Plants and habitats — a consideration of Dene ethnoecology in northwestern Canada[1]

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Abstract: This paper discusses local understanding of plants and habitats, based on the linguistic evidence [terms for plants and (or) habitats] gathered from ethnobotanical and ethnoecological field work conducted with several Dene Nations of the Canadian northwestern boreal forest and adjacent regions. Nations involved in the study include Gwich'in (Mackenzie Delta Region), Sahtú'otine' (Great Bear Lake), Kaska Dena (southern Yukon), and Witsuwit'en (northwest British Columbia). Key plant-related habitats include meadow, "swamp", forest, "willows", and "brush". The ethnobotanical classification of willows is explored in conjunction with the explanation of the Dene habitat concept. In local classifications, 'willow' is not co-extensive with the genus *Salix*, but includes a variety of medium to tall woody shrubs that lack either conspicuous flowers, 'berries', or thorns; these may include shrubby species of *Salix*, *Alnus*, *Cornus*, and *Betula*. Shoreline and alpine environments are also discussed as plant habitats. Dene use of alpine environments and resources is ancient, according to the results of recent alpine ice patch research in the Yukon region. The Human dimensions of habitat knowledge are presented. Indigenous concepts of plant taxa and of landscape associations or habitats may differ substantially from those of scientific botany and ecology, and are based in a holistic and interactive ethnoecology.

Key words: ethnoecology, ethnobotany, plant habitats, traditional ecological knowledge, Dene, Canada.

Résumé : Les auteurs font état de discussions sur les perceptions locales des plantes et des habitats, basées sur des travaux ethnobotaniques et ethnoécologiques de terrain, conduites avec plusieurs nations Déné des forêts boréales du Nord-ouest canadien et de régions voisines. Les nations concernées incluent Gwich'in (région du delta du Mackenzie), Sahtu'otine (Grand lac à l'Ours, Kaska Dena (Yukon méridional), et Witsuwit'en (Nord-ouest de la Colombie canadienne). Les principaux habitats liés aux plantes incluent la prairie, le marécage (swamp), la forêt, la saulaie (willows), et la broussaille (brush). On explore la classification ethnobotanique de la saulaie (willows) en relation avec une explication du concept de l'habitat chez les Déné. Dans la classification locale, saulaie (willows) ne correspond pas au genre *Salix*, mais inclut des arbustes ligneux de moyenne stature qui sont dépourvus de fleurs, de baies, ou d'épines; ils peuvent inclure des espèces arbustives des genres *Salix*, *Alnus*, *Cornus* et *Betula*. On discute également des environnements alpins et riverains. Sur la base de récentes recherches sur les champs de glace au Yukon, les dénés ont utilisé les environnements alpins et leurs ressources de longue date. On présente également les dimensions humaines de la connaissance des habitats. Les conceptions indigènes des taxons végétaux et des associations en paysages peuvent différer substantiellement de celles des botanistes et écologistes scientifiques, et trouvent leurs bases dans une ethnoécologie holistique et interactive.

Mots-clés : ethnoécologie, ethnobotanique, habitats des végétaux, connaissance écologique traditionnelle, Déné, Canada.

[Traduit par la Rédaction]

Introduction

Ethnoecology is the broad domain of local understanding of the environment, of the land and the entities that dwell there, and of the relationships among them, including the relationships of people to other living things and the land (Johnson 2000). Athapaskan-speaking peoples of northern Canada and Alaska are well known for their deep knowledge of the animals with which they share their homelands, as they are consummate hunters and fishers for whom knowledge of animals is of high cultural and economic importance (cf. Nelson 1983; Gwich'in Elders 1997, 2001). Plants, however, are also vital for Athapaskan or Dene people, as they constitute a significant feature of the environments or habitats used both by people and animals. Plants are also necessary for heating and for housing, as well as for the creation of the tools and materials culture upon which people depend, as was eloquently expressed by Richard Nelson in his monograph on the Alaskan Koyukon (Nelson 1983). Recognizing qualities of fuel wood, as well as fire-making skills, are significant aspects of northern Athapaskan cultural knowledge (cf. Andre and Fehr 2000; Wishart et al. 2000). Plants are also extensively used for medicines and tonics (Marles 1984; Ryan 1994; Marles et al. 2000) and form a crucial, although relatively small, part of the annual diet, especially the various small fruits referred to as "berries" (cf. Wein 1994; Parlee 2005; Murray et al. 2005).

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The elaboration of knowledge about plants and habitats amongst northern Athapaskan speakers is not generally well studied, although Marles (1984) investigated Chipewyan (Denesułine) plant knowledge in northern Saskatchewan, Sherry E. and Vuntut Gwitchin First Nation (1999) and Andre and Fehr (2000) present synopses of Gwich'in plant knowledge, and Kari (1987) recorded Dena'ina plant knowledge. Marles et al. (2000) summarize Cree and Dene (especially Chipewyan or Denesułine) plant uses for the western Boreal forest. Literature on the nutrition of northern populations also includes plant foods in the lists of country foods (Wein 1994). The northern traditional ecological knowledge (TEK) literature has been presented almost exclusively from a wildlife, resource management, or environmental-impact perspective (cf. Gwich'in Elders 1997, 2001), and much of this is in the unpublished form of government and consulting reports. Almost nothing has been written about plant habitats from an ethnoecological perspective (but see Parlee 2005 for data on plant collection locale decision making for Denesołine and Gwich'in, and Legat et al. 2001 for a synopsis of Dogrib habitats and toponyms).

By the same token, interest in cultural understandings of landscapes and habitats, and local or folk classification of place kinds or cultural ecotypes has been developing over the past decade, but much of the published literature has described the landscape and habitat concepts of subtropical and tropical cultivators (e.g., Martin 1993; Taller de Tradiccion Oral del CEPEC and Pierre Beaucage 1996; Sillitoe 1998; Fleck and Harder 2000; Shepard et al. 2001). Relatively little work has dealt with the landscape and habitat concepts of noncultivators in the temperate and northern portions of North America and the circumpolar north. Hunn's (1990) pioneering discussion of Sahaptin landscape knowledge in N'chi-Wana, The Big River, produced a model and framework for looking at landscape knowledge and the relationship of landscape to plant and animal distribution in the Columbia Basin in Oregon and Washington. Davidson-Hunt and Berkes' (2003) exposition of the Shoal Lake Anishinaabe understanding of landscape is an important recent Canadian study focusing on Algonquianers of northwestern Ontario. Published studies of Dene or Athapaskan ethnoecology are largely lacking, although Athapaskan-speaking peoples occupy the western portion of Canada's subarctic boreal-forest region. Indigenous understanding of landscape features as habitats and their relationship to plant and animal distributions has practical and theoretical significance, especially as development intensifies in Canada's north (Legat et al. 2001).

This paper presents a synthesis of the understanding of plants and habitats by Athapaskan-speaking (Dene) First Nations groups in northwestern Canada, with whom I have worked over the past decade. This work is part of a long-term comparative project in ethnoecology in northwestern Canada, involving several Athapaskan-speaking groups, and one group that speaks a Tsimshianic language; the Gitksan. In this work I will focus primarily on plant-habitat knowledge of the Witsuwit'en of the Bulkley Valley region of Northwest British Columbia, and the Kaska Dena of the Watson Lake area of the Yukon, supplemented with observations from work with the Gwich'in in the Mackenzie Delta Region and the Sahtú people of Great Bear Lake in the Northwest Territories. A synopsis of Gitksan ethnoecology appeared in 2000 (Johnson 2000), and a preliminary examination of Witsuwit'en ethnogeography was presented in 2006 (Johnson and Hargus 2006).

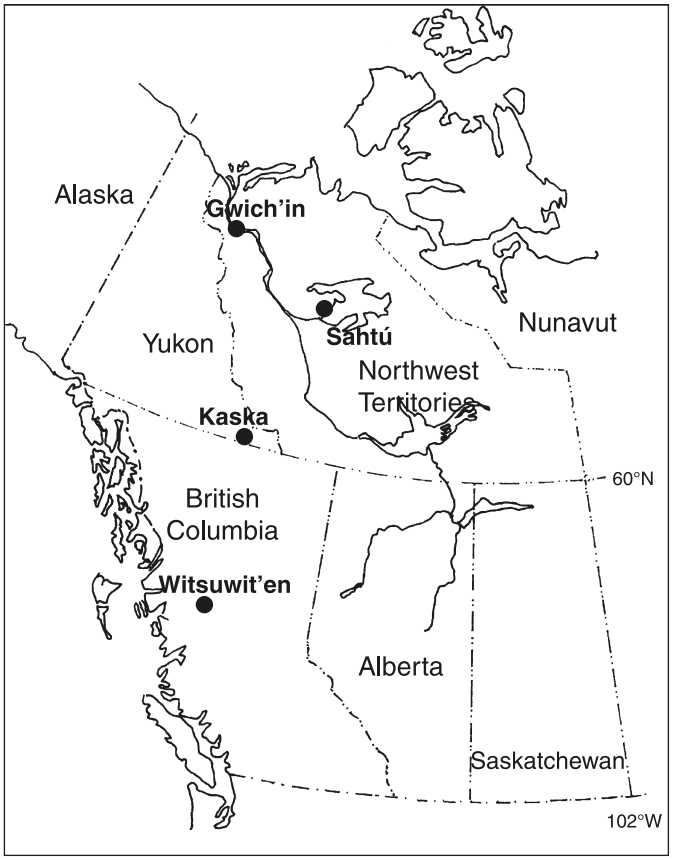
Linguistic evidence forms a major part of the following analysis. Accordingly, I will briefly review the position of the languages here in terms of the broad divisions of Athapaskan languages. Athapaskan languages are a distinct language family, comprising a large number of languages spoken in Alaska and the western Canadian Subarctic, interior British Columbia, and Cordilleran Alberta, with outlying groups in northern California and Oregon, and in the American southwest, where Navajo and Apache are two large language groups (Mithun 1999). As might be expected for such a large language family, there are groupings within this area. A widely accepted classification breaks out Northern Athapaskan, Pacific Coast Athapaskan, and Apachean subgroups. To a large degree, the variation in language is geographic, rather than genetic. All of the languages I have dealt with are Northern Athapaskan languages; they fall into three of Rice's groupings within the Northern languages: the Central Alaska – Yukon group (Gwich'in); the Northwestern Canadian group (Kaska, Ts'ekani, and Slavey); and the Central British Columbia group (Witsuwit'en) (in Mithun 1999, p. 346).[2] In general, languages in the Northern Athapaskan branch of the family have somewhat fuzzy boundaries, and in some areas dialect complexes exist, as within the languages grouped as Slavey (South Slavey and various dialects and variants of North Slavey) or between Tahltan, Kaska, and Tagish along the British Columbia – Yukon border (Mithun 1999). In 1996, linguist Jim Kari (Kari 1996) classified Athapaskan languages in terms of hydronymic groups (broad areas within which a related set of terms for 'river' are shared). According to this classification, the four groups fall within different hydronymic areas.

Study areas

The Witsuwit'en live along the Bulkley River and the headwaters of the Nechako River system in the inner edge of the Coast Mountains and the adjacent plateau country in northwest B.C. at about latitude 53°N–55°N (Fig. 1). The landscape falls largely in the Sub-Boreal Spruce and Interior Cedar Hemlock biogeoclimatic zones, with areas of Coastal Western Hemlock in the Coast Mountains, and Engelman Spruce – Subalpine Fir biogeoclimatic zones at higher elevations (Anonymous 1999). The southern and eastern parts of their territory are of more subdued topography, and are drier. The principal village at Moricetown is near Morice-

[2] Witsuwit'en is somewhat distinctive, as it retains a number of features of ProtoAthapaskan lost in other languages in B.C., but nontheless has broad similarities in lexicon to Dakelh (Carrier) and to Ts'ekani (Sekani). The Fort Ware dialect of Ts'ekani in turn, has grammatical and lexical links with Kaska (Elders 1997), perhaps fostered by lengthy trade relations and intermarriage. Somewhat more distant connections are apparent between Kaska and the language of the Sahtu people [Bear Lake or North Slavey], with some pronounced phonological differences, though mutual intellegibility is possible with work. Gwich'in is more distinctive in lexicon and phonology. Mutual intellegibility with, for example, Kaska or Slavey would not be expected, but would require second language learning.

Fig. 1. Index map showing the general location of four study areas. The dots are indicative of the general study areas, and are not precise locations.



town Canyon, on the Widzín Kwah, or Bulkley River; this site has a history of occupation spanning more than 3500 years, and is significant for its salmon fishery (Gottesfeld 1993).

The Kaska homeland is a rolling, boreal forested landscape, traversed by large rivers and with lakes of many sizes, extensive peatlands, and rugged mountains with alpine areas (Oswald and Senyk 1977). Kaska lands cover an extensive area of northern British Columbia and the southeastern Yukon, straddling the 60th parallel (Fig. 1). The largely forested lowlands are fully developed boreal forest dominated by black and white spruce [*Picea mariana* (Mill.) B.S.P. and *Picea glauca* (Moench) Voss], with extensive seral lodgepole pine (*Pinus contorta* Loud. var. *latifolia* Engelm.) stands, and well-developed muskeg areas with tamarack [*Larix laricina* (DuRoi) Koch].

The Mackenzie Delta Gwich'in live in a low-Arctic environment, encompassing forest and wetland areas of the Mackenzie Valley and Delta; the Richardson Mountains, with extensive alpine areas; and a mosaic of forest and nonforest environments in the Peel River drainage area (Fig. 1). The waters of the Mackenzie and the Peel rivers warm their respective lower reaches, and also bring nutrients into the system. Alpine timberline is at 600–700 m a.s.l. (Oswald and Senyk 1977), and latitudinal treeline is not far north (or east) of Inuvik at the northeastern edge of the Gwich'in Settlement Area in the Northwest Territories

The community of Deline sits on Great Bear Lake (Sahtú), not far south of the Arctic Circle in the western Northwest Territories (Fig. 1). The environment of the Sahtú'otine, the Bear Lake people, is conditioned by Great Bear Lake itself, one of the largest freshwater lakes in the world. The landscape is covered by a mosaic of taiga, spruce woods, and wetlands. The lake cools the local environment, and owing to the calcareous sediments in the southwestern part of the lake and river ecosystem, the taiga there is dominated by white spruce.

Materials and methods

This research represents a synthesis of information from a number of different, but related, research projects in traditional knowledge and ethnoecology covering a 9 year period. For each phase of the research, ethics approval was obtained from the relevant University Ethics review Board (University of Alberta, 1997 and 2001) and Athabasca Ethics proposal Reviews 02-07, 03-15, 04-13, 05-22, and 05-71, for research conducted in 2002, 2003, 2004, 2005, and 2006, respectively. Oral and (or) written informed consent was obtained from Elders and knowledge holders for recording and appropriate publication of research results, in accordance with the procedures outlined in the ethics approvals. Science licences issued in connection with the research include NWT 12019N (1999) and NWT 13089R (2000), and Yukon 99-15S&E, 00-41S&E, 01-78S&E, 02-66S&E, 02-50S&E, and 04-67S&E for the years 1999–2004. Consultation with various First Nations organizations, bands, tribal councils, and renewable resource councils was carried out as part of planning and conducting the research projects, and data from the projects has been deposited with the local organizations.

I used both interview and field methods for gathering ethnoecological data, and made extensive use of visual methods for both elicitation and documentation over the course of the research project. I used a variety of visual methods in my work. Photographs were used for elicitation, and line drawings served for both elicitation and recording information. Photographic and video documentation was undertaken both of places, and of narratives about places, as well as of specific activities carried out in particular places (e.g., berry picking).

Most of my work with Witsuwit'en elders involved interviews and conversations in the community supplemented by use of photographs and drawings of the landscape in the region. This was facilitated by my own longterm residence in the region and the resultant familiarity with places on the Witsuwit'en territories. This region has experienced considerable ecological impact from nonindigenous settlement, including agriculture, intensive forestry, and mining. Before beginning my present ethnoecological research in 1997, I spent the previous 12 years doing ethnobotanical and ethnomedical research in the same region: results of this research are presented in Gottesfeld and Anderson 1988; Gottesfeld 1994*a*, 1994*b*; Johnson-Gottesfeld and Hargus 1998; and Johnson 1999.

In the Kaska phase of this project, my methodology principally involved learning on the land with knowledgeable cultural experts. Shared activities, such as gathering medici-

nal plants, picking berries, fishing, travelling, and attending language and culture workshops afforded opportunities to learn about place kinds or cultural ecotopes, and about fundamental Kaska interaction with, and value of, the land. I used natural discourse to determine what kinds of place were significant, and sought specific information on Kaska terminology for habitats and ecotypes. Photography, audio, and video recording were used to record place kinds and narratives, rather than for elicitation. Formal research began in 1998 and 1999, and ended in 2004.

Research in the Gwich'in Settlement Region was largely conducted by sharing experiences on the land in summer and in winter. This methodology was the approach advised by the local Renewable Resource Councils, the Gwich'in Social and Cultural Institute, and the Gwich'in Renewable Resource Board. The research reported here was carried out from 1998 to 2001.

My work with Sahtú people has been relatively brief, as a collaborator on a land and health project headed by Dr. Christopher Fletcher of the University of Alberta. The project is locally referred to as "Plants for Life," and has involved the collection of traditional medicinal and other significant plants with community collaborators, and participation in two plant-medicine camps with youth, elders, community and university researchers, one on Great Bear Lake (2005) and the other on the Great Bear River (2006). Information on habitats and plant taxonomy has been recorded as a part of the documentation of traditional plant uses and the gathering and preparation of plant medicines. We have collected a set of voucher specimens, and have used still photography and video to record places, plants, and activities.

Results

In this paper I focus on three broad vegetation domains (low elevation nonforest environments, wooded environments, and scrub communities), and close with a discussion of some habitats that are strongly tied to physiographic features (shoreline and alpine habitats). Berry habitats, transitional between open and wooded environments, are also discussed. To facilitate comparison of the understanding of plant habitats between different Dene groups, I will present examples of habitat terminology of these broad types from different areas, rather than describing landscape terms of each cultural group in turn.

Meadows and open areas

Although much of the northern landscape below northern treeline is dominated by forests, woodlands, or willow thickets, treeless environments are both ecologically significant and psychologically salient. Such environments are significant in the ecology of key animal species, such as moose and beaver, and also present opportunities or barriers to travel, as well as providing plant resources. Here, I will discuss lower elevation sites and will defer the discussion of open areas in the alpine region to the section on habitats related to physiographic features. Meadows or graminoid-dominated openings are distinctive and universally recognized. Several Athapaskan languages form their words for meadow from the word *tl'o* (grass) and cognate forms, as Witsuwit'en *tl'o k'it*, Tłı̨chǫ *tłoga* or Ts'ekani *tl'owe k'eh*. Tl'o k'it consists of tl'o and *k'it* 'on a flat surface'. Gwich'in from the northern Yukon shares this term; there is an important archaeological site on the Porcupine River near Old Crow that is called *Tl'oo k'it* (spelled "Klo Kut" in the archaeological literature) (Ray LeBlanc, personal communication, 2006), although the usual word for meadow is *gwahsri*. The word tl'o is highly conserved in Athapaskan languages; it is sometimes extended to other herbaceous forms with linear leaves such as sedges (*Carex* spp.), cottongrass (*Eriophorum* spp.), or wild onions (*Allium cernuum*).

Wetlands are the second major treeless habitat type, which grade into drier meadow openings. Wetlands, often locally called "swamps", are significant in Dene ethnoecology. I have documented a range of wetland terms in Witsuwit'en and in Kaska. The challenge is to try to understand the kinds of sites to which these terms refer. One method I employed was to show albums of local landscape photos to knowledgeable speakers, and record the terms they used for each specific photo. In the Witsuwit'en area, this process was facilitated by my broad familiarity with the regional landscape, which allowed me to supplement the images with discussions of the sites referred to in the photos. Witsuwit'en Elder Lucy Namox recognized the "swamp" by Adzil Creek shown in Fig. 2, and called this area *c'iye k'it*. She said cranberries (*Vaccinium oxycoccos* L.) grow in the moss and told me a story about how her grandmother said that the cranberries hide in the moss (L.M.J., field notes, 30 October 1998).

Witsuwit'en Elders, Pat and Lucy Namox, called a sedge- and grass-dominated wetland along Chicago Creek near Hazelton B.C., *witsil k'it*. Another Witsuwit'en elder, Dan Michell, explained that the word witsil k'it means a place that is damp. Sedge-tussock marshes and graminoid dominated wet meadows can be called *tl'otl'is k'it*, which translates as "meadow" or "marsh" 'where large grass grows' according to linguist Sharon Hargus (Johnson and Hargus 2006). This was the term Pat Namox gave in 1998 for a swamp area on a landscape diagram I drew of the Nadina country for elicitation purposes. The site is the wetland shown in Fig. 3.

Table 1 provides a summary of terms for meadows and wetlands in Witsuwit'en. The nonforested types grade from dry meadows to productive wetlands and sloughs, and also include open, wet sphagnum-dominated areas. The bulk of the Witsuwit'en landscape is forested with spruce, pine, or aspen-dominated stands, with mixed forests containing hemlock [*Tsuga heterophylla* (Raf.) Sarg.] and red cedar (*Thuja plicata* Donn ex D. Don) in the northern Bulkley Valley, or vegetated with woody scrub. Open heath or graminoid communities predominate in the alpine.

Kaska terminology for wetlands, and recognition of the importance of wetlands, are also well developed. The Kaska landscape is fully boreal, with considerable development of peatlands and fens in areas of gentler topography. The term *tūtsel*, usually interpreted as "swamp", covers a wide range of wetland habitats, including both moss and sedge-dominated sites. Tutsel have implications for the location of seasonally important wildlife habitat, such as summer moose-feeding areas, and also may be sites for the harvesting of berries, diaper moss, and medicinal plants. The

Fig. 2. Photograph of wetland on Adzil Creek, Bulkley Valley B.C. called "swamp" in English and *ciyë k'it* in Witsuwit'en by Witsuwit'en Elder Lucy Namox. The image was scanned from the negative and saved as a .tif file. It was slightly cropped, converted to greyscale, and the contrast slightly enhanced in Photoshop 7.0 for this paper. The swamp is the open area with scattered black spruce in the foreground. The slope behind is covered by deciduous woodland.

Fig. 3. Sedge-dominated fen on Peter Alec Creek (Nadina River Valley south of Houston, B.C.), which illustrates the area called *tl'o tlis k'it* by Witsuwit'en Elder Pat Namox, in 1997. The photograph (courtesy of A.S. Gottesfeld) was taken on kodacolor film with a 35 mm camera in about 1983. The print was scanned, and converted to grayscale in Photoshop 7.0.

match between English and Kaska terms is not precise. An old abandoned channel of the Liard River, characterized by low flows, beaver activity, and sedge-meadow development was also designated tutsel, while other sloughs were called by different terms depending on their width and degree of shading, and by how recently it had been abandoned, and frequency of flood scour (Johnson 2005) (Table 2).

Specific information on wetland terminology was not

Table 1. Witsuwit'en terms for open areas.

Witsuwit'en term	English gloss
*Tl'o k'it**	'Meadow, open grassy area' (e.g., a lawn, a grazed slope, alpine meadow)
Tl'otl'is (*k'it*)	'Meadow' or 'marsh' ("where large grass grows")
C'iye (*k'it*)	'Swamp' (where moss grows?)
Ts'al k'ët	'Swamp' (lit. 'diaper place', from sphagnum use for diapers)
Witsil k'it	'Damp place'
C'ato', *lht'ato'*	'Slough'

*Spellings from Johnson and Hargus 2006.

recorded for Gwich'in or for North Slavey, although Legat et al. (2001, p. 17) report a number of Dogib (Tłı̨chǫ) terms for wetland types.

Berry habitats

Productive patches of berries are another significant type of plant habitat for Athapaskan speakers, particularly sites for species of *Vaccinium* (huckleberries, blueberries, and lowbush cranberries *Vaccinium vitis-idaea* L. var. *minus* Lodd.). In the North, productive sites for cloudberries, *Rubus chamaemorus* L., are important for the Gwich'in and Sahtú'otine (Parlee 2005; Murray et al. 2005). (In this paper I use the term "berry" in its popular sense as a sweet, small, juicy fruit rather than its botanical sense). For the Witsuwit'en, patches of the prized black *digï* (huckleberries), (*Vaccinium membranaceum* Dougl.) were formerly managed, and were the owned properties of clans and houses. (Gottesfeld 1993, 1994*b*; Johnson 1999; Trusler 2002; Trusler and Johnson 2007). A berry patch is called *nit'ay*[3] *k'it* ['berries on (surface)'] (Johnson and Hargus 2006). In this region, the ecological amplitude of the black huckleberry is very wide, but it requires management by burning to maintain specific productive patches (Trusler 2002; Trusler and Johnson 2007).

For the Kaska, in their boreal environment, lowbush cranberries and bog blueberries (*Vaccinium uliginosum* L.) are the most significant local berry species, along with the widespread crowberry (locally called "blackberries") *Empetrum nigrum* L. subsp. *hermaphroditum* (Lge.) Böcher. Although both the lowbush cranberry and bog blueberry are very widely distributed, some kinds of sites are more productive than others, and one must know what kinds of places to check to see whether the fruit is abundant enough to pick in any given season. In boreal environments, fruit productivity varies between years and between places in a manner difficult to predict. Interestingly, no word in Kaska for "berry patch" has yet been recorded in linguistic research (P. Moore, personal communication, June 2006). However, Kaska Elder Mida Donnessey, one of my principal local teachers, is quite aware of the association of berry species with other vegetation. Bog blueberries, for example, grow with black spruce in tūtsel of the moss sort.[4] Mida Donnessey said "Lots of *ts'ibe*, *dahbă'* lots. Always you go in there you get *dzidze'*." (L.M.J., fieldnotes, summer 2003). That is, "lots of black spruce, lots of blueberries, whenever you go in there you get berries." Whereas cranberries are more common among pine stands with a moss understory. However, if the site is too dry, kinnickinnick [*Arctostaphylos uva-ursi* (L.) Spreng] will prevail instead. Mida articulated this relationship in 2004 when we were searching for productive cranberry sites at the end of a long dry spell.

Table 2. Kaska wetland terms.

Kaska term	English gloss
*Tūtsel, tūtsel mā**	'Swamp'
Tūtsel	Slough with fringing sedge meadow
Tu łetese elīn, łetesgwech'edi	Slough (not specified what type)
Łíni	Slough (not specified what type)
Tsēlē'	Slough (small, wooded shores)
Tū tı̨li, *tū tilı̨̄*	Slough (open, sandy, has flood scour)

*Spellings from the author's unpublished notes and Kaska Elders 1997.

Forested or wooded environments

The regions where Dene speakers in the North live are largely forested, or are dominated by woody second growth or scrub. For Witsuwit'en, you are *dicah* 'in the bush' or *dicin tah* 'among the trees/sticks' if you want to indicate tree cover without specifying the type of tree or, if you are in a mixed stand. There is also a concept of *widits'itl* and related terms ("jungle"[5] or very thick brush). It is not clear if coniferous or deciduous growth is implied by this last term.

Pat Namox (L.M.J., fieldnotes, 1997) said that if you are hunting in a poplar (aspen) (*Populus tremuloides* Michx.) forest, you could say *tighis co tah*, which he translated as "big poplar country". I subsequently learned that the words literally translate as "among big aspen trees". Similarly, if you are hunting in a place where the forest is dominated by spruce, you can say *ts'o co tah* (among big spruce trees).

The Kaska use a similar construction to describe forest vegetation. A lodgepole pine stand is *gǫdze tah* 'among the pines'. And white spruce stand is *gatcho tah* 'among big white spruce trees' or, *gat tah* 'among white spruce'. I have also heard *dechen cho* 'big sticks/trees', for tall, mixed forest of white and black spruce. In North Slavey, Charlie Neyelle described an area of tall trees along a particular creek flowing into the Bear River as *ts'ú nechá* 'big spruce trees' (L.M.J., fieldnotes, July 2006).

Fires and post-fire succession are inevitable aspects of forested landscapes. There was a huge fire in the 1980s around Nadina Mountain in northwestern British Columbia. Witsuwit'en Elder, Pat Namox, called this burn area *wik'in k'it* (L.M.J., fieldnotes, from photo, 1997). In Kaska, a burned area is *cholede* 'burn place'. I have also heard the

[3] This is one of two Witsuwit'en terms for "berries"; this one carries the connotation of something that ripens (Johnson-Gottesfeld and Hargus 1998).

[4] Two distinctly contrasting types of environments are both called tūtsel in Kaska: wetlands with open water and sedge dominated wet meadows, and peatland areas with hummocks of *sphagnum* and ericoid shrubs with black spruce and tamarack. I was unable to learn any specific terms for the moss dominated areas, though sometimes people in English referred to "moss" when describing places with thick bryophyte mats.

[5] This is not my translation, but the term used by the elder to describe what *widits'il* was (L.M.J., fieldnotes, 1997).

Table 3. Willow terminology.

Indigenous name	Scientific name	English term
Witsuwit'en*		
K'indlih	*Salix* spp.	Willow
K'is	*Alnus incana*	Grey alder
Wize	*Alnus crispa*	Green alder
K'ëntsic, *kak delka'n*	*Cornus stolonifera* Michx.	"Red willow", red osier dogwood
Kaska†		
Gű́lé	*Salix* spp.	Willow
Gű́le dat'ele	*Salix* spp. with red stems, ? *Cornus stolonifera*	'Red willow'
Gű́le deba'i	*Elaeagnus commutata*	'Grey willow'
K'is	*Alnus incana* (L.) Moench ssp. *tenuifolia* (Nutt.) Breitung	Alder
Kuh sāze	*Alnus crispa* and *Betula glandulosa*	Alder and dwarf birch
Sǫs dzídzé'	*Cornus stolonifera*	"Red willow", 'bear's berries'
North Slavey‡		
K'áe det'ele	*Salix* sp.	Red stemmed willow
K'áe whá	*Alnus crispa*	
K'áe	*Salix* spp., *Betula glandulosa*	Willow
K'a gh'oteh k'áe	*Salix* sp.	Red stemmed tree willow
K'áhdzá	*Salix* sp.	Dry willow [sticks]
(*Kots'akó*)	*Potentilla fruticosa*	"Tea"
Gwich'in§		
K'aii	*Salix* spp.	Willow
K'oh 'aii'	*Alnus* sp.	Alder
K'aii k'was	? *Alnus incana*	"Red willow"

*Witsuwit'en spellings from Gottesfeld 1994*a* and unpublished notes.
†Kaska spellings from unpublished manuscript and Kaska Elders 1997.
‡North Slavey spellings provisional, based on school materials and Slavey Dictionary database.
§Gwich'in spellings from Wilson 1998.

Kaska refer to a place in English and say "fire come through" (L.M.J., fieldnotes, 2004), emphasizing action, as Dene languages tend to do, rather than a static-object-oriented linguistic approach. The Dogrib elders consulted by Legat et al. (2001) called a burned area *gok'eni̧i̧k'ǫ̀ǫ*, and a burned forest *gòlo*.

Willows

Although forests are significant in Dene landscapes, willows and other types of shrub-dominated communities are important and salient in mountainous and northern areas. The regional importance of willow in the landscape in northern British Columbia is recognized by the widespread "spruce–willow–birch biogeoclimatic zone" (Anonymous 1998). They are taxonomically diverse and an important vegetation type. Willow is a significant and complex concept in Dene languages. Dene willows are focally deciduous shrubs without edible fruits or thorns. Willow seems to function at several levels: taxonomically as a generic, and as an intermediate term, and as the name for a vegetation type. *Salix* species are quintessential willows.

Willow thickets or dense scrub of *Salix* spp., are a distinctive and recognizable habitat type in the Bulkley Valley and Nechako Plateau regions of the Witsuwit'en homeland in British Columbia. In the North, dense tall willow stands may line rivers in the ice thrust zone. *Salix alaxensis* (Anderss.) Cov. was prominent in willow communities in the ice-thrust zone along the lower Peel River in the Northwest Territories.

The term willows, however, appears to comprise more than shrubby species of *Salix*, while ground forms of *Salix* are not willows for Dene speakers (Table 3). Shrubby species of *Salix*, *Alnus*, *Betula*, and *Cornus* are often considered willows in local taxonomy (cf. Johnson-Gottesfeld and Hargus 1998). Cuerrier (2004) has documented that Inuit in his study area also differentiate between prostrate and erect willows; their term for erect willows also signifies bushes. However, according to Cuerrier, *Betula glandulosa* Michx. has its own name. Davidson-Hunt et al. (2005, p. 210) report that Iskatewizaagegan Anishinaabe speakers also include *Cornus sericea* L. "red willow" their *wiigobiig* taxon, and indeed, English folk taxonomy also includes red osier (*Cornus stolonifera* L. and *sericea*) as a willow, given that the common name "osier" is a term that means willow.

Willow, as a vegetation type, is named in the same way as specific forest types; indeed, for Dene speakers, *dicin* and its cognates refer both to trees and to large woody shrubs, all of which are 'wood' or 'sticks', and many of which have useful or medicinal barks. The extensive willow swamp along Owen Creek was described by Witsuwit'en Elder Pat Namox as *k'indlihcota* (Fig. 4).

Wize is usually translated 'mountain alder' and refers taxonomically to *Alnus crispa* (Ait.) Pursh. subsp. *sinuata* (Regel) Hult. (slide or green alder) . The abrupt edge of a thicket of slide alder at the south end of Morice was described from a photograph by Witsuwit'en Elder Dan Michell, as *wize begh*, a word he also used to refer to timberline at the top of the mountains (L.M.J., fieldnotes,

Fig. 4. Photo (courtesy of A.S. Gottesfeld) of a willow swamp (foreground) along Owen Creek, south of Houston B.C. that was described by Witsuwit'en Elder Pat Namox, as *k'indlihcota* (from print of same image). Ektachrome 35 mm slide taken in May 1988, scanned, saved as .tif, and then converted to grayscale in Photoshop 7.0.

2005). It means 'edge of the mountain alder'. *Begh* is also used for physiographic terms ike river bank, as in 'edge of the river' *tabegh*. In Witsuwit'en, *Salix* spp., *Alnus incana* (L.) Moench subsp. *tenuifolia* (Nutt.) Breitung, *A. crispa*, and *Cornus stolonifera* Michx. are named forms that all appear to be considered willows (Table 3).

Kaska willow taxonomy (Table 3) is even more elaborate than Witsuwit'en, and includes both *B. glandulosa* and *Elaeagnus commutata* Bernh. along with *Salix*, *Alnus*, and *Cornus*. When we were walking along the Campbell Highway near her home, Kaska Elder Alice Brodhagen described the dense, tall willow (*Salix* spp.) stand along Watson Creek as *chū kinēli gű̆le dä̆a* ('creek flowing down, willows down there'). I photographed the area, and later, the Kaska speaker and linguist Leda Jules described the site as *gūle chō tah* ('among big willows'), from the photograph. Perhaps, as she wasn't present at the site, the creek and its flow were less salient to her.

Willows are highly salient to the Sahtú people, and are used for medicine. Preliminary work in summer 2005 suggests that *Alnus* and *Salix* species are willow in local perception (Table 3). At least as a component of vegetation, *Potentilla fruticosa* L. and *B. glandulosa* are also willows in local perception. Indeed, the Slavey Dictionary used in the local school translates *k'áe* (willow) as "bushes". It appears that most types of willows are not individually named in North Slavey; the only term we were able to elicit for shrubby cinquefoil turned out to translate as "tea" or "for making tea", a phrase also used with *Rhododendron groenlandicum* (Oeder) Kron & Judd (formerly *Ledum groenlandicum* Oeder), and probably is not the name of the plant. Willows with red stems, however, are distinguished and have different medicinal uses. The species of local red-stemmed willow have not yet been determined.

Willows are also salient to the Gwich'in. The terms in Table 3 were recorded from language materials prepared in Ft. McPherson. Willows have medicinal and ecological significance to Gwich'in (Gwich'in Language Centre n.d., Andre and Fehr 2000). Ecologically, the association of wintering moose with willow flats along the main rivers is well known to Gwich'in, and people take note of willow flats as moose habitat, significant for hunting (L.M.J., fieldnotes, Peel River July 1999 and February 2000). The Witsuwit'en too, recognize the association of willows with moose. *K'indlihensiy* means "willow area where moose go" in Witsuwit'en (L.M.J., interview notes, 1998).

Willows as a habitat have a number of entailments. Willows are difficult to walk through. They often grow along creeks or rivers. Willows are known as a good winter feeding habitat for moose, and are a good bear habitat. Ptarmigan winter among willows. Willows may grow up in berry patches or along old trails and roads, making sites less productive or more difficult to traverse. When talking about vegetation, willows may include young aspen and poplar growth and other tall shrubs. In this sense, willows is a cover term for bushes and thick growth of deciduous species.

Scrubby conifer growth

Most Dene speakers use "brush", in English, to refer to conifer boughs (*ele* and its cognate terms), rather than to designate scrubby vegetation. Conifer boughs are important

Table 4. Kaska and Witsuwit'en terms for coniferous scrub or "brush".

Indigenous term	Meaning	Group
Ts'adli	Brush ("short" or "dwarf")	Kaska*
Gǫ́dze ts'adli	Pine brush	Kaska
Gǫ́dze ts'éle	Small pine trees	Kaska
Ts'ikh, *ts'ikh k'it*	"The low trees that start in one place and spread over the ground" Krumholz; mountain goat habitat at timberline; also "mountain juniper"	Witsuwit'en†
Widits'itl	A really brushy place, a place you cannot walk through, "jungle" (might not be confined to coniferous growth)	Witsuwit'en

*Kaska spellings from unpublished notes.
†Witsuwit'en spellings from Johnson and Hargus 2006.

culturally for clean flooring and for medicine (L.M.J., Gwich'in fieldnotes, 1999, 2000; L.M.J. Kaska field notes, 1999). By extension, people may refer to scrubby coniferous growth, in English, as "brush" (see Table 4 for conifer scrub terms). This was particularly evident with Kaska speakers.

Coniferous- and deciduous-scrub communities can be important as animal habitats. Grouse, for example, prefer small pines, while ptarmigan winter among willows. Thick, brushy pine stands with small trees, called *ts'adli* ('dwarf') in Kaska, are also good for rabbits (showshoe hares *Lepus americanus* Erxleben), a reliable Dene survival food.

Physiographic features as plant habitats

The association between certain physical features and plant or animal habitats are recognized by Dene, who are careful observers of their environments. In a Kaska language class, fluent speakers had no difficulty listing the plants which grew on shorelines such as *tsās* (bear roots), (*Hedysarum alpinum* L. var. *americanum* Michx.), which grow on river banks, or *s̲undli* (wild chives, *Allium schoenoprasum* L. var. *sibiricum* (L.) Hartm.), which grow on gravel beaches.

For Dene living in mountainous areas, altitudinal zones and alpine areas are ecologically significant. The Athapaskan use of alpine areas, and local knowledge of characteristics and resources of alpine zones, is likely ancient, as heavy use of alpine resources extending back thousands of years has been documented in the ice-patch archaeology of the mountain ranges in the southwestern Yukon over the past 9 years (Farnell et al. 2004; Hare et al. 2004).

Witsuwit'en has several words that describe alpine and timberline environments. Bare, sparsely vegetated areas are called *wizulh k'it* [*-zulh* 'empty']. *Tsikh*, dwarf trees at timberline, are often called mountain juniper, in English. This term may be a Gitksan loanword as the term *tse̲x* 'mountain juniper' also exists in Gitxsamimx (Johnson 1999). Those who use it, associate it with timberline environments and with mountain goat bedding areas. *Wize*, 'mountain alder' may also be used to refer to timberline scrub, and timberline itself can be called *scinlegh*. This may also be in part a loan word from Gitksan; *s̲gan* is 'mountain' in Gitxsanimx (Johnson 2000).

The alpine is called *héskage* 'on mountain' by Kaska. Mountains are strongly associated with caribou and caribou hunting for Kaska, and with certain plant resources. Kaska have a great deal of knowledge about alpine environments as habitat for caribou and for thin horned sheep (*Ovis dalli* Nelson; dark Stone Sheep colour phase). Some named and culturally significant plants grow in the alpine region, such as *Silene acaulis* L., known in Kaska as 'gopher food' ["gophers" are Arctic ground squirrels *Spermophilus parryii* (Richardson, 1825) in the Yukon]. Green, moist, meadowy alpine slopes are recognized as gopher habitat. Gophers were formerly a valued food and fur resource, and are considered spiritually powerful because of their closeness with the earth.

Discussion

As hunting peoples, Dene are attentive to the habits and ecological requirements of animals, but are also aware of the locations and habitats of plants which they harvest or use, and which are used by animals. I found when talking about habitats that people were highly attuned to the relationships of animals to plants and place. People described the significance of habitats to animals such as caribou, moose, rabbits and ptarmigan, knowing both the seasons of animal activity and which plants were food sources for the animals; important information for people for whom hunting is a significant part of their economy. The sense of plants and animals as persons or agents is also present in Dene perspectives on the natural world. For example, the poster prepared for the Deline Plants for Life Project features the spruce, describing its many uses. It also includes the story of the origin of spruce pitch, which had its origin when Wolverine threw his snot on the tree, and told people to use the spruce gum when they were sick (Johnson et al. 2006).

There were several recurrent patterns for describing vegetation that occur in more than one Athabascan language. Vegetation was often described as the following: 'among [plant name]' or 'among big [plant name]' and its position on a flat surface may be indicated with *k'it* or other terms indicating "on" such as Kaska *kage*.

Athapaskan languages are highly nuanced in expressing spatial relationships, and often express these in relation to the observer or speaker (Basso 1996; Moore 2000). This has implications for ethnoecology; for example, referring to a spruce forest as "among the trees/sticks" or "among big spruce" situates the speaker *in* the landscape as opposed to an abstracted classification that separates the environment from the speaker.

A local Dogrib (Tłı̨chǫ) document produced for the West Kitikmeot Slave Study Society examines knowledge of the land through Dogrib broad environmental terms and the meanings of place names (Legat et al. 2001) in the taiga plains and barrens on the Canadian Shield to the south and

east of the Great Bear Lake area. I became aware of this study after completing my own research, and find it offers a valuable independent exposition of Dene ethnoecology, and a testament to the richness and subtlety of local understanding of environment. What I found distinctive about the habitats and environments discussed in this paper is the correlation of substrate and soil characters, and topography, with characteristic plants- a true description of habitats in the sense ecologists understand them. I also found the inclusion of broad ecoregion-like terms of interest. They list the following:

> *Nǫdìì* as a large plateau where both woodland and barrenland caribou are hunted, also used for trapping and is the habitat of several important medicinal plants.
>
> *Detsı̨ta* as a general term used for a forested area consisting of spruce, poplar, and birch, which is heavily forested to the west and thins on the Canadian Shield and becomes progressively more sparse and stunted towards treeline.
>
> *Detsı̨laa* as treeline. The area just below the treeline is known as *detsı̨tsíǫneè*.
>
> *Hozìi* refers to the barrenlands (tundra).

Conclusions

In this paper I have provided a brief survey of several important vegetation types distinguished by Dene and the words used to talk about these kinds of place. I discuss connections to indigenous plant knowledge, and to animal use, and I also indicate relations to human ecology and economy. To better situate plant habitat knowledge within the framework of Dene ethnoecology, I offer the following generalizations about Dene understanding of land.

Dene ethnoecology is active and interactive and is framed in shifting potentials and relationships rather than fixed types. This is true of plant resources such as berries, as well as more obviously moving actors such as moose or caribou. Vegetation terms are a subset of the words that designate places on the land, and are not obviously and cleanly separated from physiographic terms. This is particularly evident for wetlands, or alpine areas. The holistic perspective on land unites knowledge about places, their history, their physical, seasonal and biotic aspects, and specific named exemplars in one whole cloth. Following from this, knowledge about plants includes a great deal of ecological knowledge about habitat and locales, which kinds occur together, which animals feed on them, explanatory stories from Distant Time about the origins and uses of plants and plant parts, and their names, and the uses people have for them.

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