

**Floristic Inventory of
Kitwanga Fort National Historic Site:
Species at Risk, Ethnobotany, and Considerations
for Historical Ecosystem Restoration**

prepared by

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Executive Summary

The 7.3 ha Kitwanga Fort National Historic Site in northwestern British Columbia was inventoried for all vascular plant species, with special attention paid to those listed as rare or vulnerable. Field work was conducted over 8 person-days during 5 separate visits from May to August, 2002. The site was subjectively mapped into 15 strata, and a species list was compiled for each stratum. The property includes formerly pastured meadows, brushed hillsides, mixed deciduous forest, and riparian scrub and forest. Most vegetation would be considered early- or mid-seral.

More than 178 vascular plant species were found on the site, of which 38 are exotic to the region. Additional species were encountered on each visit, confirming the importance of multiple visits throughout the growing season when conducting floristic inventories of this sort. None of 6 rare vascular species or 1 rare lichen species previously known from the Kispiox Forest District were found on the site. No sign of any listed animal species was found.

Some opportunities and constraints for vegetation management and the restoration of historically appropriate ecosystems are presented. The challenge will be to maintain open but weed-free vegetation on and around Battle Hill, the key feature of the Historic Site. Stands of St. John's wort (*Hypericum perforatum*), Canada thistle (*Cirsium arvense*), and ox-eye daisy (*Chrysanthemum leucanthemum*) should be controlled. Opportunities exist for the greater use of prescribed fire, a traditional Aboriginal tool for manipulating vegetation. The identity of a plant reported to have been established on the site by the Gitwankak prior to European contact as a deterrent to enemy attack is explored, and some candidate species are proposed. However, a thorough ethnobotanical investigation, starting with the original transcripts of recorded legends and oral histories, is needed before this plant can be properly identified or appropriately featured in interpretive material.

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Background

In order to meet the responsibilities of Parks Canada for species at risk, each national park and national historic site needs to determine which species at risk occur within the protected areas. “Species at risk” are considered to be those species or subspecies listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; Anonymous 2002a), and (in British Columbia) those considered endangered, threatened or vulnerable by the B.C. Conservation Data Centre (CDC; Anonymous 2002b). Whereas some national parks and national historic sites may have detailed inventories of flora and fauna on file, the Kitwanga Fort National Historic Site did not have a recent inventory of its biotic resources. Consequently, on-site surveys were undertaken in the summer of 2002 to fill this information gap. This report primarily addresses plant species and vegetation, and Pojar (2002) reports on bird species.

The Kitwanga Fort National Historic Site consists of a 7.3 ha property in the Kispiox Forest District of northwestern British Columbia (B.C.), located in the Hazelton variant of the moist cold subzone of the Interior Cedar-Hemlock (ICH) biogeoclimatic zone (the “ICHmc2,”; Banner et al. 1993) between Hazelton and Terrace in the Skeena River valley, near the village of Kitwanga. The site is located at 55° 08’ N latitude, 128° 01’ W longitude, at 204 m to 235 m above mean sea level. Focusing on a formerly fortified hill (“Battle Hill,” Ta’awdzep) that rises steeply some 22 m above the adjacent Kitwanga River (Figure 1), the site was declared a national historic site in 1971. The historic site commemorates a fortified Gitwangak village built on Battle Hill in the late 1700’s, prior to European contact in the region. The historic site is also associated with legends of the epic battles of the warrior Nekt who fought to gain control of the network of lucrative trading trails in the Skeena, Kitimat and Nass region (MacDonald 1984, Anonymous 2000).

Objectives and Scope of Work

Work was conducted to address the following objectives:

1. To survey the Kitwanga Fort National Historic Site for the occurrence of any COSEWIC- or CDC-listed species at risk, and any other rare plants occurring in the Kitwanga National Historic Site;
2. To record all vertebrate sightings and sign, with particular emphasis on listed bird species and a search for grizzly bear sign;
3. Document occurrences and precise locations of plant species at risk, and collect voucher specimens of possible species at risk; and
4. Investigate the likely identity and current status of a plant species reputedly planted on the site during its occupancy as a fortified Gitwangak village.



Figure 1. Overview of the Kitwanga Fort National Historic Site, viewed from the northeast corner of the property, looking southwest. Battle Hill and the adjacent Kitwanga River are visible near the middle of the picture.

Approach to Work

Species at Risk and General Floristic Survey

Plant and animal species at risk were systematically searched for throughout the Kitwanga Fort National Historic Site. Vital to the effectiveness of this search was the strategy of visiting the site several times in the spring and summer of 2002, in order to collect plant samples in flower and to improve the chances of finding species with short flowering seasons. The 7.3 ha Parks Canada property was searched for rare plants by a technician on May 31 and June 19, 2002, and again by two ecologists on July 7, July 16, and August 25, 2002. The July 16 visit included a canoe crossing of the Kitwanga River in order to sample the northwest corner of the property, which is not easily accessible by road or trail. Use was also made of additional observations made by Pojar (2002) during a visit on June 10, 2002.

Searches for rare plants and animal sign were conducted on systematic grids, with most parts of the property inspected repeatedly on transects spaced 10 to 20 m apart. A comprehensive list of vascular plant species was prepared, stratified by a number of different habitat types found on the site. These habitat strata overlap somewhat with those used by Pojar (2002) for her inventory of bird species, but were developed independently. Strata are largely subjective, and are based on vegetation structure and openness, not on any quantitative or structured assessment of plant community composition. A running list of plant species encountered or collected was kept for each stratum, though some were explored more thoroughly than others. Attention was paid to the successional status of the vegetation,

with the intent of being able to reconstruct the composition and structure of the pre-European vegetation of the historic site.

Where plant species were unknown and had not yet flowered, a labeled wire flag and GPS coordinates were used to mark the spot so the population could be observed again in the future. Where plants were still not identified to species when in flower, and especially when they might have been congeners of species at risk, voucher specimens were taken for laboratory identification. These samples were then identified primarily through the use of keys published in Douglas et al. (1998a, 1998b, 1999), and by comparison with authoritatively identified specimens accessioned in the herbarium of the Prince Rupert Forest Region (B.C. Ministry of Forests, Research Section). Nomenclature follows the Douglas et al. series of publications, “*Illustrated Flora of British Columbia*.”

Based on posted findings of rare, endangered and threatened species reported in the Kispiox Forest District (Anonymous 2002a, 2002b), we searched for the following plants:

<i>Nephroma occultum</i>	COSEWIC listed	(habitat probably unsuitable)
<i>Apocynum x floribundum</i>	CDC blue-listed	(habitat suitable)
<i>Draba lonchocarpa</i> var. <i>thompsonii</i>	CDC blue-listed	(habitat unsuitable)
<i>Draba lonchocarpa</i> var. <i>vestita</i>	CDC blue-listed	(habitat unsuitable)
<i>Polemonium elegans</i>	CDC blue-listed	(habitat unsuitable)
<i>Polemonium occidentale</i>	CDC blue-listed	(habitat suitable)
<i>Anenome canadensis</i>	CDC blue-listed	(habitat suitable)

In addition, the following animal species at risk have been found in the Kispiox Forest District in the past (Anonymous 2002a, 2002b):

Freshwater Fish:

<i>Oncorhynchus clarki clarki</i> (<i>clarki</i> ssp. of Cutthroat Trout)	CDC blue-listed
<i>Salvelinus confluentus</i> (Bull Trout)	CDC blue-listed
<i>Salvelinus malma</i> (Dolly Varden)	CDC blue-listed

Amphibians:

<i>Ascaphus truei</i> (Coast Tailed Frog)	COSEWIC-listed
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Birds:

<i>Ardea herodias fannini</i> (Pacific Great Blue Heron)	COSEWIC-listed
<i>Otus kennicottii</i> (Western Screech Owl)	COSEWIC-listed
<i>Botaurus lentiginosus</i> (American Bittern)	CDC blue-listed
<i>Cygnus buccinator</i> (Trumpetor Swan)	CDC blue-listed
<i>Haliaeetus leucocephalus</i> (Bald Eagle)	CDC yellow-listed
<i>Buteo swainsoni</i> (Swainson’s Hawk)	CDC red-listed
<i>Falco peregrinus anatum</i> (<i>anatum</i> ssp. of Peregrine Falcon)	CDC red-listed
<i>Asio flammeus</i> (Short-eared Owl)	CDC blue-listed

Mammals:

<i>Myotis keenii</i> (Keen’s Long-eared Bat)	COSEWIC-listed
<i>Ursus arctos</i> (Grizzly Bear)	CDC blue-listed
<i>Martes pennanti</i> (Fisher)	CDC blue-listed
<i>Gulo gulo luscus</i> (<i>luscus</i> ssp. of Wolverine)	CDC blue-listed

We did not search for fish species, but we did look for tadpoles of Coast Tailed Frog in backwater ponds (not the usual habitat of this species, which prefers rapidly flowing mountain streams; Anonymous 2002c) on either side of the Kitwanga River. The rare bird species were specifically searched for and reported on by Pojar (2002), though we kept an eye open for these eight species while on site. The site contains no mature or old-growth conifer forest, and experiences considerable human activity, making it very unsuitable habitat for Fisher and Wolverine. The occasional Grizzly Bear has been reported along the Kitwanga River, especially during salmon runs, so we looked for bear sign and tracks. Though Keen's Long-eared Bat prefers dense mature forest (Anonymous 2002d), we stayed on the site past dusk on two occasions in order to see if bats were active, and large trees with loose bark (suitable for use in roosting) were noted.

References to a Plant with Narcotic or Intoxicating Properties

Though not explicitly part of the terms of reference for a "Species at Risk" survey, we also sought to clarify the identity and status of a mysterious plant reported to have been found on the site in prehistoric times. The Commemorative Integrity Statement for Kitwanga Fort National Historic Site (Anonymous 2000) makes the following intriguing references to this plant:

"The Gitwangak also sowed the hill approaches with plants which possessed intoxicating properties. As invaders passed through the new growth, their advance would be slowed by the narcotic effects of these introduced plants."

Anonymous 2000, p. 5

"Kitwanga Fort represents the ingenious development of defences by the Gitwangak:

- *the re-routing of water springs around the fort for defence purposes;*
- *the practice, recorded in oral tradition, of suspending logs with spike-like branches from the palisade wall, to be released against invaders ascending the hill;*
- *the placement of plants with narcotic properties around the hill, to slow the advance of invaders."*

Anonymous 2000, p. 19

This plant is not mentioned in MacDonald's (1984) documentation of the Ne \acute{u} t legend and its relationship to the Kitwanga Fort's archaeology and the region's pre-history. Nor is such a plant referred to in the standard ethnobotanical literature for the region (Turner 1995, 1997, Compton et al. 1997).

If such a plant were "introduced" to the site (as suggested above), then it might be considered a floristic anomaly in the area. If identified, it could also make a valuable contribution to the historical interpretation of the site. Therefore, efforts were made to find and note any such anomalous plants that might also serve a deterrent role. A number of ethnobotanical experts were consulted for their ideas, interpretations and suggestions.

Results

Species at Risk

None of the seven plant taxa cited as species at risk in the Kispiox Forest District were found at the Kitwanga Fort National Historic Site. However, related species of *Apocynum*, *Polemonium*, and *Anemone* were found on the site. Populations of these species were marked in the field and samples were taken to facilitate identification through keying in the laboratory and through comparison with herbarium specimens.

Populations of pink-flowered *Apocynum androsaemifolium* L. (Figure 2) were found at several locations at the Kitwanga Fort National Historic Site. These plants were found in open areas, or those with only light shade from deciduous or shrubby species. All plants were clearly distinguished from the rarer *Apocynum x floribundum* by sepals less than half as long as petals and by having obtuse rather than pointed petal lobes (Douglas et al. 1998a). Furthermore, no white-flowered *A. cannabinum*, or any *Apocynum* specimens with ascending leaves, were found in the vicinity. Since *Apocynum x floribundum* is a naturally occurring hybrid of *A. androsaemifolium* and *A. cannabinum* (Douglas et al. 1998a), the absence of *A. cannabinum* from the area also makes the local existence of *A. x floribundum* less likely. *Apocynum x floribundum* has, however, been reported from the ICHmc2 variant in the nearby Hazelton area (Douglas et al. 2002).



Figure 2. Representative photograph of an *Apocynum androsaemifolium* plant found at the Kitwanga Fort National Historic site. Note the “drooping” leaves and short sepals that distinguish this species from its rarer hybrid, *Apocynum x floribundum*.

Three small populations of *Anenome multifida* var. *multifida* Poir. were found at the Historic Site (Figure 3). They were found on the southeast flank of Battle Hill and on the riverbank adjacent to the shrub meadow on the northwest side of the Kitwanga River. *Anenome multifida* is a common species with narrowly divided leaves, quite different from the widely palmate leaves of the rarer *Anenome canadensis* (Douglas et al. 1999). *Anenome canadensis* L. is largely a species of eastern North America, where it is common, though it has been collected elsewhere (near Hazelton) in the ICHmc2 subzone (Douglas et al. 2002).



Figure 3. Individual of *Anenome multifida* (behind plastic flag) found in the middle of the southeast slope of Battle Hill. Note specimens of *Apocynum androsaemifolium* found at this spot too.

A few plants of *Polemonium pulcherrimum* Hook. were found growing in the gravelly riverbank on the northwest side of the Parks Canada property, on the edge of the open meadow there (Figure 4). Plants were 20 to 30 cm tall, distinguishing them from the rarer and shorter *Polemonium elegans* Greene (Douglas et al. 1999), which is more usually found in alpine and subalpine habitats and has never been collected from the ICH zone (Douglas et al. 2002). Multiple stems emerged from a central base, distinguishing these plants from the rarer *Polemonium occidentale* Greene (Douglas et al. 1999), which has single-stemmed rhizomes but has been found elsewhere in the ICHmc2 variant (Douglas et al. 2002).

No examples of *Nephroma* species were found, and even the mature cottonwood stand north of the river (Figure 5) is unlikely to support *Nephroma occultum*, which is only known from humid old-growth forests (Anonymous 2001). Though we might presume that “humid old-growth forest” refers to closed stands of old conifer trees, this is not clear. We

could not sample the canopy of the cottonwood trees, so the presence of *Nephroma occultum* or any other epiphytic lichen species, cannot absolutely be ruled out.



Figure 4. Shrub meadow and gravelly riverbank on the northwest side of the Kitwanga River. *Polemonium pulcherrimum* and *Anemone multifida* were found on the sparsely vegetated river bank and grassy meadow visible to the left of the dead trees in the foreground. The large dead cottonwood in the foreground has loose bark that may support bat roosts.



Figure 6. Mature cottonwood (*Populus balsamifera* ssp. *trichocarpa*) stand found on Parks Canada property, but on the north side of the Kitwanga River, as viewed from the south side of the river.

No specimens of *Draba* were encountered on the site. We can be quite certain that neither of the listed subspecies of *Draba lonchocarpa* would be found at this low-elevation ICH site, as this species is only known from “subalpine and alpine zones” (Douglas et al. 1998b). Douglas et al. (2002) specifically limit the known distribution of these plants to the Alpine Tundra (AT), Engelmann Spruce – Subalpine Fir (ESSF), and Mountain Hemlock (MH) biogeoclimatic zones.

General Floristic Survey

Kitwanga Fort National Historic Site includes deciduous and mixed conifer-deciduous wooded slopes and riparian areas, as well as more open meadows and shrub-dominated slopes on Battle Hill. All vegetation cover types on the property would be considered early- or mid-successional; none consists of old-growth or climax forest. The 15 strata by which plant occurrences were documented are indicated in the map constituting Figure 7. Results of the floristic inventory are summarized by these same 15 strata in Table 1, in which the results of the several visits to the site are combined.

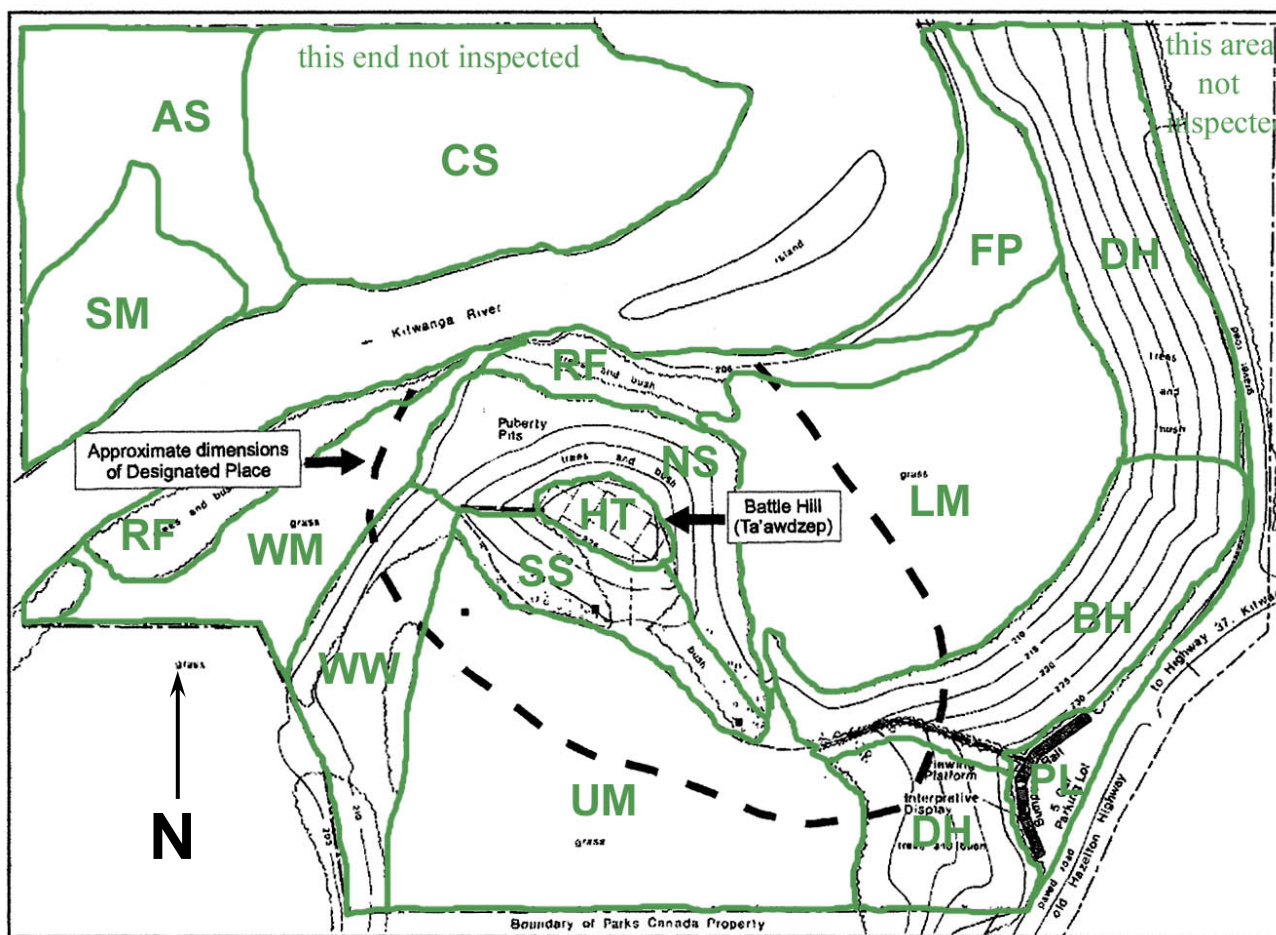


Figure 7. Map of the topography and vegetation strata of Kitwanga Fort National Historic Site (base map from Anonymous 2000). As in Table 1, AS=aspen stand; BH=brushed hillside; CS=cottonwood stand; DH=deciduous hillside; FP=riparian floodplain; HT=hilltop of Battle Hill; LM=lower meadow; PL=parking lot fringe; NS=north side of Battle Hill; RF=high-banked river fringe; SM=shrub meadow;

SS=south side of Battle Hill; UM=upper meadow; WM=west meadow; and WW=west wood and glade.

Table 1. Vascular plant species found at the Kitwanga Fort National Historic Site, 2002.

Species	Valley Slope			Battle Hill			Terraces				Riverside		Other Side		
	PL	BH	DH	HT	SS	NS	UM	LM	WM	WW	FP	RF	SM	AS	CS
Tree Layer (>5m tall)															
<i>Alnus incana</i> ssp. <i>tenuifolia</i>											X	X			X
<i>Betula papyrifera</i>	X	X	X				X	X				X			X
<i>Picea glauca</i> x <i>sitchensis</i>			X				X					X		X	X
<i>Pinus contorta</i>	X		X					X		X		X			X
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	X							X		X		X	X		X
<i>Populus tremuloides</i>	X		X			X				X		X	X	X	
<i>Salix scouleriana</i>	X						X	X							
Shrub Layer (woodies to 5m)															
<i>Abies lasiocarpa</i>			X												
<i>Acer glabrum</i>				X		X									
<i>Alnus incana</i> ssp. <i>tenuifolia</i>											X	X			X
<i>Alnus viridis</i> ssp. <i>sinuata</i>			X						X		X	X	X		X
<i>Amelanchier alnifolia</i>		X	X	X	X	X	X	X	X	X		X	X	X	X
<i>Arctostaphylos uva-ursa</i>	X	X	X				X			X		X	X		
<i>Betula papyrifera</i>		X	X							X		X			
<i>Cornus stolonifera</i>			X	X		X		X	X	X	X	X	X		
<i>Corylus cornuta</i>	X	X	X	X	X	X	X			X					
<i>Crataegus douglasii</i>							X	X	X	X		X	X	X	
<i>Juniperus scopulorum</i>								X							
<i>Lonicera involucrata</i>	X	X	X	X		X	X	X	X	X		X		X	X
<i>Malus domestica</i> *														X	X
<i>Malus fusca</i>			X												
<i>Paxistima myrsinites</i>	X	X	X		X		X					X			
<i>Picea glauca</i> x <i>sitchensis</i>							X	X		X					
<i>Pinus contorta</i>			X				X	X							
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>				X			X	X			X				
<i>Populus tremuloides</i>		X		X	X	X	X	X	X	X	X	X			X
<i>Prunus pensylvanica</i>			X										X		
<i>Prunus virginiana</i>	X	X	X	X	X	X		X				X	X	X	
<i>Ribes lacustre</i>				X		X						X			
<i>Ribes laxiflorum</i>												X			
<i>Rosa acicularis</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
<i>Rosa nutkana</i>						X		X	X	X		X	X		
<i>Rubus idaeus</i>				X		X		X		X		X	X		
<i>Rubus parviflorus</i>	X	X	X	X		X	X	X	X	X		X			
<i>Rubus pubescens</i>			X									X			
<i>Salix ?bebbiana</i>								X			X	X			
<i>Salix ?planifolia</i>											X	X			
<i>Salix ?scouleriana</i>	X	X													
<i>Shepherdia canadensis</i>	X		X										X		
<i>Sorbus scopulina</i>								X							
<i>Spiraea douglasii</i>									X			X			
<i>Symphoricarpos albus</i>	X		X	X	X	X	X	X	X	X	X	X	X	X	
<i>Tsuga heterophylla</i>			X									X			
<i>Vaccinium caespitosum</i>		X	X				X			X					
<i>Viburnum edule</i>	X	X	X					X							

* exotic to western North America FP, AS and CS were not inspected as thoroughly as other strata.

Valley Slope: PL=parking lot fringe; BH=brushed hillside; DH=deciduous hillslope

Battle Hill: HT=hilltop; SS=south side; NS=north side

Terraces: UM=upper meadow; LM=lower meadow; WM=west meadow; WW=west wood and glades

Riverside: FP=lower riparian floodplain; RF=river fringe, high bank

Other Side of River: SM=shrub meadow; AS=aspen stand; CS=cottonwood stand

Table 1. Vascular plant species, continued

Species	Valley Slope			Battle Hill			Terraces				Riverside		Other Side		
	PL	BH	DH	HT	SS	NS	UM	LM	WM	WW	FP	RF	SM	AS	CS
Herb Layer -- Forbs															
<i>Achillea millefolium</i>	x	x	x	x	x	x	x	x	x	x		x	x		
<i>Actea rubra</i>			x										x		
<i>Allium cernuum</i>		x	x		x					x			x	x	
<i>Anenome multifida</i>			x		x								x		
<i>Antennaria microphylla</i>				x			x						x		
<i>Antennaria neglecta</i>		x					x	x			x	x	x		
<i>Apocynum androsaemifolium</i>	x	x	x		x		x			x					
<i>Aquilegia formosa</i>						x		x		x	x			x	
<i>Arabis glabra*</i>					x							x			
<i>Arabis holboellii</i>										x					
<i>Aralia nudicaulis</i>	x	x	x						x				x		
<i>Arctium minus</i>			x				x	x		x	x	x			
<i>Arnica chammissonis</i>									x						
<i>Arnica cordifolia</i>	x	x	x							x					
<i>Aster ciliolatus</i>		x	x							x	x		x	x	x
<i>Aster conspicuus</i>	x	x	x	x	x	x	x		x	x		x			
<i>Aster foliaceus</i>		x		x	x		x	x	x						x
<i>Athyrium filix-femina</i>						x				x		x			
<i>Campanula rotundifolia</i>							x					x			
<i>Castilleja miniata</i>		x	x	x	x	x	x	x	x	x		x	x	x	x
<i>Cerastium arvense*</i>		x		x		x	x			x			x		
<i>Cerastium fontanum*</i>									x			x			
<i>Chenopodium album</i>								x							
<i>Chrysanthemum leucanthemum*</i>	x	x		x	x		x	x	x	x	x	x	x		
<i>Cirsium arvense*</i>									x		x	x			
<i>Clintonia uniflora</i>		x	x												
<i>Collinsia parviflora</i>					x							x			
<i>Collomia linearis</i>							x			x			x		
<i>Cornus canadensis</i>		x	x				x					x			
<i>Crepis tectorum*</i>		x			x										
<i>Cyrtopodium montanum</i>												x			
<i>Cystopteris fragilis</i>						x						x			
<i>Disporum hookeri</i>		x	x			x						x			x
<i>Dryopteris expansa</i>				x						x					
<i>Epilobium angustifolium</i>	x	x	x	x	x	x	x	x	x	x		x	x		
<i>Epilobium ciliatum</i>												x			
<i>Equisetum arvense</i>	x						x	x		x	x				
<i>Equisetum hyemale</i>	x										x				
<i>Equisetum sylvaticum</i>												x			
<i>Equisetum pratense</i>								x			x	x			x
<i>Equisetum variegatum</i>											x				
<i>?Eupatorium maculatum*</i>					x										
<i>Erigeron acris</i>									x		x	x			x
<i>Fragaria virginiana</i>		x	x	x			x	x	x	x		x	x		
<i>Fritillaria camschatcensis</i>						x									
<i>Galeopsis tetrahit*</i>												x			
<i>Galium boreale</i>	x	x	x	x	x	x	x	x		x		x	x	x	
<i>Galium triflorum</i>						x									

* exotic to western North America

FP, AS and CS were not inspected as thoroughly as other strata.

Valley Slope: PL=parking lot fringe; BH=brushed hillside; DH=deciduous hillslope

Battle Hill: HT=hilltop; SS=south side; NS=north side

Terraces: UM=upper meadow; LM=lower meadow; WM=west meadow; WW=west wood and glades

Riverside: FP=lower riparian floodplain; RF=river fringe, high bank

Other Side of River: SM=shrub meadow; AS=aspen stand; CS=cottonwood stand

Table 1. Vascular plant species, herb layer forbs, continued

Species	Valley Slope			Battle Hill			Terraces				Riverside		Other Side		
	PL	BH	DH	HT	SS	NS	UM	LM	WM	WW	FP	RF	SM	AS	CS
<i>Geranium bicknellii</i>			x				x	x							
<i>Geranium richardsonii</i>						x						x			
<i>Geum macrophyllum</i>				x				x	x		x				
<i>Heracleum lanatum</i>								x	x	x	x	x			
<i>Heuchera chlorantha</i>								x				x			
<i>Hieracium albiflorum</i>					x			x							
<i>Hieracium gracile</i>		x	x				x			x		x	x		
<i>Hieracium umbellatum*</i>					x			x						x	
<i>Hypericum perforatum*</i>				x	x	x						x			
? <i>Lappula occidentalis</i>							x			x					
<i>Lathyrus nevadensis</i>	x	x	x	x	x	x	x	x	x	x		x	x		
<i>Lathyrus ochroleucus</i>		x		x		x	x			x		x			
<i>Linaria vulgaris*</i>				x											
<i>Medicago lupulina*</i>							x	x		x		x			
<i>Medicago sativa*</i>							x	x	x	x				x	
<i>Melilotus officianalis*</i>	x						x								
? <i>Moehringia lateriflora</i>				x	x		x								
<i>Neslia paniculata*</i>								x							
<i>Orthillia secunda</i>		x													
<i>Osmorhiza purpurea</i>		x	x			x					x	x	x	x	x
<i>Penstemon procerus</i>					x										
<i>Petasites palmatus</i>								x							
<i>Plantago major*</i>	x										x				
<i>Platanthera dilatata</i>							x			x					
<i>Polemonium pulcherrimum</i>														x	
<i>Polygonum convolvulus*</i>								x							
<i>Polygonum sp.*</i>														x	
<i>Potentilla anserina</i>							x								
<i>Potentilla argentea*</i>							x			x					
<i>Potentilla arguta</i>							x	x							
<i>Potentilla ?glandulosa</i>				x							x		x		
<i>Potentilla gracilis</i>								x							
<i>Prunella vulgaris*</i>					x		x	x	x	x		x	x		
<i>Pterospora andromedea</i>								x							
<i>Pyrola asarifolia</i>		x	x			x									x
<i>Ranunculus acris*</i>									x						
<i>Ranunculus occidentalis</i>								x			x		x		
<i>Ranunculus uncinatus</i>										x					
<i>Rhinanthus minor</i>			x					x	x						
<i>Rumex acetosella*</i>				x			x							x	
<i>Sanicula marilandica</i>	x	x	x		x		x	x						x	
<i>Senecio vulgaris*</i>											x				
<i>Smilacina racemosa</i>	x	x	x	x	x	x	x	x						x	
<i>Smilacina stellata</i>			x		x				x	x	x	x			x
<i>Solidago canadensis</i>				x	x	x	x	x	x		x		x		
<i>Streptopus amplexifolius</i>		x	x												
<i>Streptopus streptopoides</i>		x	x				x								

* exotic to western North America

FP, AS and CS were not inspected as thoroughly as other strata.

Valley Slope: PL=parking lot fringe; BH=brushed hillside; DH=deciduous hillslope

Battle Hill: HT=hilltop; SS=south side; NS=north side

Terraces: UM=upper meadow; LM=lower meadow; WM=west meadow; WW=west wood and glades

Riverside: FP=lower riparian floodplain; RF=river fringe, high bank

Other Side of River: SM=shrub meadow; AS=aspen stand; CS=cottonwood stand

Table 1. Vascular plant species, herb layer forbs, continued

Species	Valley Slope			Battle Hill			Terraces				Riverside		Other Side		
	PL	BH	DH	HT	SS	NS	UM	LM	WM	WW	FP	RF	SM	AS	CS
<i>Tanacetum vulgare</i> *				X		X									
<i>Taraxacum officinale</i> *	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Thalictrum occidentale</i>	X	X	X	X	X	X	X	X	X	X		X	X	X	
<i>Tragopogon dubius</i> *					X								X	X	
<i>Trifolium hybridum</i> *									X	X			X		
<i>Trifolium pratense</i> *	X	X	X	X			X	X	X	X		X	X		
<i>Trifolium repens</i> *	X	X					X	X	X			X			
<i>Veronica americana</i>							X	X	X						
<i>Vicia americana</i>	X			X	X	X	X	X	X	X		X	X	X	X
<i>Viola adunca</i>							X			X					
<i>Viola canadensis</i>				X		X	X		X	X					
<i>Viola glabella</i>		X													
Herb Layer -- Graminoids															
<i>Achnatherum occidentale</i>				X	X					X			X		
<i>Achnatherum richardsonii</i>				X									X		
<i>Agrostis exarata</i>													X		
<i>Agrostis stolonifera</i> *		X	X	X			X	X		X		X			
? <i>Arctagrostis latifolia</i>												X			
<i>Bromus inermis</i> *	X			X			X	X		X					
<i>Bromus vulgaris</i>								X	X	X			X		X
<i>Bromus sp.</i>		X													
<i>Calamagrostis canadensis</i>	X										X	X			X
<i>Carex aenea</i>							X						X	X	
<i>Carex ?aquatilis or ?rostrata</i>											X				
<i>Carex macloviana</i>		X		X	X	X	X		X				X		
<i>Carex ?microptera or ?pachystachia</i>											X				
<i>Carex ?siccata</i>							X								
<i>Carex sp.</i>		X	X			X									
<i>Cinna latifolia</i>				X		X								X	
<i>Dactylis glomerata</i> *								X				X			
<i>Danthonia spicata</i>							X	X							
<i>Elymus glaucus</i>	X	X	X	X	X	X	X	X		X	X	X	X	X	X
<i>Elymus repens</i> *	X						X	X			X				
<i>Elymus sp.</i>											X				
<i>Festuca rubra</i> var. <i>rubra</i> *	X	X					X	X	X				X		
<i>Festuca saximontana</i>											X				
<i>Hierochloa odorata</i>													X		
? <i>Juncus falcatus</i>		X													
<i>Oryzopsis asperifolia</i>		X	X										X		
<i>Phleum pratense</i> *	X	X	X	X	X	X	X	X	X	X		X	X	X	X
<i>Poa annua</i> *	X														
<i>Poa pratensis</i> *	X	X		X	X		X	X	X	X		X	X	X	X
<i>Poa sp.</i>								X							
<i>Scirpus microcarpus</i>											X				
<i>Trisetum cernuum</i>				X		X					X				
unknown grass				X			X						X		
Species Count, Total:	49	60	62	57	44	47	78	74	48	67	39	81	66	28	31
Exotic Species Count:	12	10	4	12	11	5	17	17	13	14	5	16	14	5	4
Species Count, % of 178 spp. on site:	28%	34%	35%	32%	25%	26%	44%	42%	27%	38%	22%	46%	37%	16%	17%
Exotic Species, % of spp. in stratum:	24%	17%	6%	21%	25%	11%	22%	23%	27%	21%	13%	20%	21%	18%	13%

* exotic to western North America

FP, AS and CS were not inspected as thoroughly as other strata.

Valley Slope: PL=parking lot fringe; BH=brushed hillside; DH=deciduous hillslope

Battle Hill: HT=hilltop; SS=south side; NS=north side

Terraces: UM=upper meadow; LM=lower meadow; WM=west meadow; WW=west wood and glades

Riverside: FP=lower riparian floodplain; RF=river fringe, high bank

Other Side of River: SM=shrub meadow; AS=aspen stand; CS=cottonwood stand.

At least 178 vascular plant species were encountered on Parks Canada property at the Kitwanga Fort National Historic Site, including several that were only identified or recorded to genus or family. Of these, 38 species (21%) are likely to have been introduced in the European era and are considered exotic to western North America. The richest stratum was the riparian fringe (stratum “RF” in Figure 7 and in Table 1), with 81 species. The highest proportion of exotic species (27%) was found in the western meadow (stratum “WM”) that appears to have been heavily grazed, with large numbers of exotic weeds and agronomic species found on the south side of Battle Hill and along the border of the parking lot (Figure 8) as well. The aspen stand and cottonwood stand on the north side of the Kitwanga River appear to be the most species-poor, but this is largely because we could not spend as much time sampling the vegetation there as we did at the sites visited repeatedly. The mixed forest on the valley flank (Figure 9, stratum “DH”) had the lowest proportion of exotic species, only 6%. The relatively rare *Sanicula marilandica* was found scattered throughout this stratum. However, efforts to improve the view or reinstate a non-treed vegetation in the brushed area (Figure 10, stratum “BH”) have resulted in some exotic plant invasion, notably *Cerastium arvense*, *Chrysanthemum leucanthemum*, *Trifolium repens*, *Festuca rubra* var. *rubra*, and *Poa pratensis*. These species are unlikely to persist in great numbers as the shrubs resprout and re-establish some shade. Nevertheless, the use of prescribed ground fire might be investigated as a more traditional means of maintaining the desired vegetation structure here. It is interesting to note that sun-loving species such as *Allium cernuum* were found throughout the deciduous forest of the valley wall, suggesting that the area had been more open in the recent past. It will be interesting to see if this species increases in abundance (at least temporarily) on the brushed hillslope.

The level meadows found on the site had been used as pastures in the past, and all show evidence of grazing by horses within the last few years, though not in 2002. Such grazing may not be harmful, if it is carefully managed, in that it may help suppress some of the more competitive plant species. The lower meadow (Figure 11, stratum “LM”) has become dominated by scattered lodgepole pine (*Pinus contorta*) trees over the last few decades, while much of the western meadow (Figure 12, stratum “WM”) is dominated by the exotic ox-eye daisy (*Chrysanthemum leucanthemum*). The upper or southern meadow (Figure 13, stratum “UM”) is more diverse than the others, and seems to have a largely stable plant community composition.

Battle Hill has been repeatedly cleared of woody vegetation to facilitate archaeological excavation and interpretation. The level top of the hill (Figure 14, stratum “HT”) and its south-facing slope (Figure 15, stratum “SS”) are dominated by native and exotic grasses and other herbaceous vegetation. In contrast, the cooler and more shaded north-facing slopes of Battle Hill have experienced a more vigorous resprouting of shrubs (Figure 16, stratum “NS”).



Figure 8. Vegetation around the parking lot includes a number of exotic agronomic and weed species, but these have not expanded their foothold where the forest canopy has remained intact.

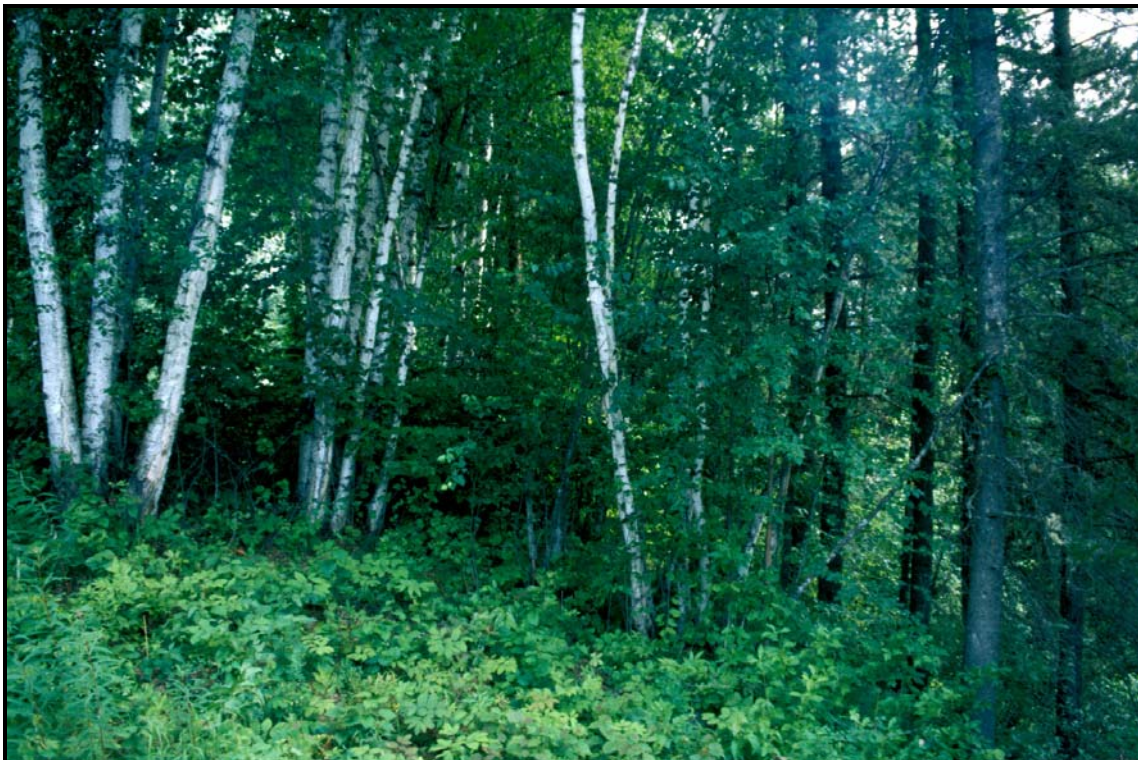


Figure 9. The mixed deciduous forest lining the eastern slope of the Kitwanga National Historic site is dominated by paper birch and trembling aspen, with scattered lodgepole pine and hybrid white spruce. It has the fewest number of exotic plant species.



Figure 10. Cleared vegetation of the “BH” stratum. The staircase down the hill is visible on the right. Shrubs are rapidly resprouting after being cut in the previous year.



Figure 11. The formerly open lower meadow (stratum “LM”) now has an open canopy of scattered young lodgepole pine trees. The band of dark green vegetation and red pine trees near the bottom of the picture probably indicate the impact of surface fires started when brush piles were burned.



Figure 12. The western meadow ("WM" stratum) appears to have experienced more livestock grazing and exotic plant invasion than other parts of the Kitwanga Fort National Historic Site.



Figure 13. The relatively stable upper meadow (stratum "UM"), looking south from Battle Hill. Parks Canada property extends to the fence line running horizontally part-way across the open area.



Figure 14. The level top of Battle Hill (stratum "HT"), looking east.



Figure 15. The south-facing side of Battle Hill (stratum "SS"), dominated by herbaceous vegetation.



Figure 16. The north-facing side of Battle Hill (stratum "NS"), dominated by shrubby vegetation.

Additional species were encountered on each of five visits to the site, confirming the value of multiple visits during the season when searching for rare plant species. We also failed to find five species (including the relatively rare *Cypripedium montanum* and *Fritillaria camschatcensis*) mentioned by Pojar (2002) in her habitat descriptions made earlier in the season; these species have been added to Table 1. Nor did we find any specimens of *Agrimonia striata*, regionally rare, but known from the Kitwanga area (S. Haeussler, pers. comm.).

Some interesting lichen specimens encountered on site were given to Mr. Patrick Williston (Mnium Ecological Research, Smithers, B.C.) for identification. Specimens growing on a mineral soil substrate in the southern bank of the Kitwanga River were identified as *Peltigera canina*, *Peltigera neckeri*, and an unknown lichenicolous ascomycete. Growing on a single dead twig of *Prunus virginiana*, taken from the southeast side of Battle Hill, were found the following 9 macrolichen species:

Hypogymnia physodes

Melanelia multispora

Melanelia subaurifera

Ochrolechia szatalaensis

Parmelia sulcata

Physcia adsdens

Physcia aipolia

Usnea substerilis

Xanthoria hasseana

Since this variant of the Interior Cedar-Hemlock zone is known for its rich lichen flora (Goward and Pojar 1999), and this site has an interesting mixture of meadow, upland forest and riparian forest habitats, it is recommended that a complete inventory of the moss and lichen flora be conducted for the Kitwanga Fort National Historic Site.

There were no indications of any listed animal species using this site. All birds noted during the floristic inventory were common species. Evidence of browsing by moose or deer was noted. We found scats of Coyote and Black Bear, but not Grizzly Bear. We found no evidence of Fisher, Wolverine, bats, frogs or tadpoles. Pojar (2002) has evaluated the site for eight listed bird species, none of which were detected on June 10, 2002.

Plant Species Worthy of Further Investigation

Plants with unusual properties or distributions were sought while visiting the Kitwanga National Historic Site during the summer of 2002. In addition, a number of ecological, botanical, ethnobotanical, and archaeological experts were consulted for their input on the possible identity of the legendary plant species with “narcotic” or “intoxicating” properties. Experts queried included the following individuals:

- Adolph Ceska, ecological botanist, Victoria, B.C.
- Brian Compton, ethnobotanist, Vancouver, B.C.
- Wade Davis, ethnobotanist, Washington, D.C.
- Sybille Haeussler, plant ecologist, Skeena Forestry Consultants and Université du Québec à Montréal
- Andrew Martindale, Tsimshian archaeologist, McMaster University
- Jim Pojar, ecological botanist, B.C. Forest Service, Prince Rupert Forest Region
- Nancy Turner, ethnobotanist, University of Victoria

No plant species in the flora of northwestern B.C. are known to have narcotic or hallucinogenic properties, though a number of fungal species do (e.g., ergot, *Claviceps purpurea*, on rye and wildrye seed heads, magic mushrooms, *Psilocybe* spp., and agaric or toadstool mushrooms, *Amanita* spp.). A number of other poisonous plant species were taken in small quantities as medicine and in spiritual ceremonies by different First Peoples; some of these species include *Veratrum viride*, *Zigadenus* spp., *Cicuta douglasii*, or *Actaea rubra* (Turner 1997). It is not clear how the presence of such poisonous plants would deter attackers, however. The deterrence or defensive advantage conferred by the plants may be more mechanical than chemical, or more metaphorical than material.

Some suggestions for the identity and significance of plants that might have served as some kind of deterrent to attackers include the following:

- *Anemone multifida* – like many members of the Ranunculaceae, *Anemone* spp. yield a skin-irritating compound, protoanemonin, which causes reddening, swelling, blistering and soreness upon contact (Turner 1997); though one of the few individuals found at the Historic Site was on the flanks of Battle Hill, this species is not infrequent in other south-facing grasslands nearby;
- *Apocynum androsaemifolium* – milky sap of *Apocynum* spp. is considered a cardiac glycoside; quite common at Kitwanga Fort Historic Site;
- *Arctostaphylos uva-ursi* – smoked as a tobacco substitute, kinnikinnik may have served the same cultural role;
- *Artemisia* spp. and *Achillea millefolium* have very aromatic foliage, though these aromas couldn’t be called “intoxicating” except in a figurative sense;

- *Crataegus douglasii* – characterized by long spines, small trees of hawthorn would obstruct advancing warriors;
- *Heracleum lanatum* – like many members of the Apiaceae, sap from broken stalks (or even the surface of some leaves) is a photoactive skin irritant; requires rich soil;
- *Nicotiana quadrivalvis* – Haida tobacco has apparently been extirpated, but it was cultivated on the mainland by the Tlingit (Turner and Taylor 1972); it certainly played an important ceremonial role in Northwest cultures;
- *Oplopanax horridus* -- would provide a mechanical deterrent to advancing warriors, but requires moist sites, and other species would be more suitable for dry open slopes; but devil’s club also has a strong ceremonial role in Northwest cultures, and the smoke of sawdust from its burned stems is reputed to be mildly psychotropic;
- *Rosa nutkana* – with long robust prickles and long flexible stems, this species could be woven into living fences that would provide a substantial mechanical barrier to the advance of attackers;
- *Sanicula marilandica* -- an unusual find in this area; seems to be associated with First Nations settlements in the Skeena Drainage; some species of *Sanicula* are toxic, and their chemistry is largely unknown;
- *Urtica dioica* – stinking nettle was widely used by First Peoples as a spring pot-herb, and for making cordage; its strong properties of skin irritation are well known (Turner 1995, 1997);
- *Valeriana dioica* – reported to have aromatic roots; could various “aromatic” plants have served as a distraction?

It is impossible to make a more educated determination of the likely identity of the mystery plant without: (1) an examination of the original sources of information leading to these statements in the Commemorative Integrity Statement; and then possibly (2) phytochemical assays of a short-list of candidate species, if its concluded that assertions of a psychoactive properties were intended literally. Much rests on the basis for the terms translated to English as “narcotic” and “intoxicating.”

Discussion

Species at Risk

It can be concluded with a high degree of confidence that no COSEWIC- or CDC-listed species are found at the Kitwanga Fort National Historic site. Collection records from nearby and potentially suitable habitat conditions, however, suggest that the following plant and animal species may possibly occur on the site, now or in the future:

Plants:

<i>Nephroma occultum</i>	(cryptic paw lichen)
<i>Apocynum x floribundum</i>	(western dogbane)
<i>Polemonium occidentale</i>	(western Jacob’s-ladder)
<i>Anenome canadensis</i>	(Canada anenome)

Amphibians:

<i>Ascaphus truei</i>	(Coast Tailed Frog)
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Birds:

<i>Ardea herodias fannini</i>	(Pacific Great Blue Heron)
<i>Otus kennicottii</i>	(Western Screech Owl)
<i>Haliaeetus leucocephalus</i>	(Bald Eagle)
<i>Buteo swainsoni</i>	(Swainson's Hawk)
<i>Asio flammeus</i>	(Short-eared Owl)
Mammals:	
<i>Myotis keenii</i>	(Keen's Long-eared Bat)
<i>Ursus arctos</i>	(Grizzly Bear)

It is nearly impossible to demonstrate the absence of a species, so it is better to acknowledge the potential for some of these species to be found in the Kitwanga area in the future.

Historical Ecosystem Restoration

One perspective from which to evaluate the vegetation of a National Historic Site is to compare it with the vegetation that predominated during the period of interest. To this end, archival work may be able to extract contemporary descriptions of the Kitwanga Fort National Historic Site in mid-1800's, not long after its abandonment in approximately 1835. It can be expected that the area immediately around the village would have been burned on an annual basis, in order to promote the growth of food plants and browse for hunted ungulates (Gottesfeld 1994). There are indications (e.g., the presence of *Allium cernuum* in the understory of closed deciduous forest) that much of the site had a much more open vegetation in the past. It is also expected that an array of food plants useful to Coastal and Interior peoples might have been found around the village. The modern abundance of *Prunus* spp. and *Corylus cornuta*, for example, may still reflect that heritage. Finally, one often encounters an abundance of useful nitrophilous species, such as *Urtica dioica* (not found here currently) and *Heracleum lanatum*, in the vicinity of old villages and their waste disposal areas.

A vegetation management plan for Kitwanga Fort National Historic Site will have to evaluate and select a number of options:

- What vegetation types, ecologically sensitive species, and culturally significant species to maintain, re-establish, or restore;
- Where and how to maintain, re-establish and restore historically appropriate vegetation;
- The extent to which exotic species (both escaped agronomics and introduced weeds) can be tolerated in each vegetation type on site.

It is beyond the scope of this evaluation of species at risk to develop a full vegetation management or restoration plan. However, a number of opportunities and constraints are worthy of note. For instance, the earlier agricultural land use of the property has maintained a number of open meadows (strata WM, LM, UM, and possibly SM) that are probably not too dissimilar from the managed vegetation around a Gitwangak village. Likewise, the recent tree and brush removal on the northwest-facing slope (stratum BH; Figure 10) has opened up the ground layer there too, though a handful of deciduous trees might have been left in a scattered configuration. The encroaching lodgepole pine trees in the lower meadow (Figure 11) should probably be thinned out further. In all cases, decisions have to be made on long-term vegetation management methods, so as to reduce the density of trees and shrubs, but also exclude exotic species. Woody plants can be excluded by any or a combination of several methods: prescribed fire; grazing/browsing by livestock; manual

brushing; girdling; selective foliar herbicide applications; or selective stem herbicide applications. In some cases, it may be desirable to promote the establishment and recovery of a tree layer. For example, a natural site and sound barrier along the southern edge of the property (Figure 7) would shield views of the adjacent farmyard (Figure 13) from ground level view at the National Historic Site.

In the short term, priority must be placed on legally binding obligations to eliminate noxious weeds. This requires the spot removal (by pulling, digging, or herbicide application) of the St. John's Wort (*Hypericum perforatum*) found on Battle Hill, and the scattered patches of Canada thistle (*Cirsium arvense*) found at several lowland locations. Then efforts should be made to curtail the abundance of ox-eye daisy (*Chrysanthemum leucanthemum*; see Figure 12).

An Ongoing Ethnobotanical Mystery

The historical existence of the plant reported to have “intoxicating” or “narcotic” properties remains unconfirmed. A number of plant species have been identified for further study of their phytochemistry and ethnobotany. But it may be more fruitful to first review the primary sources of information on which the Commemorative Integrity Statement is based, i.e., tapes or transcripts of oral interviews, presumably with Gtiwangak elders, describing the legend of Ne \underline{k} t and the history of the Battle Hill Ta’awdzep. The particular words used in those interviews may be very important, and there may have been translation errors. It will be especially important to determine the mode by which the designated plants are supposed to have acted:

1. In a spiritual or metaphorical sense, like an icon, family crest, or ceremonially important offering or medicine;
2. In a physical or mechanical sense, so as to hide the village or its access trails, or to obstruct human movement;
3. In a chemical sense, denoting narcotic or poisonous properties upon contact with the skin, by smoking or consuming part of the plant.

The latter or literal interpretation of these few clues in Anonymous (2000) must be considered the least likely solution at this stage. An invading force bent on conquering is unlikely to be deterred by the opportunity to stop and get stoned!

This mystery has many implications of interest to ethnographers, ethnobotanists, ecologists, and to the interpretation of the Kitwanga Fort National Historic Site. If the identity of this plant can be ascertained, it would be highly desirable to reintroduce it to the site, and to feature it in interpretive displays and literature. It is recommended that the issue be further pursued by a qualified ethnobotanist, preferably one with experience in Gtiwangak, Tsimshian, and Git \underline{x} san traditions.

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