

Wu Ledges Forest Management Plan

2014



Prepared by the Waitsfield Conservation
Commission with assistance from Sharpless
Ecologic, LLC.
DRAFT May 2014

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WU LEDGES FOREST MANAGEMENT PLAN

WAITSFIELD, VERMONT

**MAY 2014
DRAFT**

**Prepared by
Waitsfield Conservation Commission**

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WU LEDGES FOREST MANAGEMENT PLAN - DRAFT

[Final Date]

Prepared by the Waitsfield Conservation Commission
with assistance from Sharpless Ecologic, LLC. Kristen Sharpless, Ecologist

Accepted by: _____
Chair, Waitsfield Selectboard Date

Accepted by: _____
Jonathan Decker Date
Regional Stewardship Manager, Vermont Land Trust

Please direct questions about this plan or the Wu Ledges Forest to the Waitsfield Town Administrator at 496-2218.

DRAFT

CONTENTS

INTRODUCTION	1
VISION AND GOALS	3
PROPERTY DESCRIPTION	4
POLICIES AND GUIDELINES	16
MANAGEMENT OBJECTIVES AND ACTIONS	29
REFERENCES AND RESOURCES	32
GLOSSARY	34
APPENDIX A: REGULATIONS, EASEMENTS, AND PERMITS	44
APPENDIX B: SUMMARY OF PUBLIC INPUT	46
MAPS	58
Town Ownership and Access	
Orthophoto Map	
Trail Map	
Soil Map	
Forest Stand Map	
Forest Bird Habitat Map	
Natural Communities Map	
Ecological Features Map	

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I INTRODUCTION

This Management Plan has been created to guide the use of the 143-acre Wu Ledges Forest (WLF) in a manner that protects the ecological values of the property and for the long-term benefit of the current and future Waitsfield and broader Mad River Valley communities.

The WLF consists of three parcels. The Town was gifted the 123-acre Waldron Parcel in 2004 and the 15-acre Lawton Parcel in 2005 (Appendix A). The Waldron parcel is subject to the legal terms and conditions of a conservation easement held by the Vermont Land Trust, which runs with the land in perpetuity. The Lawton Parcel is not currently protected by a conservation easement. The 5-acre Austin parcel, donated to the Town in 1999 is subject to the terms and conditions of a Grant of Right of Entry, Covenants and Conservation Restrictions held by the Vermont Land Trust (Appendix A).

These properties also are subject to the provisions of the Waitsfield Town Plan and Zoning Regulations. Together with the conservation easements mentioned above, these legal documents establish key guidance and sideboards for management and use of the WLF. A brief summary of these documents is provided in Appendix A.

In addition to owning the Waldron, Lawton, and Austin parcels in fee, the Town holds (1) a conservation easement on the 25.5-acre parcel of forest land located between and adjacent to its Waldron and Lawton parcels that is currently owned by Alexander Lawton IV, and (2) rights of way and easements for non-vehicular public access

on designated trail routes across portions the Hastings Meadow subdivision property and lands retained by Alexander Lawton IV, as well as for space for limited public parking on the Hastings Meadow property.

The locations of the Town's ownerships in the area – fee lands, conservation easement, trail rights of way and easements, and right of way for a parking area – are shown on the Town Ownership and Access Map.

The Waitsfield Conservation Commission commissioned five studies and analyses of the WLF for the purpose of inventorying the ecological and natural resources of the property in order to inform management. These documents are:

- ***Natural Communities Inventory*** – Conducted in 2006 by ecologist, Brett Engstrom. Identifies and describes upland and wetland natural communities on the property. Identifies state and locally significant communities and implications for some wildlife species. Natural community map included (Natural Community Map). Waldron and Austin Parcels only.
- ***Audubon Forest Bird Habitat Assessment*** – Conducted in 2008 by ecologist Aaron Worthley. Characterizes current habitat available for breeding birds of conservation concern and makes recommendations for how to protect and/or enhance habitat for these species on the property. Habitat unit map included (Forest Bird Habitat Map). Waldron parcel only.
- ***Forest Stewardship Plan*** – Initially drafted in 2012 by Washington County

Forester, Russ Barrett. Identifies goals and stand-by-stand objectives for forest management, describes current stand conditions, and prescribes silvicultural treatments to occur over 10-year period. Stand map included (Forest Stand Map). Waldron parcel only.

This plan will be reviewed and updated as necessary in 10-15 years or sooner if circumstances dictate.

- ***Recreational Trails Inventory and Assessment*** – Prepared by UVM Land Stewardship Program (LANDS) intern team in 2013. Trail map included. Waldron and Lawton parcels only.
- ***Access Assessment*** – Prepared by Mad River Path Association in 2013. Summarizes current legal means of access to WLF and includes copies of original deeds and conservation easements. Waldron and Lawton parcels only.

In fall 2013, the Conservation Commission hired Sharpless Ecologic, LLC to assist with gathering public input and to begin drafting this plan. A draft vision and goals were presented to the public for initial feedback in December 2013 along with an online survey to gather additional information on people's uses of and desires for the WLF. Additional comments were received from Will Flender for the Mad River Path Association, John Atkinson for the Mad River Riders, and natural resource professionals Dan Kilborn (Vermont Land Trust) and Dan Singleton (Washington County Forester, Vermont Department of Forests, Parks, and Recreation). A full draft of the plan was presented for review to the public in June, 2014 and to the Select Board in [DATE]. The final plan was approved by the Select Board and Vermont Land Trust (Page iii).

II VISION AND GOALS

II.1 VISION STATEMENT

The Wu Ledges Forest is a public forest valued by the residents of Waitsfield and the broader Mad River Valley community for a variety of reasons. Our vision is to conserve these lands for scenic, educational, and non-commercial, non-motorized recreational purposes, and to maintain their value for watershed protection, habitat and biodiversity conservation, forestry, and sustainable forest products. We also hope the Town's stewardship of these lands will serve as an exemplary demonstration and an inspiration for other forest landowners.



II.2 MANAGEMENT GOALS

The following are the goals of the Town of Waitsfield for the sustainable management and use of the Wu Ledges Forest:

- Promote and manage non-commercial, non-motorized recreational uses that are compatible with other management goals.
- Promote educational and community uses of the WLF that are compatible with other management goals.
- Conserve the scenic beauty and open space values - including space for quiet solitude - of the forest, trails, vistas, wetlands, and waterways.
- Maintain and/or enhance ecological and recreational connections between the WLF and the surrounding landscape.
- Protect riparian buffers, aquatic habitats, wetlands, waterways, water quality, and stream flow.
- Practice sustainable forestry that generates forest products and/or revenue for the benefit of the Waitsfield community.
- Model any active forest management on regional and historic patterns, frequencies, sizes, and intensities of natural disturbances to the extent possible.
- Monitor and respond to changes.
- Conserve habitat for native plants and animals, including game and non-game wildlife. Limit non-native, invasive species to the extent possible.
- Conserve biodiversity.

III PROPERTY DESCRIPTION

The Wu Ledges Forest (WLF) consists of approximately 143 acres of forest, cliffs, wetlands, open land, and river shores located within walking distance of Waitsfield Vermont's historic village. The WLF is characterized by a rugged series of north-south-running cliffs and sloping benches that rise to a high point at 1,100 feet and provide stunning views of Waitsfield and Fayston to the west. Hardwood and hemlock forests grow on the slopes and ledges respectively and numerous small wetlands are located in shallow basins between ridges. The lowest elevations of the WLF are located in the Mad River floodplain, and the river forms the western boundary of the Waldron Parcel and the eastern boundary of the Austin Parcel. The combination of the town-owned WLF, Lareau Swimhole Park and Tardy parcels protects approximately six-tenths of a mile of river frontage on the east side and about 0.15 mile on the west side, with about 300 feet protected on both sides (Waitsfield Town Plan, 2012). The Austin Parcel is dominated by an old hayfield that has reverted to a meadow. A small 1.5-acre portion of the Waldron Parcel located across the river from the Austin Parcel is part of a larger hayfield on the adjacent Lee property to the south.

The WLF is a popular destination for hikers, mountain bikers, and others. Many visitors access the property from a number of informal trails that connect onto the WLF from adjacent private land. However, current legal public access points are limited to: (1) a trail for pedestrian and bike access from the end of Pine Hill Road (no parking); (2) the

designated trail routes for non-vehicular access on the Hastings Meadow subdivision property and lands retained by Alexander Lawton IV on which the Town holds rights-of-way and easements for public access (which also have associated legally-authorized space for limited public parking on the Hastings Meadow property that has not yet been established on the ground); and (3) a right-of-way along the southern boundary of the Austin parcel that requires fording the Mad River to access the lower/western portion of the Waldron parcel. Also, a short section of the Mad River Path travels onto the Austin Parcel from the Lareau Swimhole parking area along Route 100.



The following attributes characterize the WLF and its **primary conservation values**:

- ❖ Access and trails available to the public for non-motorized, non-commercial recreation.
- ❖ Close proximity to the Waitsfield Village, Lareau Swimhole Park, and residential neighborhoods.
- ❖ Dramatic cliffs with stunning views.
- ❖ A diversity of forests, wetlands, and open land that provide habitat for a variety of native wildlife species including deer, bear, and breeding birds of conservation concern. Includes more than 114 acres of mapped deer yard and multiple vernal pools, seeps, and swamps.
- ❖ Recreational and wildlife habitat connectivity as part of a larger 1,670 acre forest block.
- ❖ Extensive Mad River frontage and public access to the river.
- ❖ Productive forest soils supporting a valuable timber resource.
- ❖ Part of the scenic backdrop of Irasville and Waitsfield Village viewed from Route 100.

III.1 LAND USE HISTORY

The property is named Wu Ledges in accordance with the request of Chauncey and Arleon Waldron who donated the property to the Town. James Wu and the Waldrons were good friends, and the

Waldrons wanted to name the land in his honor.

There is a long history of timber harvesting on the WLF. Commercial logging was – and still is – an important part of the Mad River Valley economy. Historically, logs were cut by hand and pulled out of the woods by horses or oxen then hauled by wagon, sled, or truck to mills along the Mad River where they were turned into everything from lumber and clapboards to boxes and packing material. The timber company Bowen-Hunter owned portions of WLF for a time and likely sold maple from the site to the bobbin mill along Route 100 south of Warren Village (Leo Laferriere, personal communication). Today, the only local mill remaining in the Mad River Valley is the Baird Sawmill on Mill Brook in Waitsfield. Most of the wood harvested in the Mad River Valley today is sold locally for firewood or hauled to mills or other processing plants elsewhere in Vermont and Canada.

Most recently, in the winter of early 1999, a timber sale was conducted on the Waldron Parcel under its previous ownership (Leo Laferriere, personal communication). Under the guidance of a consulting forester, trees were individually marked and harvested, producing approximately 94,000 board feet of timber which was sold to nearby sawmills. The operation was done in conjunction with a similar harvest on the abutting Smith property to the north. Timber from the WLF forest was drawn out on and trucked from the Smith land. Evidence of past logging is visible throughout the property and includes numerous stumps, blazes and basal scarring,

as well as a series of skid roads, some of which are used for recreational access.



Figure 1: Some old skid roads on the WLF are currently used as trails for recreational access.

Additionally, maple sugaring operations took place in the hardwood forests on the WLF, which are rich in sugar maples. Old sugar maple stumps show tap holes, and sap bucket covers and the remains of boiling pans and brick fire pits (arches) are found in three separate locations on the WLF.



Figure 2: The remains of one of the three sugarhouse foundations on the WLF.

The floodplain forests, meadows, and thickets along the Mad River on both the

Austin Parcel and the WLF have a history of agricultural use. The thickets along the rivershore in the northern most part of the WLF was formerly pasture land according to Jack Smith who owns the adjacent Smith property. The Austin Parcel was hayed by local farmer Hadley Gaylord until the land flooded during Topical Storm Irene in 2011 (Leo Laferriere, personal communication). Due to a lack of mowing over the past few years, the field has reverted to meadow. As of 2014, Hadley was still haying and using the the field across from the Austin Parcel as pasture. He accesses the field via the WLF right-of-way.



Figure 3: Most of the Austin Parcel was a hayfield, but has reverted to a meadow since it has not been mowed for the past few years (looking east toward the Waldron parcel).

III.2 LANDSCAPE CONTEXT

The WLF is located at the northern end of a 1670 acre contiguous block of forest that extends south to Airport Road in Warren (Figure 4). This large, unfragmented block of forest is identified as part of the 1043-acre Contiguous Habitat Unit (CHU) #21 that is described in the *Natural Heritage Inventory and Assessment for Waitsfield and Fayston, Vermont* (Arrowood Environmental, 2007). CHU #21 has the following ecological values that should be

considered and protected when making management choices on the WLF:

- ❖ A large area of contiguous **deer wintering habitat**.
- ❖ Extensive **ledge habitat** which may be of significance in providing protective bobcat, raccoon, and porcupine denning habitat.
- ❖ **Extensive wetland and streamside forested riparian habitats** that may be important for bear during spring and/or summer.
- ❖ **Vernal pools and perched Hemlock-Hardwood Swamps** that are important amphibian habitat.

Large blocks of unfragmented forest habitat are critical for the survival of large, wide-ranging mammals as well as for breeding forest birds that have better reproductive success away from forest edges and human development, such as the scarlet tanager and wood thrush. The Audubon Vermont Forest Bird Habitat Assessment (Worthley, 2008) identifies a suite of *responsibility birds* whose breeding populations are largely restricted to the Atlantic Northern Forest region – which includes most of Vermont - and many of which are also in decline. Ideally, quality habitat for many of the 40 responsibility species and all of 14 focus wildlife species listed in the following section will be available on and around the WLF. In order to ensure habitat availability for all of these species on the landscape, management decisions should be made after assessing the habitat features, and forest age classes and configuration on the surrounding $\geq 2,500$ acres.

The 2,500-acre landscape that includes and surrounds the WLF is characterized by both the contiguous forest of CHU #21 and dense development and agriculture along Route 100. Currently, based on aerial imagery analysis and knowledge of land use history and patterns, very old and very young forests both appear to occur only in very small amounts ($<1\%$) in this landscape and on the WLF. Historically, prior to the extensive agricultural settlement and associated land clearing and timber harvesting that occurred during the 1700s and 1800s, old forests would have dominated the area with young forest stands comprising a small percent of the landscape (1-3% of northern hardwood forests, and 3-6% of spruce-northern hardwood forests; Lorimer and White, 2003). Small, frequent disturbances such as windthrow and icestorms would have created numerous small to medium-sized canopy gaps. Large stand-replacing natural disturbances, such as hurricanes, would have been very rare.

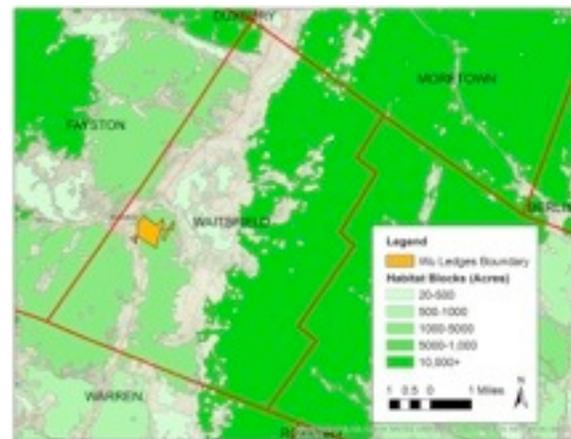


Figure 4: The WLF is located at the northern end of a highly ecologically significant 1,670-acre contiguous forest habitat block (Source: VT Fish and Wildlife).

Many wildlife, including bear and deer, require suitable travel corridors to move

safely between habitat blocks in search of territories, food, and mates. One potential general corridor across Route 100 is located near the Austin Parcel and WLF (Arrowwood Environmental, 2007). Safe travel corridors across Route 100 are particularly important and rare due to the high level of development along the road. An amphibian crossing zone has also been mapped in this area where some species of frogs and salamanders likely cross Route 100 in the spring to move from upland forests to their wetland breeding habitats. A few of the natural communities on the WLF and the Austin Parcel are state significant: hemlock forest, rich northern hardwood forest, and river cobble shore (Engstrom, 2006). These are some of the best examples of these communities existing in the state. Sustainable forest management is compatible with maintaining the integrity of the forest communities as long as their unfragmented nature is also maintained. As a public forest, the WLF plays an important role in protecting the value and integrity of these communities.

The combination of these important features resulted in WLF and much of CHU #21 being mapped as a Primary Conservation Area by the Forests, Wildlife, and Communities Project in 2011 (Tiered Ecological Priorities Map).¹ Primary Conservation Areas are the most fragile, sensitive, and/or diverse in the Mad River Valley. They are limited in area, fixed in location, and should be managed for conservation purposes rather than developed. They cannot be developed or

moved (mitigated) without sacrificing current levels of biological diversity.

III.3 GEOLOGY AND SOILS

As its name suggests, the Wu Ledges Forest's character is largely defined by its steep terrain, which is created by the underlying bedrock. Bedrock features include dramatic cliffs and ledges and numerous rock outcrops. These bedrock formations run in a north-south direction parallel to the nearby spine of the Green Mountains. The ledges on the WLF were likely formed as part of the same uplift events that formed the Green Mountains. The bedrock of WLF is composed of metamorphic schist, quartzite, greenstone and amphibolite.



Figure 5: Metamorphic bedrock exposed at the WLF's many dramatic cliffs and rock outcrops.

Most of the property is covered in glacial till, which forms the parent material for the very rocky Tunbridge-Lyman complex soils across most of the WLF (Soils Map). The

¹ The Forests, Wildlife, and Communities Project is a science-based collaboration between the Mad River Valley towns, the MRV Planning District, the VT Department of Fish & Wildlife, and several statewide conservation organizations. Additional information, including the referenced map, is available at <http://www.mrvpd.org/fwc.php>

soils in portions of the WLF in the Mad River floodplain are Waitsfield silt loams which were formed from river sediments and deposits. Hydric wetland soils are likely associated with the small shallow emergent marsh and alder swamp wetlands on the Austin Parcel.

III.4 FORESTS, NATURAL COMMUNITIES AND BIRD HABITAT

Most of the WLF is forested. Both natural communities (Engstrom, 2006) and forest stands (Barrett, 2009) have been identified and mapped on the Waldron parcel of the WLF (Natural Communities and Forest Stand Maps). Natural Communities were also mapped on the Austin Parcel, although this parcel was not included in the forest inventory. The Lawton Parcel was not included in either of these inventories.

A natural community is an interacting assemblage of plants and animals, their physical environment, and the natural processes that affect them (Thompson and Sorenson, 2005). Forest stands are a related, but different way of categorizing forest types for the purposes of management based on species composition, forest age, access, and/or other characteristics. In this case, 75 occurrences of 24 natural communities were mapped (includes those mapped on the town-owned Tardy Parcel) and only three forest stands were mapped on the WLF. Natural community classification can guide management within forest stands to work with natural species composition and processes such as disturbance regimes and forest succession. Forest stands are summarized here since these will be the units used as the basis for management with natural communities listed within stands. Bird habitat as described in the Audubon

Forest Bird Habitat Assessment (Worthley, 2008) is also summarized here.

III.4.1 Stand 1: Northern Hardwoods

Acres: 54

Natural Community Type: Northern Hardwood Forest with small patches of:

- Rich Northern Hardwood Forest
- Dry-mesic semi-rich northern hardwood forest
- Northern hardwood talus woodland
- Sugar maple-ostich fern-riverine floodplain forest
- Vernal pool



Figure 6: Northern Hardwood forest on the WLF in Stand 1 (Photo credit: Kristen Sharpless).

Description: Mature stand of sawlog size northern hardwoods. Species composition is 35% sugar maple, 18 % beech, 15% hemlock, 11% white ash, 6% yellow birch and associated species. Regeneration is generally inadequate, consisting of scattered beech with fern ground cover. No forest health problems were noted with the exception of a moderate amount of beech bark disease. Site quality (productivity) is good to excellent with signs of enriched soils noted. Stocking is adequate. With the exception of a few small but significant

wetlands, the recreation potential is good throughout the stand. Good to excellent site for timber production. Contains a few small significant wetland areas, a vernal pool and headwaters of an unnamed stream that flows into the Mad River.

Forest Bird Habitat Unit 1: Current conditions in this habitat type likely provide good quality nesting habitat for a number of forest bird species, due in part to its moderately well-developed vertical forest structure, including dense understory (regeneration), abundance of snags (dead standing trees), and coarse woody debris (large branches and portions of tree trunks on the ground). Timber harvesting that improves mature forest structure has the potential to enhance habitat conditions for a wide variety of bird species including: black-throated blue warbler, wood thrush, veery, eastern wood-pewee, yellow-bellied sapsucker, American redstart, ovenbird, and scarlet tanager.



Figure 7: Black-throated blue warblers (above) nest (below) in dense understory vegetation in northern hardwood forests (Photo credits: Powdermill Avian Research Center and Steve Hagenbuch).

III.4.2 Stand 2: Hemlock Hardwoods

Acres: 57 Acres (plus 15-acre Lawton parcel)

Natural Community Type: Hemlock-white pine-northern hardwood forest with patches of:

- Hemlock forest
- Hemlock northern hardwood forest
- Hemlock-red spruce forest
- Temperate acidic cliff
- Temperate acidic outcrop
- Hemlock hardwood swamp

Description: Generally occupying the ridge tops and steeper portions of the forest, Stand 2 is a sawlog-sized stand of hemlock and hardwoods. Species composition is: 65% hemlock, 10% red maple, 9% sugar maple, 8% yellow birch and 5% red spruce. No forest health problems noted with the exception of a moderate amount of beech bark disease. Slightly overstocked. This stand is mapped deer wintering area, but also provides habitat for other upland species. Hiking and mountain bike trails take advantage of the dry and firm ridge top conditions in much of the stand. Steep slopes and rocky outcrops will restrict harvesting on portions of this stand. The quality of trees present is moderate. There are no specific water quality concerns in Stand 2. The Lawton Parcel was not part of the forest inventory that delineated this stand, but is likely a similar forest type and condition.



Figure 8: Hemlocks and hardwoods dominate the ridge tops and steeper portions of the WLF (Photo credit: Kristen Sharpless).

Forest Bird Habitat Unit 2 , 3, and 5

Units 2 and 3 are mature forest although they have not yet developed the complex structure and high habitat quality characteristic of old forests. This is not atypical in young softwood-dominated stands, especially hemlock, as the dense canopy of these long-lived and slow growing trees shades the forest floor reducing understory regeneration. The large component of softwoods sets this unit apart from a habitat perspective since birds such as the blackburnian warbler, purple finch and black-throated green warbler are more likely to be found nesting here. Snags are present, but in fairly low numbers throughout the unit, with only the central ridgeline showing the recommended 3 per acre over 16” DBH. Coarse woody material varies throughout this unit. Low levels of coarse woody material are also typical in slow-growing hemlock forests, and efforts should be made to retain or create this habitat feature when possible.



Figure 9: Blackburnian warblers (left) and blue-headed vireos (right) find nesting habitat in mature softwood and mixed wood forest with closed canopies (Photo credits: Charley Eisman and Powdermill Avian Research Center).

Also includes cliffs that support nesting ravens. The talus below the cliffs may also support birds associated with canopy gaps and a dense understory including American redstart, black-throated blue warbler, Canada warbler, Nashville warbler, mourning warbler, magnolia warbler, and white-throated Sparrow.

Unit 5 is comprised of forested wetlands embedded within this mixedwood stand which are described in Section III.5. These swamps, seeps, and vernal pools are hotspots for biodiversity on the property in general and may support breeding birds including Canada Warbler, American Woodcock, Ruffed Grouse, and Lincoln’s Sparrow.

III.4.3 Stand 3: Riparian Shrublands and Open land

Acres: 16 acres

Natural Community Type: Young and degraded sugar maple-ostrich fern-riverine floodplain forest as well as rivershore thickets and meadows, which may have originally been forested as well. Also includes small patches of:

- Shallow emergent marsh
- Alder swamp

Description: Semi-open shrubland and open land that borders the Mad River and serves as a riparian buffer. Former agricultural land used for pasture and to grow hay; a small portion of the stand on the Waldron parcel was hayed annually until recently. Most of the stand was likely floodplain forest prior to clearing for agricultural use. Forest health issues include severe levels of infestation by non-native, invasive plants including Japanese knotweed and bush honeysuckle. Scattered apple trees are present on the Austin parcel. Timber quality is low, and no timber production is currently planned for this area. Provides fish, aquatic and wetland habitat. Recent beaver activity was observed along the river and in the alder swamp in 2013. Acts as an important riparian buffer for Mad River and provides public access to the Mad River for fishing and other water related activities. Includes a ford crossing the mad river and is just downstream from the Lareau Swimhole Park.



Figure 10: The riparian zones along the Mad River were likely once forested, but were cleared for use as fields and pasture. Japanese knotweed dominates many areas along the river today (Photo credit: Kristen Sharpless).

Forest Bird Habitat Unit 4 and 6: These units include an early-succession transition structure that is important nesting habitat for

several responsibility species including chestnut-sided warbler, white-throated sparrow, American woodcock, Nashville warbler, magnolia warbler, and northern flicker. The old-field habitat is becoming exceedingly rare throughout the region as abandoned farmland is quickly becoming young forest. Because there are several bird species that need a young forest to meet their nesting requirements, it is an important habitat type to retain when possible. Standing and downed dead wood are present in low amounts in this unit. The apple and hawthorn trees provide fruits for a variety of bird species, as well as other wildlife, especially during late summer and early fall. The abundance of non-native, invasive plants in these units present a threat to both native plant and animal diversity – including birds.



Figure 11: American woodcock (left) and veery (right) likely find breeding habitat in the old fields and young forests along the Mad River on the WLF (Photo credit: Powdermill Avian Research Center).

III.5 WATER AND WETLANDS

III.5.1 Wetlands

A total of 12 occurrences of 5 different wetland communities have been mapped and described on the property (Engstrom, 2006).

III.5.1.1 Seeps and Vernal Pools

Although less than one acre in size, these tiny wetlands make a significant contribution to biodiversity on the WLF. Six seeps were mapped on the Waldron

parcel, although it is likely that more occur on the property. Seeps occur in forests where groundwater rises to the surface. These small plant communities provide valuable water resources for wildlife during the winter since they often do not freeze. They are also often the first places to green up in the spring, which makes them critical food sources for species such as black bear during this sparse time of year.

Two vernal pools were mapped on the Waldron Parcel. They are located in shallow, perched basins that collect rain and melt water in the spring, then typically dry up in the summer. These small, temporary woodland pools provide critical breeding habitat for several species of amphibians, including wood frogs and spotted salamanders. These two occurrences are in excellent condition and likely provide high-quality habitat.



Figure 12: Wood frogs mate and lay their eggs in vernal pools where eggs and larvae are free from predation by fish and other predators found in permanent water bodies (Photo credit: Kristen Sharpless).

III.5.1.2 Hemlock-Hardwood Swamp

Two examples of these small wetlands are found on the Waldron Parcel. These forested wetlands that develop on bedrock

benches where groundwater rises to and collects at the surface. They have a similar value to seeps for wildlife, and could also attract breeding birds including Canada warbler that prefer wet, shrubby habitats with abundant downed dead wood.



Figure 13: A hemlock-hardwood swamp on the WLF (Photo credit: Kristen Sharpless).

III.5.1.3 Shallow Emergent Marsh and Alder Swamp

These small wetlands are located together on the Austin Parcel. Their condition and hydrology are likely influenced by beavers; recent evidence of beaver activity including trails, chews, and lodges were observed in and close to the wetlands. Wildlife such as white-tailed deer, bear, newts, frogs, turtles, and a wide variety of songbirds likely make use of the varied and dynamic habitats associated with beaver wetlands. Non-native, invasive plants are abundant in and around these wetlands, which degrades their condition.

III.5.2 Streams and Rivers

The WLF is part of the Mad River watershed. Most water in the uplands drains in to ephemeral, first order streams that flow directly into the Mad River. Mill Brook forms the northern boundary of the Austin

Parcel and merges with the Mad River opposite from the Waldron Parcel.

The current conditions of the reaches of the Mad River that run through and along the WLF (M12 and M13) are described in depth in Upper Mad River Corridor Plan (Fitzgerald and Godfrey, 2008). In general, the river channel and corridor are in fair condition in these areas; they have been significantly altered by past straightening, dredging, bank armoring and loss of wetlands and stream bank vegetation associated with the construction and maintenance of Route 100, as well as conversion of adjacent and upstream floodplains to agricultural use and development. These channel management practices have resulted in a simplified channel that is effective at transporting flood flows, but provides only limited habitat for aquatic plants and animals, including fish, although wild brook and rainbow trout are present in reaches M12 and M13, as are brown trout in lesser numbers. In response to these alterations and others throughout the watershed, the channel in the M12 and M13 reaches is changing and migrating to form meanders where it has the opportunity to move in its corridor.

The WLF provides an important buffer for the river, allowing it to reach its floodplains where waters can slow and drop sediments without damaging infrastructure. Undeveloped land on the WLF located within the river corridor also gives the river channel room to naturally migrate over time as it reestablishes bends and curves that act to slow and reduce the erosive powers of river waters during flood events, which helps to reduce the risk of flooding and damage in downstream areas, including

Waitsfield Village and Bridge Street. These functions are increasingly important as the frequency and severity of flooding events increase in association with climate change. The steep bedrock ledges along the northern boundary of the Waldron parcel act to restrict the river channel in this section.



Figure14: Mad River along the Waldron Parcel (Photo credit: Kristen Sharpless).

III.6 RECREATION AND ACCESS

III.6.1 Parking and Access

Although many people visit the WLF, formally established and clearly-marked public access is currently very limited. Better access from locations with ample public parking – particularly from Waitsfield Village – was one of the most common suggestions for improvements to the WLF from those who responded to the public survey (Appendix B). Although 44% of people who responded to the survey indicated that they access the WLF from the Village Cemetery, the Waitsfield Cemetery Commission has indicated that recreational access through the cemetery is not permitted (Appendix B). Currently, the Town does not have any agreements with adjacent landowners that would allow visitors to the WLF to park in the Village and walk onto the WLF across private land. Kindergarten teachers at the Waitsfield Elementary School

have obtained permission from two landowners to access the WLF across their properties from the Village (Ann Beattie, personal communication).

The Town does have deeded, non-motorized public access to the Waldron Parcel from (1) a trail from the end of Pine Hill Road, and (2) a right-of-way along the southern boundary of the Austin parcel that requires fording the river (Appendix A). Only 16% of survey respondents indicated that they access the WLF from Pine Hill Lane and six people indicated that they ford the river. Public parking is available at the Lareau Swimhole Park, where visitors can follow a short section of the Mad River Path to the Waldron right-of-way or onto the Austin Parcel, where the section of path dead-ends at the confluence of the Mill Brook and the Mad River.

The Town also has deeded non-vehicular public access rights onto the Lawton and Waldron Parcels via designated trail routes on the Hastings Meadow subdivision property and adjacent lands retained by Alexander Lawton IV off the end of Hastings Meadow Road, as well as for a three-car public parking area on the Hastings Meadow subdivision property (Appendix A). This access is not currently well-marked and the parking area has not yet been developed, although 39% of survey respondents indicated that they access the WLF from Hastings Road.

III.6.2 Current Recreational Uses

Intensity and frequency of current recreational use of the WLF is characterized

as moderate and common. Trail walking and mountain biking appear to be the most recreational common uses (Appendix B). Users have identified hiking on the property as being relatively easy and “family-friendly,” although the terrain is challenging for mountain bikers. The view at the top of one of the ledges is a popular destination for many visitors. Recreational motor vehicle access is prohibited under the conservation easement on the Waldron parcel held by VLT and under the deeded trail rights on the Hastings Meadow subdivision property and adjacent lands retained by Lawton, and there is little evidence that visitors currently use ATVs, snowmobiles, or other motor vehicles on the property. Hunting, trapping, and fishing are currently permitted, although very few survey respondents indicated that they use the WLF for these purposes.

Most public survey respondents indicated that they think most current public uses should continue to be permitted (Appendix B). However, many expressed concern that hunting and trapping are not safe on the property and should be prohibited or restricted. 14% of respondents indicated that they thought mountain biking should be prohibited or that they were not sure if it should be allowed. Concerns expressed included that bikes could cause increased erosion or damage to trails² and could make the WLF less peaceful. Similarly, 12% of respondents were against or uncertain about whether dog walking should be permitted. Concerns expressed included that dogs stress and scare wildlife.

² Mountain biking and foot traffic have been shown to have similar impacts on trails. In the case of these two uses, trail design and maintenance have the larger influence on trail condition than type of use.

III.6.3 Trails

The trail network on the WLF is extensive, but informal. Most trails are single-track hiking/biking trails that traverse ridges and slopes. Wider, old skid trails are also part of the current recreational trail network. Trails enter and leave the WLF from numerous points, which are difficult to identify on the ground since the boundaries of the WLF and adjacent properties are well-marked in only a few places. Users of the trail network have indicated that there are likely many more trails on the property than those that have been mapped (Appendix B).

No maps and few trail markers are currently posted on the WLF, which can make navigating the trail network a challenge – especially for those who are visiting the property for the first time. Improving trail markings and making trail maps available to the public were two of the most common suggestions for how the WLF could be improved in the public survey (Appendix B). However, some users indicate that they appreciate the quiet and remote feel of the WLF, which is enhanced by the lack of permanent signs and markers, and that they would like any addition of these features be limited and/or understated.

With a few notable exceptions where the trails pass through wet areas, the trails on the property are generally well-drained and in good condition (Markey et al., 2013). However, many survey respondents indicated that they thought the trail network could be better maintained and that trail flow and connectivity could be improved (Appendix B). The Waitsfield Conservation Commission recently oversaw the improvement of an old logging road on the northern part of the property. The road was

re-graded and water bars were added to improve drainage and prevent erosion.



Figure15: Hiking and mountain biking are currently the most popular recreational uses of the WLF (Photo credit: Kristen Sharpless).

IV POLICIES AND GUIDELINES

Certain easements and permits – along with the Waitsfield Town Plan and zoning regulations – affect the uses that are permitted and restricted on the WLF and adjoining lands with deeded public access rights. (Appendix A). These documents must be adhered to when planning future management and use of the WLF.

IV.1 RECREATION AND TRAILS

The WLF is a population destination for hiking, biking, and dog walking and recreational use is likely to increase in the future. In order to balance the benefits of recreational access with the need to protect other conservation values, some uses are permitted, others are prohibited, and a few are discouraged or restricted.

Permitted and restricted recreational uses include:

- **Daytime use of trails for non-commercial, non-motorized recreation** – including hiking, mountain biking, snowshoeing, hunting, fishing, trapping, cross-country skiing, and wildlife observation. Trail users are asked to carry in and carry out trash and waste; to avoid trail use during muddy periods; and to respect wildlife, the forest, other visitors, and neighboring landowners - including land-posting signs.
- **Dog walking.** In accordance with Town ordinance, dogs must be leashed or under voice control of the owner. Dog walkers are asked to pick up after their dogs.
- **Hunting, fishing, and trapping.** These uses are permitted in legal seasons in accordance with the Vermont Department of Fish and Wildlife rules and regulations. Beaver trapping is discouraged because beavers play an important role in maintaining diverse wetland habitats along the Mad River.

Prohibited recreational uses include:

- **Motorized recreation** including snowmobile and ATV.
- **Horseback riding.** This use is currently prohibited due to the lack of an interested group that would take primary responsibility for managing the use and because the current trail network could not sustainably support horse travel.
- **Overnight camping and fires.**
- **Cutting of vegetation or creation of new trails** without permission from the Waitsfield Conservation Commission.



Figure16: Sign welcoming visitors that is posted along the trail from Pine Hill Lane where it crosses onto the WLF (Photo credit: Kristen Sharpless).

The Town of Waitsfield via the Conservation Commission and Select Board will employ the following guidelines when planning for future maintenance and/or expansion of recreational access to the WLF:

- 1) When mutually advantageous, establish formal cooperative arrangements with local recreation groups to assist in developing, maintaining, and monitoring the trail network on the WLF.
- 2) Ideas for new or expanded public use and/or new management of existing uses will be presented to the Waitsfield Conservation Commission, which will determine whether and how to proceed in a manner that is in keeping with the vision and goals of this management plan.

- 3) Encourage non-motorized, non-commercial recreational use that:
 - a. Is consistent with the protection of natural systems;
 - b. Adheres to the terms of the conservation and public access easements;
 - c. Minimizes conflict between recreational uses;
 - d. Respects the rights and privacy of adjoining landowners.
- 4) Temporarily restrict or curtail recreational activities when needed to allow for other management activities provided for by this plan (e.g. timber management) or when conditions are not suitable (e.g., mud season).
- 5) Over time, update recreation policies and guidelines as appropriate to reflect changes in recreational demand and changes in natural systems.
- 6) Recognize and take advantage of the educational opportunities created by recreational use.
- 7) Concentrate recreational use on existing trails and woods roads. Prohibit the creation of new trails except to replace unsuitable trails, to complete or create trail loops or travel to vistas, or to connect to trails on adjacent properties where public access is permitted.
- 8) Adhere to best available trail and recreational standards. Refer to the Vermont Trails and Greenways Manual

(Vermont Trails and Greenways Council, 2007) and subsequent publications.

- 9) Any significant development associated with a public use (which includes, but is not limited to trail maintenance, construction, and/or rerouting) conducted by an individual or group other than the Waitsfield Conservation Commission requires submission of a plan³. Written approval of the plan by the Waitsfield Conservation Commission is required before any trail construction may begin. A written agreement between the Town and any non-town recreational group is likely to be required if the group will play a significant role in ongoing planning, construction, and maintenance.
- 10) Work with neighboring landowners to help ensure that public access on WLF does not adversely affect those owners and their lands, and encourage them to coordinate with the Town (through the Conservation Commission) on any activities on their lands that are likely to affect public access to and use of the WLF.

IV.2 FORESTRY AND WILDLIFE

IV.2.1 Focus Species Wildlife

The value of WLF's habitats for wildlife has been summarized in the previous landscape context, forest, and wetland sections. However, it is helpful for management purposes to simplify the task of integrating land management and conservation of

³ An acceptable plan may address or include (1) how infrastructure (e.g., trails) will be constructed and maintained, (2) how use will be managed, (3) how the Mad River Valley community will benefit from the development, (4) how ecological values identified in this Management Plan will be protected, (5) who is responsible for closing trails or dismantling other infrastructure if deemed necessary by the Town, and (6) a detailed map.

biodiversity by identifying and managing for a few focus species whose habitat needs cover those of many other species (Bryan, 2007). These include flagship species that are popular species among the public and help raise support for conservation efforts; economically important species, such as fish and game species; and easy-to-identify species that are easily recognized by sight or sound with minimal training. An ideal suite of focus species includes several that are year-round residents. Selecting species that humans enjoy helps build support for focus species management. In addition, several relatively obscure species or species groups have been selected to represent important habitats that are less well known. The suite of focus species for the WLF property is:

- ❖ American woodcock
- ❖ Barred owl
- ❖ Beaver
- ❖ Black-throated blue warbler
- ❖ Brook Trout
- ❖ Canada warbler
- ❖ Fisher
- ❖ Northern redback salamander
- ❖ Pileated woodpecker
- ❖ Spotted Salamander
- ❖ White-tailed deer
- ❖ Wood frog
- ❖ Wood thrush
- ❖ Wood turtle

Managing for the needs of this full suite of species across the property would protect all existing habitats needed to support a diverse and functioning suite of ecosystems and native plants and animals.

IV.2.2 Forest Management Guidelines

Public concern about logging and cutting trees on the WLF has been raised; some

people have had negative experiences with logging and/or would like to see the WLF remain in a “natural” state (Appendix B). Many residents and users of the WLF who attended the Conservation Commission’s public forum on December 12, 2013 had questions about timber management on the WLF moving forward. Forestry and management for forest products on the WLF is an important purpose of the property because they (1) have the potential to provide a sustainable, local source of revenue for the Town that can support stewardship activities on the town land, (2) are a source of local wood products that can be used for community benefit, (3) have the potential to improve forest health and resiliency, as well as wildlife habitat quality, and (4) serve as useful demonstrations for private landowners for how to sustainably manage their woodlands for multiple values. Educating and engaging the public in understanding and participating in any active forestry and timber management on the WLF will be extremely important.

Forest stands will be managed to improve (1) general forest health (2) wildlife habitat, and (3) quality of the timber resource. A “healthy forest” is defined as “a resilient forest ecosystem that possesses the long-term capacity for self-renewal of its ecological productivity, diversity, and complexity (Sustainable Forestry Task Force, Field Staff Report, October 2007). Management activities will promote a diversity of stand ages and naturally occurring forest types. Special attention will be given to the conservation of rare and exemplary natural communities, and the conservation and enhancement of native plant and animal species and their habitats, including, but not limited to, the

establishment and retention of a range of sizes and types of downed woody material, snags, cavity trees, occasional large/old trees, and a small amount of early-successional habitat. Location-specific significant ecological features that will be given special attention are shown on the Ecological Features Map.

Concern over region-wide loss of early-successional habitat and population declines in associated species has led wildlife biologists and conservations organizations to recommend that a higher percent of forested landscapes be maintained in a young, regenerating condition than what would have been present historically (5-15%, DeGraaf et al., 2005; 3-5%, Audubon Vermont, personal communication, 2014). Similar concern over lack of mature forest stands with well-developed vertical and horizontal structure (e.g. large live trees, downed dead wood, and canopy gaps) has led to recommendations that significant portions of forested landscapes in our region be naturally allowed or actively managed to develop older forest characteristics (~50-60%, DeGraaf et al., 2005; 80%, Audubon Vermont, personal communication, 2014).

By these standards, very young and very old forests are currently under-represented on the WLF and surrounding landscape. Opportunities to create additional forest in these age classes should be taken where appropriate and compatible with other management goals.

The majority of the operable areas of the WLF should be managed as mid-late successional forest using uneven-aged systems, which will benefit wildlife species

that include barred owl, fisher, wood thrush, black-throated blue warbler, and northern redback salamander. Uneven-aged systems mimic frequent natural disturbances, such as wind and ice storms. These disturbances form small (<2 acre) canopy gaps, which result in stands dominated by late successional species and with enhanced vertical structure. Riparian areas around small streams, ridge tops, steep slopes, and buffers around seeps, vernal pools and swamps are areas where very old forest could be allowed to develop.

Relatively small amounts of young, regenerating forest (early-successional habitat) could be maintained in Forest Bird Habitat Unit 4, which is part of Stand 3 (Worthley, 2008). Maintaining this 4.5-acre area in a young, regenerating condition has the potential to benefit wildlife species including American woodcock, ruffed grouse, and white-tailed deer. However, non-native, invasive honeysuckle is abundant in this area and would likely be favored by any cutting. In addition, because the trees are so young in this area and have yet to develop commercial value, cutting would likely be costly and/or time and energy intensive. Invasives control and economics should be carefully considered before deciding to create young forest habitat in this area. Although also severely infested with invasive plants, the rivershore thickets and alder shrub swamp may be providing habitat for early-successional species on the property.

Specific management guidance should be drawn from technical guides that include, but are not limited to, those listed in the *References and Resources* section and subsequent publications. The following

specific guidelines should be followed to protect biodiversity, ecological health, water quality, and site productivity when planning timber harvests. Since timber management and wildlife habitat protection are dual goals for the property, many of the following guidelines (5-18) are adapted from the publication *Silviculture with Birds in Mind: Options for Integrating Timber and Songbird Habitat Management in Northern Hardwood Stands in Vermont* (Audubon Vermont and the Vermont Department of Forests, Parks, and Recreation, 2011):

- 1) Grow the largest trees and use the longest rotations possible within site and log quality limitations. (For example, for high quality red and sugar maple, yellow birch, beech, and white ash, the diameter objective should be 22 inches or greater.) Culmination of mean annual board foot growth for these species occurs at 100 to 120 years.
- 2) Favor native species over non-native ones when thinning or regenerating stands.
- 3) Use natural regeneration to the maximum practical extent.
- 4) Promote the seed bearing capacities of poorly represented native plant species.
- 5) Retain, release, and regenerate hard and soft mast species such as oak, beech, black cherry, serviceberry, and apple. These species produce food sources in late summer that are critical for wildlife preparing for winter. *Rubus* species (e.g. blackberry and raspberry) that dominate large openings are also important sources of soft mast for birds.
- 6) Retain, release, and regenerate yellow birch (*Betula alleghaniensis*) whenever possible since the branches and foliage of this species are preferentially chosen foraging substrates for many insect-eating bird species including blackburnian warbler, black-throated green warbler, and scarlet tanager. Successful regeneration of yellow birch may require larger gap (1+acre) disturbance and scarification.
- 7) Retain softwood inclusions in hardwood stands and hardwood inclusions in softwood stands. Overstory inclusions resulting from site conditions are more practical to maintain than those that are a result of disturbance history.
- 8) Control and monitor invasive plants. Migratory songbirds will eat buckthorn, autumn olive, barberry, and honeysuckle berries during the post-breeding season when they are fueling up for fall migration, but the berries are less nutritious than some native berries. Refer to *Best Management Practices for the Prevention and Treatment of Terrestrial Invasive Plants in Vermont Woodlands* and subsequent publications published by The Nature Conservancy (2011).
- 9) Consider all management activities within the context of the surrounding landscape (see Section III.2 for information on features and concepts to consider). Work to create and/or maintain a forested landscape capable of supporting viable populations of species associated with a variety of forest types, successional stages, and patch sizes

(horizontal diversity). Pay special attention to ensuring habitat for species whose life-history requirements include large areas of contiguous forest.

- 10) Strive to retain 3-5 snags per acre with one exceeding 18-inches dbh and two exceeding 16-inches dbh with priority given to retaining hardwoods. Where lacking, actively recruit large-diameter (>12" dbh) snags through girdling.
- 11) Use snags and potential cavity trees as nuclei for retained patches in larger openings. Retained patches may be islands or peninsulas extending from adjacent stands.
- 12) Over time, strive to achieve the types and amounts of coarse woody material (CWM) that would accumulate in an unmanaged, mature forest stand by retaining fallen logs and large branches; growing some legacy trees that will naturally add large (>24" inch dbh) logs to the forest; and marking some low-vigor, poor commercial quality trees to be cut and left during timber management activities. After harvesting, at least 4-6 pieces per acre of CWM >10" in diameter should be present in sawtimber stands.
- 13) Use woodland seeps, swamps, and vernal pools as nuclei for uncut patches to retain snags, cavity trees, and other site-specific features since these are early-season sources of insects, green vegetation, and earthworms. Retained patches may be islands or peninsulas extending from adjacent stands.

14) Recognize that vertical structure is naturally limited in early and mid-successional stages. Look for opportunities to enhance vertical structure over time.

15) Consider and protect vernal pools and riparian buffers when laying out extent and location of openings.

16) Manage for horizontal age-class diversity over the property where opportunities exist.

17) Harvesting during frozen ground conditions is preferred, but if summer harvesting is required, it should be scheduled before the start of the bird breeding season (May 15) or after the second week in July if possible.

18) Strive to set aside four trees per acre that are representative of the stand and will serve as future biological legacies.

19) Where possible, leave slash on site to contribute to vertical structure and protect seedlings from deer browse.

IV.2.3 Protecting Vernal Pools

Two vernal pools have been identified and mapped on the WLF to date (Engstrom, 2006). The following Best Management Practices for timber management and trail construction near vernal pools should be followed as needed (adapted from Calhoun and deMaynadier, 2004):

1. Mark the pool's location. Identify the spring high water mark (during the wet season or using dry season indicators) and flag the pool's perimeter during harvest layout and prior to cutting.

2. Protect the pool basin and its natural vegetation. Leave the depression undisturbed. Avoid harvesting, heavy equipment operation, skidding activity, or landing construction in the vernal pool depression. Keep the pool free of sediment, slash, and tree-tops from forestry operations, including harvesting and road building. Leave slash or other woody debris that accidentally falls into the pool during the breeding season (March to June). Trees and branches that fall naturally into pools can serve as egg attachment sites.
3. Within a 100-foot protection zone around the pool maintain a minimum average of 75% canopy cover of trees a minimum of 20-30 ft. tall, uniformly distributed. The shade of a closed canopy will prevent premature warming and drying of the pool.
4. Within a 100-400-foot “amphibian life zone” around the pool, maintain a minimum average of >50% canopy cover of trees at least 20-30 ft. tall, uniformly distributed using single-tree or small-group selection harvesting. The shade of the surrounding forest will protect dispersing juvenile amphibians.
5. Within both zones (400 feet around the pool):
 - a. Maintain coarse woody debris by leaving a supply of older or dying trees to serve as recruitment for coarse woody debris, avoiding disturbing fallen logs, and leaving limbs and tops where felled. Adult amphibians spend most of their lives in surrounding upland habitats under moist logs and leaf litter.
 - b. Protect the forest floor by harvesting only during completely frozen or completely dry soil conditions. Do not create ruts and minimize soil disturbance. Ruts can be barriers to amphibian migration. They may also collect water and attract breeding adults, but will not support the survival of offspring.
 - c. Avoid road or landing construction, which are barriers to amphibian migration. Single track trails are not likely to be barriers to migration as long as trails surface is dirt and not gravel.

IV.2.4 Timber Harvesting and Recreation

Some residents and users of the WLF have expressed concern that timber harvesting will interfere with recreational use and trails on the property (Appendix B). The following guidelines should be applied to ensure that these two uses conflict to the lowest degree possible:

- 1) Design a sustainable trail system that anticipates periodic timber harvests in appropriate parts of the property.
- 2) Clearly mark trails on the ground and on a map before harvesting begins.
- 3) When possible, design harvest and skid trail layout to minimize impacts on trails (e.g. layout skid trails perpendicular to

foot and bike paths rather than along or perpendicular to paths).

- 4) Before harvesting begins, identify who will be responsible for clearing and/or rebuilding trails after harvesting operations are complete (e.g. logger, recreation group etc.).
- 5) Post informational signs at the WLF and updates on the Town's website letting users know when trails are closed due to harvesting operations, with a person to contact for more information (e.g. County Forester or Waitsfield Conservation Commission Chair).
- 6) Cooperate with trail user groups to educate recreational users about the purpose of harvests, their timeline, and associated trail closures.

IV.3 FOREST MANAGEMENT OPERATIONS

The Washington County Forester – or another professional, experienced forester – will act on behalf of the Town to mark and oversee all timber harvests, including the layout, design, maintenance, and reclamation of all truck roads, skid roads, and landings. The forester will make sure that buffers along all waterways and sensitive areas are well delineated before harvesting starts and adhered to once the operation begins. The Town will engage experienced and capable contractors with a clear understanding of stand treatment and the selection and marking of trees for any harvest or other forest management. Loggers will work in accordance with Vermont water resource protection and general forestry regulations.

At a minimum, all harvest activities will be implemented according to Acceptable Management Practices (AMPs). See Section 4.4 for additional information on operating guidelines to protect water quality and waterways. In addition, operations guidelines from *Silviculture with Birds in Mind: Options for Integrating Timber and Songbird Habitat Management in Northern Hardwood Stands in Vermont* (Audubon Vermont and the Vermont Department of Forests, Parks, and Recreation, 2011) and subsequent publications should be used to minimize residual stand damage, maintain pleasing aesthetics, and protect wildlife habitat.

IV.4 WATER QUALITY AND RIVER CORRIDOR MANAGEMENT

Riparian Buffer Zones (RBZs) are defined in the Waldron conservation easement (Appendix A). These zones extend 50 from the river shore onto agricultural land and 200 feet into forestland. The functions of these RBZs are to:

- 1) Protect water quality by intercepting sediments, nutrients, chemicals, runoff;
- 2) Provide wildlife habitat including food and cover for aquatic and terrestrial species;
- 3) Keep water cool by shading;
- 4) Slow erosion by stabilizing riverbanks; and
- 5) Allow the river to access its floodplain.

Activities that maintain and improve the natural functions of the RBZs are permitted. Recreation, agricultural activities and forestry are permitted only if they do not degrade RBZ function.

Protecting the Mad River corridor through permanent conservation and passive restoration on the Waldron and Austin parcels, along with some planting in the river corridor are the two strategies recommended by the Upper Mad River Corridor Plan (2008) in order to:

- 1) Improve long-term stability of the river.
- 2) Reduce sediment and nutrient pollution.
- 3) Reduce risk of flood damage to infrastructure.

The feasibility of these strategies should be evaluated and applied where possible and practical.

Steep slopes and ephemeral streams make the soils of the WLF vulnerable to erosion if disturbed by logging or recreational uses, which could compromise water quality and aquatic habitats. At a minimum, all riparian zones will be managed according to Acceptable Management Practices (AMPs) to protect surface waters from harmful discharges. In addition, recommended practices for protecting forested riparian zones from the *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire* (Bennett, 2010) and subsequent publications should be used. Riparian management and no-harvest zones should be identified and marked by a professional forester based on the width recommendations in that publication in combination with consideration of specific site characteristics. Zones may vary in width depending on stream channel size and character, the steepness of adjacent slopes, and soil character. No-harvest zones should be required along stream shores containing wet seeps, shallow or poorly-drained soils, or

areas with slopes greater than 8%. In most cases, careful harvesting along permanent and ephemeral streams should be compatible with protecting stream and riparian functions and values. Any harvesting in riparian management zones shall maintain relatively continuous canopy cover (60-70%), plentiful sources of coarse woody and organic material, wildlife habitat connectivity, forest health, and vegetation species and sizes appropriate for the plant community type.

IV.5 AESTHETICS

Aesthetics is a factor that should be taken into account while completing any type of project on the WLF, whether it is forestry, wildlife, or recreation-related. Aesthetically important areas, such as view points, should be maintained and enhanced. Unique natural features such as unusually large and unique trees and shrubs should be preserved in their natural state. Individual large trees may be identified as Legacy Trees that will remain in the stand throughout all harvesting operations. These trees should be retained for aesthetics, as seed trees, and as future den and cavity trees for wildlife use. Unique cultural resources on the property such as old stone walls should also be maintained and protected during any work in adjacent area.

Given the property's location as the backdrop to Waitsfield Village any moderate to large openings in the forest canopy created during timber harvests on the will likely be visible from and across the Route 100 corridor. It is likely that the public will view large openings as having a negative impact not only on the viewshed, but also on the forest. In these cases, part of successful harvest planning and preparation will

include public outreach through local media, the Town website, and other platforms. A best effort will be made to clearly explain and justify the work that is planned before it starts and while it is being carried out, so that the public has a clear understanding of the harvest goals – particularly related to enhancing wildlife habitat – and how other values will be protected during the harvest.

IV.6 FOREST AND RIVER HEALTH

Non-native, invasive plants are currently a significant threat to the health of both the forest and river. Infestations of honeysuckle and Japanese knotweed are currently severe along most of the Waldron and Austin parcels' Mad River shoreline and riparian areas. It is essential that invasive plant control and management efforts on the WLF be coordinated with a watershed-wide plan and efforts since these plants are likely to recolonize any areas where they are removed along the River as they are spread downstream.

Fortunately, these plants and other invasives do not yet appear to have spread into the adjacent upland forests of the WLF. However, monitoring for pests, disease, and invasive plants and insects should occur regularly. Should forest health issues develop, prompt control methods should be implemented under the guidance of a professional forester.

IV.7 BOUNDARY MAINTENANCE

Boundary line condition on the WLF is currently fair to poor, with forested lines marked by faded blazes in places and completely lacking in others. To prevent confusion over line location and violations of timber rights from adjoining lands, all property lines should be painted with good

quality boundary paint on a ten year cycle. In addition, all corners should be located and painted. After the boundaries have been initially re-marked, the Town should complete a boundary line review every three or four years. During the review, note areas that require additional painting to ensure the integrity of the boundary lines.

IV.8 LIABILITY

Like any town owned land in Vermont, the WLF is afforded some protection from liability under the doctrine of sovereign immunity, as well as case law. In addition, the Town has additional liability insurance through a policy that covers all public land and facilities. Since trails may be maintained in a primitive condition, signs at all entry points should say, "Use at your own risk."

IV.9 DEVELOPMENT

Conservation easements held by VLT on the Waldron and Austin Parcels, as well as by the Town on the 25.5-acre parcel retained by Alexander Lawton IV, prohibit development, including: residential, commercial, industrial, or mining activities and the erection of any buildings or structures (with the exception of a small camp).

IV.10 WILDFIRE

The threat of wildfire on the WLF is very minimal. Factors which contribute to this low risk include the general presence of damp green foliage from ground level up through the deciduous (leafy) treetops and the general absence of prolonged vegetation-killing droughts.

The spring and fall seasons do pose some threat, when fallen leaves become dry, but these seasons are short due to spring

regrowth and winter snowfall. If fires do start, suppression is the responsibility of the town Forest Fire Warden. This individual is appointed by the commissioner of the VT Dept. of Forests, Parks & Recreation, with the approval of the local Selectboard, and has direct control of the local fire department forest fire suppression activities.

IV.11 CLIMATE CHANGE

Warming temperatures, increasing levels of precipitation, and more frequent severe weather events are climate changes that have been documented across the region and are trends that have important implications for forest health and management in Vermont and on the WLF (Horton et al., 2013).

Tree growth may be positively impacted by increased amounts of carbon dioxide and rising temperatures, but warmer temperatures will also increase evapotranspiration, soil drying, and the frequency of short-term droughts. The cumulative impact of these changes will likely be increased stress and slower growth in many tree species. Since different tree species and forest sites will likely respond differently to the complex set of factors involved in climate change, regular monitoring should be used as a tool for adaptive management. Management outcomes and results of forest inventory should be carefully assessed and lessons learned along with the latest scientific understanding applied to the next plan.

Over time, tree species distributions will likely shift as average temperatures rise, growing seasons lengthen, and short-term droughts become more common in early spring and late fall. Northern hardwood forests in Vermont and on the WLF are

predicted to be replaced by southern forest types that are dominated by oak and pine. Since species evolutionary response lags the pace of climate change, such transitions will take place slowly, and noticeable effects may not appear for decades.

Forest pests and non-native, invasive plants are likely to spread across Vermont and to the WLF since the growth and survival of these species improve as winter and summer temperatures rise, carbon dioxide levels increase, and native trees become increasingly stressed. Insect pests including hemlock woolly adelgid, emerald ash borer, and Asian longhorned beetle are spreading into Vermont and if they reach the WLF could kill all or most of the hemlock, ash, and maple trees on the property. Invasive plants including bush honeysuckle, Japanese barberry, and glossy buckthorn are already growing along the Mad River and could spread, establish, and outcompete native species in openings in the forest canopy created by natural disturbances (e.g. wind storms), forest harvesting, or die-back caused by forest pests.

Invasive plant and forest pest monitoring should be incorporated into forest inventories, and management strategies addressed in planning. In addition, strategies to reduce other stresses on forest health, such as lengthening harvest rotations, should also be taken to increase forest resiliency to forest pests and other indirect and direct impacts of climate change. The Conservation Commission should also take opportunities to educate the public and visitors to the WLF about the threats of forest pests since public outreach is an important strategy for managing and slowing the spread of pests and invasive

plants. Sources of expertise, assistance, and resources related to forest pests include: the Vermont Department of Forests, Parks, and Recreation; The Nature Conservancy; and the Forest Pest First Detector Program.

practices; and adjust management policies, guidelines, and practices accordingly.

Anticipating future shifts in species composition on the WLF during management planning; creating and maintaining complex vertical and horizontal forest structure and improved soil productivity; and being aware of and planning for threats facing hemlock stands due to hemlock woolly adelgid are some of the key strategies that should be used to help the WLF forest systems adapt successfully to climate changes. The draft *Creating and Maintaining Resilient Forests in Vermont : Adapting Forests to Climate Change* (Horton et al., 2013) and subsequent publications should be referred to for additional specific guidance.

IV.12 ADAPTIVE MANAGEMENT

Over time, change is inevitable on the WLF – whether from climate change, natural cycles, timber harvesting activities, or other factors. And scientific knowledge and best practices in forest management will continue to evolve.

Recognizing this, and in keeping with the spirit of this plan’s Management Goal #10 to “monitor and respond to changes” (see p. 2), the Town will adopt a flexible adaptive management approach. To the extent possible within available resources and capacity, the Town (through the Conservation Commission) will seek to monitor changes in on-the-ground conditions; stay abreast of the evolving scientific understanding of forest systems and science-based best management

V MANAGEMENT OBJECTIVES AND ACTIONS

The following objectives and actions are intended to be achieved over a 10-15 year timeline. Near-term objectives and actions should be completed within 1-3 years of the plan's approval, mid-term actions within 4-6 years, and long-term actions within 7-10 years.

1. **Improve non-motorized access and develop a sustainable recreational trail system** on WLF and adjoining parcels with public access rights (near- to mid-term).
 - a. Locate public access easements on the ground on parcels retained by Alexander Lawton IV and in the Hastings Meadow subdivision. Determine whether these routes are currently used, and whether other routes are used on these parcels(near-term).
 - b. Establish Hastings Meadow parking area with appropriate signage (near-term).
 - c. Research and pursue options for securing public access to WLF from a location that is walkable from the Village and/or from a location along Route 100 with public parking (e.g. Lareau Swimhole Park) (near-term to ongoing).
 - d. In collaboration with local recreation groups (e.g., Mad River Path Association, Mad River Riders) and the public, assess the current trail network and identify needs and opportunities for changes to it (such as re-routes, closures, establishment of new trails, signage, mapping, etc.) (near-term).
 - e. Formalize partnerships with the Mad River Path Association and/or Mad River Riders to help design, manage, and monitor the trail network on and connecting to Wu Ledges. Establish written agreements describing respective roles, responsibilities, etc. (near-term).
 - f. With input from trail organizations, partners, neighbors, and the general public, plan for and create an improved trail network (near- to mid-term) that:
 - 1) Can support increased pedestrian and mountain biking activity without creating disproportionate negative impacts on the wildlife, ecology, character, and peace and quiet of the WLF by concentrating recreational use on a few well-designed trails and loops, leaving portions of the forest trail-free (especially areas near sensitive sites including wetlands, vernal pools, and some cliffs and deer yard areas).
 - 2) Closes or reroutes trails passing through seeps, swamps, and other wetland features and sensitive sites.
 - 3) Improves the drainage of other trails as needed.
 - 4) Creates loops.
 - 5) Travels to or by views and other interesting features.
 - 6) Connects with trails on adjacent parcels that are open to public access.

- 7) Makes use of existing and/or future skid trails as feasible.
 - 8) Includes appropriate, low-key signs for the trail system.
- g. Post low-key signs and/or trail markers to direct visitors along trails and to let them know when they are entering/leaving the Wu Ledges Forest; pull brush across trails and woods roads without public access (near- to mid-term).
 - h. With partners, develop a map of the trail network, and make it available through diverse means (e.g., hard copies, websites of Town/partners/Chamber of Commerce) (near- to mid-term).
 - i. With partners, address management issues associated with public access and recreation (e.g., trash, trail conditions, management of user conflicts, relationships with neighboring landowners) (ongoing).
2. **Enhance Mad River floodplain and riparian natural communities** (mid- to long-term).
- a. Obtain advice from the Friends of the Mad River and other river experts about the best strategies for protecting the function of the riparian zones and floodplains along the river, including types and locations of plantings (near-term).
 - b. Allow the fields on the Austin Parcel to regenerate to forest or wetland to improve their effectiveness as flood release zones (near-term).
 - c. Consider re-assessing benefits and implications of permanently conserving the Mad River corridor portions of the Waldron and Austin parcels through VT Department of Environmental Conservation easements (mid-term).
 - d. Promote native plant species associated with floodplain and riparian plant communities through a combination of passive management, planting, and non-native plant control (mid- to long-term).
3. **Increase public awareness and community uses of Wu Ledges** (mid- to long-term).
- a. Talk with local schools and teachers about how the Town can support educational uses of the Wu Ledges Forest (mid-term).
 - b. Once an official trail system is established, publish information about the trails and property in local guides and on Town and partner webpages (mid-term).
4. **Finalize and monitor conservation easements on the adjacent privately-owned Lawton parcels** (near- to mid-term).
- a. Establish a process for monitoring the Town-held conservation easement on the 25.5-acre parcel retained by Alexander Lawton IV (mid-term).

- b. Finalize the pending conservation easement on the remainder of the Lawton retained lands and establish a process for monitoring the easement (near-term).
- 5. **Improve on-the ground identification of property lines** (near-term).
 - a. Locate and mark corners and boundary lines.
- 6. **Seek official Municipal Forest Designation from the State of Vermont** for the WLF (and the Town's Scrag Forest) (near-term).
- 7. **Update Forest Stewardship Plan** (near-term).
 - a. Ask Washington County Forester to complete a forest inventory of the Lawton Parcel and to update the 2013 Stewardship Plan.

VI REFERENCES AND RESOURCES

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VII GLOSSARY

Acceptable Growing Stock (AGS): Any potential crop tree to be retained and managed to meet the landowner's objectives. UVA guidelines (for sawlog production) describe AGS as trees of commercial species which have the potential to produce one 12-foot log or two non-contiguous 8-foot logs.

Acre: A standard unit of area measure. One acre equals: 43,560 square feet; 4840square yards; 10 square chains.

Adaptive management: A flexible philosophy and approach to managing land, water, and other environmental assets that is responsive to changes in on-the-ground conditions, new information and best practices, management capacity, and similar considerations.

Advanced regeneration: Natural regeneration that is established prior to a timber harvest.

Age Class: One of the intervals, commonly 10-20 years, into which the age range of trees are divided for classification.

AMP's: Accepted management practices pertaining to logging operations developed by the Department of Forests, Parks and Recreation and outlined in the booklet titled "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont."

Annual Allowable Cut (AAC): A percentage of the growth in a stand that can be harvested to keep the timber yield sustainable. AAC is expressed in board feet per acre, per year (i.e. to keep stand A productive on a sustainable basis, 85 board feet per acre, per year can be harvested).

Aspect: The direction towards which a slope faces.

Basal Area: The cross sectional area of the stem of a tree at 4.5 feet above the ground (dbh). The basal area of a stand is the summation of all the trees or classes of trees per unit area of land. Basal area is expressed in square feet per acre. Basal area is directly related to stand volume and density.

Biological Diversity (Biodiversity): The complexity of life at all its levels of organization, including genetic variability within species, species and species interactions, ecological processes, and the distribution of species and natural communities across a landscape.

Biomass: The total weight of all harvestable vegetation from a stand. This term can also be used to describe a harvest that results in all material being processed into chips.

Board Foot: The volume of solid wood equivalent to a piece 12 inches long, 12 inches wide and 1 inch thick. A measure of standing or felled timber usually related to sawlogs.

Bole: The stem of a tree.

Browse: Buds, leaves, and twigs of seedling and sapling regeneration that are utilized as a food resource by wildlife.

Canopy: The combined cover of individual tree crowns.

Chain: A measurement of horizontal distance, 66 feet. Areas expressed in square chains can immediately be converted to acres by dividing by 10.

Cleaning: The removal of competing vegetation to release desired regeneration for optimal growth.

Clearcut: A silvicultural method which removes all trees from a designated area at onetime for the purpose of creating a new, even-aged stand. This management system is usually used to regenerate shade-intolerant tree species. Variations include patch and strip clearcutting.

Climax: An association of plants and animals that will prevail in the absence of disturbance.

Coarse woody material (CWM): Downed logs and branches >4 inches diameter.

Codominat: Trees with crowns forming the general level of the forest canopy and receiving full sunlight from above but comparatively little from the sides.

Contiguous Forest Habitat: An area of forested land with either no roads or low densities of class III or IV roads and little or no human development (buildings, parking areas, lawns, gravel pits).

Core Habitat: An area of land that is at least 300 feet from major roads or human structures.

Crop Trees: Trees to be grown to the end of the rotation in evenaged management or trees to be favored for future growth in unevenaged management.

Crown: The branches and twigs of the upper part of a tree.

Cruise: A survey of forest stands to determine the number, size and species of trees, as well as terrain, soil condition, access and any other factors relevant to forest management planning.

Cull: Trees that have no current or potential commercial value.

Deer Winter Habitat: An area of mature or maturing softwood cover, with aspects tending towards the south, southeast, or southwest, where deer find winter cover and browse.

Diameter at Breast Height (dbh): The diameter of a standing tree measured at 4.5 feet above the ground and expressed in inches.

Dominant: Trees with well-developed crowns which are above the canopy and receive direct sunlight from above and partially from the side.

Early-Successional Habitat: An area – usually larger than 1 acre in size - dominated by a high-density of shrubs and pioneer species seedlings and saplings. Regenerating forest and brushy, overgrown fields are two of the most common types of early-successional habitat. These conditions are temporal; generally lasting for 15-20 years in regenerating forest area, longer on old fields.

Edge: The boundary between forest and open land, such as a field or backyard. The transition from low herbaceous vegetation to tree canopy can be considered either a “soft” or “hard” edge. A soft edge is a gradual change in vegetation height moving into the forest. This gradual transition is important for buffering interior forest specialists like the wood thrush from the incursions of nest predators (such as raccoons and skunks) and nest parasites (such as the brown-headed cowbird) that are frequently found in open and developed areas.

Even-aged: An age class description of a stand in which the age of the trees is relatively close, usually within 20 years. Stands with two distinct age classes can also be referred to as even-aged.

Even-aged Management: Timber management that produces a stand of trees with relatively little difference in age usually 10-20 years. Even-age silvicultural systems include clearcut, seed-tree and shelterwood.

Fine woody material (FWM): Limbs and branches <4 inches diameter including slash.

Forest Management Plan (FMP): A long range plan designed to identify a landowner’s goals and objectives and the silvicultural methods that will be employed to achieve those goals. FMP’s in Vermont are typically written for a 15 year period and updated every 10 years.

Forest Type: A natural group or association of different species of trees which commonly occur together over a large area. Forest types are defined by one or more of the dominant species of trees in the type. Common commercial types in the northeast are: beech-birch-maple; beech-red maple; mixedwood; spruce-fir; white pine.

Forestry: The art and science of growing and managing forests and forest lands for the continuing use of their resources. *Sustainable forestry* is the practice of growing, nurturing, and

harvesting trees to meet current needs without compromising soil, air, and water quality; biological diversity; wildlife and aquatic habitat; recreation; aesthetics, or the ability of future generations to meet their own needs (adapted from the Sustainable Forestry Initiative).

Fragmented Forest: Forest that is broken into small, unconnected patches primarily due to some form of development (e.g. residential, commercial, or major roads).

Girdle: To destroy the conductive tissue of a tree in a ring around the bole.

Group Selection: An uneven-aged harvesting method designed to favor intolerant or intermediate species. Trees are generally removed in groups in areas ranging from 1/20-2 acres in size.

Habitat: The place where a plant or animal can live and maintain itself.

Hardwoods: Broad-leaved trees which lose their leaves in the fall.

Harvest: A silvicultural treatment that is intended to establish regeneration. A harvest is generally a higher level of cutting intensity than a thinning.

High-grading: A liquidation cut in which only the best quality, highest value trees are removed. Cuts of this nature are short sighted and exploitative and result in the degradation of the forest ecosystem.

Horizontal Structure: The arrangement of different habitat types across the landscape. A landscape with mature and young forest habitats, open fields, and wetlands would be rich in horizontal diversity. Landscapes with greater horizontal diversity support a greater diversity of breeding forest birds and other wildlife.

Hydrologic Class: A measure of a bare soil's runoff characteristics. Group A soil has a high water infiltration rate and a low runoff potential. Group D soil has a very slow rate of water infiltration and is prone to high runoff.

Improvement Cutting: A silvicultural treatment in which poor quality and low value trees are removed to give the best trees more room to grow.

Individual Tree Selection: An uneven-aged harvesting method designed to favor tolerant species. Trees are removed individually to maintain a continuous and uniform crown cover. Also referred to as single tree selection.

Interior Forest: Forest condition that occurs with increasing distance from a forest edge.

Intermediate: Trees whose crowns reach the canopy level but receive little or no direct light from above and none from the sides.

Intermediate Treatments: Harvesting methods employed during even-aged management. The removal of trees from a stand between the time of establishment and the final harvest with the purpose of improving stand growth and/or species composition and/or health.

Intolerant Species: Trees unable to grow and develop in the shade of other species. Intolerant commercial species in Vermont include: paper birch and aspen.

Invasive Plant: A plant that is able to establish on many sites, grow quickly, and spread to the point of disrupting native ecosystems. Often non-native.

Landing: Any place where logs are assembled for further transport.

Leaf Litter: Dead plant material such as leaves, bark, and twigs that has fallen to the ground.

Liquidation Cutting: Removal of all merchantable products from the forest with no regard for stand improvement or regeneration, usually preceding the sale of the land.

Log Rule: A table or formula showing estimated volumes, usually in board feet, for various log diameters and lengths.

Mast: Nuts, berries, and seeds utilized by wildlife as a food resource. Soft mast are soft fruits, such as blackberries, raspberries, and cherries.

Maturity: Expressed in two ways: 1. Financial maturity occurs when a tree has reached the point where it has maximized value growth from the perspective of the market place; 2. Biological maturity occurs when a tree has reached the point where the energy cost of maintaining itself exceeds the energy input from photosynthesis. Financial maturity is reached long before biological maturity.

MBF: The abbreviation for one thousand board feet.

Mean Stand Diameter (MSD): The arithmetic mean diameter of the trees in a stand.

Medial Diameter (MD): This is developed by determining by the sum the number of trees per acre in each diameter class multiplied by the basal area in that class and then dividing the result by the total basal area. MD is useful in stands with a high proportion of saplings because it is less influenced by small trees and more accurately describes the size of the crop trees.

Midstory: Live, woody vegetation in the 6-30 foot height range including trees and shrubs.

Mixed Hardwoods: Timber stands characterized by a mixture of hardwood species.

Natural Community: An interacting assemblage of plants and animals, their physical environment, and the natural processes that affect them.

Natural Disturbance: Any relatively discrete event in time not directly caused by humans that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment. Examples for forest ecosystems in the northeast include wind and ice storms, insect outbreaks, and hurricanes.

Old growth forest: a forest in which human disturbance has been minimal and natural disturbance has been limited to small-scale windthrow events or natural death of trees.

Outcrop: A portion of bedrock that is exposed and protruding through the soil layer.

Overmature: A tree or stand of trees that is older than normal rotation age for the type.

Overstory: Those trees making up the main canopy. The overstory is usually referenced as the larger trees in the stand.

Pioneer: Shade intolerant species that are the first trees to develop in an area after a large scale disturbance or after the abandonment of a field. Pioneer species include aspen, gray birch, pin cherry, and paper birch.

Pole or Pole Timber: A tree or trees greater than 4.0 inches dbh and less than 10.0 inches dbh.

Precommercial Thinning: An intermediate harvesting operation in a young stand that does not generate income.

Prescription: A course of action to effect change in a forest stand (harvest, planting, TSI).

Regeneration: Renewal of a tree crop by natural or artificial means.

Release: The freeing of well-established seedlings or saplings from surrounding growth.

Residual: Trees that are left to grow in a stand after a silvicultural treatment.

Rotation: The length of time required to grow an even-aged crop of trees to a desired age.

Rotation Age: The age at which an even-aged stand is considered ready for harvest.

Salvage Cut: The removal of dead, dying and damaged trees after a natural disaster or insect or disease infestation to utilize the wood before it loses all of its commercial value.

Sanitation Cut: The removal of dead, dying or damaged trees to prevent or interrupt the spread of insects or disease.

Sapling: Trees taller than 4.5 feet but less than 5.0 inches dbh.

Sawlog: A log considered suitable in size and quality for producing lumber. Regional standards apply for diameter, length and freedom from defect. Sawlog is also used to refer to a tree that has reached sufficient size to produce a sawlog. Small sawlog trees are 12-16 inches dbh, medium sawlog trees are 17-20 inches dbh, and large sawlog trees are 22 inches dbh or greater.

Sawtimber: Trees that have obtained a minimum diameter at breast height that can be felled and processed into sawlogs. Typical minimum size limits for commercial species in Vermont are 8 inches dbh for softwoods and 12 inches dbh for hardwoods.

Seedlings: Trees that are less than 4.5 feet tall.

Seed Tree: An even-aged silvicultural method in which most of the merchantable trees are removed in the first cut, leaving a few scattered trees of desirable species to serve as a seed source for the new stand. The seed trees are removed after successful regeneration has developed. The seed tree method is a regeneration cut used to create an even-aged stand of shade intolerant species.

Selection method: An uneven-aged silvicultural system where individual trees, or groups of trees, are removed from a stand to ensure a sustained yield from an uneven-aged stand.

Shade tolerance: The ability of trees to reproduce and grow in the shade of other trees. Tolerance ratings are very tolerant, tolerant, intermediate, intolerant, and very intolerant.

Shelterwood: An even-aged silvicultural system in which the mature trees are removed in a series of partial cuts that take place over a small portion of the rotation. The residual trees are left as a seed source and to provide shade and protection for the new seedlings. Three types of cuttings are used in this method:

1. The preparatory cut, in which the least desirable trees are removed to improve the quality and growth of the stand,
2. The seed cut, in which the regeneration is established,
3. The removal cut (or cuts) in which the mature trees are cut to release the regeneration.
4. Variations of this method include the group, irregular, strip, and uniform shelterwood.

Shrub: A multiple-stemmed or low-branching woody plant generally less than 16 feet tall at maturity.

Silviculture: The art and science of tending forest trees.

Site Class: A measurement of the quality of the soil in terms of its potential productivity. A site class of 1 indicates that the soil is highly productive and a site class of 4 is considered non-productive, usually due to excessively wet, dry, or thin soil.

Site Index: A measure of the relative productive capacity of an area. Site index is species specific and is based on a comparison of tree age and height.

Skid Trail: Any path in the woods over which multiple loads of logs are hauled, usually by a skidder or tractor. Primary skid trails are the main pathways that enter the landing.

Skidder: A four wheel drive, tractor-like vehicle, articulated in the middle for maneuverability, with a cable or grapple on the back end designed to bring logs or whole trees to the landing once that they have been felled.

Slope: A relative measure of steepness of the ground. Slope can be computed by dividing the rise in elevation by the horizontal distance traveled. Slope is usually expressed in percent (rise in ft / run) X 100. Slope can be derived automatically using various forest measurement tools.

Snag: A standing, dead tree.

Softwood: Coniferous trees, usually “evergreen” (the exception being tamarack), with needles or scale-like leaves.

Stand (Treatment Unit): A community of trees possessing sufficient uniformity in regards to composition, constitution, age, spatial arrangement or condition to be distinguishable from adjacent communities.

Stocking: An indication of the number of trees in a stand as compared to the optimum number of trees required to achieve some management objective, usually improved growth rates or increased timber values.

Stocking Level: Stocking levels are calculated by comparing either the basal area or the number of trees the site could support, if the growth potential of the land was fully utilized, to the basal area or number of trees actually on the site. UVA stocking categories include: understocked, adequately stocked, or overstocked.

Strip Cut: A timber harvesting operation where all of the merchantable trees are cut within a long, narrow strip. An even-aged cutting method usually used to regenerate spruce and fir.

Stumpage: The value of timber as it stands in the woods just before harvest (“on the stump”). Loggers usually bid on timber based on its stumpage value. Stumpage can also be used to refer to standing timber.

Succession: The orderly and predictable replacement of one plant community by another over time in the absence of disturbance.

Suppressed: Trees with crowns entirely below the general level of the forest canopy that receive no direct sunlight from above or the sides.

Thinning: A silvicultural treatment that reduces stand density to allow the best trees to grow with less competition. There are three kinds of thinning: crown thinning, low thinning, and free thinning.

Timber Stand Improvement (TSI): A non-commercial timber harvest conducted in stands of timber to improve the health, growth rate, and form of the remaining trees.

Tolerant Species: Trees that can grow satisfactorily in the shade of other trees. Tolerant species of commercial importance in Vermont include sugar maple, beech, red spruce, and hemlock.

Truck Road: A road capable of supporting a trailer truck that hauls logs from the landing to the mill.

Understory: Live vegetation in the 1-5 foot height range, including tree seedlings and saplings, shrubs, and herbaceous vegetation.

Uneven aged: An age class description of a stand of trees that contains more than two distinct age classes and a variety of size classes.

Uneven-aged (All-aged) Management: Timber management that produces a stand composed of a variety of age classes. Harvesting methods used in uneven-aged management include individual tree and group selection.

Vernal pool: A small, temporary body of water that occurs in a forest depression.

Vertical Structure: The complexity of vegetation and other structures as they are vertically arranged in the forest. A forest with a well-developed understory, midstory, and canopy exhibits complex or diverse vertical structure. Non-living features, such as coarse woody material and the microtopography of the forest floor, add to the complexity of vertical structure as well.

Vigor: The health and vitality of a tree. Vigor can most accurately be assessed by observations of foliage (density, width and color) and percent live crown.

Volume Table: A table that utilizes tree dbh or log diameters and log length(usually 16 feet) to estimate board foot volumes according to a set of assumptions (“log rules”) about how the log will be processed into boards.

Windthrow: A tree or trees that have been toppled by high winds. A common phenomena along the edge of strip cuts and clearcuts.

Yield: Total forest growth over a specified period of time, less mortality, unmarketable fiber and cull.

Yield Table: A species-specific representation of the amount of useable wood fiber a forest can be expected to produce during a single rotation based on site index.

Sources

Adapted from Vermont Land Trust glossary using the following sources:

Audubon Vermont. 2012. Forest Bird Habitat Assessment. Terms and Explanations.

Thompson, Elizabeth H. and Eric R. Sorenson. 2005. *Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont*.

Vermont Fish and Wildlife Department website. January 23, 2012. www.vtfishandwildlife.com

VIII APPENDIX A: REGULATIONS, EASEMENTS, AND PERMITS

Use and management of the Wu Ledges Forest (WLF) and Austin Parcel are guided by and must be compatible with the Waitsfield Town Plan and zoning bylaws. In addition, a few easements are legally binding and also affect permitted and restricted uses of the WLF, Austin Parcel, and adjacent private lands.

VIII.1 TOWN PLAN AND ZONING BYLAWS

The use of the WLF and Austin Parcel are subject to all relevant provisions in the Waitsfield Town Plan (October 22, 2012 and revisions that may follow) and regulations in the zoning bylaws (May 17, 2010 and revisions that may follow).

The WLF is identified in the Town Plan as a one of the Town's municipal forests which provide a variety of public benefits including: serving as buffers between more developed areas, realizing municipal revenue through periodic sales of carefully managed renewable timber, and providing tourism and recreation opportunities, public access and visual amenities. The Town Plan also indicates that WLF and the Austin Parcel must be "managed for a responsible, sustainable mix of public values in accordance with management plans prepared by the Conservation Commission with appropriate public input" (Policy 11.L-29).

The majority of the WLF is located in Waitsfield's Agricultural-Residential District. This district's purpose is to provide for low density residential development; to permit the continuance and expansion of agricultural operations; to encourage clustered housing units to preserve open space; to preserve the significant scenic resources of this district, including scenic roads, historic structures, and open spaces; and to protect natural resources.

All of the Austin Parcel as well as the low-elevation areas along the Mad River on the WLF are located in the 100-year floodplain as mapped by the National Flood Insurance Program, which defines Waitsfield's Flood Hazard Area Overlay District.

VIII.2 RIGHT-OF-WAYS, CONSERVATION EASEMENTS, AND RESTRICTIONS

- **Waldron Parcel, 123 acres:** Gifted to the Town from Arleon S. Waldron in 2004. Subject to the terms and conditions of a Grant of Development Rights and Conservation Restrictions by the Town of Waitsfield to the Vermont Land Trust, Inc., dated December 13, 2004, and recorded in Book 115, Page 39 of the Town of Waitsfield Land Records.

The Waldron Parcel enjoys two deeded right-of-ways:

1. A 50 foot right-of-way running in a northeast – southwest direction, along the southern boundary of the Town's Austin Parcel. See Waldron Deed, Parcel #3 and Warranty deed of James Wu and Pauline F. Wu, dated August 26, 1980, and recorded at Book 35, Page 286 (as referenced in the Waldron Deed). The right-of-way crosses the Mad River.

2. A 50 foot right-of-way along Pine Hill Lane. See Waldron Deed, Parcel #1 and Warranty Deed of Patrick W. Moriarty and Carol J. Moriarty to Chauncy W. Waldron, Jr. and Arleon S. Waldron, dated October 31, 1985, recorded at Book 46, Page 512 (as referenced in the Waldron Deed).

- **Lawton Parcel, 15 acres:** Gifted to the Town from Ritchie Crockett Lawton and Hastings Meadow, LLC in 2005. See Warranty Deed of Ritchie Crockett Lawton and Hastings Meadow, LLC, dated December 29, 2005 and recorded in Book 120, Page 258. This parcel does not appear to be protected by a conservation easement. However, as part of the Town's acquisition of the Lawton Parcel, the Town also acquired other rights in the remainder of the Hastings Meadow Subdivision. Through the Lawton Deed, the Town acquired "an easement and right of way for access continuing from Town Highway #25 Hastings Road..." as well as the use of three parking spaces, located northeast of subdivision lot #5. From the three parking spaces, the Town has a 10' trail easement to the Lawton Parcel. In addition, the Hastings Meadow Subdivision Permit (see below) notes a Right of Way over an "Old Woods Road" between this parcel and East Warren Road.
- **Austin Parcel, 5 acres:** This parcel was acquired by the Town in 1999 and is subject to a Grant of Right of Entry, Covenants and Conservation Restrictions by the Town of Waitsfield to the Vermont Land Trust, Inc., dated December 29, 1999, recorded in Book 86, Pages 463 & 464.
- **Lawton Conservation Easement, 25.5 acres:** The Town does not own this parcel in fee, but does hold a conservation easement on the property. Subject to the Grant of Development Rights and Conservation Restrictions conveyed by Richie Crockett Lawton to the Town of Waitsfield dated December 31, 2001 and recorded in Book 94, Page 411 of the Town of Waitsfield Land Records. Included in the Lawton Conservation Easement was an option for the Town to purchase an identical conservation easement on the remainder of the 51 acres now owned by Alexander Lawton IV. The Town exercised this option on December 17, 2007. Limited public access via designated routes across this parcel was included as part of the broader suite of identified routes on Hastings Meadow and Lawton retained lands provided in the deed for the WLF Lawton parcel.

VIII.3 PERMITS

- Hastings Meadow Subdivision Permit: Waitsfield Planning Commission Subdivision Permit No. SD 01-06 requires that trails within the Hastings Meadow subdivision remain open to the public (effectively, this likely only applies to the trail which is protected by the 10' trail easement in the Lawton Deed). See Permit No. SD 01-06 preliminary plat condition #8 and final plat condition #173.

IX APPENDIX B: SUMMARY OF PUBLIC INPUT

IX.1 ONLINE SURVEY

In order to gather initial information about Waitsfield residents' and Wu Ledges Forest users' knowledge, interests, concerns, and ideas for the Wu Ledges Forest, Kristen Sharpless assisted the Waitsfield Conservation Commission with preparing a 10-question public survey that was posted online between November 25 to December 27, 2013. A link to the survey was posted on the Town of Waitsfield website and Facebook page, hardcopies were made available, and the Waitsfield Conservation Commission organized spreading the word about the survey through community and neighborhood networks including Front Porch Forum. 255 people completed the survey. The following is a summary of the results:

1. In which town are you currently a resident?

255 responses

- Waitsfield 47%
- Other 53%

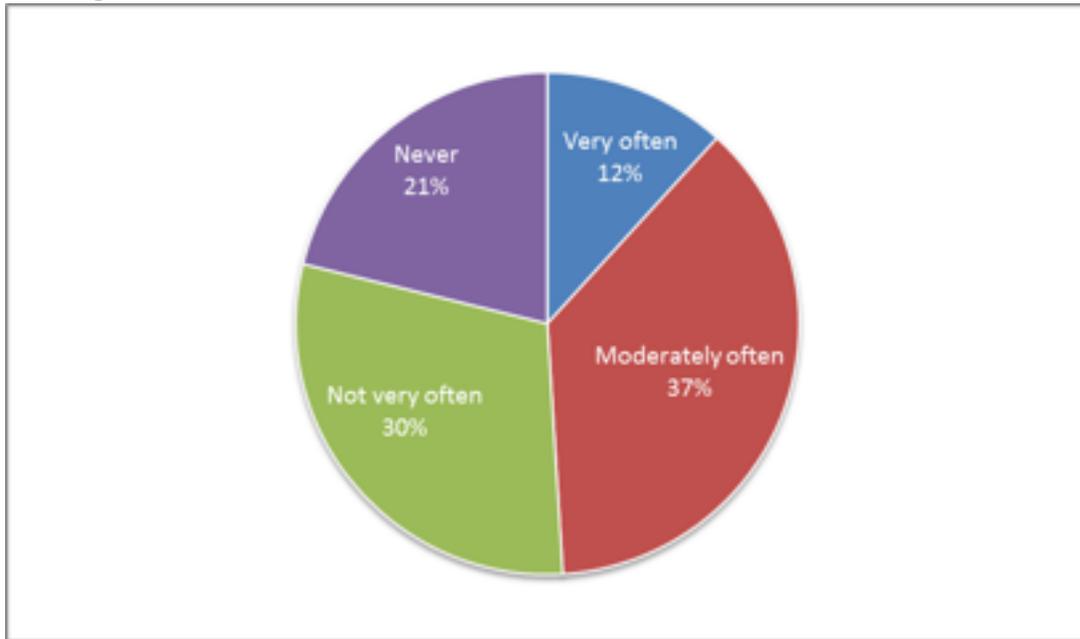
2. Were you aware that the Town of Waitsfield owns the Wu Ledges Forest?

255 responses

- Yes 73%
- No 27%

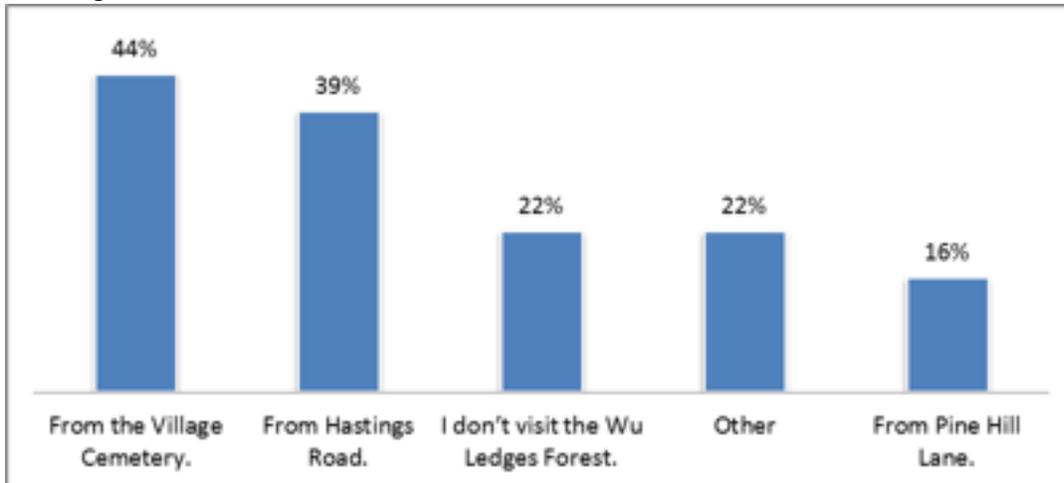
3. How often do you visit the Wu Ledges Forest?]

255 responses



4. How do you access the Wu Ledges Forest? (Check all that apply.)

233 responses

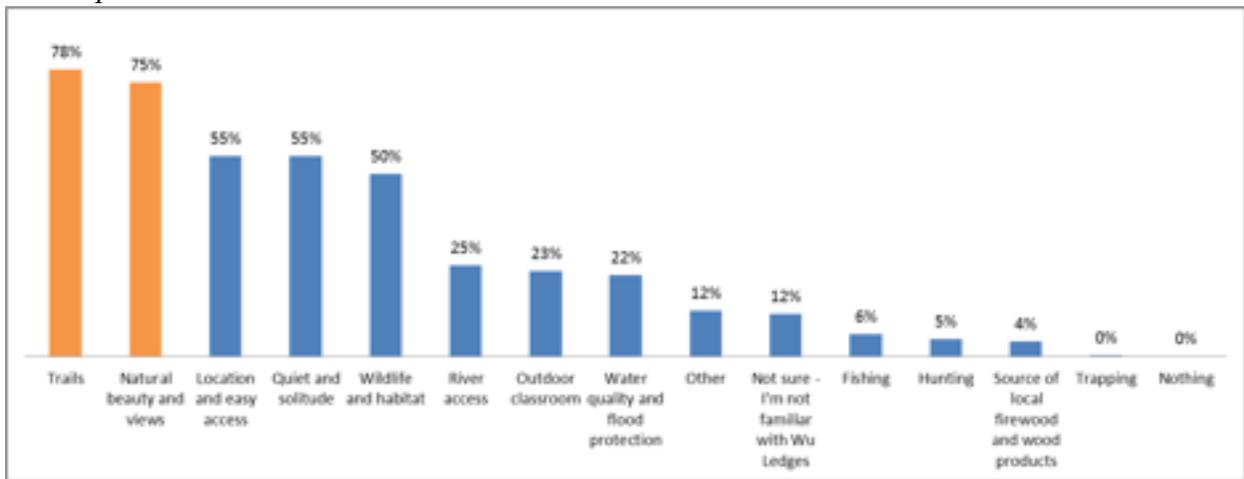


Other responses:

- From a friend/neighbor’s land – 14
- From my backyard – 7
- From Rolston Road – 7
- Wade the Mad River – 6
- From behind the Catholic Church – 3
- Off of Rte. 100 behind the Purple Moon – 2
- From Sugarhouse Lane – 1
- From the corner of the Lareau Bridge
-

5. What do you value about the Wu Ledges Forest? (Check all that apply).

249 responses

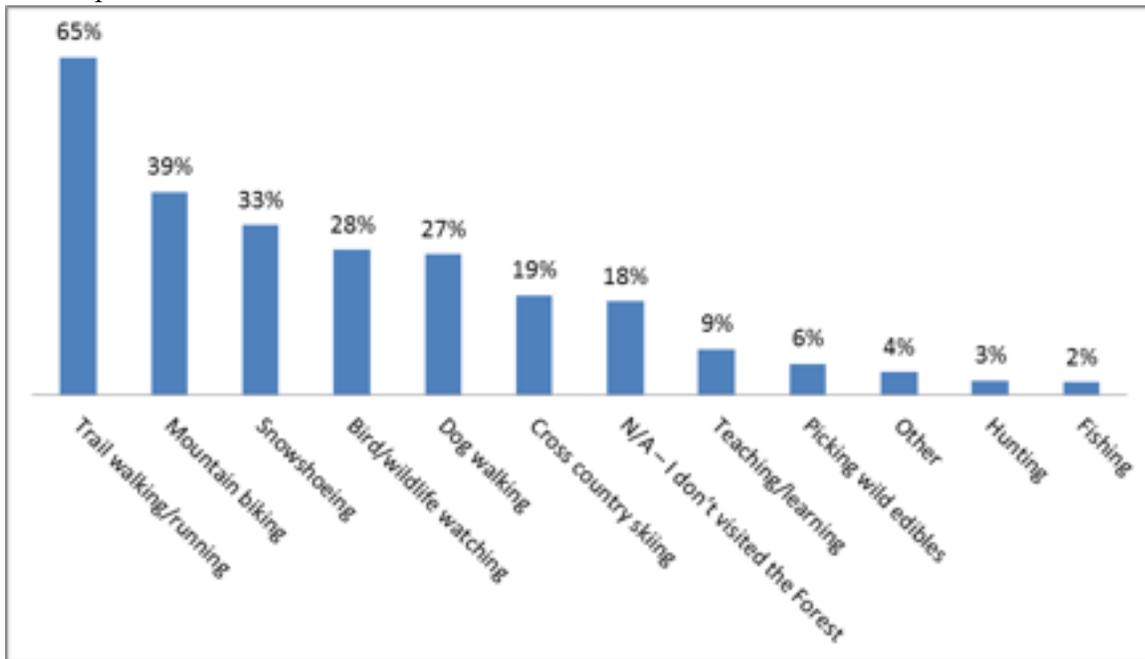


Other responses:

- Mountain biking – 19
- Proximity to school and village – 3
- Beautiful destination and view – 3
- Public access – 2
- Vernal pools – 1
- Connections to other trails – 1
- An easy hike – 1
- Place for dog swimming – 1
- Foraging for ramps - 1

6. What do you do when you visit the Wu Ledges Forest (check all that apply)?

105 responses

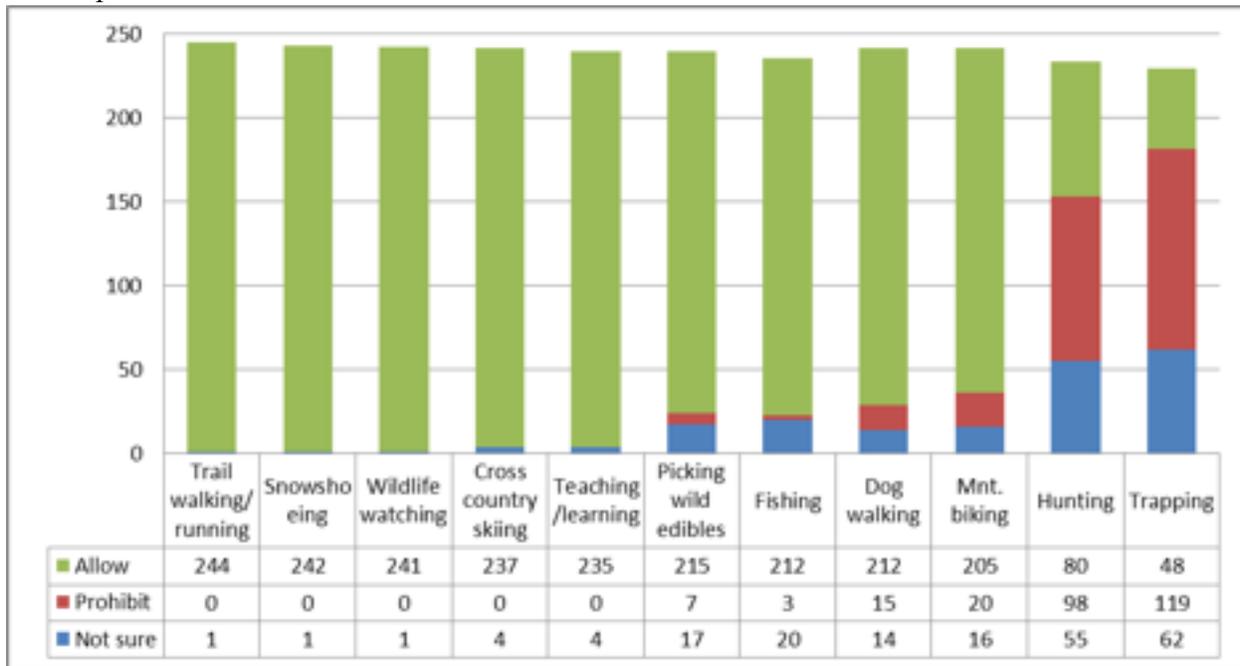


Other responses:

- Photography - 1
- Take in the valley views - 1
- Sit quietly - 1
- Help with trail work - 1
- Sunning at view overlook - 1

7. Which uses would you like to see allowed or prohibited in the future?

245 responses.



Other responses:

- No camping.
- No motorized vehicle access.
- Allow swimming.
- Allow picnicking.
- Winter biking.
- Would be nice to have a place to go in the woods during hunting season!
- I checked "prohibit" for hunting, although some restricted hunting would be acceptable in my opinion. The area being open to all hunters for all seasons may create a safety hazard for others.
- As residents of the Wu Ledges "neighborhood," we observe many out-of-area hunters violating posted signs, hunting near homes, etc.
- I always avoided it during most hunting seasons, so am willing to share. Trapping seems more apt to be problematic for dogs.
- Although I love biking, I'm concerned that mountain bikes detract from the peacefulness of the area.
- If you allow mountain biking, then you should allow snowmobiles.

8. What do you like most about the Wu Ledges Forest?

181 responses

Common Responses/Themes

- Proximity to Waitsfield Village and residential neighborhoods; easy access
- Beauty and views
- Trails and public access for recreation
- Peaceful, quiet; feels remote and secluded; not heavily used
- Variable terrain and interesting topography
- Undeveloped, wild state
- Mountain biking
- A great kid-friendly, family hiking spot
- Connectivity to a larger trail network and to the river
- It's safe

Quotes

- *I have planned to check out the Wu Ledges for some time now, but have not had the opportunity. I'm not quite sure where the current access points are? I think having a variety of trails in the Valley is great for local residents as well as tourists.*
- *The Wu Ledges Forest is a magnificent town asset. It is a mini-natural park nearly in our historic village. It has a menagerie of natural features: rock ledges, vernal pools, wetlands, wildlife habitats, an amazing variety of trees and ground cover. I "know" the Wu Ledges from every corner, nook and cranny. It is an unbelievable treasure in our town!*
- *Its name! What is a Wu Ledge? Who is Wu? Very intriguing.*
- *I can ride to the trails from my office in the Fuller House, an hour, 2 hours then a quick dip in the river and back to work!*
- *I love being able to teach my class of Kindergarteners outdoor and explore, build and learn with them in the forest.*
- *Central location. Nice walk to overlook, good payoff. We only went there for the first time this fall and after finding it went again two weeks later; each time w/ out of town guests. Great for young kids and adults. Very pretty.*
- *It's a hidden gem close to town. It's interesting that people can see the overlook/ledges, but many don't know how or where to access them.*

- *So many fun trails, it's so confusing but that's what makes it great. I think it has a magic umbrella; it's always the driest trail system in the valley. It's a critical wildlife corridor, priceless!*

9. What changes would most improve the Wu Ledges Forest?

169 responses

Most Common Suggestions

- Better trail maintenance and marking – 55
- Better and clearer access to the property with public parking – 48
 - From Bridge Street – 9
- Improved signage – 30
- Create trail map – 20
- Nothing – leave as is - 18
- Improve trail flow and connectivity – 13

Other Suggestions

- Not sure – 8
- Build a footbridge from the Village and/or Route 100 – 3
- Allow to be wild; no management - 4
- Strict or no logging – 3
- Keep property quiet and use low – 2
- Create more beginning and intermediate mountain biking trails – 2
- Install a bench – 1
- Provide trash cans – 1
- Keep dogs on leash – 1
- Allow dogs off leash – 1

Quotes

- *Not much. It could probably be advertised a bit more but with moderation. I don't think I've seen it on any maps. But at the same time it gets a lot of use without being busy. It's a perfect balance of use and protected wildlife habitat.*
- *Dedicate the area to shared recreational use - Find the root of the conflict - if hunters are complaining about bikers, maybe a closure during that period would be a compromise, but if we do this then another area should be open to bikers etc.*
- *It would be incredibly helpful to have a parking lot/entrance area closer to downtown Waitsfield. This would enable my students, and other community members, to access the Wu Ledges Forest more easily. Currently, we take a bus from Waitsfield Elementary School and must turn around on Bridge Street by the Miramar Ski Club. This is a traffic impediment for drivers when the bus is turning around. When we walk back to school, there is not a crosswalk so we teachers must stand in the road to stop traffic. This is safe*

for the time being, but it would be even better to provide a crosswalk from sidewalks to entrance points so that more people can use and appreciate the Wu Ledges Forest.

- *More formally marked trail system and presenting the area more like a "town park" that we recommend people use. It is really easy to "get into the woods and trails" from town, but it feels like this is supposed to be a secret. I'm not sure why though...*
- *Using an app such as Map My Run to map out trails and share it publicly so that we don't have to post trails or mark them. Use technology for low impact. I already have the entire area mapped out with Map My Run.*
- *Might be nice to create/enhance trails at Wu and tie in with other trails (Camel's Hump/Ole's (near Bundy)) to create a larger network, a la Burke, VT. Visitors using the trails so close to town could then be directed to Waitsfield restaurants for meals, lodging, bike/ski services, etc.*
- *While I don't have a problem at all with hunting the reason I selected to prohibit it here is because of its proximity to houses/village and lots of use by neighbors, etc.*
- *Let the Mad River Riders maintain & build a real trail system there that will feed the local Bridge Street business' and improve the recreational tourism in the town center.*
- *Don't talk about Wu Ledges/Dennyland. Hidden gems like this are part of the rugged charm of New England.*
- *Signage. We were a tad confused as to where to park, where to access the property. Is it okay to park in the cemetery? Why do we have to climb over the fence to access the trail? We also turned back from Pine Hill as there was no signage or parking. It could all be a bit more directive for the first time user.*
- *None!*

10.Name (optional)

IX.2 NOTES FROM DECEMBER 12, 2013 PUBLIC MEETING

A public meeting was held at the Waitsfield Elementary School on December 12, 2013 from 7-9pm. Approximately 33 people attended. The meeting began with an introduction to the properties and summary of findings and recommendations from existing reports, as well as a presentation of proposed vision and goals for the properties. Time was provided for questions and comments, which are summarized below:

General

- What could really be improved on the property through management? Logging and other activities interfere with natural processes – doesn't make sense to mimic them when they are already occurring. If the property is managed in this way, won't it end up being very different from the surrounding forest and wouldn't that be a bad thing?
- A hands-off approach would be best.
- Very diverse and special.
- Neighbors of the property – many enjoy the property as an extension of their backyards. Love the property and concerned about negative impacts of increased/changed uses – both on the property and in their neighborhoods.

Finances

- Is there money for improvements in the Town's current budget? If not, where will these funds come from? (A: *Timber sales would generate revenue for the Town and could be used for improvements. Grants may also be available for improvements, such as the ones that have been acquired to fund this management planning project and to construct a trail on the Waitsfield Scrag Forest*).

Uses

- Uses should not be about one vs. the other, but how to manage multiple uses successfully (e.g. bike trails and use can be planned to protect sensitive ecological features).
- Trapping should be prohibited. Dangerous with children and lots of recreation.
- Don't allow any wheeled vehicles – including bikes. They cause more erosion.
- Not much difference in erosion between mountain biking and walking if all else is equal. Foot paths can be badly eroded too if not well-designed and maintained.
- Currently – use seems to be pretty low. Rarely see anyone else out there.

- If use increases, what's the plan to deal with increased trash (on property and at access points)?
- What's the plan to deal with the impacts on neighbors, trails etc. if use increases?
- Is the Conservation Commission currently considering prohibiting any uses? (A: *No. Non-motorized and commercial uses are not permitted on the Waldron parcel due to the conservation easement*).

Logging/Timber Management

- Will logging that mimics small-scale natural disturbances be a net financial loss and be done at cost to the Town?
- Will logging be done at a cost to the Town?
- Is the Town likely to harvest timber purely for the purpose of making money?
- Concern about conflicts between maintaining mountain bike trail and logging. Have experienced slash being left in trails at other locations.
- Why mimic natural processes?
- In favor of a timber harvest, but do it incrementally. Less is more.
- Very attached to trees on the property. Do not want to see them cut.

Signs

- Less is more – fewer trails and signs. Keep it natural.
- Make signs small and subtle.
- Don't put up any signs. They will get defaced. Use technology and look into apps for iPhones (e.g. Map My Run) instead, so people can access trail maps on their digital devices.

Trails

- Trails are self-regulating – the terrain is very difficult, so trails do not attract beginner bikers.
- Formal trails and active trail maintenance could reduce trash – has in other locations.
- Trails need to be thoughtfully and carefully designed and maintained to control impact (e.g. erosion). Should be done right and responsibility. Mountain bike group is ready to do this well. Blueberry Lake is a model.

- There are LOTS of trails on the property – many more than have been mapped.
- Consider implementing a rotation – open/close trails for a period of time so that some areas are quiet/recovering while others are in use.
- Trails are very natural and well-located.
- Trails are located on natural deer/wildlife trails along ridges and contours.

Access

- Access is the biggest issue for the property.
- The limited access naturally restricts use and the number of the people on the property. Some are ok with this and don't want to see it change.
- Public access up Pine Hill Lane is only for recreation – no vehicular access.
- Access through the Cemetery – Bylaws state that no recreational activities are allowed. Commission closed access to Wu Ledges with a gate due to that concern, as well as in response to problems with trash and cars. Accessing Wu Ledges from that gate requires crossing multiple private properties (town parcels are not adjacent).
- Close proximity to the Village is a great asset of the property. Is there an access option from the Village?
- Are there opportunities to enlarge the Town's ownership adjacent to Wu Ledges? Is the Conservation Commission actively trying to acquire any parcels? *(A: Identifying potential opportunities for expanding ownership and prioritizing projects/tasks will be a part of the management plan)*
- It is important for people to have recreational access that is dispersed across the Valley (all use should not be concentrated in one spot).
- Need to plan for main access points where there is good parking and away from peoples' homes (e.g. from Village and Lareau swimhole)
- Could a bridge be constructed across the Mad River at the Lareau swimhole, which would allow access from where there is already ample parking? What would be ecological impact be of this approach? What would the Mad River Path think about it?
- Could the deeded 3 car limit at the planned Hastings Road parking area change/increase? *(A: Not unless the deed is changed)*

- Many bikers currently park at Bridge Street and ride up the Common Road to Pine Hill Lane. This route is bike-able, but not very walkable.
- Increased traffic on Hastings Road is a concern – risk of increased crime?

Tourism

- Wu Ledges is a great potential tourism asset that could draw additional visitors to Bridge Street.

Wildlife/Biodiversity

- Have seen bear on the property.
- Primary concern should be protecting the very rich biodiversity on the property.
- Is there any old growth forest on the property (A: *None that we know of.*)

X MAPS

TOWN OWNERSHIP AND ACCESS

ORTHOPHOTO MAP

TRAIL MAP

SOIL MAP

FOREST STAND MAP

FOREST BIRD HABITAT MAP

NATURAL COMMUNITIES MAP

ECOLOGICAL FEATURES MAP

DRAFT