



NORTHERN FOREST DIGITAL HERBARIUM

USER GUIDE

University of Wisconsin– Extension

Project Partners:

University of Wisconsin-Extension
Great Lakes Indian Fish & Wildlife Commission
Cooperative Education Service Agency No. 12
USDA Forest Service (Chequamegon-Nicolet National Forest)



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the Wisconsin Environmental Education Board

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including Title IX and ADA.*

Purpose:
to foster learning, respect, and stewardship ...
for our forests and each other,
and as a complement to the Northern Forest Digital Herbarium



Dedication:
To learners of all ages and walks of life ...
may our knowledge and appreciation
of the forested public lands we share continue to grow ...
as we explore, enjoy, harvest, and care for them,
serving as guardians for future generations.

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"Target: Leafy Spurge"	

Note:

Binder pockets contain the following publications provided by the Great Lakes Indian Fish and Wildlife Commission:

Ojibwe Treaty Rights: Understanding & Impact

MAZINA'IGAN

Growing up Ojibwe - A supplement to *Mazinaigan*.

Ojibwe Treaty Rights & Resource Management

Enforcement of Off-Reservation Treaty Seasons

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Illustrations for User Guide

Cropped/reduced images from Northern Forest Digital Herbarium (order of appearance; scientific name, English name, Anishinaabe name, if known)

cover	<i>Polypodium virginianum</i>	polypody fern	
title page	<i>Carex pensylvanica</i>	Pennsylvania Sedge	
page 2	<i>Mitchella repens</i>	partridgeberry	binewimin
page 3	<i>Acer rubrum</i>	red maple	zhiishiigimiwanzh
page 5	<i>Viola adunca</i>	hook-spur violet	
page 7	<i>Myosotis scorpioides</i>	true forget-me-not	
page 11	<i>Pinus banksiana</i>	jack pine	okikaandag
page 45	<i>Antennaria plantaginifolia</i>	woman's tobacco	gaagigebagoons
page 49	<i>Parthenocissus quinquefolia</i>	Virginia creeper	bebaamooded manidoo-biimaakwad

Northern Wisconsin Forest Connections



Targeted Recipients

School Districts of CESA 12 (to support forestry education and treaty rights education)

Ashland	Mercer
Bayfield	Northwood
Butternut	Park Falls
Drummond	Phillips
Glidden	Solon Springs
Hayward	South Shore
Hurley	Superior
Maple	Washburn
Mellen	Winter

Tribal/public schools of the Ojibwe Nation (to support forestry education)

(Wisconsin member bands of Lake Superior Chippewa Indians)

Bad River	Red Cliff
Lac Courte Oreilles	St. Croix
Lac du Flambeau	Sokaogon/Mole Lake

Northern Waters Library System (for loan through member libraries)

Bad River Tribal Library	Lac du Flambeau Public Library
Bayfield Carnegie Library	Land O'Lakes Public Library
Boulder Junction Public Library	Legion Memorial Library
Burnett Community Library	Madeline Island Public Library
Drummond Public Library	Mercer Public Library
Eleanor Ellis Public Library	Olson Memorial Library
Evelyn Goldberg Briggs Memorial Library	Plum Lake Public Library
Forest Lodge Library	Red Cliff Library
Grantsburg Public Library	Shell Lake Public Library
Hayward Carnegie Library	Spooner Memorial Library
Hurley Public Library	Superior Public Library
Irma Stein Memorial Library	Tice Public Library
Joan Salmen Memorial Library	Vaughn Public Library
Koller Memorial Library	Washburn Public Library
Lac Courte Oreilles College Community Library	Winchester Public Library

Northern Great Lakes Visitor Center (for use by partners in educational programs)

Friends of the Center Alliance Ltd.	USDA Forest Service
National Park Service	US Fish & Wildlife Service
University of Wisconsin-Extension	Wisconsin State Historical Society

CESA 12 Instructional Materials Center (for loan to member school districts)

Wisconsin Environmental Education Board (to support forestry education and loan through the College of Natural Resources, UW-Stevens Point)

**Northern Forest Digital Herbarium
Collection Sites**

Delorme's *Wisconsin Atlas & Gazetteer* p. 85

<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Ojibwa Town Park		Winter School District, Lac Courte Oreilles Band of Lake Superior Chippewa Indians, Hayward School District	On Tuscobia State (bike, snowmobile) Trail from Park Falls to Rice Lake, Chippewa River, campsites, water, toilets	Wis. 70 4m. W Winter	Sawyer

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Chequamegon-Nicolet National Forest	Black Lake Trail	Lac Courte Oreilles Band of Lake Superior Chippewa Indians	lake, forested trails, tent camping, parking, toilets, water	Co. GG S Clam Lake 11m., Black Rd.	Sawyer
Flambeau River State Forest	Bass Lake	Butternut and Park Falls School Districts	wilderness lake, forested trails, parking area	Wis 70 10m. W Fifield, Boyd's Rd. 2m. S	Price
Flambeau River State Forest	Lake of the Pines Campground Nature Trail	Park Falls and Phillips School Districts	lake, forested trails, tent camping, parking, toilets, water	Co. W 20 m. W-NW Phillips, turn right (N) at Lake of the Pines Camp Rd. (est. 2 m.)	Sawyer

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Chequamegon-Nicolet National Forest	Luna-White Deer	Sokaogon Chippewa Community of the Mole Lake Band	lakes, forested trails, camping, toilets, water, archaeological sites	Wis 70 16m. E Eagle River, FR 2176 S 6m.	Forest

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
St. Croix National Scenic Riverway	Namekagon Barrens Wildlife Area	Northwoods School District, St. Croix Chippewa Indians of Wisconsin	endangered Pine Barrens ecosystem, ½ m. from Namekagon R. (canoe landing), pit toilet	Wis 77 W 17m. from Minong to Namekagon Trail, N est. 3m.	Burnett

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
St. Croix National Scenic Riverway	St. Croix River from Yellow River Landing to Thayer's Landing	St. Croix Chippewa Indians of Wisconsin	Canoe landings, St. Croix River, wild rice remnants, river floodplain forests, easy rapids just before Thayer's Landing	Wis 77 and 35 NE 1m. from Danbury to Yellow River Landing; downstream to Thayer's Landing on Wisconsin side of St. Croix River just past Wis Hwy 77 bridge to MN	Burnett

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Lucius Woods County Park		Solon Springs, Superior, and Northwoods School Districts	lake, forested trails, old homestead trail, playground, picnic areas, modern toilets, water, shelter/ amphitheater, North Country (hiking/x-country ski) Trail runs through	US 53 to Co. A in Solon Springs	Douglas

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Chequamegon-Nicolet National Forest	Drummond Woods Interpretive Trail	Drummond School District	interpretive signs related to historic logging era, old growth forest	US 63 N from Drummond; left on Old 63, trailhead on right	Bayfield
St. Croix National Scenic Riverway	Namekagon River from Seeley Landing to Phipps Landing	Hayward and Drummond School Districts	shallow water canoe trail in summer/fall	Seeley landing midway (8m.) between Cable and Hayward on US 63; Phipps landing downstream 4 m. by highway distance	Sawyer

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Chequamegon-Nicolet National Forest	Lake Three	Ashland and Mellen School Districts	lake, forested hiking trails to Brunsweiller River; camping, toilets, water, near St. Peter's Dome and Morgan Falls	Co. Hwy. C west off Wis. Hwy. 13 two m. north of Mellen, 3 m. to "T" intersection, left to Silver Brook Rd. (FR 189) to Mineral L. Rd. (FR 187)	Ashland
Chequamegon-Nicolet National Forest	Penokee Mountain Overlook	Mellen School District	stairs and platforms to overlook; easy stop and short hike for any group enroute to Ashland, Mellen, Clam Lake	Co. Hwy. GG 3 m. west of Mellen	Ashland
Chequamegon-Nicolet National Forest	Day Lake	Glidden School District	lake, camping, forested trails, toilets, water	Wis. Hwy. 13 north of Glidden 3 m, US Hwy. 77 west 13 m. to Clam Lake, Co. Hwy. GG 1.5 m. north to Day Lake	Ashland

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Public Land	Site	Community Connection(s)	Amenities of Site for Field Study	Directions	Wisconsin County
Potato River Falls County Park		Bad River Band of Lake Superior Chippewa Indians, Mellen School District	Stairway and trail to river, trail and platform overlook of falls, pit toilets, parking	US Hwy. 2 9m. E Odanah, Wis. 169 S 5m., Potato River Falls Rd. between Gurney and the Potato River bridge S of Gurney	Iron
Chequamegon-Nicolet National Forest	Penokee Mtn. Overlook	Mellen School District	stairs and platforms to overlook; easy stop and short hike for any group enroute to Ashland, Mellen, Clam Lake	Co. Hwy. GG 3 m. west of Mellen	Ashland
Chequamegon-Nicolet National Forest	Lake Three	Ashland and Mellen School Districts	lake, forested hiking trails to Brunsweller River; camping, toilets, water, near St. Peter's Dome and Morgan Falls	Co. Hwy. C west off Wis. Hwy. 13 two m. north of Mellen, 3 m. to "T" intersection, left to Silver Brook Rd. (FR 189) to Mineral L. Rd. (FR 187)	Ashland
Chequamegon-Nicolet National Forest	Springbrook Non-Motorized Area	Glidden and Butternut School Districts	parking, hiking trail, wildlife watching at beaver pond (small groups only)	Wis 13 S Glidden 11m, (Co. F) Bear Lake Rd. right, 10 m., left turn, 1 m. +/-, first marked parking on left, hiking trail to beaver pond	Ashland

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Kimball Town Park		Hurley School District	picnic tables, pit toilets, parking, play area, West Fork of Montreal River	US 2 4m. W of Hurley, Park Rd. 1 m. S to Town Park Rd.	Iron
Lake of the Falls County Park		Lac du Flambeau Band of Lake Superior Chippewa Indians, Mercer School District	shelter, toilets, camping, water, forested trails, rapid water and falls, Little Turtle River, Turtle-Flambeau Flowage	US 51 N of Mercer 2 m., Co. FF W 5m.	Iron

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Northern Highland-American Legion State Forest	Jag Lake Group Campground	Lac du Flambeau Band of Lake Superior Chippewa Indians	group campground, lake, meeting areas, picnic tables, water, toilets, isolation from other campers, lake easily accessed by canoe, bog, forested trails and campsite	US 51 7m. S. Manitowish Waters, Co. H 2m. N, right on Day Lake Rd.	Vilas

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Amnicon Falls State Park	Island Loop Trail	Superior and Maple School Districts	shelters, toilets, covered walking bridge overlooking Amnicon River and waterfall, forested trails, park rangers and naturalists, parking, camping, water	US 2 to Co. U N.	Douglas

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<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Brule River State Forest	Historical Bayfield Road Hiking and Snowshoe Trail	Maple School District	forested historic trail, parking, near Copper Range Campground, toilets, and water	US 2 1m. W of Brule, Clevedon Rd. 3 ½ m. N.	Douglas

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Delorme's Wisconsin Atlas & Gazetteer p. 102

Public Land	Site	Community Connection(s)	Amenities of Site for Field Study	Directions	Wisconsin County
Port Wing Boreal Forest State Natural Area		South Shore School District	Lake Superior beach, old quarry site (no water, shelter, or toilets)	Wis 13 2m. W Port Wing, Quarry Rd. to Lake Superior	Bayfield
Chequamegon-Nicolet National Forest <i>*For more information about the Moquah Barrens Auto Tour, contact USDA Forest Service, Washburn Ranger District, 113 E. Bayfield St., Washburn, WI 54891 715-373-2667</i>	Moquah Barrens Wildlife Area (restored to barrens open habitat) Stops: Natural Area parking (Auto Tour Stop 19); Auto Tour Stop #18; FR 242 closed ATV course (this is on the way to No Name Bog Site)	Ashland, Drummond, Maple, South Shore, and Washburn School Districts (and all others)	Endangered Pine Barrens Ecosystem * Easily combined with stewardship educational programs at Northern Great Lakes Visitor Center (NGLVC) for school groups; Auto Tour booklets from USFS Washburn District or NGLVC.	<i>Refer to *Moquah Barrens Auto Tour Map, p. 44 of this User Guide.</i> Forest Road 236 6m. N of Ino (US 2 between Iron River & Ashland) From Washburn, Co. Hwy. C to Forest Road 236, south about ten miles	Bayfield
Chequamegon-Nicolet National Forest	No Name Bog (adjacent to No Name Lake); marked as Auto Tour Stop #9	Ashland, Drummond, Maple, South Shore, and Washburn School Districts (and all others)	Same as * above; unique ecosystem comparisons	<i>Refer to *Moquah Barrens Auto Tour Map, p. 44 of this User Guide, for accurate Forest Road numbers.</i> From Auto Tour Stop 18 on FR 236, travel ½ m. S to FR 242. Follow FR 242 thru intersection with FR 241. In about 1m., turn right on FR 849 to Auto Tour Stop #9.	Bayfield

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Delorme's *Wisconsin Atlas & Gazetteer* p. 102-103

<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Chequamegon-Nicolet National Forest	Long Lake	Ashland and Washburn School Districts	Small lake, bog, boardwalk, trails, beach, toilets, water	Forest Road 251 Wanebo (Long Lake) Rd. 7m. W of Washburn	Bayfield
Big Rock County Park		Washburn and Bayfield School Districts	Tent camping, toilets, water, picnic tables, quality trout stream; vantage for spring/fall trout/salmon migration viewing, forested trails; two m. from Lake Superior beach at mouth (estuary) of Sioux River	County Hwy. C one mile NW from Washburn, right on Big Rock Rd., one m. to parking/campground on Sioux River	Bayfield
Chequamegon-Nicolet National Forest	Northern Great Lakes Visitor Center (NGLVC)	Bad River and Red Cliff Bands of Lake Superior Chippewa, Ashland, Bayfield, Drummond, and Mellen School Districts (serving residents and visitors of northern Wisconsin, Michigan's UP, and northeast Minnesota)	Exhibits of region's cultural, historical and natural resources; observation tower; boardwalk trails; native gardens; Stewardship Site and Trail; auditorium and classroom; environmental education programs PK-12 and adult	At intersection of County Hwy G and US Hwy 2, 2 miles W of Ashland  website: www.nglvc.org	Bayfield

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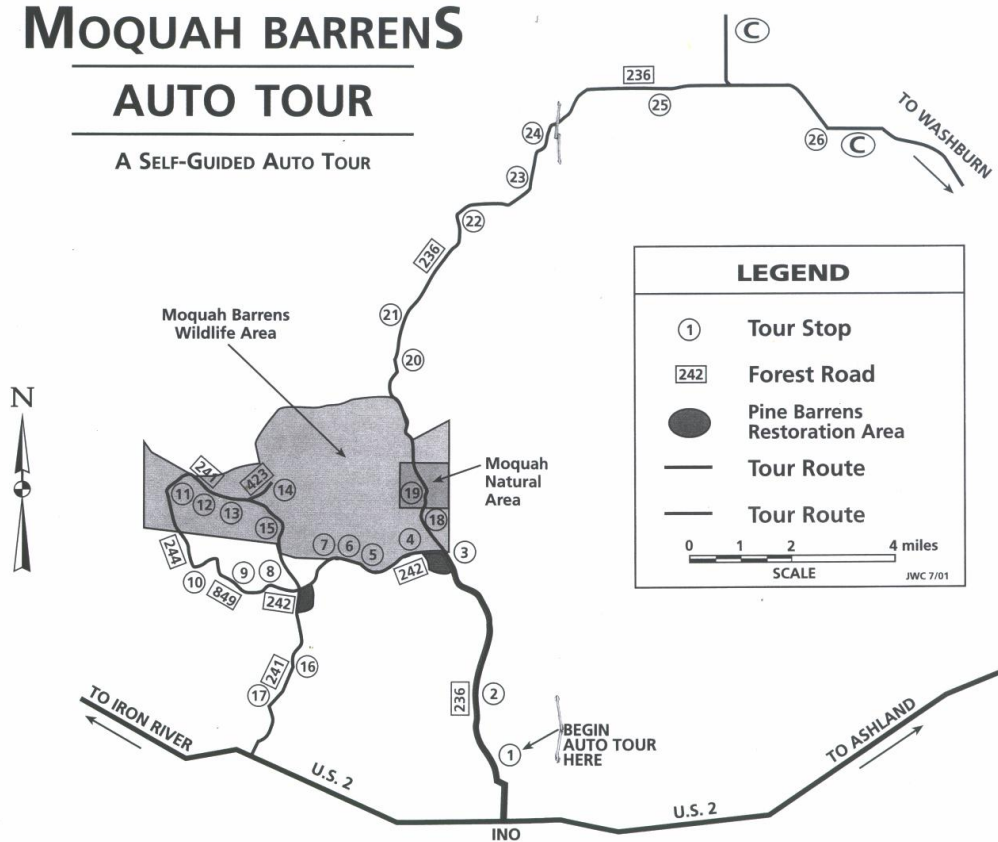
Delorme's *Wisconsin Atlas & Gazetteer* p. 103

<i>Public Land</i>	<i>Site</i>	<i>Community Connection(s)</i>	<i>Amenities of Site for Field Study</i>	<i>Directions</i>	<i>Wisconsin County</i>
Big Bay State Park Madeline Island	Lagoon Boardwalk	Red Cliff Band of Lake Superior Chippewa and Bayfield School District	Boardwalk adjacent to Lake Superior beach and inland lagoon, toilets, water, park rangers and naturalists	ferry from Bayfield to Madeline Island, Co. H 5m. E of LaPointe	Bayfield

DeLorme's *Wisconsin Atlas and Gazetteer* is copyright protected, and pages reproduced to show herbarium collection sites could not be included in electronic form on this CD. However, the *Northern Forest Digital Herbarium User Guide* binders, created for the targeted recipients of this project, do include scanned, labeled, and printed portions of gazetteer pages (permission granted by DeLorme).

THE MOQUAH BARRENS AUTO TOUR

A SELF-GUIDED AUTO TOUR



For more information about the Moquah Barrens Auto Tour, contact USDA Forest Service, Washburn Ranger District, 113 E. Bayfield St., Washburn, WI 54891 715-373-2667

Anishinaabe Connections



gaagigebagoons (woman's tobacco)

The information in this section of the User Guide is provided by the Great Lakes Indian Fish & Wildlife Commission.

“The Great Lakes Indian Fish & Wildlife Commission (GLIFWC) is an inter-tribal, co-management agency committed to the implementation of off-reservation treaty rights on behalf of its eleven Ojibwe member tribes. Formed in 1984 and exercising authority specifically delegated by its member tribes, GLIFWC's mission is to help ensure significant, off-reservation harvests while protecting the resources for generations to come.” with permission, from GLIFWC website: www.glifwc.org

Anishinaabemowin (Ojibwe Language)

The Northern Forest Digital Herbarium specimens include the Anishinaabe names for plants, when known. The Great Lakes Indian Fish and Wildlife Commission continues efforts to learn additional plant names from the people they serve. The following references were consulted:

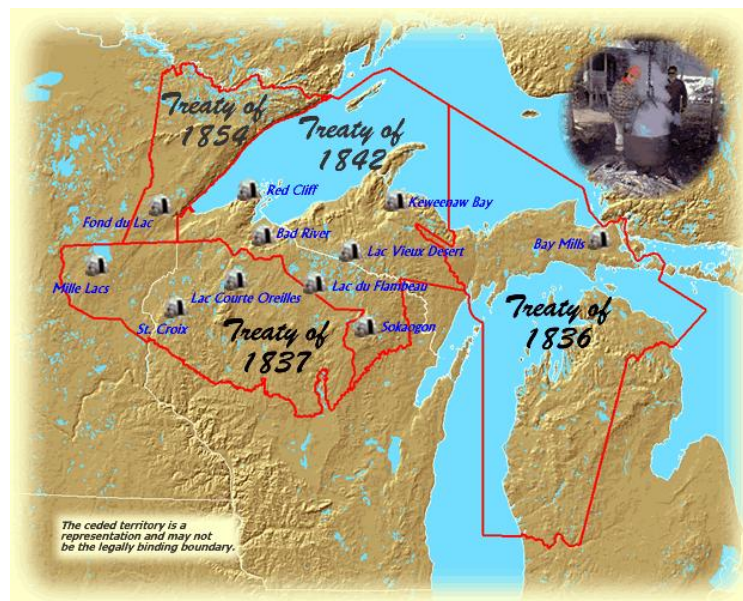
Plants Used by the Great Lakes Ojibwa by James E. Meeker, Joan E. Elias, and John A. Heim. Published by Great Lakes Indian Fish and Wildlife Commission. 1993.

Onjiaikiing – From the Earth. Non-Medicinal Uses of Plants by the Great Lakes Ojibwe. Computer CD published by Great Lakes Indian Fish and Wildlife Commission. 2001.

Tribal elders from the Bad River Band of Lake Superior Chippewa Indians, Bay Mills Indian Community, Fond du Lac Chippewa Tribe, Keweenaw Bay Indian Community, Lac du Flambeau Band of Lake Superior Chippewa Indians, Lac Courte Oreilles Band of Lake Superior Chippewa Indians, Lac Vieux Desert Band of Lake Superior Chippewa Indians, Mille Lacs Band of Chippewa Indians, Red Cliff Band of Lake Superior Indians, St. Croix Chippewa Indians of Wisconsin, and Sokaogon Chippewa Community of the Mole Lake Band.

Addressing Treaty Rights on Ceded Lands

The Anishinaabeg¹ had long lived in the Lake Superior region (portions of modern-day Minnesota, Wisconsin, Michigan, and Canada) by the time European explorers first entered the area. By the mid-1800's, the emerging United States, hungry for timber and minerals, sought lands occupied by the Anishinaabeg through a series of cession treaties. In many of these treaties, the Anishinaabeg retained the rights to hunt, fish, and gather in the ceded territories to meet economic, cultural, spiritual, and medicinal needs - in essence, to sustain their lifeway. Tribal negotiations for these rights were fastidious and purposeful, and only through the guarantee of these rights, did the tribes agree to sign the treaties. Today, these reserved rights are often referred to as treaty rights.



with permission, from GLIFWC website www.glifwc.org

The Anishinaabeg gather hundreds of plant species for food, utilitarian, medicinal, ceremonial, and commercial purposes. Tribal elders teach that all plants have one or more uses; all plants have inherent importance and should be treated with respect. Through gathering plants, tribal members demonstrate their respect. The significance of treaty rights manifests itself in this perpetual and essential interrelationship between the Anishinaabeg and the plant world.

¹The Anishinaabeg, which means original people, have also been referred to as the Ojibwe or Chippewa.

All plants included in the Northern Forest Digital Herbarium were collected on public lands. All sites are accessible to all people. All public lands in northern Wisconsin are lands where the Anishinaabeg have the (regulated) right to hunt, fish, and gather. (See GLIFWC's website for hunting, spearing, fishing, trapping, and harvesting regulations.) The Northern Wisconsin Digital Herbarium intentionally aims to connect educators with tools with which they can address the historic and current relevance of treaty rights, both to native and non-native people of Northern Wisconsin.

GLIFWC publishes and distributes a wealth of materials to promote the understanding and respect of treaty rights on public lands and to celebrate the bounty of the forests and waters. A few of these publications have been included in the pockets of this User Guide:

Ojibwe Treaty Rights: Understanding & Impact - This publication is aimed at 4-8th grade students promoting cultural awareness and background information on Ojibwe treaties. Includes activities and Ojibwe stories & legends. © 2004 1st one is free \$2.00 each thereafter.

MAZINA'IGAN - A quarterly newspaper emphasizing treaty issues and treaty resource management activities. Subscriptions are available at no charge.

Growing up Ojibwe - A supplement to *Mazina'igan*. This 20 page supplement is about Tommy Sky from the Bad River Band of Ojibwe. Like all kids Tommy spends a lot of time in school and playing sports, but he also does some special things that are part of his Ojibwe culture. This supplement takes you through spring spearing and netting, gathering and hunting with Tommy and his family. 1-5 copies of the supplement are free, and orders of 6 or more will be invoiced at .25¢ per copy.

Brochures:

Ojibwe Treaty Rights & Resource Management
Enforcement of Off-Reservation Treaty Seasons

To help you obtain these and other resources, the leaflet, "Materials Published/Distributed by GLIFWC," has been included. Many materials can also be printed and/or ordered from GLIFWC's website, www.glifwc.org. There, you will also find information related to GLIFWC's research, education, and management concerning environmental issues and health hazards, such as invasive species and fish populations contaminated with mercury.

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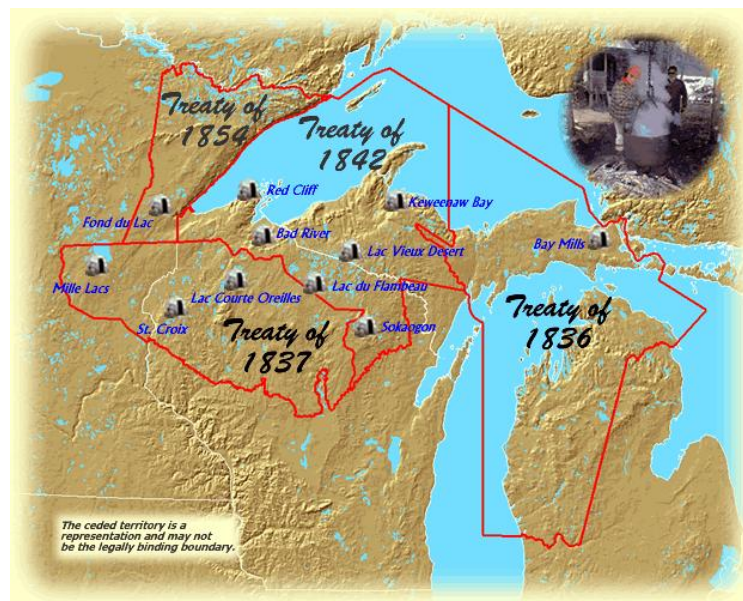
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Educational Connections



Herbarium Format and Methodology

(excerpted from an article appearing in *Mazina'igan*, Spring 2005,
written by Karen Danielsen, GLIFWC Forest Ecologist)

"Botanists collect plants for documentation and scientific purposes, meticulously noting the location and date of the collection, neighboring plants, habitat type ... and other pertinent information. An herbarium, which can consist of one small cabinet to a large building filled with many cabinets, serves as a storage facility for these collections.

"If prepared and stored properly, these plant collections, referred to as herbarium specimens, can remain intact for decades, if not centuries. In fact, some plants collected as early as the 1600's continue to be studied by modern-day botanists!"

Actual herbarium specimens become brittle and can be easily damaged by untrained hands. In the case of this herbarium, however, electronic scanning of mounted specimens and lamination has created "...robust replicas of herbarium specimens that can be used by aspiring botanists of all ages."

In creating this collection of 200 specimens, project partners "... prepared the plants as herbarium specimens by first placing the collected plants into a standard plant press—consisting of newspaper, cardboard, and special absorbent cardboard (called blotters) securely strapped between two pieces of wood. Then, while still in the press, ..." the plants were refrigerated for a week to retain color, flatten stems, and partially dry tissues.

"Finishing the process, [project partners] gently arranged and glued each [pressed] plant onto a separate 11 x 17 inch, stiff, acid-free, piece of archival quality paper. Employing computer technology, the finished herbarium specimens were scanned to create digital images, a contemporary form of storage ... and ... electronic labels [were added] to the digital images. From the completed labeled digital images, [project partners] printed master copies, each measuring 11 x 17 inches. Color-copying of these masters produced 36 sets of 200 labeled plant images, which were subsequently laminated ..."

By making this "digital" herbarium widely available, project partners hope that learners of all ages will grow in awareness, appreciation, knowledge, and stewardship of our northern forests.

Northern Forest Digital Herbarium
 Experiential/Inspirational Uses for Lifelong Learning
 (Correlated with Early Learning-Grade 12 Wisconsin Core and EE Academic Standards)

ELA (English and Language Arts)
 EE (Environmental Education)
 Math (Mathematics)
 SC (Science)
 SS (Social Studies)

Early Learning (EL): Preschool/Head Start

<i>Learning Activity</i>	<i>Standards</i>
	LDC (Language Development and Communication) CGK (Cognition and General Knowledge)
Child(ren) learn(s) the name of a forest plant (select specimen and write simple common name) that begins (except x) with letter under study:	LDC-C. Early Literacy: C.EL.3 alphabetic awareness
alder	
blackberry	
columbine	
dogwood	
evening primrose	
fern	
golden buttons (tansy)	
horsetail	
ironwood	
juniper	
kinnickinnick (bearberry)	
lady's-slipper	
milkweed	
nightshade	
oak	
pitcher-plant	
quaking (trembling) aspen	
raspberry	
sumac	
turtlehead	
umbrella aster (parasol aster)	
violet	
willow	
<i>Carex</i> (genus that includes many sedges)	
yarrow	
zigzag goldenrod	

Each child selects a Herbarium specimen he/she likes and tells why. Educator writes child's words into a sentence, i.e. "Zachary likes the rose because it is pink." Post each sentence next to the plant it describes and read. Eventually, point to key words, refraining from reading them aloud while encouraging children to read the words aloud, i.e. (points to word; children read) likes the _____ because it is _____."

LDC-C. Early Literacy:
C.EL.7 understanding writing represents thoughts

Child(ren) group(s) specimens (educator preselects 10-12 for sorting). Observe how child(ren) group(s) them (i.e. color? tree leaves vs. needles? ferns vs. wildflowers?), and reinforce the child(ren)'s logic.

CGK-A. Mathematical and Logical Thinking:
A.EL.1 group objects according to similarity

Child(ren) count an appropriate number of specimens; educator leads joining, separating, asking child(ren) to tell how many in the new set.

CGK-A. Mathematical and Logical Thinking:
A.EL.2 count, join, separate, tell how many

Write an appropriate numeral; have child(ren) select and display the correct number of specimens. Child(ren) then read(s) the numeral and count(s) the matching set.

CGK-A. Mathematical and Logical Thinking:
A.EL.3 recognize and use numerals

Child(ren) observe(s) the leaves of a tree or shrub in nearby yard, park, or forest; collects a leaf; and brings it to the class area to match with the Herbarium specimen of the same species. (Educator preselects 3 or 4 Herbarium specimens with different leaf shapes from which to choose.)

CGK-B. Scientific Thinking and Problem Solving:
B.EL.1 observe characteristics in world

Child(ren) visit a forest to witness tree harvest for lumber or paper; child(ren) also visit areas where trees have been planted for future harvest. Use Herbarium specimens (eastern white pine, trembling aspen, white birch, etc.) to help child(ren) understand the purpose for the trip.

CGK-C. Social Systems Understanding:
C.EL.4 recognize interdependence of humans with natural world

Northern Forest Digital Herbarium

Experiential/Inspirational Uses for Lifelong Learning

Grades K-1

<i>Learning Activity</i>	<i>Standards</i>
Each student selects an Herbarium specimen they think is their favorite color, most beautiful, weirdest, etc., explaining why they chose their plant, displaying it as they speak, practicing using eye contact; students listen and retell each other's explanations.	ELA C.4.1, C.4.2 orally communicate opinions; listen to communications
Students are introduced to invasive species in northern forests and learn about those included in the Herbarium (see Appendix G). See Invasive Species Awareness and Action at the end of this Educational Connections section of the User Guide for more information.	EE C.4.1 identify environmental issues
Students form sets of Herbarium specimens and use numerals to represent whole numbers.	Math B.4.1 represent whole numbers with physical materials
Students view Herbarium specimens for which the Anishinaabe names are known (see Appendix C) as an introduction to their unit of study about Ojibwe knowledge and traditional uses of plants of the northern forest.	SC B.4.2 acquire knowledge about people who have contributed major science ideas; learn about cultures in which they lived
Display forest wildflower and fern species throughout the learning space, at "ground layer" level, as if they are growing in the forest. Help children imagine they are going for a walk in the forest together. Give them each a snack with paper or plastic wrapping. Have one child carry a trash bag. Weave a story about walking together, appreciating the ferns, "smelling" the wildflowers, and stopping to eat the snack. Ask, what should we do with our paper (or plastic) wrappings? Discuss how we all have a responsibility to keep our community and our forests free of litter.	SS C.4.1 identify and explain the individual's responsibility to family, peers, and the community ...

Northern Forest Digital Herbarium

Experiential/Inspirational Uses for Lifelong Learning

Grades 2-3

<i>Learning Activity</i>	<i>Standards</i>
Students find Herbarium specimens they recognize, creating a list of the plants by common name under the title, "Forest Plants I Have Seen".	ELA A.4.4. read to acquire information
Use the Herbarium non-native invasive specimens to spark interest in the issue (see Appendix G in the User Guide). Invite a community member who takes action locally to stop the spread of non-native invasive plants (local gardener, UW Extension agent, natural resource professional, high school biology student). Students plan and implement a simple stewardship project to help stop the spread of a non-native invasive plant (such as weeding a native garden in the school yard and planting more native flowers).	EE D.4.5, D.4.6 explain how we can help solve an environmental issue; plan how to be part of the solution
Students group Herbarium specimens by twos, threes, fours, fives, etc. ... counting the number in all; i.e. three sets of two, when counted, equal six. This helps create readiness for multiplication.	Math B.4.2 determine the number of things
Students find Herbarium specimens that illustrate the state of their development that produces new members of their type (berries with seeds, cones, seeds, trailing underground stems, etc.)	SC F.4.4 illustrate ways organisms grow and survive to reproduce
Students study a map of Wisconsin, finding their community, and a town, county, state, or national forest nearby (see Northern Forest Connections section of the User Guide, as well as the Table of Contents, for a list of the Herbarium collection site(s) near your community). Show students Herbarium specimens collected from a public land nearby (see Appendix D). Explain that these plants, and all the others can be found throughout forests in all of northern Wisconsin. Have students look through the Herbarium collection to find other plants they have seen while walking or camping or otherwise enjoying the forest. Help students interpret the Herbarium labels to find other locations where plants were collected. Help them translate these forest names to a map of the state.	SS A.4.7 identify connections between the local community and other places in Wisconsin ...

Northern Forest Digital Herbarium

Experiential/Inspirational Uses for Lifelong Learning

Grade 4

<i>Learning Activity</i>	<i>Standards</i>
Students write a folk tale explaining how a selected plant got its color, name, spines, or why it twines (suggestions: forget-me-not, bristly rose, yellow lady's-slipper, blue flag, maidenhair fern, plantain-leaved pussy toes, harebell, turtlehead, smartweed, big blue-stem grass, bearberry, Virginia Creeper, ...)	ELA B.4.1 write creative pieces
Students ponder connections between European settlement of the northern forest cutover, shipping between continents and great lakes, and the invasion and spread of non-native species included in the Herbarium. Students conduct an information search on an invasive plant and develop a poster to teach others about the plant and solutions they can employ to stop the plant's spread.	EE C.4.2, C.4.3, C.4.4, C.4.5 identify environmental issues and solutions
Use Herbarium specimens as subjects (leaves, needles, petals, small plants) to be measured by students (length to the nearest half-inch or nearest cm).	Math D.4.4. measure for accuracy
Students use Herbarium specimens when studying plants and habitats of Wisconsin. They learn to read an herbarium label for information such as where the plant was found, when the plant was collected (including when it is in bloom or when it has seeds), common names for the plant, whether it is native or non-native, and the habitat in which it was growing. Students compare this information with information found on the internet and in field guides.	SC B.4.1 use various sources of science information
Have students listen as educator reads the <i>Masinaigan</i> Supplement, "Growing up Ojibwe", published by the Great Lakes Indian Fish & Wildlife Commission (GLIFWC), fall 2001, included in the pockets of the Northern Forest Digital Herbarium User Guide binder. This publication is one of many produced by GLIFWC to teach about the history, culture, tribal sovereignty, and treaty rights of the Ojibwe to hunt, trap, fish, and gather on ceded lands. Additional copies may be obtained by calling 715-682-6619 or on GLIFWC's website at www.glifwc.org	SS B.4.10 explain the history, culture, tribal sovereignty, and current status of the American Indian tribes and bands in Wisconsin
Have students locate the Herbarium specimens named in the supplement: ininaatig (sugar maple), wiigwaasaatig (white birch), waagaag (any of the fern fiddleheads), miinagaawanzh (low-bush blueberry plant), ode'imin (wild strawberry), makade miskomin (blackberry), manoomin (northern wild rice).	

(continued next page)

(Grade 4 continued)

Note: One will encounter variations in Anishinaabe names for plants, just as one encounters different English names for plants. Names are usually passed down in the family, depending often upon what one's ancestors called the plant.

See Appendix C of the User Guide for a list of other specimens with known Anishinaabe names included in the Herbarium.

SS B.4.10 explain the history, culture, tribal sovereignty, and current status of the American Indian tribes and bands in Wisconsin
(continued from previous page)

Northern Forest Digital Herbarium Experiential/Inspirational Uses for Lifelong Learning

Grades 5-6

Learning Activity

Students work in teams according to plant types (see Appendix F of User Guide), selecting as many plants of their type as they have in team members, comparing them by criteria they choose (i.e. habitat type, blooming time, size, color), and interpreting the information contained on the labels. Further challenge students to find additional information in field guides, referencing the plants' scientific names in the guides' indices. The team then reports the information to the rest of their class, utilizing the Herbarium specimens as visual references; classmates take notes.

Standards

ELA A.8.4, C.8.1, C.8.2 read to acquire information; orally communicate information; listen and take notes

After researching the issue of non-native invasive plants in a nearby forest, students find out what kinds of actions they can take to help solve the problem. They then develop a plan and carry it out. Including such a stewardship activity during a field trip to a local or regional forest leaves a positive lasting impact on both students and the environment.

EE D.8.5, D.8.6 explain how personal action can impact an environmental problem

Use Herbarium specimens as subjects (leaves, needles, petals, small plants) to be measured by students (length to the nearest 1/16 of an inch or nearest mm).

Math D.8.3 measure with accuracy

Students inspect selected pairs of species from the Herbarium collection that are either related genetically or by common name (one non-native and the other native), researching, discussing, and inferring how the aggressive, non-native species got here and how they threaten to replace native species. Pairs of plants to use:

SC F.8.9 explain environmental changes affecting survival of certain species

Non-Native

scientific name English name

Campanula rapunculoides creeping bellflower

Cirsium arvense Canada thistle*

Hypericum perforatum St. John's-wort

Lonicera tatarica Tartarian honeysuckle*

Lythrum salicaria purple loosestrife*

Myosotis scorpioides true forget-me-not

& Native

scientific name English name

& *Campanula rotundifolia* harebell

& *Cirsium muticum* swamp thistle

& *Triadenum fraseri* bog St. John's-wort

& *Lonicera canadensis* Canada honeysuckle

& *Lysimachia ciliata* fringed loosestrife

& *Myosotis laxa* small forget-me-not

*see Invasive Species Awareness and Action at the end of Educational Connections section of this User Guide for specific information on this plant.

Grade 5-6 continued

Using the resource included in the pocket of the Northern Forest Digital Herbarium User Guide binder, *Ojibwe Treaty Rights: Understanding and Impact*, read and discuss pp. 3-24. Give students a copy of the vocabulary and crossword puzzle pp. 25, 34, and 35. (Additional copies may be available by contacting the Great Lakes Indian Fish & Wildlife Commission at 715-682-6619 or on their website: www.glifwc.org.)

Display Herbarium specimens of plants gathered by Ojibwe bands in northern Wisconsin as they are mentioned in the booklet: ininaatig (sugar maple), wiigwaasaatig (white birch), miin (low-bush blueberry), ode'imin (wild strawberry), miskomin (wild red raspberry; also leaves for tea), and manoomin (northern wild rice). The Herbarium collection includes other plants gathered in the forest by the Anishinaabeg:

- zhingob gaawaandag (black spruce – roots used as twine in canoe construction)
- wiigobaatig (American basswood – inner bark – wiigob used as twine to tie frame of wiigwam)
- maananons (eastern hop-hornbeam or ironwood – saplings used for wiigwam frame)
- giizhikaandag (northern white cedar – boughs used as mattresses; needles used as tea)
- other traditional food plants:
 - berries and fruits
 - makade miskomin (common blackberry)
 - datgaagmin (thimbleberry)
 - asasaweminagaawanzh (chokecherry)
 - wiinisiibag (wintergreen; also leaves for tea)
 - oginiiminagaawanzh (wild rose; hips also used for tea)
 - vegetables
 - bagwaji-miskodiisimin (hog-peanut – edible pea-like pods)
 - bagwajipin (cream pea vine – edible pea-like pods)
 - miinikaanan (beach pea – edible pea-like pods)
 - waabiziipin (broad-leaved arrowhead, duck-potato, wapato – potato-like tubers on underwater roots)
 - nuts
 - bagaaniminzh (American and beaked hazelnuts)
 - mitigomizh (northern red and Hill's oaks – acorns gathered to make flour)
 - bagaamizh (bur oak – acorns gathered to make flour)

See Great Lakes Indian Fish & Wildlife Commission (GLIFWC) website www.glifwc.org/ at the link for Publications, Mazina'igan, for thorough lists of plants to harvest for each season:

- Winter 2002 issue—select link “Spring harvest opportunities”
- Spring 2002 issue—select link, “Onjiakiing—From the Earth Harvest Calendar” for summer gathering information
- Summer 2002 issue is a pdf document; scroll to p. 17 for “Fall harvest opportunities”
- Fall 2002 issue—select link “Winter harvest opportunities”

SS B.8.11
summarize major issues associated with the history, culture, tribal sovereignty, and current status of the American Indian tribes and bands in Wisconsin

Northern Forest Digital Herbarium

Experiential/Inspirational Uses for Lifelong Learning

Grades 7-8

<i>Learning Activity</i>	<i>Standards</i>
Students select a plant to research, beginning with formulation of research questions and compilation of accessible sources of information. Students compile, organize, review, and evaluate information. Students produce an organized written and oral report that gives proper credit to sources.	ELA F.8.1 research and communicate findings
Students become acquainted with 200 northern forest plant species through the Herbarium. Seeing the wide variety of types of plants, types of habitats, species diversity (oaks, maples, goldenrods, asters) within the same genus, and variations within a species, should help students understand and be able to explain the importance of biodiversity in northern forests. Students should be able to select a plant and explain its connection to life in the forest. Example: northern red oak – acorns eaten by turkeys, foxes, bears, woodpeckers, red squirrels, gray squirrels, northern flying squirrels, deer; leaves turned into soil by earthworms and soil organisms; branches and trunks (and underground roots) providing habitats for insects, fungi, birds, mammals, etc.; microhabitats created through climate moderation provided by shade in summer; absorption of water from rain and melting snow; holding of soil on slopes and riverbanks to prevent erosion; oxygen production and CO ² sequestering; etc.	EE B.8.3 explain the importance of biodiversity
Students each select an Herbarium specimen, reading its label for the GPS (Geographical Positioning System) location where the plant was collected. Then, by comparing the reading to longitude and latitude on topographic maps, plat maps, and in Delorme's <i>Wisconsin Atlas and Gazetteer</i> (portions reproduced, with permission, in the User Guide's Northern Forest Connections section), students interpret how GPS readings are derived and what they mean.	Math B.8.1 read and interpret rational numbers
Students study the importance of or threats to forest plant diversity in their area. Following study, students work as teams to design and conduct surveys among adults in their community at places where the public gathers (grocery stores, churches, shopping malls), to find out if people have any concerns about diversity of plants in northern forests. Students ask for reasons or evidence people use to support their viewpoints. Students follow their questions with a statement of their concern to the group, using Herbarium specimens to illustrate their point. Students then thank participants for their time and bring results back to class for analysis and discussion.	SC B.8.4 describe reasoning and evidence used outside of science to draw conclusions about the natural world

Grade 7-8 continued

Students select two Herbarium collection sites, representing what they believe will be two distinctly different areas in northern Wisconsin. See Table of Contents of User Guide, as well as Northern Forest Connections section of User Guide. Students then find the Herbarium specimens collected at these two sites (see Appendix D). Students compare Herbarium collection data, as well as internet searches to locate satellite images and/or aerial photos of the collection sites. Students compare glaciation impacts, soils, topography, forest types, and vegetation utilizing internet searches. Students compile information and draw conclusions. This activity would be a great opportunity for partnering between two schools in different parts of northern Wisconsin to exchange information, including demographic data.

SS A.8.1 use a variety of geographic representations ... to gather and compare information about a place

Northern Forest Digital Herbarium

Experiential/Inspirational Uses for Lifelong Learning

Grades 9-12

<i>Learning Activity</i>	<i>Standards</i>
Students select an Herbarium specimen and write an impromptu paragraph based on information contained in the label and/or observation/personal experience.	ELA B.12.1 write to communicate
Following studies designed to help students understand environmental processes and systems, students use Herbarium specimens as visual references for peers and other listeners as they describe examples of the values of northern forests from natural and human perspectives ; e.g. food for humans and wildlife, medicinal and culturally significant resources, shelter for humans and wildlife, flood control, water purification, climate control and moderation, carbon sequestering, etc.	EE B.12.2 describe values of ecosystems
Students select Herbarium specimens collected near their community (see Northern Forest Connections section of User Guide, Collection Sites, and Table of Contents). Students read the GPS (Geographical Positioning System) locations for each, discussing the range of accuracy that would be acceptable in order to revisit the plant's precise location. The discussion should bring in geometry (triangulation of satellite readings), numbers of satellites needed, etc. The use of a GPS unit in the schoolyard (or better yet, in the forest where the plants were collected) will demonstrate the importance of waiting to receive the signals from several satellites, increasing the accuracy of the geographical position reading. Students will see accuracy can range widely and that the smallest units in the GPS reading will change from moment to moment, and that even though technology speeds up our work, we must continue to assess and account for error. Students discuss why GPS locations in any plant inventory or study is considered important data to include.	Math B.12.6 Assess acceptable limits of error when using technology
Students study Herbarium collection to formulate sets of five or more plants often associated together in their preferred habitat type. From the sets, student teams research associated plants in field guides and on the internet, searching for clues or evidence that indicate how the plants are able to successfully live in close proximity. During their research, students may also discover how certain plants compete for space, nutrients, sunlight, etc.; (i.e. non-native invasive plants or plants that produce allelopathic chemicals).	SC F.12.7 investigate how organisms cooperate (and compete) in ecosystems

Grades 9-12 continued

Students sort and review all Herbarium specimens that include a known Anishinaabe (Ojibwe) name. (Refer to Herbarium User Guide Appendix C.) Students brainstorm traditional and current uses of the plant species by the Anishinaabeg. Students read the brochure “Ojibwe Treaty Rights & Resource Management” included in the pockets of the User Guide binder. (Additional copies may be requested/printed from the Great Lakes Indian Fish & Wildlife Commission (GLIFWC) website at www.glifwc.org.)

Following reading of the brochure, students conduct further research on the treaties wherein Ojibwe hunting, fishing, trapping, and gathering rights were retained on off-reservation lands. Encourage students to invite an Ojibwe elder, educator, or natural resource professional from GLIFWC to speak to the class about Ojibwe treaty rights.

Following the background study, students hold a discussion or write a paper demonstrating they meet the academic standard SS C.12.1 described at the right. Challenge students to address not only the rights of Ojibwe people, but their responsibilities, as well as the responsibilities of the rest of the citizenry of northern Wisconsin. Students should also understand the role of GLIFWC in managing and regulating resources on ceded lands.

SS C.12.1 identify the sources, evaluate the justification, and analyze the implications of certain rights and responsibilities of citizens

Northern Forest Digital Herbarium Experiential/Inspirational Uses for Lifelong Learning

Adults

Use Herbarium specimens and the User Guide:

- when teaching/learning about native forest plants.
- when teaching/learning about non-native, invasive northern forest plants.
- to become aware of and appreciate diversity of forest vegetation.
- when creating botanical drawings.
- to help in identifying northern forest plants.
- as flash cards to memorize scientific, English, and/or Anishinaabe names of plants.
- to decorate for a party or gathering with a forest theme.
- at professional botanical workshops and seminars.
- when making related presentations for schools and youth groups.
- to motivate conversation and interaction with people of all ages and abilities.
- to inspire and inform habitat restoration and rehabilitation efforts.
- in conjunction with field guides, to learn botanical terminology in any season.
- at gatherings or interviews of Anishinaabe elders in the continued search for Anishinaabe names for native species where they are still unknown.
- to learn more about Ojibwe treaty rights to gather plants on public lands.

Northern Forest Digital Herbarium Curricula Complement For
LEAF (Learning, Experiences, & Activities in Forestry)
The Wisconsin K-12 Forestry Education Program

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The Northern Forest Digital Herbarium (Herbarium) includes 200 laminated 11 x 17 digitally reproduced actual plants found in northern Wisconsin forests. Each specimen is labeled with scientific, common, and Anishinaabe (Ojibwe) names, along with complete collection data.

The following examples will illustrate ways in which the Herbarium resource can be used to specifically complement LEAF guides for the following grade levels:

K-1 Unit

- **Lesson 1: Tree Hardware** – Use Herbarium oak specimens (bur, northern red, and Hill's) along with Activity 2 and Activity 3 to impress upon students that there are many kinds of oak trees in Wisconsin's forests (helping to build the foundation for understanding biodiversity, addressed with older students).
- **Lesson 2: What's in a Forest?** – Enhance student understanding of the variety of kinds of living plants, other than trees, that are part of the forest by displaying and discussing Herbarium wildflowers, ferns and fern allies, grasses and grass-like plants, and shrubs. Help students discover which of these non-tree species also have woody branches (shrubs). Help students understand that plants with woody branches rest from growing in the winter but add new branches and grow bigger each spring. Ask what happens to the other kinds of plants without woody branches and stems (trunks) in winter. (They die back above the ground each fall, live underground in the winter, and grow new stems each spring.)
- **Lesson 4: Forest Product Time Machine** – Adaptations/enhancements for northern Wisconsin
 - Introduction Step 1: Expand student's concepts of "pine cone" after playing the game, "Hot Pine Cone." Display and discuss Herbarium trees that all have cones, noting that not all cone trees are pines (a common misconception by all ages). See Appendix F of User Guide for list of coniferous trees in the collection. Note: eastern white pine, eastern hemlock, and white spruce specimens include cones; common juniper, balsam fir, black spruce, red pine, jack pine, eastern white cedar, and tamarack specimens do not include cones, though all these species bear cones.
 - Introduction Step 3 and Activity: Use the Herbarium collection to focus on and provide visual enhancements for how the Anishinaabeg (Ojibwe) traditionally

used forest plants. Refer to Appendices B and C of the User Guide for specific examples included in the Herbarium. Two of these specimens are clearly illustrated in Student Page 1, Native American, and Student Page 3, Forest Resource Cards: ininaatig (sugar maple) and wiigwaasaatig (white birch). Others directly relate to the illustration: zhingob gaawaandag (black spruce – roots used as twine in canoe construction), wiigobaatig (American basswood – inner bark – wiigob used as twine to tie frame of wiigwam), maananooons (eastern hop-hornbeam or ironwood – saplings used for wiigwam frame), and giizhikaandag (northern white cedar – boughs used as mattresses; needles used as tea).

Other plants gathered for food include:

- Berries and fruits
 - makade miskomin (common blackberry)
 - datgaagmin (thimbleberry)
 - asasaweminagaawanzh (chokecherry)
 - ode'imin (wild strawberry)
 - miin (low-bush blueberry)
 - miskomin (wild red raspberry; also leaves for tea)
 - wiinisiibag (wintergreen; also leaves for tea)
 - oginiiminagaawanzh (wild rose; hips also used for tea)
- vegetables
 - bagwaji-miskodiisimin (hog-peanut – edible pea-like pods)
 - bagwajipin (cream pea vine – edible pea-like pods)
 - miinikaanan (beach pea – edible pea-like pods)
 - waabiziipin (broad-leaved arrowhead, duck-potato, wapato – potato-like tubers on underwater roots)
- nuts
 - bagaaniminzh (American and beaked hazelnuts)
 - mitigomizh (northern red and Hill's oaks – acorns gathered to make flour)
 - bagaamizh (bur oak – acorns gathered to make flour)
- grains
 - manoomin (northern wild rice)

See Great Lakes Indian Fish & Wildlife Commission (GLIFWC) website www.glifwc.org/ at the link for Publications, Mazina'igan, for thorough lists of plants to harvest for each season:

- Winter 2002 issue—select link “Spring harvest opportunities”
 - Spring 2002 issue—select link, “Onjiakiing—From the Earth Harvest Calendar” for summer gathering information
 - Summer 2002 issue is a pdf document; scroll to p. 17 for “Fall harvest opportunities”
 - Fall 2002 issue—select link “Winter harvest opportunities”
- Following the above Herbarium adaptation/enhancement for northern Wisconsin, ask, “Which of these forest plant products are still gathered throughout northern Wisconsin by Ojibwe people?” (All are potentially still used to celebrate and teach traditional ways to next generations and to keep the gifts of cultural knowledge, art, and spirit alive. Manoomin (northern wild

rice), ininaatig (sugar maple for maple syrup), and giizhikaandag (northern white cedar for healing and spiritual uses) are widely gathered today.

- Ask a similar question for Student Page 2, European Settlers, “Which of the wild forest foods do you think European settlers gathered?” (mainly wild berries, nuts, and maple sap). The next question relates to everyone, “Which of these forest plant products do you and your family gather today?”

➤ **Lesson 5: Animals Need Forests Too –**

Activity 1, Step 2 – Use Herbarium specimens to help students picture (and draw) some of the plants that forest animals eat. A few examples include:

- white-tailed deer (northern white cedar, Pennsylvania sedge, trillium)
- red fox (raspberries, blackberries)
- white-footed deer mouse (seeds of rattlesnake manna grass)
- black bear (blackberries, hazelnuts)
- showshoe hare (dogwoods, gooseberry, currant)
- goldfinch (seeds of thistles)
- earthworm (leaves of aspens and maples)
- northern flying squirrel (seeds of maple trees)
- red squirrel (seeds from white pine and white spruce cones)
- wood duck (underwater roots of arrowhead or “duck potato”)
- beaver (bark and twigs of aspens)
- porcupine (bark of aspens)
- muskrat (pickerel weeds and giant bur-reeds)
- robin (fruits of viburnums and chokecherries)
- painted turtles (pickerel weeds)
- monarch butterfly caterpillar (milkweeds)

Northern Forest Digital Herbarium Curricula Complement For
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2-3 Unit

➤ **Lesson 1: To Be a Tree –**

INTRODUCTION:

- Step 8: Select a few of the many wildflowers from the Herbarium collection to help students see that their stems are not woody and they are not trees. This concept could be extended to include ferns, grasses, and sedges.
- Step 9: Use woody vines from the Herbarium collection (virgin's bower, greenbriar, Virginia creeper) to help students understand that because they lack crowns and cannot stand on their own, they are not trees.
- Step 10: Select several shrubs from the Herbarium collection (alder, dogwood, viburnum, honeysuckle, etc.) to show students some of the many kinds of shrubs found in the forest. Remind them that shrubs have many, many stems and not one main trunk.
- Steps 11 and 12: Select deciduous and coniferous trees from the Herbarium collection to show examples of diversity in trees.
 - Deciduous (leaves): sugar maple, silver maple, red maple, bur oak, red oak, Hill's oak, trembling aspen, big-tooth aspen, white birch, yellow birch, American basswood, white ash, green ash, black ash, mountain ash, American elm, shining willow, eastern hop-hornbeam (ironwood), chokecherry, pin cherry, smooth serviceberry
 - Coniferous (needles): common juniper, eastern hemlock, balsam fir, white spruce, black spruce, eastern white pine, red pine, jack pine, eastern white cedar, and tamarack (technically a deciduous conifer)

EXTENSION: Have students work as partners to choose one Herbarium deciduous tree specimen to trace the leaves, color, and cut to replace the leaf pattern on Teacher Page 1, Tree Parts, when making their tree costumes. The classroom forest will be a picture of diversity!

ACTIVITY 1: Once again, draw upon the Herbarium tree specimens used in steps 11 and 12 of the introduction as hands-on tools for learning tree identification vocabulary and skills. Here are some tips related to the vocabulary on Student Pages 1 and 2:

- Leaf types are evident on the tree Herbarium specimens. Conifers will be clearly single needles or groups of needles. (Cedars and junipers have yet a different type of needle structure, overlapping.)
- When determining leaf type in deciduous trees, buds hold the key to determining whether a leaf is simple or compound. Tell your students "look for the bud". Each leaf will have a new bud at its base, where it attaches to the branch.
- Simple leaves each have a new bud at their base (see a maple or oak Herbarium specimen).
- Compound leaves, like the ashes, are composed of several leaflets. New buds will not be found at the base of leaflets, rather where the compound leaf attaches to the branch.

- The Herbarium often shows tree leaves both attached to a branch and separated with a bud. You can also illustrate whether the leaves are arranged opposite or alternate.
- Leaf edges can be clearly observed and described using deciduous Herbarium specimens.
- Fruits (seeds and cones) are included in a few of the Herbarium tree specimens:
 - berries (chokecherry)
 - cones (eastern white pine, eastern hemlock, white spruce)

➤ **Lesson 2: What Makes a Forest?**

MATERIALS LIST

Add to list on p. 33 of guide:

- selected Herbarium specimens (see TEACHER PREPARATION Bullet 3 additions)
- 4 bath towels or hula hoops, labeled: Forest A, Forest B, Forest C, Forest D

TEACHER PREPARATION changes/additions to steps outlined on p. 33 of the guide:

- Bullet 1 as is, in addition see Bullet 3 below.
- Bullet 2 re Teacher Page 1 Forest Description Cards (TP1) – substitute the following:
 - a. Calculate the number of copies of TP1 needed (number of students/4); make copies
 - b. Cut copies to separate cards A, B, C, D
 - c. One by one, enlarge each card on a copy machine and print (i.e. card A fills an 8 ½ x 11 page, etc. – save for teacher use in Activity 1, Step 3 Adaptation d.
- Bullet 3 in addition, set up a “Forest Plant Nursery” in the classroom, gym, or cafeteria with the Herbarium specimens listed below. Spread specimens out with 2-3 feet separating each from the others but clustered in three distinct groups--deciduous trees; coniferous trees; shrubs. On each specimen, place the matching Tree and Shrub Community Member Cards copied and cut apart as directed on Teacher Pages 1A-C in the guide.
 - a. Deciduous trees: (American elm, silver maple, red maple, sugar maple, chokecherry, white birch, trembling aspen, red oak, white ash,
 - b. Coniferous trees: (white spruce, red pine, jack pine, white pine, white cedar)
 - c. Shrubs (maple-leaved viburnum, American blackberry, gooseberry, blueberry, American hazelnut, alternate-leaved dogwood)

ACTIVITY 1 ADAPTATION

Step 1 as presented in the guide

Step 2 as presented in the guide

Step 3 Adapt as follows:

Divide the class into four teams with the help of Teacher Page 1 (Forest Description Cards) (TP1) found in the LEAF guide.

- a. Ask students to sit in a circle. Explain that they will be doing an activity in teams, and that in just a moment, they will find out which team they'll belong to.

- b. Sit in the circle with the students. Shuffle the cards and place them face down on the floor in the middle of the circle.
- c. Starting with one student (birthday child?), and moving around the circle clockwise, have students (one at a time) draw a card and hold it until all students have drawn.
- d. (See TEACHER PREPARATION Bullet 2c above.) Using the enlarged cards A, B, C, and D, read all four cards aloud, while students read silently. Refer to Activity 1, Step 3 in the guide and to the symbols on the cards to explain how each card describes a different kind of forest in Wisconsin.
- e. Explain that those with the same cards will be a team. Have students with Card A sit together; follow suit for students with Cards B, C, and D.

Step 4 Adapt as follows:

Take students on a “field trip” to the “Forest Plant Nursery.” Explain that a forest nursery is a place where young trees and shrubs can be purchased to plant a new forest or to replace certain kinds of plants that might be missing from a forest that has been changed too much by people (i.e. cutting all the trees, planting all one kind of tree, etc.). Tell students they will work as teams to choose plants from the nursery that would grow well with the amount of moisture and nutrients found in the soil in their part of Wisconsin (as shown on their Forest Description Card). Select species from each group of plant types...plants that would thrive in forests represented by Forest Description Cards A, B, C, and D. (Explain that each Herbarium specimen was taken from a branch of the plant and might show leaves, needles, flowers, or fruits.) Examples:

- a. Silver Maple (deciduous tree) would thrive in Forest Type C (symbols all match – moist soil, high nutrients, southern Wisconsin; could also be Forest Type B)
- b. Jack Pine (coniferous trees) would thrive in Forest Type A (symbols all match – dry soil, low nutrients, northern Wisconsin; could also be Forest Type B).
- c. Aspen (deciduous tree) would thrive in Forest Type D (moisture symbol matches, nutrients symbol fits the range, central Wisconsin okay); could also be in Forest Type A (moisture fits range, nutrients fits range, northern Wisconsin okay; could also be Forest Type B).
- d. Blackberry (shrub) could thrive in Forests A, B, C, or D (fits within all ranges in moisture, nutrients, or state location).

Step 5 Adapt as follows:

- a. Instruct students to each select 2 – 4 trees or shrubs (Tree and Shrub Community Member Cards) from the nursery (number can vary depending upon class size; there are 58 cards in all.) Each student should select at least one tree (leaves or needles okay) and one shrub, and each plant selected should be different than the others. Challenge students to make sure the symbols on their tree or shrub card fit into the range of moisture, nutrients, or state location shown on their forest type. They can help each other.
- b. After students have “purchased” their trees and shrubs from the nursery (cards), they should plant them in their forest plots, making sure there are not two alike. Extras can be returned/exchanged at the

nursery. Give teams time to gather around their forest plots and talk about whether each plant belongs in their forest type.

- c. Check the answer key to make sure their plants belong on their forest.

Step 6 and Step 7 as presented in the guide

CONCLUSION enhancement

Step 2 and 3 – use Herbarium specimens as visual references for plant species mentioned in each Wisconsin Forest Description (Student Pages 1A-1D)

- Student Page 1A - Pine
red pine, white pine, jack pine, yellow lady's slipper, moccasin flower (pink lady's slipper), blueberry, wintergreen
- Student Page 1B – Urban
White or paper birch, sugar maple, silver maple, red maple, American elm
- Student Page 1C – Deciduous
bur oak, northern red oak, pin cherry, chokecherry, sugar maple, red maple, silver maple, trembling aspen, big-tooth aspen, eastern hop-hornbeam (ironwood), red osier dogwood, alternate-leaved dogwood, round-leaved dogwood, poison ivy, maidenhair fern
- Student Page 1D – Pine/Deciduous Mixed
Red pine, white pine, sugar maple, red maple, silver maple, northern red oak, bur oak, white birch, yellow birch, American red raspberry, dwarf red raspberry, wintergreen, Virginia creeper

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4 Unit

➤ **Lesson 1: Native Americans and the Forest**

Activity 1, Step 2 – use Herbarium specimens as references for plants named in each journal.

Student Page 1A:

- eastern white pine (zhingwaak)
- red pine (apakwanagemag)
- white spruce (gaawaandag)
- balsam fir (zhingob)
- American basswood (wiigobaatic)
- dark-green bulrush
- white birch (wiigwaasaatic)

Student Page 1B:

- white birch (wiigwaasaatic)
- white spruce (gaawaandag)
- eastern white pine (zhingwaak)
- red pine (apakwanagemag)
- northern white cedar (giizhik - tree, giizhikaandag - bough)
- northern wild rice (manoomin)

Student Page 1C:

- sugar maple (ininaatic)
- eastern white pine (zhingwaak)
- red pine (apakwanagemag)
- common blackberry (makade miskomin)
- American red raspberry (miskomin)
- trembling aspen (azaadii)
- big-tooth aspen (azaadii)

Student Page 1D:

- eastern white pine (zhingwaak)
- red pine (apakwanagemag)

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5-6 Unit

- **Lesson 2: What Makes a Forest?** – ACTIVITY 2 Step 5 Enhancement – Use the Herbarium collection of shrubs and forbs to help students understand the diversity of species found in these forest layers. Refer to Appendix F of the User Guide for a complete list of represented species. The specimens will also help students distinguish between forbs and shrubs. They will easily see that shrubs have woody stems, whereas forbs (wildflowers, ferns and fern allies) do not. It is good to note that their definitions of shrubs can be expanded with the help of the Herbarium. Not all shrubs have multiple stems. Some creep along the forest floor (bearberry, wintergreen); others trail under the surface, sending only leaves or flowers aboveground (bunchberry); and some both creep and climb (poison ivy, Virginia creeper). In addition, the forb layer also includes sedges and grasses, two of which are included in the Herbarium (bottlebrush grass, Pennsylvania sedge).
- **Lesson 3: Forests Are Always Changing** –
 - ACTIVITY 1, Step 4 - Use Herbarium specimens to serve as display references and visual enhancements (trembling aspen, white birch, eastern white pine, northern red oak, American basswood, sugar maple).
 - ACTIVITY 2, Step 3 – Use red pine Herbarium specimen as visual reference for student recognition. Displaying it alongside eastern white pine is a good way to reinforce identification skills. Students can see white pine has five needles in a bundle and red pine has two, much longer needles in each bundle.
- **Lesson 4: Ecosystem Extravaganza** – ACTIVITY 2 Extension – Encourage students to read about each of the animals listed as consumers (rabbit, deer, grouse, squirrel, mouse) to find out which plant species they primarily consume. Teams could create elaborate food chains and webs using yarn to connect poster-sized pictures and incorporating species from the Herbarium. Example: In addition to eating insects, ruffed grouse eat buds, seeds, nuts, and fruits of numerous plant species (strawberry, raspberry, blackberry, hemlock, aspen, maple, birch, willow, alder, spruce, partridgeberry, etc.). Research and display could further extend to consumers beyond the scope of those named in the activity.
- **Lesson 5: We All Need Trees** – Enhancement – Have students decorate the classroom with Herbarium specimens to celebrate the diversity of forest species that provide beauty, recreation, environmental services, products, ecological benefits to wildlife, and food.

Northern Forest Digital Herbarium Curricula Complement For
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7-8 Unit

➤ **Lesson 1: Discovering Wisconsin's Forests – ACTIVITY 2/CONCLUSION**

Extensions –

Forest/habitat type categories differ between the Herbarium and LEAF. The Herbarium uses forest/habitat type categories in northern Wisconsin based on soil moisture and species composition as described on the University of Wisconsin Botany website www.botany.wisc.edu/wisflora/

- Boreal Forest
- Northern Dry Forest
- Northern Dry-Mesic Forest
- Northern Mesic Forest
- Northern Wet-Mesic Forest
- Pine Barrens

LEAF's forest type categories correspond with forest/habitat types based upon tree dominance. Northern forests are, for the most part, represented by the following forest type categories (with Oak/Hickory Forests more commonly in southern Wisconsin):

- Maple/Basswood
- Spruce/Fir
- Aspen/Birch
- Pine

Challenge students to investigate how the differing categories correspond. In the process, have them sort Herbarium specimens according to forest/habitat types. It would also be helpful to have them study associated species within each forest/habitat type.

Further investigations could focus on specific forests located in or near their community. Make the User Guide available to students (maps, site descriptions, and copies of Appendices D and E, specifically) to help them in their task of comparing, correlating, and equating the different forest/habitat type categories. Investigations should show that the following conclusions could be drawn:

Herbarium Habitat Type Category	correlates most closely with	LEAF Forest Type Category
Boreal Forest*		Spruce/Fir Forest
Northern Dry Forest		Pine Forest
Northern Dry-Mesic Forest		Aspen/Birch Forest
Northern Mesic Forest		Maple/Basswood Forest
Northern Wet-Mesic Forest		Spruce/Fir Forest
Pine Barrens		Pine Forest

*LEAF uses Boreal Forest as a biome, and Wisconsin forest *types* as part of the Temperate Forest Biome.

- **Lesson 2: Biodiversity and the Forest Connection** - Display Herbarium specimens to celebrate biodiversity in northern Wisconsin forests and to serve as visual and information references throughout the lesson (omit invasive species – see Appendix G; use in Lesson 6). Help students to notice the different habitat types represented in the Herbarium collection (refer to Appendix E). Pointing out examples, ask, “Why do you think this forest Herbarium includes plants found in bogs (pitcher plant, cotton grass), along riverbanks (blue flag, wild rice), in open wet meadows (rattlesnake manna grass, swamp milkweed), and in an open pine barrens (naked sunflower, blazing star)?” (Answer: The forests of northern Wisconsin include a diversity of habitats and encompass streams, lakes, wetlands, beach dunes, farms, homes, and communities.)

- **Lesson 6: Making Broader Connections** – ACTIVITY 3 – Extension – Offer the Herbarium collection and the User Guide (Educational Connections, Invasive Species Awareness and Action) as a resource for a team of students as they research, prepare, and present information about the issue of invasive plant species and their social, economic, and environmental impacts. See Appendix G for a list of invasive plant specimens that can be found in the Herbarium.

- **Field Enhancement 1: Tree Identification** - Use Herbarium tree specimens in the classroom as hands-on tools to help students learn tree identification vocabulary and skills (they are too large and might be damaged if used outdoors). Note: Buds hold the key to determining whether a leaf is simple or compound. Tell your students “look for the bud”. Each leaf will have a new bud at its base, where it attaches to the branch. Simple leaves each have a new bud at their base (see a maple or oak Herbarium specimen). Compound leaves, like the ashes, are composed of several leaflets. New buds will not be found at the base of leaflets, rather where the compound leaf attaches to the branch. The Herbarium often shows tree leaves both attached to a branch and separated with a bud. Use the specimens as you teach the vocabulary associated with: branching (opposite or alternate); conifers (bundles, coniferous, evergreen, scaly); deciduous (broad-leafed, compound leaf, deciduous, leaflets, petiole, simple leaf, veins); and leaf margins (entire, lobed, margin, sinuses, toothed). The Herbarium includes specimens from the following trees:
 - Coniferous (needles): common juniper, eastern hemlock, balsam fir, white spruce, black spruce, eastern white pine, red pine, jack pine, eastern white cedar, and tamarack (technically a deciduous conifer)
 - Deciduous (leaves): sugar maple, silver maple, red maple, bur oak, red oak, Hill’s oak, trembling aspen, big-tooth aspen, white birch, yellow birch, American basswood, white ash, green ash, black ash, mountain ash, American elm, shining willow, eastern hop-hornbeam (ironwood)

Northern Forest Digital Herbarium Curricula Complement For
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9-12 Unit

➤ **Lesson 1: The Forest Odyssey**

ACTIVITY 3 – Forest Ecosystem Research

Steps 5-7 Make the Herbarium collection available during research. Encourage students particularly interested in botany to utilize Appendices D and E of the User Guide to help them find specimens in the Herbarium collection that would be found in the ecosystem their group is researching. Point out that the Herbarium refers to “Habitat Types”. The following tips will be useful:

- For students studying the “Oak Savanna” ecosystem, remind them that savannas in northern Wisconsin were typically Pine Barrens, an endangered ecosystem. The Herbarium, collected in northern Wisconsin, includes plants found in Pine Barrens or Northern Dry Forests (many of which are overgrown barrens lost to cessation of fire).
- Students studying the “Forested Wetland” ecosystem will find specimens in the Herbarium collected in the following habitat types:
 - Alder Thicket
 - Northern Wet-Mesic Forest
 - Northern Mesic Forest
 - Open Bog
- Students researching the “Northern Hardwood Forest” ecosystem would find species dispersed throughout the Herbarium, but mainly in the following habitat types:
 - Northern Dry-Mesic Forest
 - Northern Mesic Forest

➤ **Lesson 2: A History of Succession** – ACTIVITY 5 – Tree Profiles - Place the five profiled Herbarium tree species throughout the room to designate group study areas: red pine, jack pine, trembling (quaking) aspen, black ash, sugar maple. Use the white pine specimen during the example (step 3).

➤ **Lesson 3: Forest Biodiversity: Tree Case Studies**

○ ACTIVITY 2 – Case Study Preparation

- Step 1 – while presenting Forest Biomes (Teacher Page 8) using Forest Biomes Lecture Notes (Teacher Page 7), have Herbarium specimens displayed as ready visual references when mentioned in the discussions
 - Temperate Forests (oaks, maples, poplars, pines, balsam fir, spruces)
 - Grasslands (big blue-stem grass is an example)
 - Savannas (jack pine, bearberry, and low-bush blueberry are examples from the Pine Barrens)
 - Boreal (eastern hemlock, northern white cedar, mountain ash)
- Steps 2 and 3 – For the sake of review for students, have students find examples of each of the following from the Herbarium: deciduous, coniferous, understory (including shrub and forb layers)

- ACTIVITY 4 – Tree Case Studies – Place the four Herbarium tree species highlighted in this activity throughout the room to designate case study groups: American elm, eastern hemlock, red maple, white (bur) oak. Note: the Herbarium was created in northern Wisconsin, out of the white oak (*Quercus alba*)’s native range. Bur oak (*Quercus macrocarpa*) is a member of the white oak family and is referred to in the white oak study. As each group presents, they should utilize their Herbarium specimen as a visual reference for the rest of their class. Encourage students in the white oak group to show a visual of *Quercus alba*, for comparison with *Quercus macrocarpa*. For images of the white oak, direct students to LEAF’s online tree identification cards at www.uwsp.edu/cnr/leaf/treeid
- **Lesson 4: The Forest Marketplace** - ACTIVITY 5 – A Wisconsin Marketplace – Display Herbarium tree species featured on Student Pages 4B-4G: jack pine, red pine, white pine, northern white cedar, white spruce, black spruce, tamarack, black ash, white ash, green ash, big-tooth aspen, trembling (quaking) aspen, American basswood, yellow birch, paper birch, sugar maple, red maple, and northern red oak

Note: Balsam poplar and black cherry, common northern forest species, are not included in the Herbarium. The Herbarium also does not include beech, cottonwood, hickory, white oak, black walnut, or butternut, all of which are more common in southern and eastern/southeastern Wisconsin. Encourage student(s) to draw/print images of the leaves of these species to complete the display. LEAF’s website at www.uwsp.edu/cnr/leaf/treeid.htm contains not only all the above trees (except butternut), but also numerous other internet sites where tree images and identification information can be found. The University of Wisconsin botany website is another excellent resource. www.botany.wisc.edu/wisflora/

Reference is also made to some trees that do not grow in Wisconsin (yellow poplar or tulip tree, Douglas fir, mahogany, pecan, yellow pine, Canadian spruce, western red cedar, and ebony).

- **Lesson 5: Forest Science and Technology** – ACTIVITY 5: Forest Management: Landscape Scale and ACTIVITY 6: Forest Management: Time Scale -- Display four Herbarium species as visual references to enhance discussion of Teacher Pages 8-11 (red pine, trembling aspen, sugar maple, eastern hemlock).

Northern Forest Digital Herbarium Curricula Complement for
Project Learning Tree: Environmental Education PreK-8 Activity Guide

American Forest foundation
1111 Nineteenth St., NW, Suite 780
Washington, D.C. 20036
(202) 463-2462
email: information@plt.org
website: www.plt.org

Wisconsin Project Learning Tree
Wisconsin Department of Natural
Resources
101 S. Webster, CE/6
Madison, WI 53707-7921

The Northern Forest Digital Herbarium (Herbarium) includes 200 laminated 11 x 17 digitally reproduced actual plants found in northern Wisconsin forests. Each specimen is labeled with scientific, common, and Anishinaabe (Ojibwe) names, along with complete collection data.

The following examples will illustrate ways in which the Herbarium resource can be used to specifically complement the Project Learning Tree Activity Guide's five major theme areas: diversity, interrelationships, systems, structure and scale, and patterns of change.

Diversity

- **Activity 1 (PK-3), pp. 3-4 “The Shape of Things”** - Use the Herbarium collection to illustrate and demonstrate diversity of habitats and organisms; diversity in types of trees; diversity of life in forest ecosystem; diversity of types of plants (ferns, horsetails, coniferous trees, deciduous trees, shrubs, vines, wildflowers, grasses, sedges, aquatic plants).
- **Activity 2 (PK-6), pp. 5-6 “Get In Touch With Trees!”** – Add sense of vision – collect deciduous leaves in fall – observe diversity; match with Herbarium deciduous tree specimens back in the classroom.
- **Activity 17 (5-8), pp. 54-55 “People of the Forest”** – Substitute learning that relates to Anishinaabe (Ojibwe) traditional dependence on the forest, including treaty rights to hunt, fish, trap, and gather on public lands. (Example: “Growing Up Ojibwe” included in the binder pockets of this User Guide; see also Anishinaabe Connections section of this User Guide. Other publications included in the pockets are appropriate for middle school, high school, and adult learners.)

Interrelationships

- **Activity 27 (K-8), pp. 83-84 “Every Tree For Itself”** – Extension: Have students select all the trees in the Herbarium collection and sort into three groups according to the amount of moisture in the soil needed. This relates to forest habitat types in northern Wisconsin: northern dry forest, northern dry-mesic forest, northern mesic forest, northern wet-mesic forest, and boreal forest. This information is noted on each Herbarium label. Best suited for K-5, with Activity 29 more challenging for middle school.
- **Activity 29 (6-8), pp. 88-92 “Rain Reasons”** – Adapt, extend, or use as assessment by relating the activity to northern Wisconsin habitat types and the plants adapted to these habitats.

- o Consult Appendix E of the User Guide for a list of habitat types and associated species represented in the Northern Forest Digital Herbarium collection.
 - o Select Herbarium specimens to form teams “serendipity” style—in a class of 24 students, form six teams by selecting four plants from six different habitat types. Remember to choose a variety of plant types. Your selection might look like this:
 - o Pine Barrens (jack pine, blackberry, big blue-stem grass, and showy blazing star)
 - o Northern Dry Forest (Hill’s oak, bracken fern, Canada honeysuckle, and wood anemone)
 - o Northern Dry-Mesic Forest (northern red oak, balsam fir, scouring rush, and yellow lady’s-slipper)
 - o Northern Wet-Mesic Forest (black ash, marsh-marigold, Jack-in-the-pulpit, and purple-stemmed aster)
 - o Northern Mesic Forest (eastern hemlock, tag alder, maidenhair fern, and liver-leaf wintergreen)
 - o Open Bog (black spruce, leather leaf, rusty cotton-grass, and pitcher-plant)
 - o Without revealing that students will be divided into teams based on the habitat type listed on their Herbarium sheets, lay out the 24 specimen sheets and ask students to select any sheet for the next activity. This can be done as students enter the classroom.
 - o Have students read the label on their specimen, noting the plant’s names and habitat type where it was collected.
 - o Designate six areas in the classroom, cafeteria, or computer lab with names of habitat types. Have students move to and sit at “assigned” area. (No fair, trading!) This usually results in balanced and diverse teams, drawn together by “serendipity”.
 - o Teams then conduct research on their habitat type, their selected species, and other plants found in their habitat type. Your best resource as close as your computer is the University of Wisconsin Botany website at www.botany.wisc.edu/wisflora/
 - o Team documents, presentations, etc. can then be shared with the entire class.
- **Activity 35 (6-8), pp. 108-113 “Loving It Too Much”** – The User Guide will help you adapt this activity to public lands and forests in northern Wisconsin. See Northern Forest Connections section and Appendices D and H for information related to specific sites on public land near your community where plants were collected. (Amnicon Falls State Park, Big Bay State Park, Big Rock County Park, Brule River State Forest, Chequamegon National Forest (Chequamegon-Nicolet National Forest), Flambeau River State Forest, Kimball Town Park, Lake of the Falls County Park, Lucius Woods County Park, Nicolet National Forest (Chequamegon-Nicolet National Forest), Northern Highland American Legion State Forest, Ojibwa Town Park, Port Wing Boreal Forest State Natural Area, Potato River Falls County Park, and St. Croix National Scenic Riverway).

Systems

- **Activity 41 (4-8), pp. 135-136 “How Plants Grow”** – To further enrich or extend this activity for gifted and talented students, see Appendix G for a list of invasive plants included in the collection. Select these Herbarium sheets and distribute them among the students. Have students read each label – it will indicate habitat type and the term, “disturbed”, will be used. Pose the question, “What happens when a non-native, invasive plant moves into an area? How does it spread? How do humans cause “disturbance” and why are invasive plants often found in disturbed habitats? How do invasive plants “rob” native plants? Challenge students to design and conduct a scientific investigation that would prove or disprove their theories. Have students seen any of these invasive plants or others they have learned about? Where? Are any in the schoolyard? school forest? local park? public lands near them? Involve students in stewardship activities to help stop the spread of invasive plants. See Table of Contents, Educational Connections, Invasive Species Awareness and Action, for background information, resources, and more teaching tips.
- **Activity 42 (2-8), pp. 137-138 “Sunlight and Shades of Green”** – As an introduction to this activity, have students browse the Herbarium collection, selecting examples of different shades of green. Students can match the shades with greens in a large box of crayons or greens available in computer programs for fonts and designs. Have students arrange Herbarium specimens from lightest to darkest green. What is the color green in plants all about?
- **Activity 43 (K-8), pp. 139-141 “Have Seeds Will Travel”** – Select Herbarium specimens that include seeds or seed structures to introduce the activity, to motivate discovery and discussion, and to prepare students for the outdoor seed collection part of the activity.
 - seeds (American spikenard, bland sweet cicely, swamp thistle, big-bluestem grass, bottlebrush grass, fringed brome, American manna grass, rattlesnake manna grass, Canada wild-rye, bottlebrush sedge, fringed sedge, dark-green bulrush, woolgrass, giant bur-reed, and northern wild rice)
 - fruits (common blackberry, American red raspberry, dwarf red raspberry, chokecherry, bristly rose, and Tartarian honeysuckle [non-native, invasive])
 - nuts (American and beaked hazelnut)
 - cones (eastern white pine, eastern hemlock, white spruce)
- **Activity 45 (4-8), pp. 148-150 “Web of Life”** – Use Herbarium specimens to enhance step 3 of “doing the activity”--make a class list of plants that live in the forest. Select a variety of plant types. Of the examples listed in the activity, the Herbarium includes the following native species: columbine, honeysuckles (northern-bush, Canada), maples (silver, sugar, red), pines (white, red, jack), poison ivy, and violet (hooked-spur). A total of 200 species are available. Select species students are most likely to experience in forests near you and others they can appreciate or discover. In Steps 5-7, the Herbarium sheets will assist the plant team as they draw the plants to include in the class mural.

- **Activity 54 (4-8), pp. 188-190 “I’d Like to Visit a Place Where ...”** – The Herbarium will help students recognize and list the kinds of plants they’ve seen in northern Wisconsin forests (Part A step 3). The Herbarium and User Guide will help you adapt the activity to northern Wisconsin. In Part B, select a park or public forestland near you. Consult the Table of Contents to find collection sites near you. Many are recommended for on-site study and stewardship.

Structure and Scale

- **Activity 61 (PK-6), pp. 217-218 “The Closer You Look”** – Use Herbarium leaves and needles collected from deciduous and coniferous trees to have students focus on variation. This could be used as a motivating activity in fall prior to taking students to a forest to observe tree variation in shape, size, and structure and to collect and press leaves/needles of their own.
- **Activity 62 (PK-4), pp. 219-222 “To Be a Tree”** – Have each student select one Herbarium deciduous tree specimen to trace the leaves, color, and cut for use in steps 1 and 2 (making a tree costume).
- **Activity 63 (3-6 Activity; PK-2 Variation), pp. 223-227 “Tree Factory”** – Use Herbarium specimens of non-woody plants to help students observe roots and root hairs. Students are better able to transfer this concept to trees after this visual experience. Recommended specimens: ferns and allies (maidenhair fern, oak fern, common polypody fern, scouring rush, northern tree clubmoss), grasses (rough grass, northern wild rice), forbs/wildflowers (round-lobed hepatica, smooth aster, three-leaved goldthread, thick-leaved wild strawberry, bushy pinweed, small forget-me-not, swamp smartweed, broad-leaved arrowhead, eastern swamp saxifrage, early meadow-rue, nodding trillium, hook-spur violet, barren strawberry).
- **Activity 64 (K-4), pp. 228-231 “Looking at Leaves”** – Use deciduous tree leaves in the collection during “Getting Ready”. With close inspection and observation, students will be able to describe differences between species ... even differences in leaves from the same branch of the same tree. They will be able to see whether the leaves are hairy or have been eaten by insects. (Provide magnifiers.) Young students can answer, “Who found the biggest leaf? The narrowest leaf? The smallest leaf?” Now is the time to introduce the difference between simple and compound leaves ... combine this with activity 65 “Bursting with Buds”. Which leaf is actually bigger? The black ash (compound) or the bur oak (simple)?
- **Activity 65 (K-6), pp. 232-233 “Bursting Buds”** – This activity is designed to be conducted outside in late fall (after trees have lost their leaves), in winter, and several times again in spring. Use the Herbarium at the beginning of the school year to help students prepare for learning about buds. Buds hold the key to determining whether a leaf is simple or compound. Tell your students “look for the bud”. Each leaf will have a new bud at its base, where it attaches to the branch. Simple leaves each have a new bud at their base (see a maple or oak Herbarium specimen). Compound leaves, like the ashes, are composed of several leaflets. New buds will not be found at the base of leaflets, rather where the compound leaf attaches to the branch. The Herbarium often shows tree leaves both attached to a branch and separated with a bud. You can also

illustrate whether the leaves are arranged opposite or alternate. These terms are basic when using a dichotomous identification key. By the time students are in grades 4-6, they should be able to begin using a key to identify trees by their leaves. Back to Activity 65: The activity will hold even more magical discovery as students observe changes in the buds from the time leaves have fallen to when trees flower and leaves unfold in spring. Use the Herbarium deciduous tree specimens to help students relate to their leafless tree's identity.

- **Activity 68 (2-8), pp. 244-246 “Name That Tree”** – Use Herbarium tree specimens as hands-on tools for learning tree identification vocabulary and skills as you teach “needles or broad leaves, the shape of things, margins, simple and compound, and leaf arrangements” – see Activity 65 above.
 - Coniferous (needles): common juniper, eastern hemlock, balsam fir, white spruce, black spruce, eastern white pine, red pine, jack pine, eastern white cedar, and tamarack (technically a deciduous conifer)
 - Deciduous (leaves): sugar maple, silver maple, red maple, bur oak, red oak, Hill's oak, trembling aspen, big-tooth aspen, white birch, yellow birch, American basswood, white ash, green ash, black ash, mountain ash, American elm, shining willow, eastern hop-hornbeam (ironwood)
- **Activity 71 (7-8), pp. 258-264 “Watch on Wetlands”** – For Part A, Adopt a Wetland, refer to Appendix E for a list of Herbarium wet-mesic forest, open bog, northern sedge meadow, and emergent aquatic species. Select them from the collection to give students visual introductions to a few of the diverse kinds of plants they may encounter in various types of wetlands. This background will also help the “Plant Survey Team” prepare for field studies. Help students become aware of threats posed by non-native invasive purple loosestrife (see Invasive Species Awareness and Action information in this section of the User Guide for more on teaching about this plant).

Patterns of Change

- **Activity 80 (3-6), pp. 306-310 “Nothing Succeeds Like Succession”** – Use the Herbarium to prepare students for their field trip to plant communities in different stages of succession. Refer to Appendix F for species sorted by plant types. Prior to their trip, they should be able to define and find examples of grasses and other “non-woody” herbaceous plants (sedges, ferns and fern allies, forbs/wildflowers) and shrubs (woody species smaller than trees but differentiated from tree saplings).
- **Activity 94 (6-8), pp. 362-365 “Where are the Cedars of Lebanon?”** – The Herbarium will help you introduce this activity by building on what students already know, helping them to truly grasp the intended objectives ... that 1) “students will investigate how ancient civilizations used natural resources and affected the environment and 2) apply environmental lessons learned in the past toward solving current environmental problems.” Dedicate an entire lesson to laying the foundation for this activity and revealing its relevance for this generation.
 - Use the eastern white pine specimen to stimulate a discussion of what students know about the tree that once was “king” of northern forests, its importance in the region's history, and its loss during the logging heyday of the late 1800s and early 1900s.

- o Use the northern white cedar specimen to query students on their knowledge of this tree. White cedar is *Arbor vitae*, the “tree of life.” One of the sacred plants to the Anishinaabeg, it heals and purifies and repels insects. Once another giant of old growth forests, it too fell to the cross-cut saw following the white pine cutover. Prized for beautiful grain and insect and rot resistance, white and red cedar are still valued for siding the houses and lining the closets of the wealthy and middle-class. Unlike white pine, cedar struggles to regenerate itself. Cursed as deer “candy”, and confined largely to wet habitats, cedar has ceased to be a “profitable” resource in northern Wisconsin. Our northern forests, wonderful as they are, largely lack the majesty of old growth cedars and pines. A few gems can still be found in special places. One such place is Menominee County, managed in trust for this and for future generations by the Menominee Nation. Go to the website of Menominee Tribal Enterprises for an adventure in inspiration and education in forest sustainability: www.mtewood.com
- o Tell students they are now going to study an ancient civilization’s uses of another cedar, also a giant in its native country. From an empire known as “Babylonia”—now Iraq--students will investigate the history of how the ruler of a vast empire prided himself in exploiting the rich resources of the region to create unprecedented wealth and power-- and how this ruler’s short-sighted greed led to the loss of the richest soil ever found anywhere, and eventually to the downfall of the empire itself.

Northern Forest Digital Herbarium Curricula Complement for *Wisconsin Forests Forever*

Wisconsin Forest Resources
Education Alliance (WFREA)
6343 Hwy 8 West,
Rhinelander, WI 54501
(888) WFREA-64
website: www.wfrea.org

The Northern Forest Digital Herbarium (Herbarium) includes 200 laminated 11 x 17 digitally reproduced actual plants found in northern Wisconsin forests. Each specimen is labeled with scientific, common, and Anishinaabe (Ojibwe) names, along with complete collection data.

The Herbarium complements the CD educational resource, *Wisconsin Forests Forever*, produced by Wisconsin Forest Resources Education Alliance (WFREA), in the following ways:

- Expands northern Wisconsin forest descriptions as study sites
 - Amnicon Falls State Park
 - Big Bay State Park
 - Brule River State Forest
 - Chequamegon-Nicolet National Forest*
*listed separately in *Wisconsin Forests Forever*
NFDH focuses on ten national forest sites for field study
Ashland County (Chequamegon National Forest)
 - 1. Black Lake
 - 2. Day Lake
 - 3. Lake Three
 - 4. Penoque Mt. Overlook
 - 5. Springbrook Non-Motorized AreaBayfield County (Chequamegon National Forest)
 - 6. Drummond Interpretive Trail
 - 7. Long Lake
 - 8. Moquah Barrens
 - 9. Northern Great Lakes Visitor CenterForest County (Nicolet National Forest)
 - 10. Luna-White Deer
 - Flambeau River State Forest
 - Northern Highland-American Legion State Forest
- Describes and recommends additional northern Wisconsin sites for field study:
 - County Parks
 - 1. Big Rock County Park (Bayfield County)
 - 2. Lake of the Falls County Park (Iron County)
 - 3. Lucius Woods County Park (Douglas County)
 - 4. Potato River Falls Park (Iron County)
 - Town Parks
 - 1. Kimball Town Park (Iron County)
 - 2. Ojibwa Town Park (Sawyer County)

State Natural Areas and Riverways

1. Port Wing Boreal Forest Natural Area
2. St. Croix National Scenic Riverway
 - Namekagon River
 - Namekagon Barrens
 - St. Croix River

The Herbarium can also be used to specifically complement the *Wisconsin Forests Forever* Teacher's Guide (student activities) as follows:

- Pp. 31-38 "Get Connected" - Use Herbarium collection to illustrate and demonstrate diversity of habitats and organisms; diversity in types of trees; diversity of life in forest ecosystem; diversity of types of plants (ferns and fern allies, coniferous trees, deciduous trees, shrubs and woody vines, wildflowers, grasses and grass-like plants)
- Pp. 39-46 "Nothing Succeeds Like Succession" – Use Herbarium collection to reinforce understanding and examples of plant types ("weeds" – non-natives? shrubs) Students can select specimens that might "succeed" in different forest types.
- PP. 77- "A Forest Near You!" – Herbarium specimens have been collected from public forested lands throughout northern Wisconsin. Twenty-seven collection sites are fully described in the User Guide. Examples of specific plants are included in the collection.
- Pp. 81-87 "Picture the Forest" – Use Herbarium collection to aid students as they draw a forest and its diversity of plants.

Invasive Species Awareness and Action

The Northern Forest Digital Herbarium includes 19 non-native plants collected in northern forests (see Appendix G of the User Guide). Eight of these terrestrial species have proven to be particularly invasive, and strenuous effort to stop their spread is underway by citizens, non-profit conservation groups, and natural resource agencies at tribal, state, and federal levels. (Note: The Herbarium is not all-inclusive in its representation of invasive species and does not imply other invasive species are of less significance.)

Education for citizens of all ages is vitally important in this fight against invasive species and the ecological, aesthetic, and economic threats they pose. Stewardship efforts can slow their spread. People need to understand the issues, recognize the plants, and know what kinds of action they can take.

The scope of this project cannot adequately address education on the issue of invasive species. However, educators, students, and citizens will find detailed information on how to control the following Herbarium species in the “Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants” [referred to below as Manual], Bureau of Endangered Resources, Wisconsin Department of Natural Resources, May 1997. The manual, in its entirety, can be found on the WDNR’s website at www.dnr.state.wi.us/invasives/. The material may be reproduced and distributed to further educational and stewardship efforts to control the spread of invasive species.

Manual pages	Scientific name	English (common) name(s)
11-15	<i>Rhamnus cathartica</i>	European buckthorn, common buckthorn
19-21	<i>Lonicera tatarica</i>	Tartarian honeysuckle
32-34	<i>Cirsium arvense</i>	Canada thistle
41-43	<i>Euphorbia esula</i>	leafy spurge
44-47	<i>Centaurea maculosa</i>	spotted knapweed
51-53	<i>Melilotus alba</i>	white sweet clover
57-60	<i>Lythrum salicaria</i>	purple loosestrife

The Herbarium also includes four native species that can become invasive and require control. Manual page references follow for these species as well:

Manual pages	Scientific name	English (common) name(s)
72-74	<i>Populus grandidentata</i>	big-tooth (large tooth) aspen
	<i>Populus tremuloides</i>	quaking (trembling) aspen
75-77	<i>Cornus stolonifera</i>	red-osier dogwood
89	<i>Toxicodendron radicans</i>	poison ivy

The WDNR website cited above also offers comprehensive lists and links to numerous other invasive species educational resources. Adding to the wealth of educational resources available, publications, workshops, and more links can be found on WDNR’s sponsored website for Project Wild, Project Wet, and Project Learning Tree at <http://dnr.wi.gov/org/caer/ce/pltwild/edres.htm>.

In addition, another incredibly impressive list of invasive plant educational materials, including activity books, binders, books, booklets, videos, brochures, CD-Roms, curricula, displays, education packages, email outreach, factsheets, field guides, learning kits, manuals, newsletters, online publications, photos, identification cards, posters, Powerpoint presentations ... even lifelike weed models ... is provided by Midwest Invasive Plant Network at MIPN.org.

Note:

Three brochures are included in the back of the Appendices section of this User Guide:

“Plants Out of Place”

“Purple Loosestrife: What You Should Know, What You Can Do”

“Target: Leafy Spurge”