

Black Bear Food Items in Northern Wisconsin

Abstract We identified 68 black bear (*Ursus americanus*) food items in 967 scats collected during May through August 1976–79. Frequency of occurrence and volume composition indicate that seasonally important foods were grasses (*Gramineae*), sedges (*Carex* spp.), sweet cicely (*Osmorhiza claytonii*), and quaking aspen (*Populus tremuloides*) in May; grasses, sedges, ants (*Formicidae*), jack-in-the-pulpit (*Arisaema triphyllum*), and sweet cicely in June; ants, tree and shrub fruit, and wild sarsaparilla (*Aralia nudicaulis*) in July; ants and tree and shrub fruit in August. Plants were found in 100% of the scats, insects in 47%, and other animals in 15%. Of 13 forest communities examined, important bear foods appeared to be more abundant in boreal, aspen, wet mesic, and wet communities.

Black bear food habits have been reported elsewhere in recent studies (Beeman and Pelton 1980, Irwin and Hammond 1985, Rogers 1987, Hellgren and Vaughan 1988, MacHutchon 1989, McClinton et al. 1992, Hellgren 1993, Boileau et al. 1994). Seasonal changes in diets of black bears are related to availability of foods, preference, and physiological needs (Tisch 1961, Landers et al. 1979, Beeman and Pelton 1980). Availability of foods has been reported to influence reproductive success and the localization of activities within home ranges (Rogers 1976, 1987; Lindzey and Meslow 1977; Novick 1979; Beecham 1980; Young 1980). Thus, the identification of principal and alternate food sources is an important aspect of black bear ecology.

This paper is the compilation of 2 studies (Norton 1981, Bertagnoli 1986) designed to identify the important summer (May–August) food items for black bears. The compilation provides the most comprehensive list of black bear foods for

¹ Deceased, June 20, 1993, at age 43 from Lou Gehrig's disease. This paper is dedicated to him and the memory of his sense of humor and his professionalism, especially his contribution to black bear biology.

Wisconsin. The information can be used to help understand differences in bear productivity within the Great Lakes region and to identify potential impacts of forest management activities on bear habitat quality.

Study Area

The 995-km² study area was located in western Iron County, Wisconsin, which borders Lake Superior and the Upper Peninsula of Michigan (Figure 1). Kohn (1982) estimated a population of 255 black bears (1 bear/3.9 km²) in the study area. A series of hills (the Penokee Range) divides the area into northern and southern zones. The northern zone comprises 25% of the study area and has moderately fertile loams and sandy loams (Soil Conservation Service 1972), with forestry and agriculture the major land uses. The southern zone soils are typically clay or sandy loams representing the Gogebic and Wakefield series (Curtis 1959), with forestry and forest-related recreation the major land uses.

Hardwood and coniferous forest types (Curtis 1959) dominate the study area. Forest reconnaissance data from 1978 (Wisconsin Department of Natural Resources files) showed a composition of 43% northern hardwoods, 25% aspen (*Populus* spp.), 21% conifers, and 8% cleared land. Municipalities and lakes comprise 3% of the study area. Dominant tree species include sugar maple (*Acer saccharum*), yellow birch (*Betula lutea*), and American basswood (*Tilia americana*) in the northern hardwood type. Quaking aspen (*Populus tremuloides*) and big-tooth aspen (*P. grandidentata*) constitute the aspen type. Coniferous forests consist of 3 associations: (1) white spruce (*Picea glauca*) and balsam fir (*Abies balsamea*) are dominant in the boreal or upland type; (2) northern white cedar (*Thuja occidentalis*) and balsam fir domi-

nate in the wet-mesic, or swamp conifer type; (3) black spruce (*P. mariana*) and tamarack (*Larix laricina*) dominate in the wet forest type (Curtis 1959). Cleared land includes areas under active cultivation and abandoned farmlands. Both provide sodded openings and a source of domestic apples (*Pyrus* spp.). Common crops are corn, oats, potatoes, and hay. Many streams, lakes, ponds, and bogs occur in the area.

Weather patterns in the area are influenced by Lake Superior. Summer temperatures are lower and precipitation is generally higher than in other areas of the state. Snow cover usually exists from mid-November until mid-April with an annual accumulation of over 279 cm. Length of the growing season is 110–120 days.

Methods

This study was conducted in conjunction with a bear population study by the Wisconsin Department of Natural Resources (Kohn 1982). Food habits were determined by analyzing fresh scats (fecal droppings) collected daily during May through August, 1976–1979. Scats were placed in plastic bags, labeled (date, location), and frozen to maintain color, texture, and aroma of food items.

Laboratory procedures described by Adams (1957) and Korschgen (1969) were used to analyze the scats. Food items were identified by comparing scat fragments with plates in Symonds (1963) and Montgomery (1977), reference materials collected on site, plant keys, and herbarium specimens. Mammal remains were identified with the hair key developed by Adorjan and Kolenosky (1969) and by comparing bone and hair samples with museum specimens. An ocular estimate of the percent composition of solid material in each scat was recorded: trace, 2–5%, 6–15%, 16–50%, 51–75%,

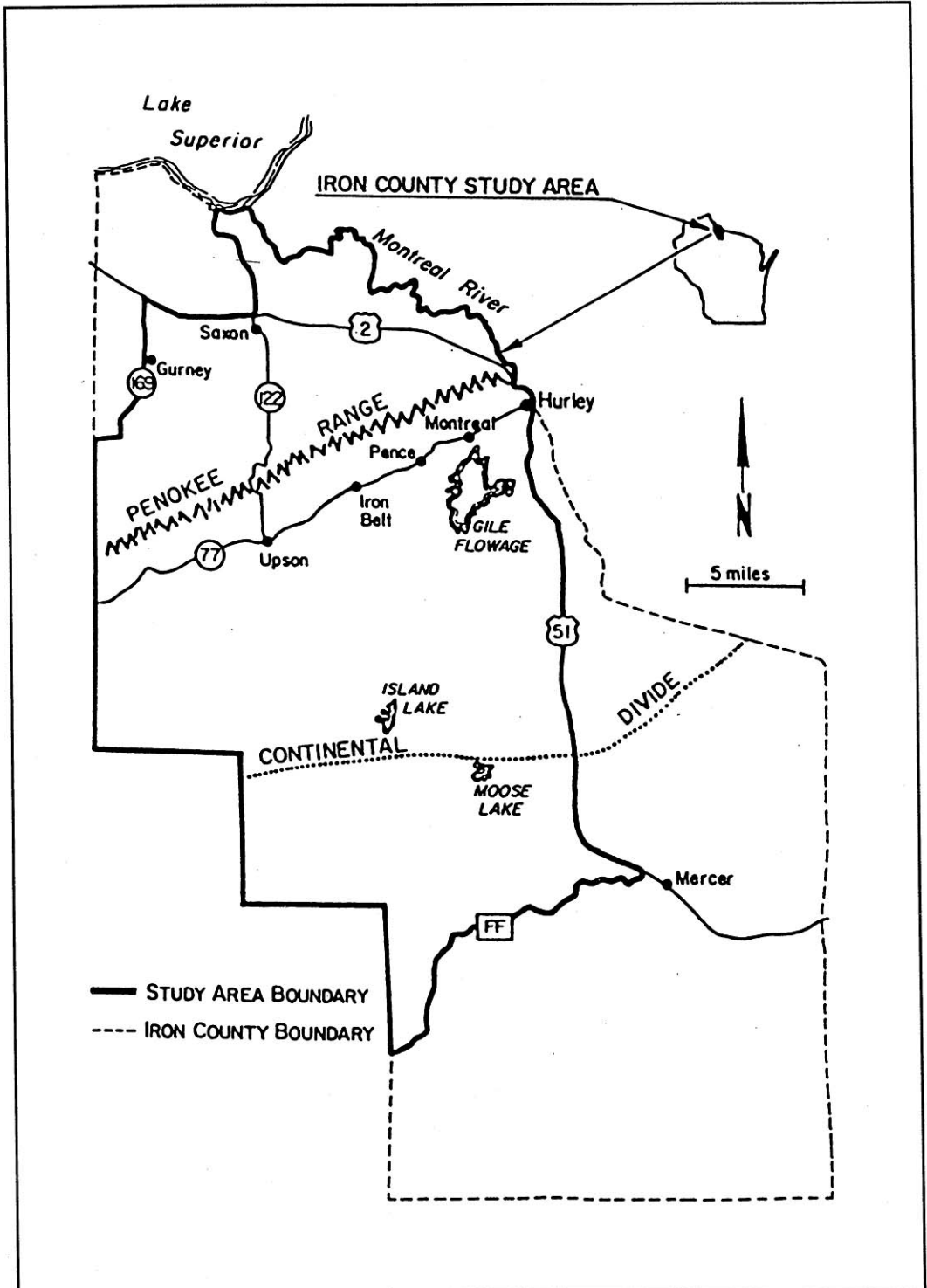


Figure 1. Location and major features of the Iron County study area in Wisconsin.

76–100% (Clark 1957, Tisch 1961, Beeman 1971). Food use was summarized monthly by percent composition and frequency of occurrence in the scats. Forage importance values (frequency of occurrence x percent composition) also were determined for each food item (McCaffery et al. 1974). Percent composition values for all food items eaten each month were compared among all years by using Z-tests (Neu et al. 1974).

Availability of bear foods within forest types was estimated by using data from the original field sheets of Curtis (1959) in the Plant Ecology Laboratory, Department of Botany, University of Wisconsin-Madison. The percentage of study plots in which Curtis (1959:79) observed a plant species in each forest community was used to estimate availability of that plant species. Similarities between forest communities relative to availability of plant foods were determined by using indices of similarity (Curtis 1959:83). In 1978 and 1979, the relative importance of a forest community as a source of plant foods for black bears was estimated from the percent occurrence of each plant food found in the community and from the forage importance value (determined by scat analysis) for that food.

Results

Sixty-eight black bear food items were identified from analysis of 967 scats collected during May through August 1976–79. Nineteen percent of the scats were collected in May, 38% in June, 23% in July, and 20% in August. Plants occurred in 100% of the scats, insects in 47%, and other animals in 15%.

Foods of black bears were identified and ranked by their forage importance (FI) values (Table 1). Plant material dominated the diet in frequency and volume, with grasses

and sedges having the greatest forage importance value (1,151). Grasses and sedges were combined and identified as 1 food item because of the difficulty in separating families, genera, and species. Of the black bear foods identified from scats, 32 had low (<10) forage importance values. Some unidentifiable material occurred in all scats examined.

Members of the Rosaceae had relatively high forage importance values: apple (*Pyrus malus* and *Pyrus* spp.), raspberry (*Rubus* spp.), cherry (*Prunus* spp.), junberry (*Amelanchier* spp.). So did blueberry (*Vaccinium* spp.). Excluding fruit, quaking aspen leaves and catkins were the most important tree parts used by black bears in this area.

Colonial insects (mainly ants) were the most important of the animal remains identified. Snowshoe hares (*Lepus americanus*) had the highest forage importance value of all other animal foods. The remains of hares, consisting of small amounts of hair and bone, could have represented scavenging or predation. White-tailed deer (*Odocoileus virginianus*) remains were observed at low levels. The remains consisted of hair and bone chips, the result of scavenging or predation. We observed 12 occurrences of black bear remains in black bear scats.

In all months a variety of foods was eaten, but only a few had high monthly forage importance values (Table 2). The general pattern in food habits for bears in northern Wisconsin was as follows: (1) In May, grasses, sedges, sweet cicely, and aspen catkins and leaves were most important. Ants, skunk cabbage (*Symplocarpus foetidus*), common dandelion (*Taraxacum officinale*), cow parsnip (*Heracleum maximum*), clover (*Trifolium* spp.), hemlock (*Tsuga canadensis*) needles, and cranberries (*Vaccinium* spp.) were important as some of the diet for most bears or most of the diet for some bears. (2) In June, grasses, sedges, ants, jack-in-the

pulpit, and sweet cicely were most important. Skunk cabbage, common dandelion, and aspen leaves and catkins were important as some of the diet for most bears or most of the diet for some bears. (3) The diets of black bears seemed to be the most diverse in July. Ants, tree and shrub fruits (especially Rosaceae: *Rubus* spp., blueberry [*Vaccinium* spp.], wild sarsaparilla, and apple) and jack-in-the-pulpit were most important. Common dandelion, grasses, sedges, and sweet cicely were important as some of the diet for most bears. (4) In August, ants, tree and shrub fruit (especially *Rubus* spp., cherry, mountain holly [*Nemopanthis mucronatus*], red-osier dogwood [*Cornus stolonifera*], and apple) were most important. Grasses, sedges, clover, wild sarsaparilla, jack-in-the-pulpit, and bees (Vespidae) were important as some of the diet for most bears or most of the diet for some bears. The occurrence of Vespidae in scats probably indicates the use of honey and honey bees (*Apis mellifera*), both wild and commercial, in the diet. In Wisconsin, bears often raid apiaries, resulting in nuisance complaints.

Type and pattern of food use were similar during all 4 years, but differences ($P < 0.05$) were noted in the number of occurrences of some foods. The use of apples, blueberries, blackberries (*Rubus allegheniensis*), and juneberries and the farm crops of corn and oats reflected annual differences in their availability. Jack-in-the-pulpit, skunk cabbage, red-osier dogwood, sweet cicely, wild sarsaparilla, and common dandelion were important in the diet in 1976 and 1977, but were not eaten in 1978 and 1979. Only 10 of the 68 bear food items were present all 4 years.

Of those foods common all years, ants ($Z = -5.19$), buds ($Z = -11.45$), blackberries ($Z = -2.87$), clover ($Z = -3.95$), grasses ($Z = -8.41$), juneberries, raspberries, and snow-

shoe hares occurred more ($P < 0.05$) in 1978 and 1979 than in 1976 and 1977. Occurrences of aspen catkins ($Z = 2.26$), cherries ($Z = 4.08$), and mountain holly ($Z = 2.60$) were greater ($P < 0.05$) in 1976 and 1977 than in 1978 and 1979.

Plant foods used by black bears were present in every forest community of the study area in 1978 and 1979 (Table 3). With > 26 food items in wet mesic, > 25 in boreal, and > 25 in aspen communities, these communities appeared to contain the greatest number of plant foods and have the greatest community forage importance values (Table 4). Most ($> 65\%$) of the plant foods in the wet mesic, boreal, and aspen communities occurred in $> 25\%$ of the stands examined by Curtis (1959).

Although sample sizes were low, differences ($P < 0.05$, 12 df) existed between availability and use of grasses ($\chi^2 = 79.8$), red-osier dogwood ($\chi^2 = 64.8$), sweet cicely ($\chi^2 = 134.1$), raspberry ($\chi^2 = 102.2$), cherry ($\chi^2 = 75.0$), wild sarsaparilla ($\chi^2 = 183.2$), juneberry ($\chi^2 = 84.2$), aspen leaves ($\chi^2 = 76.8$), blueberry ($\chi^2 = 115.7$), clover ($\chi^2 = 69.9$), water arum ($\chi^2 = 63.2$), blackberry ($\chi^2 = 74.7$), moss (Lycopodiales, $\chi^2 = 137.2$), and gooseberry (*Ribes* spp., $\chi^2 = 75.0$) throughout the 13 forest communities. A chi-square test of frequency indicated a positive relationship ($P < 0.05$) between availability of plant foods and use by black bears in the forest communities studied (Table 5). Dry mesic, mesic, wet mesic, wet, aspen, sedge, and bracken communities provided more ($P < .05$) grasses than other communities. Similarly, wet mesic, wet, aspen, and alder communities provided more ($P < 0.05$) red-osier dogwood than other communities. In general, of the 13 forest communities examined, important bear foods appeared to be more abundant in boreal, aspen, wet mesic, and wet communities.

Discussion

Plants and insects were the most important bear food items found in this study. The importance of plant material for black bears has long been recognized (Cottam et al. 1939). The relatively small number of important plant foods indicates that black bears rely on certain key foods to meet their nutritional needs (Rogers 1976, 1987).

Grasses and sedges, sweet cicely, and the catkins and leaves of quaking aspen were the most important bear food items from the time of den emergence until 30 June. Early fruiting shrubs (*Ribes* spp. and *Vaccinium* spp.) also were important food items during this period.

Ants (Formicidae) had the highest forage importance value of all food items in July and were important in all 4 months. Fruits of raspberry, blueberries, and wild sarsaparilla also were important food items in July. Although jack-in-the-pulpit is mildly toxic (Gleason and Cronquist 1963), it too was eaten often in July.

Tree fruits (*Prunus* spp. and *Pyrus* spp.) constituted a major portion of the August diet. Tree fruits were dominated by a single species—black cherry (*Prunus serotina*). When abundant, black cherries were preferred to other fruits. Bears foraged for black cherries on the forest floor or climbed the trees for them. Branches of fruiting trees along opening edges and roadsides often were broken by bears. Preference for black cherries might be responsible for the reduced frequency of shrub fruits in the diet. Bears in the nonagricultural portion of the study

area appeared to supplement their diet with mountain holly when black cherries were not abundant.

Domestic oats also provided an alternate food source. Farmers in the study area reported that bear damage to oats crops was highest when black cherries and blueberries were scarce; damage was nonexistent or low when the fruits were abundant.

White-tailed deer were not an important food item of bears during this study. But Anderson and Fleming (1994) reported that 7 of 12 radio-tagged fawns killed by predators in their study area (only 40 km west of ours) were killed by bears. They thought that most of the bear predation was due to chance encounters with fawns less than 2 weeks old, but noted that bears were known to be purposely hunting fawns on several occasions.

Most of the principal foods used by bears in this study were produced by shade intolerant plants as defined by Curtis (1959). In Wisconsin, these are abundant in grassy forest openings, road rights-of-way, recent cutovers, canopy gaps, natural wetlands, pine openings, and the aspen and aspen-balsam forest types. In addition, all of the rotting logs in the sodded forest openings on the study areas were visited by bears in search of insects. Except for sweet cicely and a few mature black cherry trees, northern hardwood stands provided limited amounts of bear food items in the study area.

Wisconsin's black bears are among the largest and most productive in the country (Reneau and Reneau 1993, Kessler 1994). This undoubtedly reflects the quality of the current habitat.

Table 1. Annual black bear food habits in northern Wisconsin as determined from 967 scats collected during 4 summers (May, June, July, August) 1976-79.

Food Item ^a	1976			1977			1978			1979			Average		
	F	C	FI	F	C	FI	F	C	FI	F	C	FI	F	C	FI
Monocots															
Gramineae and															
Cyperaceae															
<i>Arisaema triphyllum</i>	41.2	25.2	1038	48.4	19.0	920	71.6	12.0	859	73.7	22.0	1621	58.7	19.6	1151
<i>Symplocarpus foetidus</i>	16.2	36.7	595	11.0	31.5	347	0.0	0.0	0	0.0	0.0	0	6.8	17.1	116
<i>Zea mays</i>	4.0	46.0	184	3.1	27.2	84	0.0	0.0	0	0.0	0.0	0	1.8	18.3	33
<i>Alisma</i> spp.	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	2.3	22.0	51	0.6	5.5	3
<i>Acorus calamus</i>	2.1	18.4	39	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.5	4.6	2
<i>Juncus</i> spp.	0.8	28.0	22	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.2	7.0	1
<i>Avena sativa</i> ^b	0.5	49.1	25	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.1	12.3	1
<i>Equisetum</i> spp.	—	—	—	—	—	—	0.5	3.0	2	0.0	0.0	0	0.1	0.8	<1
Unidentified monocots	0.5	3.0	2	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.1	0.8	<1
	1.6	19.7	32	3.2	19.2	61	3.4	1.0	3	5.3	1.0	5	3.4	10.2	35
Dicots															
<i>Osmorhiza claytonii</i>	19.7	24.8	489	16.2	18.3	297	13.2	11.0	145	15.8	22.0	348	16.2	19.0	308
<i>Trifolium</i> spp.	4.5	13.6	61	7.5	13.2	99	13.2	2.0	26	12.8	9.0	115	9.5	9.5	90
<i>Taraxacum officinale</i>	9.6	17.2	165	16.5	21.5	355	0.0	0.0	0	0.0	0.0	0	6.5	9.7	63
<i>Fragaria</i> spp.	0.3	5.0	2	0.8	10.0	8	1.5	1.0	2	1.5	45.0	68	1.0	15.3	15
<i>Heracleum maximum</i>	1.8	17.7	32	4.0	18.2	73	0.0	0.0	0	0.0	0.0	0	1.5	9.0	14
<i>Calla palustris</i>	0.0	0.0	0	0.0	0.0	0	25.0	2.0	50	27.8	2.0	56	13.2	1.0	13
Unidentified Umbelliferae	1.6	5.0	8	11.9	6.1	73	0.0	0.0	0	0.0	0.0	0	3.4	2.8	10
<i>Lycopodium</i> spp.	1.1	11.0	12	0.8	10.3	8	0.0	0.0	0	0.0	0.0	0	0.5	5.3	3
<i>Urtica</i> spp.	0.0	0.0	0	0.0	0.0	0	9.8	1.0	10	9.0	1.0	9	4.7	0.5	2
<i>Polygonum cilinode</i>	0.0	0.0	0	0.5	30.0	15	0.0	0.0	0	0.0	0.0	0	0.1	7.5	1
Unidentified Compositae	0.0	0.0	0	1.2	18.2	22	0.0	0.0	0	0.0	0.0	0	0.3	4.6	1
<i>Viola</i> spp.	0.0	0.0	0	0.4	25.0	10	2.0	1.0	2	4.5	1.0	5	1.6	0.5	1
Unidentified ferns	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.1	6.3	1
<i>Potentilla</i> spp.	0.3	5.0	2	0.4	1.0	1	1.5	1.0	2	3.0	1.0	3	1.1	0.5	1
<i>Sonchus</i> spp.	0.2	1.0	1	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.2	1.5	<1
<i>Cornus canadensis</i>	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.1	0.3	<1
<i>Lactuca</i> spp.	0.0	0.0	0	0.0	0.0	0	1.0	1.0	1	1.5	1.0	2	0.4	0.3	<1
Unidentified dicots	4.1	27.0	111	5.5	28.1	155	9.8	1.0	10	6.8	1.0	7	6.6	14.3	94

Table 1, continued.

Food Item ^a	1976			1977			1978			1979			Average			
	F	C	FI	F	C	FI	F	C	FI	F	C	FI	F	C	FI	
Tree fruit																
<i>Prunus serotina</i> ^c	12.2	45.0	549	30.3	60.4	1830	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0
<i>Pyrus</i> spp. ^d	5.8	49.3	286	2.4	38.0	91	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0
<i>Pyrus malus</i> ^d	0.0	0.0	0	0.0	0.0	0	9.8	40.0	392	3.8	7.0	27	3.4	11.8	40	0
<i>Prunus</i> spp. ^c	0.0	0.0	0	0.0	0.0	0	13.2	18.0	238	8.3	8.0	66	5.4	6.5	35	0
<i>Sorbus americana</i>	0.8	37.2	30	4.7	36.5	172	0.0	0.0	0	0.0	0.0	0	1.4	18.4	26	0
<i>Prunus virginiana</i> ^c	3.2	33.4	107	1.2	6.6	8	0.0	0.0	0	0.0	0.0	0	1.1	10.0	11	0
<i>Pyrus coronaria</i> ^d	0.0	0.0	0	0.0	0.0	0	0.5	1.0	1	0.0	0.0	0	0.1	0.3	<1	0
Shrub fruit																
<i>Rubus</i> spp. (raspberry)	8.2	1.1	9	2.8	41.6	117	18.6	11.0	205	21.8	12.0	262	12.9	16.4	212	0
<i>Aralia nudicaulis</i>	20.0	14.2	284	5.9	13.5	80	15.7	11.0	173	18.8	5.0	94	15.1	10.9	165	0
<i>Vaccinium</i> spp. (blueberry)	8.0	30.9	247	4.7	24.2	114	12.8	8.0	102	3.0	2.0	6	7.1	16.3	116	0
<i>Cornus stolonifera</i>	0.0	0.0	0	0.0	0.0	0	13.2	31.0	409	6.8	24.0	163	5.0	13.8	69	0
<i>Nemopanthus mucronatus</i>	7.4	35.9	266	0.8	48.5	39	2.5	5.0	13	0.0	0.0	0	2.7	22.4	60	0
<i>Ribes</i> spp.	3.2	12.2	39	2.0	45.7	91	5.4	1.0	5	3.0	1.0	3	3.4	15.0	51	0
<i>Amelanchier</i> spp.	0.3	5.0	2	0.0	0.0	0	6.4	1.0	6	17.3	18.0	311	6.0	6.0	36	0
<i>Vaccinium</i> spp. (cranberry)	1.9	10.4	20	3.1	12.3	38	1.0	1.0	1	5.3	1.0	5	2.8	6.2	17	0
<i>Rubus allegheniensis</i>	2.1	57.1	120	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.5	14.3	7	0
<i>Viburnum</i> spp.	0.0	0.0	0	1.2	25.3	30	1.5	1.0	2	0.8	1.0	1	0.9	6.8	6	0
<i>Rubus</i> spp.	0.0	0.0	0	0.0	0.0	0	6.9	11.0	76	0.0	0.0	0	1.7	2.8	5	0
<i>Sambucus pubens</i>	0.3	5.0	2	0.0	0.0	0	2.0	2.0	4	4.5	2.0	9	1.7	2.3	4	0
<i>Vitis</i> spp.	0.0	0.0	0	0.4	25.0	10	0.0	0.0	0	0.0	0.0	0	0.1	6.3	1	0
<i>Cornus alternifolia</i>	0.0	0.0	0	0.0	0.0	0	1.0	2.0	2	0.8	1.0	1	0.5	0.8	<1	0
Unidentified	3.5	13.3	47	2.4	21.6	52	4.9	3.0	15	17.3	7.0	121	7.0	11.2	78	0
Other tree and shrub parts																
<i>Populus tremuloides</i> (leaves)	2.1	18.0	38	7.1	37.0	263	4.9	1.0	4.9	5.3	42	223	4.9	24.5	120	0
<i>Populus tremuloides</i> (catkins)	7.2	30.6	220	2.0	39.0	78	0.5	1.0	1	4.5	30.0	135	3.6	25.2	91	0
<i>Thuja occidentalis</i> (leaves)	1.8	4.4	8	0.0	0.0	0	0.5	1.0	1	6.1	52.0	317	2.1	14.4	30	0
<i>Tsuga canadensis</i> (needles)	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	2.3	51.0	117	0.6	12.8	8	0
<i>Rhamnus alnifolia</i>	0.0	0.0	0	0.0	0.0	0	3.9	5.0	20	1.5	12.0	18	1.4	4.3	6	0
<i>Ulmus americana</i> (seeds)	0.0	0.0	0	3.1	21.0	65	0.0	0.0	0	0.0	0.0	0	0.8	5.3	4	0
<i>Tsuga canadensis</i> (cones)	0.3	75.0	23	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.1	18.8	2	0
<i>Corylus</i> spp.	0.0	0.0	0	0.0	0.0	0	1.5	1.0	2	3.8	1.0	4	1.3	0.5	1	0
Pinaceae (cone scales)	0.0	0.0	0	0.0	0.0	0	2.5	1.0	3	3.0	1.0	3	1.4	0.5	1	0

Table 1, continued.

Food Item ^a	1976			1977			1978			1979			Average		
	F	C	FI	F	C	FI	F	C	FI	F	C	FI	F	C	FI
	<i>Corylus</i> spp.	0.0	0.0	0	0.0	0.0	0	1.5	1.0	2	3.8	1.0	4	1.3	0.5
Pinaceae (cone scales)	0.0	0.0	0	0.0	0.0	0	2.5	1.0	3	3.0	1.0	3	1.4	0.5	1
<i>Thuja occidentalis</i> (cones)	0.0	0.0	0	0.0	0.0	0	0.5	1.0	1	0.0	0.0	0	0.1	0.3	<1
<i>Picea glauca</i> (needles)	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.8	1.0	1	0.2	0.3	<1
<i>Abies balsamea</i> (needles)	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	3.8	1.0	4	1.0	0.3	<1
Unidentified buds	0.5	3.0	2	0.0	0.0	0	19.6	1.0	20	21.8	3.0	65	7.3	1.9	14
Unidentified plants	32.7	17.1	559	41.4	14.6	604	85.8	34.0	2917	75.9	25.0	1898	59.0	22.7	1339
Insects															
Formicidae	36.2	11.1	402	37.5	14.0	525	52.0	3.0	156	57.1	9.0	514	45.7	9.3	425
Vespidae	7.2	7.8	56	1.2	11.0	13	2.5	1.0	3	3.8	9.0	34	3.7	7.2	27
Orthoptera (grasshopper)	0.5	30.0	15	0.3	5.0	2	0.0	0.0	0	0.0	0.0	0	0.2	8.8	2
Bombidae	0.0	0.0	0	0.0	0.0	0	1.0	1.0	1	4.5	1.0	5	1.4	0.5	1
Coleoptera	0.3	1.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.1	0.3	<1
Unidentified	0.9	3.9	4	0.4	10.0	4	1.0	1.0	1	1.5	1.0	2	1.0	4.0	4
Mammals															
<i>Lepus americanus</i>	0.3	45.0	14	0.4	20.0	8	7.8	1.0	8	4.5	1.0	5	3.3	16.8	55
<i>Ursus americanus</i>	0.0	0.0	0	5.0	59.5	298	3.4	1.0	3	1.5	1.0	2	2.5	15.4	39
<i>Procyon lotor</i>	0.5	38.3	19	0.4	35.0	14	0.0	0.0	0	0.0	0.0	0	0.2	18.3	4
Other animal	0.0	0.0	0	0.0	0.0	0	12.3	1.0	12	18.8	1.0	19	7.8	0.5	4
<i>Castor canadensis</i>	0.3	10.0	3	1.2	9.1	11	0.0	0.0	0	0.0	0.0	0	0.4	4.8	2
<i>Marmota monax</i>	0.5	8.0	4	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.1	2.0	<1
<i>Ondatra zibethicus</i>	0.3	5.0	2	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.1	1.3	<1
<i>Odocoileus virginianus</i>	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	6.0	1.0	6	1.5	0.3	<1
Unidentified	3.7	41.0	152	2.0	28.2	56	3.4	1.0	3	6.8	1.0	7	4.0	17.8	71
Total plants	98.9	69.1	6834	98.4	67.5	6642	100.0	53.0	5300	100.0	57.0	5700	99.3	61.7	6127
Total insects	43.1	10.7	461	39.0	13.9	542	54.9	3.0	165	58.6	9.0	527	48.9	9.2	450
Total mammals	6.1	34.0	207	5.2	33.0	172	0.0	0.0	0	0.0	0.0	0	2.8	16.8	47
Birds	1.9	3.9	7	0.0	0.0	0	0.0	0.0	0	1.5	1.0	2	0.9	1.2	1
Fish	0.3	2.0	1	0.0	0.0	0	1.0	1.0	1	0.0	0.0	0	0.3	0.8	<1
Debris and fine materials	95.5	17.9	1709	97.6	18.4	1796	100.0	36.0	3600	100.0	11.0	1100	97.6	20.4	1991

^aF = % frequency, C = % volume composition, FI = forage importance value (FI = F X C).
^bDomestic oats was present all 4 years, but included with grasses in 1976 and 1977.
^cIn 1976 and 1977, 2 species of *Prunus* were identified; in 1978 and 1979, these were combined as *Prunus* spp.
^dIn 1978 and 1979, 2 species of *Pyrus* were identified; in 1976 and 1977, these were combined as *Pyrus* spp.

Table 2. Monthly black bear food habits^a in northern Wisconsin as determined from 967 scats collected during 4 summers, 1976-1979.

Food Item	May			June			July			August		
	F	C	FI	F	C	FI	F	C	FI	F	C	FI
Monocots												
Gramineae and												
Cyperaceae	88.5	37.0	3275	62.0	10.0	620	37.0	6.0	222	30.0	9.0	270
<i>Symplocarpus foetidus</i>	5.5	24.0	132	3.2	62.0	198	0.0	0.0	0	0.0	0.0	0
<i>Arisaema triphyllum</i>	3.7	12.0	44	14.0	40.0	560	14.0	30.0	420	4.2	37.0	155
<i>Juncus</i> spp.	0.4	99.0	40	0.0	0.0	0	4.4	1.0	4	0.0	0.0	0
<i>Acornus calamus</i>	1.4	2.8	4	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
<i>Equisetum</i> spp.	1.0	3.0	3	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
<i>Alisma</i> spp.	0.0	0.0	0	2.5	21.0	53	4.4	1.0	4	0.0	0.0	0
<i>Zea mays</i>	0.0	0.0	0	3.0	1.0	3	0.8	32.0	26	0.0	0.0	0
<i>Avena sativa</i> ^b	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.4	3.0	1
Unidentified monocots	4.6	8.4	39	1.4	25.7	36	7.0	34.5	242	3.0	14.0	42
Dicots												
<i>Osmorhiza claytonii</i>	32.2	23.3	750	23.0	20.0	460	10.0	15.3	153	2.5	23.3	58
<i>Taraxacum officinale</i>	3.6	30.0	108	8.0	22.0	176	16.0	21.0	336	4.6	12.0	55
<i>Heracleum maximum</i>	5.0	20.0	100	0.3	1.0	<1	1.3	22.0	29	0.8	10.5	8
<i>Trifolium</i> spp.	8.7	9.5	83	9.0	5.0	45	7.7	2.4	19	7.5	17.0	128
<i>Calla palustris</i>	3.2	1.0	3	14.3	2.0	29	7.7	3.0	23	5.4	1.0	5
<i>Polygonum cilinode</i>	0.4	5.0	2	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
<i>Fragaria</i> spp.	0.0	0.0	0	1.4	2.0	3	1.7	25.0	43	0.0	0.0	0
<i>Hieracium</i> spp.	0.4	1.0	<1	0.0	0.0	0	1.7	15.0	26	0.4	5.0	2
<i>Urtica</i> spp.	0.0	0.0	0	0.4	30.0	12	0.0	0.0	0	0.0	0.0	0
<i>Viola</i> spp.	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.4	25.0	10
<i>Sonchus</i> spp.	0.0	0.0	0	3.1	1.0	3	0.0	0.0	0	0.0	0.0	0
<i>Potentilla</i> spp.	0.0	0.0	0	0.7	3.0	2	0.0	0.0	0	0.0	0.0	0
<i>Lactuca</i> sp.	0.0	0.0	0	0.0	0.0	0	1.3	1.0	1	0.4	1.0	<1
<i>Cornus canadensis</i>	0.0	0.0	0	0.0	0.0	0	0.4	1.0	<1	0.4	1.0	<1
Unidentified Umbelliferae	0.9	7.5	7	2.1	5.0	11	0.8	8.0	6	0.0	0.0	0
Unidentified Compositae	0.0	0.0	0	0.7	1.0	1	0.8	1.0	1	2.5	1.0	3
Lycopodiales	1.4	1.0	1	5.0	1.0	5	4.7	1.0	5	2.1	1.0	2
Unidentified ferns	0.0	0.0	0	0.7	1.0	1	1.7	1.0	2	0.4	1.0	<1
Unidentified dicots	3.2	15.6	50	11.3	14.0	158	6.2	15.0	93	2.5	13.0	33

Table 2, continued.

Food Item	May			June			July			August		
	F	C	FI	F	C	FI	F	C	FI	F	C	FI
	Tree fruit											
<i>Prunus serotina</i> ^c	0.0	0.0	0	0.7	1.0	1	5.1	17.0	87	45.4	17.5	795
<i>Pyrus malus</i> ^d	0.4	1.0	<1	0.3	1.0	<1	0.8	1.0	1	8.7	40.0	348
<i>Prunus</i> spp. ^c	0.0	0.0	0	0.0	0.0	0	2.1	1.0	2	13.7	12.0	164
<i>Prunus virginiana</i> ^c	0.0	0.0	0	0.0	0.0	0	4.0	15.0	60	2.5	47.5	119
<i>Pyrus</i> spp. ^d	1.4	23.0	32	0.0	0.0	0	5.2	62.0	322	0.8	40.0	32
<i>Sorbus americana</i>	0.0	0.0	0	0.7	1.0	1	4.7	19.0	89	0.8	40.0	32
<i>Pyrus coronaria</i> ^d	0.004	1.0	<1	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Shrub fruit												
<i>Rubus</i> spp. (raspberry)	0.0	0.0	0	2.2	1.0	2	22.4	26.5	594	19.6	46.0	902
<i>Nemopanthus mucronatus</i>	0.0	0.0	0	0.3	1.0	<1	2.1	17.0	36	12.0	36.0	432
<i>Cornus stolonifera</i>	0.0	0.0	0	0.0	0.0	0	3.4	2.0	7	11.7	32.0	374
<i>Rubus</i> spp.	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	16.0	11.0	176
<i>Aralia nudicaulis</i>	0.0	0.0	0	4.0	4.0	16	40.0	13.0	520	13.3	11.0	146
<i>Vaccinium</i> spp. (blueberry)	0.0	0.0	0	0.7	1.0	1	23.3	23.4	545	6.6	11.0	73
<i>Amelanchier laevis</i>	0.0	0.0	0	1.0	2.0	2	7.7	18.0	139	6.6	7.0	46
<i>Rubus allegheniensis</i>	0.0	0.0	0	0.3	4.0	1	0.8	14.3	11	2.1	20.0	42
<i>Ribes</i> spp.	0.0	0.0	0	2.5	27.0	68	7.7	8.0	62	3.0	9.4	28
<i>Vitis</i> sp.	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.4	25.0	10
<i>Viburnum</i> sp.	0.0	0.0	0	0.0	0.0	0	1.3	20.0	26	1.6	6.0	10
<i>Cornus alternifolia</i>	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	1.2	2.0	2
<i>Vaccinium</i> spp. (cranberry)	3.2	14.0	45	4.0	7.0	28	4.3	1.0	4	0.8	1.0	1
<i>Sambucus pubens</i>	0.0	0.0	0	0.7	3.0	2	3.4	1.2	4	0.4	1.0	<1
Unidentified	0.4	1.0	<1	4.0	1.4	6	7.3	15.0	110	4.6	6.0	28
Other tree and shrub parts												
<i>Populus tremuloides</i> (catkins)	16.1	28.0	451	2.2	39.0	86	0.0	0.0	0	0.0	0.0	0
<i>Populus tremuloides</i> (leaves)	12.4	30.0	372	5.4	22.0	119	0.0	0.0	0	0.0	0.0	0
<i>Ulmus americana</i> (seeds)	3.7	21.0	78	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
<i>Tsuga canadensis</i> (needles)	1.4	51.0	71	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
<i>Rhamnus alnifolia</i>	0.0	0.0	0	0.0	0.0	0	2.2	7.0	15	1.9	2.0	4
<i>Thuja occidentalis</i> (leaves)	6.5	3.9	25	1.8	1.0	2	0.0	0.0	0	0.0	0.0	0
<i>Abies balsamea</i> (needles)	1.4	1.0	1	0.7	1.0	1	0.0	0.0	0	0.0	0.0	0
<i>Picea glauca</i> (needles)	0.4	1.0	<1	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0

Table 2, continued.

Food Item	May						June						July						August					
	F		C		FI		F		C		FI		F		C		FI		F		C		FI	
<i>Thuja occidentalis</i> (cones)	0.0	0.0	0	0	0	<1	0.3	1.0	1.0	<1	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0
<i>Tsuga canadensis</i> (cones)	0.0	0.0	0	0	0	<1	0.3	1.0	1.0	<1	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0
<i>Corylus</i> spp.	0.0	0.0	0	0	0	<1	0.4	1.0	1.0	<1	0.9	1.0	1	1.0	1.0	1.0	2	2.0	1.0	2.0	1.0	1.0	1.0	2
Pinaceae (cone scale)	1.4	1.0	1	1	1	2	1.8	1.0	2	2	0.4	1.0	<1	0.4	1.0	<1	0.0	0.0	0.0	0.0	0.0	0.0	0	
Unidentified buds	9.7	1.0	10	10	10	25	12.6	2.0	25	25	8.6	1.0	9	8.6	1.0	9	1.7	1.0	1.7	1.0	1.0	1.0	2	
Insects																								
Formicidae	30.0	6.0	180	180	180	652	59.3	11.0	652	652	69.0	9.4	649	69.0	9.4	649	22.0	67.0	22.0	67.0	1474	1474	1474	
Vespidae	0.9	1.0	1	1	1	<1	0.3	1.0	1.0	<1	2.1	2.0	4	2.1	2.0	4	13.3	9.0	13.3	9.0	120	120	120	
Orthoptera	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0	0.8	30.0	24	0.8	30.0	24	0.4	5.0	0.4	5.0	2	2	2	
Bombidae	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0	1.7	1.0	2	1.7	1.0	2	0.0	1.0	0.0	1.0	1	1	1	
Coleoptera	0.5	1.0	1	1	1	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0	0	
Unidentified	1.4	7.0	10	10	10	4	0.7	5.5	4	4	8.6	1.0	9	8.6	1.0	9	1.7	1.0	1.7	1.0	2	2	2	
Mammals																								
<i>Ursus americanus</i>	1.3	27.3	36	36	36	1	0.7	1.0	1.0	1	2.1	4.0	8	2.1	4.0	8	1.2	1.0	1.2	1.0	1	1	1	
<i>Procyon lotor</i>	0.0	0.0	0	0	0	11	0.3	35.0	11	11	4.4	5.0	22	4.4	5.0	22	0.4	71.0	0.4	71.0	28	28	28	
<i>Lepus americanus</i>	3.2	4.0	13	13	13	24	4.0	6.0	24	24	1.7	1.0	2	1.7	1.0	2	0.8	1.0	0.8	1.0	1	1	1	
<i>Castor canadensis</i>	1.4	12.0	17	17	17	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.4	1.0	0.4	1.0	<1	<1	<1	
<i>Ondatra zibethicus</i>	0.4	30.0	12	12	12	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0	0	
<i>Marmota monax</i>	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0	0.9	8.0	7	0.9	8.0	7	0.0	0.0	0.0	0.0	0	0	0	
<i>Odocoileus virginianus</i>	1.4	1.0	1	1	1	<1	0.3	1.0	1.0	<1	2.0	1.0	2	2.0	1.0	2	0.0	0.0	0.0	0.0	0	0	0	
Unidentified	5.5	19.0	105	105	105	37	4.3	8.5	37	37	2.1	5.0	11	2.1	5.0	11	2.5	8.2	2.5	8.2	21	21	21	
Total plants	98.6	67.7	6675	6675	6675	5252	98.9	53.1	5252	5252	100.0	60.6	6060	100.0	60.6	6060	99.2	75.1	99.2	75.1	7450	7450	7450	
Total insects	18.9	5.2	98	98	98	637	60.1	10.6	637	637	70.7	16.0	1131	70.7	16.0	1131	32.9	8.0	32.9	8.0	263	263	263	
Total mammals	15.2	22.5	342	342	342	101	9.4	10.7	101	101	9.1	20.1	183	9.1	20.1	183	4.2	13.9	4.2	13.9	58	58	58	
Birds	0.0	0.0	0	0	0	4	1.0	4.0	4	4	2.6	3.0	8	2.6	3.0	8	0.0	0.0	0.0	0.0	0	0	0	
Fish	1.4	1.3	2	2	2	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	0	0	
Debris and fine material	100.0	21.3	2130	2130	2130	2200	100.0	22.0	2200	2200	100.0	20.9	2090	100.0	20.9	2090	100.0	16.7	100.0	16.7	1670	1670	1670	

^aF = % frequency, C = % volume composition, FI = forage importance value (FI = F X C).

^bDomestic oats was present all 4 years, but included with grasses in 1976 and 1977.

^cIn 1976 and 1977, 2 species of *Prunus* were identified; in 1978 and 1979, these were combined as *Prunus* spp.

^dIn 1978 and 1979, 2 species of *Pyrus* were identified; in 1976 and 1977, these were combined as *Pyrus* spp.

Table 3. Percent of stands in each forest community in northern Wisconsin (Curtis 1959 and Plant Ecology Laboratory, University of Wisconsin-Madison) in which black bear foods were observed in summer 1978 and 1979.

Food	Dry Mesic		Wet Mesic		Wet		Boreal		Aspen		Alder		Sedge Meadow		Bog		Bracken Grassland		Dry Weed		Northern Pasture		Mesic Weed		
Gramineae and Cyperaceae	91.4	95.1	97.1	100.0	89.7	95.0	91.7	100.0	86.7	100.0	71.4	100.0	100.0	100.0	—	—	—	—	—	—	—	—	—	—	—
<i>Cornus stolonifera</i>	—	—	41.2	21.6	17.9	35.0	50.0	18.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Osmorhiza claytonii</i>	44.4	72.5	32.4	—	39.3	15.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Rubus</i> spp. (raspberry)	47.2	20.0	58.8	27.5	64.3	50.0	8.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Prunus</i> spp.	54.3	17.5	14.3	6.0	46.4	75.0	8.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Aralia nudicaulis</i>	94.4	90.0	94.1	41.2	96.4	80.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Amelanchier</i> spp.	50.0	7.5	8.8	—	50.0	60.0	8.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Populus tremuloides</i>	71.4	10.0	31.4	16.0	64.3	100.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Vaccinium</i> spp. (blueberry)	63.9	12.5	38.2	94.1	50.0	75.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Trifolium</i> spp.	—	—	—	—	28.6	10.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Calla palustris</i>	—	—	8.8	21.6	10.7	5.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Rubus allegheniensis</i>	58.3	17.5	17.6	—	25.0	70.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Tsuga canadensis</i>	40.0	80.0	48.6	2.0	25.0	5.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Fragaria</i> spp.	66.7	30.0	44.1	—	64.3	95.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Rhamnus alnifolia</i>	—	—	17.6	23.5	7.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Lycopodium</i> spp.	82.9	80.0	57.1	58.0	96.4	80.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Nemopanthus mucronatus</i>	2.8	2.5	26.5	56.9	7.1	15.0	8.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Sambucus pubens</i>	25.0	55.0	8.8	—	32.1	20.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Ribes</i> spp.	38.9	40.0	76.5	35.3	75.0	55.0	50.0	22.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Vaccinium</i> spp. (cranberry)	—	2.5	20.0	74.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Corylus</i> spp.	83.3	57.5	44.1	—	71.4	90.0	8.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Thuja occidentalis</i>	20.0	25.0	91.4	42.0	64.3	15.0	8.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Abies balsamea</i>	51.4	60.0	80.0	38.0	100.0	95.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Cornus alternifolia</i>	34.3	30.0	20.0	—	10.7	30.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Lactuca</i> spp.	8.6	7.5	28.6	8.0	14.3	40.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Viburnum</i> spp.	72.2	25.0	32.4	—	28.6	65.0	16.7	3.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Cornus canadensis</i>	54.3	40.0	71.4	76.0	96.4	90.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Picea glauca</i>	17.1	7.5	20.0	—	89.3	35.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average ^a	49.2	32.9	39.7	37.8	49.0	52.2	18.5	11.1	36.0	33.0	58.7	39.3	50.0	—	—	—	—	—	—	—	—	—	—	—	—
Number food items ^a	22	24	26	17	26	25	9	6	10	12	3	4	3	—	—	—	—	—	—	—	—	—	—	—	—

^a Excludes Gramineae and Cyperaceae.

Table 4. Forage importance values^a indicate the relative importance of each forest community in northern Wisconsin for black bear foods comprising $\geq 2\%$ frequency of occurrence in scats collected during summer 1978 and 1979.

Food Item	Forage Importance Value	Community Importance Values													
		Dry Mesic	Dry Mesic	Wet Mesic	Wet Mesic	Boreal Aspen	Aspen	Alder	Sedge Meadow	Bog	Grassland	Dry Weed	Northern Pasture	Mesic Weed	
Gramineae and Cyperaceae	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4	1158.4
<i>Cornus stolonifera</i>	311.4	—	311.4	311.4	—	311.4	311.4	—	311.4	—	—	—	—	—	—
<i>Osmorhiza claytonii</i>	228.6	228.6	228.6	—	228.6	228.6	—	—	—	—	—	—	—	—	—
<i>Rubus</i> spp. (raspberry)	220.9	220.9	220.9	220.9	220.9	220.9	220.9	220.9	—	—	—	—	—	—	—
<i>Prunus</i> spp.	170.6	170.6	170.6	170.6	170.6	170.6	170.6	170.6	—	170.6	—	—	—	—	—
<i>Aralia nudicaulis</i>	138.6	138.6	138.6	138.6	138.6	138.6	—	—	—	138.6	—	—	—	—	—
<i>Amelanchier</i> spp.	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	—	129.5	—	—	—	—	—
<i>Populus tremuloides</i>	88.5	88.5	88.5	88.5	88.5	88.5	—	—	—	88.5	—	—	—	—	—
<i>Vaccinium</i> spp. (blueberry)	66.8	66.8	66.8	66.8	66.8	66.8	66.8	66.8	66.8	66.8	66.8	66.8	66.8	66.8	66.8
<i>Trifolium</i> spp.	60.3	—	—	—	60.3	60.3	—	—	—	—	60.3	60.3	60.3	60.3	60.3
<i>Calla palustris</i>	52.2	—	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2
<i>Rubus allegheniensis</i>	47.9	47.9	47.9	47.9	—	47.9	47.9	—	—	—	—	—	—	—	—
<i>Lycopodium</i> spp.	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
<i>Ribes</i> spp.	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Sum		2263.8	2263.8	2627.4	2350.9	2687.7	2687.7	1995.3	1526.5	1814.1	1554.1	1218.7	1218.7	1218.7	1218.7

^a Forage importance value = % frequency multiplied by % volume composition of food items in scats.

Table 5. Communities in northern Wisconsin where a positive relationship ($P < 0.05$) existed between availability and use of plant foods comprising $\geq 2\%$ frequency of occurrence in black bear scats, summer 1978 and 1979.

	<i>Cornus stolonifera</i>	<i>Osmorhiza claytonii</i>	<i>Rubus spp. (raspberry)</i>	<i>Prunus spp.</i>	<i>Aralia nudicaulis</i> spp.	<i>Amelanchier spp.</i>	<i>Populus tremuloides</i>	<i>Vaccinium spp.</i>	<i>Trifolium spp.</i>	<i>Calla palustris</i>	<i>Rubus allegheniensis</i> spp.	<i>Lycopodium spp.</i>	<i>Ribes spp.</i>
Dry mesic	Wet mesic	Dry mesic	Dry mesic	Dry mesic	Dry mesic	Dry mesic	Dry mesic	Dry mesic	Boreal	Bog	Dry mesic	Dry mesic	Dry mesic
Mesic	Wet	Mesic	Wet mesic	Boreal	Mesic	Boreal	Wet mesic	Wet mesic	Bracken grassland		Mesic	Mesic	Mesic
Wet mesic	Aspen	Wet mesic	Boreal	Aspen	Wet mesic	Aspen	Wet	Wet	Dry weed		Wet mesic	Wet mesic	Wet mesic
Wet	Alder	Boreal	Aspen	Bracken grassland	Boreal		Boreal	Boreal	Pasture		Boreal	Wet	Wet
Aspen					Aspen		Aspen	Aspen	Mesic weed		Aspen	Boreal	Boreal
Sedge							Bog	Bog			Aspen	Aspen	Aspen
Bracken grassland							Bracken grassland	Bracken grassland			Bog	Bog	Alder
												Bracken grassland	Sedge

Appendix A. Forest community terminology used in this study for northern Wisconsin.

<i>Curtis (1959) Terminology</i>	<i>Dominant Species</i>	<i>WDNR^a Terminology</i>
Dry mesic forest	<i>Pinus strobus</i> <i>Acer rubrum</i> <i>Quercus borealis</i>	White pine/oak
Mesic forest	<i>Acer saccharum</i> <i>Fagus grandifolia</i> <i>Tsuga canadensis</i> <i>Betula lutea</i>	Northern hardwoods
Wet mesic forest	<i>Thuja occidentalis</i> <i>Abies balsamea</i> <i>Fraxinus nigra</i>	Swamp conifer
Wet forest	<i>Picea mariana</i> <i>Larix laricina</i>	Black spruce
Boreal forest	<i>Picea glauca</i> <i>Abies balsamea</i>	Fir – spruce
Aspen forest	<i>Populus tremuloides</i> <i>Populus grandidentata</i>	Aspen
Alder	<i>Alnus rugosa</i>	Alder
Sedge meadow	<i>Carex</i> spp. <i>Calamagrostis canadensis</i> <i>Aster simplex</i>	Marsh/muskeg
Bog	<i>Andromeda glaucophylla</i> <i>Chamaedaphne calyculata</i> <i>Kalmia polifolia</i>	Muskeg – bog
Bracken grassland	<i>Pteridium aquilinum</i> <i>Bromus kalmii</i> <i>Danthonia spicata</i>	Herbaceous vegetation
Dry weed	<i>Conyza canadensis</i> <i>Oenothera biennis</i> <i>Agropyron repens</i>	Noncommercial herbaceous vegetation
Northern pasture	<i>Poa pratensis</i> <i>Taraxacum officinale</i> <i>Trifolium repens</i>	Heavily grazed
Mesic weed	<i>Phleum pratense</i> <i>Trifolium pratense</i> <i>Plantago major</i>	Grass

^aWisconsin Department of Natural Resources.

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Literature Cited

- Adams, L. 1957. A way to analyze herbivore food habits by fecal examination. *Transactions of the North American Wildlife Conference* 22:152-59.
- Adorjan, A. S., and G. B. Kolenosky. 1969. A manual for the identification of hairs of selected Ontario mammals. Ontario Department of Lands and Forests. Research Report (Wildlife) 90. 64 pp.
- Anderson, R. K., and K. C. Fleming. 1994. Dynamics of black bear populations on un hunted Stockton Island and hunted mainland Wisconsin. Wisconsin Department of Natural Resources. 1994 Progress Report. 9 pp (mimeograph).
- Beecham, J. 1980. Population characteristics, denning, and growth patterns of black bears in Idaho. Ph.D. thesis. University of Montana, Missoula. 101 pp.
- Beeman, L. E. 1971. Food habits of the black bear in Tennessee. M.S. thesis. University of Tennessee, Knoxville. 81 pp.
- Beeman, L. E., and M. R. Pelton. 1980. Seasonal foods and feeding ecology of black bears in the Smoky Mountains. Pages 141-47 in C. J. Martinka and K. L. McArthur, eds. *Bears—their biology and management*. Morges, Switzerland.
- Bertagnoli, G. G. 1986. Availability and use of foods by black bears in Wisconsin. M.S. thesis. University of Wisconsin-Stevens Point. 42 pp.
- Boileau, F., M. Crate, and J. Huot. 1994. Food habits of the black bear, *Ursus americanus*, and habitat use in Gaspésie Park, eastern Quebec. *Canadian Field-Naturalist* 108:162-69.
- Clark, W. K. 1957. Seasonal food habits of the Kodiak bear. *Transactions of the North American Wildlife Conference* 22:145-51.
- Cottam, C., A. L. Nelson, and T. E. Clarke. 1939. Notes on early winter food habits of the black bear in George Washington National Forest. *Journal of Mammalogy* 24:25-31.
- Curtis, J. T. 1959. *The vegetation of Wisconsin*. University of Wisconsin Press, Madison. 657 pp.
- Gleason, H. A., and A. Cronquist. 1963. *Manual of vascular plants of northeastern United States and adjacent Canada*. Van Nostrand Reinhold Co., New York. 810 pp.
- Hellgren, E. C. 1993. Status, distribution, and summer food habits of black bears in Big Bend National Park. *Southwestern Naturalist* 38:77-80.
- Hellgren, E. C., and M. R. Vaughan. 1988. Seasonal food habits of black bears in Great Dismal Swamp, Virginia—North Carolina. *Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies* 42:295-305.
- Irwin, L. L., and F. M. Hammond. 1985. Managing black bear habitats for food items in Wyoming. *Wildlife Society Bulletin* 13:477-83.
- Kessler, G. P. 1994. Black bear reproductive biology, denning biology, habitat use, and movements in northern Wisconsin. M.S. thesis. University of Wisconsin-Stevens Point. 174 pp.
- Kohn, B. E. 1982. Status and management of black bears in Wisconsin. Wisconsin Department of Natural Resources. Technical Bulletin 129. 31 pp.
- Korschgen, L. J. 1969. Procedures for food habits analysis. Pages 233-50 in R. H. Giles Jr., ed. *Wildlife techniques manual*. The Wildlife Society, Washington.
- Landers, J. L., R. J. Hamilton, A. S. Johnson, and R. L. Marchinton. 1979. Foods and habitat of black bears in southeastern North Carolina. *Journal of Wildlife Management* 43:143-53.

- Lindzey, F. G., and E. C. Meslow. 1977. Population characteristics of black bears on an island in Washington. *Journal of Wildlife Management* 41:295-319.
- MacHutchon, A. G. 1989. Spring and summer food habits of black bears in the Pelly River Valley, Yukon. *Northwest Science* 63:116-18.
- McCaffery, K. R., J. Tranetzi, and J. Piechura, Jr. 1974. Summer foods of deer in northern Wisconsin. *Journal of Wildlife Management* 38:215-19.
- McClinton, S. F., P. L. McClinton, and J. V. Richerson. 1992. Food habits of black bears in Big Bend National Park. *Southwestern Naturalist* 37:433-35.
- Montgomery, F. H. 1977. *Seeds and fruits of plants of eastern Canada and northern United States*. University of Toronto Press, Toronto. 232 pp.
- Neu, C. W., C. R. Byers, and J. M. Peek. 1974. A technique for analysis of utilization-availability data. *Journal of Wildlife Management* 38:541-45.
- Norton, N. C. 1981. Food habits, growth, and cover types used by northern Wisconsin black bears. M.S. thesis. University of Wisconsin-Stevens Point. 48 pp.
- Novick, H. J. 1979. Home range and habitat preference of black bears (*Ursus americanus*) in the San Bernardino Mountains of south California. M.S. thesis. California State Polytechnical University, Pomona. 58 pp.
- Reneau, J., and S. Reneau, ed. 1993. *Records of North American big game, 1993*. 10th ed. Boone and Crockett Club, Missoula, MT. 624 pp.
- Rogers, L. 1976. Effects on mast and berry crop failures on survival, growth, and reproductive success of black bears. *Transactions of the North American Wildlife and Natural Resources Conference* 41:431-40.
- Rogers, L. L. 1987. Effects of food supply and kinship on social behavior, movements, and population growth of black bears in northeastern Minnesota. *Wildlife Monographs* 97. 72 pp.
- Soil Conservation Service. 1972. General soil areas, Iron County, Wisconsin. U.S. Department of Agriculture, Lincoln, NE. 10 pp.
- Symonds, G. W. D. 1963. *The shrub identification book*. William Morrow Company, New York. 379 pp.
- Tisch, E. L. 1961. Seasonal food habits of the black bear in the Whitefish Range of northwestern Montana. M.S. thesis. University of Montana, Missoula. 108 pp.
- Young, D. 1980. Black bear habitat use at Priest Lake, Idaho. M.S. thesis. University of Montana, Missoula. 62 pp.

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