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DRAFT – FOR CONSIDERATION AT THE OCTOBER 18, 2007 MEETING OF THE HIGHLANDS COUNCIL

DRAFT
ECOSYSTEM MANAGEMENT TECHNICAL REPORT ADDENDUM
OCTOBER 2007
Vernal Pool Habitat Protection

Version - October 9, 2007

Overview:
The Highlands Council received public comments expressing both support for and strong objections to the Draft Regional Master Plan (RMP) policy and mapping methodology of 1,000-foot buffers around NJDEP-confirmed vernal pools in the Highlands Region. The following addendum provides additional analysis of the appropriate resource protection area for these sensitive habitats.

Vernal pools are unique ecosystems that:

- Provide critical breeding habitat for a variety of amphibian and invertebrate species;
- Contribute significantly to local biodiversity by supporting plants, animals, and invertebrates that would otherwise not occur in the landscape; and
- Contribute significant amounts of food to adjacent habitats.

Protecting vernal pools and adjacent habitat are important for maintaining ecological integrity and providing amphibian and invertebrate breeding habitat (Semlitsch 1998, Gibbons 2003). For pool-breeding amphibian species, studies indicate amphibian species travel distances ranging from 400 to 4,000 feet from vernal pools to surrounding terrestrial habitat (Faccio 2003; Petranka 1998; Calhoun and deMaynadier, 2004).

The New Jersey Department of Environmental Protection (NJDEP) currently regulates vernal habitat through the Freshwater Wetlands Act Rules at N.J.A.C. 7:7. Unless threatened/endangered (T&E) species habitat is present within the vernal habitat, the Freshwater Wetlands Act Rules classify vernal habitat as intermediate value wetlands. The Freshwater Wetlands Act Rules prescribe a 50-foot transition area adjacent to intermediate value wetlands unless T&E species are identified, at which point the Rules provide for a 150-foot transition area. These protective areas do not provide adequate habitat protection for species dependent upon ephemeral vernal pools.

Semlitsch (1998) summarized the use of terrestrial habitat by pond-breeding salamanders and evaluated whether current laws (as of publication date) adequately protect salamander populations. The author summarized average migration distances for adults of six species (411 feet), and juveniles of two of these species (228 feet) of pond-breeding salamanders respectively. An average migration distance represents a distance encompassing only 50% of the studied populations. A terrestrial buffer encompassing the majority (i.e., upper 95% confidence limits) of the populations would have to encompass the terrestrial habitat 534 feet from a wetland's edge. Semlitsch noted that literature results state that adult and juvenile salamanders were found up to 2,051 feet and 810 feet from the edge of wetlands, respectively. The author stated that all studied salamander migration occurred well beyond federal wetland protection boundaries and that 76% of studied salamanders were found beyond the extended terrestrial buffers provided through Massachusetts and Florida state regulations. It should be noted that the studied populations occurred well beyond the vernal pool transition areas provided by New Jersey's Freshwater Wetlands Act Rules. Results from Semlitsch (1998) indicate that New Jersey's transition areas are inadequate to protect the salamander species potentially utilizing these habitats. The author recommends that the 534 foot buffer encompassing 95% of the studied populations is scientifically defendable and is an appropriate general starting point for initiating legislative change regarding wetland buffers for pond-breeding amphibians.

Rittenhouse and Semlitsch (2007) applied a univariate kernel density estimation to a series of data sets about amphibian migration to reflect an aggregate distribution from wetland breeding habitat to non-breeding upland habitat for all amphibians. Results from the study found that 95% of amphibians occur within 2,179 feet from the wetland edge, and 50% of amphibians occur within 305 feet. Species data included: California tiger salamander, Spotted salamander, Mole salamander, Tiger salamander, Great crested newts, Western toad, Japanese common toad, Spotted frog, Wood frog, and Dusky gopher frog.

Semlitsch and Bodie (2003) reviewed literature related to amphibian and reptile terrestrial habitat requirements around wetlands. They distinguish between core habitat and wetland/riparian buffer zones for amphibians and reptiles. Core habitat is defined as the amount of terrestrial habitat used by a population during migrations to and from wetlands and for foraging. Wetland/riparian buffer zones are typically applied to promote water quality protection, and are often significantly smaller in size than core habitat required by local amphibian and reptile populations.

Using extensive, species-specific data for migration distances from wetlands, the authors compiled a table of mean minimum and maximum core terrestrial habitat for each taxa.

Table 1. Mean Minimum and Maximum Core Terrestrial Habitat for Amphibians and Reptiles*

Group	Mean minimum (ft)*	Mean maximum (ft)*
Frogs	673	1207
Salamanders	384	715
Amphibians	522	951
Snakes	551	997
Turtles	404	941
Reptiles	417	948
Herptofauna	466	948

*Table reproduced from Semlitsch and Bodie (2003)
**Values represent mean linear radii extending outward from the edge of aquatic habitats from summary data.

The data suggest that an appropriate core habitat value could be derived from the maximum value generated by the local taxon with the largest core habitat requirements. It is assumed that utilizing the largest habitat area would encompass all other taxa core habitat requirements. The authors suggest that the maximum value is appropriate for application to public lands, where conserving biodiversity is often a high priority. They state that, on private lands, where sustainable land use is the priority, a tiered protection zone system could minimize impacts to wildlife and support private land uses. The authors propose a tiered system of three terrestrial zones adjacent to core aquatic and wetland habitat:

1. Aquatic Buffer - a first terrestrial zone immediately adjacent to the aquatic habitat which is restricted from use and designed to buffer the aquatic habitat and protect water resources.
2. Core Habitat - a second terrestrial zone that starts at the aquatic habitat edge, overlaps the first terrestrial zone, and extends to encompass the core terrestrial habitat defined by the local taxon.
3. Terrestrial Buffer - a third zone terrestrial zone that extends from the edge of the second terrestrial zone outward to serve as a buffer to protect the core terrestrial habitat from edge effects of surrounding land use.

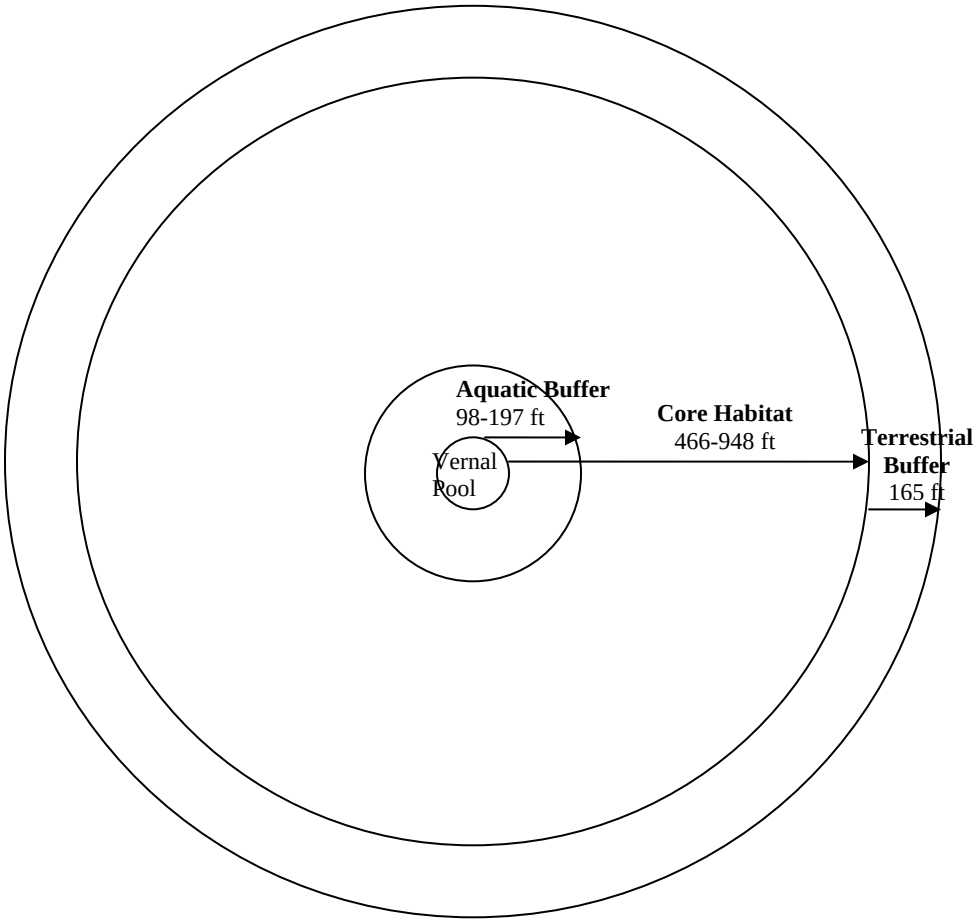

Figure 1. Proposed zones of protection of a vernal pool (reproduced from Semlitsch and Bodie [2003]).

The Highlands Council performed a literature review of migration distances from vernal pools to upland habitat for the species listed by NJDEP as obligate (i.e., dependent upon for survival) and facultative (utilizes for habitat requirements) vernal pool-breeding species in the state. Results from the literature review are included in the following table:

Table 2. New Jersey's Vernal Pool-breeding Amphibians

Species	Vernal Class	State Status	Migration Distance (in feet)**	Literature**
Marbled salamander	Obligate	Special Concern	637 (mean) 0-1,476 (range); 98	Williams (1973) in Semlitsch and Bodie (2003); Douglas and Monroe (1981) in Semlitsch (1998)
Eastern tiger salamander	Obligate	Endangered	197 (mean) 0-938 (range); 532;	Maddison and Farrand (1998) in Semlitsch and Bodie (2003); Semlitsch (1983) in Semlitsch (1998)

Species	Vernal Class	State Status	Migration Distance (in feet)**	Literature**
Spotted salamander	Obligate		387 (mean) 49-689 (range); 656; 220; 339; 211; 492; 630	Madison (1997) in Semlitsch and Bodie (2003); Windmiller, B.S. (1996); In Semlitsch (1998): Wacasey (1961); Wacasey (1961); Williams (1973); Douglas and Monroe (1981); Kleeberger & Werner (1983)
Jefferson salamander	Obligate	Special Concern	827 (mean) 65-2,051 (range); 820; 303	Williams (1973) in Semlitsch and Bodie (2003); Douglass & Monroe (1981) in Semlitsch (1998); Wacasey (1961) in Semlitsch (1998)
Blue-spotted salamander	Obligate	Endangered	570 (mean); 656 (max); >820; impacts occur at 82-114 from an edge	Homan and Windmiller (1999) in MNHESP (2006); Windmiller (1996) in MNHESP (2006); Regosin et al. (in press) in MNHESP (2006); Lannoo (2005)
Wood frog	Obligate		6,561	Berven, and Grudzien (1990)
Eastern spadefoot frog	Obligate		3,000 (max)	Dodd (1996) in Lannoo (2005)
Green frog	Facultative		397 (mean) 1,181 (max)	Lamoureux & Madison (1999) in Semlitsch and Bodie (2003)
Bullfrog	Facultative		1,332(mean)	Ingram & Raney (1943) in Semlitsch and Bodie (2003)
Pickerel frog	Facultative		None found	
Southern leopard frog	Facultative		None found	
Carpenter frog	Facultative	Special Concern	None found	
Northern cricket frog	Facultative		26-72 (range)	O'Neil (2001) in Semlitsch and Bodie (2003)
Northern spring peeper	Facultative		1,000 (max)	Davis (1999)
NJ chorus frog	Facultative		None found	
Upland chorus frog	Facultative		None found	
Northern gray treefrog	Facultative		None found	
Southern gray treefrog	Facultative	Endangered	None found	
Pine Barrens treefrog	Facultative	Threatened	230 (mean) 348 (max); (344)	Freda & Gonzalez (1986) in Semlitsch and Bodie (2003); Freda and Gonzalez (1986) in Lannoo (2005)
Four-toed salamander	Facultative		None found	
Long-tailed salamander	Facultative	Threatened	100 (max)	Anderson & Martino (1966) in Semlitsch and Bodie (2003)
American toad	Facultative		76-1,575 (range)	Oldham (1966) in Semlitsch and Bodie (2003)
Fowler's toad	Facultative	Special Concern	None found	

*Table reproduced from NJDEP-DFW (2007)
**Migration distance added through literature review

For vernal pools located on privately-owned, small parcels of land the Metropolitan Conservation Alliance (Calhoun and Klemens, 2002) recommends three rings of buffers (vernal pool depression, 100-foot protection zone, 750-foot amphibian life zone) around vernal pools in which differing degrees of management activities are recommended. It should be noted that the authors do not reference literature to support the specific recommended distances for either the 100-foot protection zone or the 750-foot life zone. The authors include a recommendation allowing disturbance of up to 25% of the amphibian life zone in the Management Goals and Recommendations Section. This recommendation appears to be based on data from one unpublished study in Massachusetts in which the researcher compared amphibian populations at two vernal pool breeding sites for five years. One site was undisturbed and the other site lost 25% of surrounding forest to residential development within 1,000 feet of the pool. Data from the disturbed site showed a 53% decline in spotted salamander population, a 40% decline in wood frog population, and a 2-year decline in blue-spotted salamander numbers, that recovered the following two years. The authors state that this study indicates that development that removes 25% of surrounding critical terrestrial habitat can harm vernal pool-breeding wildlife. They then recommend that future development footprints be limited to <25% of the area surrounding vernal pools. This recommendation is not scientifically defensible as it assumes that limiting development footprints to <25% will protect vernal pool-breeding wildlife. However, in the one study in which 25% of the surrounding forest was cleared for development, the data shows fairly dramatic declines in amphibian populations at that site. It would seem that more extensive research would be needed to support a recommendation for a percentage of land that may be disturbed without harming existing vernal pool-breeding wildlife populations. In the Specific Issues and Recommendations Section, the authors include literature citations relating to Conservation Issues for amphibians but include very few sources relating to their Management Recommendations.

Similarly, the Metropolitan Conservation Alliance (Calhoun and deMaynadier, 2004) recommends three rings of buffers (vernal pool depression, 100-foot protection zone, 400-foot amphibian life zone) around vernal pools located in "managed" forests (i.e., forest canopy disturbance followed by renewed forest growth and not subject to permanent conversion to development, roads, and associated impervious surfaces) in which differing degrees of management activities are recommended. It should be noted that the authors do not reference literature to support the specific recommended distances for either the 100-foot protection zone or the 400-foot life zone nor for the management goals and recommendations within those zones. They do cite literature sources presenting data for vernal pool-breeding wildlife migration distances away from vernal habitat, and all reported data are larger than the 400-foot life zone recommendation.

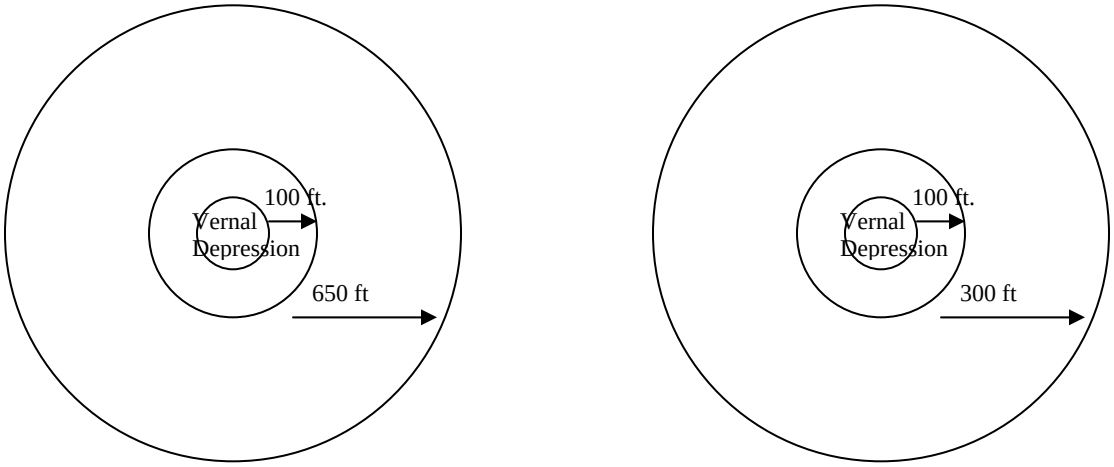

Figure 2. Proposed zones of protection around vernal pools on 1) privately-owned, small land parcels and 2) managed forests respectively (reproduced from Calhoun and Klemens [2002] and Calhoun, A. J. K. and P. deMaynadier [2004]).

Given the lack of scientific defensibility of the management recommendations for activities allowed within the amphibian life zone outlined by Calhoun and Klemens (2002), the Highlands Council is not proposing their tiered management approach for undisturbed vernal pools. Instead, the Council is proposing that a 1,000-foot protective buffer be applied to Highlands Region vernal pools. This size buffer is scientifically robust as evidenced by data in Tables 1 and 2. It also accounts for the three protective buffers recommended by Semlitsch and Bodie (2003) for: 1) water quality protection around the vernal pool, 2) core terrestrial habitat, and 3) terrestrial habitat. The Council is proposing a nomination procedure be to increase vernal pool protection buffers if an applicant can demonstrate, in coordination with the Highlands Council and NJDEP's Endangered and Nongame Species Program, that:

- Existing vernal pool-breeding wildlife require a larger protective buffer.

Similarly, the Council is proposing a procedure to permit decreased vernal pool protection buffers if an applicant can demonstrate, in coordination with the Highlands Council and NJDEP's Endangered and Nongame Species Program, that:

- In an undisturbed wetland, existing vernal pool-breeding wildlife require a smaller protective buffer;
- Existing land uses present a human, natural, or development barrier to vernal pool-breeding wildlife; or
- A need to protect public health and safety, or to provide for minimum practical use with required mitigation, (including a habitat protection buffer in addition to mitigation), in the absence of any alternative through issuance of a waiver by NJDEP.

If an applicant successfully demonstrates the first item listed above, in concert with the Highlands Council and NJDEP's Endangered and Nongame Species Program, migration distances for the specific species identified at the site dictate the protection buffer size, and that protection buffer will remain intact.

If an applicant successfully demonstrates the second item listed above, in concert with the Highlands Council and NJDEP's Endangered and Nongame Species Program**,** then the vernal pool is classified as disturbed. For disturbed vernal pools, the Council propose implementation of a variety of the best management practices (BMPs) for land use outlined in Calhoun and Klemens (2002) that maintain a majority of vernal pool-breeding wildlife habitat.

If an applicant successfully obtains a Highlands Preservation Area Approval with a waiver from NJDEP, the Council recommends a requirement for in-kind mitigation with additional terrestrial habitat protection buffers.

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