

KA1 Hemlock / Christmas fern – White lettuce – Wood goldenrod

KA2 Sugar maple / Christmas fern – Rattlesnake fern – Bulbet bladder fern

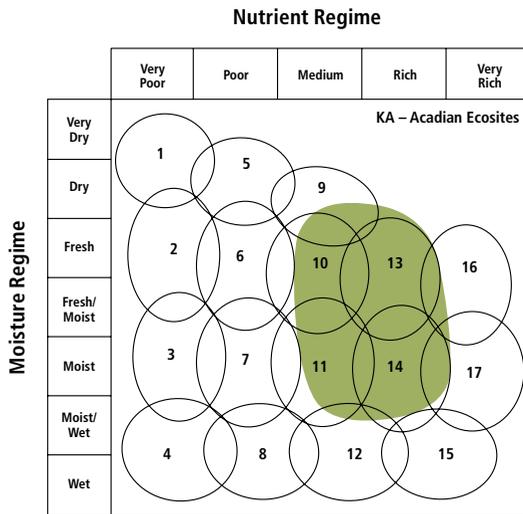
Concept: This group is distinguished by its unique karst topography and scattered presence of vascular plants associated with karst habitat. Exposure of gypsum/limestone bedrock is needed to assign Vegetation Types (VT) to this group. Sites where karst influences are minimized by thick glacial till deposits (i.e. sites with sinkholes but no exposed bedrock) are not included. Only two broadly described VTs are currently recognized, a mature softwood/mixedwood unit and a mature hardwood unit. Early and mid-successional forest (red maple, white birch, aspen, white spruce) are known and fact sheets for these units will be developed as more data are collected. Vegetation types in this group are found only in the Acadian Ecosite group.

Vegetation: Vegetation types are closed canopy forests usually dominated by hemlock and red spruce (softwood/mixedwood unit) or sugar maple (hardwood unit), but other species are possible. The shrub layer often includes striped maple and round-leaf dogwood, with Christmas fern, wood goldenrod and white baneberry found in the herb layer. Several rare plants including yellow lady slipper, ram's head lady slipper and bulbet bladder fern are associated with this group, but are not necessarily found in every stand.

Environmental Setting: In Nova Scotia karst topography is usually associated with gypsum sites, but similar landforms have been observed over limestone and dolomite. Groundwater dissolves these soluble bedrock types producing a highly irregular surface relief called karst or “egg carton” topography containing sinkholes. Bedrock exposures are common, but surface stoniness is normally low. Most sites range from fresh to moist with medium to rich fertility. Vegetation types form small to medium size patches on the landscape. This group is found in the Northumberland Bras d’Or Lowlands (500) and Valley Central Lowlands (600) ecoregions, and in the Victoria Lowlands (220), Cape Breton Hills (310) and Inverness Lowlands (320) ecodistricts (with scattered occurrences in the Pictou Antigonish Highlands (330) ecodistrict).

Successional Dynamics: This group is associated with mid to late successional zonal VTs. Depending on site conditions and disturbance history, eventual climax forests are either softwood, mixedwood, or hardwood VTs dominated by hemlock, red spruce, balsam fir, white pine, sugar maple, yellow birch, red maple, white ash, red oak and/or beech. In the absence of harvesting, late successional stages will develop an uneven-aged structure between infrequent stand-level disturbance events. Natural disturbance agents include hurricanes (windthrow), fire, insects and subsidence.

Edatopic Grid



Ecological Features

In Nova Scotia, karst occurs over soluble bedrock types such as gypsum, limestone and dolomite. Karst landscapes are rugged and irregular with diverse surface expressions including cliffs, caves, fissures, talus, pinnacles and steep sided depressions called sinkholes. Temperate gypsum karst forests are rare in Canada and the majority of occurrences are concentrated in Nova Scotia. This presents unique conservation challenges, many of which are strongly exacerbated by gypsum mining pressures. Rare plant species (e.g. bulblet bladder fern, ram’s-head lady’s-slipper, shepherdia, hyssop-leaved fleabane, leatherwood and yellow lady’s slipper, among other species) most commonly associated with karst are not frequent in plot data because many are only sparsely scattered across karst landscapes, and are generally more common on open cliffs and talus slopes. Karst caves provide some of the province’s most important bat hibernacula. This group has good potential to support old growth composed of a variety of climax species, however stand dynamics are not well understood.

KA1

Hemlock / Christmas fern – White lettuce – Wood goldenrod

Tsuga canadensis/ *Polystichum acrostichoides* –
Prenanthes altissima – *Solidago flexicaulis*

n=3



Brooklyn,
Hants County

Concept: The late successional Hemlock / Christmas fern – White lettuce – Wood goldenrod forest is characterized by its canopy composition and unique karst site conditions. The overstory is dominated by hemlock and a variety of hardwoods including red maple, large-tooth aspen and red oak. Similar to other forests dominated by hemlock—our longest living and most shade-tolerant conifer—this Vegetation Type (VT) will develop old forest characteristics, maintained by gap disturbances.

Vegetation: The canopy is characterized by intermediate to high levels of hemlock. Red maple, large-tooth aspen and red oak are common deciduous components of stand structure, while white pine and balsam fir may be important co-dominants in some stands. Understory layers are usually sparse and species-poor, although several species show high frequency (e.g. striped maple, white lettuce, Christmas fern, wood goldenrod, drooping wood sedge, among others). Bryophyte cover is reduced. Plant species locally associated with karst are not frequent in plot data because many of these species are sparsely scattered across karst landscapes, and are generally more common on open cliffs and talus slopes. On deeper soils, where alkaline bedrock is further from the

rooting zone, nutrient enrichment is weakened, further limiting the prominence of karst plants. The KA1 ecosystem has fewer karst plants than KA2 (a deciduous karst forest) because in KA1 the forest floor is heavily shaded.

Environmental Setting: KA1 occurs on fresh to moist and nutrient medium to rich soils. This ecosystem is only found on karst topography, a rugged landscape with scattered bedrock exposures and steep sided sinkholes. This VT is mainly found in the Central Lowlands and Bras d'Or Lowlands ecodeistricts. Microtopography is usually weakly expressed due to the shallow surficial deposits which limit rooting potential. This VT occurs in southern New Brunswick but is very uncommon. It is absent from Prince Edward Island.

Successional Dynamics: Depending on disturbance history, this late successional VT can be even-aged, but will develop an uneven-aged structure as it matures. Disturbance agents include wind, insects/disease, harvesting and karst forming processes (e.g. bedrock dissolution, soil subsidence and sinkhole formation). These processes can open relatively large canopy gaps and expose mineral soil, promoting shade-intolerant hardwoods.

Ecological Features

This VT occurs as a small to large patch in areas where glacial tills are underlain by calcareous bedrock. This uncommon closed canopy community supports many rare plants, including yellow and ram's head lady's slippers and leatherwood. Ram's head lady's slipper is legally protected and listed as endangered under the Nova Scotia Endangered Species

Act. Most karst in Nova Scotia develops over gypsum deposits forming rugged landforms with funnel shaped sinkholes, subterranean caves and tunnels. Caves may be used by porcupine, creating unique cave faunal communities associated with porcupine dung. Larger caves, some up to several hundred meters deep, may also provide important winter hibernacula for

bats. Karst landscapes contain a diverse mix of habitats ranging from dry hill crests and actively collapsing sinkholes to small alkaline ponds and wetlands. Their calcareous soils support the greatest diversity of land snails in the Province. Gypsum and limestone quarrying, which are common in areas of Nova Scotia karst, has detrimental impacts on biodiversity.

Characteristic Plants

KA1

	Freq. (%)	Cover (%)
Hemlock	100	22.0
Red maple	100	16.0
Large-tooth aspen	100	12.0
Red oak	100	10.0
White pine	100	6.0
Beech	100	2.1
Balsam fir	67	28.0
Sugar maple	67	12.0
Yellow birch	67	0.1
Tree Layer (Mean % Cover)		88
Hemlock	100	2.5
Balsam fir	100	0.6
Large-tooth aspen	100	0.1
Beech	67	0.5
Red spruce	67	0.1
Striped maple	67	0.1
White pine	67	0.1
Witch-hazel	67	0.1
Shrub Layer (Mean % Cover)		4
Christmas fern	100	1.5
Common speedwell	100	0.5
Evergreen wood fern	100	0.3
Bluebead lily	100	0.1
New York fern	100	0.1
White lettuce	100	0.1
Allegheny hawkweed	67	4.0
Hawkweeds	67	3.0
Lady fern	67	1.5
Bracken	67	1.0
Large-leaved aster	67	1.0
Tall buttercup	67	1.0
Drooping wood sedge	67	0.1
Eastern spreading wood fern	67	0.1
Fibrous-root sedge	67	0.1
Goldenrods	67	0.1
Helliborine	67	0.1
Ram's head lady's slipper	67	0.1
Rough goldenrod	67	0.1
Wood goldenrod	67	0.1
Yellow-green sedge	67	0.1
Herb Layer (Mean % Cover)		9
Broom moss	100	0.5
Hypnum moss	100	0.1
Stair-step moss	67	0.1
Bryo-Lichen Layer (Mean % Cover)		1

Distinguishing Features

This is a broadly defined softwood forest occurring on karst topography. Hemlock is usually the dominant overstory species, but depending on past disturbances and successional stage other species such as balsam fir, spruce, red maple, aspen, birch and red oak may be present.



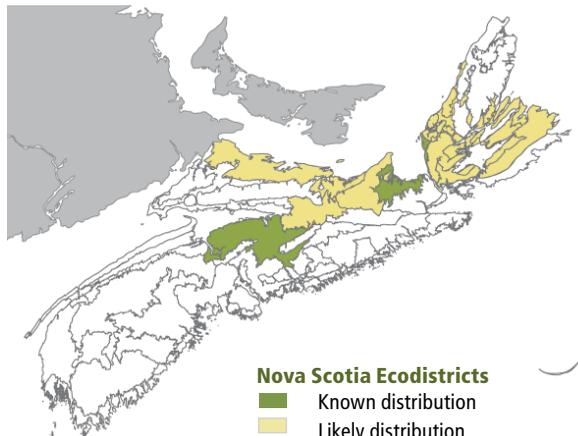
Wood goldenrod

Site Characteristics

Slope Position:	Level ³ Lower ³ Middle ³
Surface Stoniness:	(Non - Slightly) ¹⁰
Bedrock Outcrop:	(Non-rocky) ⁷ (Slightly - Moderately) ³
Elevation Range:	13 - 41m
Slope Gradient:	Gentle ³ Level ³ Steep ³
Aspect:	North ³ South ³ None ³
Exposure:	Moderate ³ Mod. Exposed ³ Sheltered ³
Microtopography:	Level ⁷ Strongly ³
Drainage:	Well ¹⁰

Soil Characteristics

Soil Type:	ST2-L ³ ST8 ³ nd ³
Parent Material:	Glacial till ¹⁰
Rooting Depth (cm):	(>45) ⁷ nd ³
Duff Thickness (cm):	(0-5) ⁷ nd ³



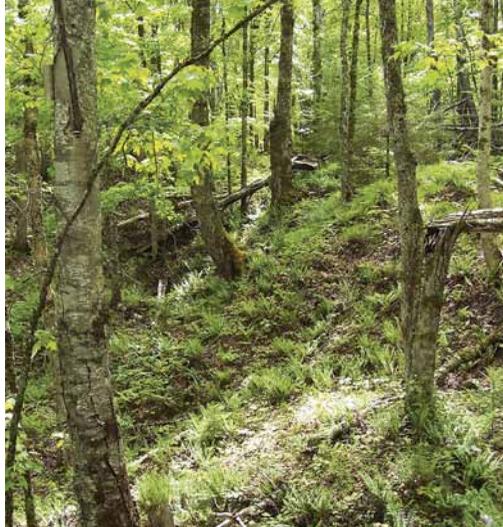
Nova Scotia Ecodistricts
 Known distribution
 Likely distribution

KA2

Sugar maple / Christmas fern – Rattlesnake fern – Bulblet bladder fern

Acer saccharum / *Polystichum acrostichoides* –
Botrychium virginianum – *Cystopteris bulbifera*

n=5



Brookfield,
Colchester County

Concept: The Sugar maple / Christmas fern - Rattlesnake fern - Bulblet bladder fern forest is distinguished from other provincial forests by its unique site conditions, overstory composition, and by the presence of understory plants locally associated with karst topography. This late successional Vegetation Type (VT) has an overstory dominated by sugar maple with lesser yellow birch, beech and white ash. These long-lived and shade-tolerant trees will develop old forest characteristics, maintained by gap disturbances.

Vegetation: The canopy supports moderate to high crown closure and is usually dominated by sugar maple. Beech, yellow birch /or white birch can be locally abundant, while white ash and balsam fir are somewhat frequent but occur with reduced cover. The understory supports low to moderate levels of woody and bryophyte species but higher herbaceous cover. Characteristic plants include striped maple, round-leaved dogwood, oak fern, Christmas fern, white baneberry and marginal wood fern. Plant species commonly associated with karst are not frequent in plot data because most of these species are sparse across broader karst landscapes, particularly where soils are deeper and nutrient enrichment is weakened.

Environmental Setting: KA2 is associated with fresh to moist, nutrient medium to rich soils found in karst landscapes. These landscapes are typically rugged with scattered bedrock exposures and steep sided sinkholes. This VT is mainly found in the Central Lowlands and Bras d'Or Lowlands ecodistricts. KA2 occurs at low elevation on karst flats, short slopes and shallow depressions; microtopography is moderate. Rooting potential can be strongly limited by shallow surficial deposits. This VT occurs in southern New Brunswick but is very uncommon. It is absent from Prince Edward Island.

Successional Dynamics: KA2 is a late successional, uneven-aged VT dominated by sugar maple. Excluding harvesting, stand-level disturbance events are rare with gaps or small patches usually created by individual tree mortality, wind, ice damage or karst processes. Bedrock dissolution, sinkhole formation and soil erosion, and subsidence are common ecosystem processes in karst landscapes. Where stand-level disturbances have occurred, potential early successional VTs include IH4 (Trembling aspen / Wild raisin / Bunchberry) and IH5 (White birch – Red maple / Sarsaparilla – Bracken). In areas where deeper till deposits occur over calcium-enriched bedrock, TH8 (Red maple – Yellow birch / Striped maple) may be found in conjunction with KA2 stands.

Ecological Features

This VT occurs as a small to large patch in areas where glacial tills are underlain by calcareous bedrock. This uncommon closed canopy community supports many rare plants, including yellow and ram's head lady's slippers and leatherwood. Most Nova Scotia karst develops over gypsum deposits forming rugged landforms with funnel

shaped sinkholes, subterranean caves and tunnels. Caves may be used by porcupine, creating unique cave faunal communities associated with porcupine dung. Larger caves, some up to several hundred meters deep, may also provide important winter hibernacula for bats. Karst landscapes contain a diverse mix of habitats ranging from dry hill crests

and actively collapsing sinkholes to small alkaline ponds and wetlands. Their calcareous soils support the greatest diversity of land snails in the Province. Gypsum and limestone quarrying, which are common in areas of Nova Scotia karst, has detrimental impacts on biodiversity.

Characteristic Plants

K42

	Freq. (%)	Cover (%)
Sugar maple	100	46.0
Yellow birch	100	12.6
White ash	60	13.7
Balsam fir	60	10.0
White birch	40	18.0
Beech	40	17.5
Hemlock	40	5.0
Ironwood	40	5.0
Red maple	20	15.0
Striped maple	20	5.0
Tree Layer (Mean % Cover)		92
Balsam fir	100	1.7
Sugar maple	80	17.5
Striped maple	80	4.5
White spruce	80	2.0
White ash	60	1.7
Hemlock	60	1.0
Fly-honeysuckle	60	0.9
Yellow birch	60	0.7
Mountain maple	60	0.3
Red-berried elder	60	0.1
Beech	40	3.6
Alternate-leaved dogwood	40	0.2
Serviceberry	40	0.1
Shrub Layer (Mean % Cover)		28
Oak fern	100	15.9
Christmas fern	100	12.7
Violets	100	8.2
Wild lily-of-the-valley	100	4.6
Evergreen wood fern	100	3.0
Northern beech fern	100	1.4
Drooping wood sedge	80	0.2
Indian cucumber root	80	0.1
White baneberry	80	0.1
Hay-scented fern	60	9.0
Wood-sorrel	60	1.8
Marginal wood fern	60	1.7
Lady fern	60	0.8
Sarsaparilla	60	0.7
Common speedwell	60	0.4
Rattlesnake fern	60	0.2
Sweet-scented bedstraw	60	0.2
False Solomon's seal	60	0.1
Shinleaf	60	0.1
Wood reed	60	0.1
Bulbet bladder fern	40	3.0
New York fern	40	2.5
Small enchanter's nightshade	40	0.4
Wood goldenrod	40	0.4
Partridge-berry	40	0.3
Ribless woodland sedge	40	0.2
Herb Layer (Mean % Cover)		62
Schreber's moss	80	0.9
Hair-cap moss	80	0.3
Stair-step moss	80	0.1
Fern moss	60	9.8
Shaggy moss	60	2.2
Brachythecium moss	60	1.7
Bryo-Lichen Layer (Mean % Cover)		10

Distinguishing Features

This is a broadly defined hardwood forest occurring on karst topography. Sugar maple is usually the dominant overstory species, but depending on past disturbances and successional stage other species such as yellow birch, beech, white ash, white birch and red maple may be present.



Gypsum cliff,
Mabou Harbour

Site Characteristics

Slope Position:	Upper ⁴ Crest ² Lower ² Middle ²
Surface Stoniness:	(Non - Slightly) ¹⁰
Bedrock Outcrop:	(Non-rocky) ⁴ (Slightly - Moderately) ⁴ (Very - Excessively) ²
Elevation Range:	13 - 80m
Slope Gradient:	Moderate ⁴ Steep ⁴ nd ²
Aspect:	North ⁴ South ² West ² None ²
Exposure:	Moderate ⁸ Sheltered ²
Microtopography:	Moderately ⁸ Slightly ²
Drainage:	Moderately well ⁴ Well ⁴ Imperfect ²

Soil Characteristics

Soil Type:	ST11 ⁴ ST5 ² ST12 ² ST15-L ²
Parent Material:	Glacial till ⁸ Colluvium ²
Rooting Depth (cm):	(<30) ² (30-45) ² (>45) ⁴ nd ²
Duff Thickness (cm):	(0-5) ⁶ (6-10) ² nd ²

