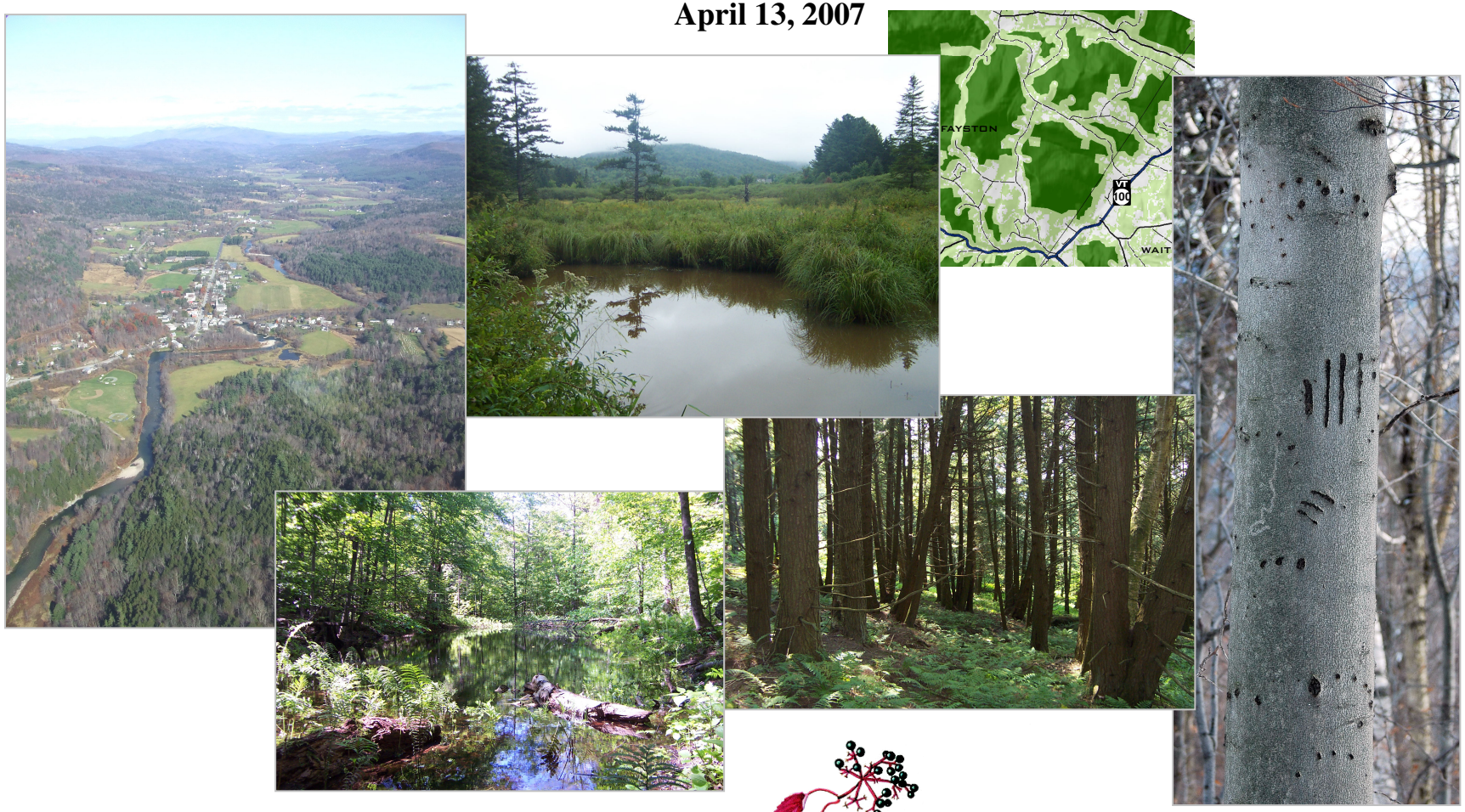
Mad River Valley Planning District

Natural Heritage Element Inventory and Assessment for Waitsfield and Fayston, Vermont

April 13, 2007



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1.0 Introduction

The purpose of this inventory was to map and assess the natural heritage elements that are important to the preservation of biological diversity in the Towns of Fayston and Waitsfield. This information will be used to inform town planning decisions, further define the towns' sense of community, and to establish priorities for preserving significant resources.

The scope of the project included the identification, inventory, assessment and ranking of five resource elements: wetlands, vernal pools, upland natural communities, wildlife habitat and connecting lands and rare elements. The inventory process involved three phases: 1) remote landscape analysis; 2) field work and public input; and 3) final ranking and map creation.

The methodology used in mapping and assessing these resources is presented in Appendix 1. The results of the inventory are divided into the five resource areas and presented below.

2.0 Wetlands

The wetlands inventory conducted as part of this survey process revealed the presence of 493 wetlands. This includes wetlands that are considered "potential" wetlands (see Section A in Appendix 1). Due to lack of landowner permission, some of these wetlands still need to be field verified for definitive classification. The total acreage of wetlands in the study area is 979 acres. Prior to this inventory, there were only 119 mapped wetlands in the study area comprising approximately 200 acres (as identified on the National Wetland Inventory maps).

Summary statistics for the wetland natural communities mapped in the study area are provided in Table 1 below. Some of the mapped types, such as the Agricultural Fields, Old Fields and Ponds, are not considered natural communities but were mapped for their potential regulatory status and functioning on the landscape. Other types, such as the Beaver Wetlands, Floodplain Forests, and Shrub Swamp actually consist of multiple natural communities. These multiple communities were lumped into the mapping units shown below because of the difficulty in mapping specific communities on a town-wide scale. Table 2 shows the different natural communities that may be present in the mapping units.

Figure 1. Beaver Meadow (Unit #214)

Table 1. Wetland Communities in Waitsfield and Fayston Summary

Community Type	Number of Sites	Average Acreage	Total Acreage
Agricultural field	35	2.93	102.66
Beaver Wetland	27	0.74	20.09
Erosional River Bluff	1	0.21	0.21
Floodplain Forest	28	3.41	95.41
Hemlock-Hardwood Swamp	4	2.55	10.19
Old Field	52	4.89	254.13
Open Water	6	0.56	3.38
Pond	130	0.42	54.90
Red Maple Black Ash Swamp	4	5.85	23.38
Red Spruce-Hardwood Swamp	1	0.55	0.55
River Cobble Shore	5	0.16	0.82
Rivershore Grassland	14	0.49	6.84
Sedge Meadow	3	0.93	2.80
Seep	29	0.41	12.01
Seepage Forest	28	3.51	98.29
Shallow Emergent Marsh	70	2.12	148.73
Shrub Swamp	42	2.15	86.59
Spruce-Fir-Tamarack	14	4.16	58.30
TOTAL	**493**	**--**	**979**

Table 2. Natural Communities Present in the Wetland Mapping Units

Mapping Unit	Natural Communities
Shrub Swamp	Alder Swamp* Alluvial Shrub Swamp
Red Maple-Black Ash Swamp	Red Maple-Black Ash Seepage Swamp Calcareous Red Maple-Tamarack Swamp Red Maple-Acidic Basin Swamp* Red Maple-Red Spruce Swamp
Beaver Wetland	Shallow Emergent Marsh* Alder Swamp Open Water beaver flooding* Deep Emergent Marsh
Floodplain Forest	Silver Maple-Ostrich Fern Floodplain Forest* Sugar Maple-Ostrich Fern Floodplain Forest

* indicates the most common community found within the mapping unit

As detailed in Section B of Appendix 1, wetlands were considered significant for either the natural community or the functions and values that they perform on the landscape. Table 3 shows the different sites that were considered locally or state significant. Of the 493 wetlands and potential wetlands identified in the study area, a total of 62 were deemed to be locally significant. Thirty-two (32) of these were deemed locally significant because of the functions and values that they perform on the landscape. Thirty (30) were determined to be locally significant for both functions and values and natural communities. Only three wetlands are considered state significant natural communities. There is currently no state protocol for deeming a wetland state significant based on functions and values alone. The significant wetland sites are described below, grouped according to natural community type. Management recommendations are presented for the particular natural community type discussed. The Wetland Inventory Map is included in the appendix and a summary data table in Appendix 2.

Table 3. Summary of Locally and State Significant Wetlands

Natural Community	Number of Sites	Total Acreage	Locally Significant	State Significant
Floodplain Forest	18	63.5	Y	N
Seep	1	4.5	Y	Y
Wetland Complexes	5	107	Y	N
Red Maple-Black Ash Swamp	1	11.8	Y	Y
Spruce-Fir-Tamarack Swamp	1	13.6	Y	Y
Oxbows (Emergent Marshes)	2	7.5	Y	N
Hemlock Hardwood Swamp	4	10.2	Y	Y (1)

Floodplain Forest Communities

Floodplain forest are perhaps one of the most fragmented and disturbed natural communities in Vermont (and throughout New England). Because they typically occupy flat areas along rivers, have relatively fertile soils and lack stones, they were often the first sites to be converted to agricultural production during colonial settlement of the area. As a result, only a small fraction of floodplain forests remain, many of these existing as thin strips of vegetation between agricultural land and rivers. In addition, because of the ecology of these sites, floodplain forests are highly susceptible to invasion by non-native plant species. The annual or periodic flooding regime often creates areas with disturbed, bare soil. These conditions are conducive to the establishment of a wide variety of non-native invasive plants. Species such as Japanese knotweed (*Polygonum cuspidatum*) often have propagules carried in the floodwaters which can readily colonize a site. Once established, these invasives can be difficult to remove and can degrade the condition of the natural community.

Pristine examples of floodplain forest are therefore quite rare. The floodplain forests found in the study area are typical for the

region in that most are small, fragmented, and colonized by invasive species. Of the floodplain forests seen during the public access survey (along the Mad River Path and by canoe in the Mad River) there are two that appeared to be in relatively good condition: wetland #429 and the southern part of #391 (See attached map for wetland locations). These sites both contain typical structure of floodplain forest with mature trees, little shrub cover and dense herbaceous vegetation. While some invasives such as Japanese knotweed were found on the margins of the community, both sites appear to have areas that are free of invasives and look relatively undisturbed. More detailed field work should be conducted to confirm these preliminary findings.

Despite the poor condition of most of the floodplain forest sites from a natural community perspective, many of these areas are significant for the functions and values that they perform on the landscape. Being positioned along the banks of the Mad River, these sites are typically very good at attenuating and retaining floodwaters. During these flood events, excess nutrients are often deposited in the floodplain forests and sequestered by the forest vegetation, making these sites critical for maintaining water quality. The forested buffer that these sites create along the river binds the soil preventing erosion, and provides shade for the river thereby decreasing water temperatures and increasing the quality of the fish habitat. This forested buffer also acts as a valuable travel corridor for many species of wildlife. Finally because of their location along the river, these sites are often important for recreation, open space and aesthetics. Because of their wide ranging importance on the landscape, floodplain forests are an incredibly valuable wetland resource and most are considered locally significant.

Floodplain Forest Management Recommendations

As mentioned above, floodplain forests are one of the most degraded and fragmented communities in the region. At the same
time, they are one of the most highly functioning wetland communities because of their close association with surface waters.

Invasive Species Management: It is recommended that the highest quality examples of this community in the study area (sites #391 and #429), be targeted for invasive species management. For most sites, invasive species control would be a difficult if not impossible task. In the two sites described above, preventing invasives from colonizing the interior of the natural community may be a feasible undertaking and would preserve these sites in a more natural condition.

Floodplain Forest Restoration Projects: It is recommended that floodplain forest restoration projects be initiated with willing landowners. Ideally, these sites would occur adjacent to existing floodplain forest sites creating a more connected network of riparian buffers. Given the wide variety of functions that these sites can perform, the ecological benefits of such restoration projects are many.

Seep Communities

The seepage community is widespread and typically occurs within a forested matrix where ground water surfaces. The surfacing water creates openings in the canopy which harbor wetland vegetation and can provide wildlife habitat. These occurrences are usually small and difficult to map. Most of the seeps that were mapped as part of this inventory were discovered while doing field work. One seep (wetland #694) that was mapped by state personnel in Camel's Hump State Forest is

recognized here as being locally significant because of its size and condition. This is a large seep (4.5 acres) and is relatively undisturbed. Seeps of this size and condition are somewhat rare. Because they are typically small, it is individually difficult to assign importance to a particular seep. Taken collectively, however, they are very important wetlands in terms of wildlife habitat, water quality and erosion control.

Seep Management Recommendations

The biggest threat to these communities is improper forest management and residential development. Encouraging foresters and loggers to avoid seeps (even in winter) can prevent damage to these wetlands. Local regulations protecting these small wetlands can prevent damage to these sites from development.

Wetland Complexes

There are five wetland complexes in the study area that have been determined to be locally significant sites. These are outlined in Table 3 above. These beaver-influenced wetlands generally score high for many functions and values. The diversity of wetland types, often including open water, herbaceous and shrub types makes them highly significant for wildlife habitat. The presence of beaver dams, at least temporarily, can retain sediment and pollutants making them valuable for water quality. The large basins usually associated with these wetland complexes can also attenuate floodwaters. Being located along streams, most beaver wetlands are also important for controlling erosion on the stream banks.

Beaver influenced wetland complexes, strictly speaking, are not natural communities; they are a closely related mosaic of natural communities that occur together as a result of hydrologic changes brought on by beavers. As can be seen in Table 4 below, these complexes can consist of open water areas with Deep Emergent Marshes, Shallow Emergent Marshes, Alder Swamps and, in some cases, forested swamps The boundaries between these different wetland communities typically fluctuates from year to year based on the activity of the beavers and the yearly precipitation. For this reason, it is useful to map this mosaic of communities together as "Wetland Complexes".

Figure 2. Scragg Mountain Complex

Table 4. Locally Significant Wetland Complexes

Location	Natural Communities Present	Total Acreage	Significance	Unique ID#
German Flats Beaver Wetland	Shallow Emergent Marsh Spruce-Fir-Tamarack Swamp Open Water	8.0	Functions and Values	316-320
Scragg Mtn Beaver Wetland	Shallow Emergent Marsh	6.4	Functions and Values	510
Phen Basin Wetland	Open Water Sedge Meadow Alder Swamp	9	Functions and Values	680-693, 697-701
Floodwoods Wetland	Shallow Emergent Marsh Red Maple-Black Ash swamp Spruce-Fir-Tamarack Swamp	72	Functions and Values; Natural Communities	373-375, 615-620
Shepard Brook Wetland	Shallow Emergent Marsh	11.8	Functions and Values	604-605, 184

German Flats Beaver Wetland (ID# 316-320)

The German Flats beaver wetland sits along a small tributary of Slide Brook just east of German Flats Road and is surrounded by Northern Hardwood Forest and Hemlock-Northern Hardwood Forest. This site was not visited during this inventory due to lack of landowner permission. This site was assessed from remote sources and from what could be viewed along German Flats Road.

It appears that this wetland complex contains areas of open water, areas of Shallow Emergent Marsh and a small Spruce-Fir-Tamarack Swamp. This site likely functions for erosion control along the stream, floodwater attenuation, water quality, and provides significant wildlife habitat in the area. This wetland should be field verified for the functions, and type and condition of natural communities present.

Phen Basin Wetland Complex (ID #'s 680-693, 697-701)

The Phen Basin wetland complex occurs on Camel's Hump State Forest and was previously mapped and assessed by state personnel. Like the Scragg Mountain wetland (discussed below), it is an example of a higher elevation beaver wetland complex. It includes areas of open water, Sedge Meadow and Alder Swamps.

It is very well buffered by undisturbed natural communities and surrounded by Lowland Spruce-Fir forests and a state significant Northern Hardwood Forest. It provides a significant amount of wildlife habitat diversity in an area dominated by upland community types.

Scragg Mountain Beaver Wetland Complex (ID#510)

Like the Phen Basin wetlands, the Scragg Mountain wetland complex is an example of a high elevation beaver wetland. This wetland consists of a long, thin basin containing a Shallow Emergent Marsh interspersed with areas of open water. At the time of the site visit during this inventory, there were a series of three beaver dams, the lowest of which was still functioning. The marsh surrounding the open water was colonized by annual herbs typically found in beaver marshes. The most important function of this site is the significant addition to the wildlife habitat diversity of the area. Being located on public property and near a hiking trail, this site is also important for recreation, open space and aesthetics.

Floodwoods Wetland Complex (ID#'s 373-375, 615-620)

The Floodwoods wetland complex is the largest, perhaps most significant wetland complex in the study area. It sits in a large flat area south of Mt.Waitsfield surrounded by Hemlock-Northern Hardwood Forest. This wetland complex consists of open water areas, Shallow Emergent Marsh, a Red Maple-Black Ash Swamp and Spruce-Fir-Tamarack Swamps. Smaller (unmapped) areas of Alder Swamp are also present within some of the conifer swamps and on the margins of the marshes. This wetland complex contains the only state significant wetland natural communities in the study area: the Red Maple-Black Ash Swamp and Spruce-Fir-Tamarack Swamps.

Figure 3. Floodwoods Wetland Complex

The Red Maple-Black Ash Swamp sits on the margin of the main beaver wetland and appears to be dominated by ground water seepage areas. Hummocks and hollows are common, with the hollows often containing standing water. The canopy is dominated by hardwoods such as red maple (*Acer rubrum*) and black ash (*Fraxinus nigra*) but occasional red spruce (*Picea rubens*) trees are also common. Speckled alder (*Alnus incana*) is common in the shrub layer. The herbaceous layer is dominated by wetland herbs such as sensitive fern (*Onoclea sensibilis*), spotted touch-me-not (*Impatiens capensis*) and cinnamon fern (*Osmunda cinnamomea*). Peat moss (*Spahgnum spp.*) is found in hummocks on the forest floor. This community may have been

influenced by beaver flooding at one time, but appears to be somewhat isolated from the effects currently.

The Spruce-Fir-Tamarack Swamps in this wetland complex, on the other hand, appear to have been greatly influenced by historic and current beaver activity. They consist of a layer of speckled alder and dogwood (*Cornus stolonifera*) shrubs overtopped by scattered red spruce trees. It is likely that the red spruce once formed a more complete canopy but was flooded out by beaver activity. The herbaceous layer is dominated by bluejoint-grass (*Calamagrostis canadensis*), marsh fern (*Thelypteris palustris*), tussock sedge (*Carex stricta*), and cattails (*Typha latifolia*). Hummocks and hollows form a microtopography on the forest floor and standing water is common throughout the swamp.

Both of these forested swamps appear to be in very good condition. There is no sign of logging or other human disturbance. They are well buffered by other wetland communities and by the surrounding upland forests. Their condition, size and landscape context make them state significant natural communities.

This wetland complex as a whole has a wide variety of different habitat types, from open water, to shrubby areas to forested wetlands. This diversity provides a habitat for a wide variety of wildlife species including bear, moose, deer, otter, mink, and a wide array of song birds and raptors. The wildlife habitat coupled with the unique natural communities make this site an ecological gem in the study area.

Shepard Brook Wetland (ID#'s 604-605, 184)

The Shepard Brook wetland complex consists of a few nearby Shallow Emergent Marsh communities on either side of Shepard Brook in Fayston. There is a fair amount of open water currently present from beaver flooding as well as small inclusions of Alder Swamp and Sedge Meadow. These communities, though generally too small to include on the natural communities map, add to the overall plant and wildlife habitat diversity of the site. This site likely functions to retain any excess nutrient runoff from the adjacent agricultural land, providing water quality protection for Shepard Brook.

Figure 4.
Shepard Brook

Wetland Complexes Management Recommendations

As mentioned above, the identified wetland complexes contain a wide variety of natural communities and wildlife habitats, and are valuable for the many functions that they perform.

100' Buffer Zone: It is recommended that a minimum 100' buffer zone around the wetland margin be maintained in a natural condition. This buffer can help to ensure that the natural communities present retain their undisturbed state and the functions and values that these wetlands perform are maintained.
Logging Restrictions: In the case of the forested swamps, logging should not occur due to the presence of fragile soils. Disturbing the soils in these sites can disrupt local hydrology of the wetland and open the site up to invasion by non-native plant species.

Oxbow Communities (Shallow Emergent Marsh Wetlands)

There are two significant oxbows along the Mad River that harbor Shallow Emergent Marsh communities. One of these sites (#439) was viewed along the River, the other site (# 281) did not receive a field visit. Both of these sites were determined to be locally significant for the functions and values that they perform on the landscape. Depending on the nature and condition of the communities present, they may also be locally significant natural communities. Such a determination, however, can only be made after a more thorough field investigation. What could be seen of site #439 from the river indicated that this site offered valuable wildlife habitat and other functions outlined below.

Sites of oxbows are often located in river and stream valleys near human activity. As such, they are often dredged for ponds, partially filled, drained or otherwise impacted by the development nearby. Their location near human activity can make them valuable for recreation.

More undisturbed sites can perform a wide array of functions and values. Since oxbows are connected to the river channel during periods of high water, they can be very important in flood water retention and attenuation. They often have a diversity of wetland habitat types within them, including areas of open water, herbaceous vegetation and shrub vegetation. This interspersion of habitat types creates incredibly valuable wildlife habitat in the river valleys. Since they are often near development or agricultural activity, these sites can be extremely important for water quality, often retaining excess nutrients and other pollutants before they reach the surface waters.

Oxbow Management Recommendations

Neither of the two identified oxbow sites received a formal field assessment that is necessary to determine the condition of the natural community and the full functioning of the wetlands. From all available information, however, it appears that these sites perform the functions outlined above. It is recommended that an ecologist visit these sites to confirm these preliminary findings. If these preliminary findings are accurate, a 100' protected buffer around these wetlands is recommended. The 100' buffer is recommended in order to preserve the condition of the community and to ensure that the wetlands remain a functioning part of the landscape. Any invasive species present should be controlled. Trails around these wetlands can be encouraged with landowner permission. Conservation of these sites should also be considered.

Hemlock-Hardwood Swamp Communities

Hemlock-Hardwood Swamps within the Green Mountains usually occur as small wetland communities in saddles or benches in areas with variable topography and shallow bedrock. There are currently four of these sites mapped in the study area; three are considered to be locally significant (wetland #s 608, 609, 621) and one is considered to be state significant (wetland #627). The first three occur on or near the town-owned land near Irasville (the Waldron parcel). Only one of these sites was visited (wetland #621) due to lack of landowner permission for the others. Given the topography of the area, there may be more of these small swamps in this vicinity. These swamps are dominated by a mixture of hemlock (*Tsuga canadensis*) and red maple. Scattered shrubs of red spruce, hemlock and red maple are found over a dense cover of herbaceous plants dominated by sensitive fern and cinnamon fern. Standing water is common in the hollows of the varied microtopography. Though small, the swamp visited was in very good condition and showed no signs of human disturbance or invasive plant colonization.

The state significant Hemlock-Hardwood Swamp (wetland #627) is located southeast of the above mentioned swamps in Camel's Hump State Forest. This swamp is approximately 7 acres and sits in the saddle just north of Kew Hill. The vegetation is similar to that described above. Standing water is common in the hollows and the soils are composed of very deep organic peats. The swamp appears to be in very good condition. There is a hiking trail which runs near the swamp, but does not affect the condition of the community. This is a C-ranked example of this community type (See Appendix 1, Section F for discussion of ranking).

These examples of the Hemlock-Hardwood Swamp appear to be good examples of a community that is relatively uncommon in the heart of the Green Mountains. The most significant function that these swamps perform is that of wildlife habitat. These wetlands offer habitat and food for a wide variety of species including deer, moose, bear, spotted salamanders, wood frogs, green frogs, and possibly the uncommon four-toed salamander.

Hemlock Swamp Management Recommendations

The hemlock swamps identified in the study area are generally well buffered by surrounding upland forest in their current condition. Development in or near these sites does not appear to be a threat.

100' Buffer Zone: A minimum 100' buffer zone should be maintained around these swamps from any development.
Logging Restrictions: It is recommended that logging not occur within the swamp or within a 50' buffer of the swamp edge.

3.0 Vernal Pools

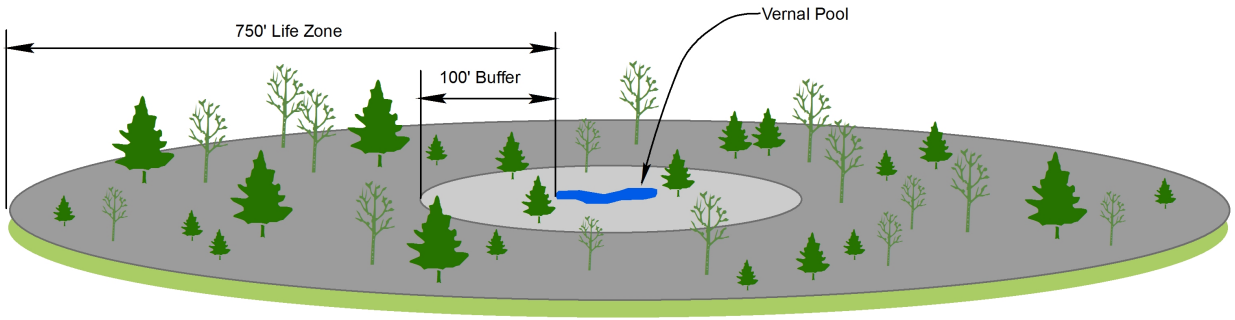
Vernal pools are seasonal wetlands that typically contain water during the wet spring months but become dry as the summer progresses. These isolated wetlands typically occur under a forest canopy, lack fish, and provide habitat to a wide variety of wildlife.

A total of 15 potential vernal pool locations were identified during the remote inventory. This includes two pools that were identified during the public meeting, two pools from the mapping of state land and one pool from the State of Vermont Department of Environmental Conservation's bio-assessment study of pools throughout Vermont. During the course of the field work, 7

potential pools were added to this list. The final map (provided in the appendix) shows the presence of 22 vernal pools in the study area. All but 2 of these pools (those identified during the town meeting) received a field visit to confirm their presence.

As can be seen from the vernal pool data summary table in Appendix 2 and attribute table information in Appendix 3, each pool that was visited received a state and local significance assessment. This ranking is based on the faunal number and diversity that a particular pool supports as well as the hydroperiod of the pool (See Appendix 1, Section B for discussion of methodology). The hydroperiod is an important measure of the reliability of a particular pool for animals that require long development stages for successful reproduction. The pools that were ranked as High for local significance were also considered to be state significant. While the "Low" and "Moderate" pools are likely not as reliable and diverse as the high ranking pools, they should still be considered locally significant. As such, each of the ranked vernal pools is included in the following section on management recommendations.

Figure 5. Vernal Pool Buffer Zones



Vernal Pool Management Recommendations

As can be seen on the attached map and Figure 5 below, there are two buffer areas around each vernal pool. These buffer distances are based on the work of Semlitsch (1998), Calhoun and Klemens (2002), Calhoun and deMayandier (2004). The first buffer distance is 100' in diameter and is important because the density of amphibians within this area is very high both during the spring breeding period and the fall juvenile dispersal period. The nature of the forest immediately around the vernal pool has a tangible affect on the nature of the pool itself. Shading from surrounding trees can drastically prolong the hydroperiod of a pool. In addition, leaf litter that enters the pool from the surrounding trees forms the basis for the food chain in the vernal pool ecosystem.

The condition of the forest in this 100' buffer zone is therefore strongly linked to the condition of the vernal pool itself. For this reason, it is recommended that the vernal pool envelope be managed in a way that will not interfere with the functioning of the vernal pool. This includes maintaining a complete forested cover within this envelope. Light thinning of forest trees is, in most cases, acceptable but should come no closer than 25' to the pool's edge. Since many amphibians require a dense leaf litter on

the forest floor with un-compacted soils, logging should occur when the soils are frozen and there is adequate snow cover. The creation of ruts in this area can often disrupt the hydrology of the nearby vernal pool. Development and other barriers to amphibian movement should be avoided within this buffer zone.

The next buffer shown on the attached map is calculated at 750' from the vernal pool habitat. This is termed the "amphibian life zone" or the "critical terrestrial habitat". As we have seen, amphibians that breed in vernal pools spend most of their adult lives in the forests surrounding their natal pools. These amphibians require a forest with dense leaf litter, decomposing woody debris, un-compacted soils, and adequate canopy cover. If logging is to occur in this area, it should occur in the winter when the ground in frozen and there is adequate snow cover. Ruts that occur in the life zone can fill with water and create population sinks as amphibians lay eggs in the ruts and never reach the more reliable vernal pool. Compaction of the soil can also result in direct loss of habitat for mole salamanders.

Calhoun and Klemens (2002) recommend maintaining 75% forested cover within this life zone to retain adequate habitat for forest dwelling amphibians.

4.0 Upland Natural Communities

A preliminary map of upland natural communities was created as part of the inventory process; see Appendix 1, Section C for methodology. Table 5 shows the summary statistics of the upland natural communities mapped in the study area. As can be seen from Table 5 above there are 271 occurrences of 13 different natural communities comprising a total of 33,862 acres. All of these types, with the exception of the Plantations, are considered to be natural communities according to Thompson and Sorenson (2000). Due to difficulties associated with mapping communities on a town-wide scale, the total number of acres presented above should be considered an approximate number. Small patches of forest were generally not mapped while some of the larger forests may contain open fields and residential development. The upland natural community map (included in the appendix) should be considered a preliminary map. The sites that were deemed to be significant were mapped more accurately based on field work and remote sensing. In all cases, however, boundary lines represent gradual transitions between natural communities and should not be considered discrete margins of the community. A detailed data summary table is provided in Appendix 2.

State and Locally Significant Upland Natural Communities

The methodology for determining state significance is based on the Vermont NonGame and Natural Heritage guidelines and is detailed in Section C of Appendix 1. Seventy-one (71) different occurrences of locally and state significant upland communities were discovered during the course of the field work. Each of these occurrences is briefly described below, and summarized in Table 6. For the most part, these determinations are based on field work conducted as part of this inventory. For the larger matrix forests (especially those on state land) information from the state ecologist was used in the assessments. For most of the larger communities, assessments were made only on a portion of the community for which landowner permission was obtained.

Table 5. Upland Natural Community Summary Data

Community Type	Number of Occurrences	Average Acreage	Total Acreage
Boreal Outcrop	3	3.93	11.78
Hemlock Forest	17	109.05	1853.85
Hemlock-Northern Hardwood Forest	66	107.30	7081.79
Hemlock-Red Spruce Forest	11	7.33	80.65
Lowland Spruce-Fir Forest	12	27.43	329.11
Montane Spruce-Fir Forest	24	80.07	1921.79
Montane Yellow Birch-Red Spruce Forest	28	114.03	3192.86
Montane Yellow Birch-Sugar Maple-Red Spruce Forest	1	39.24	39.24
Northern Hardwood Forest	43	291.10	12517.51
Plantation	9	27.48	247.30
Red Oak-Northern Hardwood Forest	1	9.39	9.39
Red Spruce-Northern Hardwood Forest	36	164.83	5934.01
Rich Northern Hardwood Forest	14	21.56	301.87
TOTAL	271	--	33862

Table 6. Summary of Locally and State Significant Upland Natural Forest Communities

Natural Community	# of Sites	Total Acres	Locally Significant	State Significant
Montane Spruce-Fir	13	1769	Yes	Yes
Montane Yellow Birch Red Spruce	27	3050	Yes	Yes
Montane Yellow Birch Sugar Maple Red Spruce	1	39	Yes	Yes
Northern Hardwood	13	7838	Yes	Yes
Hemlock Northern Hardwood	8	292	Yes	No
Hemlock Forests	4	1140	Yes	Yes
Rich Northern Hardwood	1	99	Yes	Yes
Red Spruce-Northern Hardwood	3	14	Yes	Yes
Red Oak-Northern Hardwood	1	9	Yes	No

Montane Spruce-Fir Forests

The Montane Spruce-Fir forest is a high elevation, conifer dominated forest that is common on the peaks of the green mountains. These forests are dominated by Red Spruce (*Picea rubens*), balsam fir (*Abies balsamea*), and paper birch (*Betula papyerifera*). Mountain ash (*Sorbus spp*.) and mountain maple (*Acer spicatum*) are common in the shrub layer. The herbaceous layer is typically dominated by boreal herbs such as bunchberry (*Cornus canadensis*), Canada lily (*Maiathemum canadense*) and goldthread (*Coptis groenlandica*). These communities are characterized by steep slopes, shallow soils and frequent outcroppings of bedrock.

There are two occurrences of this forest that were considered state significant within the study area. This first occurrence includes polygon #s 2-3, 711-714, and 749 and encompasses a long ridge line from the Lincoln Gap in the south up to the Huntington Gap to the north. Because this is part of a state-wide mapping effort, much of this state significant occurrence sits outside of the study area.

The second significant occurrence of this type includes the montane forest north of the Huntington Gap up to Burnt Rock Mountain (#s 716, 719, 721, and 18). The portion of this occurrence within the study area is the southern end of a large forest that runs north to Camel's Hump.

Both of these large forests (together comprising over 1700 acres within the study area alone) are a significant feature in the landscape of the Green Mountains. Because of their size and relative remoteness, large-scale ecological processes are able to occur with only limited (or no) human interference.

These sites were not visited during the field work of this inventory. The condition of the community for these sites is based on field work done in Camel's Hump state forest and elsewhere.

Montane Yellow Birch-Red Spruce Forest

This type occurs as a transitional community between the Montane Spruce-Fir Forests at higher elevations and the Northern Hardwood Forests at lower elevations. The vegetation is typically intermediate between the two types with montane species intergrading with hardwood species.

There are three occurrences of this type within the study area that are considered state significant. The first one includes the sub-montane forests around Scragg Mountain in the southeastern part of the study area. The other occurrences flank the Montane Spruce-Fir Forests along the spine of the Green Mountains along the western part of the study area.

These sub-montane forest can be fairly remote sites with little human disturbance. Large scale ecological processes generally drive these communities. Like the montane forest, they also include areas outside of the study area.

These sites were considered to be state significant because of their size, the relatively undisturbed nature of the community and the quality of the landscape. None of these sites were visited during this inventory. The determination of significance is taken from field visits from state personnel in Camel's Hump State Forest and elsewhere.

Northern Hardwood Forests

The Northern Hardwood forest is a matrix natural community that occurs throughout the state. It can be found in large tracts and occur as a "background" natural community. Three occurrences of this community in the study area were found to be significant examples of this type.

Figure 6. Northern Hardwood Forest (#177)

The largest example of this community in the study area (and the region) is in Fayston and starts at the Appalachian Gap Road and runs north to the Camel's Hump area. This large forest consists of 5600 acres within the study area and approximately four times that outside of the study area. This community is considered to be a state significant example of this type.

The second largest northern hardwood forest in the study area is also a state significant occurrence. This forest is in the eastern

part of Waitsfield but continues into Northfield, Warren and Roxbury. It consists of 1600 acres within the study area and twice that amount outside of the study area.

The third example, a locally significant forest, is situated in the valley between Mt. Waitsfield and Bald Mountain and runs north into Moretown (# 158-9). This forest appears to be in very nice condition, contains localized areas of enrichment and is well buffered by surrounding natural communities. Within the study area, this forest is approximately 540 acres.

Hemlock-Northern Hardwood Forests

There are two examples of Hemlock-Northern Hardwood Forests in the study area that are considered to be locally significant. One occurs as a series of small patches on knolls and steep slopes around Deer Brook and French Brook in Fayston (#s 125, 135-7, 722-3, and 732). The other occurrence is a larger contiguous forest south of the Center Fayston Road (#176). Both of these occurrences appear to be in very nice condition and represent the best examples of this community type that was seen in the study area.

Hemlock Forests

Unlike the above mentioned communities, the Hemlock Forests are not matrix forests. Rather, they typically occur in patches on the landscape surrounded by matrix forest blocks. The largest and most significant Hemlock Forest visited during this inventory sits partially on the Waitsfield town property (Waldron parcel). Only the northern part (on town owned land) of this community was visited. This site appears to be in very good condition and displays a wide variety of topographic and ecologic conditions. Its condition and size make it a state significant example of a Hemlock Forest. This ranking, coupled with the presence of wildlife habitat features, vernal pools and wetlands make this area an ecological gem in the study area.

Figure 7. Hemlock Forest (#52)

Two other very nice Hemlock forests can be found on either side of Number Nine Road in Fayston (#s 149 and 150). While surrounded by roads and rural development, these sites contain some very nice forest habitat in good condition. They occur in a typical Hemlock forest setting: on slopes and along the banks of high-order streams. These two sites are considered locally significant for their condition and size.

Rich Northern Hardwood Forest

In the Central Green Mountains, Rich Northern Hardwood Forests usually occur as small patches of forest surrounded by typical Northern Hardwood forests. As part of mapping of

Camel's Hump State Forest, the state mapped and assessed a large, nearly 100 acre stand of Rich Northern Hardwood Forest (#643). This site is unusual for this area in its large size and undisturbed nature. This site was not visited as part of this inventory.

Figure 8. Rich Hardwood Forest (#177)

Red Spruce-Northern Hardwood Forest

One occurrence of this type was identified in the study area as being state significant. This occurrence exists as a series of three small sites on the ridges and knolls on the slope south of Deer Brook in Fayston (#105-6, and 138). Like the Hemlock-Northern Hardwood Forests nearby, these sites appear to be in very good condition and are well buffered by the surrounding natural communities.

Red Oak-Northern Hardwood Forest

Only one example of this type was discovered during the field inventory. This site sits on a relatively steep slope with shallow soils north of Bragg Hill Road (#158). Occasional bedrock outcrops create canopy openings which add to the plant diversity of the site and make it reminiscent of much larger oak forests or woodlands in southern Vermont. Though small, this site contains some nice large scattered red oak trees which are uncommon in the study area.

Figure 9. Red Oak-Northern Hardwood Forest (#177)

Management Recommendations for Significant Upland Communities

Many of the natural communities described above occur as "matrix" communities on the landscape. This means that they can occur as very large examples that often form the background natural communities on the landscape. Therefore, in order for a particular site to be considered state significant it must represent some of the best examples in the state. The site must be a very large un-fragmented example, be in overall good condition (lack of exotics/invasives or other major, human-caused disturbance) and be well buffered by other undisturbed natural communities.

Because of the large size of these communities, the management recommendations for maintaining their integrity are very different than those for smaller patch communities (see below). With matrix communities it is not an individual acre or parcel that is as important as the entire forest as a whole. Maintaining the integrity of these communities is more a matter of maintaining the un-fragmented nature of the community and limiting human encroachment into the interior of these sites. For this reason, infringement by residential development on the edges of these communities is not a cause for concern as much as the development of large fragmenting features into the heart of the community.

Unlike many wetland communities or smaller patch communities, matrix and larger patch communities tend to be more ecologically resilient. Active forest management including a wide variety of forestry practices generally does not threaten the ecological integrity of these sites. Many of these practices can mimic natural disturbance regimes and provide valuable wildlife habitat. Nearly all manners of recreation can be a part of the overall management plan for these sites.

The recommended management for patch communities (such as Hemlock Forests and Rich Northern Hardwood Forests) is similar to that presented above for the matrix communities. It differs primarily in the matter of scale. Large fragmenting developments that cut across or reach into the center of these sites should be discouraged. Some degree of encroachment around the margins of these sites is tolerable as long as it does not impact or degrade a significant section (>20%) of the community. If some impact to these communities is inevitable, development that is clustered near the edges are preferable to those that are scattered over a wider area.

Because they are generally smaller than patch communities, active forest management can have greater impact on the overall condition rank of patch communities. Whereas in matrix communities, an area of clear-cut may not affect the overall rank of the community, patch communities may be significantly affected by these cuts. If logging is to occur in these significant patch communities, selective logging is generally recommended over small clear-cuts.

5.0 Rare, Threatened and Endangered Species

Historical locations of rare plants and animals in the towns of Waitsfield and Fayston were obtained from the Vermont Non-Game and Natural Heritage Program (NNHP). Sites found within the study area were targeted for a field visit to determine the current status of the population in question. In addition, areas containing potential habitat for these species were targeted for a field visit to determine if other populations of these species exist.

There are currently no known rare species occurrences within the study area. Field visits to likely habitats were conducted as part

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. Typically, 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, several 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.

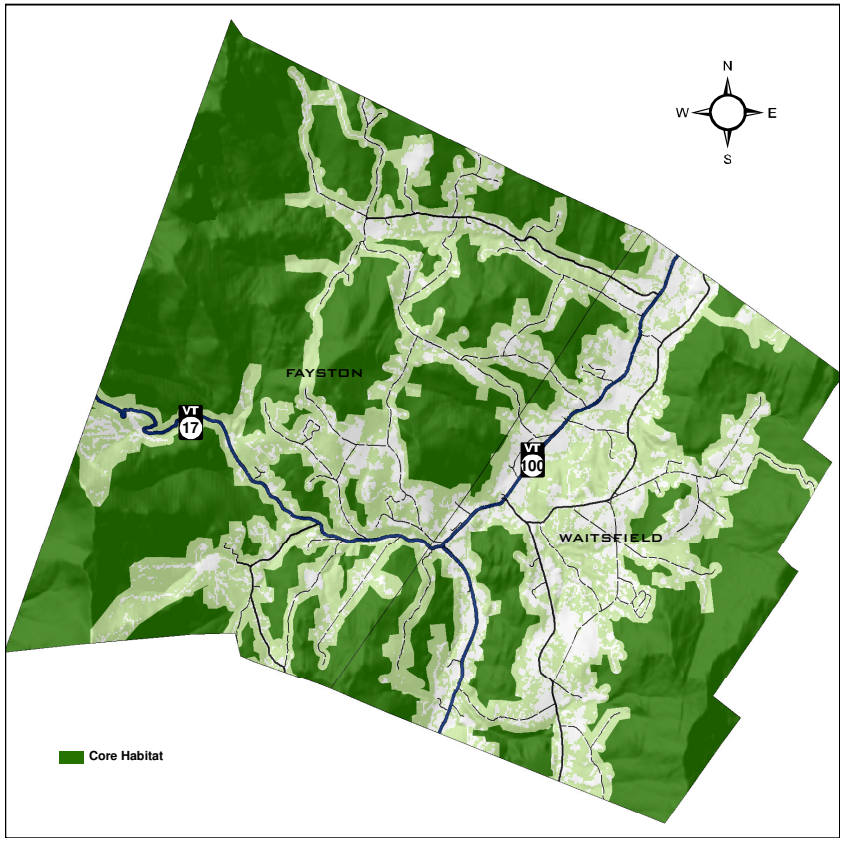


Figure 10. Core Habitat Map

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.

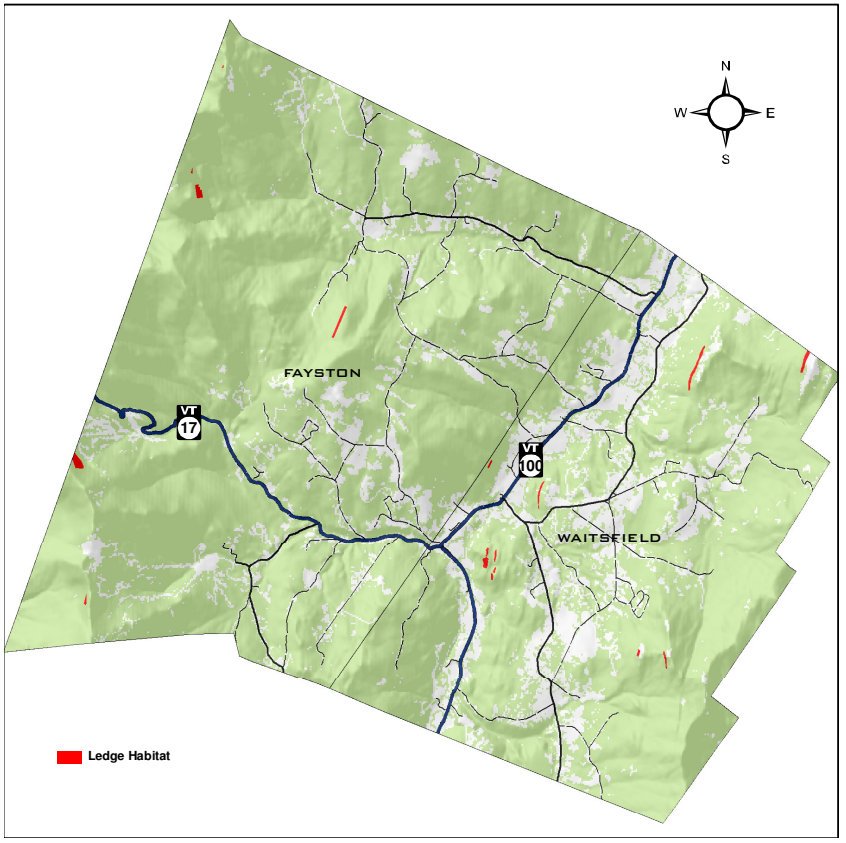


Figure 12. Ledge Habitat Map

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 requirements (i.e. sufficient cover for bear use and potential food resources). See Figure 14 for 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.

Figure 13. Logging clear-cut creating early succession habitat

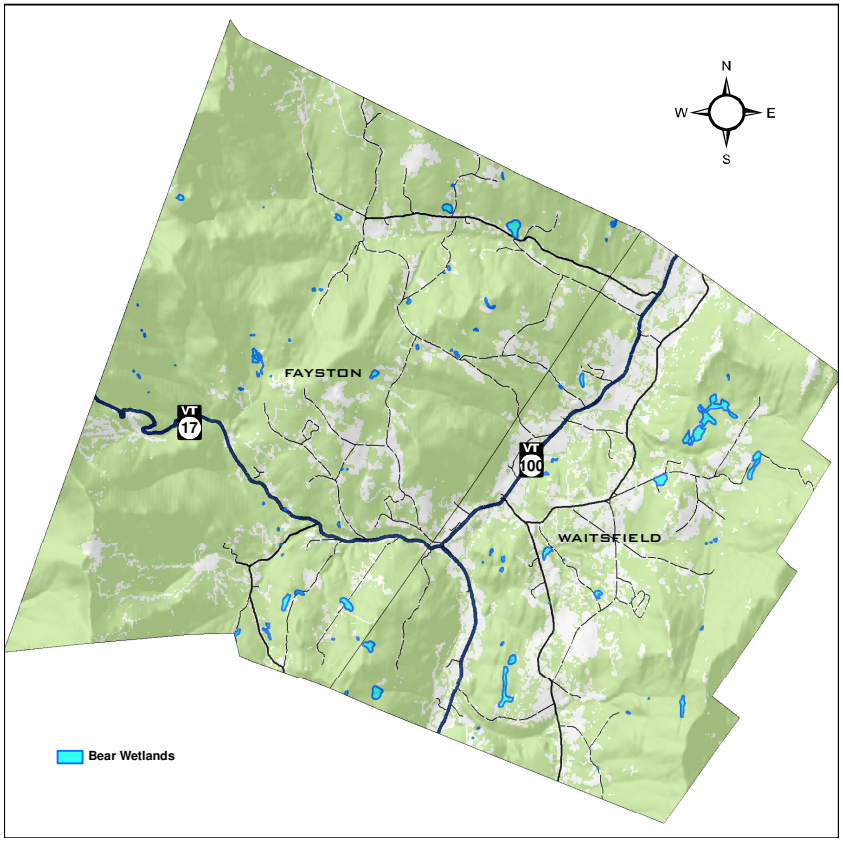


Figure 14. Bear Wetlands Map

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.

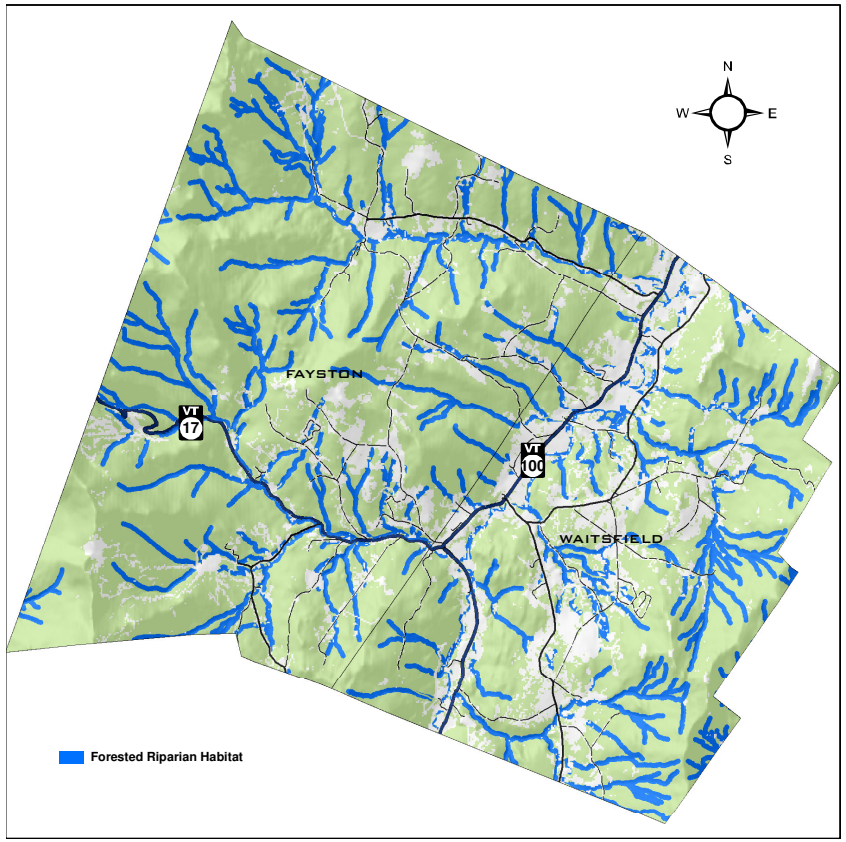


Figure 15. Forested Riparian Habitat Map

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.

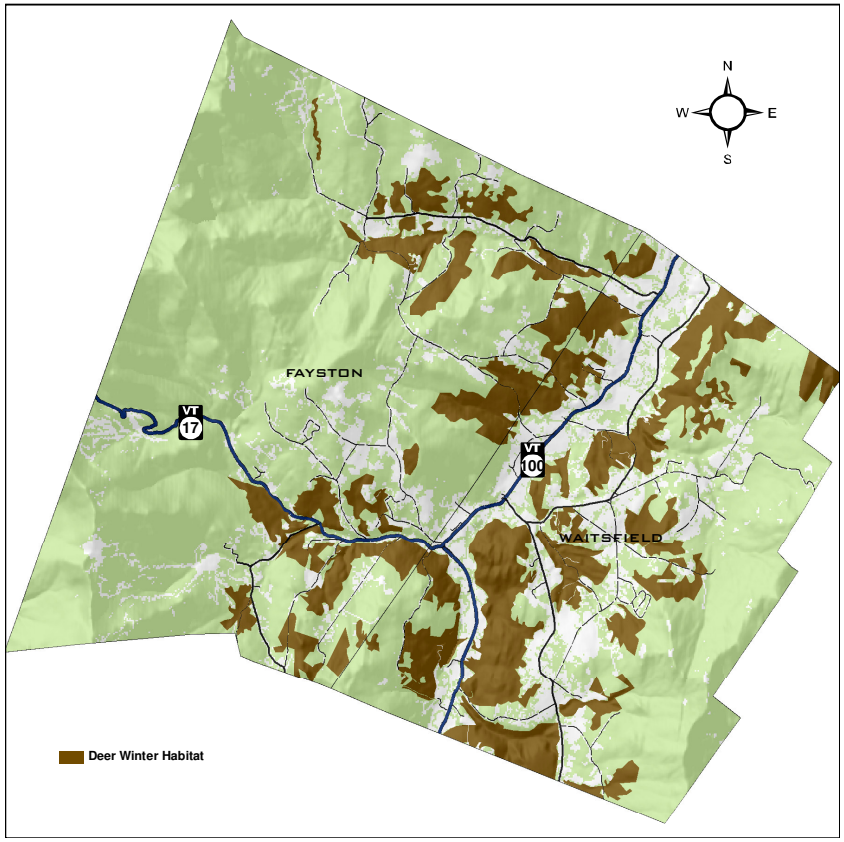


Figure 16. Deer Winter Habitat Map

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 smaller, even 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.

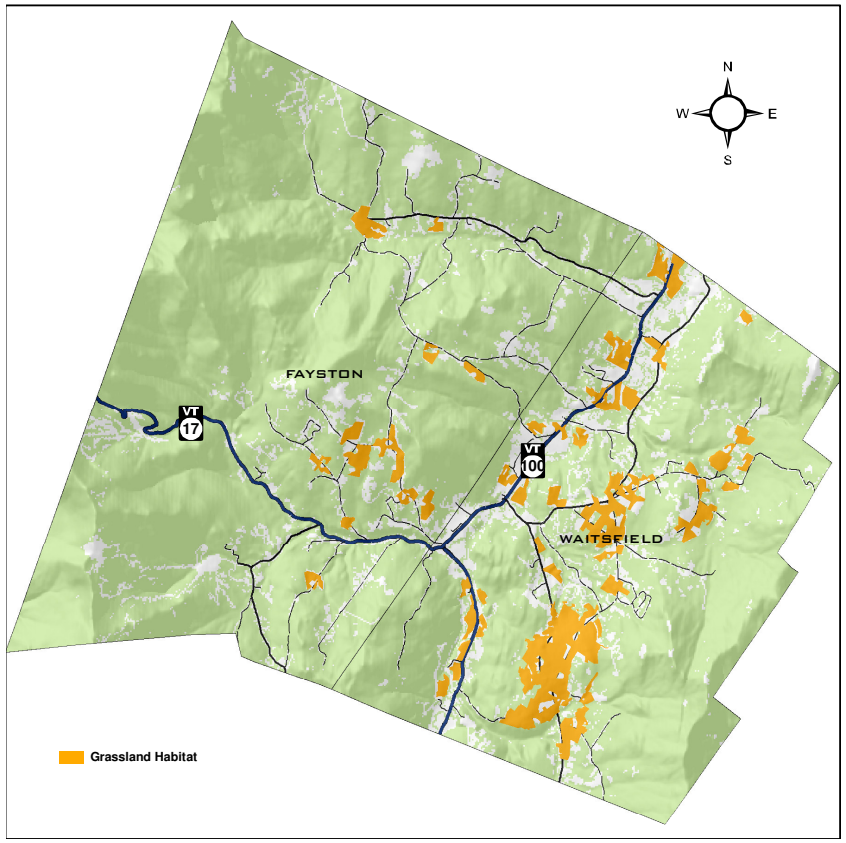


Figure 18. Grassland Habitat Map

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.

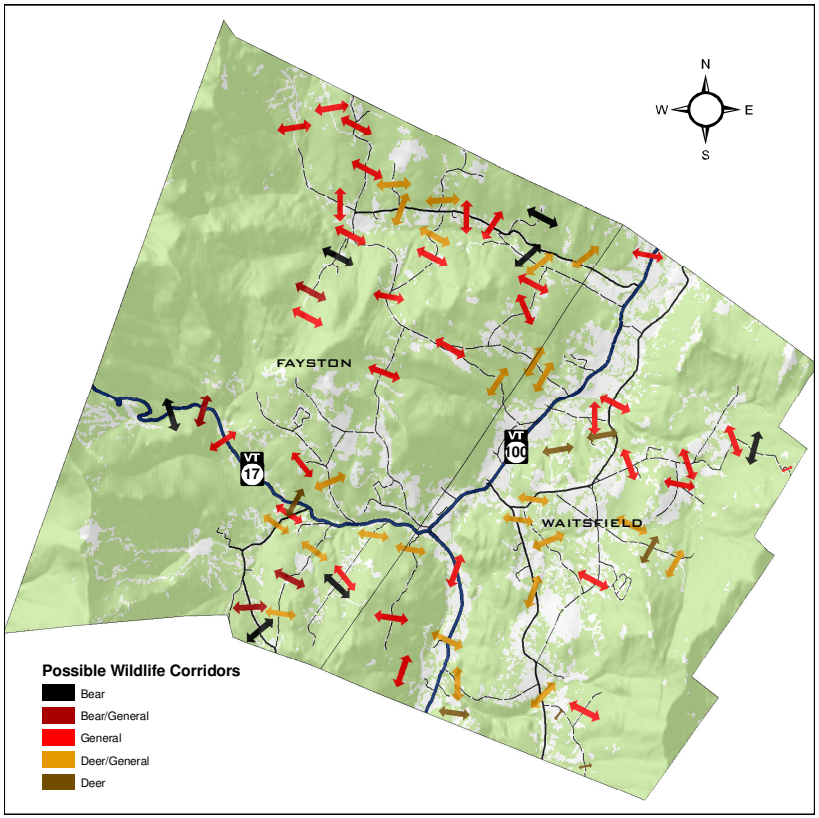


Figure 19. Possible Wildlife Corridors Map

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,

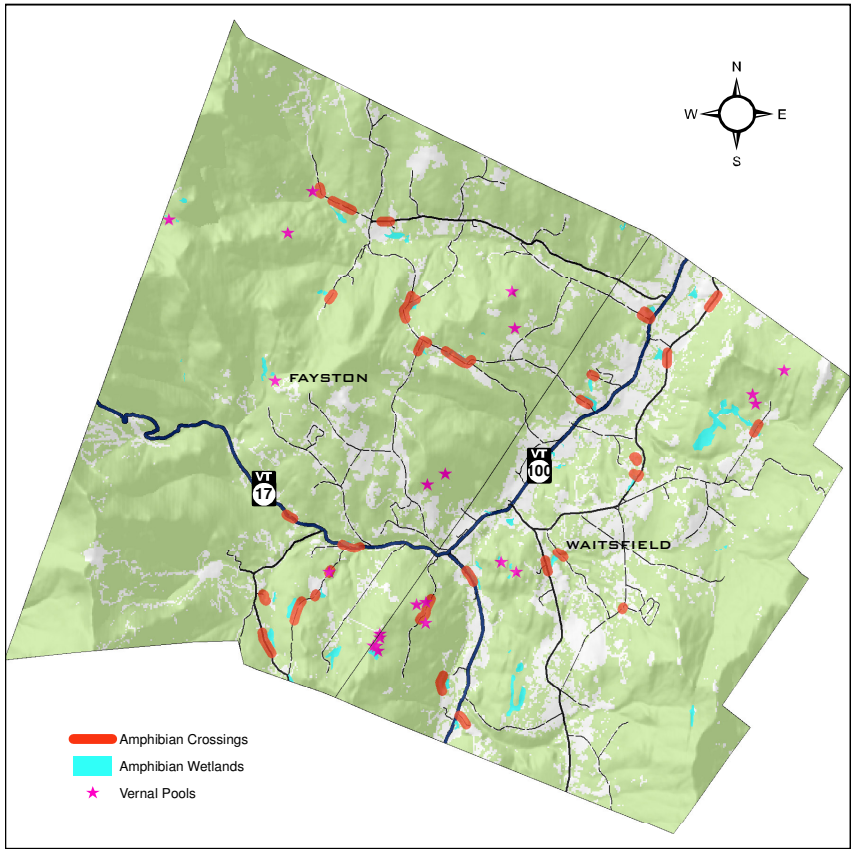


Figure 20. Amphibian Crossing Zones

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.

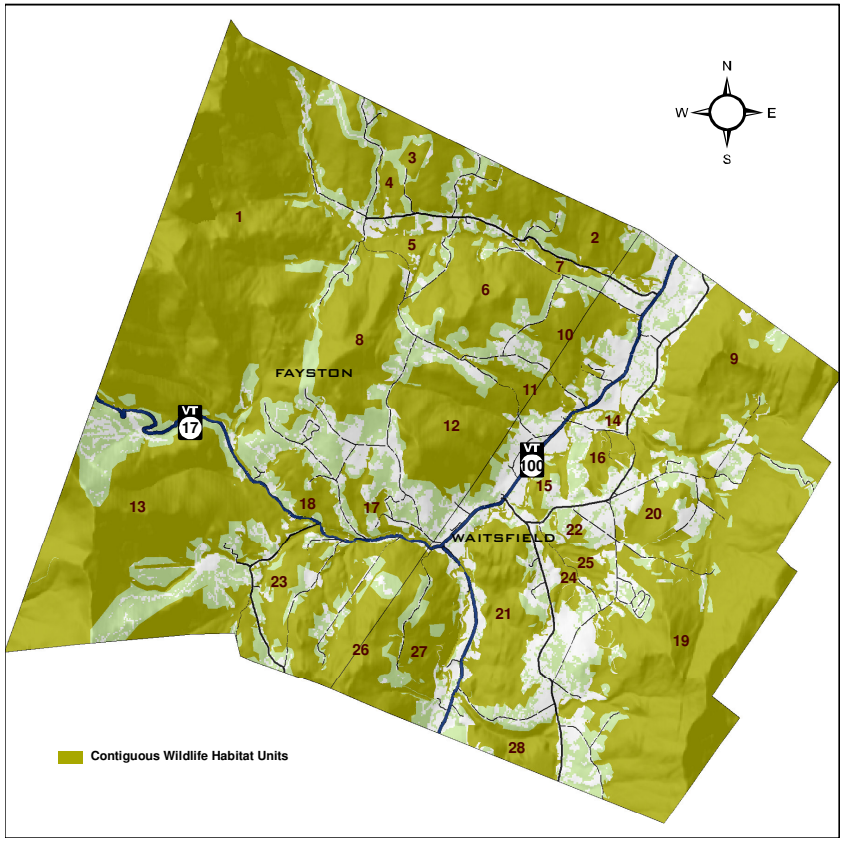


Figure 21. Contiguous Habitat Units Map

Within the CHUs, approximately 7,164 acres of Deer Winter Habitat has been identified and mapped. Mast stands were identified in 10 of the CHUs. A summary data table is provided in Appendix 2 detailing the individual habitat elements within all the CHUs. A discussion of the most significant CHUs is provided below.

CHU# 1

General Habitat Information

- 6376 acres total
- 6068 acres core habitat
- 1906' mean elevation
- Low horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
wetlands
riparian
mast
ledge
bear wetland
vernal pool
significant community

CHU1 has the largest core area in the study area and extends over the mountains into Huntington and Buell's Gore. Mast stands and forested wetlands are present and important for the productivity and maintenance of black bear and other deep forest species populations. Ledge habitat is also present in this unit. CHU1 has 26 miles of stream habitat and generally well-vegetated and topographically incised stream valleys which add to their value and use as wildlife movement corridors. This unit has several vernal pools (generally lower on the landscape) and contains substantial areas over 2700 feet in elevation with potential Bicknell's Thrush and other high-elevation songbird habitat. Other birds associated with this Montane Spruce-Fir habitat include: the blackpoll, bay-breasted and yellow-rumped warblers, ruby-crowned kinglet, and the olive-sided flycatcher. Just below this forest zone, the Montane Yellow Birch-Red Spruce Forest offers habitat for the winter wren, blackburnian and Canada warbler as well as the solitary vireo. Included in CHU1 is a portion of the Camels Hump State Park and Phen

Basin Wilderness area. This CHU1 is dominated by un-fragmented core forest.

CHU# 2

General Habitat Information

- 1367 acres total
- 1057 acres core habitat
- 1315' mean elevation
- Moderately low horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
wetlands
early succession
riparian
mast
bear wetland
significant community

CHU2 extends north into wild forested country in Duxbury and is close enough to CHU1 that wildlife probably moves readily between the two areas. CHU2 contains substantial areas of deer wintering habitat, early successional vegetation, and riparian/floodplain vegetation. With CHU2 containing both deeryard and early succession habitat, it is probably used by coyotes and other predators seeking food in these habitat types. The area has good potential habitat for black bears with beech stands present and wetlands that are appropriate for bear use. Signs of bear presence were noted during a field visit to the western finger of CHU2.

CHU2 contains areas that could be utilized by high-elevation songbirds, including potential habitat for Bicknell's thrush.

CHU# 9

General Habitat Information

- 2275 acres total
- 1783 acres core habitat
- 1326' mean elevation
- Moderately low horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
wetlands
early succession
riparian
mast
ledge
bear wetland
vernal pool
significant community

CHU9 has an extensive core area, substantial deer wintering habitat (with extensive sign of current use), and several large areas of wetland habitat. The observation of bear sign in wetlands at this site, the presence of mast stands and a substantial core area suggest that this unit is important to maintaining Waitsfield's bear productivity. CHU9 has ledge habitat, extensive forested riparian habitat as well as early successional wildlife habitat. CHU9 has vernal pools and a nice early succession balsam fir forest situated adjacent to a large streamside wetland complex where river otter, mink and bobcat sign were observed.

CHU# 26

General Habitat Information
- 1435 acres total
- 1050 acres core habitat
- 1468' mean elevation
- Moderately low horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
wetlands
early succession
riparian
bear wetland
vernal pool
significant community

CHU 26 is perhaps most notable as the area with at least 6 identified vernal pools. These provide important breeding habitat for a diversity of vernal pool-dependent wildlife. Also present within this unit is extensive forested riparian habitat and many wetlands. Remote forested wetlands and recently climbed American beech trees attest to the value of this area to bear. This forest area is extensively managed and several patches of early succession vegetation provide good snowshoe hare, mice, and predator habitat. A portion of this unit includes a large Norway Spruce plantation, with impressive regeneration in the understory likely to provide significant habitat for a variety of species.

CHU# 8

General Habitat Information
- 1093 acres total
- 984 acres core habitat
- 1783' mean elevation
- Moderately high horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
wetlands
early succession
riparian
mast
ledge
bear wetland
significant community

CHU8 is situated between the remote Big Basin area and several lower gradient forested areas. This unit has substantial areas of early successional vegetation resulting from active forest management activity, floodplain/riparian streamside forests, and ledge habitat that could provide important protective cover for bobcat and other animals. CHU8 may provide a role as an important forested landscape connection between the large remote habitat in Big Basin and the landscape closer to Route 100 and the village. The area has a high potential for bear habitat with the presence of mast stands and wetlands.

CHU# 12

General Habitat Information
- 1215 acres total
- 1042 acres core habitat
- 1415' mean elevation
- Moderately high horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
early succession
riparian
mast
ledge
vernal pool
significant community

CHU12 has extensive deer winter habitat, areas of early successional habitat, and forested riparian habitat. Field observations suggest that deeryards in this unit were receiving moderate amounts of deer use (Natural Community

#157). The area has a Northern red oak mast stand, vernal pools, and wetlands. CHU12 is likely used at least seasonally by bear.

CHU# 13

General Habitat Information

- 3436 acres total
- 3106 acres core habitat
- 2287' mean elevation
- Low horizontal diversity

Specific Wildlife Features

CHU13 has one of the largest co re areas in the study area and includes ski area development. CHU13 has large areas of Montane Spruce-Fir Forest which likely provides breeding habitat for several species of warblers and other high elevation birds including Bicknell's thrush. Significant mast stands and forested wetlands are present.

Features Present:
core
deeryard
streams
wetlands
early succession
riparian
mast
ledge
bear wetland
significant community

The Slide Brook beech stand, one of the heaviest used beech stands known in Vermont, is partially contained within this unit. Black bear and other deep forest species likely use this area year-round. CHU13 also is contiguous with large forested habitat outside of the study area to the west. The area has several deer winter habitats, ledge habitat and extensive areas of forested riparian habitat.

CHU# 19

General Habitat Information

- 4145 acres total
- 3551 acres core habitat
- 1868' mean elevation
- High horizontal diversity

Specific Wildlife Features

CHU19 has a very large core area that extends across most of the higher elevations of Waitsfield and east into Northfield. CHU19 has the largest core area in Waitsfield and likely provides "source" habitat for bear, bobcat, fisher, coyote, moose and other mammals and birds. CHU 19 has a relatively high diversity of plant community types (i.e. a high horizontal diversity) and extensive areas of early successional habitat. This area likely contains year-round populations of black bear and other deep forest species. Field work indicated that mast stand #19 was not heavily utilized by bear either historically or recently.

Features Present:
core
deeryard
streams
wetlands
early succession
riparian
mast
ledge
bear wetland
significant community

CHU19 has extensive forested stream riparian areas. The unit includes a remote beaver-influenced wetland that likely is used by bears and other wildlife. Extensive deer sign was documented in the Hemlock Forest communities within this unit (Deer winter habitat #38).

Scragg Mountain and areas within the southern part of the unit have coniferous forest vegetation and may provide breeding

habitat for high elevation songbirds including the Bicknell's thrush.

CHU# 21

General Habitat Information

- 1043 acres total
- 702 acres core habitat
- 974' mean elevation
- Moderately high horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
wetlands
early succession
riparian
ledge
bear wetland
vernal pool
significant community

Nearly the entire CHU21 is a Hemlock Forest Community mapped as deer winter habitat. The unit also contains extensive ledge habitat which may be of significance in providing, protective bobcat, raccoon, and porcupine denning habitat. Porcupine, and probable bobcat sign was noted within the ledge areas of this unit. Both the deer winter habitat and the potential ledge denning sites have western aspects and may be sunny and quite warm.
This increases their value as potential wildlife habitat. There are also extensive wetland and streamside forested riparian habitats within the unit that may be utilized by bear in spring and/or summer months. CHU21 also has vernal pools and perched Hemlock-Hardwood Swamps that offer important amphibian habitat.

CHU# 6

General Habitat Information

- 1011 acres total
- 793 acres of core habitat
- 1429' mean elevation
- Moderately high horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
wetlands
early succession
riparian
mast
bear wetland
vernal pool
significant community

This Wildlife Unit has a substantial area of deer winter habitat, floodplain/riparian streamside habitat, and well as mast stands and wetlands with a high potential for bear use. American beech stands exhibited signs of both recent and historical use.

CHU6 also contains vernal pools and a locally significant wetland community. The area has diverse vegetation and several areas of heavy forest cutting resulting in berry patches which are likely used by wildlife. Extensive moose sign was observed in this area.

CHU# 28

General Habitat Information

- 367 acres total
- 230 acres of core habitat
- 1083' mean elevation
- Low horizontal diversity

Specific Wildlife Features

Features Present:
core
deeryard
streams
wetlands
bear wetland

CHU 28 stretches into Warren in the south, but its forested extent is limited by the presence of farmlands. The area has extensive deer winter habitat (the Folsom Brook section is very steep and could also be a focus of wildlife movements across the Mad River and Route 100). This parcel extends uphill from Route 100 containing forested riparian habitats that provide winter deer habitat and wildlife movement possibilities.

CHUs Dominated by Deer Winter Habitats

CHU's 16, 22, 24 and 28 are all relatively small habitat areas that are mapped almost entirely as deer winter habitat. These relatively small areas may receive a disproportionately high use by wintering deer because of their concentrated cover. These areas require field verification of deer winter habitat use.

Wildlife Habitat in Smaller CHUs

Contiguous Wildlife Units 3, 4, 5, 7, 11, 14-17, 18, 22 , 24, and 25 are small enough that core habitat is non existent or relatively small in extent. These CHUs may contain special wildlife elements such as aquatic habitats, wetlands, ledges or special food plants that can be utilized by a wide-variety of wildlife species. In many cases these smaller forested habitats will not provide year-round habitat for larger species such as bear or moose, but these larger mammals may be utilizing these habitats seasonally. Animals such as woodchuck, red fox, skunk, raccoon, deer, snowshoe hare, mice, moles, voles, amphibians, reptiles and the more common bird species live in these smaller wildlife units. These areas are of greater value to wildlife when they have higher vegetative diversity, or special habitats such as ledges, vernal pools, ponds, and streams that connect them to other wildlife habitats.

Small Unit's can be important to animals traversing the landscape and moving between larger core areas. Smaller units (such as CHU 11, 16, 24, 25 and 28) can serve as travel corridors for these animals in transit. In some cases these relatively small forested units may link Fayston and Waitsfield with other nearby towns.

Habitat units 5, 10-11, 17-19, 23, 25, 27, and 28 have substantial areas of forested riparian habitat. These areas may be used by wildlife moving throughout the landscape. The cover provided by these forests is often dense and facilitates seasonal and annual migration by wildlife. Cover provided by riparian forests and other plant communities is utilized during wildlife movements and can help animals escape people, predators and other obstacles during this vulnerable period in an animal's cycle.

In other cases, these smaller forested areas may be near a population center with major roads and may provide for some opportunistic wildlife viewing opportunities. CHUs 10, 11, 14, 15, and 16 are forested areas populated areas near Route 100 and may serve a wildlife viewing function.

Small Wildlife Habitats in the Mad River Valley

Wildlife can be found throughout the Mad River Valley including near villages, and houses, in farm fields and along hedgerows and near small streams and woodlots. In the more agricultural settings, sitings of deer, red fox, skunk, groundhogs, and wild turkey are most likely a common occurrence. These same species are also occasionally spotted close to villages and more developed areas in the Valley. Maintaining small woodlots, wooded streamside habitat, and hedgerows in agricultural fields is vital to the continued utilization of these areas by this suite of wildlife. These environments are critical for the majority of the residents to continue to observe wildlife where they live.

Management Recommendations for Wildlife Habitat

Large Contiguous Habitat Units: The Core Habitat Units described above are areas with large core size, substantial forest interior habitat and generally a wide-diversity of wildlife habitat elements. They provide important habitat for large, wide-ranging wildlife such as black bear as well as specific habitat features critical for a wide variety of other species.

- Forest fragmentation in these larger CHUs should be discouraged. Roads (especially paved), housing and most other human activities should be restricted to the periphery of these units.

- Forest management activities that support a diversity of forest and early successional natural communities are an appropriate use of these areas.

- Connections between the various wildlife habitats/elements within the units should be maintained.

- To maintain deep forest habitat for many declining songbirds, heavy forest cutting which promotes the development of edge conditions should be limited in these areas.

High Elevation Bird Habitat: High elevation songbird habitat is found in CHUs 1, 13, and 19. Bicknell's thrush and other high-elevation birdlife may nest in the higher elevations (generally above 2700 ft) within these units.

- Any forest removing activities proposed for areas above 2700 ft should be assessed by a professional biologist to ensure the minimization of impact to Bicknells' thrush breeding habitat.

Bear Habitat: Black bear require extensive remote areas to meet their yearly habitat requirements. Large, non-road areas must be preserved to maintain sustainable populations within the Mad River Valley. Bears must continue to have access to mast stands and forested wetlands. Bear habitat management can also focus on beech stands that have documented bear use (see Wildlife Habitat Elements Map included in the Appendix).

- Mapped beech stands and forested wetlands utilized by bear should be protected from development activities with buffers ¼ mile in extent. A professional biologist should address potential impacts to bear and their populations in these cases.

- Harvesting of beech that shows current or historic use by bear should be discouraged.

Ledge, Talus, and Cliff Habitats*:* Ledge, talus and cliff habitats are utilized by nesting birds, resting wildlife, and in some cases denning bobcats and porcupine.

- Human development activities should be discouraged on and near ledges, talus, and cliffs.

- A minimal 100' buffer should be maintained between these habitats and human development activities.

Deer Winter Habitat: These habitats are critical to the survival and maintenance of deer populations in the Mad River Valley. Without deer winter habitat preservation, deer populations within the Valley could decline.

- Deer winter habitats identified in this report should be protected from human activities by 300' buffers.

- A professional biologist should assess potential impacts from human development activities (except forest management activities) proposed within 300' of deer winter habitats.

Forested Riparian Communities: Forested riparian habitats offer important wildlife habitat and provide cover for wildlife movement.

- Wherever possible, forested riparian communities should not be fragmented by human activities.

- Forest management activities in forested riparian communities should utilize selective harvesting techniques only and maintain a continual forest cover.

Grassland Habitat: Grassland habitats were not a primary focus of this project, although a preliminary mapping of likely suitable habitat areas was completed. Further evaluation of the presence and use of this declining habitat type should be conducted within the two towns, and opportunities for conservation explored. Additionally, management of grassland areas should be encouraged in ways that is conducive to the reproductive success of the species that rely upon it whenever possible. Management strategies in should include delayed mowing (after July 15th) and bi-annual rather than annual mowing.

Travel Corridors: Functioning travel corridors allow for the movement of wildlife across the landscape. Conservation of wildlife travel corridors is often a difficult undertaking in that much of the negative impact to these features happens slowly over time. The affect on a particular corridor from one residential development, for example, may be small. Over the years, however, as more small development occurs, the once functioning travel corridor may receive less use and eventually disappear. Concrete management recommendations for the travel corridor presented here are, therefore, difficult to develop. The following steps, however, will increase the knowledge about the specific corridors in the towns and enable planners to draw more specific conservation guidelines.

- Conduct field verification studies to identify and characterize the important travel corridors within the Mad River Valley and especially those presented in this study.

- Prioritize the importance of these travel corridors for conservation action.

- Take steps to conserve the most important travel corridors by creating isolation buffers around them to maintain wildlife movement patterns.

- Limit development to the outside edge of corridors and encourage screening, natural color schemes and other actions to limit negative effects of development in or near corridors.

- Important black bear corridors are especially vulnerable and may require buffers of up to ¼ mile in extent.

- Improve vegetated buffer conditions along the Mad River and its tributaries to provide protected movement opportunities for wildlife.

7.0 Conclusions

The Mad River Valley provides habitat for a wide-variety of wildlife, including bear, moose, deer, fox, coyote, fisher, bobcat, mice, voles, and moles, abundant birdlife, a variety of amphibians and reptiles. It is home to a wide variety of upland and wetland natural communities. Waitsfield and Fayston have undertaken this investigation to better understand the nature and specifics of their natural resources and to plan for protecting these resources for their own sake and to enhance the quality of life for it's residents.

The quality of life in Waitsfield and Fayston is uniquely tied to the condition of the natural features in the towns. It is the clean water to fish and swim in, the woods to walk and hunt in, and the clean air to breathe that makes this area an attractive place to live and work. We are hopeful that the towns in the Valley will use the information within this report to carve out a home for wildlife, woods and wetlands as well as its citizens.

What we have presented in this report is essentially a snapshot of a dynamic landscape, the Mad River Valley, where habitats and people will push up against each other for some time to come. Hopefully the information contained here will inform the citizenry, developers, and town planners in the Mad River Valley and provide a basis for informed decisions that will promote conservation and human activities side by side. The natural resource inventory process is an ongoing endeavor constantly in need of fresh information. It is our hope that over the years, towns in the Valley will continue to map and assess their natural features and add to this snapshot in time.

8. References

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