of the field work for the upland and wetland natural community inventories. No populations of rare species were recorded during these surveys.

6.0 Wildlife Habitat

Wildlife Habitat in the Mad River Valley is a diverse and constantly changing mosaic on the landscape. Wildlife habitat can be a woodlot in the village or hedgerow in the farm fields; these and all other wildlife habitats are influenced by natural processes and human development activities. Some wildlife habitat elements, such as vernal pools, have distinct boundaries around them. Other wildlife habitat elements such as Bicknell's thrush habitat in early successional montane spruce-fir forests are patchy and dynamic and therefore harder to put within boundaries that are temporally meaningful.

In this investigation and report, the larger Contiguous Wildlife Habitat Units serve as the starting unit of measure and description. Within each of these areas are described core habitat (remote from most human activities), wetlands, forested riparian areas and other habitat types where wildlife live and reproduce. These are meaningful in terms of individual species habitats (such as deer and deer wintering habitat, and bear and beech stands) as well as management of these areas by people in the Mad River Valley.

Below is a descriptive analysis of the wildlife habitat elements assessed (on the ground and remotely) and following the descriptions, a discussion of the Contiguous Wildlife Habitat Units themselves.

Description of Wildlife Habitat Features

Core Area

Core habitat is forested wildlife habitat that is far removed from human activities and their artifacts such as roads, houses, and active farmlands. This remote wildlife habitat is qualitatively distinct from small fragmented areas in that it provides important mating, nesting, feeding, and denning habitats for species that cannot survive in more fragmented landscapes. These animals also require travel corridors between various landscape patches that provide these elements.

A wide-variety of birdlife in the northeast utilizes the larger contiguous forests available only in core areas. These birds include species such as the broad-winged and red-shouldered hawks, owls, and forest songbirds like the ovenbird, wood thrush, scarlet tanager, pileated woodpecker, and the Canada and black and white warblers. Several of these species suffer from greater nest predation (by animals such as squirrels, raccoons, snakes and other birds) and nest parasitism (by other birds such as the brown-headed cowbird) where nesting grounds are near human disturbance. Bird populations throughout the Mad River Valley, therefore, benefit from the deep forest "interior" habitat provided by core areas, see Figure 10 for core locations.

Remote wildlife habitat found in core areas can provide the various habitat elements for wide-ranging species such as fisher, bobcat, and black bear. Core areas are often hilly or mountainous, without easy access, and only rarely or seasonally visited by landowners, hunters, and loggers. Wide ranging species thrive in the remote habitat of the core areas.

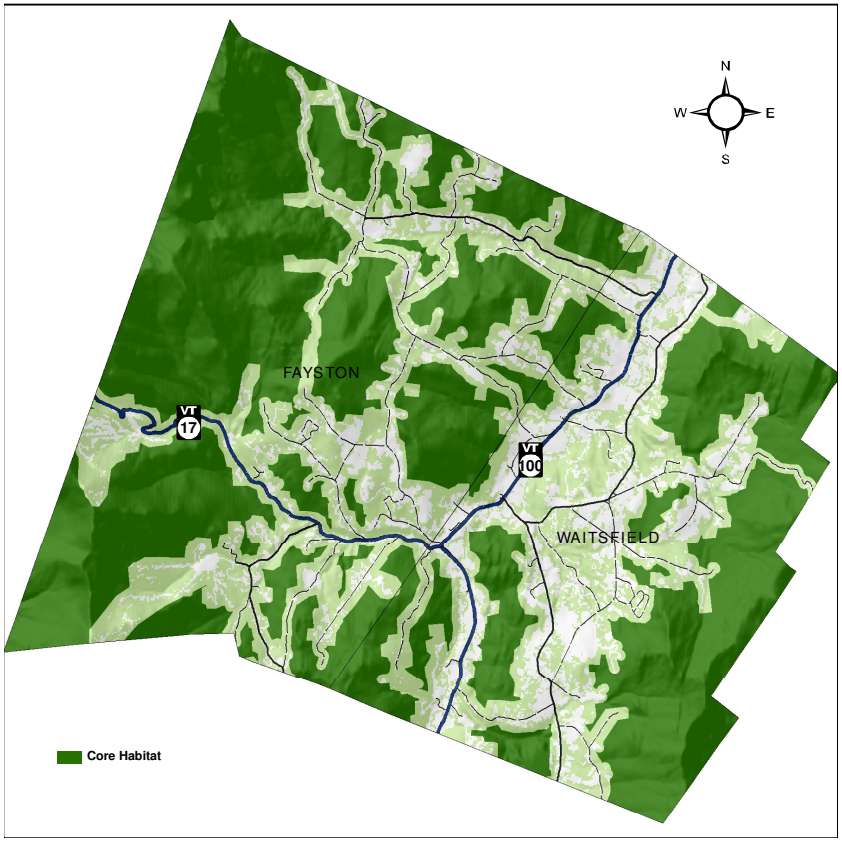

Figure 10. Core Habitat Map

Core areas are often the most important "source areas" where reproductively active female bear, bobcat, fisher, and coyote have their young and contribute to the overall population of these species. In general, the larger the core area size, the greater the population (and territories) of individual species it can support. Larger populations are generally more stable over longer periods. Core areas often provide the breeding grounds and nurseries that support relatively high populations of these deep forest species. Although most human wildlife observations may be near town, within our small woodlots and crossing roads, it is these core areas that produce a surplus of young and without them populations would likely go into decline.

Approximately 30,700 acres of core habitat were identified within the study area.

Horizontal Diversity

Horizontal diversity is a measure of the change in vegetative types across an area of undeveloped land (i.e., core areas). These patterns or changes can result from differing bedrock and soil types, or past land use or management activities.

In general, the greater the change in vegetative diversity across a core area, the greater the overall species diversity of animals within that area. This applies most directly to mammals, such as fox, coyote, deer, moose and black bear, but horizontal diversity is also applicable to bird species. Mammals and birds often need different vegetative structure and species composition to fulfill various habitat needs. For instance taller trees may be needed for nesting activity of a bird while the preponderance of the feeding activities of this bird may be on smaller saplings or shrubs. Black bear may utilize mid to older American beech trees for fall feeding and then travel to beaver-dam wetlands for spring and summer feeding and utilize areas of dense cover for travel corridors. A wide variety of habitat types can translate into more prey opportunities for predators.

When species specific habitat features on the landscape are not otherwise limiting an increase in horizontal diversity usually produces an increase in mammalian and bird species diversity.

Ledge, Talus and Cliff Habitat

Ledge habitat is generally associated with steep land and vertical rock structure. Vertical rock structure itself is only valued in the Mad River Valley by a limited number of species such as nesting peregrine falcon, common ravens, and the small-footed bat. If the ledge is broken, that is, with crevices, hollows and caves it becomes important habitat for a wide-variety of animals. Porcupines and raccoons live in hollows, under larger rocks, and in deeper cave-like structures in ledge and talus environments. Fisher and coyote often use these sites for protection from the weather while moving throughout their home ranges. Ruffed grouse and small rodents often utilize these areas. In many areas throughout the northeast, bobcats use ledges for courting and breeding grounds and the broken ledge (often at the foot of a ledge) for birthing and rearing of their young.

Figure 11.
Talus pile at the base of ledges

Broken ledge is considered defendable from predators like the coyote that may try to kill and eat bobcat young. Bobcats are reported to also utilize broken ledge (similar to coyote and fisher) when it's cold and snowy as well as when it's hot (for relief from the heat). There is some evidence that ledges facing south and west (areas that generally are more exposed to the sun) may receive higher use by certain species and are more valuable to wildlife.

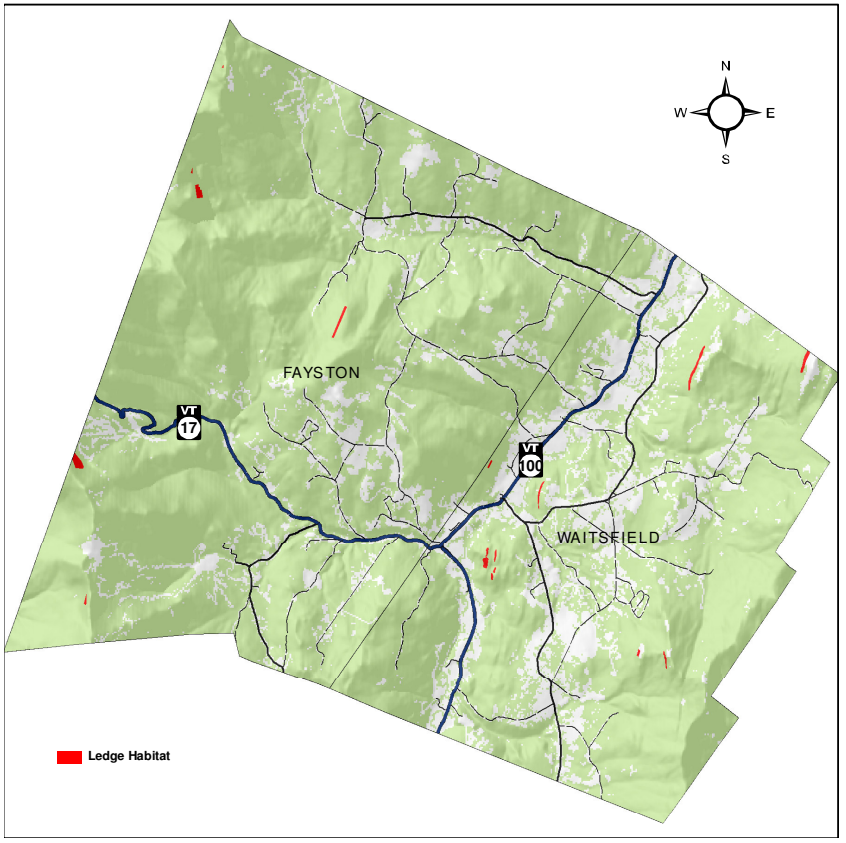

Figure 12. Ledge Habitat Map

18 ledge or talus areas were identified, and more are likely to exist within the study area.

Bear Wetlands

Black bear utilize a wide variety of wetlands during the spring and summer months. Forested, shrubby, beaver-flow wetlands, and forested seeps are sought out for the flush of early leafy

vegetation that often grows in these environments. In the early spring, wetlands with ground-water discharge promote an early growth of leafy green vegetation at a time when the trees are still barren of nutritious buds and new leaves. Black bears (as well as deer and turkeys among other animals) will utilize this food source and also search out plant roots, grasses, sedges and ants in these environments. Free flowing water is also available at many of these wetlands. Bear wetlands typically have shrubs or tree vegetation nearby which provide cover.

Throughout the Mad River Valley remote forested seeps are probably the most heavily utilized wetlands by bear. As such, they warrant special protection for their wildlife value.

The 118 wetlands identified as preferential bear habitat in this study represent a mix of wetlands that were observed in the field to have either 1) sign of bear use or 2) fulfill bear wetland habitat requirement (i.e. sufficient cover for bear use and potential food resources). See Figure 14 for Bear Wetlands Map.

Figure 13. Logging clear-cut creating early succession habitat

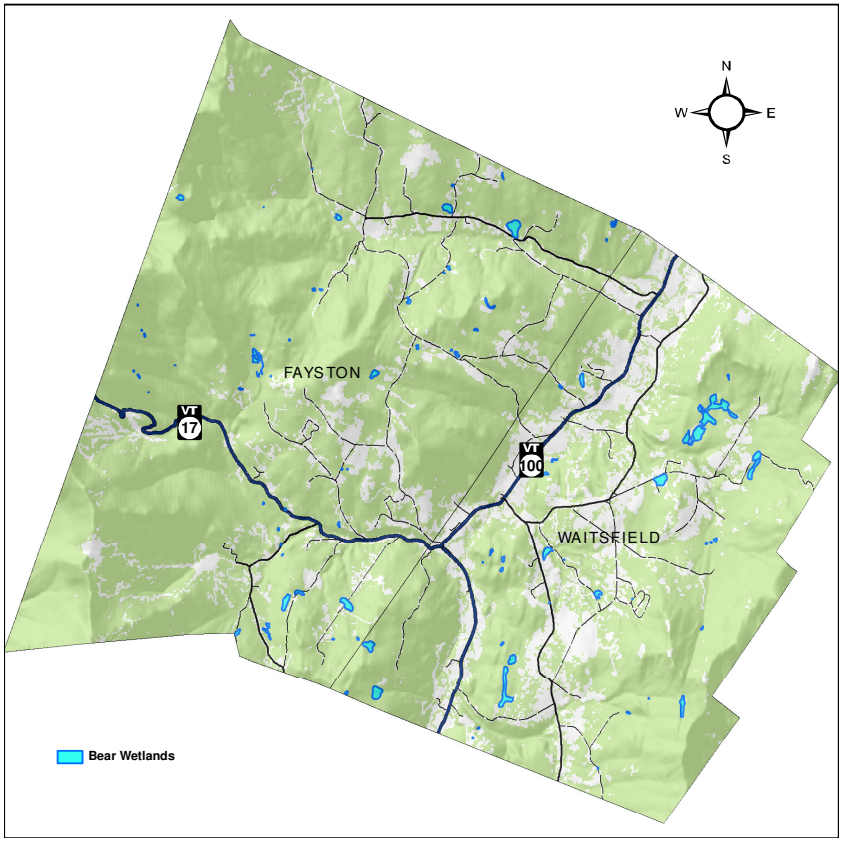

Figure 14. Bear Wetlands Map

Early Successional Habitat (ESH)

ESH is forested habitat that is characterized by young, often dense shrubs, saplings or trees. Active forest management or natural disturbances such as disease infestation, ice storms, or wind blow can create a new growth of woody vegetation. Old fields with a substantial shrub component were also identified as ESH in this study. ESHs are important for many species of birds and mammals. Bird species that thrive in areas with tree saplings and shrubs include: the song sparrow and field sparrow, chestnut-sided and golden-winged warbler (rare), common yellowthroat, gray catbird, indigo bunting, brown thrashers, veery, American woodcock, and ruffed grouse.

ESH that is interspersed with older forestland, old fields, and wetlands harbors many small mammals that are prey for

predators. Snowshoe hare, woodchucks, white-footed and woodland jumping mice, and shrews are often found in high densities in areas of successional patches on the landscape. Red and gray fox, coyote, ermine, skunk, raccoon, and bobcat will search these patches for food. Black bears and other animals will utilize these areas extensively in years when berry-producing shrubs are thick with berries.

Approximately 1500 acres of ESH were identified in the study area.

Forested Riparian Habitat

Forested streamside riparian habitats are important for species that utilize the aquatic habitats, terrestrial vegetation and cover that are provided. Riparian forested vegetation anchors the stream shoreline and limits streambank erosion. It also provides shade and provides coarse woody debris to streams that adds to the stream structural and substrate diversity as well as provides food that fuels stream food chains.

Amphibians such as the green frog and the Northern dusky salamander live along streams in forested habitat and utilize the adjacent riparian environment. The raccoon and long-tailed weasel use streamside forested habitats to hunt for food and for denning habitat. The moose and white-tailed deer use streams and streamside forested habitats for cover and water. Aquatic animals such as the river otter and beaver use streamside vegetation for cover, denning and food. Several species of bats such as the little brown myotis and the big brown bat use these environments to hunt for insects. Birds such as the belted kingfisher, wood duck, red-shouldered hawk, snipe, Eastern screech and barred owl, the wood pee-wee and alder flycatcher, American gold finch, tufted titmouse, and the yellow, Canada, and cerulean warblers make extensive use of forested riparian habitats.

There are approximately 372 kilometers of river and stream mapped in the two towns, and just over 6000 acres of forested riparian habitat was identified.

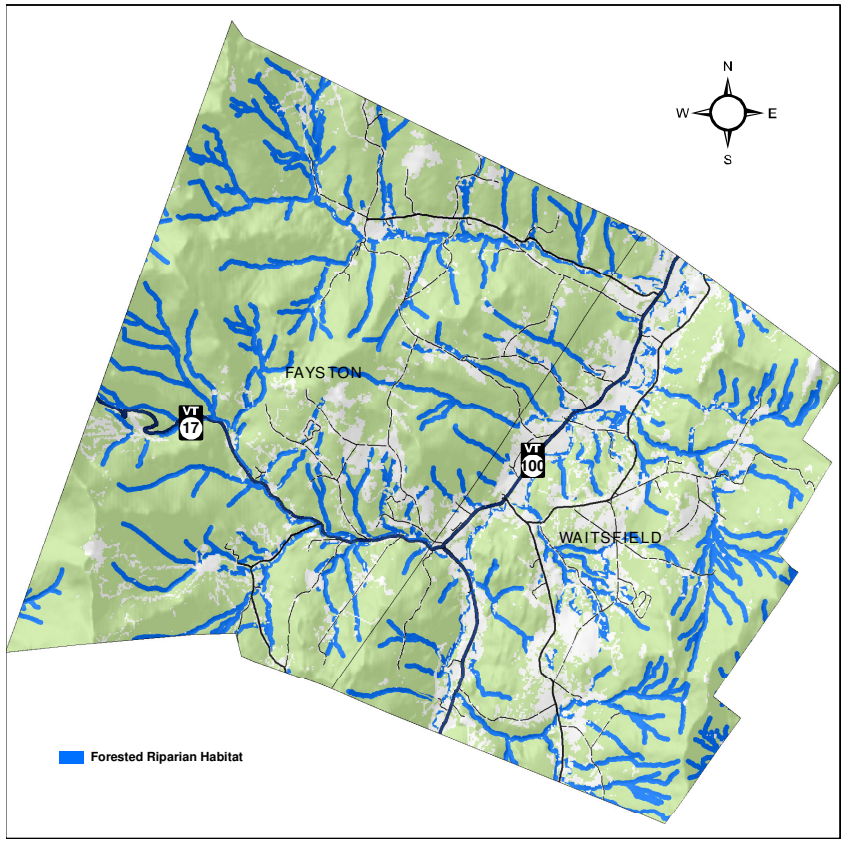

Figure 15. Forested Riparian Habitat Map

Deer Winter Habitats

In years where significant amounts of snow accumulate in the woods, white-tailed deer utilize evergreen forests for habitat. Evergreen trees intercept snow as it falls to the ground generally resulting in shallower snow depths. These habitats offer an overhead canopy of needles that shield deer from the cold. Deer congregate in these areas when snow depths exceed about 15 inches and remain until the snow melts in spring. These winter habitats can be critical in limiting the energy expenditures of deer and supporting the overall survival of this species in the north.

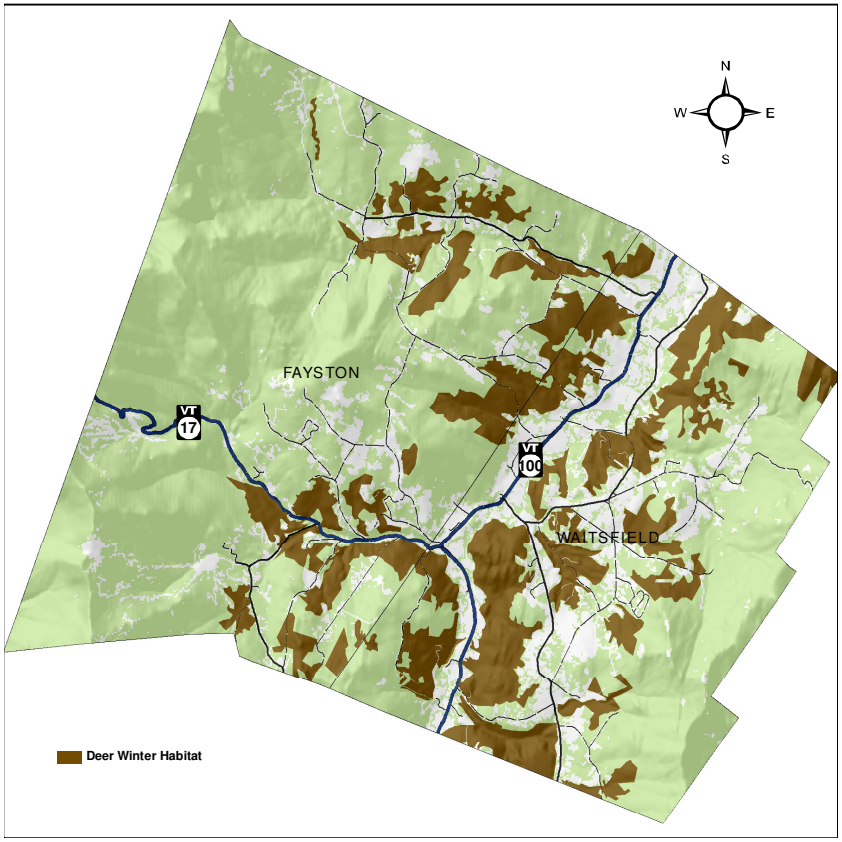

Figure 16. Deer Winter Habitat Map

Deer winter habitat that faces into the sun (either west or south) is often more valuable than east or north facing areas. Eastern hemlock, balsam fir, and Northern white-cedar stands provide the best cover and food value to deer, but pine and spruce will sometimes be utilized. These deer winter habitats are also home to bobcat, coyote, and scavenging bears that come looking for live deer to eat during the winter or carrion to scavenge in spring. Other animals such as evergreen-loving birds, porcupines and fox utilize these habitats during other seasons.

AE mapped 7200 acres of deer winter habitat in the study area, the State of Vermont had previously mapped 5800 acres.

Mast Stands

Masting trees are those which synchronize fruit production in an area. In the Mad River Valley, masting trees are Northern red oak and American beech trees. Both of these trees, when found clumped into stands are regularly visited by many species of wildlife.

Figure 17. Bear claw marks on a beech tree

Some of these stands are very large, such as the Slide Brook beech stand in Fayston and Warren which is several hundred acres in size and other areas are 20-30 trees in extent. When beech and oak stands are remote, use by black bear is generally

higher than stands near human activities. Wildlife attracted to the fruits of American beech (beechnuts) and Northern red oak (acorns) include squirrels, wild turkey, deer, and bear.

Bear will climb the trees in fall to gather beechnuts, leaving scars from their climbing activities. They often return in spring and scavenge beechnuts from the ground under the beech trees. Bears act in a similar fashion in search of acorns, however, their climbing activities do not usually leave persistent scars and their use is therefore difficult to detect on the tree itself.

22 mast stands were identified in the study area, 9 of which were confirmed for bear use in the field.

Grassland Habitat

Grassland habitats are open areas that are in hay or natural meadow vegetation. Some grassland habitats alternate from year to year with row crops. In years when they are not in row crops they are utilized by a wide variety of wildlife including: birds, red fox, coyote, deer and woodchucks. Some species such as deer, fox and bear will use these areas even while in row crops.

While in meadow vegetation (largely grasses and sedges) deer will graze and red fox will hunt in these habitats. Several species of grassland birds live and breed only in this type of meadow habitat including: the upland sandpiper, grasshopper sparrow, sedge wren, Henslow's sparrow, bobolink, the vesper and savannah sparrow, and the Eastern meadowlark. Grassland habitat units of greater than 25 acres in size are important breeding habitats for many of these grassland species.

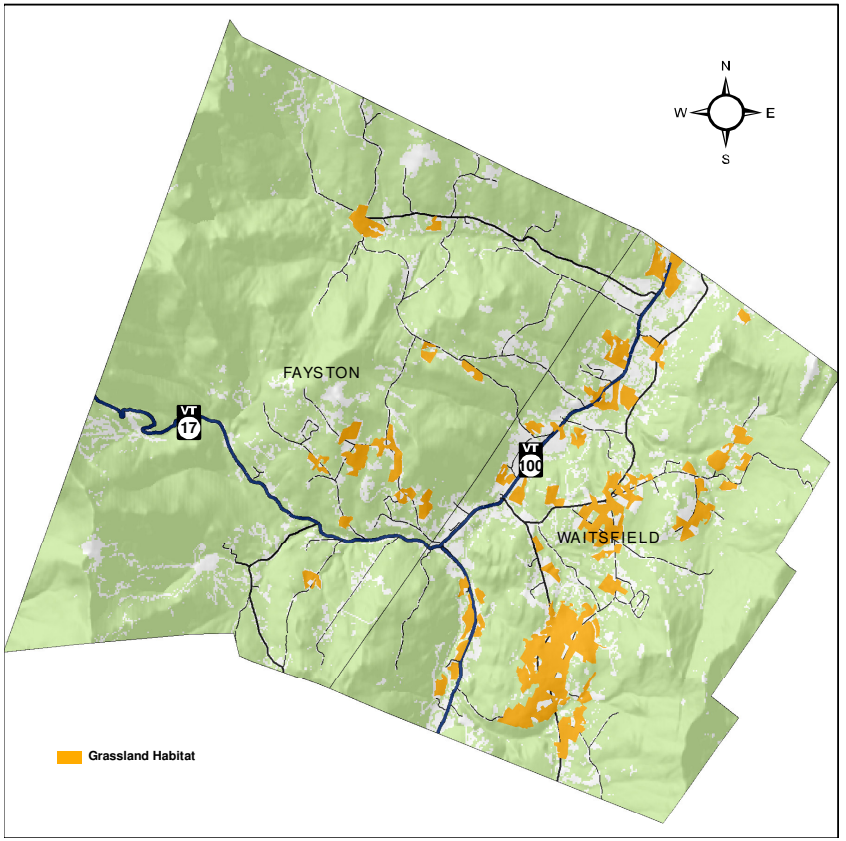

Figure 18. Grassland Habitat Map

Wetlands

Wetlands are habitats that are transitional between aquatic habitats and terrestrial habitats. Wetlands are a combination of hydric soils, hydrophytic plants, and the presence of water itself.

Wetlands associated with water bodies provide habitat for muskrat, river otter, mink, moose and deer, fisher and bobcat,

raccoon, spawning fish, and birdlife such as herons, ducks, geese, shorebirds, northern harriers, and a wide variety of songbirds.

Forested swamps are visited by over-wintering deer, bear, fisher, raccoons and coyotes, as well as other species of wildlife. Prey species (such as snowshoe hares and mice) can be common in wetlands and thus they are attractive to predators. Sedges and other broad-leaved herbaceous plants support a rich food chain that herbivores such as deer and moose enjoy.

Wetlands that contain open water (but not fish) can serve as breeding habitat for a variety of frogs and salamanders. Many wetlands are breeding grounds for the insects that amphibians eat. The Wetlands Inventory Map created for this study is included in the Appendix.

Travel Corridors

Travel corridors are places where landscape and land use characteristics combine to form an area where wildlife can move across roads to and from habitat areas. Many species of wildlife utilize a diversity of different habitat and plant community types within their home ranges (or territories). Wildlife move across the landscape for a variety of reasons but generally they move in search of new territories, food resources, and/or potential mates.

A good example to illustrate seasonal wildlife movements is that of the black bear in Vermont. The black bear typically moves in spring from its high, remote denning areas to wetlands (often forested seeps) lower on the landscape. In summer bear will seek berry patches in openings and along old logging roads within the forest. In fall, bears will move to beech stands, orchards, or possibly corn fields depending on the availability of natural foods in the forest.

General wildlife corridors for wide ranging species are shown on Figure 19. In addition to these general corridors, the presence of more specific habitat elements allowed for the mapping of potential species specific corridors for bear and deer. Finally, travel corridors for amphibians moving from upland to wetland habitats were determined based on location of roads and available habitats.

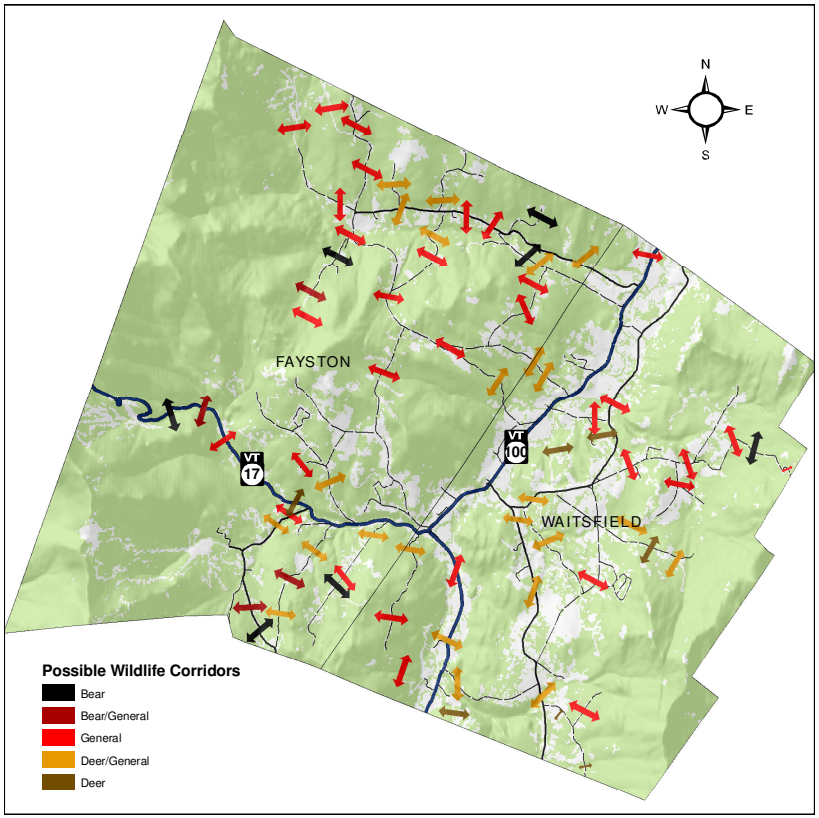

Figure 19. Possible Wildlife Corridors Map

Detailed discussion of corridor assessment methodology is provided in Appendix 1, Section G. Discussed here are the results of the corridor assessment, focused on the three areas listed above.

General Wide Ranging Mammal & Species Specific Corridors

A total of 76 potential corridors were identified within the study area. Seven of these potential corridors are specific to bear movements, seven are specific to deer movements and the remainder to deer, bear, bobcat and other wide ranging species. As mentioned in the methodology (Appendix 1, Section G) these corridors were not field verified or assessed.

Many of the wide ranging wildlife corridors identified in this project are located within areas of limited development and contain large, significant habitat features in close proximity to the corridors. As would be expected, wide ranging mammals are likely to find these areas most preferential as movement zones due to the lack of human disturbance and the necessities of moving between critical food, cover and/or other habitats.

There were relatively few probable corridors identified crossing the more developed areas of the study area such as the Mad River valley, Route 17, German Flats Road or the East Warren Road. The limited opportunities for wildlife travel in these developed areas highlight the importance of maintaining and improving what already exists for movement corridors within these areas.

These probable corridors should be field verified and, if used by wildlife, should be considered as high conservation and protection priorities.

In the Mad River valley bottom, the opportunities for movement are severely limited by development and agricultural lands. Some contiguous habitat units (discussed below), such as #15 and #25 offer wildlife very limited ingress or egress options. These areas risk becoming biological islands or population sinks for wildlife if no movement corridors continue to exist, wildlife populations die off, and no new animals can repopulate the area from adjacent wildlands.

Improvement and expansion of the vegetated buffer conditions of both the Mad River and the tributaries feeding it would greatly assist in providing travel corridors across and within this area without putting undue burden on agricultural or development activities. Finally, opportunities for passage structures under the heavily traveled roads such as Route 100 should be sought, especially in those areas where further field work suggests wildlife movements are concentrated.

Land conservation of connecting lands, in conjunction with improved riparian buffers and structures that provide wildlife safe travel, will aid in maintaining a healthy and diverse wildlife population throughout the area.

Amphibian Road Crossing Zones

Many busy roads bisect amphibian travel corridors and amphibians are forced to cross roads to get from their upland forest habitat to the breeding habitat in the vernal pools and wetlands. Thirty-one potential amphibian road crossings have been identified in the study area. None of these sites have been field verified. Field verification requires monitoring these road crossing sites during spring migration of the vernal pool amphibians. By knowing the location of the crossings,

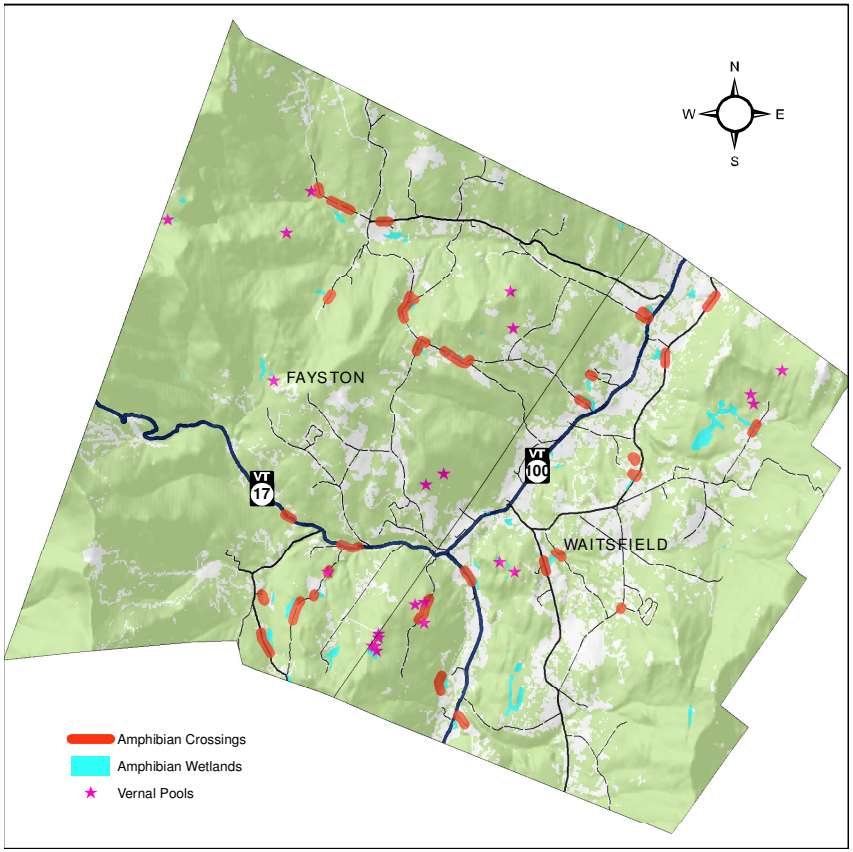

Figure 20. Amphibian Crossing Zones

townspeople can be made aware that they should drive with care during the migration time. Some towns have organized volunteers to be out on nights of the migration to warn drivers and assist amphibians crossing the roads. Other towns have obtained signage to erect near the sites of the highest amphibian mortality.

Forested travel corridors between forest and vernal pool habitat should be maintained to facilitate migration of pool breeding amphibians. Barriers to amphibian movement such as busy roads, large clearings, or intensive development should be avoided or minimized within these amphibian travel corridors. Small developments (e.g. a single family house), yards, and infrequently traveled dirt roads are often not a major barrier to amphibian movement but may decrease migration success and habitat availability on a meta-population level.

Travel pathways that allow these movements are critical for animals that have habitat requirements in distant places and these pathways help maintain the genetic variability of various species of wildlife including: bear, bobcat, coyote and fox, fisher, deer and moose and some amphibians.

Contiguous Habitat Units (CHUs)

Contiguous Habitat Units are a combination of several different wildlife habitat types combined to form a unit of relatively continuous wildlife habitat. The largest forested area, often the most valuable wildlife habitat is the core area (largely free from most human activities). In constructing CHUs the core areas are combined with early succession habitats, forested riparian habitats, wetlands, deer wintering habitat, mast stands, and ledge or cliff habitats. In some cases, these specific wildlife habitat features (like riparian areas) may not add new area (they are already subsumed within the core area boundary) to the already mapped central core, while in other cases (when they are tangential but not within the mapped core area) they add new area and additional acreage to the CHU.

A total of 28 contiguous wildlife habitat units (CHUs) were identified in the two town study area, see Appendix 1, Section E for methodology. The 28 CHUs comprise a total land area of 27,578 acres, of which 21,756 acres is considered core habitat.