% impervious surface in the developed area; or, the proposed development is nonresidential with <40% of the total upland site area proposed to be occupied by permanent development.

Moderate Potential for Site-Specific Impacts. 2.0

The proposed residential development on the site has 20-29% impervious surface in the developed area.

Moderate to Low Potential for Site-Specific Impacts 1.5

The proposed residential development has 10-19% impervious surface in the developed area.

Low Potential for Site-Specific Impacts 1.0

The proposed residential development has less than 10% impervious surface in the developed area.

Note: Developed area is defined as the area occupied by long-term alterations of the landscape, including lawns and landscaped areas. In wooded developments, the developed area is defined as the area within a boundary that can be drawn to encompass all constructed and otherwise altered areas of the site.

Data source: Project application or other documentation supporting the application. Where not provided, approximate percent impervious surface can be estimated. However, if the estimated percentage does not clearly fall within one of the specified ranges, the total developed area and total impervious area should be measured with a planimeter.

Procedure for data application: Percent impervious surface is calculated as a percent of that area which would be permanently disturbed for development.

B. Potential for Downstream Impacts

Due to the presence of threatened or endangered species in or adjacent to the wetland, the potential for downstream impacts is considered high, with an assigned value of 3.

C. Potential Impact Rating

Site-specific and downstream impacts are equally important concerns when evaluating development proposals. Therefore, the two scores derived for these categories should be averaged to derive a rating of the potential for impacts to be generated by the proposed project. The following scale provides the potential impact ratings to be applied to average scores:

Average Score	Potential Impact Rating
3.0 - 2.6	High
2.5 - 2.1	Moderate to High
2.0	Low to Moderate

2.2.2.2 Buffer Capability

In this section, buffer width is determined based on the magnitude of the impact (as determined in the previous section) and the physical ability of the buffer to manage sediment and nutrient loads.

Delineate Buffer Evaluation Area. Delineate the area within which buffer characteristics will be evaluated.

Data Source: Site plans with delineated wetlands; aerial photographs.

Procedure for Applying the Data: Draw a 150-foot wide buffer around the perimeter of the wetland. To concentrate the evaluation on that area of the buffer that would be most impacted by the project, the buffer evaluation area is limited to that area defined by lines extended 200 feet from each outermost limit of the project site, drawn perpendicular to the wetland, then extended to the wetland at a right angle to the first line (see Figure 2.2-2). If the post-project drainage area can be easily identified, the buffer evaluation area will be the actual post-project drainage area that occurs within the land area defined by this method. If the post-project drainage area is not easily delineated, the buffer evaluation area will be the entire land area within the boundary drawn as described above.

In situations where a project is within 150 feet of a non-tidal wetland of exceptional resource value and also within 300 feet of a tidal wetland, two buffer evaluation areas (one for each wetland) should be delineated and evaluated independently (use Section 2.1 Buffer Delineation Method for Tidal Wetlands). After obtaining buffer widths for both wetlands, the buffer extending far enough to satisfy the legal requirements of both wetlands should be selected.

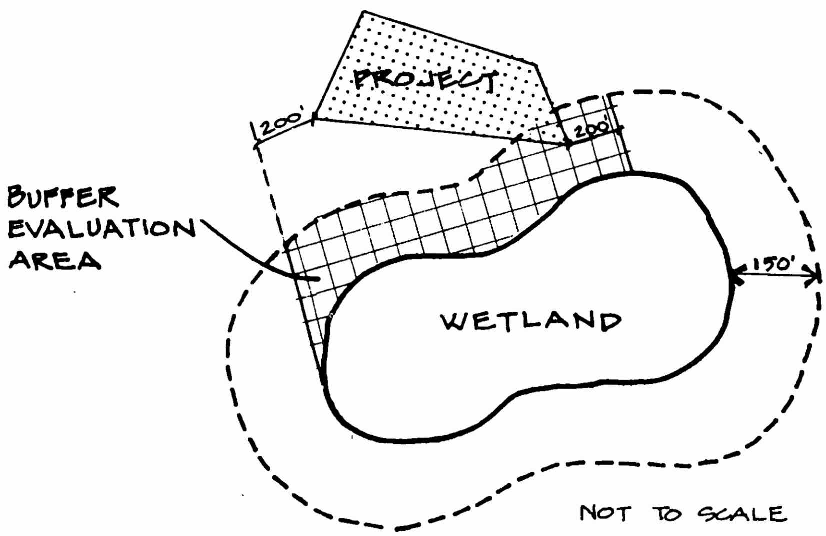
A corollary to this approach may be necessary for situations in which a proposed development as been granted a permit for actions in a tidal wetland, and this wetland is associated with a non-tidal wetland. It is recommended that impacts to adjacent wetlands (other than the wetland in which the action will occur) be evaluated during the permit review process. At that time, appropriate protection or mitigation measures can be identified and imposed as permit conditions.

Determine Cover Type. The predominant vegetation type found in the potential buffer area should be selected based on the following definitions:

<u>Herbaceous</u> - land dominated (more than 2/3) by herbaceous species with an average height of less than 12 inches.

Figure 2.2-2

Procedure for Defining the Buffer Evaluation Area for Non-Tidal Wetlands of Exceptional Resource Value.



Scrub-Shrub - land dominated (more than 2/3) either by herbaceous species with an average height of greater than 12 inches, shrub species with an average height of less than 20 feet, or a combination of both.

Forest - land dominated (more than 2/3) by trees with an average height of greater than 20 feet.

If the potential buffer area is partially unvegetated or impervious, the percentage of non-vegetated surface should be noted.

Data source: Cover type within the buffer area is primarily determined from 1" = 200' scale aerial photography (DCR). Results should be field verified.

Procedure for data application: Identify cover types and their relative percent composition within the evaluated buffer area. Use field survey results to differentiate areas of taller grasses from those of shorter grasses, and to verify the identification of existing cover types.

When field verification of each cover type appearing on the aerial is not feasible, the user should make estimates in favor of the worst case condition. For example, where it is difficult to assess whether a land cover is comprised of tall grasses or short grasses, short grasses should be assumed, since they are less effective at controlling sedimentation.

Determine Slope. Within the appropriate vegetation type, select the buffer slope. The steepest slope within the buffer should be selected.

Data source: Site plans (preferred), or USGS topographic maps if no more accurate source is available. Applicants should be encouraged to provide sites plans showing minimum contour interval distances, especially where topography is highly variable.

Procedure for data application: In those cases where site topography within the buffer is in a continually downgradient pattern from the project to the wetland, the distance over which slope is measured is the width of the buffer evaluation area. In those cases where topography is variable (e.g., depressions and higher elevation areas are within the midregion of the buffer), slope is defined as the steepest slope found over the widest continually downgradient area within the buffer evaluation area.

2.2.2.3 Baseline Buffer Width

The buffer width corresponding to the vegetation, slope, and development impact identified for the proposed project should be found on Figure 2.2-3.

Where no cover type predominates, estimate the percent coverage of each vegetation type (as a precentage of total vegetated area), and continue with the method on the basis of that vegetation type to derive appropriate baseline buffer widths (Note: Use Figure 1-4 in the Technical Basis document if you are using this approach). Multiply each buffer width by the percent coverage of the vegetation type on which that buffer width was based. Add the results to obtain the actual baseline buffer width. The following example is provided for clarification:

Example:

Forest - 45%   Shrub - 55%

Baseline buffer widths from Figure 1-4:

forest @ 6% slope = 70 feet
shrub @ 6% = 150 feet

Forest - 45% x 70 ft = 31.5 ft
Shrub - 55% x 150 ft = 82.5 ft

Baseline buffer width:
31.5 ft + 82.5 ft = 114 ft.

Figure 2.2-3
Buffer Widths for Sediment Control In Palustrine Hardwood Wetlands of Exceptional Resource Value

DEVELOPMENT IMPACT

COVER TYPE	SLOPE (%)	Low	Low-Moderate	Moderate-High	High
Herbaceous	1	60	70	80	90
	2	100	120	135	
	3				
	4				
	5				
	6		1 5 0	F T.	
	7				
	8				
	9				
	10				
	>10				
Scrub-Shrub	1	30	35	40	45
	2	50	60	70	75
	3	60	70	80	90
	4	70	85	95	105
	5	90	110	120	135
	6	100	120	135	
	7	125			
	8	130			
	9		1 5 0	F T.	
	10				
	>10				
Forest	1	25	30	35	40
	2	30	35	40	45
	3	35	40	50	55
	4	45	55	60	70
	5	45	55	60	70
	6	45	55	60	70
	7	45	55	60	70
	8	50	60	70	75
	9	50	60	70	75
	10	50	60	70	75
	>10	Add 4 feet for every additional 1% slope over 10%.			

Derived from Wong and McCuen (1982)

If part (but less than 20 percent) of the potential buffer area is nonvegetated, double the percent of nonvegetated area, then increase the width derived from Figure 1-4 by this percent. For example, if the buffer area is 10 percent nonvegetated, the width derived from Figure 1-4 should be increased by 20 percent to compensate for the ineffectiveness of the non-vegetated area.

If the derived buffer width is 150 feet, stop here.

If the derived buffer width is less than 150 feet, this is the baseline buffer width, and it will be further evaluated in the next step.

2.2.2.4 Final Buffer Width

If the buffer width derived from Figure 2.2-3 is less than 150 feet, the user must evaluate buffer soil(s) to determine the final buffer width using Figure 2.2-4.

Soils. Determine the drainage class and organic content of soils found in the evaluated buffer area.

Data source: Soils within the buffer area may be found in Soil Conservation Service (SCS) County Soil Surveys, site plans or EIS's. Information for each soil class regarding drainage class and organic matter content is obtained from SCS County Soil Surveys. Because soil descriptions are often County specific, the correct county soil survey should always be used.

Procedure for data application: Identify those soils occurring within the buffer evaluation area. If this information is not available on the site plans, an overlay, enlarged to scale, from the soil survey should be used.

If several soil types occur in the buffer evaluation area, follow the following procedure:

Figure 2.2-4

Additional Buffer Width Based on Soil Adsorption and Drainage

	Organic Content		
Soil Drainage Class	High	Medium	Low
Somewhat Excessively or Excessively Drained	30 ft.	30 ft.	30 ft.
Well Drained	20 ft.	20 ft.	20 ft.
Moderately Well Drained	0 ft.	10 ft.	20 ft.
Somewhat Poorly Drained	10 ft.	10 ft.	20 ft.
Poorly Drained	20 ft.	20 ft.	30 ft.

Instructions to the user: The indicated width should be added to the buffer width derived from Figure 2.2-3. If final width is less than 75 feet, the required buffer should be 75 feet. If the final width is greater than 150 feet, the required buffer should be 150 feet.

Note soil drainage class, organic content, and approximate percent coverage for each soil type. Where both drainage and organic content descriptions are identical for two or more encountered soil classes, combine percent coverages of these areas. Use Figure 2.2-4 of the buffer delineation method to identify additional feet to be added to baseline buffer width for each type (or group) of soil. Average these distances in the following manner. For each soil type or group, multiply percent coverage by additional buffer distance (derived from Figure 2.2-4 of the method). Then add respective products to determine additional buffer width. An example is provided below.

Example:

Soil A: well-drained, low organic content, 20% coverage

Soil B: somewhat poorly drained, high organic content, 50% coverage

Soil C: moderately well drained, medium organic content, 10% coverage

Soil D: somewhat poorly drained, high organic content, 20% coverage

From Figure 2.2.4:

Soil A - 20 ft	Soil C - 10 ft
Soil B - 10 ft	Soil D - 10 ft

Since both Soil B and Soil D have identical descriptions, the percent coverage is combined; 50% + 20% = 70%.

Soil A - 20% x 20 ft = 4 ft

Soil C - 10% x 10 ft = 1 ft

Soil B + D - 70% x 10 ft = 7.0 ft

Additional feet to be added to base buffer width:

4 ft + 1 ft + 7.0 ft = 12 ft

Where organic matter content is not explicit in soil descriptions found in the soil surveys, and if the applicant has not provided this information based on standard laboratory testing, assume the following: excessively well-drained, well drained, and moderately well-drained soils have low organic matter content. Somewhat poorly drained soils have moderate organic matter content and poorly drained soils have high organic matter content.

2.3

Non-Tidal Wetlands of Intermediate Resource Value

2.3 Buffer Delineation Method
for
Non-Tidal Wetlands of Intermediate Resource Value
Users' Manual

In coastal New Jersey, all non-tidal wetlands of intermediate resource value should have a 50 foot buffer. Narrower buffers may be considered under the circumstances described under Buffer Reductions. However, the buffer width should not be reduced if any of the Special Cases described below apply.

2.3.1 SPECIAL CASES

A reduction in buffer width should not be considered if one of the following Special Cases apply:

A. The project is a commercial or industrial facility that will be engaged in operations involving the generation, manufacture, refining, transportation, treatment, storage, handling, or disposal of hazardous substances or hazardous wastes. This information may be obtained from the developer directly or from an EIS or building plan.

B. A septic leach field, spray field, or sewage/septage application area of an on-site wastewater treatment system will be located within 300 feet of the wetland.

C. The project involves any mining or quarrying of metals or nonmetallic minerals within 300 feet of the wetland.

D. The wetland has been designated by the state or federal government as a wildlife refuge, wildlife management area, or wildlife sanctuary. This information is available from USGS topographic maps, and the DEP Environmental Information Inventory prepared by the Division of Parks and Forestry.

E. The predominant soils in the potential buffer area are excessively drained, somewhat excessively drained, or well drained.

2.3.2 BUFFER REDUCTIONS

If none of the Special Cases apply, buffer reductions should be considered for the following situations only.

A. **The potential buffer area is predominantly forested.**

In this situation, the following buffer widths may be provided:

25 feet - Only if the slope is $\leq$ 1 percent, and the project has less than 20 percent impervious surface in the developed area.

35 feet - Only if the slope is $\leq$ 3 percent, and the project has less than 40 percent impervious surface in the developed area.

50 feet - All others.

B. **The potential buffer area is predominantly vegetated with trees, shrubs, and/or herbaceous material taller than 12 inches in height.**

In this situation, the following buffer widths may be provided:

35 feet - only if the slope is $\leq$ 1 percent.

50 feet - all others.

Appendix A

APPENDIX A

STATUS REPORT ON THE APPLICATION OF THE NEW JERSEY WETLAND BUFFER DELINEATION METHOD

Status Report On The Application of the New Jersey Wetland Buffer Delineation Method

Division of Coastal Resources
New Jersey Department of Environmental Protection

INTRODUCTION

Rogers, Golden and Halpern has developed a buffer delineation method designed to assist the Division of Coastal Resources (DCR) in determining appropriate, site-specific buffer widths to protect the integrity of wetlands within New Jersey's coastal zone. In addition to being based on the best available technical information, the method must be reliable and predictable. Therefore, this application of the method was designed to verify that data needed to use the method could be easily obtained and used, to clarify procedures for using the method under a variety of conditions, and to identify and incorporate situations that were not foreseen when the draft method was prepared.

APPLICATION PROCEDURE

Four typical development projects and ten actual wetland sites were identified for application of the wetland buffer method. Two of the four projects were placed at each of the ten wetland sites based on their zoning feasibility and their "closeness to fit" within an area adjacent to the wetland site. Therefore, twenty permutations were created to which the method was applied. A summary of the twenty combinations is included as Table 1.

TABLE 1
COMBINATIONS SELECTED FOR APPLYING THE WETLANDS BUFFER DELINEATION METHOD

Wetland	Mod. Density Residential	High Density Residential	Commercial	Industrial
PFO1 Forest Park Inner Coastal Plain			XX	XX
PFO1 Beaverdam Creek Outer Coastal Plain			XX	XX
PFO1 Whale Creek Inner Coastal Plain	XX	XX		
PFO1 Absecon Creek (trib) Outer Coastal Plain	XX	XX		
E2EM Mill Creek Cape May Harbor	XX	XX		
E2EM Whale Creek Raritan Bay		XX		XX
E2EM Tuckerton Creek Little Egg Harbor			XX	XX
R1OW Raccoon Creek Delaware River		XX		XX
R1OW Assiscunk Creek Delaware River		XX		XX
R1OW Manatico Creek Delaware Bay	XX		XX	

Development projects were characterized by their type and intensity. The four projects used for application of the method were characterized as high density residential, moderate density residential, commercial, and industrial. The following specific projects, provided by DEP, were selected as examples of these development types:

High density residential- The Orchards (northwest quadrant), Pleasantville, Atlantic County.

Moderate density residential - Oakwood Estates, Ocean Township, Ocean County.

Commercial - Howard Johnson's Restaurant and Motel, Somers Point, Atlantic County.

Industrial - Pureland Industrial Complex, Logan Township, Gloucester County.

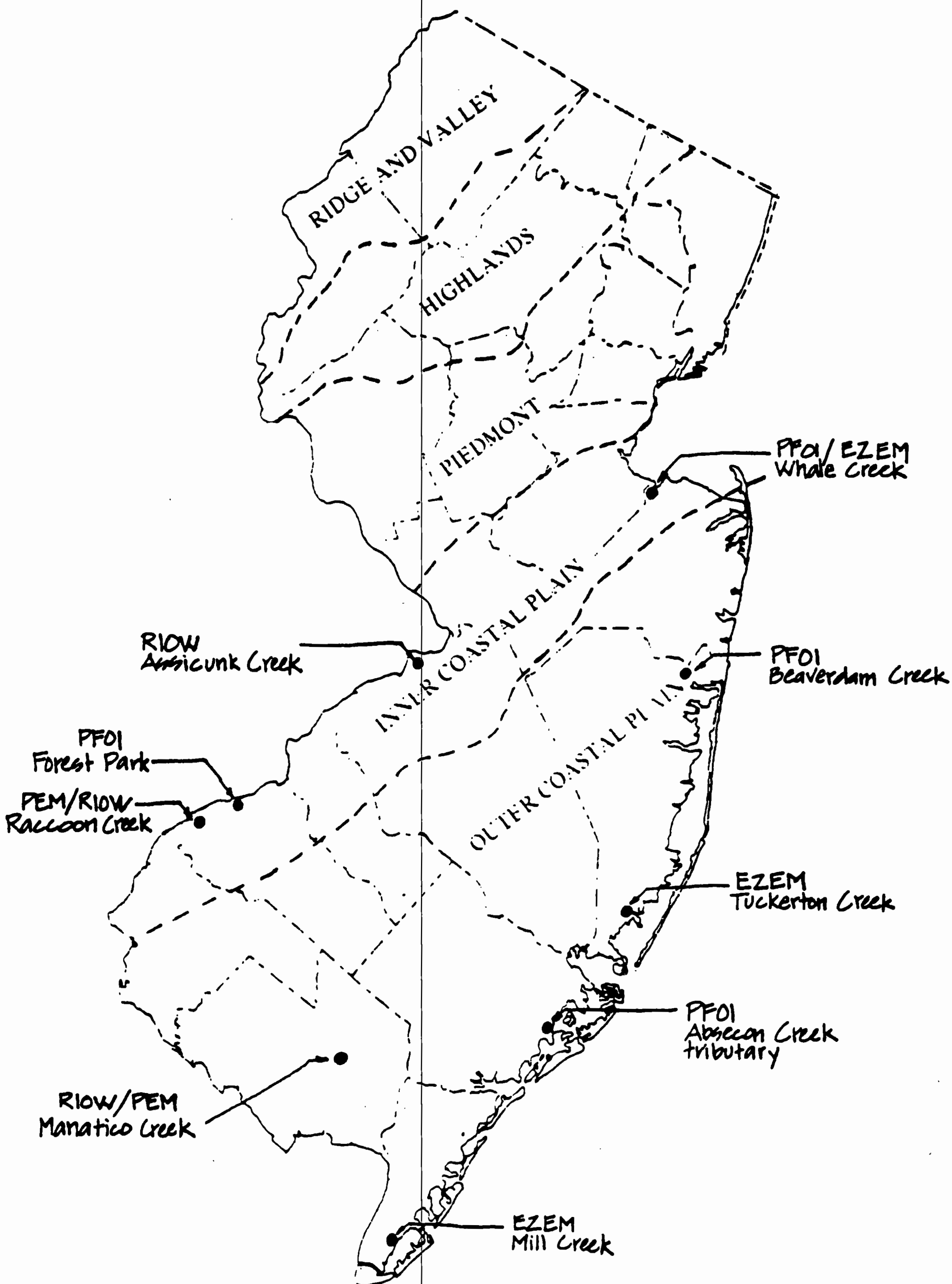
Of the ten wetland sites chosen, four are palustrine deciduous forests (PFO1), three are salt marshes (E2EM), and three are freshwater tidal marshes (R1OW/PEM; see site location map, Figure 1). These sites were selected using the following locational criteria:

Palustrine deciduous forest--two Inner Coastal Plain wetlands (Whale Creek and Forest Park); and two Outer Coastal Plain wetlands (Beaverdam Creek and Absecon Creek tributary).

Salt marsh--one Raritan Bay marsh (Whale Creek); one Barnegat Bay/Egg Harbor marsh (Tuckerton Creek); and one Cape May Harbor marsh (Mill Creek).

Freshwater Tidal Marsh--one Delaware Bay marsh (Manatico Creek); and two Delaware River marshes (Raccoon Creek and Assiscunk Creek). A Raritan Bay marsh would have been preferable to a second Delaware River marsh; however, there were none identified within DCR's jurisdiction.

Figure 1
Wetland Site Location Map



Eight of these wetland sites were selected from among the delineated wetlands identified in DCR project files. Two sites, both freshwater tidal wetlands, were selected from DCR aerial photographs, as no recent project proposals associated with freshwater wetlands within the upper Delaware River and Delaware Bay regions were available.

In the draft method (RGH's 1/26/88 submittal to DCR), buffer widths are determined by evaluating the impacts of the development and the capacity of the buffer area to prevent or reduce potential impacts. To apply this method, buffers were considered for any project having the following characteristics: 1) the project was within the drainage area and within 300 feet of a tidal wetland; 2) the project was within 150 feet of a non-tidal wetland containing threatened or endangered species; and 3) the project was within the drainage area and within 50 feet of a nontidal wetland.

The method for applying each buffer width evaluation factor is described below in the order that the factors appear in the method. The required findings to use each evaluation factor are summarized, and the following information is provided for each:

1. Data source
2. Procedure for data application
3. Problems (e.g., data availability or accuracy, procedural difficulties, or delineation method shortcomings)
4. Resolution

Part I - Special Cases

A. Commercial/Industrial Facilities That May Release Hazardous Materials.

The user must determine whether the project is a commercial or industrial facility that will be engaged in operations involving the generation, manufacture, refining, transportation, treatment, storage, handling, or disposal of hazardous substances or hazardous wastes.

1. Data source: This information may be obtained from the developer directly or from an EIS or building plan.

2. Procedure for data application: None.

3. Problems: None identified. This task involved only one industrial facility; however, this type of information should be readily available.

4. Resolution: Not applicable.

B. On-Site Domestic Wastewater Treatment.

The user must determine whether the project will involve on-site domestic wastewater treatment, and must determine the location of septic leach fields, spray fields, or sewage/ septage application areas.

1. Data source: This information is obtained from site plans and an EIS, if available.

2. Procedure for data application: A 300-foot wide band (i.e., the minimum buffer width required by this special case) should be drawn around the perimeter of the wetland. If the on-site domestic wastewater treatment system intercepts a point within the 300-foot band, this special case is applicable.

3. Problems: None identified. None of the four typical developments applied involved on-site treatment.

4. Resolution: Not applicable

C. Mineral Extraction.

The user must determine whether the project will involve sand, gravel, or other mineral extraction activity and must determine the location of such activities.

1. Data source: The designation of such a project is readily obtained from the developer or site plans.

2. Procedure for data application: None.

3. Problems: None encountered, since this case did not apply to the four typical developments assessed.

4. Resolution: Not applicable.

D. Infill-Type Residential Development.

The user must determine whether the following conditions apply to the project:

1. At least 75 percent of the land surrounding the proposed project, excluding wetlands, is developed.
2. The maximum lot size of adjacent development does not exceed 1 acre.
3. Lots have direct access to a paved public road.
4. Lots are serviced by a municipal wastewater treatment system.

If these conditions apply, the applicant must determine adjacent and nearby existing buffer widths.

1. Data source: Aerial photographs (available from DCR), plus site plans.

2. Procedure for data application: "Developed" is defined here as any long-term alteration in the landscape associated with residential, commercial, or industrial use.

3. Problems:

(a) The total land area of surrounding development needed to apply this special case was not specified in the draft buffer method.

(b) The determination of an infill-type development was based on site plans and aerial photographs. The majority of aerial photographs used were from 1972. Site visits confirmed that many of those areas appearing as undeveloped on photographs have now been developed.

4. Resolution:

(a) "Land surrounding the proposed project" refers to land within a radial distance from the perimeter of the project area equal to the longest linear dimension of the project site. Determination of 75% development is based on visual inspection. Determination of lot acreage is based on information shown on project site plans (where coverage extends to existing development) or on aerial photographs.

(b) It is recommended that the most up-to-date aerial photographs be applied and that field surveys be conducted where feasible (it may often be difficult to survey large areas of presumably undeveloped land). Applicants wishing to provide a buffer under this special case should provide the information needed to support the necessary findings.

E. Wildlife Refuges, Management Areas, and Sanctuaries.

The user must determine whether the wetland is designated by the state or federal government as a wildlife refuge, wildlife management area, or wildlife sanctuary.

1. Data source: USGS topographic maps, DEP Environmental Information Inventory prepared by the Division of Parks and Forestry.

2. Procedure for data application: The site location of the wetland(s) of concern should be identified on both the USGS and DEP inventory maps to determine whether this special case applies. The entire wetland, including the portion adjacent to the project, need not be designated as a refuge, management area, etc. for this special case to be applicable.

3. Problems: The sources used to evaluate this information were not up-to-date; therefore, special areas may exist where documentation does not exist.

4. Resolution: No revisions to the buffer delineation method or data application procedure are suggested. However, applicants should be asked to provide this information with their submittals.

F. <u>Habitat of Threatened and Endangered Species</u>.

The applicant must determine whether the wetland is designated as providing habitat for threatened or endangered species.

1. Data source: NJ DEP Natural Heritage Program

2. Procedure for data application: Delineate wetland and project sites on NWI quadrangles and send to the NJ DEP Natural Heritage Program (NHP) for identification of documented occurrence of threatened or endangered species within or adjacent to the wetland.

3. Problems:

   (a) Species may be mapped as in or adjacent to a wetland, when in reality they may occur in a different type of habitat. Conversely, map information could show actual wetland species in non-wetland locations due to mapping error. Mapping accuracy is noted in information provided by NHP.

(b) The determination of threatened and endangered species habitat is based on documentation that may be old and therefore unreliable.

4. Resolution:

(a) To compensate for map error in NHP data, we reviewed field notes and species information to predict habitat suitability and to determine whether mapped species should be considered in or adjacent to wetlands. For our purposes, species occurrence was considered adjacent to the wetland if the location as provided by NHP was accurate to within 400, and if the adjacent habitat appeared suitable for the species involved.

It should be noted that this approach excludes species that may actually occur in or adjacent to the wetland, if NHP mapping was only accurate to within 1.5 miles. We recommend, therefore, that in the interest of consistent and accurate application of this data, NHP be requested to provide its own conclusions as to whether species should be considered as occurring in or adjacent to wetlands.

(b) Only a thorough site survey could confirm the presence or absence of rare species. EIS's are not a reliable source for such information, since many EIS's only address rare species on the project site and not on the wetland. DEP may either conduct the necessary surveys or require the applicant to do so. In the interim, the Natural Heritage Program should continue to be relied upon.

G. Additional "Special Case"

The buffer delineation method is based on preventing water quality impacts to wetlands. Therefore, based on technical consideration of water quality alone, projects that do not drain to wetlands (if not described by the previous special cases) do not require a buffer.

PART II - Buffer Delineation

A. Development Impacts

A.1 Potential for Site-Specific Wetland Impacts.

The applicant must determine the impervious surface in the developed area of residential projects in terms of the following ranges:

- ≥40% impervious surface
- 30-39% impervious surface
- 20-29% impervious surface
- 10-19% impervious surface
- less than 10% impervious surface

For nonresidential projects, the applicant must determine whether the impervious surface in the developed area of nonresidential projects is greater than or equal to 40%, or is less than 40% impervious surface.

1. Data source: Project application or other documentation supporting the application. Where not provided, approximate percent impervious surface can be estimated. However, if the estimated percentage does not clearly fall within one of the specified ranges, the total developed area and total impervious area should be measured with a planimeter.

2. Procedure for data application: Percent impervious surface is calculated as a percent of that area which would be permanently disturbed for development (i.e., including landscaped areas).

3. Problems: None.

4. Resolution: Not applicable.

A.2 Potential for Watershed-Wide Impacts.

The applicant must determine whether the wetland adjacent to the proposed development site is associated with a stream or water course, and if so, whether any of the following occur within 1/2, 1, or 2 miles downstream of the development site:

An intake for a public water supply.
Any part of an environmentally sensitive open space/natural area.
Resident and/or breeding populations of threatened or endangered plant or animal species (in or associated with wetlands).

If the wetland is not associated with a stream or water course, the user must determine whether any portion of the wetland or upland area immediately adjacent to the isolated wetland is an environmentally sensitive open space/natural area.

1. Data sources:

(a) Public water supply intakes are identified in the NJ DEP Environmental Information Inventory prepared by the Division of Water Resources, Planning and Standards.

(b) Documented threatened and endangered species habitats are available through the NJ DEP Natural Heritage Program.

(c) Sensitive open spaces/natural areas are identified by consulting USGS topographic maps and the DEP Environmental Information Inventory prepared by the Division of Parks and Forestry. Information in the inventory report is presented on reduced topographic maps. County, municipal and privately owned protection areas may be identified in Comprehensive Plans, County and township maps, or in EIS's.

2. Procedure for data application: To evaluate watershed-wide impacts, review USGS topographic maps first for clarification of 1-mile and 2-mile downstream limits, since NJDEP inventory maps are at a much smaller scale. Then transfer these limits onto the inventory maps. Note public water intakes along the stream corridor within these limits.

To identify rare species habitats, highlight the water channel (up to 2 miles downstream) associated with the wetland of concern on an NWI map. Also highlight wetlands adjacent to this defined portion of the stream, and provide the map to the Natural Heritage Program (NHP) for their review. The NHP should identify threatened and endangered species habitats located in these areas.

Sensitive open spaces/natural areas identified within 2 miles downstream of the project site must border the water channel within the 2 mile zone to be included for consideration as a downstream impact.

3. Problems:

(a) The definition of sensitive open spaces/natural areas includes municipal, county and private natural resource protection lands. However, no one reference was found as a source for county, municipal and privately owned protection lands.

(b) As discussed under the Special Case for Threatened and Endangered Species, map information provided by the Natural Heritage Program contains some degree of mapping error.

(c) During application of the watershed-wide impact factor it was noted that the downstream distances associated with public water supply intakes, documented threatened and endangered species habitats, and sensitive open space/natural areas were inconsistent.

(d) **When** potential watershed-wide impacts were evaluated, it was noted that several of the sites investigated were within a short distance to a major water body, such as the Delaware River, Raritan Bay and Great Egg Harbor. These major freshwater tidal rivers and estuarine waters are important from a commercial, recreational, and biological standpoint, and are continually threatened from upstream activities. These waters often serve as a final dumping ground for many watershed pollutants. Therefore, it is especially important to protect those wetlands within close proximity to these waters, since these wetlands are exposed to cumulative impacts from within the watershed.

4. Resolution:

(a) Information pertaining to non-federal or state-owned protection lands should be requested from the applicant.

(b) The resolution discussed under the Special Case for threatened and endangered species applies to this factor as well.

(c) The distances for the various sensitive areas, as originally proposed, imply that open space natural areas are more sensitive and require more protection than threatened and endangered species habitat and public water supplies. This section was therefore revised before applying the method. These changes will be incorporated in the revised buffer method as presented below.

(d) The method will be revised to address the sensitive waters finding. The Delaware River and estuarine/marine waters will be identified within 2 miles downstream from the project site.

The downstream impacts ranking scheme will be revised to incorporate the two changes suggested in (c) and (d). The scheme is as follows:

High Potential for Significant Downstream Impacts..............3

The wetland adjacent to the proposed development site is associated with a stream or water course and: (1) The Delaware River or estuarine/marine waters (i.e., bays, harbors, ocean) are within 1 mile from the project site; or (2) within 1 mile downstream of the development site there is a public water supply intake, or any part of an environmentally sensitive open space/natural area, or resident and/or breeding population(s) of threatened or endangered plant or animal species; or (3) the wetland is isolated from a streamwater course, and a portion of the wetland or upland area immediately adjacent to the isolated wetland is an environmentally sensitive open space/natural area.

Moderate Potential for Significant Downstream Impacts...........2

The wetland adjacent to the proposed development site is associated with a stream or water course and: (1) The Delaware River or estuarine/marine waters are between 1 mile and 2 miles from the project site; or (2) between 1 mile and 2 miles downstream of the development site there is a public water supply intake, or any part of an environmentally sensitive open space/natural area, or resident and/or breeding population(s) of threatened or endangered plant or animal species.

Low Potential for Significant Downstream Impacts.................1

All other wetlands.

B. Evaluation of Buffer Capability

Buffer Area for Evaluation:

While New Jersey laws and policies only require that those lands with in a given distance from a wetland be considered for a buffer, application of the method involves sometimes looking at an area larger than that requiring a buffer in order to evaluate how well the buffer functions as a water quality renovator.

Data Source: Site plans with delineated wetlands; aerial photographs.

Procedure for Applying the Data:

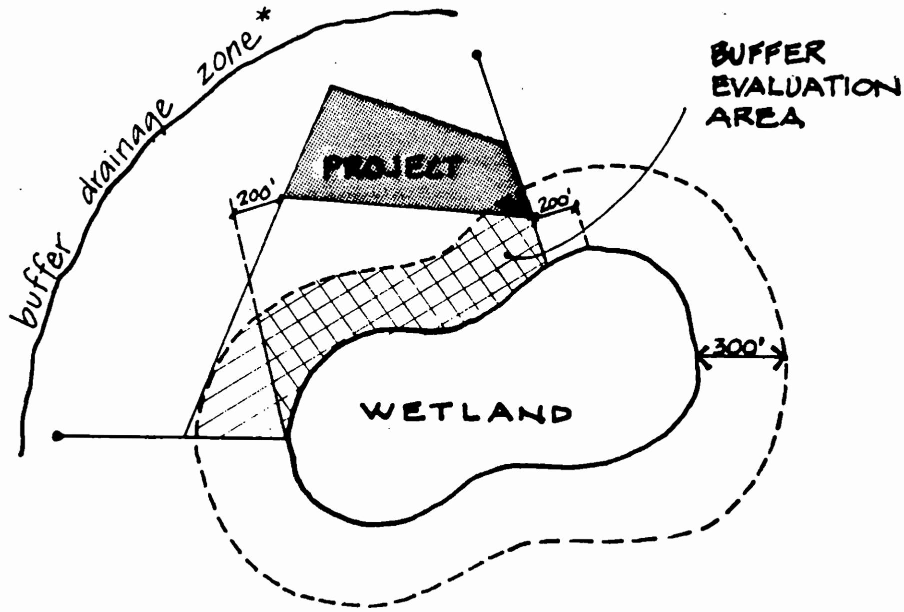
> [Note: The procedure described in this section was used when applying the model. However, as a result of Problem (a), below, a revised procedure has been developed (see Resolution (a), below).]

A 50-, 150-, or 300-foot wide buffer (depending on wetland type) was drawn around the perimeter of the wetland. The area within this buffer area collecting drainage from the project site was identified by considering existing topography (this area is referred to as the buffer drainage zone, see Figure 2). In order to concentrate the evaluation on that area of the buffer which would be most impacted by the project, the buffer evaluation area was limited to be within the drainage area and within a distance of no greater than 200 feet from the outermost limits of the project site.

Problems:

(a) The project drainage area was not always discernible given poorly drawn contour lines, large contour interval distances, minimal slopes, or lack of information. Identifying this area accurately involves use of judgement, which reduces replicability. Post development drainage patterns were not considered, since this information was not always provided or easily assessed.

Figure 2
Procedure Used to Define Buffer Evaluation Area



* delineated from drainage patterns

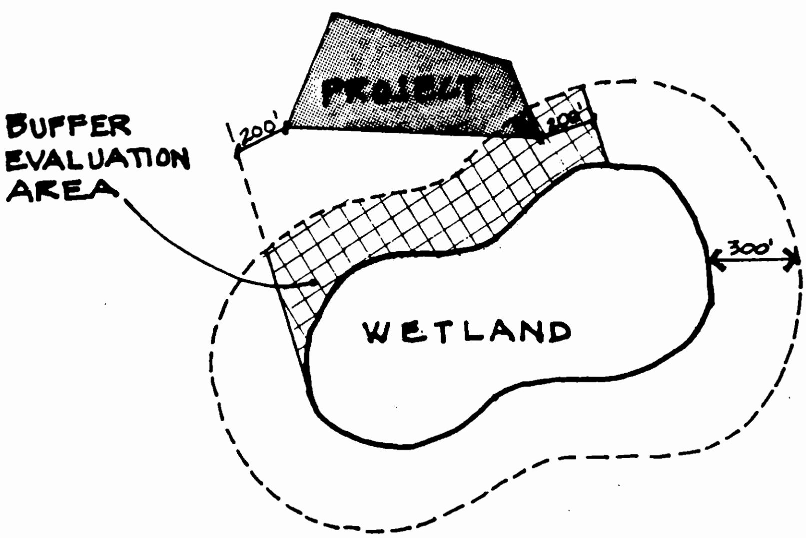
(b) When selecting the appropriate buffer area to evaluate, it was noted that three wetland sites (Sites 5, 9, and 10) contained two distinct wetlands aligned parallel to one another. Projects on sites 9 and 10 were located within non-tidal wetland upgradient and adjacent to a tidal wetland. If there were no laws to dictate buffer limits, the buffer area beginning at a point beyond the upper limit of the wetland complex would be evaluated; however, there are laws in New Jersey which dictate different limits for wetlands within separate jurisdictions. For example, a developer need not consider a buffer if he is not within 150 feet of a freshwater wetland that is subject to the Freshwater Wetland Protection Act (assumes exceptional resource wetland). However, a developer must still consider a buffer if he is within 300 feet of a tidal wetland within the coastal zone. Therefore, a project may be sited within 300 feet of a saltmarsh, requiring buffer consideration, but may be more than 150 feet from an associated forested wetland, thereby remaining outside of the zone for non-tidal wetland buffer consideration.

Resolution:

(a) Draw a 50-, 150-, or 300-foot wide buffer (depending on wetland type) around the perimeter of the wetland. To concentrate the evaluation on that area of the buffer that would be most impacted by the project, the buffer evaluation area is limited to that area defined by lines extended 200 feet from each outermost limit of the project site, drawn perpendicular to the wetland, then extended to the wetland at a right angle to the first line. If the post-project drainage area can be easily identified, the buffer evaluation area will be the actual post-project drainage area that occurs within the land area defined by this method. If the post-project drainage area is not easily delineated, the buffer evaluation area will be the entire land area within the boundary drawn as described above. See Figure 3 for clarification of this procedure.

Figure 3

Recommended Procedure for Defining Buffer Evaluation Area, Post-Project Drainage Area Not Known



(b) In situations where a project is within buffer delineation distance of both a tidal wetland and a non-tidal wetland, two buffer areas (one for each wetland) should be evaluated independently of one another (Figure 5 of the method will be revised to address poorly drained soils so this type of evaluation can be conducted). After obtaining results, the buffer extending far enough to satisfy the legal requirements of both wetlands should be selected. Where the project is not within buffer delineation distance of the non-tidal wetland, the buffer area should be evaluated from the upper limit of the tidal wetland only; evaluation of this area should include consideration of the physical properties of the associated non-tidal wetland.

A corollary to this approach may be necessary for situations in which a proposed development as been granted a permit for actions in a non-tidal wetland, and this wetland is associated with a tidal wetland. It is recommended that impacts to adjacent wetlands (other than the wetland in which the action will occur) be evaluated during the permit review process. At that time, appropriate protection or mitigation measures can be identified and imposed as permit conditions.

Cover Type.

The user must determine the predominant (i.e., 2/3 coverage) vegetation type found in the potential buffer area.

1. Data source: Cover type within the buffer area is primarily determined from 1" = 200′ scale aerial photography (DCR, 1972). Results should be field verified.

2. Procedure for data application: Identify cover types and their relative percent composition within the evaluated buffer area. Use field survey results to differentiate areas of taller grasses from those of shorter grasses, and to verify the identification of existing cover types.

3. Problems:

(a) Aerial photos used to identify cover type were more than fifteen years old, and often were inaccurate.

(b) Not every area within the studied buffer area was surveyed during the field investigation task of this project,

(c) The draft method did not address situations in which the buffer is comprised of nondominant (less than 2/3) cover type.

(d) The draft method did not address situations in which the buffer has non-vegetated or impervious cover.

4. Resolution:

(a) Field verification of aerial photo interpretations can be used to obtain sufficient information on vegetation coverage.

(b) When field verification of each cover type appearing on the aerial is not feasible, the user should use the same approach as we used during application. That is, estimates should be made in favor of the worst case condition. For example, where it is difficult to assess whether a land cover is comprised of tall grasses or short grasses, short grasses should be assumed, since they are less effective at controlling sedimentation. The means by which cover type is used to derive an estimated base buffer width is discussed in the following section.

(c) Two sites evaluated did not have dominant vegetative cover as defined in the draft method. Several evaluation schemes were tested, including looking at each cover type as a separate unit, noting slope and soil, but none of the methods considered were easy to use or easily replicated. Therefore, to remedy this situation, the following method was used and the 2/3 vegetation dominance rule was disregarded. In the future, however, the following approach should be followed only where the 2/3 rule does not apply.

New Procedure. The slope of the buffer area must first be identified. Then apply each cover type category with the corresponding slope to Figure 4 of the method to identify applicable baseline buffer width for that cover type. Calculate actual baseline buffer width by averaging the various cover types in the following manner. For each cover type, multiply percent coverage by the buffer width derived for that cover type from Figure 4. Then add all respective products to determine base buffer width. An example is provided below.

Example: Whale Creek (salt marsh)

Forest - 10% Herbaceous - 35% Shrub - 55%

Baseline buffer widths from Figure 4:

forest @ 6% slope = 70 feet
herbaceous @ 6% = 375 feet
shrub @ 6% = 150 feet

Forest - 10% x 70 ft = 7 ft Herbaceous - 35% x 375 ft = 131.25 ft
Shrub - 55% x 150 ft = 82.5 ft

Base buffer width:
7 ft + 131.25 ft + 82.5 ft = 220.75 ft; rounded off to the nearest 10th = 221 feet.

(d) Vegetation plays a major role in impeding or trapping sediment. Without vegetation, soil pore spaces would eventually be choked with sediment, creating impervious-like conditions. Incorporating this lack of vegetation cover into the method requires that a roughness coefficient be assigned and that appropriate buffer widths then be derived. This task will be completed and incorporated into the revised method. Therefore, results for projects involving nonvegetated or impervious surfaces (Sites 3 and 10) are incomplete.

Slope.

The user must determine the steepest slope within the buffer.

1. Data source: site plans (preferred), or USGS topographic maps if no more accurate source is available.

2. Procedure for data application: Find the steepest slope within the evaluated buffer area. The distance over which slope should be measured is the maximum buffer width applicable for the wetland.

3. Problems: The steepest slope over the width of the surveyed buffer area is not always easily discernible given variable topography. Without site plans illustrating contours having intervals of no more than two feet, topographical variability may not be recognized at all.

4. Resolution: In those cases where site topography within the buffer was in a continually downgradient pattern from the project to the wetland, the distance over which slope is measured is the width of the buffer area studied. In those cases where topography is variable (e.g., depressions and higher elevation areas are within the midregion of the buffer), slope is defined as the steepest slope found over the widest continually downgradient area within the buffer evaluation area. Applicants should be encouraged to provide sites plans showing minimum contour interval distances, especially where topography is highly variable.

Soils (Used in Step 5 - Determine Final Buffer Width).

The user must determine the drainage class and organic content of soils found in the evaluated buffer area.

1. Data source: Soils within the buffer area may be found in Soil Conservation Service (SCS) County Soil Surveys, site plans or EIS's. Information for each soil class regarding drainage class and organic matter content is obtained from SCS County Soil Surveys.

2. Procedure for data application: Identify those soils occurring within the buffer evaluation area. If this information is not available on the site plans, an overlay, enlarged to scale, from the soil survey should be used.

3. Problems:

(a) Frequently, several soil types occur within the evaluated buffer area.

(b) Organic matter content was not always explicit in soil descriptions found in the soil surveys.

(c) Descriptions of soil drainage class and organic matter content occasionally varies from one soil survey to another.

(d) Poorly drained soils are not included on Figure 5 of the draft method. Therefore a final buffer width could not be identified for sites 4, 5, 9 and 10.

4. Resolution:

(a) When identifying soils within the buffer area, note soil drainage class, organic content, and approximate percent coverage for each type. Where both drainage and organic content descriptions are identical for two or more encountered soil classes, combine percent coverages of these areas. Use Figure 5 of the buffer delineation method to identify additional feet to be added to base buffer width for each type (or group) of soil. Average these distances in the following manner. For each soil type or group, multiply percent coverage by additional buffer distance (derived from Figure 5 of the draft delineation method). Then add respective products to determine additional buffer width. This method was used during application of this soil evaluation factor. An example is provided below.

Example:

Soil A: well-drained, low organic content, 20% coverage

Soil B: somewhat poorly drained, high organic content, 50% coverage

Soil C: moderately well drained, medium organic content, 10% coverage

Soil D: somewhat poorly drained, high organic content, 20% coverage

From Figure 5:

Soil A - 30 ft

Soil B - 10 ft

Soil C - 0 ft

Soil D - 10 ft

Since both Soil B and Soil D have identical descriptions, the percent coverage is combined; 50% + 20% = 70%.

Soil A - 20% x 30 ft = 6 ft

Soil C - 10% x 0 ft = 0 ft

Soil B + D - 70% x 10 ft = 7.0 ft

Additional feet to be added to base buffer width:

6 ft + 0 ft + 7.0 ft = 13 ft

(b) If no information on organic matter content is provided, presume the following: Excessively well-drained, well drained, and moderately well-drained soils have low organic matter content. Somewhat poorly drained soils have moderate organic matter content and poorly drained soils have high organic matter content.

(c) Because soil descriptions are often County specific, the correct county soil survey should always be used.

(d) Figure 5 of the draft method will be revised to include poorly drained soils.

APPLICATION RESULTS

Data collection forms for each project and wetland combination site are included in the appendix of this report. The data contained in these forms is summarized in Tables 2 through 6. Data are summarized for each major evaluation category described in the buffer delineation method, including special cases, development impacts (site specific and downstream), and buffer capability.

Special Cases

As noted in Table 2, only one special case, "Habitat of Threatened and Endangered Species" was applicable to the sites studied. This special case applied to Sites 2, 5, 7, and 10. Using the delineation method, a buffer of 300 feet would be assigned automatically for these sites. If this special case were not applied, the resulting buffer widths for Sites 2, 5, 7, and 10 would be approximately 100 feet, 50 feet, 70 feet, and 100 feet respectively. These numbers refer to the distances required to buffer water quality impacts; whereas the 300 feet requirement incorporates habitat and human disturbance factors.

TABLE 2
SPECIAL CASE REVIEW

WETLAND SITE	HAZARDOUS SUBSTANCES	ON-SITE SEPTIC	MINERAL EXTRACTION	INFILL TYPE RESIDENTIAL DEVELOPMENT	WILDLIFE AREA	T & E SPECIES
1. Forest Park	No	No	No	No	No	No
2. Beaver Dam Creek	No	No	No	No	No	Yes
3. Whale Creek (PF01)	No	No	No	No	No	No
4. Absecon Creek Trib.	No	No	No	No	No	No
5. Mill Creek	No	No	No	No	No	Yes
6. Whale Creek (E2EM)	No	No	No	No	No	No
7. Tuckerton Creek	No	No	No	No	No	Yes
8. Raccoon Creek	No	No	No	No	No	No
9. Assiscunk Creek	No	No	No	No	No	No
10. Manatico Creek	No	No	No	No	No	Yes

Development Impacts

Site specific impacts and downstream impacts are summarized on Tables 3 and 4. None of the four typical projects applied incurred a score less than "2." This was expected, since low density developments were not considered. All but the moderate density residential development received a score of "3."

As shown in Table 3, at least one of the three criteria assessed for downstream impacts was applicable to all but four (the two developments at Sites 1 and 3) of the twenty combinations used in the delineation method. Therefore, the majority of combinations scored a high downstream impact rating. All but four of the twenty combinations scored either moderate to high or high development impact ratings, since both site specific and downstream impacts were typically high (Table 4).

That the majority of combinations scored a high downstream impact rating may raise questions about the appropriateness of evaluating potential impacts as far away from the project as two miles, especially when considering the probability of dilution over this distribution area. While dilution may be at work, cumulative impacts originating throughout the watershed threaten public water supply intakes, threatened and endangered species habitats, and sensitive areas. Therefore, a two mile downstream impact zone is considered reasonable to account for cumulative impacts.

Buffer Capability

The composition of the buffer areas evaluated varied widely among many cover types, including impervious, nonvegetated, herbaceous, shrub, and forest cover. Slopes within the evaluated buffer areas ranged from 1% to 8%; the average steepest slope over all areas evaluated was approximately 3% (Table 5). In most cases, the steepest slope identified for each project/wetland buffer area was not very different from the slope most frequently encountered at the site. Therefore, derived buffer widths were

TABLE 3
DOWNSTREAM IMPACTS

Wetland Site	T & E	Public Water Intake	Sensitive Area
1. Forest Park	NO *	NO	NO
2. Beaver Dam	< 1 mile	NO	Park 1-2m
3. Whale Creek	NO	NO	NO
4. Absecon Creek	NO	< 1 mile	NO
5. Mill Creek	< 1 mile	NO	WMA < 1m
6. Whale Creek	NO	NO	bay < 1m
7. Tuckerton Creek	< 1 mile	NO	bay < 1m WMA 1-2m
8. Raccoon Creek	NO	NO	Del. River 1-2m
9. Assiscunk Creek	NO	< 1-2 miles	Del. River 1-2m
10. Manatico Creek	< 1 mile	NO	NO

* No = Not present within 2 miles downstream
WMA = Wildlife Management Area

TABLE 4
DEVELOPMENT IMPACT SCORES

WETLAND	DEVELOPMENT TYPE	SCORE	COMMENT
1. Forest Park	commercial	2.0	no sensitive downstream impacts
	industrial	2.0	no sensitive downstream impacts
2. Beaver Dam	commercial	3.0	rare species occurrence
	industrial	3.0	rare species occurrence
3. Whale Creek	mod. density res.	1.5	no sensitive downstream areas
	high density res.	2.0	no sensitive downstream areas
4. Absecon Creek	mod. density res.	2.5	water intake within .5 mile
	high density res.	3.0	water intake within .5 mile
5. Mill Creek	mod. density res.	2.5	wma within 1 mile, rare species
	high density res.	3.0	wma within 1 mile, rare species
6. Whale Creek	high density res.	3.0	Keyport Harbor within 1 mile
	industrial	3.0	Keyport Harbor within 1 mile
7. Tuckerton Creek	commercial	3.0	Egg Harbor within 1 mile; T&E species
	industrial	3.0	Egg Harbor within 1 mile; T&E species
8. Raccoon Creek	high density res.	2.5	Delaware River within 1-2 miles
	industrial	2.5	Delaware River within 1-2 miles
9. Assiscunk Creek	high density res.	2.5	Delaware River within 1-2 miles
	industrial	2.5	Delaware River within 1-2 miles
10. Manatico Creek	mod. density res.	2.5	rare species in .5 m;wma upstream
	commercial	3.0	rare species in .5 m;wma upstream

TABLE 5
BUFFER CAPABILITY SUMMARY

WETLAND	EVALUATED BUFFER AREA	SLOPE	SOIL PROPERTIES	COVER TYPE
1. Forest Park	50 ft.			
Project A		2%	100% spd, med.OM	shrub
			a) 100% wd, low OM;	shrub
Project B		4%	b) 33% wd, low OM;	
			67% mwd, med. OM	
2. Beaver Dam Creek	150 ft.			
Project A		4%	30% mwd, low OM; 70% ed, low OM	forest
Project B		4%	50% mwd, low OM; 50% ed, low OM	forest
3. Whale Creek	50 ft.			
Project A		8%	100% mwd, low OM	nonvegetated
Project B		8%	100% mwd, low OM	nonvegetated
4. Absecon Creek	50 ft.			
Project A		2%	15% pd, med. OM; 85% wd, med. OM	forest
Project B		2%	15% pd, med. OM; 85% wd, med. OM	forest
5. Mill Creek	300 ft.			
Project A		2%	48% mwd, med. OM; 52% pd, high OM	forest
Project B		2%	43% mwd, med. OM; 57% pd, high OM	forest
6. Whale Creek	300 ft.			
Project A		6%	34% mwd, 66% wd, low OM	55% s, 35% h, 10% f
Project B		6%	34% mwd, 66% wd, low OM	55% s, 35% h, 10% f
7. Tuckerton Creek	300 ft.			
Project A		2%	100% mwd, low OM	forest
Project B		2%	100% mwd, low OM	forest
8. Raccoon Creek	300 ft.			
Project A		4%	100% mwd, low OM	83% s; 17% f
Project B		4%	100% mwd, low OM	90% s; 10% f
9. Assiscunk Creek	300 ft.			
Project A		1%	66% pd, high OM; 34% ed, low OM	80% f; 20% h
Project B		1%	66% pd, high OM; 34% ed, low OM	80% f; 20% h
10. Manatico Creek	300 ft.			
Project A		1%	40% wd, low OM; 60% pd, high OM	60% f; 40% disturbed
Project B		1%	40% wd, low OM; 60% pd, high OM	60% f; 40% disturbed

* Two wetlands (both PFO1) were located near this project.

KEY:
pd = poorly drained; spd = somewhat poorly drained; mwd = moderately well-drained; wd = well drained; ed = excessively well drained; OM = organic matter; f = forest; h = herbaceous; s = shrub

generally not significantly greater than what they would be if average slope had been identified at each site. Differences between steepest slope and average slope ranged from 0 to 5%. Site 3 represented the site with the greatest difference between average slope and steepest slope. Given an herbaceous ground cover, the derived baseline buffer width would be more than two times that which would be required for a 3% slope compared to an 8% slope. While this difference is significant, it represents an extreme case, and does therefore not warrant changing the method of slope identification, since changing the method would result in a loss of replicability, an important feature of the buffer delineation method.

While wetland properties were not evaluated as a factor in delineating wetlands, three different types of wetlands were considered over a distributed geographical range. This was done to determine whether or not buffers could be characterized based on the type of wetland they are associated with and the geographical location of the wetland. As shown in Table 6, the properties of a buffer could not be determined by the buffer's geographical location or by the class of wetland associated with it. The determination of appropriate buffer width is very case specific and is dependent upon a host of factors. For example, Site 6 (Whale Creek), a tidal wetland, requires a buffer of 240 feet; whereas, Site 8 (Raccoon Creek), also a tidal wetland, requires a buffer of approximately 120 feet. Even though both sites are associated with tidal wetlands, slopes differ by 2% and Site 6 has a higher development impact rating and a much higher percentage of short grasses, thereby requiring a greater buffer width.

The suggestions mentioned in the resolution section for each factor are expected to improve the replicability, reliability, and predictability of the delineation method. The approaches employed in the method are based on technical accuracy and administrative feasibility and are not to be construed as technically precise.

TABLE 6
SUMMARY OF DERIVED BUFFER WIDTHS FROM
APPLICATION OF THE NJ WETLANDS BUFFER DELINEATION METHOD

WETLAND/PROJECT SITE	BUFFER WIDTH (as per method)	BUFFER WIDTH (as per NJ law)
Forest Park (PF01)		
Commercial	70 ft	50 ft
Industrial*	115 ft, 95 ft	50 ft
Beaver Dam Creek (PF01)		
Commercial	97 ft; (sc=300 ft)	150 ft
Industrial	95 ft; (sc=300 ft)	150 ft
Whale Creek (PF01)		
Mod. Density Res.	NR	within 300 ft
High Density Res.	NR	within 300 ft
Absecon Creek Trib. (PF01)		
Mod. Density Res.	(57 ft)	50 ft
High Density Res.	(62 ft)	50 ft
Mill Creek (E2EM)		
Mod. Density Res.	(40 ft)	(40 ft)
High Density Res.	(45 ft)	(45 ft)
Mill Creek (PF01)		
Mod. Density Res.	50 ft; (sc=300 ft)	150 ft
High Density Res.	55 ft; (sc=300 ft)	150 ft
Whale Creek (E2EM)		
High Density Res.	241 ft	241 ft
Industrial	241 ft	241 ft
Tuckerton Creek (E2EM)		
Commercial	65 ft; (sc=300 ft)	70 ft
Industrial	65 ft; (sc=300 ft)	70 ft
Raccoon Creek (R10W/PEM)		
High Density Res.	119 ft	119 ft
Industrial	122 ft	122 ft
Assiscunk Creek (R10W/PEM)		
High Density Res.	(54 ft)	(54 ft)
Industrial	(54 ft)	(54 ft)
Manatico Creek (R10W/PEM)		
Mod. Density Res.	NR	within 300 ft
Commercial	NR	within 300 ft

* There are two wetlands (both PF01) near this project.

KEY:
sc = special case applies.
(xx ft) = derived buffer width without consideration of poorly drained soil; results will be revised pending modification of the method to address poorly drained soil.
NR = No results, pending modification of method to address nonvegetated cover.

ATTACHMENT 1

Data Collected During Model Application

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Forest Park***

2) Wetland Class: ***non-tidal, pf01***

2) Location (Twp, Cnty.): ***West Deptford Township, Gloucester Co.***

3) Applied Developments: (A) ***Commercial*** (B) ***Industrial***

Project A:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***over 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
None

4) Size of Buffer Width Surveyed (Based on #1): ***50 feet***

5) Identify steepest slope within buffer area: ***2%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% Tall grasses - survey
Herb/Forested = 1972 aerial map

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Lakehurst	*100%*	*Spd, mod OM*

8) Calculate appropriate buffer width based on application of the model:

Calculations

Base Buffer
60 ft.

Dev. Impact
Site Specific = 3.0
Downstream = 1.0
2.0 Low-Mod

From Fig. 5
10 ft

Final Buffer
60 ft + 10 ft = 70 ft

Project B: Two wetlands involved

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***over 80%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
None

4) Size of Buffer Width Surveyed (Based on #1): ***50 feet***

5) Identify steepest slope within buffer area: ***4% (2% most areas)***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% tall grasses - identified by field survey

7) Identify soils within buffer area:

	Soils	% coverage	characteristics
(Wetland A)	*Sassafras*	*100%*	*WD, low OM*
(Wetland B)	*Sassafras*	*33%*	*WD, low OM*
	Woodstown	*67%*	*MWD, mod OM*

8) Calculate appropriate buffer width based on application of the model:

Calculations

Dev. Impact
Site Specific = 3.0
Downstream = 1.0
2.0 Low-Med

From Fig. 5
Wetland A: 30 ft x 100% = 30 ft
Wetland B: 33% x 30 ft = 10 ft
(67% x 0 ft = 0 ft)
10 ft

Base Buffer
Wetland A = 85 ft
Wetland B = 85 ft

Final Buffer
Wetland A = 8f ft + 30 ft = 115 ft
Wetland B = 85 ft = 10 ft = 95 ft

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Beaver Dam Creek***

2) Wetland Class: ***non-tidal, pf01***

2) Location (Twp, Cnty.): ***Brick, Ocean County***

3) Applied Developments: (A) ***Commercial*** (B) ***Industrial***

Project A:

1) Identify Special Cases: ***T&E species on site***

2) Calculate percent impervious surface of disturbed area: ***over 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
T & E within 1/2 mile
State park within 1 - 2 miles

4) Size of Buffer Width Surveyed (Based on #1): ***150 feet***

5) Identify steepest slope within buffer area: ***4%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Evesboro	***70%***	***ED, low OM***
Lakehurst	***30%***	***MWD, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Base Buffer
70 ft.

Dev. Impact
Site Specific = 3.0
Downstream = 3.0
3.0 High Impact

From Fig. 5
70% x 30 ft = 21 ft
30% x 20 ft = 6 ft
27 ft

Final Buffer
70 ft + 27 ft = 97 ft

Project B:

1) Identify Special Cases: ***T&E species on site***

2) Calculate percent impervious surface of disturbed area: ***> 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
T & E within 1/2 mile
State park within 1 - 2 miles

4) Size of Buffer Width Surveyed (Based on #1): ***150 feet***

5) Identify steepest slope within buffer area: ***4%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Evesboro	***50%***	***ED, low OM***
Lakehurst	***50%***	***MWD, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Dev. Impact
Site Specific = 3.0
Downstream = 3.0
3.0 High

Final Buffer
70 ft + 25 ft = 95 ft

Base Buffer
70 ft.

From Fig. 5
50% x 30 ft = 15 ft
50% x 20 ft = 10 ft
25 ft

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Whale Creek (#3)***

2) Wetland Class: ***non-tidal, pf01/PEM***

2) Location (Twp, Cnty.): ***Aberdeen, Monmouth County***

3) Applied Developments: (A) ***Mod Density Res*** (B) ***High Density Res***

Project A:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***25%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
None

4) Size of Buffer Width Surveyed (Based on #1): ***50 feet***

5) Identify steepest slope within buffer area: ***8% (2 - 4 % in most areas)***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% disturbed sandy soil, nonvegetated

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Urban Lands	***100%***	***WD, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

SCS Survey identifies area as Keyport; site survey defines area as Urban land

Base Buffer
****Not applicable. Model does not include disturbed cover type.***
If using herb = 345 ft
Buffer would be greater given lower roughness coefficient

Dev. Impact
Site Specific = 2.0
Downstream = 1.0
1.5 Low Impact

From Fig. 5
30ft

Min. Final Buffer
375 ft

Project B:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***over 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
None

4) Size of Buffer Width Surveyed (Based on #1): ***50 feet***

5) Identify steepest slope within buffer area: ***8% (3% most places)***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% nonvegetated

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Urban Land	*100%*	*WD, low OM*

8) Calculate appropriate buffer width based on application of the model:

Calculations

Dev. Impact
Site Specific = 3.0
Downstream = 1.0
2.0 Low-Med

Minimum Final Buffer
445 ft

Base Buffer
Can't apply - no nonvegetated category
415 ft if herb (almost worst case) applied
From Fig. 5
30 ft

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Absecon Creek (Trib)***

2) Wetland Class: ***non-tidal, pf01***

2) Location (Twp, Cnty.): ***Pleasantville, Atlantic County***

3) Applied Developments: (A) ***Mod Density Res*** (B) ***High Density Res***

Project A:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***≈ 25%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Public water supply within 1 mile

4) Size of Buffer Width Surveyed (Based on #1): ***50 feet***

5) Identify steepest slope within buffer area: ***2%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% forested (aerial)
****Area developed when field surveyed (Applied as it still proposed)***

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Atsion Sand	***15%***	***PD, mod OM***
Sassafras	***85%***	***WD, mod OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Dev. Impact
Site Specific = 2.0
Downstream = 3.0
2.5 Mod-high

Base Buffer
40ft

From Fig. 5
15% x __ ft = _
85% x 20 ft = 17 ft

Final Buffer
40 ft + 17 + _ = 57 feet min

Project B:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***> 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Public Water intake w/in 1 mile

4) Size of Buffer Width Surveyed (Based on #1): ***50 feet***

5) *Identify steepest slope within buffer area:* **2%**

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Atsion sand	***15%***	****PD, mod OM***
Sassafras	***85%***	***WD, mod OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

**** Poorly drained soils could not be applied***

Base Buffer
45 ft

Dev. Impact
Site Specific = 3.0
Downstream = 3.0
3.0 High

From Fig. 5
__ ft x 15% = __ ft
20 ft x 85% = 17 ft

Minmimu Final Buffer
45 ft x17 ft + 0 ft = 62 ft minimum

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Mill Creek***

2) Wetland Class: ***non-tidal, pf01 (Parallel)***
Tidal, E2EM

2) Location (Twp, Cnty.): ***Cape May, Cape May County***

3) Applied Developments: (A) ***Mod. Density Res.*** (B) ***High Density Res.***

Project A:

1) Identify Special Cases: ***T&E species on site (documented) Gr. Blue Heron identified during 10/87 survey***

2) Calculate percent impervious surface of disturbed area: ***25%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
WMA within 1 mile
T&E specvies within 1 mile

4) Size of Buffer Width Surveyed (Based on #1): ***300 ft/150 feet (nontidal)***

5) Identify steepest slope within buffer area: ***2%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Hammonton	***48%***	***MWD, mod OM***
Pocomoke	***52%***	***pd, high OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations **Tidal** ***Base Buffer***
40 ft.

Dev. Impact
Site Specific = 2.0
Downstream = 3.0
2.5 Mod-High Impact

From Fig. 5
0 ft x 98% = 0 ft
_ ft x 52% = _ ft

Final Buffer
40 ft + 0 ft + _ = 40 ft min

Nontidal ***Base Buffer***
50 ft.

150 ft survey width
Slope = 3%
Cover type = 100% Forested
Soil = 100% Hammonton

From Fig. 5
0 ft

Final Buffer
50 ft + 0 ft = 50 ft

Project B:

1) Identify Special Cases: ***T&E species on site***

2) Calculate percent impervious surface of disturbed area: ***> 40 %***

3) Identify downstream impacts within zero to 2 miles downstream of project:
WMA within 1 mile
T&E habitat within 1 mile

4) Size of Buffer Width Surveyed (Based on #1): ***300 ft***

5) Identify steepest slope within buffer area: ***2%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Hammonton	*43%*	*MWD, mod OM*
Pocomoke	*57%*	*PD, high OM*

8) Calculate appropriate buffer width based on application of the model:

Calculations Tidal

* Poorly drained soils could not be applied.

Base Buffer
45 ft.

Dev. Impact
Site Specific = 3.0
Downstream = 3.0
3.0 High

From Fig. 5
0 ft x 43% = 0 ft
* *ft x 57% = ft*

Final Buffer
45 ft + 0 ft + = 45 ft min

Non-tidal

Base Buffer
55 ft.

Slope = 2.7%
Cover type = 100% Forested
Soil = 100% Hammonton

From Fig. 5
0 ft

Final Buffer
55 ft + 0 ft = 55 ft

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Whale Creek Creek #6***

2) Wetland Class: ***tidal, E2EM***

2) Location (Twp, Cnty.): ***Aberdeen, Monmouth County***

3) Applied Developments: (A) **High Density Res.** (B) ***Industrial***

Project A:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***>40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Raritan Bay within 1 mile

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***6%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
10% forested, 55% shrubs/herbs, 35% sm. herbs *as per aerial

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Keyport	***34%***	***MWD, mod OM***
Urban Complex	***66%***	***WD, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Dev. Impact

Site Specific = 3.0
Downstream = 3.0
3.0 High

Base Buffer

Forest = 70 ft. x 10 %= 7 ft
Shrub = 150 ft x 55 % = 82.5 ft
Herb = 375 ft x 35 % = 131.25 ft

From Fig. 5

0 ft x 34% = 0 ft
30 ft x 66% = 19.8 ft
20 ft

Final Buffer

221 ft + 20 ft = 241 ft

Project B:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***> 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Raritan Bay within 1 mile

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***6%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
55% shrub, 10% forested, 35% herb

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Keyport	***3 4***	***Mud, mod OM***
Urban Complex	***6 6***	***wd, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Same as calulations for Project A.

Final Buffer
241 ft.

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Tuckerton Creek***

2) Wetland Class: ***tidal,E2EM***

2) Location (Twp, Cnty.): ***Tuckerton, Ocean County***

3) Applied Developments: (A) ***Commercial*** (B) ***Industrial***

Project A:

1) Identify Special Cases: ***T&E species on site***

2) Calculate percent impervious surface of disturbed area: ***over 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Egg Harbor within 1 mile, WMA within 1-2 miles

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***1.67%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Hammonton	**100%**	**MWD, low OM**

8) Calculate appropriate buffer width based on application of the model:

Calculations

Base Buffer
45 ft.

Dev. Impact
Site Specific = 3.0
Downstream = 3.0
3.0 High Impact

From Fig. 5
= 20 ft

Final Buffer
45 ft + 20 ft = 65 ft

Project B:

1) Identify Special Cases: ***T&E species on site***

2) Calculate percent impervious surface of disturbed area: ***> 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Egg Harbor within 1 mile
WMA within 1-2 miles

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***1.67%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
100% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Hammonton	***100%***	***mud, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Identical to Project A

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Raccoon Creek***

2) Wetland Class: ***tidal,R1OW/PEM***

2) Location (Twp, Cnty.): ***Logan, Gloucester County***

3) Applied Developments: (A) ***High Density Res.*** (B) ***Industrial***

Project A:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***over 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Delaware River within 1-2 miles

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***4%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
83% tall grasses
17% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Freehold	***[100 %]***	***WD, low OM***
Sassafras		***WD, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Base Buffer
60 ft. x 17% = 10.2 ft
95 ft. x 83% = 78.9 ft

Dev. Impact
Site Specific = 3.0
Downstream = 2.0
2.5 Mod-High Impact

From Fig. 5
89 ft + 30 ft = 119 ft

Final Buffer
30 ft

Project B:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***over 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Delaware River within 1 - 2 miles

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***4%***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:

90 % tall grasses
10% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Freehold	*[100 %]*	*WD, low OM*
Sassafras		*WD, low OM*

8) Calculate appropriate buffer width based on application of the model:

Calculations

Base Buffer
60 ft. x 10% = 6 ft.
95 ft x 90% = 85.5 ft
91.5 ft

Dev. Impact
Site Specific = 3.0
Downstream = 2.0
2.5 Mod-High

From Fig. 5
30 ft

Final Buffer
91.5 ft + 30 ft = 121.5 ft

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Assiscunk Creek***

2) Wetland Class: ***tidal R1OW/PEM***

2) Location (Twp, Cnty.):

3) Applied Developments: (A) ***High Density Res.*** (B) ***Industrial***

Project A:

1) Identify Special Cases: ***None***

2) Calculate percent impervious surface of disturbed area: ***over 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Delaware River between 1-2 miles downstream

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***1% (based on USGS)***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
20% herbaceous, 80% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Fallsington	***66%***	***PD, high OM***
Galestown	***34%***	***ED, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Base Buffer
F = 35 ft. x 80% = 28 ft
H = 80 ft x 20 % = 16 ft
44 ft

Dev. Impact
Site Specific = 3.0
Downstream = 2.0
2.5 Mod-high

From Fig. 5
30 ft x 34 % = 10.2 ft
__ ft x 66 % = ___ ft

Final Buffer
44 ft + 10.2 ft + __ ft = 54.2 ft + __ ft.
**** no distance given for poorly drained soil.***

Project B:

1) Identify Special Cases: ***none***

2) Calculate percent impervious surface of disturbed area: ***> 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
Delaware River between 1-2 miles

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***1% (USGS)***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
20% herbaceous, 80% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Fallsington	***66%***	***PD, high OM***
Galestown	***3 4***	***ED, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

**** Two wetlands, one tidal, one non-tidal, aligned parallel to one another. Project in non-tidal wetland, assumes permit granted. Buffer considered for tidal only.***

Calculations idential to Project A

<u>Final Buffer</u>
54.2 ft + __ ft

Data Collection Form for Application of the NJ Wetland Buffer Model

1) Wetland Site Name: ***Manatico Creek***

2) Wetland Class: **Tidal R1OW/PEM**

2) Location (Twp, Cnty.): ***Cumberland, Cumberland County***

3) Applied Developments: (A) ***Mod. Density Res.*** (B) ***Commercial***

Project A:

1) Identify Special Cases: ***T&E species on site***

2) Calculate percent impervious surface of disturbed area: ***≈25%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
T%E species within 1 mile

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***1% (USGS)***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:
40% disturbed*
60% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Borrow Pit	*40 %*	*WD, low OM*
Tidal Marsh	*60 %*	*PD, high OM*

8) Calculate appropriate buffer width based on application of the model:

Calculations

Base Buffer
60 % x 35 ft = 21 ft
40% x __ ft = __ ft

Dev. Impact
Site Specific = 2.0
Downstream = 3.0
2.5 mod-high

From Fig. 5
60% x __ft = __ ft
40% x 30 ft =12 ft

Minimal Final Buffer
21 ft + 12 ft = 33 ft

*** Disturbed cover not accounted for in model***

Project B:

1) Identify Special Cases: ***T&E species on site***

2) Calculate percent impervious surface of disturbed area: ***> 40%***

3) Identify downstream impacts within zero to 2 miles downstream of project:
T & E within 1 mile

4) Size of Buffer Width Surveyed (Based on #1): ***300 feet***

5) Identify steepest slope within buffer area: ***1% (USGS)***

6) Identify cover type within buffer via aerial photointerpretation and field survey. Note relative coverage in more than one type:

40% non-vegetated
60% forested

7) Identify soils within buffer area:

Soils	% coverage	characteristics
Borrow Pit	***40***	***WD, low OM***
****Tidal Marsh***	***60***	***PD, low OM***

8) Calculate appropriate buffer width based on application of the model:

Calculations

Base Buffer
40 % x __ ft = __ ft
60% x 40 ft = 24 ft

Dev. Impact
Site Specific = 3.0
Downstream = 3.0
3.0 High

From Fig. 5
40% x 30 ft = 12 ft
60% x __ ft = __ ft

Final Buffer
(24+) ft + (12+) ft = 36 feet minimum

**** NWI does not identify nontidal wetlands; site survey identified hydrophytic veg.***

Appendix B

APPENDIX B

SUMMARY OF RECENT REGULATORY DEVELOPMENTS

NEW JERSEY WETLANDS BUFFER MODEL

DIVISION OF COASTAL RESOURCES,

NJ DEPARTMENT OF ENVIRONMENTAL PROTECTION

SUMMARY OF RECENT REGULATORY DEVELOPMENTS

Since the publication of "Coastal Wetlands-Wetlands Buffer Delineation Study-Task 1" in December 1985, wetland protection has surfaced as an issue in government administration, scientific and regulatory affairs. Aspects of wetland protection being investigated across the country are: wetland and critical area acquisition by private groups, mitigation of wetland damages and losses, and broadbased determinations of the biological function and dollar value of wetlands. Within the Federal government and in response to growing concern over the protection of wetlands EPA created the office of Wetland Protection as a means to pull together and coordinate several aspects of wetland regulation, protection and scientific analysis at several governmental levels.

Two key legislative developments at the federal level have an impact on wetland use and development. Changes in the federal farm policy remove incentives for wetland conversion for agricultural production. The "swamp buster" provision of the Food Security Act of 1985 (PL 99-198) denies eligibility for farm subsidies or program benefits to persons who grow agricultural commodities on converted wetlands after December 23, 1985. Because farming, silviculture and ranching practices are exempt from the Corps of Engineers' 404 permitting process, significant freshwater wetland losses are attributable to farm programs. Farm program benefits and tax subsidies have helped offset the costs of converting wetlands, although many of these freshwater wetlands would probably not have been converted in the near future due to a sluggish agricultural economy. The swampbuster provision will ensure greater consistency between federal wetland protection programs and general farm and tax programs.

In November 1986 the Department of the Army issued final regulations concerning the Corps permit program under Section 404 of the Clean Water Act (33 CFR 320-330). The new regulations are in response to the directives issued by the Presidential Task Force on Regulatory Relief, with the primary emphasis put on shortening the Corps' permitting process. Aspects of these new regulations are important for two reasons. The regulations have a slightly new interpretation of wetland protection including: consideration of impacts from both point and non-point source pollution (sec. 320.4(d)); consideration of a project's environmental benefits as well as environmental detriments (sec. 320.4(p)); general acceptance of an applicant's determination that a proposed activity is economically viable and needed, although an independent review can be made if necessary (sec. 320.4(q)); and a revision of the Corps' mitigation policy (sec. 320.4(r)).

Because the Corps role in the Section 404 permitting process is the primary regulatory tool for wetland protection, any change in the regulations signals a change in wetland protection. It is not known whether these changes in the regulations will have an impact on states developing legislation and regulations in an effort to assume the Corps' role in 404 permitting authority. Currently Michigan is the only state to receive federal authority to administer and enforce the Section 404 program within its state's boundaries. New Jersey's Freshwater Wetlands Protection Act, signed June 1987, is also intended to provide New Jersey with the statutory authority to assume the Section 404 program.

Wetlands legislation at the state level concerning buffer zones is especially noteworthy in Maryland and New Jersey. The Maryland Critical Area Act of 1984 is based on two premises:

1. that all land within 1,000 feet of the Chesapeake Bay, its tributaries to the head of the tide and tidal wetlands play a critical role in the health of the estuary, and

2. that this shoreline has a limited capacity to withstand development without further degradation of water quality.

Statewide regulations control many aspects of land use planning and development in the critical area plans that local jurisdictions must prepare. The Act details the need, types and requirements for buffer zones (COMAR 14.15.09.01). Buffers are required for several different land uses in the critical area including:

- o New development: a minimum 100-foot buffer of natural vegetation along tidal waters, tidal wetlands and perennial and intermittent streams in the critical area. Specified new development activities are prohibited in the buffer. Non-tidal wetlands are protected by a 25-foot buffer between the development activity and the wetland.

- o Forestry: Commercial cutting is prohibited within 50′ of tidal waters or perennial streams. A 50 to 100-foot buffer area restricts clear cutting for species other than loblolly pine or tulip poplar.

- o Agriculture: a 25-foot vegetated filter strip is required between cultivated land and receiving waters, except where Best Management Practices are used. Feeding and watering of livestock is prohibited within 50 feet of mean high water line of tidal water and tributary streams or the edge of tidal wetlands. Clearing of natural vegetation within 100 feet of tidal waters, tidal wetlands and perennial and intermittent streams to create new agricultural land is prohibited.

Because local plans, zoning ordinances and subdivision regulations are the primary tools for implementing the criteria, the program's success depends on the resolve of local jurisdictions to implement and enforce an effective plan. The state does however have the authority to develop or amend a plan if the local jurisdiction refuses to do so.

New Jersey's Freshwater Wetlands Law establishes a comprehensive program that requires anyone proposing to undertake specific activities in a freshwater wetland or in the transition (buffer) area adjacent to a sensitive freshwater wetland to apply to NJ Dept. of Environmental Protection to obtain a permit. The Act utilizes the generally accepted definition of a wetland with specific reference to the three parameter approach (hydrology, soils and vegetation). Under the New Jersey Act almost all activities in the freshwater wetlands are regulated; under the Corps Section 404 permit program, only deposits of dredged or filled materials in freshwater wetlands are regulated. Three classes of freshwater wetlands are established by this Act:

1. Wetlands of exceptional resource value, which either discharge into trout production waters or provide habitat for threatened or endangered species.

2. Wetlands of ordinary value, which do not exhibit the characteristics of exceptional resource value systems and include certain isolated wetlands and man-made drainage ditches; and

3. Wetlands of intermediate resource value, which are all remaining freshwater wetlands.

The statute establishes transition areas (buffer zones) based on the wetland classification Freshwater wetlands of "exceptional resource value" have transition areas of 75 to 150 feet. Wetlands of intermediate resource value have transition areas between 25 and 50 feet in width. No specific buffer is described for wetlands of ordinary resource value. The Act stipulates that the buffers can be reduced through a transition averaging plan. There can be reductions in the transition area width if an applicant can show no substantial adverse impact on adjacent freshwater wetlands or a substantial hardship caused by circumstances peculiar to the property. Regulated activities within the transition areas include: the removal excavation or disturbance of soil; the placement of fill; the erection of structures (except for temporary structures of a certain size); paving; and the destruction of plant life which would alter the existing pattern of vegetation. Regulation of freshwater wetlands is to be carried out at the state level and the Act prohibits any municipality, county or political subdivision from regulating activities in those wetlands. Most of the Act's provision take effect in July 1988; however DEP may not implement provisions relating to transition areas until 1989. Because of extensive developmental pressures in the state it will be important to track any legal challenges to the law and to note what scientific and technical decisions by NJDEP hold off those challenges.

To support the use of buffer zones or transition areas legislators need scientific evidence. A recent study by Jody Jones of the Maine Department of Inland Fisheries and Wildlife, "Important Wildlife Areas in Southern Maine" (1986), recommends buffer strips of 100 meters (330 feet) in cases of development near a lake, marsh, wetland or permanent stream in order to protect travel corridors for wildlife and to maintain species diversity. The author describes the riparian zone as two different sections, each requiring a different level of protection. The first section i.e., the first 30 meters (100 feet), includes the area immediately adjacent to the river, marsh, wetland or lake. This section is essential for the maintenance of a stable ecosystem for fisheries and invertebrates and should be left undisturbed. Riparian habitat in the second section, the next 70 meters (230 feet), should be maintained as a wildlife travel corridor and acts to buffer the more sensitive first section. The Department of Inland Fisheries and Wildlife asks that the document be regarded as a first-cut at developing recommendations for revisions of shoreland and other municipal zoning ordinances. It is assumed that the recommendations will be revised as more information and experience are gained. Also, the application of strict riparian habitat measures cannot be warranted unless scientific documentation (ie. a fish and wildlife inventory) can back up the recommendation.

In an effort to expand scientific knowledge of wetland ecosystems, EPA's Office of Research and Development and the new Office of Wetland Protection are implementing a Wetlands Research Plan. The Plan addresses three major research topics: assessing the contribution of wetlands to water quality; analyzing cumulative impacts of wetland loss and relating permitting decisions to those losses; and studying techniques for creation and restoration of wetlands.

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION