

**Natural Resource Inventory and Management Plan for
Mount Jasper Property, Berlin, New Hampshire**

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INTRODUCTION, HISTORY, AND OBJECTIVES

The Mount Jasper property is 203 acres, located in Berlin, New Hampshire, and owned by the City. Route 110 is to the south, paralleling the railroad tracks and the Dead River. The property accessed from the southern end includes the Berlin Senior High School, running track and soccer field, and baseball field. To the northeast there are privately owned properties off Cates Hill Road. The Mount Jasper property abuts private properties along the northwest portion near a main transmission line. The property contains a hiking trail with access near the High School track where a kiosk and trailhead are located. There is an alternative access off Cates Hill Road behind the Mt. Calvaire Cemetery. There are faintly discernable segments of ancient trail where Native Americans traveled many years ago. The New Hampshire Bureau of Trails and local snowmobile club maintain a main corridor snowmobile trail that runs along the edge of the Dead River floodplain and over Mount Jasper to Cates Hill, adjoining the larger State-wide trail system. There are several older trails and access roads up and around the property used mostly by ATVs.

The Mount Jasper property is mostly forested and contains a diversity of habitat types. There are wetlands, vernal pools, headwater streams, mature mixed hardwood stands, some scattered mature red oak, and areas of mature white pines and eastern hemlock. This provides habitat for a diversity of wildlife species, some of which travel beyond the boundaries of the property to adjacent undeveloped areas.

Due to the configuration and steepness of the property, there are many views including a spectacular view of downtown Berlin, the Dead River floodplain, and Mt. Forest. At its highest elevation, Mt. Jasper is 1584 feet above sea level, and the lowest is the Dead River at 1070 feet. The average slope from the Dead River to the top of Mt. Jasper is 47%, and has rugged terrain, exposed ledge and scattered boulder throughout

The Mount Jasper site has a long history of human use of natural resources beginning with Native Americans who mined rhyolite to make knives, scrapers, drills, and projectile points. Artifacts found in northern New Hampshire and Maine have been traced back to the Mount Jasper rhyolite site according to NH State Archeologist Dr. Richard Boivert. A large triangular shaped portion of the Mount Jasper site has been designated in the National Register of Historic Places. Please refer to the aerial map attached to the back of this report.

The New Hampshire Department of Resources and Economic Development (DRED) also holds an easement along a section of the Dead River floodplains that overlaps the National Register of Historic Places designation. The property is currently used for many forms of recreation.

The Berlin Planning Board, City Planner Pamela LaFlamme, and City Council are seeking ways to enhance the use of the Mount Jasper property, while maintaining its natural resources and integrity. A committee consisting of the Appalachian Mountain Club (AMC) represented by Sally Manikian - Back Country Resource Manager, Pamela LaFlamme, members of the Planning Board, Corinne E. Cascadden- Superintendent SAU 3, and private citizens was formed to develop goals and future use of this property. The committee hired Watershed to Wildlife, Inc. (WTW) in April 2012 to assess the property for wildlife habitat diversity, wetlands and natural resources.

The goal of this project is to inventory natural resource features throughout the property and to provide recommendations for multi-use by the Public, while identifying sensitive areas to protect. Results of this project can be used as a tool to maintain the integrity of the property.

Measurable objectives of this project include the following:

1. Provide an evaluation of the property from a natural resources perspective while identifying sensitive areas.
2. Provide an assessment of cultural and scenic resources found throughout the property.
3. Allow the City of Berlin to assess Public multi-use and conservation plans proposed for the Mount Jasper property.
4. Provide the City of Berlin with the ability to integrate data generated from this project into existing GIS coverages, particularly related to natural resources.
5. Provide the ability of the City to continue to build upon and update the digital database for the property.
6. Incorporate data generated from this study with other complementary studies including Natural Resource Inventories, Master Plan updates, and watershed-wide planning.

METHODOLOGY

Compile Existing Data into Autocad and ArcGIS

Digital data was gathered from the following resources:

1. NH GRANIT – Statewide GIS data
2. Natural Resource Conservation Service (NRCS)
3. Peg Heaney – GIS Specialist
4. Dr. Richard Boivert – Mt. Jasper Geological
5. Naomi Levesque - Dead River floodplain Plants
6. Michael Eastman- Local artist with Abenacki lineage - personal communications.

GRANIT data includes the following:

1. Aerial photography
2. USGS Topographic map
3. Hydrology (rivers, streams, lakes and ponds)
4. National Wetlands Inventory wetlands (NWI)

Existing available maps were then integrated using ArcMap-ArcView software. Using the 2009, 2003, 1998 and 1992 aerial photos, topographic maps, and soils maps, features were digitized and overlaid onto a base map. These include:

1. Dense softwood stands
2. Mixedwood stands
3. Hardwood stands
4. Unique or noteworthy community types including potentially significant wildlife habitat
5. Wetlands
6. Vernal pools
7. Recreational trails

Steep slopes were determined using the NRCS soils maps. Data was displayed in Arc MAP and queried so only those soils map units with 15% slope and greater were displayed. Habitat types were digitized by WTW using a combination of aerial photographs, topographic maps, and GPS points with associated photographs and notes. They were displayed as polygons. Newly found wetlands were delineated and incorporated into the existing National Wetlands Inventory mapping. GPS points were taken at all documented vernal pools and brought into the mapping.

All maps are displayed at the end of this report with the features described above. All information gathered, compiled, and mapped for this report is in digital format, owned by the City of Berlin.

Field Work

Fieldwork was conducted throughout the property in Berlin in the summer and early fall of 2012. This work included inventories and assessments of several different habitat types, wildlife sign (direct or indirect observations). GPS data was collected at points of interest including wildlife sign (tracks, scat, feeding or bedding sites, or direct visual or audio observations), habitat types, vernal pool locations, mast producing oaks and beech stands, and rock outcrops. In addition, photographs were taken with a digital camera at points of interest throughout the properties. WTW was joined by Naomi Levesque during fieldwork in August and Michael Eastman during a fieldwork day in September. During fieldwork sessions habitat types, wetlands, wildlife evidence were documented.

RESULTS

Wetlands

Wetlands are an essential habitat type for the majority of plant and animal species in New Hampshire. As a whole, wetlands are extremely diverse depending on the hydrology, soils, topography, and climate of an area. In addition to the rivers, lakes, and ponds, there are four general types of Palustrine¹ wetlands: marsh, swamp, bog, and fen, with additional sub-types within each of these categories. Each individual wetland contains diverse plant and wildlife species and water regimes. This creates edge habitats within and around wetlands which are frequently used by a great deal of wildlife species. It is estimated that riparian areas and wetlands are used by over 90% of the region's wildlife species and provide preferred habitat for over 40% of local species.

¹ Palustrine wetlands are a group of vegetated wetlands traditionally called marshes, swamps, bogs, fens. They also include the small, shallow, permanent or intermittent water bodies often called ponds.



This surprisingly calm great blue heron (*Ardea herodias*) was observed in the Dead River wetland complex.

Dead River Wetland Complex

The Dead River is a sinuous perennial stream with a mostly sandy bottom and some cobbly bottom in areas of riffle flows. It is braided by areas of organic sedimentation in its coves and broad floodplain areas. The river flows for approximately one mile along the Mount Jasper property in a southeasterly direction. Its headwaters are the subwatersheds of Jericho Lake and Head Pond. The Dead River flows into the Androscoggin River approximately 3,000 feet downstream from the Mount Jasper property. The Dead River is 3.5 miles long and is entirely within the City of Berlin. It is a third order² perennial stream. Past and present beaver activities have impacted the slow flowing, gently sloped river throughout the property.

The Dead River Wetland Complex is approximately 55 acres within the Mt. Jasper property...making up about 27.1%.

² A first order stream is a stream which does not have any other recurring or perennial stream feeding into it. When two first-order streams come together, they form a second-order stream. When two second-order streams come together, they form a third-order stream. Streams of lower order joining a higher order stream do not change the order of the higher stream.



View of the Dead River and associated wetland complex from Mt. Jasper. The perennial stream and associated wetlands are diverse and highly functional.

The railroad tracks and Route 110 form a border on the south side of the Dead River with much human impact and development activities. This is a sharp contrast to the north side of the Dead River. The river is mostly poorly shaded and relatively shallow but supports a diversity of fish and invertebrate species and is an important habitat for wildlife. During fieldwork several ducks, small fish, song birds, great blue heron, and signs of additional wildlife species were observed. A healthy diversity of plant life was documented including many wetland plant species and communities, among them several areas of healthy growing large cranberries (*Vaccinium macrocarpon*). In 2009, Naomi Levesque of Berlin NH did an inventory of plant species along the Dead River flood plain area for a class.



Ripening cranberries were abundant in several areas along the Dead River and associated wetlands complexes.

The land adjacent to the Dead River is an abrupt boundary into uplands creating excellent edge habitat with evidence of wildlife travel corridors along the edge. Moose, whitetail deer, and bear tracks were observed during fieldwork. There are limited human impacts along the northern edge of the Dead River riparian zone, but the multi-use trail is used for walking, running, and snow machines. ATV traffic is prohibited in this portion of the trail.



An overview of the Dead River looking upstream. This photo is taken from the ledges of Mount Jasper in Berlin, NH.

Past older beaver sign was observed, but no fresh dams were found along the project portion of Dead River. Several species of wildlife were documented, including white-tailed deer, moose, blackbear, at least three species of ducks, red-tail hawk, turkey vulture, muskrat, and raccoon. Mapping data obtained from NH GRANIT website shows a sand based aquifer of approximately 380 acres under the Dead River. An estimated 70 acres of the aquifer is located primarily under the southeastern portion of the Dead River within the Mount Jasper property.



Even in the quiet coves of the Dead River the water clarity is surprising good. There were several small fish observed in this cove. Note the small fragrant water lily leaves (*Nymphaea odorata*) and the *Eriocaulaceae* sp. commonly called hatpin or pipewort.

Floodplain Scrub-Shrub Wetlands

These wetlands are connected with the Dead River in the southern portion of the property and offer valuable wildlife habitat, including feed, water, and breeding areas. They create a valuable transition between open water and emergent plant species and the adjacent upland forest habitat. Scrub-shrub wetlands are important in their role as edge habitats, as well as erosion and flood control. They provide sheltered wildlife travel corridors, cover, food and nesting habitat for a variety of species.



A close up view of scrub/shrub wetlands found throughout the Dead River Wetland Complex

Perennial Streams

Several unnamed perennial streams were observed throughout the Mount Jasper property. They are within the subwatershed Hydrologic Unit level 12 'Berlin Tributaries' which are within the larger Hydrologic Unit level 10 - 'Mid Androscoggin' subwatershed. In some instances, there have been snowmobile bridges built that span *top-of-bank-to-top-of-bank* crossings, and in other cases more modest foot bridges and planks. There are at least four unnamed perennial streams with additional drainages flowing from the height of Mount Jasper into the Dead River and ultimately the Androscoggin River.

These perennial streams have cobbly, rocky bottoms and are well shaded, mostly flowing through forests. In some cases they are probable fish spawning habitat. These are upper headwater systems with steep slopes until they reaching the Dead River and associated wetlands. They are a valuable wildlife habitat in themselves. They are also beneficial at their confluence with the Dead River, adding cooler water temperature and food sources for fish, ducks, and many other species.



A small perennial stream crossing for snowmobiles and foot traffic on a main snow machine corridor trail.



One of several perennial streams and drainages flowing off Mount Jasper towards the Dead River.

Vernal Pools

Unique, sometimes isolated and important wetland types are vernal pools. Vernal pools provide essential breeding habitat for certain amphibians and invertebrates such as wood frogs (*Rana sylvatica*), yellow spotted salamanders (*Ambystoma maculatum*), Jefferson/blue spotted salamanders (*A. jeffersonianum* / *A. laterale*), and fairy shrimp (*Branchinecta lynchi*). These creatures depend on vernal pools as breeding sites, because they are mostly temporary water bodies preventing fish and other aquatic predators from taking up residency. Reptiles such as Blanding's turtles (*Emydoidea blandingi*), wood turtles (*Clemmys insulpta*), and spotted turtles (*Clemmys guttata*) also may rely on vernal pools as important feeding areas in early spring. Vernal pools fill annually from precipitation, runoff, and rising groundwater, typically in the spring and fall. By mid-summer, however, these wetlands are typically dry, making them a dynamic system habitable to specifically adapted plant and wildlife species.

Several vernal pools were documented throughout the Mount Jasper property. Although some were isolated pools, some were associated with headwaters of perennial stream drainages and Dead River wetland complex.



The photo on the left shows an isolated vernal pool near the hiking trail to Mount Jasper. The photo on the right is near the trail closer to Cates Hill. Note that the pool is nearly dry and was documented on September 10, 2012.

Forested Wetlands

Red spruce swamp

As described by the NH Natural Heritage Bureau in Natural Communities of New Hampshire, Red Spruce (*Picea rubens*) swamps are dominated by red spruce (25-50+% cover) and occur on poorly drained mineral soils with a shallow organic cap. Three-seeded sedge, cinnamon fern, and carpets of peat moss form a lush understory beneath a light to moderate tall shrub layer and a sparse dwarf heath layer. They form in large swamp complexes or lake basins, along small, stagnant drainages, and in pockets or benches on mountain sideslopes, primarily in northern and central parts of the state. Understories are lush, there are light to moderate tall shrub layers, and hummock-hollow topography is slightly to moderately well developed. Soils are acidic, nutrient-poor, and poorly to very poorly drained.

This conifer swamp was documented in the northern part of the Mt. Jasper property and the wetland extends beyond property boundaries. It is 9 acres and in a natural depression or bowl to the northeast of Mt. Jasper's peak. Some of the species found within this forested wetland

include the following: red spruce (*Picea rubens*), cinnamon fern (*Osmunda cinnamomea*), peat moss (*Sphagnum* spp.), mountain holly (*Nemopanthus mucronatus*), witherod (*Viburnum nudum*), winterberry (*Ilex verticillata*), bluebead lily (*Clintonia borealis*), bunchberry (*Cornus canadensis*), and northern wood sorrel (*Oxalis montana*).



A previously un-mapped Red Spruce Swamp approximately 9 acres in size, at about 1500 feet elevation.



Red spruce swamp with a mucky organic layer of soil, and a lush undergrowth of cinnamon fern, sphagnum moss, and shrubs along the edges.

Forest Types

White Pine Dominant

There is a 5.6-acre area within the Mount Jasper property that contains white pine (*Pinus strobus*) dominate forests: approximately 400 feet north of hiking trail kiosk. The main hiking trail goes through the open white pine stand, and it is quite scenic. The areas surrounding the White Pine Stand contain a mixture of hardwood species including scattered red oak (*Quercus rubra*). White pine in this area are 2-3 feet and larger in diameter, measured DBH. Other plant species present in the area include:

- Bracken fern (*Pteridium aquilinum*)
- Red Maple (*Acer rubrum*)
- Canada mayflower (*Maianthemum canadense*)
- Low bush blueberry (*Vaccinium*)



A hiking trail goes through this white pine stand near the base of Mount Jasper.

Red Oak Dominant

Near the crest of exposed ledge and scenic overlook of Mount Jasper, the dominant tree species is red oak (*Quercus rubra*). Mature red oak produce acorns, which are an important fall food source for many wildlife species including black bear, deer, ruffed grouse, and squirrels, to name a few. Many areas near the top contain younger, regenerating red oak saplings. Some of these could be thinned in choice locations to enhance the views along the hiking trail near the top of the mountain. All mature larger trees should remain as important mast producing trees.



By cutting a few saplings and general clean up of debris this area would offer an attractive “park-like” overlook as you approach the Mount Jasper summit. This area is a dominated by red oak, with a grassy understory.



It is recommended to leave the mature red oak trees while removing some of the younger saplings in choice viewshed areas.

Northern Mixed Hardwood Forest

By far the most common forest type within Mount Jasper property is mixed hardwoods containing white and yellow birch (*Betula papyrifera* and *B. alleghaniensis*) red maple (*Acer rubrum*), poplar (*Populus tremuloides*), white ash (*Fraxinus americana*), hop hornbeam (*Ostrya virginiana*), American beech (*Fagus grandifolia*), striped maple (*Acer pensylvanicum*). There are some over-story mature trees but mostly a sapling to pole stage forest. Mixed hardwood forests are very common throughout New Hampshire. They offer excellent food and habitat for a diversity of wildlife species, particularly when adjacent to softwood forests and/or wetlands.



This photo shows a diversity of hardwood tree species (beech, birch, maple, and ash). Although most of these are young, they are good wildlife habitat and will increase their value to wildlife as they mature and increase their mast production.

Softwood species

In addition to the red spruce swamp mentioned previously, there are several small areas of mixed eastern hemlock, eastern white cedar, balsam fir, and/or black spruce scattered within the property, particularly in wetland areas abutting small headwater streams, vernal pools, and seeps. Maintaining softwood stands, particularly along wetlands and streams, will help keep the water cooler, help prevent erosion, and allow for travel of wildlife adjacent to wetlands.



Although not plentiful, there are northern white cedar scattered on the property.

Permanent Openings

With the exception of athletic fields associated with the Berlin High School and the Dead River Floodplains, the Mount Jasper property lacks permanent openings. There may be opportunities to create a couple of small (<1 acre) permanent openings in the northern portion of the property, east of the crest and exposed ledge of Mount Jasper. The openings would need to be on fairly flat sloped land and undoubtedly would be irregular in shape to conform to the existing terrain. Access may be gained from the Cates Hill trail for annual bush-hogging maintenance. The value of edge habitat and additional diversity of habitat could make this an attractive option. Small, carefully placed opening would also open views towards downtown Berlin, the Dead River Valley and across to Mt. Forest.

Wildlife Habitat

The table below is a summary of different habitats in acres as well as a percent composition throughout the properties.

Habitat Type	Number of Acres	Percentage of Total Property
Mount Jasper property	203.0	100%
Wetlands	59.8	29.0%
Hardwood Stands	26.8	13.2%

Habitat Type	Number of Acres	Percentage of Total Property
Mast-producing (mature) Red Oak and Beech	Scattered within other forest types	
Dense Softwood Stands	5.7	2.8%
White Pine Stand	5.6	2.8%
Mixedwood Stands	91.6	45.1%
Rocky Outcrop	2.6	1.1%
Berlin High School Developed	20.8	10.2%

Wildlife

The diversity and abundance of wildlife is directly correlated to the diversity and richness of habitat, plant community types, and vegetation. Throughout the Mount Jasper property, several different species of wildlife were observed directly and indirectly. Direct observations include visual or audio observations during field work. Indirect observations include tracks, scat, evidence of feeding, evidence of marking, bedding areas, and densites. The table below lists wildlife species observed during field work.

Species (Common Name)	Species (Latin name)	Direct or indirect evidence
White tail deer	<i>Odocoileus virginianus</i>	Tracks
Black Bear	<i>Ursus americanus</i>	Tracks, scat
Moose	<i>Alces alces</i>	Tracks, scat
Great Blue Heron	<i>Ardea herodias</i>	Visual
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Visual
Red squirrels	<i>Tamiasciurus hudsonicus</i>	Visual Tracks, feeding areas
Snowshoe hare	<i>Lepus americanus</i>	Tracks, scat, evidence of browsing
Raccoon	<i>Procyon lotor</i>	Tracks
Beaver	<i>Castor Canadensis</i>	Chewing, lodges, dams

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Species (Common Name)	Species (Latin name)	Direct or indirect evidence
Broad-winged hawk	<i>Buteo platypterus</i>	Visual- 2 hawks
Pileated woodpecker	<i>Dryocopus pileatus</i>	Calls cavities in trees
Hairy and downy woodpeckers	<i>Picoides villosus</i> <i>Picoides pubescens</i>	Visuals, calls, young
Ruffed grouse	<i>Bonasa umbellus</i>	Visuals, drumming, scat
Small fish - minnows	<i>Unknown- possibly several species in school</i>	Visuals
Clutch of ducks- ducklings	<i>Family Anatidae</i>	Visuals Unsure of species
Black-capped chickadees	<i>Poecile atricapillus</i>	Visuals calls/songs
Black-throated green warbler	<i>Dendroica virens</i>	Song
Veery	<i>Catharus fuscescens</i>	Song
Red breasted nuthatch	<i>Sitta canadensis</i>	Visuals Calls/song
Common Raven	<i>Corvus corax</i>	Visual
Blue jay	<i>Cyanocitta cristata</i>	Visual, song
Yellow-throated vireo	<i>Vireo flavifrons</i>	Song
Several songbirds	<i>Colors and song difficult-late in the season</i>	Song
Cedar waxwings	<i>Bombycilla cedrorum</i>	Visual, song
Wood frog	<i>Rana sylvatica</i>	Adult visual, tadpole visuals
Yellow spotted salamander	<i>Ambystoma maculatum</i>	newts
Red spotted newt	<i>Notophthalmus viridescens</i>	Visuals on adult and juvenile "red eft"
Green frog	<i>Rana clamitans</i>	Visuals on adults

The list above is by no means an exhaustive survey of all wildlife species that could be found throughout the property. These are species recorded during field work, recognizing that time in the field are "snapshots", and the goal of the project was to identify overall wildlife habitat diversity rather than detailed species inventories.

Main Wildlife Travel Corridors

Generally wildlife trails were observed in most areas throughout the Mount Jasper property. There were some locations which are frequently traveled with more extensive wildlife trail networks. These are considered to be main wildlife travel corridors. Although areas outside of the property were not assessed during field work, these travel corridors extend beyond property boundaries into an extensive area of relatively undeveloped land. The main corridors documented are along the north side of the Dead River floodplains, along and within the wetland complex in the northeast portion of the property, and on the north side of the Mount Jasper summit. It also should be pointed out that, based on field observations, the summit may be an important migration point for many raptors, turkey vultures, and ravens due to favorable thermal currents. Travel corridors are important for wildlife movement not only within the Mount Jasper property, but also in the entire region in general. Maintaining intact travel corridors are especially important for wildlife that have large home ranges and travel far distances.

Rock Outcrops

The Mount Jasper property is known for the large rock outcrops near the summit (at 1,584 feet). These outcrops allow visitors to the summit to have panoramic views after a relatively quick hike up. Erratic boulders are found scattered throughout the property, some as large as 20' + in height and diameter. Many of these erratics have broken off the ledges at the height of land and crashed downhill through the forest below often in the general direction of the Dead River wetland complex. Occasionally a fresh broken section of boulder can be found leaning against trees with gravitational potential energy poised to continue its downhill decent sometime in the future.

The New Hampshire Bedrock Geology mapping indicates that the Mount Jasper bedrock is coded Oalx, described as metasedimentary and metavolcanic rocks of the Central Maine Trough, Bimodal volcanic rocks. As is the case with soils mapping, there are often inclusions and unmapped units within many of the assigned coded mapping units. Further details about NH geology are available through the State Geologist – www.des.nh.state.us/geology/ and www.nhgeology.org.



This large fragmented piece of ledge fell from above and is precariously perched against a tree.

Soils

The nature of soil has a profound effect on plant growth. Whether it is rich with organic material or sandy, will affect the type of vegetation adapted to grow in those conditions. Scientists can learn much about the soil type by examining the vegetation. At the same time, examining the soil will predict the type of vegetation that can grow in the area. Because soils affect the vegetation that will grow in an area they also influence the habitat types and therefore the wildlife species that will occur in particular areas. As a result, understanding soil conditions and characteristics can be excellent indicators of critical areas such as wetlands, agricultural lands, forestlands, wildlife habitat and areas with limitations to development. In descriptions of soil types, the Natural Resource Conservation Service (NRCS) evaluates soil types according to their capacity for agriculture, woodland, community development, recreation, and wildlife habitat.

Soil information is critical in making sound land use decisions. By examining soil types and morphology, many predictions can be made regarding forest management, erosion potential, and development possibilities. Certain soils are better suited for certain land uses such as forestland, agriculture or residential development. For example, residential development should be located away from areas with unstable soil conditions such as high water tables, areas of shallow or exposed bedrock, and areas with high erosion potential

The Mt. Jasper property contains largely Tunbridge-Lyman Rock Outcrop complex soils (61E) that range in slope from 25% to 60%, with inclusions of vertical rock outcrop areas. Most of the property north of the Dead River has a slope ranging from 8 to 60 percent. There is a large polygon of very poorly drained Peacham- Bucksport- Rumney complex associated with the Dead River Floodplains (897A) along the southern portion of the property. An area of human disturbed soils abuts this very poorly drained soil complex upstream to the northwest, Udorthents (400), where gravel and sand was removed in the past. Southeast and downstream along the Dead River are Colton (22A) excessively well drained and Sheepscot (14B) moderately well drained soils. Please refer to the attached map and table below for more information on the soils found throughout the property.

Detailed description of soils on Mount Jasper Property

Soil number	Soil name	Drainage	Community Development
61E 25-35%	Tunbridge-Lyman Rock Outcrop Complex	Well drained	The slope, rock outcrops, and surface stones make areas of this complex unsuited for agriculture practices common in Coos Woodland management concerns on Tunbridge and Lyman soils are erosion hazard, equipment limitation, and windthrow hazard.

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Soil number	Soil name	Drainage	Community Development
143C 10-15%	Monadnock fine sandy loam, 10 to 15% slope	Well drained	<p>Hiking paths and trails can be designed and maintained with few limitations.</p> <p>This soil has good potential for woodland wildlife habitat development, poor potential for openland wildlife, and very poor potential for wetland wildlife habitat development.</p>
670D 15- 25%	Tunbridge-Berkshire-Lyman Rock Outcrop Complex	Well drained	<p>Slope is a moderate limitation for path and trail development. Designing switchbacks and installing waterbars on the steeper slopes of trails can help reduce erosion.</p> <p>Tunbridge and Berkshire soils are well suited for development of woodland wildlife habitat and fairly suited for openland wildlife habitat development. Lyman soil is poorly suited for development of woodland and openland wildlife habitats. This map unit is very poorly suited for wetland wildlife habitat development.</p>
169C 8-15%	Sunapee fine, sandy loam,	Moderately well drained soil	<p>This soil has moderate limitations for hiking paths and trails due to wetness. Installing waterbars may be helpful.</p> <p>This soil has good suitability for woodland wildlife habitat development, poor suitability for openland wildlife, and very poor suitability for wetland wildlife habitat development.</p>
55C 8-15%	Hermon , sandy loam, very stony	Somewhat Excessively Drained	<p>Large stones are a moderate limitation for developing paths and trails. Removing surface stones, cutting and filling to level areas help reduce the limitations.</p> <p>This soil has poor suitability for development of openland wildlife habitat, fair suitability for development of woodland wildlife habitat, and very poor suitability for development of wetland wildlife habitat.</p>

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Soil number	Soil name	Drainage	Community Development
22A 0-3%	Colton, gravelly, fine sandy loam	Excessively Well Drained	<p>This soil may have severe limitations for developing camping areas, picnic areas, and playgrounds in areas that are too acidic for plants. Adding lime to these areas may reduce this limitation. This soil has few limitations for the development of paths and trails.</p> <p>This soil has a fair suitability for the development of openland wildlife habitat, poor suitability for woodland wildlife habitat, and very poor suitability for wetland wildlife habitat development.</p>
14B 1-8%	Sheepscot, cobbly, very fine sandy loam	Moderately Well Drained	<p>This soil has moderate limitations for development of paths, trails, campgrounds, picnic areas, and playgrounds due to wetness.</p> <p>This soil has good suitability for openland wildlife but fair suitability for woodland habitat. It has very poor suitability for wetland habitat.</p>
897A 0-2%	Peacham, Bucksport, and Rumney soils	Very Poorly Drained	<p>The Peacham and Bucksport soils have severe limitations for developing camps, picnic areas, playgrounds, or paths and trails due to ponding and excess humus. It might be possible to construct boardwalks for trails but the pilings may have to be very deep to reach mineral soil in some areas. The Peacham and Rumney soils have fair suitability for wetland wildlife habitat development. Bucksport soil has good potential for wetland wildlife habitat. Peacham and Bucksport soils are poorly to very poorly suited for development of openland and woodland wildlife habitat. Rumney soils have fair suitability for the development of openland and woodland wildlife habitat.</p> <p>These areas improve and maintain water quality by acting as natural filters to remove harmful chemicals, nutrients, and sediment. They also recharge groundwater aquifers and store runoff water, which lessens flood damage.</p>
400	Udorthents, sandy	Excessively Well Drained	Sand and Gravel pits, manmade disturbances

Scenic Views/ Public Recreational Use

Berlin is New Hampshire's most northern city. With its rough mountainous topography and ledge overlooks it offers abundant scenic viewsheds. Mount Jasper is located on the northern side of the Dead River floodplain valley and provides a unique blend of views. Berlin is often called *the City built by trees* which speaks to the industrious hardworking atmosphere of residents. Views from Mount Jasper range from wilderness to downtown to industrial scenes, to a blend of all three. By far the most popular viewing location on this property is from the open rock outcrop ledges at the top of Mount Jasper. Though not as high as some other peaks in Berlin, including its neighbor along the south side of the Dead River, Mount Forest, the Mount Jasper ledges are positioned on the landscape to provide views not seen elsewhere. It is also relatively easy to get panoramic views with a short hike to the top.



Looking southeast from Mount Jasper offers a blend of Mount Forest to the right, an industrial strip along Rt. 110, part of the Dead River floodplain, the Berlin High School and athletic fields, residential homes. It illustrates that Berlin is nestled in a valley among mountains.



A view from Mt. Jasper illustrating the ruggedness and forests of the Mount Jasper area.



Looking upstream of the Dead River floodplain valley towards the White Mountains and a relatively undeveloped area



Note proximity of the Mount Jasper ledges, Dead River wetland complex, active railroad and an industrial area of Berlin.

In addition to the panoramic views from the top of Mt. Jasper, there are many internal views within the property, which allows for wildlife and nature viewing as well as peaceful places to rest. The Dead River flood plain area and associated wetlands offer excellent wildlife viewing opportunities of species such as beaver, mink, river otters, ducks, great blue heron, moose, whitetail deer, raptures, and song birds. There are numerous internal views on this property with quiet contemplation spots within the forest or by some of the large erratics.

In recent years, development and population growth throughout the State and region have caused people to increase their appreciation of the natural scenery New Hampshire has to offer. Berlin's Mount Jasper property has many scenic opportunities and this should be considered an important natural resource to maintain, particularly with its proximity to the downtown area, with quick and easy access for people who want to get out of the City.

Mount Jasper is accessible in several ways. There is a newly revamped hiking trail that leads to the summit from a kiosk and signage near the Berlin High School track and field. There are a series of old former ATV trails in various states that are now illegal for ATV use with all effected landowners in agreement. There is a state easement (DRED) on a maintained snow machine trail that is part of PT108. The snow machine trail travels parallel to the Dead River, over Mount Jasper, and on to Cates Hill Road near the Mount Calvaire Cemetery as part of an extensive snowmobile trail system.



Plank walkway across a headwaters perennial stream.

Cultural Values

Mount Jasper has a long and unique history around its natural resources, dating back in geological time of volcanic activity and the retreat of the Glacial Period, approximately 12,000 years ago. Amongst the igneous rocks, rhyolite - a substitute for chert (excellent raw material for making flaked tools) - was discovered approximately 12,000 years ago. Abenaki tribes mined the Mount Jasper rhyolite up until firearms and iron tools replaced stone weapons. "In its heyday Mt. Jasper was visited regularly by Indians, at least every few years and perhaps every season." (Berlin NH History, 2012)

In more recent times, archeological studies have found that the use of Mount Jasper rhyolite by Native Americans was widespread into other rivers and watersheds as far away as Maine. New Hampshire State Archaeologist Richard A. Boisvert wrote and submitted documentation of the Mount Jasper rhyolite mine and workshop sites in a successful submittal for proclamation and listing of the Mount Jasper site on the National Register of Historic Places, accepted on May 29, 1992. (<http://www.nh.gov/nhdhr/documents/aena92mtjasper.pdf>). The area for this designation is 41 acres and is along the southern slope of Mt. Jasper. Please refer to the maps at the back of this report to see the layout of the portion of the property that lies within the National Register of Historic Places.

Earlier studies of this area can be found by referring to an article published in *The New Hampshire Archeologist*, 2009 volume 49, Number 1, Library of Congress No. ISSN-0077-8346: *Archeology and Geology of the Mount Jasper Lithic Source* by Richard A. Boisvert and Stephen G. Pollack. In an attempt to control the collection of artifacts and/or rhyolite samples, and hand digging that has occurred on the property, the City of Berlin, working with the State of New Hampshire and the National Registry, have determined that mineral rights are not extended

to visitors and samples are not to be taken, nor is disturbing the earth (e.g. pick and shovel) allowed.



The inactive rhyolite mine as it looks today.



Date of photo unknown, with much less vegetation on Mount Jasper.
(photo by Poof Tardiff)

Well before European settlement in the area, Abenaki People have been a part of this area and relied on not only the natural resources, but also the spirituality of Mt. Jasper. Though the mining of rhyolite was very important to the Abenaki, Mount Jasper has other attractions from an era considered ancient by today's date. The Abenaki traveled up and down the nearby Androscoggin River valley as well as the Dead River valley to Head Pond and sometimes eventually portaged into the Connecticut River valley. Michael Eastman of Abenaki lineage and knowledge, pointed out how advantageous the crest of Mount Jasper was in viewing up and down river valleys. Visitors, friend or foe, could be seen approaching from considerable distances. The view along the river valleys and beyond continues today. Though there is not much undisturbed ground within the hiking trail system and snowmobile trails, there are remnants of ancient trails in short sections that are discernable if you look carefully. Many of these trails continue to be used by wildlife today. While we walking on the Mt. Jasper Property with Michael, he told us of the intense spirituality and presence he always felt here, from his childhood to today.



The dragon fly choosing to hitch a ride on Michael Eastman's hat could be a sign from his ancestors.

There are concerns about the public using culturally sensitive areas on this property from the Abenaki perspective. These are similar to the concerns of the State of New Hampshire Division of Historical Resources, the National Register of Historic Places, and the City of Berlin.

Future Berlin High School Project

The area just north of the existing School was examined during fieldwork as requested by the SAU 3 School system. The proposal is to develop an area for installation of a bio-fuel plant to heat the school in the eastern section of the Mt. Jasper Property, adjacent to the school. There were no rare or endangered species or exemplary plant communities found during fieldwork in

this portion of the property. There is a relatively flat section of land that parallels the school building on the north side. It seems feasible to create an area for parking buses and installation of a bio-fuel (chip) burning heating system. There are a few considerations from a natural resource perspective.

1. Ledge or rock outcrops and shallow soil - erosion potential
2. Steep slopes – erosion potential
3. One perennial stream crossing
4. Elevated plateau, e.g. higher than the existing school building,

The design, construction, and drainage issues are beyond the scope of this natural resource inventory project and will need to be carefully considered and addressed.

Recommendations

Field observations, research of existing data, and input from many people have highlighted how diverse and important this area is to the City of Berlin, its residents, and the public. General consensus indicates that the land and its trails should be open for public use as **Conservation** - sustainable use of natural resources by regulating human activities - rather than **Preservation** - protection of nature by eliminating human impact.

Based on field work, personal communications, and GIS analyses, below are recommendations for the future use of the Mount Jasper property.

Recommendations for wetlands

1. Maintain buffers around all wetlands. Ideally buffers should be over 100 feet or more, particularly around wetland containing open water and emergent vegetation. For some wetlands (forested, scrub-shrub) a 50-foot buffer should be adequate, especially since the area will not be developed
2. Use some of these wetlands for education, especially where access is relatively easy. The Dead River Wetland Complex has easy access to old beaver ponds, vernal pools, and stream habitat, and is easily accessible from the snow machine/multi-use trail that parallels it.

Recommendations for perennial streams

1. Protect all perennial streams by maintaining an adequate buffer around them. We recommend 50+ feet around all perennial streams with more in steep sloped areas.
2. Removal of any temporary crossings used for access to logging or maintenance activities. Examples include temporary bridges and pole ford crossings.
3. If a crossing is planned for perennial streams, a bridge that runs “top of bank” to “top of bank” is recommended to maintain natural stream flow, fish passage, and insect travel.

Vernal pool recommendations

1. Maintain buffers around vernal pools. Ideally buffers should be over 100 feet or more. The US Environmental Protection Agency and NH Department of Environmental Services recommend at least a 50-foot buffer around vernal pools.
2. Education – bring schools in to document some of these pools, particularly those that are easily accessible for groups.

3. Monitor some or all vernal pools, especially if there is a change in use of the forest (eg., timber harvest, new trails, etc.).

Soil protection recommendations

1. Detailed soil mapping should be completed before any type of activity occurs on the property. The soils mapped by NRCS are sensitive to activities such as timber harvest, community development, and use by motorized vehicles. The three main issues on the Mt. Jasper Pasture property are:
 - a. Poorly drained (hydric) soil conditions
 - b. Steep slopes (over 15%)
 - c. Shallow soil depth

Maintain and improve the existing hiking trail

1. Plank crossings where needed in wet areas
2. Stonework where appropriate to control erosion
3. Adapt the trail to go around sensitive spots including vernal pools, extra steep slopes, rare plants, etc.
4. Have yearly trash removal days where volunteers gather to remove garbage from the property
5. Stress the rule “carry-in, carry-out” to discourage people from littering.

Recommendations to enhance views

1. Consider choice spots to open small viewsheds by cutting saplings and brush while leaving mature trees standing
2. Place benches in choice locations to enhance scenic views, wildlife observation sites.
Examples of locations:
 - a. Set back on the top of Mt. Jasper
 - b. Top of knolls where there are small sunny openings
 - c. Scenic forest areas with shade.

Maintain and improve upon the existing snowmobile trail

1. Continue to work the trail away from the Dead River wetlands and floodplain when possible (this has been done to some extent)
2. Consider planting clover as a ground cover crop to help prevent erosion. Wildlife will also benefit from this.
3. Consider plantings to narrow the width of the trail in some places keeping in mind that the width must accommodate a groomer and drag for winter upkeep of the trail. Plantings could be lowbush blueberry, raspberry, black berries, red oak, poplar, beaked hazelnut, highbush cranberry. These would benefit wildlife and people.
4. Proposed plantings should be discussed with the snowmobile club prior to implementation.
5. On the steep sloped portions place water-bars across the trail or reconstruct the trail into a sinuous switchback configuration. This will help minimize flashy runoff and subsequent erosion.
6. Monitor and increase enforcement prohibiting ATV use of snowmobile trails, particularly in wet and steeper slopes areas.

7. Stress the importance of staying on the trail
8. Stress the rule “carry in, carry out”.



Perhaps in some places, the trail could be narrowed with plantings. It is important to work with the snow machine club and DRED in deciding the best placements for plantings.

Recommendations for education

1. Expand upon the signage kiosk at the beginning of the hiking trail. Information could include:
 - a. History of Mount Jasper rhyolite mine
 - b. Abenaki culture and use of the area
 - c. Habitat types
 - d. The importance of staying on the trail
2. No ancient worksites or particular locations of sensitive natural resources should be displayed to protect sensitive area.
3. Provide a map of the trail system(s)
4. Stress the rule ‘carry in, carry out’ for food, beverages, etc.
5. Hold an Annual Mount Jasper information and hike event for the residents of Berlin and the Public. A ‘show and tell’ by a variety of speakers
6. Create a map and/or informational brochure. More ambitiously consider development of a newsletter to disseminate new developments, studies, events of Mount Jasper.



The beginning of the hiking trail up Mt. Jasper was built and improved by students in Berlin High JAG Program with guidance from AMC. This is a good spot for an information kiosk.

Consider development of an ATV trail on adjacent properties

Due to steepness, wetland issues, and the overall sensitivity of the Mount Jasper property, it is determined that ATV use should not be allowed on the Mt. Jasper property. However, there is local support including the snow machine club for creation of ATV trails in other more suitable locations in Berlin.

1. Allow ATVs only on certain pre-determined trails
2. Avoid wetlands, very steep slopes, and sensitive areas
3. Implement erosion control
4. Monitor for erosion problems
5. Avoid use during mud season or immediately after storm events
6. Stress the importance of staying on the trail
7. Stress the rule 'carry in, carry out'



There are a few trails which ATVs have used in the past, where there is significant erosion. Erosion control repairs are needed (culverts, water bars, etc.). Currently ATV use is prohibited.



The DRED Easement corner pins are well marked and easy to find.

CONCLUSION

Based on inventories of natural resources, wildlife, cultural and historic value, and recreational use of the Mount Jasper property, it is obvious that Mt. Jasper is a treasure to the community for many different reasons: recreation, scenic views, cultural heritage, spirituality, wildlife habitat and viewing.

The challenge of this study is to supply the City of Berlin with sufficient information of the property's natural resources to best conserve the integrity of the Mount Jasper, the Mine, and Ancient places while allowing Public access and enjoyment of this unique piece of history. Education should play a vital role in future multi-uses. The natural resources, cultural, and wildlife values go beyond the property's boundaries to the larger region; north to the Head Pond and Jericho area continuing to the Connecticut River valley, and south to the confluence of the Dead River and the Androscoggin River.

It is commendable that the City of Berlin is working in a proactive way to protect the integrity of all facets of this property. Links with the Berlin & Coos County Historical Society, Berlin High School, National Register of Historic Places, the Appalachian Mountain Club, the State of New Hampshire- Trails Bureau & Archaeologist Departments, are just a few of the potential partnerships available to assure a successful Mount Jasper future.

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MAPS

2009 Aerial Photography map
Mount Jasper Topographic map
Natural Resources map
NRCS Soils map
Zoning Overlay map