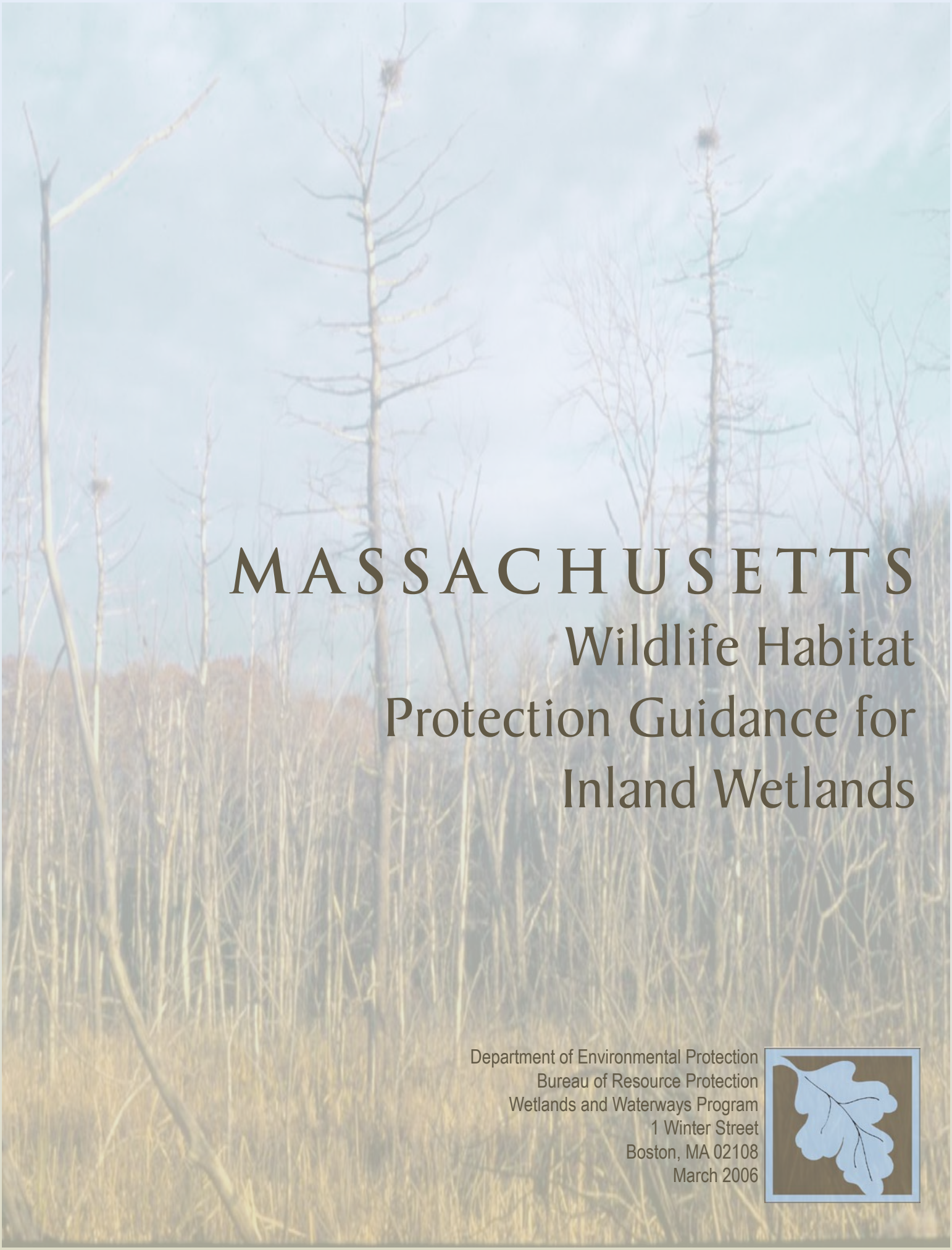

MASSACHUSETTS
Wildlife Habitat Protection Guidance for Inland Wetlands

Department of Environmental Protection
Bureau of Resource Protection
Wetlands and Waterways Program
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Appendices

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This document and any future updates can be downloaded from MassDEP's website at: www.mass.gov/dep/water/laws/policies.htm#wetlguide.

Flow Chart for Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands

Determine each Massachusetts Wetland Protection Act resource area likely to be adversely affected by the proposed work

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For each resource area determine whether the amount of work is above or below the "significance" threshold, and whether it is in vernal pool habitat or mapped Habitat of Potential Regional or Statewide Importance
[See: Page 3, Section III, Table 1 Wetland Resource Areas and Wildlife Habitat Regulations]

↓

For each resource area, determine whether Appendix A or Appendix B is required.
[See: Page 10, Section III, Table 2 Inland Wetland Resource Areas and Wildlife Habitat Summary]

↓

Based on the findings from above, complete Appendix A and/or B as required.
[See: Page 11 & 12, Section IV, Evaluations of Important Wildlife Habitat in Resource Areas]

↓

Based on the findings from Appendix A and/or B for each resource area, determine whether the work will have:
• no adverse affect; or
• an adverse effect that can be avoided via redesign, mitigation, or conditioning; or
• an adverse effect that cannot be avoided via redesign, mitigation, or conditioning
[See: Pages 13-17, Section V, Adverse Effect]

I. Preface

In 1986 the Massachusetts legislature recognized that wetlands can provide wildlife habitat and added "wildlife habitat" to the list of interests protected under the Wetlands Protection Act, M.G.L. c.131, §40. The following year, the Massachusetts Department of Environmental Protection (MassDEP) revised the Wetlands Regulations (310 CMR 10.00) to incorporate protection of wildlife habitat as a wetlands interest and adopted standards and procedures to protect important wildlife habitat functions in wetland resource areas. In 1996, the Rivers Protection Act was adopted, providing additional requirements for habitat protection under the Wetlands Regulations. As a result, MassDEP, in collaboration with the Massachusetts Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Advisory Committee (NHESAC) Wildlife Working Group and with assistance from the University of Massachusetts, developed this guidance document to provide greater consistency and enhance the protection of the Commonwealth's wetland and riparian wildlife habitats. These guidelines are intended for inland resource areas only.

The purpose of this document is to provide guidance to identify important wildlife habitat and illustrate the full extent of protection that can be afforded to protect important wildlife habitat in wetlands. The guidance also serves to help Conservation Commissions and applicants know what level of evaluation should be required for projects that trigger the thresholds for the review of wildlife habitat alterations. This guidance will also help Conservation Commissions know what to do with the wildlife habitat information to be sure that projects are designed to meet performance standards for wildlife habitat. The ability to achieve habitat protection through the Wetlands Protection Act is limited by the scope of wetland jurisdiction and other factors. Comprehensive wildlife habitat protection must be incorporated within a regulatory framework and supplemented by practical considerations of many people including applicants proposing construction in or near wetlands. There is much that a Conservation Commission can do within the authority of the Wetland Protection Act. Sound judgment is needed to determine when an alteration to wildlife habitat will substantially reduce its capacity to provide important wildlife habitat functions listed in 310 CMR 10.60 (2). The challenge is to determine what habitat is important, assess the nature and scope of the alteration contemplated to that habitat, ensure that there is no adverse effect on those important habitat features, and condition the project accordingly.

This document is primarily intended to provide guidance on the evaluation of projects and their potential impact to wildlife habitat for species other than rare or endangered species. Projects located in the habitat of rare and endangered species cannot have a short or long term adverse impact on the species. The Massachusetts Natural Heritage and Endangered Species Program (MNHESP), which amended its regulations in 2005, administers the Massachusetts Endangered Species Act (MESA), and provides opinions to Conservation Commissions and the MassDEP regarding the impacts of projects on species protected by MESA pursuant to the Wetlands Regulations at 310 CMR 10.59.


Scott D. Jackson

II. Protecting "Important" Habitat

The 1987 wetland regulatory revisions require review of individual projects to protect wildlife habitat within resource areas that is of regional or statewide importance. MassDEP recommends that the wildlife preface be reviewed for further details on regional or statewide significant areas. This guidance document outlines a strategy for implementing the wildlife provisions of the Wetlands Protection Act regulations including:

1. Habitat of Potential Regional or Statewide Importance. Through issuance of this guidance, MassDEP adopts a new approach to wildlife habitat management by assessing and mapping habitat of potential regional or statewide importance for use in wetland protection review. A new and innovative assessment model developed at the University of Massachusetts Amherst (UMass) provides an objective, dynamic, and flexible tool for assessing and prioritizing important wildlife habitat. Utilizing the assessment model, UMass is creating a statewide set of maps that depict "Habitat of Potential Regional or Statewide Importance." Currently, Habitat of Potential Regional or Statewide Importance maps are being completed for 50 communities in the Highlands and Housatonic Regions of Western Massachusetts.[1] Once complete, each map will depict polygons representing 40% of the landscape with the highest wildlife habitat value. Areas within the polygons that are also within Wetland Protection Act jurisdiction represent "Habitat of Potential Regional or Statewide Importance" and may trigger detailed review (See Section III of this guidance). MassDEP also encourages the use of the UMass assessment and mapping methodology for the selection of alternatives for linear infrastructure projects such as utilities, roadways and railroads. As completed maps will be available at http://www.umass.edu/landeco/research/caps/applications/dep/dep.html.

2. Simplified Wildlife Habitat Evaluation (Appendix A). This tool provides a simplified evaluation of small-scale alterations to ensure protection for certain "important habitat features" and identify projects that warrant detailed wildlife habitat evaluations.

3.Detailed Wildlife Habitat Evaluation (Appendix B). This tool provides the instructions, forms, and standards for conducting detailed wildlife habitat evaluations applicable to larger projects, project locations identified to be within the Habitat of Potential Regional or Statewide Importance map polygons, vernal pool habitat, or by activities listed in Appendix A.


Thomas G. Barnes

III. Wetland Resource Areas and Wildlife Habitat

A. Regulations

Table 1 summarizes the thresholds established by the regulations and lists the sections of the regulations that pertain to wildlife habitat. These sections of the regulations should be consulted when assessing the impacts of project alterations to wildlife habitat. The need for a wildlife habitat evaluation will depend on the type of resource area impacted and the magnitude of the impact. Wildlife habitat evaluation forms are described within this guidance, and are located in Appendix A (simplified evaluation) and B (detailed evaluation).

[1]Analysis for the rest of the state needs to be completed. As new regions of the state are completed, the Department will assess the effectiveness of this new approach and refine the extent of "Habitat of Potential Regional and Statewide Importance," as needed.

Table 1. Wetland Resource Areas and Wildlife Habitat Regulations

Resource Area	Thresholds (below which deemed not to impair wildlife habitat)	Regulatory Citation (310 CMR 10.00)
Bank (all banks are presumed significant for wildlife habitat)	10% of the length of bank on a single lot or 50 linear feet (whichever is less)	10.54(4)(a)5
Bordering Vegetated Wetland (BVW) (all BVWs are presumed significant for wildlife habitat)	No threshold - impacts must be replicated in a manner that will function similar to the area that will be lost	10.55 (4)(b) (preface to Wetlands Regulations relative to protection of wildlife habitat - 1987 Regulatory Revisions - Section IV)
Land Under WaterBodies and Waterways (LUW) (all land under water is presumed significant for wildlife habitat)	10% of the land in this resource area on a single lot or 5,000 square feet (whichever is less)	10.56(4)(a)4
Bordering Land Subject to Flooding (BLSF) (presumed significant for all areas on the 10 year floodplain or within 100 ft. of the Bank or BVW (whichever is further from the waterbody or waterway, so long as it is within the 100-year floodplain). Vernal pool habitat presumed significant wherever it occurs in BLSF.	10% of the land in this resource area on a single lot or 5,000 square feet (whichever is less) except for work that will adversely affect vernal pool habitat	10.57(1)(a)3, (2)(a) 5&6, (4)(a)3
Isolated Land Subject to Flooding (ILSF) (presumed not significant unless it is vernal pool habitat)	No threshold - No impairment of its capacity to provide wildlife habitat where said area is vernal pool habitat per 10.60	10.57 (1)(b) 1 & 4, (2)(b) 4 & 5, (4)(b)4
Riverfront Area (the entire Riverfront Area is presumed to be significant for wildlife habitat)	No threshold - however, different review requirements apply depending on whether the riverfront is undisturbed (310 CMR 10.58(4))(and the size of impact), previously developed (310 CMR 10.58(5)) or if the activity is grandfathered or exempted from requirements for the riverfront area (310 CMR 10.58(6)).	10.58(4)(b), (4)(d)1.c, (4)(d)2.c, (4)(d)3.b
Bank, Land Under Water, Riverfront, Land Subject to Flooding	Listed above	10.60 (Adverse Effect, Evaluations, Mitigation)

B. Presumptions of Significance to the Interests of Wildlife Habitat

All inland resource areas are presumed significant for protection of wildlife habitat (with a few exceptions detailed in Table 1 and noted below). The presumption is predicated on a statutory definition that requires the presence of characteristics providing important wildlife habitat functions such as food, shelter, migratory and over-wintering areas, or breeding areas. The presumption is rebuttable by a showing that the resource area lacks wildlife habitat functions. There are some exceptions to the presumption for wildlife habitat: 1) Isolated Land Subject to Flooding is presumed not significant unless it is vernal pool habitat; and 2) Bordering Land Subject to Flooding is presumed significant to the protection of wildlife habitat in all areas on the ten (10) year floodplain (which should be shown on the plans) or within 100 feet of the Bank or Bordering Vegetated Wetland (whichever is further from the waterbody or waterway, so long as such area is contained within the 100-year floodplain). Vernal pool habitat found in Bordering Land Subject to Flooding is likely to be significant to wildlife habitat except for those portions which have been so extensively altered by human activity that their important wildlife habitat functions have been effectively eliminated (See 310 CMR 10.57(1)(a) 3).

C. Resource Areas with Thresholds

In resource areas listed below, the size of the alteration relative to the threshold allowance, determines the permitting requirements. Alterations greater than the thresholds listed may be permitted if they will have no adverse effects on important wildlife habitat. Therefore, these alterations must be avoided, minimized and/or mitigated in order to achieve the standard of "no adverse effect" discussed in Section V.

1. Bank, Land Under Water, Bordering Land Subject to Flooding

a. Bank (10% of the length of bank on a single lot or 50 linear feet (whichever is less));
b. Land under water (LUW) (10% of the land in this resource area on a single lot or 5,000 square feet (whichever is less)).
c. Bordering land subject to flooding (BLSF) (10% of the land in this resource area that is presumed significant to wildlife habitat on a single lot or 5,000 square feet- whichever is less) except for work that will adversely affect vernal pool habitat.

Alterations Below Thresholds:

A wildlife habitat evaluation is not required for projects with alterations below the specific thresholds listed above (except for vernal pool habitat in BLSF). However, field studies demonstrate that some small landscape features have wildlife habitat values substantially greater than their small size would suggest. For example, the particular characteristics of a 20-foot section of bank may be the only section with the combination of vertical relief and sandy soils that allows kingfisher nesting. Therefore, applicants are encouraged to avoid and minimize alterations to the maximum extent possible, but are not required to complete a wildlife habitat evaluation.

Alterations Above Thresholds:
When alterations exceed thresholds for Bank, LUW or BLSF for a single lot, or cumulatively for multi-lot projects, applicants must submit completed Appendix A with their application. Depending on the information collected in Appendix A, applicants may be instructed to complete a detailed wildlife habitat evaluation (Appendix B). Additional alterations exceeding thresholds may be allowed if there will be no adverse effect on the wildlife habitat as established by information collected in Appendix A and/or Appendix B used together with the guidance for adverse effects in Section V. The determination of adverse effect includes consideration of mitigation, and Appendices A and/or B should be used to determine which features should be included in the mitigation design.

D. Resource Areas without Thresholds

Important wildlife habitat functions may be protected for alterations of any size in Bordering Vegetated Wetlands and Riverfront Area or in Isolated Land Subject to Flooding if it is vernal pool habitat.

1. Bordering Vegetated Wetlands (BVW):
For most projects, existing performance standards for BVW allow only small alterations (under 5,000 sq. ft.). In most cases, these resource areas must be replicated in a manner that will function similar to the area that will be lost. Replication of the wildlife habitat function can be achieved, for example, by replanting the same native species and by providing the same soils, hydrology, and associated important habitat features as the impacted wetland. Applicants must document that there will be no adverse effect to wildlife habitat in BVW.

Alterations Below 5000 s.f.
Applicants must complete Appendix A when impacts to BVW less than 5000 s.f. are proposed so that important wildlife habitat features in the altered wetland may be identified and avoided if possible, and replication can be designed that will function as important wildlife habitat, similar to the lost area. For any size BVW impacts that are in mapped Habitat of Potential Regional or Statewide Importance or certified or documented vernal pool habitat, applicants shall submit Appendix B containing the Wildlife Specialist's Certification that the project has been designed so that there is no adverse effect on wildlife habitat.

Alterations Above 5000 s.f.
For all projects altering greater than 5000 s.f. of BVW applicants must submit a detailed wildlife habitat evaluation (Appendix B) and demonstrate that the project will not adversely affect wildlife habitat (Section V).

2. Riverfront Area
The entire Riverfront Area is presumed to be significant for wildlife habitat. However, different review requirements apply depending on whether the riverfront is undeveloped (310 CMR 10.58(4)), previously developed (310 CMR 10.58(5)) or if the activity is grandfathered or exempted from requirements for the riverfront area (310 CMR 10.58(6)). Review requirements are detailed below. In riverfront areas that contain coastal resource areas, this guidance would apply only to those portions of the riverfront area that are landward of coastal bank,

salt marsh, dune and rocky intertidal shores. Riverfront area extends to the mouth of river line referenced in 310 CMR 10.58(2)(c).

Alterations to Undeveloped Riverfront Below 5000 s.f.
The regulations allow alterations below 5000 s.f. if the proposed work does not impair the capacity of the riverfront area to provide important wildlife habitat functions. However, projects cannot have an adverse effect on a vernal pool certified prior to the filing of the application or a vernal pool (not yet certified) that is documented as such by evidence from a competent source during the application process. Thus, applicants must submit Appendix B for any size riverfront alterations that are certified or documented vernal pool habitat. In all cases where Appendix B is required the project shall not adversely affect (as defined in Section V) wildlife habitat.

In accordance with 310 CMR 10.58 (4) d.3, no wildlife habitat evaluation shall be required for the construction of a single family house, a septic system if no sewer is available, and a driveway, on a lot recorded before August 7, 1996 where the size or shape of the lot within the riverfront area prevents the construction from meeting the requirements of 310 CMR 10.58(4)(d) 1. or 2. except where the lot contains vernal pool habitat or specified habitat sites of rare species. However, the performance standards of 310 CMR 10.58 (4)(d) must be met to the maximum extent possible.

Alterations to Undeveloped Riverfront Above 5000 s.f.
Applicants should submit a simplified wildlife habitat evaluation (Appendix A) and must demonstrate that the project will not adversely affect wildlife habitat (Section V) for all projects altering greater than 5000 s.f. of undeveloped riverfront area. Applicants must submit a detailed wildlife habitat evaluation (Appendix B) for all alterations that are greater than 5000 s.f. that alter any portion of Habitat of Potential Regional or Statewide Importance or for any size alteration to certified or documented vernal pool habitat.

Alterations to Previously Developed Riverfront or Grandfathered/Exempted Activities in the Riverfront Appendix A and Appendix B are not required for previously developed riverfront or grandfathered/exempted activities in riverfront.

3. Isolated Land Subject to Flooding (ILSF)
Those portions of ILSF presumed to be vernal pool habitat are only those that have been certified by MDFW prior to the NOI filing. Similar habitat not yet certified by MDFW does not benefit from such a presumption but the lack of the presumption that such areas are not vernal pools may be overcome upon a clear showing to the contrary.

ILSF with Certified or Documented Vernal Pool Habitat
Applicants must submit Appendix B containing the Wildlife Specialist's Certification that the project has been designed to avoid adverse effects on certified or documented vernal pools.

ILSF without Certified or Documented Vernal Pool Habitat
Appendix A and Appendix B are not required for ILSF without certified or documented vernal pool habitat.

E. Limited Projects

For certain projects in all inland resource areas, when subject to wildlife habitat alteration thresholds, completion of Appendix A and Appendix B may or may not be required at the discretion of the issuing authority. Such "limited projects" are those activities listed in 310 CMR 10.53 (3) for which strict adherence to performance standards are not required and thus, the performance of a wildlife habitat evaluation can be waived after considering the magnitude of the impact, the significance of the site, the availability of reasonable alternatives, minimization of impacts, and mitigation. Wildlife habitat review for limited projects can be conducted using the same procedures as for non-limited projects.

F. Vernal Pool Habitat

The Wetland Regulations in Section 310 CMR 10.04 define vernal pool habitat as follows:

"Vernal pool habitat means confined basin depressions which, at least in most years, hold water for a minimum of two continuous months during the spring and/or summer, and which are free of adult fish populations, as well as the area within 100 feet of the mean annual boundaries of such depressions, to the extent that such habitat is within an Area Subject to Protection Under M.G.L. c. 131, § 40 as specified in 310 CMR 10.02(1). These areas are essential breeding habitat, and provide other extremely important wildlife habitat functions during non-breeding season as well, for a variety of amphibian species such as wood frog (Rana sylvatica) and the spotted salamander (Ambystoma macultum), and are important habitat for other wildlife species."

Vernal pool habitat—that is the vernal pool and the 100-ft zone around a vernal pool—must occur within a resource area before it receives protection. Vernal pool habitat does not extend into non-jurisdictional upland or in the buffer zone of a resource area.[2]

Vernal pool habitat may be identified by certification prior to the filing of the application or may be identified during the application review process with evidence from a competent source (such as evidence that would be sufficient to certify a pool if submitted to the Division of Fisheries and Wildlife – See www.mass.gov/dfwele/dfw/nhesp/nhesp.htm). Conservation commissioners with appropriate training or experience can be considered competent sources for the identification of vernal pool habitat. Whether certified or "documented" during the application review process, vernal pool habitat is protected as long as it occurs within resource areas.

The only portions of BLSF and ILSF that are presumed to be vernal pool habitat are those that have been certified prior to the filing of the NOI. However, the presumption that an area is vernal pool only when certified prior to the filing of a NOI is rebuttable, and may be overcome upon a clear showing to the contrary. In LSF where there is no certified vernal pool there is a presumption that vernal pool habitat does not exist. However, when there is clear and convincing evidence that an area is a vernal pool, an issuing authority can issue a finding overcoming the presumption and establishing that the area is vernal pool habitat.

[2] *Discharge of dredged or fill material to an Outstanding Resource Water specifically identified in 314 CMR 4.06(1)(d) (e.g., vernal pools, within 400 feet of a water supply reservoir and any other areas so designated) is prohibited as provided therein unless a variance is obtained under 314 CMR 9.08.*

Conversely, in BLSF, those portions of vernal pool habitat which have been so extensively altered by human activity that their important wildlife habitat functions have been effectively eliminated are not likely to be significant (such "altered" areas include paved and graveled areas, golf courses, cemeteries, playgrounds, landfills, fairgrounds, quarries, gravel pits, buildings, lawns, gardens, roadways (including median strips, areas enclosed within highway interchanges, shoulders, and embankments), railroad tracks (including ballast and embankments), and similar areas lawfully existing on November 1, 1987 and maintained as such since that time.

The Massachusetts Natural Heritage & Endangered Species Program (MNHESP) (www.mass.gov/dfwele/dfw/nhesp/nhesp.htm) administers the official vernal pool certification program and may be contacted for further information regarding the status of vernal pools.[3]

Impacts to Certified or Documented Vernal Pool Habitat in All Resource Areas

In all resource areas, any direct alteration associated with certified or documented vernal pool habitat requires a detailed wildlife habitat evaluation (Appendix B). A finding that impacts to vernal pool habitat will not result in an adverse effect will only occur under rare and unusual circumstances. A finding of no adverse effect must include consideration of the restoration and/or replication proposed after two growing seasons. However, replication and restoration of vernal pool habitat is difficult to successfully accomplish. Therefore, avoidance of impacts to vernal pool habitat is almost always necessary to meet performance standards.

G. Buffer Zones

Activities in wildlife habitat found within the buffer zone do not trigger jurisdiction to require an NOI or the filing of Appendix A and/or B. Activities within the buffer zone are subject to regulation (i.e. filing of a Notice of Intent (NOI)) only when in the judgment of the issuing authority they will alter a resource area (310 CMR 10.02(2)(b)).

The revised regulations effective March 1, 2005 (310 CMR 10.02(2) b.) set narrative standards for work in the buffer zone proposed under a Notice of Intent. Extensive work in the inner fifty (50)-foot portion of the buffer zone, particularly clearing of natural vegetation and soil disturbance is likely to alter the physical characteristics of resource areas by changing their soil composition, topography, hydrology, temperature, and the amount of light received. Alterations to biological conditions in adjacent resource areas may include changes in plant community composition and structure, invertebrate and vertebrate biomass and species composition, and nutrient cycling. These alterations from extensive work in the buffer zone can occur through the disruption and erosion of soil, loss of shading, reduction in nutrient inputs, and changes in litter and soil composition that filters runoff, serving to attenuate pollutants and sustain important wildlife habitat within resource areas.

[3] The Massachusetts Natural Heritage & Endangered Species Program is part of the Massachusetts Division of Fisheries and Wildlife located on Route 135 in Westborough MA, 01581. Copies of the publication entitled Massachusetts Aerial Photo Survey of Potential Vernal Pools dated Spring 2001 can be obtained from the above address, or by calling (508) 792-7270 x200.

Although simplified or detailed wildlife habitat evaluations are not required, conditions on work in the buffer zone may include erosion controls, a limit of work, and preservation of natural vegetation adjacent to the resource area. The review and conditioning of activities in the buffer zone should be commensurate with the extent and location of the work in the buffer zone and its potential to alter resource areas that provide important wildlife habitat. This standard is intended to provide better guidance by identifying the measures that will protect adjacent resource areas.

Table 2. Inland Wetland Resource Areas and Wildlife Habitat Summary

Resource Area/Buffer	Appendix A Required	Appendix B Required	No Adverse Effect/No Impairment
Bank	For alterations above thresholds	When triggered by Appendix A	For alterations above thresholds
Bordering Vegetated Wetland (BVW)	For alterations less than 5,000 sq. ft	When triggered by Appendix A, for alterations greater than 5000 sq ft or for any size impact in Habitat of Potential Regional or Statewide Importance or certified or documented vernal pool habitat[4].	For all alterations
Land Under Water (LUW)	For alterations above thresholds	When triggered by Appendix A	For alterations above thresholds
Bordering Land Subject to Flooding (BLSF - presumed significant to wildlife habitat)	For alterations above thresholds	When triggered by Appendix A or for any impacts to certified or documented vernal pool habitat	For alterations above thresholds or for any impacts to certified/ documented vernal pool habitat
Isolated Land Subject to Flooding (ILSF)	Not applicable	When certified or documented vernal pool habitat present	When certified or documented vernal pool habitat present
Riverfront Area	For alterations to undisturbed riverfront greater than 5000 s.f. **that are outside of** Habitat of Potential Regional or Statewide Importance or outside of certified or documented vernal pool habitat	For alterations to undisturbed riverfront greater than 5000 s.f. **that alter any portion of** Habitat of Potential Regional or Statewide Importance or for any alteration to certified or documented vernal pool habitat	For all alterations
Limited Projects	See guidance for resource area	See guidance for resource area	See guidance for resource area
Vernal Pools	Not applicable	All alterations to certified or documented vernal pool habitat	All alterations to certified or documented vernal pool habitat
Buffer Zone	Not applicable	Not applicable	Not applicable

[4] *Certified/ documented vernal pools are described in Section III F.*

IV. Evaluations of Important Wildlife Habitat in Resource Areas

A. Simplified Wildlife Habitat Evaluation (Appendix A)

For many projects with smaller alterations, only the *Simplified Wildlife Habitat Evaluation* may be required (see Table 2). This simplified evaluation tool provides a convenient way to document the presence of important wildlife habitat features and describe activities that may have significant impacts on wildlife habitat functions. Depending on the habitat features and activities identified on the site, Appendix B may be triggered. These circumstances are described in the Appendix A instructions and on the form. Appendix A may also be used to avoid and minimize important wildlife habitat features during design, and to restore or replicate wildlife habitat.

B. Detailed Wildlife Habitat Evaluation (Appendix B)

For projects with greater alterations, Appendix B will likely be required (See Table 2). Appendix B comprises a detailed wildlife habitat evaluation that includes a summary sheet for the identification of resource areas present within the impact area, a standardized field data form to use in wetland resource areas; demonstration of avoidance, minimization, restoration or replication of alterations to important habitat features; and certification by a wildlife specialist that the proposed project is designed to avoid adverse effects on wildlife habitat. Instructions for how to complete the detailed wildlife habitat evaluation are contained in Appendix B.

C. Who conducts the Simplified and Detailed Evaluations?

The Wetland Regulations (310 CMR 10.60 (1)(b)) require that all wildlife habitat evaluations (either simplified (Appendix A) or detailed (Appendix B) "be performed by an individual with at least a masters degree in wildlife biology or ecological science from an accredited college or university, or other competent professional with a least two years experience in wildlife habitat evaluation."[5] These same qualifications should apply to individuals responsible for mitigation design and follow up monitoring. For extremely large or complex projects altering sensitive wildlife habitat, Conservation Commissions may want to hire wildlife experts to review wildlife habitat evaluations.

D. When Can an Evaluation Be Performed?

It is not a requirement that wildlife habitat evaluations be performed only during the growing season (i.e. generally, from mid-April through October), however, completion of the recommended Wildlife Habitat Evaluation Field Data Form is difficult to accomplish when features such as emergent wetland plants or nesting sites cannot be verified. Applicants must use common sense in determining when to conduct the evaluation. For example, if the snow is too deep to see the ground, or if certain features of the site cannot be observed, then the evaluation should be delayed until habitat features can be observed. In any case, the issuing authority must consider whether it has sufficient information to evaluate the habitat. Issuing authorities may choose to hire an independent professional to aid in making this determination. If the issuing authority determines that insufficient information exists to evaluate the habitat, the best approach is to seek the applicant's consent to extend the public hearing until the applicant can obtain additional information. Less preferable alternatives

[5] *For alterations in BVW that do not trigger Appendix B, Conservation Commissions should determine if a wildlife specialist is needed on a case-by-case basis. The need for a wildlife specialist for these BVW alterations will depend on existing site conditions, the nature and extent of the alteration, and the complexity of the replication area design.*

include (a) conditioning the project to require additional wildlife habitat evaluation pre and post construction, and requiring remediation if impacts are documented (difficult to administer and enforce); or (b) in extreme cases where the above options are not possible and/or where Conservation Commissions cannot reasonably condition the project due to the lack of information, deny the project for insufficient information.

E. What should be evaluated?

The impact area for a wildlife habitat evaluation is that portion of resource areas that will be altered by the proposed activity (both permanent and temporary). There may be more than one impact area in an individual project. Information about the entire surrounding wetland/riparian system on the site (and offsite to the extent needed to characterize the relationship of the site to the surrounding habitat) will be necessary to evaluate issues of wildlife habitat use, continuity, and connectivity. A written narrative, as well as a sketch map and/or photos of the impact area should be included. Identification, description, and quantification of important wildlife habitat functions and features in the impact area must also be included.

F. How Should Cumulative Impacts be Addressed?

Consideration of cumulative impacts is typically beyond the scope of evaluation for a single project. In an attempt to address this issue, MassDEP recommends the following:

1. The wetlands regulations establish project size thresholds for three resource areas (inland Banks, Land Under Water, and Land Subject to Flooding). As stated in the 1987 preface to the wetlands regulations, a concern was expressed that although the regulatory thresholds may appear small individually, repeated undertakings of threshold projects on the same property could cause large cumulative impacts on wildlife habitat. The Department responded to that concern by providing that after the effective date of the wildlife provisions in the regulations (November 1, 1987), the thresholds may only be applied once on a single lot or once cumulatively across the lots of a multi-lot project.

2. Cumulative impacts should first be addressed by ensuring that alterations to resource areas and their associated wildlife habitat are avoided to the maximum extent practicable. Alterations that cannot be avoided should be minimized through project designs or redesign. In addition, as required under the wetland regulations for the above three resource areas, the alteration thresholds may only be applied once on a single lot or once cumulatively across the lots of a multi-lot project.

3. Please note that the Department also has the authority to consider cumulative impacts of discharges of dredged or fill materials to waters of the United States (and subject to the wetlands regulations as well) associated with the creation of a real estate subdivision. Under the Department's water quality certification regulations at 314 CMR 9.04 (3) (i.e. the Department's 401 Water Quality Certification Program), such discharges are exempt from the need to obtain a water quality certification when there is a recorded deed restriction (and a final Order of Conditions) that limits the amount of fill for the "single and complete project" to less than 5,000 sq. ft. cumulatively of bordering and/or isolated vegetated wetlands and land under water (and the discharge is not to an ORW).

V. Adverse Effect

A. How is No Adverse Effect on Wildlife Habitat Defined?

Applicants must certify, and Conservation Commissions must find, that project alterations requiring Appendix A or B have no adverse effect on wildlife habitat. The wetland regulations define adverse effects on wildlife habitat as the alteration of any habitat characteristics listed in 310 CMR 10.60(2) (e.g. plant community, soil structure, hydrologic regime) insofar as such alteration will, following two growing seasons of project completion and thereafter (or if a project would eliminate trees, upon maturity of replanted saplings) substantially reduce its capacity to provide important wildlife habitat functions listed in 310 CMR 10.60(2) (e.g. shelter and breeding areas, food, nesting sites). It is not adequate to conclude that a project will result in an adverse effect only because alterations to wildlife habitat features are proposed. The alterations become "adverse" when they substantially reduce the site's capacity to provide important wildlife habitat functions (e.g. shelter, food, breeding areas) and consequently reduce the site's capacity to support wildlife. The evaluation of a site's capacity to support wildlife does not require measurement of animals or populations. Rather, a competent wildlife professional should consider changes to habitat features, in conjunction with the expected response of representative wildlife populations using the site as an indicator of reduced capacity to provide important wildlife habitat function. In doing so, wildlife professionals and conservation commissions should recognize that each project represents a model for future impacts to wildlife habitat. The standard for no adverse effect should be one that, if applied to all similar projects in the vicinity, would maintain wildlife habitat functions (capacity to support wildlife abundance and diversity) within wetland resource areas.

Simply put, no adverse effect does not mean no alteration. In many instances a project may alter a resource area but be designed or conditioned to meet a "no adverse effect" standard. By ensuring that important habitat features are identified and that adverse impacts are avoided and/or minimized and mitigated, the goal of no adverse effect will be met. The standard of "no adverse effect" applies to alterations in resource areas only and not to activities proposed within the buffer zone.

B. Meeting the Standard of No Adverse Effect

Alterations greater than the thresholds listed may be permitted if they will have no adverse effects on important wildlife habitat. In order to achieve the standard of "no adverse effect", these alterations must be avoided, minimized and/or mitigated.

1. Identify & Document Wildlife Habitat Features and Alterations

a. Identify and Document Wildlife Habitat Features: Based on the discussion in Section III (See Table 2 for summary), Appendix A or B should be completed where required to identify important wildlife habitat features and activities on the site. Habitat Features and Activities should be described both in the form and on a project site plan. A narrative may also help describe the site.

b. Define Project Alterations: Once the important habitat features and Activities are documented, project alterations should be identified by describing the extent of the proposed alteration of each resource area in narrative and plan form. Depicting proposed conditions on the plan as a contrasting overlay on existing conditions is the preferred method for showing the impacts since it provides contrast between existing and proposed conditions.

2. Demonstrate No Adverse Effect

a. Demonstrate that a site lacks any important habitat features by documenting that:

i. An area lacks any important habitat features listed in Appendix A and/or B.

ii. Certain on-site habitat features are not important for providing habitat functions because they are unlikely to be utilized by wildlife. For example, an area may contain underwater banks of fine silt or clay, but it's in an urban area where muskrats, beavers or otters (species that might utilize this characteristic for dens) are unlikely to occur.

b. Demonstrate that important habitat features exist on the site, but that adverse effects will be avoided because the project will not substantially reduce the capacity of the site to provide the important wildlife habitat functions (i.e. those listed in 310 CMR 10.60(2) including food, shelter, migratory and breeding areas, etc.):

i. Generally, the larger the alteration, the larger the impact to wildlife habitat. However, there are sites where even a small alteration can cause a large impact, such as a roadway or driveway that blocks a wildlife migration corridor. In most cases, though, efforts should be made to reduce the size of the alteration to important wildlife habitat characteristics and activities identified in Appendix A and/or B. This in turn will reduce the need for mitigation. In determining whether it is practicable to reduce alteration, consideration must be given to the presence of habitat characteristics and activities under pre and post construction conditions, costs, existing technology, proposed use and logistics. A sample method to compare different design strategies that may help to reduce alterations is provided in Part 4 of Appendix B, however, other methods may be used if acceptable to the issuing authority.

ii. Depending on the type of activity proposed and the characteristics of the site, it may be possible to avoid adverse effects through careful site design, restoration, replication (in accordance with 310 CMR 10.60 (3)) or other mitigation. Other types of mitigation may include a wildlife-crossing tunnel where a site is shown to be a migration corridor for wildlife between vernal pools or other wetlands. The more important the habitat features on a site or the larger the alteration, the more difficult it will be to meet this standard.

iii. Applicants may show that alterations will have a negligible effect on important wildlife habitat functions in some circumstances. This may occur only when an above-threshold activity will alter an important habitat feature that is very common on the site, so that the amount of that habitat feature lost on the site is insignificant compared with the amount that remains. For example, a project may alter underwater branches and logs that provide important cover for wildlife, but do so in an area where the amount of cover that will remain on the site is sufficient to meet all wildlife needs. The impact can be considered insignificant only if an alteration would not substantially reduce the resource area's capacity to provide important wildlife habitat functions.

iv. The abundance of a specific habitat feature offsite is not grounds for the applicant to find that the destruction of such features on site will have a negligible impact. As noted above, the standard for determining that the work will not have a significant impact on wildlife habitat on the site is that the alteration will not substantially reduce the resource area's capacity to provide important wildlife habitat functions.

C. Restoration or Replication of Altered Habitat

A determination by the issuing authority that an alteration of wildlife habitat will not substantially reduce its capacity to provide important wildlife habitat functions should be based upon a demonstration by the applicant that they will restore onsite or replicate offsite the habitat functions of the altered habitat. The protected habitat functions are listed in 310 CMR 10.60 (2) for each resource area. Wildlife habitat restoration or replication must follow the general conditions detailed in 310 CMR 10.60(3). Any other mitigation not involving restoration or replication must be justified by the wildlife specialist based on the unique conditions of the site. Plans for wildlife habitat restoration or replication should be combined with the plans to meet other mitigation requirements detailed in the performance standards of each resource area. For example, replication of bordering vegetated wetland should be designed in accordance with the *Massachusetts Inland Wetland Replication Guidelines*, March 2002 (www.mass.gov/dep/water/laws/policies.htm.) Wildlife habitat mitigation should be included in the replication plans if it can be clearly labeled as such or provided on a separate plan if needed. Mitigation for alterations significant to wildlife habitat in land subject to flooding should be designed in accordance with performance standards detailed in 310 CMR 10.57(4)(a) for site grading, and habitat characteristics of the area to be altered should be replaced to restore or replicate existing site conditions as closely as possible. For any aquatic plant management project in a lake or pond, protection of wildlife habitat should be demonstrated through adherence to the MassDEP's *Guidance for Aquatic Plant Management in Lakes and Ponds As it Relates to the Wetlands Protection Act* (MassDEP April 2004).

In general, keep in mind the following guidelines when developing plans for restoration or replication:


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1. Document Features to be Restored or Replicated Details should be provided in plan and narrative form showing specific wildlife habitat characteristics or areas of characteristics to be restored, replicated or otherwise mitigated;

2. Important Habitat Characteristics Documents should clearly demonstrate that important wildlife habitat characteristics and activities of the area to be altered are closely restored onsite, replicated offsite, or otherwise mitigated. In addition to individual features, general site characteristics such as plant community

composition and structure, water and other wildlife habitat characteristics of the replacement area, as well as its location relative to neighboring wildlife habitats and connectivity to adjacent habitats, must be similar to that of the lost areas, insofar as necessary to maintain the wildlife habitat functions of the lost area;

3. Vernal Pool Habitat: Mitigation for direct alterations to vernal pool habitat in resource areas may involve restoration or replication of that habitat. Careful design of restored or replicated vernal pool habitat must closely replicate the hydrology of the existing condition, and must be in close proximity to the existing vernal pool. The substrate of the pool (i.e. dead leaves, organic or mineral soil) and the vegetation in and around the pool must also mimic existing conditions. However, there are other indirect and potentially important alterations that must be identified and mitigated if they cannot be avoided. Projects altering resource areas can inadvertently disrupt existing migration routes between vernal pool systems, or between vernal pool habitat and other wetlands or upland nesting areas. In some cases, effective mitigation can involve a field survey to identify the migration patterns of obligate and facultative species and design features that maintain connections between vernal pool/wetland/upland habitats used. Some strategies may include wildlife tunnels, oversized stream culverts or arch culverts combined with fencing to direct wildlife movement to crossing structures. In addition, design features may include restrictions on construction during breeding, egg-laying or dispersal periods for the identified species, creation of nesting areas and monitoring and adjustment of erosion controls as necessary to prevent obstruction of animal movement. Some vernal pool hydrology depends on overland surface water drainage that should not be diverted. However, stormwater runoff should not be routed into existing or restored/replicated vernal pools unless it is treated first in accordance with the *Massachusetts Stormwater Management Policy*.

A qualified vernal pool specialist meeting the criteria in 310 CMR 10.60 (1)(b) should certify the vernal pool mitigation plan. If the vernal pool habitat overlaps with rare species habitat then MNHESP should be consulted in accordance with 310 CMR 10.59. It is important to remember that the issuing authority can only require mitigation for alterations to wildlife habitat within resource areas. Mitigation for alterations to wildlife habitat in the buffer zone is not required.

4. Maintaining wildlife migration corridors: Where project alterations of a wetland resource area disrupt known important migration corridors between wetlands or toward upland resource area sites (i.e. riverfront and land subject to flooding) or when project alterations disrupt the sole connector between habitats that are greater than 50 acres in size, issuing authorities may be justified in requiring that the applicant maintain those travel routes or provide adequate on-site mitigation.

5. Stream Crossings: Projects involving stream crossings are encouraged to follow the Massachusetts River and Stream Crossing Standards, March 1, 2006 (Appendix E) or as otherwise amended, and referenced in the Army Corps of Engineers Programmatic General Permit, Section 404, to the maximum extent practicable.

6. Monitoring: A condition to monitor the mitigation site must be included in the application. Details must include frequency of monitoring (at least two growing seasons), credentials of person to conduct monitoring, data to be collected, measures of success and annual report submittal.

7. Remediation: A condition to conduct remedial actions as necessary to replace failed plantings, eliminate invasive species, correct grading or take other measures necessary to ensure success must be included.

D. If No Adverse Effect, Approve Project with or without Conditions

If the applicant, following the guidelines above, can document that the alteration of wildlife habitat will not substantially reduce the capacity of the site to provide important wildlife habitat functions, and thus have no adverse effect, and the issuing authority concurs with that assessment, then the project should be approved. The issuing authority should condition the project and reference any appropriate materials submitted by the applicant to restore, replicate or mitigate adverse effects on wildlife habitat. Appendix F provides sample conditions that may be adapted to the particular Order of Conditions, if applicable.

E. If Adverse Effect Cannot be Avoided, Minimized or Mitigated, Project Must be Denied

Projects should be denied in cases where the wildlife habitat characteristics or activities on the site are rare or have important habitat value, and where the impacts are extensive and mitigation is very unlikely to succeed. In other cases, mitigation may be absent or inadequately designed to avoid an adverse effect. In these cases, the project should be denied. Denial, however, should only be an option if impacts are not avoided, minimized or adequately mitigated. Some examples where denial may be warranted are:

1. Projects where mitigation plans or other essential information are absent or inadequate: When projects will have an adverse effect, but applicants do not propose mitigation, or when mitigation plans do not adequately restore, replicate, or otherwise mitigate the functions of the altered wetland, the issuing authority may be justified in denying a project. Similarly, if the information provided is clearly not sufficient for the issuing authority to determine the extent of impact, then the issuing authority may have little choice but to deny the project. See 310 CMR 10.05(6)(c) in both instances. Denial, however, should be a last resort after specific and essential information is requested and not provided, and discussions with the applicant have failed.

2. Projects Altering Rare Species Habitat: When a project receives a negative opinion from the MNHESP after reviewing an NOI and/or cannot obtain approval by MNHESP pursuant to the Massachusetts Endangered Species Act, then issuing authorities must deny the project.

3. Unique ecosystems such as white cedar swamps, calcareous fens, bogs and seepage swamps: Some wetland resource area habitats are difficult to reproduce because they are unique communities and take many years to develop. In rare cases, issuing authorities may be justified in denying a project, even when mitigation is proposed, if the mitigation will not eliminate an adverse effect to wildlife habitat and will substantially reduce its capacity to provide important wildlife habitat functions (310 CMR 10.60(2)).

VI. Tools for Data Collection & Other Appendices

Appendix A: Simplified Wildlife Habitat Evaluation:

Use Appendix A for evaluating smaller-scale projects in accordance with the guidance in Section III for purposes of avoidance and minimization of alterations to important wildlife habitat features and activities, and design of mitigation areas. When any important habitat features listed in Appendix A will be altered, applicants should demonstrate that there will be no adverse effect by following the guidance in Section V. When any resource area alteration involves an activity listed in Appendix A the conservation commission should require the completion of Appendix B with the associated evaluation of design strategies and mitigation design.

Appendix B: Detailed Wildlife Habitat Evaluation:

Guidance for when to use Appendix B is detailed in Section III. The purpose of the Field Data Form is to provide a more detailed description of the impact area, and an extended checklist of important habitat features that may occur. There are five main parts to the Detailed Wildlife Habitat Evaluation: Part 1 – Summary Sheet, Part 2 – Field Data Form, Part 3 – Conceptual Wildlife Assessment Plan, Part 4 – Reducing the Alteration, Part 5 – Adverse Effect Analysis and Certification. All parts must be completed to satisfy the evaluation requirements.
A narrative evaluation should accompany the data forms and provide professional opinion interpreting information from the site in a way that is relevant for evaluating impacts and compliance with performance standards. Commissions should ensure that the narrative addresses all important habitat features that occur in the impact area and that the conclusions logically follow from information on the data forms. In some cases it may be necessary to seek a qualified outside reviewer to determine whether the conclusions presented in the narrative are reasonable.

Appendix C: Wildlife Impoundments:

The Wetland Regulations allow for the construction of wildlife impoundments as limited projects under 310 CMR 10.53(3)(g). Depending on the location and design of the impoundment and the pre-existing conditions of the site, wildlife impoundments may enhance the habitat value of an area. However, the creation of a wildlife impoundment in a wetland resource area may cause considerable harm to its ecological functions and values, including wildlife habitat. When constructing wildlife impoundments as allowed under limited project provisions refer to Appendix C for guidance as to when impoundments are appropriate for wildlife habitat management and what features must be included in design.

Appendix D: Wildlife Management:

This Appendix provides guidance for the presumption (cited in 310 CMR 10.60(1)) that wildlife management practices conducted or approved by the Massachusetts Division of Fisheries and Wildlife will not result in significant adverse impacts to wildlife habitat. Using Appendix D will ensure that the wildlife habitat interest of wetlands of the Commonwealth will be protected.

Appendix E: Massachusetts River and Stream Crossing Standards, March 1, 2006 (or as otherwise amended, and referenced in the Army Corps of Engineers Programmatic General Permit, Section 404.)

Applicants required to complete Appendix B should adhere to these standards. Other applicants should also follow these standards where feasible. It is important to note that the Army Corps of Engineers Programmatic General Permit has added these river and stream crossing standards to the Category 1 eligibility requirements related to new permanent stream crossings. Therefore, applicants for Notices of Intent should incorporate the new stream crossing standards if they want to qualify for both an Order of Conditions and a non-reporting Category 1 PGP permit.

Appendix F: Conditions:

This Appendix provides draft conditions that may be used by Conservation Commissions.

VII. Conclusions

This guidance attempts to improve understanding of the Wetland Protection Act requirements for the protection of wildlife habitat and the responsibilities of the applicant. The ability to achieve adequate habitat protection through the Wetlands Protection Act is limited by the scope of jurisdiction and other factors. Comprehensive wildlife habitat protection must be incorporated within a regulatory framework and supplemented by practical considerations of many people including applicants proposing construction in or near wetlands. However, there is much that a Conservation Commission can do within the authority of the Wetland Protection Act and sound judgment is needed to determine when an alteration to wildlife habitat will substantially reduce its capacity to provide important wildlife habitat functions listed in 310 CMR 10.60 (2). When this guidance is used in a manner that is commensurate with the scope of the alteration, MassDEP will support decisions by Conservation Commissions where their authority is used to protect <u>important</u> wildlife habitat, or designs by applicants that meet the requirements within this guidance. The challenge is in determining what is important, assessing the nature and scope of the impact, ensuring that there is no adverse effect on important habitat features and functions, and conditioning project accordingly.

Appendices

Appendix A
Simplified Wildlife Habitat Evaluation

Instructions:

This simplified evaluation provides a convenient way to document the presence of important wildlife habitat features and describe activities where even small-scale projects are likely to have significant impacts on wildlife habitat functions. Section III describes when this Appendix should be used.

Note that when evaluating alterations that are above thresholds, the evaluation should cover the entire alteration and not just the portion of the alteration that is above the threshold. For example, if a project will alter 60-feet of Bank, the evaluation should cover the entire 60-feet of Bank and not just the 10 feet of Bank that is above the 50-foot threshold.

When any important habitat features listed in Appendix A will be altered in a resource area, applicants should demonstrate that there will be no adverse effect by following the guidance in Section V. When any resource area alteration involves an activity listed in Appendix A, the conservation commission should require the completion of Appendix B with the associated evaluation of design strategies and mitigation design. The simplified evaluation form is followed by background information that explains the particular reason(s) why a habitat feature or activity is on the list.

Project Location (from NOI):_____
Person Completing Form:_____ Date:_____

APPENDIX A
Simplified Wildlife Habitat Evaluation

IMPORTANT HABITAT FEATURES: Direct alterations to the following important habitat features in resource areas may be permitted only if they will have no adverse effect (Refer to Section V)

- ❑ habitat for state-listed animal species (receipt of a positive opinion or permit from MNHESP shall be presumed to be correct. Do not refer to Section V).

- ❑ sphagnum hummocks and pools suitable to serve as nesting habitat for four-toed salamanders
- ❑ trees with large cavities (≥18" tree diameter at cavity entrance)
- ❑ existing beaver, mink or otter dens
- ❑ Areas within 100 feet of existing beaver, mink or otter dens (if significant disturbance)
- ❑ existing nest trees for birds that traditionally reuse nests (bald eagle, osprey, great blue heron)
- ❑ land containing freshwater mussel beds
- ❑ wetlands and waterbodies known to contain open water in winter with the capacity to serve as waterfowl winter habitat
- ❑ turtle nesting areas
- ❑ vertical sandy banks (bank swallows, rough-winged swallows or kingfishers)

The following habitat characteristics when not commonly encountered in the surrounding area:

- ❑ stream bed riffle zones (e.g. in eastern MA)
- ❑ springs
- ❑ gravel stream bottoms (trout and salmon nesting substrate)
- ❑ plunge pools (deep holes) in rivers or streams
- ❑ medium to large, flat rock substrates in streams

ACTIVITIES: When any one of the following activities are proposed within resource areas, applicants should complete a Detailed Wildlife Habitat Evaluation (Refer to Appendix B).

- ❑ activities located in mapped "Habitat of Potential Regional or Statewide Importance"
- ❑ activities affecting certified or documented vernal pool habitat, including habitat within 100' of a certified or documented vernal pool when within a resource area
- ❑ activities in bank, land under water, bordering land subject to flooding (presumed significant) where alterations are more than twice the size of thresholds.
- ❑ activities affecting vegetated wetlands >5000 sq. ft. occurring in resource areas other than Bordering Vegetated Wetland
- ❑ activities affecting the sole connector between habitats >50 acres in size
- ❑ Installation of structures that prevent animal movement
- ❑ Activities for the purpose of bank stabilization using hard structure solutions that significantly affect ability of stream channel to shift and meander, or disrupt continuity in cover that would inhibit animal passage.
- ❑ dredging (greater than 5,000 sf)

Background Information

Important Habitat Features
When Appendix A is required, alterations to the following important habitat features may be permitted only if they will have no adverse effect (See Section V).

1. Activities Affecting Habitat for State Listed Animal Species. See 310 CMR 10.59 regarding consultation with, and approval, by MNHESP.

2. Sphagnum hummocks and pools of standing water suitable to serve as nesting habitat for four-toed salamanders (*Hemidactylium scutatum*). This state-listed amphibian requires a particular nesting habitat of sphagnum hummocks directly adjacent to pools of water that persist into the summer. This nesting habitat is generally found in limited supply throughout Massachusetts and should be protected wherever it occurs.

3. Trees with large cavities. Trees with large cavities (≥18" tree diameter at the cavity entrance), especially ones close to water, are particularly valuable for a variety of wildlife. These cavities should be large enough to be used by wood ducks, hooded mergansers, barred owls, mink and otter. This important habitat feature is very limited in supply throughout much of Massachusetts.

4. Direct disturbance to existing beaver, mink or otter dens. These are important for their existing wildlife occupants as well as future occupants of the same or different species.

5. Activities that result in significant disturbance within 100 feet of existing beaver, mink or otter dens.

6. Existing bald eagle, osprey, and great blue heron nesting trees. These species typically reuse the same nests for many years.

7. Land containing freshwater mussels beds. Freshwater mussels are a valuable food resource for raccoon, mink, otter and various species of waterfowl. Land containing these beds must be protected when they are found in dense clusters, as opposed to isolated individuals.

8. Areas that are known to contain open water in winter with the capacity to serve as waterfowl winter habitat. Relatively few areas of significant open freshwater are available for wintering waterfowl in Massachusetts. Those areas that do exist must be protected from alteration.

9. Turtle nesting areas. Turtles require particular soil conditions and sun exposure within reasonable travel distances from appropriate aquatic habitats. Availability of appropriate nesting areas may be a factor limiting turtle abundance and distribution in Massachusetts. Turtle nesting typically occurs during the month of June.

10. Vertical sandy banks. Bank and Northern rough-winged swallows and kingfishers prefer vertical sandy banks near water for nesting. This important habitat feature is generally found in limited supply throughout Massachusetts.

11. The following habitat features when not commonly encountered in the surrounding area. Although these habitat features may be very common in some areas, they are quite rare and extremely valuable in other parts of Massachusetts.

a. stream bed riffle zones (especially rare in eastern MA, the Cape and the Islands)
b. springs (important for maintaining base flows and moderating water temperatures)
c. gravel stream bottoms (trout and salmon nesting substrate)
d. plunge pools or deep holes in streams (important winter and dry weather habitats for fish and salamanders)
e. medium to large, flat rock substrates in streams (important for salamander nesting habitat and invertebrate production)

Activities

The following activities may adversely affect wildlife habitat functions even when the area of work is relatively small. The following activities when occurring within resource areas require a detailed wildlife habitat evaluation (Appendix B).

1. Projects Located in Mapped Habitat of Potential Regional or Statewide Importance. The maps depicting "Habitat of Potential Regional or Statewide Importance" have been completed for 50 communities in the Highlands and Housatonic Regions of Western Massachusetts. Analyses for the rest of the state needs to be completed. These maps identify areas of important habitat requiring detailed wildlife habitat evaluation for proposed projects. MassDEP also encourages the use of these maps for the selection of alternatives for linear infrastructure projects such as utilities, roadways and railroads. The completed maps are available at http: //www.umass.edu/landeco/research/caps/applications/dep/dep.html.

2. Activities Affecting Certified or Documented Vernal Pool Habitat (Including Habitat Within 100' of Certified or Documented Vernal Pools). Vernal pool habitat is extremely important to a variety of wildlife species including some amphibians that breed exclusively in vernal pools, and other organisms such as fairy shrimp, which spend their entire life cycle confined to vernal pool habitat. The Massachusetts Natural Heritage and Endangered Species Program conducts certification. The wetland regulations limit jurisdiction for protection of "vernal pool habitat" to a 100' zone around the mean annual boundary of a vernal pool or the to the limit of the resource area, whichever is less. Where vernal pools have been certified or documented the 100-foot habitat zone around those pools (when located within a resource area) are especially important as upland, migration, and dispersal habitat for vernal pool amphibians and reptiles. Nonetheless, it is possible to protect habitat in the vicinity of vernal pools even when it doesn't officially qualify as "vernal pool habitat", as long as it is within a resource area. Studies have documented that areas beyond the 100-foot habitat zone is biologically important for breeding amphibians and other vernal pool-using species, which do not distribute themselves uniformly around the vernal pool. In those instances where the vernal pool habitat is embedded in a much larger resource area (e.g., river front area) the issuing authority should consider how the resource area beyond the 100-foot vernal pool habitat zone may be used by wildlife, including vernal pool species, and require appropriate protection. However, the issuing authority should not require additional protection beyond the limits of the 100-foot habitat zone unless site specific information is available indicating that these areas are of particular importance for vernal pool wildlife and unless those areas are within resource areas. For example, a project that takes place within a resource area but beyond 100 feet of a vernal pool may hamper wildlife habitat functions if it affects the last areas of available upland habitat for vernal pool

amphibians and reptiles (e.g. a small wedge of appropriate habitat within a previously altered landscape). Alternatively, it may be appropriate to conclude that activities within 100 feet of vernal pools will not result in adverse impacts to wildlife habitat when the area in question is extensively altered and does not in its current condition provide appropriate habitat for vernal pool wildlife (e.g. parking lots, lawns). Therefore, applicants are encouraged to develop project designs providing the maximum undisturbed zone of habitat around vernal pools that is feasible given the project objectives.

3. Projects in bank, land under water or bordering land subject to flooding where alterations are more than twice the size of thresholds. (See section III for guidance).

4. Activities Affecting Vegetated Wetlands >5000 sq. ft. Occurring in Resource Areas Other Than Bordering Vegetated Wetland. Although isolated wetlands are not explicitly protected under the Wetlands Protection Act, they typically provide all or most of the habitat functions provided by bordering vegetated wetlands. Where significant areas of vegetated wetland (>5000 square feet) exist within other resource areas they should be considered as especially valuable habitat features. Isolated Vegetated Wetlands are protected under the federal Clean Waters Act (CWA). Therefore, applicants should do their best to avoid and minimize impacts to isolated wetlands. The CWA regulations administered by the Department require 1:1 mitigation for all impacts to isolated wetlands (314 CMR 9.06 (2)).

5. Project area is the sole connector between areas of habitat >50 acres in size. Even relatively small areas can be very important for connecting other areas of significant habitat. They have the potential to disrupt animal movement and habitat connectivity if they alter critical areas of wetland resource that function as remaining connecting habitat.

6. Structures that prevent animal movement. A variety of structures have the potential to be significant obstacles to animal movement. These include, but are not limited to, fences, stonewalls, retaining walls, standard and granite curbs, railroad tracks and other long linear projects. A number of issues come into play in determining whether a structure will significantly prevent animal movement, including design, size and orientation of the structure, surrounding land use, and availability of reasonable alternative routes for animal passage. In evaluating the impacts of structures on animal movement it is important to keep in mind the needs of some of the least mobile wildlife species, such as box turtles, turtle hatchlings, snakes, salamanders, and moles. Appendix E entitled *Massachusetts River and Stream Crossing Standards, March 1, 2006,* or as otherwise amended, provides design guidance for new river and stream crossings. Applicants only required to complete Appendix A should follow these standards where feasible.

7. Bank stabilization projects that use hard structure solutions that significantly affect the ability of the stream or river channel to naturally shift and meander, or disrupt continuity in cover that would inhibit animal passage. For certain river and streams the ability of the channel to meander or shift over time is essential for maintaining habitat quality in those waterways and their associated wetlands and riparian areas.

Bank stabilization projects that significantly affect the ability of the channel to shift or meander can result in habitat degradation. Hard structure bank stabilization projects (e.g. rip rap, gabions) can disrupt the continuity of bank habitat with the potential to disrupt movement of riparian wildlife.

8. Dredging projects. Dredging projects may result in short-term impacts to water quality from suspended sediments or resource area impacts associated with drawdown of water bodies prior to dredging. Such projects may present significant adverse impacts to wildlife habitat, and require careful conditioning to ensure that potential adverse impacts are minimized. However, dredging projects may also be undertaken as resource improvement projects (e.g. restore hydrology, nuisance aquatic control, or improved navigation) and may result in long-term improvements to wildlife habitat. The Order of Conditions also serves as authorization under Section 401 of the Clean Waters Act for projects dredging less than 100 cubic yards. Dredge projects greater than 100 cubic yards are subject to MassDEP review and permitting through the 401 Water Quality Certification Program. Dredging projects for the primary purpose of habitat restoration may take advantage of the procedures for Division of Fisheries and Wildlife review and approval of wildlife habitat management activities (Appendix D). Wildlife habitat management practices that are reviewed and approved by the Division are presumed to have no adverse effect on wildlife habitat.[6]

[6] *310 CMR 10.60 (1)(c)*

Appendix B: Detailed Wildlife Habitat Evaluation
Instructions for Completing the Detailed Wildlife Habitat Evaluation

When conducting a Detailed Wildlife Habitat Evaluation, applicants should complete the following five parts: Part 1: Summary Sheet; Part 2: Field Data Form; Part 3: Wildlife Habitat Assessment Plan; Part 4: Reducing the Alteration; Part 5: No Adverse Effect Certification.

Part 1. Summary Sheet

The detailed wildlife habitat evaluation should be done by "impact area" (see Section IV-E, page 12) and summarized on Appendix B Part 1 Summary Sheet.

Part 2. Field Data Form

This standardized field data form should be used in both wetland and upland resource areas (i.e. riverfront or land subject to flooding). A separate field form should be used for each distinctly different habitat type (e.g. emergent marsh, forested swamp, upland riverfront area) within the impact area. The only exception is where very small areas of a given habitat occur on a site; in these cases, they may be combined with another habitat type for evaluation. In addition to fieldwork, the data for this form may be gathered from various maps and aerial photographs.

The time required to complete a detailed habitat evaluation varies according to the size and complexity of the site. A typical assessment of one acre with a mix of wetland and upland resource areas should require a day or less for data collection and another half to full day to prepare the narrative. Additional time will be needed if site plans, restoration or mitigation plans are required. The Field Data Form of the detailed wildlife habitat evaluations consists of the following key sections:

I. General Information
In this section provide the project name and location, date or dates of field data collection, date the form was completed, and the person completing the form. It is generally expected that the person who completes the form and writes the narrative will be the same person who collects the field data. To verify this, a statement is included on the form that "the information on this data sheet is based on my observations unless otherwise indicated" with a place for the signature of the person completing the form.

II. Site Description

A. Site Classification
1. Wetland resource areas (including Bank, BVW, LUW, and isolated land subject to flooding that is a certified or documented vernal pool) should be described according to the Cowardin classification for "system," "subsystem," "class," "subclass," and "hydrological modifiers."

2. Other Resource Areas (including upland portions of Riverfront and BLSF (presumed significant to wildlife habitat)) should be described according to one of the terrestrial systems listed in this section of the form.

B. Site Inventory (Plant Community)
The plant inventory for wetland resource areas should be characterized by estimating percent cover for trees (>20'), shrubs (<20'), woody vines, herbaceous plants, and mosses. Plant species that comprise 10 percent or more of the vegetative cover in each stratum should be listed and dominant species identified.

C. Site Inventory (Soils)
Soils should be characterized according to information presented in the most recent soil survey for the area, supplemented, as needed, by field data. Include information on soil survey unit, drainage class, texture in the upper part, and soil depth.

III. Important Habitat Features
This section provides an extensive checklist of habitat features that might occur on a site along with references to wildlife that depend on each particular feature. When a particular feature is present, additional information should be recorded, on a separate sheet of paper, describing the habitat feature, quantifying the feature, and listing wildlife species that are likely to utilize the feature as it occurs on the site. For some habitat features it may be necessary to estimate seasonal hydrology from indicators that may be present during a site visit.

IV. Landscape Context
The section on landscape context is divided into two subsections, habitat continuity and connectivity with adjoining natural habitats. It may be necessary to consult aerial photographs[7] or maps to accurately characterize the landscape context for an impact area.

A. ***Habitat continuity*** is related to the size of habitat patches or interrelated mosaics of habitat on the landscape. Patch size is an important characteristic affecting whether or not an area provides suitable habitat for some wildlife species. Although size thresholds differ from species to species, large blocks of unfragmented habitat are essential to these area-sensitive wildlife species.

Many wetland-dependent birds that are of conservation concern in New England (waterfowl, waders, and water birds) require relatively large areas of emergent marsh habitat. The larger the marsh, the more species it can support. Likewise, it is known that some species of forest nesting birds are area-sensitive, requiring relatively large blocks of unfragmented forests (upland forest, forested wetland or a combination of the two). In addition to the actual size of a forest patch, the ratio of forest interior to edge is an important characteristic affecting the abundance and composition of forest birds utilizing an area. Other wildlife, such as waterfowl, large mammals and turtles, utilize a variety of wetland types arranged in relatively close proximity to each other. These wetland complexes are better able to meet the varied habitat requirement of these species than could any single wetland type.

The field data form provides a section for recording the size classes of emergent marsh, wetland complex, and contiguous forest habitat associated with the impact area. The lowest size categories are large enough to have value for area-sensitive species. The larger the size class of habitat involved, typically the more "area-sensitive" species it will likely support. Thus, patch size itself is an important habitat characteristic for some areas. For habitat blocks and wetland complexes in any of the size classes listed on the form, applicants should include in the narrative an evaluation of the project's likely impacts on "area-sensitive" wildlife species.

[7] A variety of aerial photographs are available from the Earth Sciences Information Office, Blaisdell House, University of Massachusetts, Amherst, MA 01003, (413/545-0359). Also, photographs can be obtained from MassGIS.

B. ***Habitat connectivity*** within a landscape is important for providing migratory habitat for wildlife as well as for maintaining regional population dynamics that are essential for the long-term viability of local wildlife populations. The field data form includes a section for use in characterizing the landscape context of a proposed project site. Five options can be selected to characterize the relationship of the site to surrounding habitats. These include:

1. No direct connections to adjacent areas of wildlife habitat
2. Connectors numerous or impact area is imbedded in a large area of natural habitat
3. Impact area contributes to a limited number of connectors to adjacent areas of habitat
4. Impact area serves a part of a sole connector to adjacent areas of habitat
5. Impact area serves as the only connector to adjacent areas of habitat

Habitat connectivity issues should be addressed in the narrative portion of the detailed wildlife habitat evaluations.

V. Habitat Degradation

The next section of the field data form provides an opportunity to record evidence of significant habitat degradation, including chemical contamination, dumping, erosion or sedimentation problems, invasive exotic plants or animals, road or highway disturbance, and other human disturbance. A detailed study of potential habitat degradation is not required. However, if degradation is evident and will likely affect the habitat value of the area, it should be noted on the form, and described and discussed in the wildlife evaluation narrative.

VI. Quantification Table for Important Habitat Characteristics

This table should summarize the habitat characteristics observed and compare the existing conditions to the proposed conditions.

Part 3. Conceptual Wildlife Habitat Assessment Plan (Depicting Impact Areas and Habitat Features)

Part 3 includes a sample wildlife habitat plan showing impact areas and wildlife habitat features. The plan should be prepared in accordance with the additional information requirements for the Notice of Intent Site Plan as detailed in the Notice of Intent instructions at http://www.mass.gov/dep/water/approvals/wwforms.htm. The plan must be certified by a person with the credentials detailed in 310 CMR 10.60(1)(b). The site plan should include specific important habitat features or general areas where wildlife habitat features exist.

Part 4. Reducing the Alteration

Applicants can demonstrate that efforts were made to reduce alterations by comparing impacts to habitat characteristics from different alternatives and revising the design accordingly. A sample alternative analysis is included in Part 4. Consideration also includes cost, existing technology, proposed use and logistics to assess whether an alternative is practicable.

Part 5. Adverse Effect Analysis and Certification

Following the guidance in Section V, Adverse Effect, the wildlife specialist must certify that there is no adverse effect from the project as designed.

Appendix B: Detailed Wildlife Habitat Evaluation

Part 1: Summary Sheet

Project Name: _____

Location: _____

Date: _____

Size of Area Being Impacted: _____

Impact Areas (linear feet, square feet, or acres for each of the impact areas within the site)

	Name	Waterbody/Waterway	Wetland	Upland*	Total Area
1.					
2.					
3.					
4.					
5.					
6.					
7.					

*Riverfront Area/BLSF

Attach Sketch map and/or photos of the Impact Areas

Narrative Description of Site (attach separate page if necessary)

Certification

I hereby Certify that this project has been designed to avoid, minimize, and mitigate adverse effects on wildlife habitat, and that it will not, following two growing seasons of project completion and thereafter, substantially reduce its capacity to provide important wildlife habitat functions.

_____

Signature of Wildlife Specialist (per 310 CMR 10.60 (1) (b))

Appendix B: Detailed Wildlife Habitat Evaluation
Part 2: Field Data Form
(For each wetland or non-wetland resource area)

I. GENERAL INFORMATION

Project Location (from NOI page 1):_____

Impact Area (number/name):_____

Date(s) of site visit(s) and data collection:_____

Weather Conditions During Site Visit (if snow cover, include depth):_____

Date this form was completed:_____

Person completing form per 310 CMR 10.60(1)(b):_____

The information on this data sheet is based on my observations unless otherwise indicated

Signature: _____

II. SITE DESCRIPTION (complete A or B under Classification -See instructions for full description)

A. Classification

1. For Wetland Resource Areas, complete the following:

System: _____
Subsystem: _____
Class: _____
Subclass: _____

Hydrology/Water Regime:
☐ Permanently flooded
☐ Intermittently exposed
☐ Semi-permanently flooded
☐ Seasonally flooded
☐ Saturated
☐ Temporarily flooded
☐ Intermittently flooded
☐ Artificially flooded

2. For Riverfront or Bordering Land Subject to Flooding Resource Areas, complete the following:
Use a terrestrial classification system such as one of the two listed below:

a. "Classification of the Natural Communities of Massachusetts (Draft)" by Patricia C. Swain and Jennifer B. Kearsley, MA DFW NHESP, Westborough, MA. July 2000. (www.mass.gov/dfwele/dfw/nhsep/nhclass.htm)
b. "New England Wildlife: Habitat, Natural History, and Distribution" by Richard M. DeGraaf and Deborah D. Rudis, USDA Forest Service, Northeastern Forest Experiment Station. General Technical Report NE-108. August 1992. 491 pages.

Community Name _____
Vegetation Description_____
Physical Description_____

B. Inventory (Plant community)

%Cover: _____Trees (>20') _____Shrubs (<20') _____Woody Vines _____Mosses _____ Herbaceous

Plant Lists (species that comprise 10% or more of the vegetative cover in each strata; "*" designates a dominant plant species for the strata):

Strata	Plant Species	Strata	Plant Species

C. Inventory (Soils)

Soil Survey Unit: _____
Drainage Class: _____
Texture (upper part): _____
Depth: _____

Depth to Water Table _____

III. IMPORTANT HABITAT FEATURES (Complete for all resource areas)

If the following habitat characteristics are present, describe & quantify them on a separate sheet & attach

Wildlife Food

Important Wetland/Aquatic Food Plants (smartweeds, pondweeds, wild rice, bulrush, wild celery)

☐ Abundant ☐ Present ☐ Absent

Important Upland/Wetland Food Plants (hard mast and fruit/berry producers)

☐ Abundant ☐ Present ☐ Absent

Shrub thickets or streambeds with abundant earthworms (American woodcock)

☐ Present ☐ Absent

Shrub and/or herbaceous vegetation suitable for veery nesting ☐ Present ☐ Absent

Number of trees (live or dead) > 30" DBH: _____

Number (or density) of Standing Dead Trees (potential for cavities and perches):

_____6-12" dbh _____12-18" dbh _____18-24" dbh _____>24" dbh

Number of Tree Cavities in trunks or limbs of:

_____6-12" diameter (e.g., tree swallow, saw whet owl, screech owl, bluebird, other songbirds)

_____12-18" diameter (e.g., hooded merganser, wood duck, common goldeneye, mink)

_____>18" diameter (e.g., hooded merganser, wood duck, common goldeneye, common merganser, barred owl, mink, raccoon, fisher)

Small mammal burrows ☐ Abundant ☐ Present ☐ Absent

Cover/Perches/Basking/Denning/Nesting Habitat

- ☐ Dense herbaceous cover (voles, small mammals, amphibians & reptiles)
- ☐ Large woody debris on the ground (small mammals, mink, amphibians & reptiles)
- ☐ Rocks, crevices, logs, tree roots or hummocks under water's surface (turtles, snakes, frogs)
- ☐ Rocks, crevices, fallen logs, overhanging branches or hummocks at, or within 1m above the water's surface (turtles, snakes, frogs, wading birds, wood duck, mink, raccoon)
- ☐ Rock piles, crevices or hollow logs suitable for:
  - ☐ otter ☐ mink ☐ porcupine ☐ bear ☐ bobcat ☐ turkey vulture
- ☐ Live or dead standing vegetation overhanging water or offering good visibility of open water (e.g., osprey, kingfisher, flycatchers, cedar waxwings)

Depressions that may serve as seasonal (vernal/autumnal) pools: ☐ present ☐ absent

Standing water present at least part of the growing season, suitable for use by:

☐ breeding amphibians ☐ non-breeding amphibians (foraging, rehydration)
☐ turtles ☐ foraging waterfowl

Sphagnum hummocks or mats, moss covered logs or saturated logs, overhanging or directly adjacent to pools of standing water in spring (four-toed salamander): ☐ present ☐ absent

IMPORTANT HABITAT CHARACTERISTICS *(If present, describe & quantify them on a separate sheet)*

Medium to large (> 6"), flat rocks within a stream (cover for stream salamanders and nesting habitat for spring & two-lined salamanders) ☐ present ☐ absent

Flat rocks and logs on banks or within exposed portions of streambeds (cover for stream salamanders and nesting habitat for dusky salamanders) ☐ present ☐ absent

Underwater banks of fine silt and/or clay (beaver, muskrat, otter) ☐ present ☐ absent

Undercut or overhanging banks (small mammals, mink, weasels) ☐ present ☐ absent

Vertical sandy banks (bank swallow, kingfisher) ☐ present ☐ absent

Areas of ice-free open water in winter ☐ present ☐ absent

Mud flats ☐ present ☐ absent

Exposed areas of well-drained, sandy soil suitable for turtle nesting ☐ present ☐ absent

WILDLIFE DENS/NESTS *(If present, describe & quantify them on the back of this sheet)*

Turtle nesting sites: ☐ present ☐ absent

Bank swallow colony: ☐ present ☐ absent

Nest(s) present of: ☐ Bald Eagle ☐ Osprey ☐ Great Blue Heron
Den(s) present of: ☐ Otter ☐ Mink ☐ Beaver

Project area is within:

- ☐ 100' of beaver, mink or otter den, bank swallow colony or turtle nesting area
- ☐ 200' of Great blue heron or osprey nest(s)
- ☐ 1400' of a bald eagle nest[8]

EMERGENT WETLANDS (*If present, describe & quantify them on a separate sheet)*

Emergent wetland vegetation at least seasonally flooded during the growing season (wood duck, green heron, black-crowned night heron, king rail, virginia rail, coot etc.)

Flooded > 5 cm	☐ present	☐ absent
Flooded > 25 cm (pied-billed grebe)	☐ present	☐ absent

Persistent emergent wetland vegetation at least seasonally flooded during the growing season (mallard, American bittern, sora, common snipe, red-winged blackbird, swamp sparrow, marsh wren)

Flooded > 5 cm	☐ present	☐ absent
Flooded > 25 cm (least bittern, common moorhen)	☐ present	☐ absent

Cattail emergent wetland vegetation at least seasonally flooded during the growing season

Flooded > 5 cm (marsh wren)	☐ present	☐ absent
Flooded > 25 cm (least bittern, common moorhen)	☐ present	☐ absent

Fine-leafed emergent wetland vegetation (grasses and sedges) at least seasonally flooded during the growing season (common snipe, spotted sandpiper, sedge wren)

Flooded > 5 cm	☐ present	☐ absent
Flooded > 25 cm (least bittern, common moorhen)	☐ present	☐ absent

IV. LANDSCAPE CONTEXT

A. Habitat Continuity (*If present, describe the landscape context on a separate sheet and its importance for area-sensitive species)*

Is the impact area part of an emergent marsh at least	1.0 acre in size?	☐ yes	☐ no
(marsh and waterbirds)	2.0 acres in size?	☐ yes	☐ no
	5.0 acres in size?	☐ yes	☐ no
	10.0 acres in size?	☐ yes	☐ no
Is the impact area part of a wetland complex at least	2.5 acres in size?	☐ yes	☐ no
(turtles, frogs, waterfowl, mammals)	5.0 acres in size?	☐ yes	☐ no
	10.0 acres in size?	☐ yes	☐ no
	25.0 acres in size?	☐ yes	☐ no

[8] 1400 feet is the distance used by NHESP for evaluating potential disturbance impacts on eagle nests under MESA. Keep in mind, however, that this doesn't give jurisdiction within 1400' of an eagle's nest; it only identifies it on the checklist so that adverse effects can be avoided if work in a resource area is within 1400 feet.

For upland resource areas is the impact area part of contiguous forested habitat at least

(forest interior nesting birds)	50 acres in size?	☐ yes	☐ no
	100 acres in size?	☐ yes	☐ no
	250 acres in size?	☐ yes	☐ no
	500 acres in size?	☐ yes	☐ no
(grassland nesting birds)	> 1 acre is size?	☐ yes	☐ no

(special habitat such as gallery floodplain forest, alder thicket, etc.) > 1 acre is size? ☐ yes ☐ no

B. Connectivity with adjoining natural habitats

- ☐ No direct connections to adjacent areas of wildlife habitat (little connectivity function)
- ☐ Connectors numerous or impact area is imbedded in a large area of natural habitat (limited connectivity function)
- ☐ Impact area contributes to a limited number of connectors to adjacent areas of habitat (somewhat important for connectivity function)
- ☐ Impact area serves as *part of* a sole connector to adjacent areas of habitat (important for connectivity function)
- ☐ Impact area serves as *only* connector to adjacent areas of habitat (very important for connectivity function)

V. HABITAT DEGRADATION (Describe degradation and wildlife habitat impacts on back of the sheet)

- ☐ Evidence of significant chemical contamination
- ☐ Evidence of significant levels of dumping
- ☐ Evidence of significant erosion or sedimentation problems
- ☐ Significant invasion of exotic plants (e.g. purple loosestrife, *Phragmites*, glossy buckthorn)
- ☐ Disturbance from roads or highways
- ☐ Is the site the only resource area in the vicinity of an otherwise developed area
- ☐ Other human disturbance

Note: These are not the only important habitat features that may be observed on a site. If the wildlife specialist identifies other features they should be noted in the application.

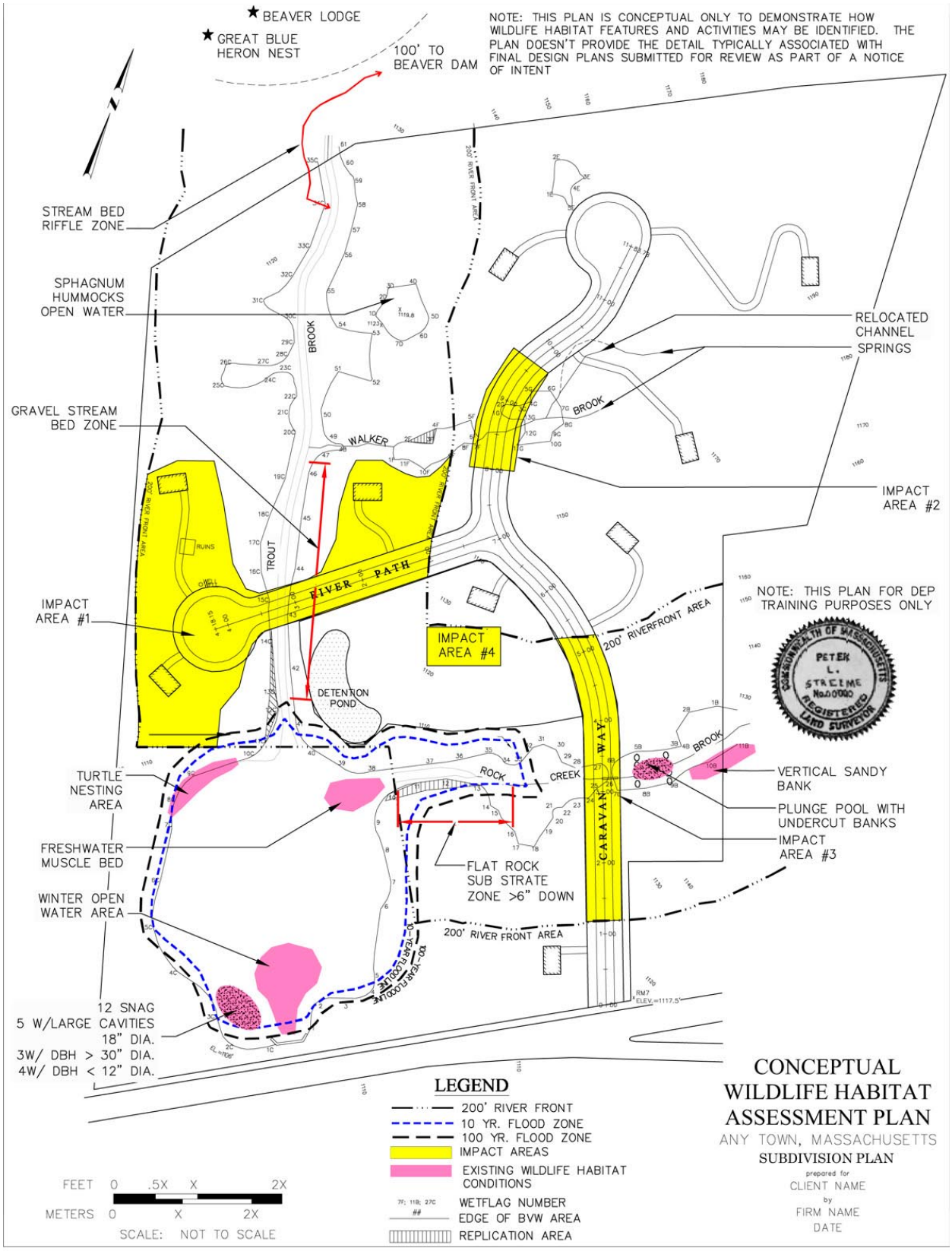
VI. QUANTIFICATION TABLE FOR IMPORTANT HABITAT CHARACTERISTICS

(For each important habitat characteristic identified within the impact area, describe amount/extent and distribution of that characteristic under current and post-construction conditions)

Habitat Characteristic	Amount Impacted in Impact Area	Current (entire site)	Post-Construction (entire site)
Example: Standing dead trees 6-12" dbh	4	12	8

SAMPLE PLAN

Appendix B: Detailed Wildlife Habitat Evaluation
Part 3: Plan Depicting Impact Areas and Habitat Features



SAMPLE

Appendix B: Detailed Wildlife Habitat Evaluation
Part 4: Reducing the Alterations

Habitat Characteristics	Amount Altered in Impact Area (Preferred)	Amount Altered in Impact Area (Alt 1)	Amount Altered in Impact Area (Alt 2)	Current (entire site)	Post-Construction (entire site) Preferred	Post Construction (entire site) Alt 1	Post Construction (entire site) Alt 2
Rocks & Woody debris under water	130 s.f.	100 s.f.	400 s.f.	Moderate (950 s.f.)	Moderate (820 s.f.)	Moderate (850 s.f.)	Limited (550 s.f.)
Live trees > 30" DBH	2 trees (32" & 36")	2 trees (32" & 36")	4 trees 2-32" & 2-36")	Limited (8)	Limited (6)	Limited (6)	Limited (4)
Dead Standing tree, >24" DBH	1 @ 28" DBH	none	1 @ 28" & 1 @ 26" DBH	1 @ 28" & 1 @ 26" DBH	1 @ 26" DBH	1 @ 28" & 1 @ 26" DBH	none
Tree cavity > 18"	1 cavity (22")	1 cavity (22")	2 cavity (22")	Rare (3)	Rare (2)	Rare (2)	(rare 1)
Vernal pool	No change	No change	Disrupt migration	Limited (2 VP – 6000 s.f.)	Limited (2 VP – 6000 s.f.)	Limited (2 VP – 6000 s.f.)	Limited (2 VP – 5000 s.f.)
Practicable Alternatives	Impact Area (Preferred)	Impact Area (Alt 1)	Impact Area (Alt 2)	Current (entire site)	Post-Construction (entire site-Preferred)	Post-Construction (entire site – Alt 1)	Post-Construction (entire site – Alt 2)
Costs	$50,000	$80,000	$40,000		X + $50,000	X + $80,000	X + $40,000
Existing Technology	Open bottom culvert	bridge	Fill drive				
Proposed Use	SFH, driveway	SFH, driveway	SFH, driveway				
Logistics	Minor ledge removal	Major ledge removal, ROW issues	none				

For Use when Appendix B is triggered

Part 5: Adverse Effect Analysis and Certification: See Section V (Adverse Effect) and Summary Sheet (Part 1) for final certification.

Appendix C: Wildlife Impoundments (Ponds)

The Wetland Regulations allow for the construction of wildlife impoundments as limited projects[9] depending on the location and design of the impoundment and the pre-existing conditions of the site; wildlife impoundments may enhance the habitat value of an area. Under other circumstances, the creation of a wildlife impoundment in a wetland resource area may cause considerable harm to its ecological functions and values, including wildlife habitat. Many species depend on vegetated wetlands and/or riparian uplands during one or more stages of their life cycles and these may be permanently displaced by creation of an open water impoundment.

In the United States, the amount of forested and emergent wetlands has decreased significantly since European colonization, while the amount of land area covered by lakes and ponds has actually increased. Conversion of wetlands to ponds effectively sacrifices an ever-diminishing resource in favor of one that has been increasing over time. What's more, many constructed ponds support wildlife species that are not native or are considered over-abundant in Massachusetts, such as mute swans and Canada geese. If they are carefully designed and constructed, wildlife impoundments can actually enhance the value of an area for native species of wildlife, including species of conservation concern. Wildlife impoundments are considered appropriate wildlife habitat management if they meet the following criteria:

- ✓ none of the important wildlife habitat features listed in Appendix A or B is adversely affected;
- ✓ the pond is constructed with a minimum 2:1 ratio of shallow water (<3ft.) to deep water (>3ft.); and
- ✓ the area surrounding the pond is vegetated with native plants[10].

Proposals for wildlife impoundments shall include:

- ✓ a justification/explanation as to how the project will enhance habitat for wildlife and identification of wildlife species the project is intended to benefit; and
- ✓ a management plan for the area that is consistent with the maintenance of habitat value.

The following accessories to impoundments generally are compatible with their function as wildlife habitat (assuming that they are of reasonable size and design for the site):

- ✓ nest boxes;
- ✓ bird blinds;
- ✓ boardwalks; and
- ✓ a small cleared area to provide access to the water (for fishing, observation, small boat launching).

[9] 310 CMR 10.53 (3)(g)

[10] For a list of native plants see Sorrie and Somers "The Vascular Plants of Massachusetts: A County Checklist" (available from the Mass. Natural Heritage Program)

The following accessories and land uses adjacent to impoundments generally are ***incompatible*** with their function as wildlife habitat:

- ✓ lawns;
- ✓ retaining walls;
- ✓ impervious surfaces;
- ✓ vehicular access;
- ✓ boat house;
- ✓ bathhouse;
- ✓ equipment sheds; and
- ✓ fencing.

As with other limited projects, it may be useful to have the applicant prepare a wildlife habitat evaluation to better determine the likely impact of the proposed impoundment on current wildlife habitat value. In addition, a review of the proposed project by the MA Division of Fisheries and Wildlife will effectively address concerns about negative impacts on wildlife habitat (see Appendix D).

Appendix D: Procedures for Massachusetts Department of Fish and Game, Division of Fisheries and Wildlife Review and Approval of Wildlife Habitat Management Projects

The Wetlands Protection Act Regulations at 310 CMR 10.60 (1)(c) recognize the value of habitat management for enhancing the wildlife habitat functions of wetland resource areas. But habitat management always involves trade-offs as habitat for some species is altered to create conditions better suited to others. The Regulations presume that habitat management practices conducted or approved by the Massachusetts Division of Fisheries and Wildlife (DFW) will not result in significant adverse impacts to wildlife habitat. The Regulations state:

"Any wildlife habitat management practice conducted by the Division of Fisheries and Wildlife, and any wildlife management practices of any individual or organization if reviewed and approved in writing by said Division, shall be presumed to have no adverse effect on wildlife habitat. Such presumption is rebuttable, and may be overcome by a clear showing to the contrary."[11]

This section of the Wetlands Regulations allows the DFW to approve wildlife management projects and, by doing so, greatly facilitates the issuance of permits for those projects. This also may relieve the issuing authority of the burden of having to consider and judge the merits of wildlife habitat practices ranging from the creation of forest clearings to lake management. A variety of ecosystem restoration projects also qualify as wildlife habitat management, including prescribed burning and the removal of invasive exotic plants. Other examples of projects that will likely be consistent with DFW's goals and objectives include the reclamation, enhancement, or enlargement of various types of early successional habitats and wildlife impoundments that adhere to the guidelines in Appendix C of this document. Given that the science of wildlife habitat management is highly complex, the types of projects approvable by DFW will change as our understanding of ecology and wildlife requirements improves. Once DFW receives a project proposal, it will review the proposal and provide a written response to the project applicant, the local issuing authority, and MassDEP. The DFW's response will include one or a combination of the following:

1. The project is a wildlife habitat management project. This shall address wildlife habitat concerns about the project and help facilitate the issuance of a permit.

2. The project provides no significant benefits to wildlife habitat or its possible benefits are unclear. In this case the applicant will need to justify the project on grounds other than wildlife habitat improvement, or make his or her own independent argument for the project's wildlife habitat management benefits before he or she will be eligible to use this purpose as a justification for the wetlands permit.

3. The project is likely to cause harm to the existing wildlife habitat values of the site. This decision will prevent the project from proceeding as proposed.

[11] *310 CMR 10.60 (1)(c)*

The DFW response is a rebuttable presumption in accordance with 310 CMR 10.60(1) c.

The Division will endeavor to respond within 60 days from receipt of the project proposal. However, failure to respond within the 60 days does not imply approval.

In order to take advantage of the DFW's wildlife habitat management approval provision, a detailed description of the project, along with applicant's name, address, telephone number, and email address (if available) may be submitted to:

Wildlife Habitat Management Review
Natural Heritage & Endangered Species Program
Division of Fisheries and Wildlife
Route 135
Westborough, MA 01581

The project description shall include:

- ✓ a list of target species for management;
- ✓ a description of the project site prior to management;
- ✓ a description of management practices to be used;
- ✓ a justification/explanation as to how the project will enhance habitat for wildlife; and
- ✓ any monitoring or on-going management plans.

Appendix E

For updates to this version, please see www.streamcontinuity.org. and the Army Corps of Engineers Programmatic General Permit, Section 404.

Massachusetts River and Stream Crossing Standards

Developed by the

River and Stream Continuity Partnership

Including:

University of Massachusetts Amherst
MA Riverways Program
The Nature Conservancy

March 1, 2006

INTRODUCTION

Movement of fish and wildlife through river and stream corridors is critical to the survival of individual organisms and the persistence of populations. However, as long and linear ecosystems, rivers and streams are particularly vulnerable to fragmentation. In addition to natural barriers, a number of human activities can, to varying degrees, disrupt the continuity of river and stream ecosystems. The most familiar human-caused barriers are dams. However, there is growing concern about the role of river and stream crossings, and especially culverts, in disrupting river and stream continuity.

Road networks and river systems share several things in common. Both are long, linear features of the landscape. Transporting materials (and organisms) is fundamental to how they both function. Connectivity is key to the continued functioning of both systems. Ultimately, our goal should be to create a transportation network that does not fragment or undermine the essential ecological infrastructure of the land and its waterways.

With funding from the Sweetwater Trust, the Massachusetts Watershed Initiative, and the Massachusetts Riverways Program, the University of Massachusetts–Amherst coordinated an effort to create river and stream crossing standards and a volunteer inventory program for culverts and other crossing structures to more effectively identify and address barriers to fish movement and river and stream continuity. Information was compiled about fish and wildlife passage requirements, culvert design standards, and methodologies for evaluating barriers to fish and wildlife passage.[1] This information was used to develop performance standards for culverts and other stream crossing structures.The following standards were developed by the River and Stream Continuity Partnership with input from an Advisory Committee that includes representatives from UMass-Amherst, MA Riverways Program, Massachusetts Watershed Initiative, Trout Unlimited, The Nature Conservancy, the Westfield River Watershed Association, ENSR International, Massachusetts Highway Department (MassHighway), and the Massachusetts Departments of Environmental Protection and Conservation and Recreation. In developing the standards, the Partnership received advice from a Technical Advisory Committee that included representatives of the U.S. Fish and Wildlife Service, USGS BRD, U.S. EPA, U.S. Army Corps of Engineers, MA Division of Fisheries and Wildlife, American Rivers, Connecticut

[1] In developing the Standards the Partnership benefited greatly from work that has been done and materials developed over the years in Washington state, Oregon, California, and Maine, and by the US Forest Service.

River Watershed Council, Connecticut DEP, a hydraulic engineering consultant, as well as input from people with expertise in Stream Simulation approaches to crossing design[2]. The standards are recommended for new permanent crossings (highways, railways, roads, driveways, bike paths, etc.) and, when possible, for replacing existing permanent crossings.

These standards seek to achieve, to varying degrees, three goals:

1. Fish and other Aquatic Organism Passage: Facilitate movement for fish and other aquatic organisms, including relatively small, resident fish, aquatic amphibians & reptiles, and large invertebrates (e.g. crayfish, mussels).

2. River/Stream Continuity: Maintain continuity of the aquatic and benthic elements of river and stream ecosystems, generally through maintenance of appropriate substrates and hydraulic characteristics (water depths, turbulence, velocities, and flow patterns). Maintenance of river and stream continuity is the most practical strategy for facilitating movement of small, benthic organisms as well as larger, but weak-swimming species such as salamanders and crayfish.

3. Wildlife Passage: Facilitate movement of wildlife species including those primarily associated with river and stream ecosystems and others that may utilize riparian areas as movement corridors. Some species of wildlife such as muskrats and stream salamanders may benefit from river and stream continuity. Other species may require more open structures as well as dry passage along the banks or within the streambed at low flow.

There are a few approaches available for designing river and stream crossings. These Crossing Standards are most consistent with a "Stream Simulation" approach for crossing design. Given the large number of species that make up river and stream communities and the almost complete lack of information about swimming abilities and passage requirements for most organisms, it is impractical to use a species-based approach for designing road crossings. The Stream Simulation approach is the most practical way to maintain viable populations of organisms that make up aquatic communities and maintain the fundamental integrity of river and stream ecosystems. Stream Simulation is an ecosystem-based approach that focuses on maintaining the variety and quality of habitats, the connectivity of river and stream ecosystems, and the essential ecological processes that shape and maintain these ecosystems over time.

Stream Simulation is a design approach that avoids flow constriction during normal conditions and creates a stream channel that maintains the diversity and complexity of the streambed through the crossing. Crossing structures that avoid channel constriction and maintain appropriate channel conditions (channel dimensions, banks, bed, and bed forms) within the structure should be able to accommodate most of the normal movements of aquatic organisms, and preserve (or restore) many ecosystem processes that maintain habitats and aquatic animal populations. The goal is to create crossings that are essentially "invisible" to aquatic organisms by making them no more of an obstacle to movement than the natural channel.

These standards are for general use to address issues of river and stream continuity, fish passage and wildlife movement. In some cases, site constraints may make strict adherence to the standards impractical or undesirable. For example, in some situations the road layout and

[2] Special thanks go to Ken Kozmo Bates and Kim Johansen for their review and useful comments on previous drafts of the Crossing Standards.

surrounding landscape may make it impossible or impractical to achieve the recommended standards for height and openness. These standards may not be appropriate for highly degraded streams where stream instability may be a serious concern. Site-specific information and good professional judgment should always be used to develop crossing designs that are both practical and effective.

Here are some important considerations to keep in mind when using these standards.

1. They are intended for permanent river and stream crossings. They are not intended for temporary crossings such as skid roads and temporary logging roads.
2. They are generally intended for fish-bearing streams. These standards are not recommended for those portions of intermittent streams that are not used by fish. However, these standards may be useful in areas where fish are not present but where protection of salamanders or other local wildlife is desired. Further, the standards are not intended for constructed drainage systems designed primarily for the conveyance of storm water.
3. These standards were developed with the objective of facilitating fish and wildlife movement and the preservation or restoration of river/stream continuity. They may not be sufficient to address drainage or flood control issues that must also be considered during design and permitting of permanent stream crossings.
4. These standards are not prescriptive. They are intended as conceptual performance standards for river and stream crossings. They establish minimum criteria that are generally necessary to facilitate fish and wildlife movement and maintain river/stream continuity. Use of these standards alone will not satisfy the need for proper engineering and design. In particular, appropriate engineering is required to ensure that structures are sized and designed to provide adequate capacity (to pass various flood flows) and stability (bed, bed forms, footings and abutments).
5. The design of any structure must consider the channel type and long profile and must account for likely variability of the stream or river for the life of the structure. A "long profile" is a surveyed longitudinal profile along the thalweg (deepest portion of the channel) of the stream extending well upstream and downstream of the crossing.
6. In urbanizing environments there is greater potential for land use changes to result in stream instability. Wherever there is potential for stream instability it is important to evaluate stream adjustment potential at the crossing location and to factor this into the design of the structure. (This is true of all crossing structures whether or not they are designed to these standards.)

Design Standards for New Crossings

These standards are for new structures at sites where no previous crossing structure existed. Culvert replacements are addressed in the following section "Standards for Culvert Replacement."

There are two levels of standards (General and Optimum) to balance the cost and logistics of crossing design with the degree of river/stream continuity warranted in areas of different environmental significance.

General Standards:

***Goal*:** Fish passage, river/stream continuity, some wildlife passage

Application

Where permanent stream crossings are planned on fish bearing streams or rivers, they should at least meet general standards to pass most fish species, maintain river/stream continuity, and facilitate passage for some wildlife.

> Fish bearing streams or rivers include rivers and streams that support one or more species of fish[3], including those portions of intermittent streams that are used seasonally by fish. These standards are also warranted where fish are not present, but where protection of salamanders or other local wildlife species is desired.

General standards call for open bottom structures or culverts that span the river/stream channel with natural bottom substrates that generally match upstream and downstream substrates. Stream depth and velocities in the crossing structure during low-flow conditions should approximate those in the natural river/stream channel. An openness ratio of 0.25 meters will pass some wildlife species but is unlikely to pass all the wildlife that would be accommodated by the optimum standards.

Standards

1. *Bridges are generally preferred, but well designed culverts and open-bottom arches may be appropriate*

   Site constraints may make the use of bridge spans impractical and in some cases well-designed culverts may actually perform better than bridges (areas with deep soft substrate). However, in areas where site constraints don't limit the usefulness of these structures, bridges are preferred over culverts.

2. *If a culvert, then it should be embedded:*

   - *≥ 2 feet for box culverts and other culverts with smooth internal walls,*
   - *≥ 1 foot for corrugated pipe arches*
   - *≥ 1 foot and at least 25 percent for corrugated round pipe culverts*

   These minimum embedment depths should be sufficient for many culverts. However, circumstances may dictate a need for deeper substrates that are based on site specific analysis. These include high gradient streams and streams experiencing instability or with potential instability that could result in future adjustments to channel elevation. In these cases long profiles and calculations of potential channel adjustments should be used to determine embedment depth.

   The intent of this standard is to provide for:

   - Sufficient depth of material within the culvert to achieve stability of the culvert bed material comparable to that of the upstream and downstream channel;

[3] These standards would also be appropriate for a portion of a stream where fish were historically present but were lost as a result of migratory barriers when there is a reasonable expectation that fish could be restored to that stream section.

- Sufficient depth of material to permit shaping of material to achieve natural depths of flow at low-flow conditions; and
- Sufficient embedment to account for long-term vertical channel adjustment anticipated for the adjacent stream bed.

In some cases site constraints may limit the degree to which a culvert can be embedded. In these cases pipe culverts should not be used and pipe arches, open-bottom arches, or bridges should be considered instead.

Use scour analyses to determine footing depths for open-bottom arches, open-bottom boxes and bridges.

3. *Spans channel width (a minimum of 1.2 times the bankfull width)*

   It is critical to avoid channel constriction during normal bankfull flows. A width of 1.2 times bankfull width is the minimum width needed to meet these standards. Bankfull width should be determined as the average of at least three typical widths, ideally measured at the proposed structure's location, and then upstream and downstream of the proposed structure (except where stream sections are not representative of conditions where the structure will be located). The stream width should be measured at straight sections of the channel outside the influence of existing structures and unusual channel characteristics. The structure should not be narrower than the bankfull width at the crossing location.

   In constricted channels 1.2 times bankfull may also be adequate for passing large, infrequent storm events and maintaining stability of both the structure and channel. However, this should be verified through standard engineering practices and calculations.

   For streams within floodplains, a clear span of 1.2 times bankfull may not be sufficient to ensure adequate water conveyance for large, infrequent flood events without destabilizing the stream channel. In these cases, wider structures or alternative means of conveying flood waters may be necessary. It is critically important that structure design on these streams be based on sound engineering.

4. *Natural bottom substrate within the structure*

   Careful attention must be paid to the composition of the substrate within the culvert. The substrate within the structure should match the characteristics of the substrate in the natural stream channel (mobility, slope, stability, confinement) at the time of construction and over time as the structure has had the opportunity to pass significant flood events.

   The substrate should resist displacement during flood events and be designed to maintain appropriate channel characteristics through natural bed load transport. Sometimes in order to ensure bed stability (stability is not the same as rigidity) at higher than bankfull flows it may be necessary to use larger substrate within the structure than is generally found in the natural stream channel. In these cases the substrate should approximate the natural stream channel and fall within the range of variability seen in the natural channel upstream and downstream of the crossing.

5. *Designed with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows*

   In order to provide appropriate water depths and velocities at a variety of flows and especially low flows it is usually necessary to reconstruct the streambed or preserve the natural channel within the structure. Otherwise, the width of the structure needed to

accommodate higher flows will create conditions that are too shallow at low flows. When constructing the streambed special attention should be paid to the sizing and arrangement of materials within the structure. If only large material is used, without smaller material filling the voids, there is a risk that flows could go subsurface within the structure.

6. *Openness ratio > 0.25 meters*

   Openness ratio is the cross-sectional area of a structure opening (in square meters) divided by its crossing length when measured in meters. For a box culvert, openness = (height x width)/ length. For crossing structures with multiple cells or barrels, openness ratio is calculated separately for each cell or barrel. At least one cell or barrel should meet the appropriate openness ratio standard. Embedded portions of culverts are not included in the calculation of cross-sectional area for determining openness ratio.[4]

Optimum Standards

***Goal*:** Fish passage, river/stream continuity, wildlife passage

Application

Where permanent stream crossings occur or are planned in areas of particular statewide or regional significance for their contribution to landscape level connectedness or river/stream ecosystems that provide important aquatic habitat for rare or endangered species, optimum standards should be applied in order to maintain river/stream continuity and facilitate passage for fish and wildlife.

Areas of particular statewide or regional significance for their contribution to landscape level connectedness include, but are not limited to, rivers/streams and associated riparian areas that serve as corridors or connecting habitat linking areas of significant habitat (>250 acres) in three or more towns.

Important aquatic habitat for rare or endangered species includes, but is not limited to, those river and stream segments identified by the Natural Heritage and Endangered Species Program (via the Living Waters or Biomap projects or regulatory review) that are considered important for protecting rare or endangered species.

Where permanent stream crossings occur or are planned in areas of high connectivity value – areas of particular statewide or regional significance for their contribution to landscape level connectedness – crossings should be designed to maintain river/stream continuity and facilitate passage for fish and wildlife. The best designs for accomplishing this involve open bottom structures or bridges that not only span the river/stream channel, but also span one or both of the banks allowing dry passage for wildlife that move along the watercourse. Where the crossing involves high traffic volumes or physical barriers to wildlife movement, the crossing structure should be sized to pass most wildlife species (minimum height and openness requirements).

[4] An Embedded Area Spreadsheet developed by the U.S. Army Corps of Engineers shows how to calculate the open area for embedded pipe culverts to meet the 0.25 standard for openness ratio. The spreadsheet can be downloaded from the Online Documents section of www.streamcontinuity.org.

Standards

1. *Use bridge spans*

   Unless there are compelling reasons why a culvert would provide greater environmental benefits only bridges should be used.

2. *Span the streambed and banks*

   The structure span should be at least 1.2 times the bankfull width and provide banks on one or both sides with sufficient headroom to provide dry passage for semi-aquatic and terrestrial wildlife.

   For streams within floodplains 1.2 times bankfull may not be sufficient to ensure adequate water conveyance for large, infrequent flood events without destabilizing the stream channel. In these cases, wider structures or alternative means of conveying flood waters may be necessary. It is critically important that structure design on these streams be based on sound engineering.

   The structure should be designed to allow dry passage (along banks or dry streambed) at least 90% of the year.

3. *Natural bottom substrate within the structure*

   Careful attention must be paid to the composition of the substrate within the culvert. The substrate within the structure should match the characteristics of the substrate in the natural stream channel (mobility, slope, stability, confinement) at the time of construction and over time as the structure has had the opportunity to pass significant flood events.

   The substrate should resist displacement during flood events and be designed to maintain appropriate channel characteristics through natural bed load transport. Sometimes in order to ensure bed stability (stability is not the same as rigidity) at higher than bankfull flows it may be necessary to use larger substrate within the structure than is generally found in the natural stream channel. In these cases the substrate should approximate the natural stream channel and fall within the range of variability seen in the natural channel upstream and downstream of the crossing.

4. *Designed with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows*

   In order to provide appropriate water depths and velocities at a variety of flows and especially low flows it is usually necessary to reconstruct the streambed or preserve the natural channel within the structure. Otherwise, the width of the structure needed to accommodate higher flows will create conditions that are too shallow at low flows. When constructing the streambed special attention should be paid to the sizing and arrangement of materials within the structure. If only large material is used, without smaller material filling the voids, there is a risk that flows could go subsurface within the structure.

5. *Maintain a minimum height of 6 ft (1.8 meters) and openness ratio of 0.75 meters if conditions are present that significantly inhibit wildlife passage (high traffic volumes, steep embankments, fencing, Jersey barriers or other physical obstructions)*

   Height should be measured from the average invert of the stream bed within the structure to the inside top of the structure.

Openness ratio is the cross-sectional area of a structure (in square meters) divided by its crossing length when measured in meters. For a box culvert, openness = (height x width)/ length. For crossing structures with multiple cells or barrels, openness ratio is calculated separately for each cell or barrel (do not add together the cross-sectional areas of multiple cells or barrels). At least one cell or barrel should achieve the appropriate openness ratio. The embedded portion of culverts is not included in the calculation of cross-sectional area for determining openness ratio.

6. *If conditions that significantly inhibit wildlife passage are not present, maintain a minimum height of 4 ft. (1.2 meters) and openness ratio of 0.5 meters*

Design Standards for Culvert Replacement

Given the number of culverts and other crossing structures that have been installed without consideration for ecosystem protection, it is important to assess what impact these crossings are having and what opportunities exist for mitigating those and future impacts. In the short term some barriers can be addresses by culvert retrofits: temporary modifications to improve aquatic organism passage short of replacement. However, culvert replacement and remediation generally offer the best opportunity for restoring continuity and long-term protection of river and stream ecosystems.

Methods have been developed, and are continuing to be refined and adapted, for evaluating culverts and other crossing structures for their impacts on animal passage and other ecosystem processes. Along with these assessments there needs to be a process for prioritizing problem crossings for remediation. The process should take into account habitat quality in the river or stream and surrounding areas, upstream and downstream conditions, as well as the number of other crossings, discontinuities (channelized or piped sections), and barriers affecting the system. It is important to use a watershed-based approach to river and stream restoration in order to maximize positive outcomes and avoid unintended consequences.

Culvert upgrading requires careful planning and is not simply the replacement of a culvert with a larger structure. Even as undersized culverts block the movement of organisms and material, over time, rivers and streams adjust to the hydraulic and hydrological changes caused by these structures. Increasing the size of a crossing structure can destabilize the stream and cause head cutting – the progressive down-cutting of the stream channel – upstream of the crossing. There also may be downstream effects such as increased sedimentation. Crossing replacement can result in the loss or degradation of wetlands that formed above the culvert as a consequence of constricted flow. In more developed watersheds, undersized culverts may play an important role in regulating storm flows and preventing flooding.

Before replacing a culvert or other crossing structure with a larger structure it is essential that the replacement be evaluated for its impacts on:

- downstream flooding,
- upstream and downstream habitat (instream habitat, wetlands),
- potential for erosion and headcutting, and
- stream stability.

In most cases it will be necessary to conduct engineering analyses including long profiles of sufficient length to understand potential changes in channel characteristics. A "long profile" is a surveyed longitudinal profile along the thalweg (deepest portion of the channel) of the stream extending well upstream and downstream of the crossing. The replacement crossing will need to be carefully designed in order to maximize the benefits and minimize the potential for negative consequences resulting from the upgrade. In many instances, some stream restoration will be needed in addition to culvert replacement in order to restore river/stream continuity and facilitate fish and wildlife passage.

Culvert replacements will need to be reviewed and permitted either by either the local conservation commission, the Massachusetts Department of Environmental Protection (§401 Water Quality Certification), the US Army Corp of Engineers, or a combination of the three.

Standards

1. *Whenever possible replacement culverts should meet the design guidelines for either general standards or optimal standards (see Standards for New Crossings above)*
2. *If it is not possible or practical to meet all of the General or Optimal standards, replacement crossings should be designed to:*

    a. *Meet the General Standards for crossing width (1.2 times bankfull width)*

    b. *Meet other General Standards to the extent practical, and*

    c. *Avoid or mitigate the following problems*

        → *Inlet drops*
        → *Outlet drops*
        → *Flow contraction that produces significant turbulence*
        → *Tailwater armoring*
        → *Tailwater scour pools*
        → *Physical barriers to fish passage*

3. *As indicated by long profiles, scour analyses and other methods, design the structure and include appropriate grade controls to ensure that the replacement will not destabilize the river/stream*
4. *To the extent practicable conduct stream restoration as needed to restore river/stream continuity and eliminate barriers to aquatic organism movement*

5. *Avoid High Density Polyethylene Pipes (HDPP) or plastic pipes*

   High Density Polyethylene Pipes, especially smooth bore, or plastic pipes shall not be installed. The inherent hydraulic characteristics (low friction coefficient) of HDPP are not conducive to passing aquatic life.

CONSTRUCTION BEST MANAGEMENT PRACTICES

Construction of road-stream crossings has the potential to generate significant adverse impacts to rivers and streams. Use of appropriate construction methods and best management practices (BMPs) are essential for meeting design standards and avoiding unnecessary impacts to water and habitat quality. Following are a list of BMPs that should be considered.[5]

Road and Crossing Location. Roads should be planned to avoid or minimize the number of road-stream crossings. Where crossings cannot be avoided they should be located in areas that will minimize impacts. Here are some rules of thumb.

- Avoid sensitive areas such as rare species habitat and important habitat features (vertical sandy banks, underwater banks of fine silt or clay, deep pools, fish spawning habitat).
- Avoid unstable or high-hazard locations such as steep slopes, wet or unstable slopes, non-cohesive soils, and bordering vegetated wetlands. Alluvial reaches are poor locations for road-stream crossings.
- Where possible locate crossings on straight channel segments (avoid meanders)
- To the extent possible align crossings perpendicular to the stream channel

Timing of Construction. In general the most favorable time for constructing road-stream crossings is during periods of low flow, generally July 1 to October 1. However, there may be occasions when a particular stream or river supports one or more rare species that would be particularly vulnerable to disturbances during low-flow conditions. Where rare species are a concern, contact the Massachusetts Natural Heritage and Endangered Species Program (NHESP) for information and advice on how to minimize impacts to those species. Such consultations are required for crossings that would affect areas of Priority Habitat identified by NHESP.

Dewatering

- Minimize the extent and duration of the hydrological disruption
- Consider the use of bypass channels to maintain some river and stream continuity during construction
- Use dams to prevent backwatering of construction areas
- Gradually dewater and rewater river and stream segments to avoid abrupt changes in stream flow
- Salvage aquatic organisms (fish, salamanders, crayfish, mussels) stranded during dewatering
- Segregate clean diversion water from sediment-laden runoff or seepage water
- Use anti-seep collars around diversion pipes

[5] Much of the following information about construction BMPs comes from training materials used as part of the U.S. Forest Service's Aquatic Organism Passage project and that will be included in an upcoming Forest Service publication "Stream Simulation: An Ecological Approach to Road-Stream Crossings."

- Use upstream sumps to collect groundwater and prevent it from entering the construction site
- Collect construction drainage from groundwater, storms, and leaks and treat to remove sediment
- Use downstream sediment control sump to collect water that seeps out of the construction area
- Use fish screens around the intake of diversion pipes
- Use appropriate energy dissipaters and erosion control at pipe outlets
- When using diversion pipes make sure adequate pumping capacity is available to handle storm flows

Stormwater Management, Erosion and Sediment Control

- Minimize bare ground
- Minimize impact to riparian vegetation
- Prevent excavated material from running into water bodies and other sensitive areas
- Use appropriate sediment barriers (silt fence, hay bales, mats, Coir logs)
- Dewater prior to excavation
- Manage and treat surface and groundwater encountered during excavation with the following
    - sediment basins
    - fabric, biobag or hay bale corals
    - irrigation sprinklers or drain pipes discharging into vegetated upland areas
    - sand filter
    - geotextile filter bags
- Turbidity of water 100-200 feet downstream of the site should not be visibly greater than turbidity upstream of the project site.

Pollution Control

- Wash equipment prior to bringing to the work area to remove leaked petroleum products and avoid introduction of invasive plants
- To avoid leaks, repair equipment prior to construction
- Be prepared to use petroleum absorbing "diapers" if necessary
- Locate refueling areas and hazardous material containment areas away from streams and other sensitive areas
- Establish appropriate areas for washing concrete mixers; prevent concrete wash water from entering rivers and streams
- Take steps to prevent leakage of stockpiled materials into streams or other sensitive areas (locate away from water bodies and other sensitive areas, provide sediment barriers and traps, cover stockpiles during heavy rains)

Construction of Stream Bed and Banks within Structures

- Check construction surveys to ensure slopes and elevations meet design specifications
- Use appropriately graded material (according to design specifications) that has been properly mixed before placement inside the structure

- Avoid segregation of bed materials
- Compact bed material
- After the stream bed has been constructed wash bed material to ensure that fine materials fill gaps and voids
- Construct an appropriate low-flow channel and thalweg
- Carefully construct bed forms to ensure functionality and stability
- Construct well-graded banks for roughness, passage by small wildlife, and instream bank-edge habitat
- Tie constructed banks into upstream and downstream banks

Soil Stabilization and Re-vegetation

- Surface should be rough to collect seeds and moisture
- Implement seeding and planting plan that addresses both short term stabilization and long term restoration of riparian vegetation
- Water vegetation to ensure adequate survival
- Use seed, mulch, and/or erosion control fabrics on steep slopes and other vulnerable areas
- Avoid jute netting and other erosion control materials that contain mesh near streams or rivers (have been known to trap and kill fish and wildlife)
- Use native plants unless other non-invasive alternatives will yield significantly better results

Monitoring

- Ensure that BMPs are being implemented
- Inspect for erosion
- Evaluate structure stability
- Inspect for evidence of stream instability
- Inspect for presence of debris accumulations or other physical barriers at or within crossing structures
- Ensure streambed continuity is maintained
- Inspect for problems with infiltration in constructed stream beds (subsurface flows)
- Inspect for scouring of the streambed downstream or the aggradation of sediment upstream of the structure

GLOSSARY

→ **Bankfull Width** – Bankfull is a geometric parameter that corresponds with the amount of water that just fills the stream channel and where additional water would result in a rapid widening of the stream or overflow into the floodplain. Indicators of Bankfull width include:

  - Abrupt transition from bank to floodplain. The change from a vertical bank to a horizontal surface is the best identifier of the floodplain and Bankfull stage, especially in low-gradient meandering streams.

- Top of pointbars. The pointbar consists of channel material deposited on the inside of meander bends. Set the top elevation of pointbars as the lowest possible Bankfull stage.
- Bank undercuts. Maximum heights of bank undercuts are useful indicators in steep channels lacking floodplains.
- Changes in bank material. Changes in soil particle size may indicate the operation of different processes. Changes in slope may also be associated with a change in particle size.
- Change in vegetation. Look for the low limit of perennial vegetation on the bank, or a sharp break in the density or type of vegetation.

→ **Bed Adjustment Potential** – Potential change in the elevation, width, depth, slope or meander pattern of the stream channel as it adjusts to a source of stream instability (changes in discharge, sediment supply, or base elevation). Instability may be caused by changes at a stream crossing site or conditions upstream or downstream of the crossing site or within the watershed (urbanization).

→ **Bedforms** – Natural bedforms include isolated boulders, particle clusters, steps, pools, head of riffles and pool tail crests, large woody debris, transverse bars, longitudinal ribs, and gravel bars. Constructed bedforms may include any of the above as well as rock and log weirs and roughened channels.

→ **Conditions that significantly inhibit wildlife passage** – These include high traffic volumes, steep embankments, fencing, Jersey barriers or other physical obstructions that prevent wildlife passage over the road surface

→ **Culvert –** As used in these Standards, culverts are round, elliptical or rectangular structures that are fully enclosed (contain a bottom) designed primarily for channeling water beneath a road, railroad or highway. Bottomless structures, though sometimes considered culverts by others, are treated separately in these Standards.

→ **Embedded Culvert** – A culvert that is installed in such a way that the bottom of the structure is below the stream bed and there is substrate in the culvert.

→ **Flow contraction** – When a culvert or other crossing structure is significantly smaller then the stream width the converging flow creates a condition called “flow contraction.” The increased velocities and turbulence associated with flow contraction can block fish and wildlife passage and scour bed material out of a crossing structure. Flow contraction also creates inlet drops.

→ **Inlet drop** – Where water level drops suddenly at an inlet, causing changes in water speed and turbulence. In addition to the higher velocities and turbulence, these jumps can be physical barriers to fish and other aquatic animals when they are swimming upstream and are unable to swim out of the culvert.

→ **Long Profile –** A long profile is a surveyed longitudinal profile along the thalweg (deepest portion of the channel) of the stream extending well upstream and downstream of the crossing.

→ **Open Bottom Arch –** Arched crossing structures that span all or part of the stream bed, typically constructed on buried footings and without a bottom.

→ **Openness ratio –** Equals cross-sectional area of the structure opening (in square meters) divided by crossing length when measured in meters. For a box culvert, openness = (height x width)/ length. For crossing structures with multiple cells or barrels, openness ratio is calculated separately for each cell or barrel (do not add together the cross-sectional areas of multiple cells or barrels). At least one cell or barrel should achieve the appropriate openness ratio. The embedded portion of culverts is not included in the calculation of cross-sectional area for determining openness ratio.

→ **Outlet drop** – An outlet drop occurs when water drops off or cascades down from the outlet, usually into a receiving pool. This may be due to the original culvert placement, erosion of material at the area immediately downstream of the culvert, or downstream channel adjustments that may have occurred subsequent to the culvert installation. Outlet drops are barriers to fish and other aquatic animals that can't jump to get up into the culvert.

→ **Physical barriers to fish and wildlife passage** – Any feature that physically blocks fish or wildlife movement through a crossing structure as well as features that would cause a crossing structure to become blocked. Beaver dams, debris jams, fences, sediment filling culvert, weirs, baffles, aprons, and gabions are examples of structures that might be or cause physical barriers. Weirs are short dams or fences in the stream that constrict water flow or fish movements. Baffles are structures within culverts that direct, constrict, or slow down water flow. Gabions are rectangular wire mesh baskets filled with rock that are used as retaining walls and erosion control structures. Steeply sloping channels within a structure resulting in shallow flows and/or high velocity flows can also inhibit movement of fish and other aquatic organisms.

→ **Pipe Arch** – A pipe that departs from a circular shape such that the width (or span) is larger that the vertical dimension (or rise), and forms a continuous circumference pipe that is not bottomless.

→ **River/Stream Continuity** – Maintaining undisrupted the aquatic and benthic elements of river and stream ecosystems, generally through maintenance of appropriate substrates and hydraulic characteristics (water depths, turbulence, velocities, and flow patterns)

→ **Stream Simulation** – A design method in which the diversity and complexity of the natural streambed are created inside a culvert, open-bottom arch, or open-bottom box in such a way that the streambed maintains itself across a wide range of flows. The premise is that if streambed morphology is similar to that in the natural channel the crossing will be invisible to aquatic species.

→ **Tailwater armoring** – Concrete aprons, plastic aprons, riprap or other structures added to culvert outlets to facilitate flow and prevent erosion.

→ **Tailwater scour pool** – A pool created downstream from high flows exiting the culvert. The pool is wider than the stream channel and banks are typically eroded. Some plunge pools may have been specifically designed to dissipate flow energy at the culvert outlet and control downstream erosion.

→ **Thalweg** – A line connecting the lowest points of a stream or river bed.

NOTES AND REFERENCES

Stream Simulation

An important source of information in this document comes from training materials used as part of the U.S. Forest Service's Aquatic Organism Passage (AOP) project. *"Stream Simulation: An Ecological Approach to Road-Stream Crossings"* is a detailed manual currently in preparation by the Forest Service that will likely be available sometime in 2006.

Another important reference for Stream Simulation is *"Design of Road Culverts for Fish Passage"* published by the Washington Department of Fish and Wildlife (2003). This may be downloaded from the following web site: http://wdfw.wa.gov/hab/engineer/cm/

Openness Ratio

There is both published and anecdotal evidence from a variety of sources that some animals (including fish) may be reluctant to enter structures that appear too confining. The occurrence of dead turtles, beavers, muskrat and other riverine animals on roadways above or near road-stream crossings suggests that certain structures may be too small or too confining to accommodate some wildlife.

The inverse of confinement is the concept of openness: the size of a structure opening relative to its length. Openness ratio is defined as the cross-sectional area of the structure opening (in square meters) divided by crossing length measured in meters.

Unfortunately, there is little information available on the openness requirements for fish and wildlife. Reed et al. (1979) concluded that 0.6 is the minimum openness ratio needed for mule and whitetail deer to use a structure. In a study of box culverts in Pennsylvania the average openness ratio for structures used by deer was 0.92 with a range of 0.46 to 1.52 (Brudin 2003). A report from the Netherlands cites data indicating that crossing structures with openness ratios < 0.35 were never used by deer while structures with openness ratios > 1.0 were always used (The Netherlands Ministry of Transport 1995).

Although there are no data or studies available on the openness requirements for species other than deer, we chose to include openness ratio as one of the standards in order to ensure some minimum level of openness. The openness standard of 0.25 in the general standards is well below that required by deer. However, it is hoped that it will be minimally sufficient for fish and small riverine wildlife species. For most roadways, the openness ratio in the optimum standards (0.50) also falls below that generally required by deer. Only when applying the optimum standards under conditions that would inhibit wildlife passage over the

road surface (Jersey barriers, fencing, high traffic volumes) does the openness standard (0.75) fall within the range of values for deer. It is hoped that an openness ratio of 0.75 also will be sufficient for other large mammals such as moose and bear.

Brudin, C.O. 2003. Wildlife Use of Existing Culverts and Bridges in North Central Pennsylvania. Pp. 344-352 In 2003 Proceedings of the International Conference on Ecology and Transportation, edited by C. Leroy Irwin, Paul Garrett, and K.P. McDermott. Raleigh, NC: Center for Transportation and the Environment, North Carolina State University, 2003..

Ministry of Transport, P. W. and W. M. 1995. Wildlife Crossings for Roads and Waterways. Road and Hydraulic Engineering Division, Ministry of Transport, Public Works and Water Management, Delft, The Netherlands.

Reed, D.F., T.N. Woodard, and T.D. Beck. 1979. Regional Deer-Vehicle Accident Research. Federal Highway Administration. Rep. No. FHWA-RD-79-11.

Reed, D.F. 1981. Mule deer behavior at a highway underpass exit. J. Wildl. Manage 45(2):542-543.

APPENDIX F: DRAFT CONDITIONS FOR WILDLIFE HABITAT

Below are sample conditions that may be used by issuing authorities if desired. While many of the following conditions should already be included in project plans, these conditions may be used where data is not shown, or to emphasize certain conditions. Conditions must be designed to address the individual project circumstances and therefore, not all of the conditions herein will be appropriate for every project. Issuing authorities should use discretion when deciding which of these conditions to use.

1. *[Note this requirement should be based on the lost habitat]* The important wildlife habitat characteristics of the proposed mitigation areas shall include the following: [insert site specific list of wildlife habitat characteristics here].

2. All woody and herbaceous plantings (other than grasses) used in replication or restoration of important wildlife habitat within wetland resource areas and within 100 feet thereof shall consist of species indigenous to the northeastern U.S. Plants not allowed as part of the habitat plan include invasive species and those identified in the MassDEP "Massachusetts Inland Wetland Replication Guidelines", March 2002.

3. If invasive species are present in proposed mitigation areas at the time of a request for Certificate of Compliance, elimination of invasive species within the area disturbed by the project shall be required prior to the issuance of a Certificate of Compliance.

4. The disruption of wildlife passage resulting from retaining walls and solid fences along a right of way shall be evaluated and minimized to the maximum extent feasible. Details of such fencing shall be submitted on plans to the Conservation Commission for approval at least 30 days prior to construction. All fencing (other than erosion and siltation fencing or wildlife barrier fencing at wildlife crossings) must be demonstrated to be sufficient for wildlife passage. Fencing shall be located outside the wetland areas, vernal pools, vernal pool habitat or rare species habitat unless avoidance is not feasible.

5. Stormwater discharged to any water body or waterway, vernal pool, or BVW shall meet the Massachusetts Stormwater Management Policy issued in March 1997.

6. Vegetation management shall be carried out in accordance with a Department of Food and Agriculture approved Vegetation Management Plan per 333 CMR 11.00: Rights of Way Management, effective July 10, 1987.

7. Erosion controls shall not contain nylon netting or nylon mesh material that can entangle wildlife. Erosion controls shall be removed immediately upon stabilization of soils on the property.

8. (For Bank (Inland) and land under water on streams) The proposed "wildlife habitat replacement area" shall be constructed per [title of plan] dated [date]. The "replacement area" shall be constructed so as to replicate the conditions of the natural stream channel, including the natural hydroperiod and sinuosity of the altered stream during an average growing season.

Riverfront

9. The area depicted on the plan(s) of record, shall not be maintained in any manner, including mowing, planting of non-indigenous ornamental plantings, or any other activity, as defined at 310 CMR 10.04 Activity, except those specifically necessary and approved by the Conservation Commission to maintain the "restoration/ replication/ mitigation area" as such. The applicant may erect and maintain bird feeding stations, perches, and houses; introduce plantings of indigenous species; and control and eradicate non-indigenous species for the purposes of enhancing the "restoration/replication/ mitigation area", provided that the Conservation Commission is notified and approves these actions. This requirement is ongoing and does not expire upon the completion of this project or the issuance of a Certificate of Compliance.

10. A professional wetland scientist acceptable to the Conservation Commission shall conduct annual inspections of all restoration & replication areas. These inspections shall occur on [date], and if conditions warrant, the Conservation Commission reserves the right to require additional annual inspections until such time as the "restoration/ replication/ mitigation areas" meet the design requirements specified in the plan(s) of record. Based upon these inspections, the environmental scientist shall submit a "Mitigation Status Report" by [specify date] including any recommended adjustments that will meet the intent of 310 CMR 10.58(4)(d) 1.a. and/or c., and/or 310 CMR 10.60(2)(e) and (3). If recommendations are made that the Conservation Commission approves and determines necessary to meet the conditions of this Order and of 310 CMR 10.58(4)(d) 1.a. and/or c., the applicant shall carry out those recommendations within a reasonable time period, as specified and required by the Conservation Commission.

Fisheries & Culverts

11. All new or replacement culverts shall be designed to facilitate fish passage and wildlife movements in accordance with the general standards established by the River and Stream Continuity Partnership entitled *Massachusetts River and Stream Crossing Standards, March 1, 2006* at www.streamcontinuity.org, or as amended, and referenced in the Army Corps of Engineers Programmatic General Permit, Section 404 (See Appendix E) to the maximum extent practicable.

12. The Applicant shall design all new and replacement culverts or other crossings (including any bridge sections) to maintain the existing elevations and lateral extent of resource area surface waters (including LUW and BVW) up and downstream of the culverts or crossings. Existing elevation shall mean: mean annual flood level, mean annual low water level, mean annual high water line, 10-year flood and 100-year flood elevation. Any new or replacement culvert that is designed to alter the existing wetland surface water elevation shall require written notice to and approval by the Conservation Commission (e.g. Compliance with condition 11 may result in alteration of existing surface elevation).

13. Work is prohibited within anadromous and catadromous fish runs [include names] from March 1 through June 15 (unless an alternative time frame is approved in writing by MADMF). During construction, and before February 15, the work zone shall be modified as necessary to allow fish passage. Sediment and erosion control shall be in place and functioning.

14. Throughout the year, flow shall not be obstructed and passage shall be provided to allow downstream migration of juvenile anadromous fish. Culvert inverts shall be the same elevation as existing conditions in order to avoid drop-offs that could impede fish or small animal passage, unless the Conservation Commission provides written approval for such a change in invert elevation. Prior to construction, the applicant shall seek written guidance from MADMF regarding construction restrictions or other improvements to fisheries passage or habitat and submit such written guidance to the Conservation Commission. Based on its review of MADMF guidance, the Conservation Commission may require additional mitigation to protect the fisheries.

15. During construction, the applicant shall promptly address any concerns of the Conservation Commission regarding construction restrictions, fisheries passage or habitat.

16. [In the event that a waterbody is temporarily drained] The applicant shall restock the restored [reservoir, lake, pond] with fish species such as [species] if it is deemed necessary by MDFW. The applicant shall consult with MDFW during the development of the restocking program and shall provide the Conservation Commission with written comment from MDFW that includes specifications for the restocking program such as desired species, quantities and timing of restocking. The applicant shall obtain written approval from the Conservation Commission prior to commencing the restocking program.

Vernal Pools

17. Work shall be prohibited within Certified or Documented Vernal Pool habitat during the period from March 1 through May 1 or as otherwise specified in writing by the Conservation Commission after consultation with the Massachusetts Natural Heritage and Endangered Species Program. Immediately prior to March 1, a Wildlife Specialist shall review locations of sedimentation barriers and shall remove all barriers necessary to avoid disrupting migration routes. Temporary stabilization measures shall be installed prior to removal of sedimentation barriers to prevent erosion and sedimentation of resource areas.

18. At least 30 days prior to the start of work within 100 ft. of any certified or documented vernal pools, the Contractor shall provide to the Conservation Commission for review and approval a plan that includes proposed actions to protect all project-area certified or documented vernal pools from construction related activities. These actions shall be developed in consultation with a Wildlife Specialist and/or a Biologist with specific knowledge about vernal pool species. Compliance with MNHESP requirements under 310 CMR 10.59 shall occur if the project affects rare species habitat. [This condition should not be necessary if it is already included in the application].

19. Proposed mitigation shall include additional measures to prevent sediments from entering the vernal pools during the construction phase. An inspection and maintenance plan for culverts or catch basins that eventually discharge to the pools shall be submitted. This plan shall be combined with the Operation and Maintenance Plan required for stormwater management structures including ditches and culverts. [This condition should not be necessary if it is already included in the application].

20. No activity shall occur within the vernal pool or vernal pool habitat. All contractors and subcontractors shall be trained to recognize vernal pools, even in the dry season. Appropriate erosion control and sediment barriers shall delineate the vernal pool habitat and shall be marked with special flagging to delineate the vernal pools. Efforts shall be taken to prevent the creation of ruts deeper than 6-inches in the area surrounding the vernal pool habitat since such ruts can result in trapping and predation of migrating juveniles (e.g. Construction in the vicinity of the vernal pool shall occur when the ground is frozen, if possible).

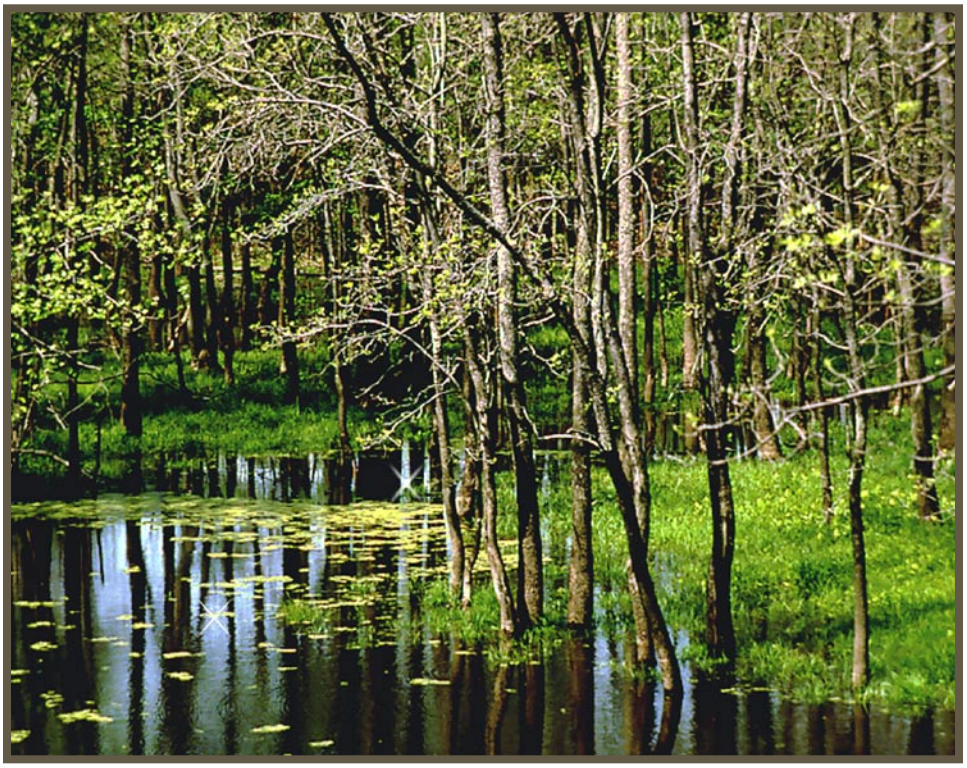
Wildlife Crossings *[For use only in projects with very large impacts or especially significant impacts]*

21. Wildlife crossings shall be constructed at [location], as shown in the plan dated [date]. The designs of all of the crossing structures must be made in consultation with MNHESP. After installation of the crossing, the applicant shall continue to consult with the Conservation Commission and with MNHESP to see what final design modifications if any, shall be made to the crossings to be installed.

22. Barrier fencing shall be installed to keep individual animals away from the [tracks, roadway] and direct them toward the crossing structure. If any design modifications are made to the crossings, both MNHESP and the Conservation Commission shall approve the new design modifications.

Beaver, Muskrat, & Otter

23. A maintenance plan shall be submitted for the water level control device to ensure that it functions as designed, and that flows are not obstructed. Annual inspections shall be conducted and maintenance shall occur as necessary.



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