

streams cross beneath NH 28. Build Alternatives A, B, C, and D would also result in floodplain impacts near the eastern end of the alignment, near the intersection of Tsienneto Road and NH 102, where a small tributary of Beaver Lake flows under Tsienneto Road (Figure 4.15-1). Alternative F would cross the floodplain for Horne’s Brook at the existing NH 102 crossing. In addition, Alternative F would require a minor impact on the floodplain along Beaver Brook along the east side of NH 102 near Hoodcroft Golf Course (Figure 4.15-1).

**Table 4.15-2. Floodplain and Floodway Impacts by Build Alternative**

Alternative	Floodway (acres)	100-Year Floodplain (acres)
A	0.15	0.45
B	0.20	0.90
C	0.45	1.87
D	0.45	1.84
F	0.06	0.31

**4.15.3 Mitigation**

With any Build Alternative selected, detailed hydraulic analyses would be completed during final design to avoid and/or minimize impacts on the floodway, and in particular to avoid raising the base flood elevation.

**4.16 Plant Communities and Wildlife**

The Fish and Wildlife Coordination Act (16 USC 661-666, as amended by PL 89-72) requires applicants of federally funded or federally permitted projects to consult USFWS and NHFGD throughout the course of the project. USFWS and NHFGD can issue recommendations to avoid, mitigate, or compensate for impacts to fish and wildlife resources within the study area. The study area for assessing plant communities and wildlife resources encompasses approximately 26 square miles within western portions of Derry and eastern Londonderry in western Rockingham County, NH (Figures 4.16-1 and 4.16-2).

Wildlife habitats are in large part determined by land cover types and land use. These variables within the project footprint and the surrounding landscape were assessed using the land cover data provided by the 2015 NH Wildlife Action Plan (NHFGD, 2015a), a document and data sets developed by NHFGD to provide information for wildlife conservation prioritization and planning. The NH Wildlife Action Plan land cover data are available as a GIS data layer from GRANIT. It identifies mixed forest types (Appalachian Oak-Pine and Hemlock-Harwood-Pine) as the dominant cover types in the Project study area. The study area is shown in Figure 4.16-1 and includes the plant communities and wildlife habitat near the alternatives that may be affected by the Project. The analysis of plant community types within these cover types and associated wildlife habitat was augmented using publically available aerial photography (Google Earth, 2016) along with limited field reconnaissance. The plant community types within the study area include hardwood, softwood, and mixed wood forests, shrubland, agricultural fields, wetlands, and developed areas. Wetland communities include forested and scrub-shrub wetlands (including

vernal pools), emergent marsh, and wetland meadows communities. In addition to land cover data, the NH Wildlife Action Plan provides an assessment of habitat value, ranking all lands within NH as highest ranked in the state by ecological condition, highest ranked in the biological region by ecological condition, supporting landscapes, and not ranked (all the rest). The habitat value of the lands within the study area was also assessed using this analysis (Figure 4.16-2).

#### 4.16.1 Affected Environment

The study area is dominated by development, with about 50 percent of the land area influenced by residential development and transportation and utility infrastructure. In addition, many of the major roadway corridors, including NH 102, NH 28, and NH 28 Bypass, contain substantial commercial, industrial, and mixed-use development. Much of the remaining undeveloped land in the study area is fragmented by this development. However, the natural land covers and the less intensively developed areas present within the study area provide suitable habitat for a wide variety of wildlife species. These habitats and the wildlife that uses them are described in the following section.

#### Plant Communities

##### *Hardwood Forests*

Mature hardwood stands within the study area are typically dominated by a dense canopy of northern red oak (*Quercus rubra*), white oak (*Quercus alba*), red maple (*Acer rubra*), sugar maple (*Acer saccharum*), and white birch (*Betula papyrifera*), often with a variable softwood component. Other less commonly occurring canopy species include white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), American beech (*Fagus grandifolia*), and American elm (*Ulmus americana*). The understory of the hardwood forests commonly includes witch-hazel (*Hamamelis virginiana*) and beaked hazelnut (*Corylus cornuta*) trees and seedlings. Bracken fern (*Pteridium aquilinum*) and other fern species, wintergreen (*Gaultheria procumbens*), Canada mayflower (*Maianthemum canadense*), lowbush blueberry, and additional forbs, sedges, and grasses occur in the herbaceous layer of these forests.

Mature hardwood forests support wildlife species requiring habitat features such as closed canopies (e.g., red-eyed vireo [*Vireo olivaceus*]) or moderately sized tree cavities (e.g., northern [*Glaucomys sabrinus*] and southern flying squirrels [*Glaucomys volans*]) (DeGraff and Yamasaki, 2001). Mature hardwood forest also provides thicker leaf litter, downed deadwood, and sparse herbaceous cover, all of which are important habitat features for a variety of wildlife species. Mature stands with mast producing trees (e.g., oaks and beech) provide important forage for a wide variety of wildlife species including squirrels, white-tailed deer, black bear (*Ursus americanus*), and wild turkey (*Meleagris gallopavo*).

Young hardwood stands that occur in cut-over or otherwise disturbed portions of the study area are typically dominated by pioneer species such as quaking aspen (*Populus tremuloides*), gray birch, pin cherry (*Prunus pensylvanica*), and stump sprouts of red maple, northern red oak, and white oak. The generally sparse overstory of young forests typically supports dense shrub and herbaceous layers that include early successional plant species. The wildlife species that use these stands depend on those early successional species or the dense growth forms. For example, American woodcock and ruffed grouse will use hardwood stands dominated by young aspen. Young hardwood stands characterized by moderately high structural complexity, may support a

greater diversity of bird species than mature stands that typically have only moderate structural complexity.

### *Softwood Forests*

Softwood forests within the study area are dominated by eastern white pine mixed with lesser amounts of red pine and hardwood species. Eastern hemlock is also present, especially on shaded slopes and along the edge of wetlands. Structural complexity is generally low within softwood forests, as shading and other factors limit development of understory vegetation. White-tailed deer in New England often use mature softwood stands during the winter because their dense, persistent canopies reduce snow cover and provides protection from the wind. Other wildlife species that prefer softwood forests include red squirrels (*Tamiasciurus hudsonicus*), red-breasted nuthatch (*Sitta canadensis*), and black-throated green warblers (*Dendroica virens*).

### *Mixed Forests*

Other forested communities within the study area are characterized by a mix of hardwood and softwood species. These mixed wood forests are often similar in plant species composition and structural complexity to the hardwood forests and likely support many of the same wildlife species.

### *Shrublands*

Shrublands within the study area include old field areas that are reverting to forests and regenerating forest cuts, both of which are uncommon, and powerline corridors that are managed to remain as early successional vegetation. The maintained ROW shrubland vegetation contains early successional shrubs and trees such as red raspberry (*Rubus idaeus*), common blackberry (*Rubus allegheniensis*), and beaked hazelnut, as well as young aspens and cherry (*Prunus*) species. A variety of wildlife such as the blue-winged warbler (*Vermivora pinus*), northern mockingbird (*Mimus polyglottos*), willow flycatcher (*Empidonax traillii*), and New England cottontail depend on shrubland habitats. Other species such as white-tailed deer, black bear, and red fox (*Vulpes vulpes*) also use the resources offered by shrublands on a regular basis.

### *Wetlands*

Descriptions of the various wetland types and dominant vegetation found within each wetland class in the study area are provided in Section 4.12.1. In general, these wetland classes include forested wetlands (i.e., deciduous, evergreen, and mixed), shrub swamps, and swales and marshes. Vernal pools, temporary water bodies that serve as breeding grounds for certain amphibians and invertebrates, may occur in several wetland classes. Each wetland type provides important wildlife habitat. Amphibians (i.e., frogs and salamanders) rely on wetlands throughout much, if not all, of their life cycle. Several reptile species that may occur within the study area are often found in association with wetlands. These include the northern water snake (*Nerodia sipedon*), ribbon snake (*Thamnophis sauritus*), painted turtle, Blanding's turtle, and spotted turtle. Mink (*Mustela vison*), muskrat, river otter (*Lutra canadensis*), and beaver are some mammals that rely on wetland and aquatic habitats. A number of other typically terrestrial species such as white-tailed deer will also use these habitats. In addition, wetlands frequently are used as travel corridors used by a variety of wildlife species. Wetlands also represent critical habitat for waterfowl and wading birds such as ducks, geese, herons, rails, and bitterns.

### *Landscape Characteristics*

The study area is part of a landscape that has been altered by residential and commercial development, and by historic and current agricultural uses including orchards and agricultural fields. Undeveloped blocks (i.e., open areas without commercial or residential development) include orchards and other farmlands, forested uplands, shrublands, and wetlands communities. Although the study area does not contain any designated wildlife refuges, it does contain conserved areas and town parkland. Many of these conserved areas are made up of multiple parcels, and most are within or abut an undeveloped block of natural habitat (Figures 4.16-1 and 4.16-2). Undeveloped blocks that are relatively long and narrow typically have lower value wildlife habitat because of their high edge-to-interior ratio. The effects of surrounding development (e.g., disturbance, nest predation) penetrate deeper into these narrow bands of habitat than large blocks that are square or circular in shape (USGS, 2002).

Many of the undeveloped blocks in the study area are composed either entirely or in large part of wetlands. The undeveloped blocks range in size from approximately 10 acres to 760 acres. In general, habitat blocks less than about 20 acres typically support only generalist species (e.g., raccoons, skunks, squirrels, deer, blue jays, robins) that can readily adapt to the urban and suburban habitats within which these small, undeveloped areas are embedded (NHFGD, 2015b). Larger blocks (i.e., 50 acres of grassland or 250 acres of forest) that have a low edge-to-interior ratio can provide habitat for habitat specialists (e.g., grassland birds or interior forest-dwelling species). Larger wildlife species such as moose, black bears, and raptors require much larger habitat blocks (i.e., 500 to 2,500 acres).

### *Habitat Ranking within the Study Area*

One analysis that NHFGD conducted for the NH Wildlife Action Plan was an assessment of habitat value of all lands within NH. This analysis rated the ecological condition of land as highest ranked in the state, highest ranked in the biological region, supporting landscape, and not ranked (all the rest). A data layer of the map delineating these ranked areas was created as part of the NH Wildlife Action Plan and is available through GRANIT.

Based on size, shape, and landscape position, the undeveloped forest block within the study area that provides the most valuable wildlife habitat is the block located north of NH 28 in Londonderry. This habitat block, encompassing 760 acres (including land extending beyond the study area depicted in Figure 4.16-1), includes a large wetland system and forested uplands, and parts of it are designated as “highest ranked habitat in biological region” as well as “supporting landscape.” Disturbance within this block appears to be limited to a powerline corridor. The three other largest unfragmented blocks in the study area that are designated as “supporting landscape” also likely provide good quality wildlife habitat. They appear to primarily comprise forested uplands with some smaller areas of forested wetlands. Although a few small clearings are apparent within these blocks, disturbance appears to be limited. Alternatives A, B, C, and D intersect areas of supporting landscapes, and Alternatives C and D pass near an area recognized as highest ranked in the biological region. An area of habitat recognized as highest ranked in the state lies west of I-93 and does not intersect any of the alternatives (Figure 4.16-2).

Appendix A, *Agency Correspondence*, includes a list of wildlife species with ranges that are likely to overlap with the study area and that use some of the previously described plant communities found in the study area.

## Wildlife

The NH Wildlife Action Plan indicates that the state is home to more than 500 vertebrate species, including mammals, birds, amphibians, reptiles, and fish, and thousands of invertebrates. Most of these are common nongame species that are distributed throughout the state's diverse landscape and the wildlife species are broadly discussed below. Additionally, a relatively small number of wildlife species are harvested and a summary of those species is also presented.

### *Nongame Species*

Nongame wildlife species, including mammals, birds, amphibians, and reptiles, are widely distributed and abundant throughout the study area. Most of these species are small in size and include small mammals (mice, voles, and squirrels), foliage roosting bats, songbirds, snakes, frogs, and salamanders. Because of their small size, the resources provided by the habitats in the study area is sufficient to support relatively large populations of these species, and in turn support viable populations of small- and medium-sized predators such as red and grey fox, owls, and hawks. The Project area is also large enough to support breeding populations of other medium-sized wildlife species, such as porcupine, raccoon, and skunk.

### *Game and Furbearer Species*

The Towns (and the study area) are located within NHFGD's Wildlife Management Unit (WMU)-M, which extends roughly from the Massachusetts border north to NH 101, west to NH 13, and east to the Maine border/Atlantic Ocean. The habitat within the study area is typical of habitat within the WMU, and species and their abundances in the study area are also expected to parallel those recorded in the WMU. The most recent harvest statistics available from NHFGD summarized below provide general information on game and furbearer populations within WMU-M, and by extension, the Project area (NHFGD, 2016b).

White-tailed deer are the most abundant game species throughout NH. Statewide, deer populations have been relatively steady for the last 10 years, and NHFGD estimates they are almost 40 percent greater than their target levels in WMU-M. As in other states, NHFGD estimates the deer population based in part on the annual antlered buck kill, which was 2.24/square mile in Derry, and 2.12/square mile in Londonderry. This is above the state average of 1.22/square mile, but is very similar to the average for the abutting towns (2.39/square mile). White-tailed deer coexist well with human development, especially moderate density suburban development, which is common in Derry and Londonderry, as well the abutting towns. Other large game species are uncommon in southeastern NH. In the southeastern management region, which includes WMU-M, NHFGD's target level for black bears is 0.05/square mile, reflecting a desire to minimize bear/human conflicts. The 2015 level was estimated to be 0.07/square mile. The target population level for moose in southeastern NH is 0.10/square mile, reflecting the general lack of suitable habitat conditions for this species in the southern part of the state. NHFGD estimated that the 2015 level in the region to be 0.11/square mile.

NHFGD also sets population targets for turkeys by WMU. The target population for WMU-M is 1.00/square mile, and the 2015 population level was estimated to be 0.89/square mile. NHFGD does not have specific population targets or population-level information on two other game bird species, ruffed grouse or American woodcock, but does conduct annual drumming and singing surveys, respectively, to track relative population levels. 2016 results indicate that ruffed grouse

populations in the southeastern management region are very low, with no drumming males heard. American woodcock populations appear to be consistent with the long-term average in the region, based on the number of sing males heard in 2016.

All NH common furbearer species occur with in the southeastern management region and are likely to be present in the Towns. Many furbearer species, including red fox, skunk, raccoon, and opossum (*Didelphis virginiana*), coexist well with human development. The 2015 harvest statistics indicate that muskrat, beaver, and raccoon are the species most often harvested in the region, and that they are harvested at comparable rates to other regions of the state. Harvest statistics reflect several different factors including population size, trapper access, pelt value, and nuisance complaints. Beaver are often targeted for trapping because they conflict with human development.

## 4.16.2 Environmental Consequences

### Plant Communities

Direct impacts on plant communities for each Alternative would result from the removal of vegetation and the conversion of undeveloped land to developed land within the footprint of each Alternative. Adjacent areas would also be subject to indirect effects of vegetation clearing. Indirect effects can include increased sunlight penetrating forested areas, altered hydrology in wetlands, and a potential increase in sediment and toxicants from the new roadway. The most prevalent undeveloped cover types in the Project area are northern hardwood forests and conifer forests, and these are the most affected plant community types regardless of Alternative, with the exception of Alternative F.

Impacts associated with construction activities outside the footprint of the alignment would not result in a complete loss of the vegetation community. These temporary work areas and areas of side clearing would revert to an early successional state of grasslands; shrublands; and, where taller growing vegetation would not interfere with infrastructure, early successional forests. Standard and Project-specific erosion control BMPs would be implemented to limit unintended impacts on adjacent undeveloped land.

Impacts on wetland communities are discussed in detail in Section 4.12 of this SDEIS. Wetland impacts are under the regulatory jurisdiction of NHDES and USACE under Section 404 of the CWA.

### Wildlife

#### *Overview of Impacts*

As discussed above, the Project area and surrounding landscape is home to a wide variety of vertebrate species, including mammals, birds, amphibians, reptiles, and fish, as well as many invertebrate species. Any of these species currently using habitats within or adjacent to the Project footprint would be exposed to direct, indirect, temporary, and/or permanent impacts as a result of Project construction and operations.

Impacts on terrestrial wildlife as a result of the Project would be primarily indirect, as a result of habitat loss and habitat fragmentation, and due to disturbance. Roadways cause habitat fragmentation both by their physical presence and through road mortality. Habitat loss and

habitat fragmentation impacts would be permanent and ongoing and result in a permanent reduction of habitat value in the Project area. Reductions in habitat value would occur because of the reduced amount of habitat; smaller habitat block sizes; and increased amount of edge relative to interior habitat, which can increase predation, parasitism, and lead to changes in plant structure and composition. Disturbance would occur as a result of the noise and activity associated with construction as well as the noise and activity associated with roadway operations. Construction-related disturbance is temporary and unpredictable, and wildlife would not acclimate to it. Operations-related disturbance would be permanent and, to some degree predictable, allowing wildlife to acclimate to it. However, operations-related noise may reduce wildlife's ability to communicate and to perceive danger, and the activity associated with operations may disturb animals (FHWA, 2004). These effects functionally reduce habitat quality and can cause animals to avoid the area, contributing to habitat loss.

Direct impacts would occur on some small, less mobile species that cannot avoid construction activities, as well as on larger animals that would be exposed to road mortality as they travel through the Project area after the Project becomes operational. Direct impacts as a result of construction are limited to the construction period, and the small, less mobile species (e.g., mole salamanders, toads, small snakes, mice, voles) most likely to be affected as a result are generally abundant. Although some individuals would suffer mortality as a result of construction, a population-level impact is unlikely. Direct impacts from road mortality would continue as long as the road remains operational and may increase or decrease over time as a function of traffic volume and changes in the quality of the surrounding habitat due to additional development. Road mortality has the potential to have population-level effects, especially on smaller populations of animals that must cross the road regularly to access all the resources needed during their annual life cycle.

### *Comparison of Alternatives*

The impacts of each of the five alternatives vary based on the amount of the alternative that follows existing roadways versus requiring a brand-new footprint, the type of habitat each footprint would consume, and each alternative's position in the landscape relative to existing habitat resources. Additionally, wetlands impacts and the number of stream crossings vary among the alternatives. The footprints of the five alternatives vary in size from 21.2 acres (Alternative F) to 90.1 acres (Alternative D) (Table 4.16-1). Based on size alone, Alternative F clearly has the least impact. Additionally, this alternative also wholly follows an existing roadway and is located within currently developed areas, creating essentially no new habitat impacts. The other four alternatives are described in the following section.

#### Alternative A

Alternative A has the smallest footprint after Alternative F, and just over half of this Alternative (Table 4.16-1) follows an existing roadway through a developed area. However, at its western end, it bisects the largest mapped unfragmented habitat block in the Project area, and this block abuts another, even larger unfragmented habitat block to the north and is ranked as Supporting Landscape (Figure 4.16-2). Alternative A also impacts 3.2 acres of non-vernal pool wetland, eight vernal pools totaling 1.2 acres, and has a total of nine stream crossings, including four new ones (Table 4.16-1). In addition to the general impact of habitat lost to the construction footprint, both the forest fragmentation and vernal pool impacts created by this Alternative would have additional negative impacts on wildlife. Currently, the large unfragmented habitat block that

would be bisected is sufficiently large to provide suitable habitat for a variety of forest-nesting bird species (e.g., wood thrush, scarlet tanager, red-eyed vireo, broad-winged hawk, barred owl) that are sensitive to the fragmentation and edge effects that the road would create. Habitat suitability for bird species in the remaining forest area would be reduced. Loss of vernal pool habitat and forest block fragmentation would also reduce the suitability of the remaining forest habitat for vernal pool breeding amphibians, which depend on both types of habitat for their annual life cycle. Medium-size mammals (skunk, fox, and raccoon) would primarily be affected by the barrier effect of the road and road mortality.

**Table 4.16-1. Habitat Impacts and New vs. Existing Roadway by Alternative**

Resource	Impact Calculation	A	B	C	D	F
Habitat	Undeveloped cover types (acres)	16	28	35	22	0
	Total footprint (acres)	70	76	90	90	21
Streams	New stream crossings (number)	4	5	0	0	0
	Existing stream crossings (number)	5	3	4	4	4
Wetlands and Vernal Pools	Non Vernal Pool Wetlands (acres)	3.2	8.9	7.7	3.6	0
	Vernal pools (acres)	1.2	1.1	0.3	0.3	0.0
	Vernal pools (number)	8	8	3	4	0
Plant Communities and Wildlife	Wildlife Action Plan supporting landscapes (acres)	15.3	22.5	8.7	1.8	0.0
	Wildlife Action Plan highest ranked habitat in biological region (acres)	0.0	0.0	0.2	0.2	0.0
	Wildlife Action Plan Unfragmented habitat Blocks (number)	1	4	4	3	0
Roadway Footprint	Existing roadway (linear feet)	14,477	7,716	14,250	20,231	12,870
	New roadway (linear feet)	13,497	21,820	18,760	9,525	0
	Total roadway (linear feet)	27,974	29,536	33,010	29,756	12,870

Alternative B

Although Alternative B has a larger footprint than Alternative A, it would be about 15 percent smaller than either Alternative C or D. Alternative B bisects the same large unfragmented habitat block as Alternative A, then east of NH 28 it passes through a mix of developed and undeveloped cover types, including three additional smaller areas mapped as Unfragmented Habitat Blocks, two of which are ranked as Supporting Landscape (Figure 4.16-2). Alternative B would impact 8.9 acres of non-vernal pool wetlands; impact eight vernal pools totaling 1.1 acres; and have a total of eight stream crossings, including five new ones (Table 4.16-1). West of NH



28, Alternative B would have the same impacts described above for Alternative A. East of NH 28, the Alternative B footprint follows an existing powerline ROW, which would reduce the amount of shrubby habitat associated with the ROW and reduce the value of the remaining habitat. In New Hampshire, powerline ROWs provide habitat for shrubland bird species (e.g., field sparrow, eastern towhee, prairie warbler), snakes, and insects that require open habitats (e.g., pollinators, butterflies).

### Alternative C

Alternatives C and D have the same footprint size, but Alternative C would consume a larger amount of natural habitat (Table 4.16-1). Less than half (14,250 of 33,010 linear feet) of Alternative C follows existing roadway as it passes through a mix of developed and undeveloped areas, including four areas mapped as Unfragmented Habitat Blocks, of which two are ranked as Supporting Landscapes in the 2015 Wildlife Action Plan (Figure 4.16-2). Alternative C would consume about 7.7 acres of non-vernal pool wetland; impact three vernal pools totaling about 0.3 acres; and have four stream crossings, none of which are new (Table 4.16-1). West of NH 28, Alternative B and C follow the same footprint and would have the same impacts. Between Alternative C's I-93 interchange and its juncture with the Alternative B footprint, Alternative C follows an existing powerline ROW, then follows the existing NH 28 footprint where it abuts a small section of wetland habitat that is mapped in the 2015 Wildlife Action Plan as Highest Ranked Habitat in Biological Region (Figure 4.16-2). Within the powerline ROW, this portion of Alternative C also could impact shrubland-associated bird, reptile, and insect species, and the wetland likely provides habitat for a wide variety of wildlife, including reptiles and amphibians. Additional pavement or traffic associated with construction of Alternative C would potentially increase road-related impacts on wildlife associated with this wetland.

### Alternative D

Alternative D primarily follows existing roadways (20,231 of 29,525 linear feet) (Table 4.16-1), but it does pass through one unfragmented habitat block (Figure 4.16-2) and would impact about 3.6 acres of non-vernal pool wetland; impact four vernal pools totaling about 0.3 acre; and have a total of four stream crossings, none of which are new (Table 4.16-1). Because Alternative D follows the same footprint as Alternative C as it departs from I-93, it would have the same impacts as Alternative C in this section. After joining with the existing NH 28 footprint, Alternative D follows existing roadways where impacts from road improvements would be minimal.

## **4.16.3 Mitigation**

Impact minimization and mitigation for plants and wildlife for all alternatives would be determined in consultation with NHFGD, New Hampshire Natural Heritage Bureau (NHNHB), NHDES, USFWS, USACE, and EPA to identify actions that reduce impacts associated with construction and operations.

## **4.17 Threatened and Endangered Species**

The federal Endangered Species Act of 1973 (16 USC 1531-1543) (ESA) designates certain species throughout the United States as threatened or endangered, and as such protects them and the habitats in which they occur. The ESA defines two categories of species warranting protection: endangered and threatened. An endangered species is "in danger of extinction