**POPULATION STATUS AND ECOLOGY OF TREMBLING ASPEN
AND BLACK COTTONWOOD COMMUNITIES ON THE
BLACKFEET INDIAN RESERVATION**

Prepared for:
The Blackfeet Nation- Fish and Wildlife Department
and United States Fish and Wildlife Service

Prepared by:
Stephen V. Cooper, Vegetation Ecologist
Bonnie L. Heidel, Botanist
Montana Natural Heritage Program of the Natural Resource Information Systems
1515 East 6th Avenue
Helena, MT 59620-1800

© 1997 Montana Natural Heritage Program

Challenge Cost-Share Agreement No. 14-48-0006-96-3034

Montana State Library

3 0864 1006 3967 6

© 1997 Montana Natural Heritage Program

This document should be cited as follows:

Cooper, S. V. and B. L. Heidel. 1997. Population status and ecology of trembling aspen and black cottonwood communities on the Blackfeet Indian Reservation. Montana Natural Heritage Program, Helena, MT. 35 pp. plus appendices.

EXECUTIVE SUMMARY

A combined botanical/ecological survey was conducted of the Blackfoot Indian Reservation's aspen parklands, targeting specifically moist to wet habitats thereof. Ecological and botanical data were entered into standard data bases, ECODATA for community attributes and BCD for botanical features, and analyzed by various multivariate techniques. The results should contribute to effective land management by providing for identification of unique habitats, especially those with wetland attributes, and placing information gathered into a statewide and national perspective.

Three plant associations, *Populus tremuloides* / *Osmorhiza occidentalis*, *P. tremuloides* / *Cornus stolonifera*, and *P. tremuloides* / *Calamagrostis canadensis*, are identified, described, rated for rarity and a vegetative key has been constructed for their field identification. One association, *P. tremuloides* / *O. occidentalis*, has exemplary representations on reservation lands and is highly likely to be relatively rare across the whole of its distribution; this report contains the most complete ecological description of this type and qualifies its uniqueness.

Structural and population analysis of these moist to wet aspen stands indicate most of them will continue to be dominated by *P. tremuloides* and *Populus trichocarpa*. These two species are replacing themselves but in certain situations the shade-tolerant *Picea* spp. and *Abies lasiocarpa* are entering stands and population trends indicate they will eventually become canopy dominants. Factors favoring the establishment of conifers in aspen stands were not explicitly identified, but cattle use is thought to play a part. Disease, decay and animal impacts to these stands are also described.

These vegetation types constitute a significant source of biodiversity. Though no TES plant species were located in any of the stands sampled, the within plot plant diversity was quite high (>30 species/plot) and the 167 plant species found in these three plant associations is a remarkably high figure for forested environments. For very similar communities and habitats it has been documented that they constitute crucial habitat for neotropical migrant bird species as well as other avians. These moister aspen types also provide an abundant grizzly bear (*Ursus horribilis*) herbaceous food source in the spring.

ACKNOWLEDGMENTS

This project was facilitated by the coordination efforts of Ira Newbreast, Blackfeet Nation-Department of Fish and Wildlife and Mitch King, U. S. Fish and Wildlife Service. Cedron Jones, Montana Natural Heritage Program (MTNHP), digitized sampling locations, placed them in a GIS environment and generated appropriate map products. Scott Lee Chadde (MTNHP) provided guidance on data base structure and statistical procedures. Several Blackfeet Nation wetlands specialists made site visits and assisted in field work, including Mary Clare Weatherwax, Brian Fitzpatrick, and Joseph Butterfly. A challenge cost-share agreement between the U. S. Fish and Wildlife Service and the Montana Natural Heritage Program, augmented by a generous monetary contribution from The Nature Conservancy, funded this project. Blackfeet Nation personnel provided direction and coordination for the project and most especially permission to access their lands.

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
II. STUDY AREA	3
III. METHODS	5
Data Collection	5
Data Analysis	8
IV. RESULTS and DISCUSSION	11
Community Ecology and Classification	11
Wetlands Determinations	24
Stand Structure and Successional Status	28
Disease, Defect, and Pests	35
Animal Impacts	37
Rare Plant Species/Floristics	39
V. CONCLUSIONS	40
VI. LITERATURE CITED	42

FIGURES

Figure 1. Trembling aspen ecology: ECODATA sampling plot locations on the Blackfeet Indian Reservation	6
Figure 2. Two-dimensional ordination of 37 samples of trembling aspen-black cottonwood forests of the Blackfeet Indian Reservation	12
Figure 3. Key to lifeform groups and selected deciduous forest types of the Blackfeet Indian Reservation	15
Figure 4. Plot of near maximum tree age and tree height (feet) versus tree diameter (inches) at breast height	29
Figure 5. Frequency distributions by species for the largest size class represented within each stand, a) for <i>Populus tremuloides</i> , b) for <i>Populus trichocarpa</i>	31

TABLES

Table 1. Montana Plant Species of Special Concern documented to occur in or adjoining aspen habitat	8
Table 2. Wetland determination results; matrix of sample plots by jurisdictional wetland parameters and community type	25

APPENDICES

Appendix A. Trembling aspen-black cottonwood communities: Cover synthesis, or "Stand" Table.	
Appendix B. Trembling aspen-black cottonwood communities: Constancy-Cover Table (constancy, average abundance, and range of cover values).	
Appendix C. Scatterplots of stem density by 2 inch size classes without regard to species.	
Appendix D. Trembling aspen-black cottonwood tree populations by site and species diameter classes.	
Appendix E. Trembling aspen-black cottonwood basal area by site, species, and sampling technique.	
Appendix F. Vascular plant species occurring in trembling aspen-black cottonwood stands.	
Appendix G. Application of comprehensive onsite determination method to selected trembling aspen-black cottonwood stands.	
Appendix H. Montana Natural Heritage Program Community Survey Form.	
Appendix I. Montana Natural Heritage Program Ocular Plant Species Data Form.	
Appendix J. Annotated photographs documenting examples of the <i>Populus tremuloides</i> / <i>Cornus stolonifera</i> , <i>P. tremuloides</i> / <i>Calamagrostis canadensis</i> and <i>P. tremuloides</i> / <i>Osmorhiza occidentalis</i> plant associations

POPULATION STATUS AND ECOLOGY OF TREMBLING ASPEN AND BLACK COTTONWOOD COMMUNITIES ON THE BLACKFEET INDIAN RESERVATION

I. INTRODUCTION

Trembling aspen stands on the Blackfeet Indian Reservation (BIR) are among the most extensive, intact, and well-developed in the Northern Rocky Mountains, spanning a continuous gradient of terrestrial-to-wetland conditions in combination with black cottonwood. These stands are pivotal in evaluating the overall status and characteristics of aspen in the Northern Rockies, and their closely-associated wildlife resources.

Staff members of the Montana Natural Heritage Program, U.S. Fish and Wildlife Service, and the Fish and Wildlife Department of the Blackfeet Indian Nation, convened in late winter of 1996 to discuss research and inventory opportunities and priorities on the Blackfeet Indian Reservation (BIR). It was concurred that the wet communities dominated by trembling aspen (*Populus tremuloides*) and black cottonwood (*Populus trichocarpa*) are the most vulnerable and least well-documented, as well as having exceptionally high wildlife values. This in turn made them a priority for baseline characterization and management analysis covering wetland delimitation, successional status and condition.

Other studies have documented that the high wildlife values of aspen stands in general, and the wet aspen-cottonwood stands in particular, include disproportionately high Neotropical migrant breeding bird use compared to these stand's areal extent on the landscape, critical spring-early summer foraging grounds for grizzly bear, a buffered travel corridor and cover for big game between the extremes of the plains and the montane forests, and a structural landscape component that enhances overall wildlife diversity. Preliminary evidence has also been compiled that their uniqueness is also reflected in a diverse flora that includes rare plant species.

The seminal work on aspen types of BIR lands was conducted by Lynch (1955), but keys were not developed for the classification, leaving questions of delineation and distinction unresolved among the mesic-wet types. Among the documented plant community types was the trembling aspen - black cottonwood/ western sweet-cicely type (*Populus tremuloides*-*Populus trichocarpa*/*Osmorhiza occidentalis*) that is not known in other states and barely documented in Canada. It is identified as a plant community type which may be imperiled throughout its range (Grossman et al. 1994). It is treated as a wetland type by the Montana Riparian Association (Hansen et al. 1995), with meager information for differentiating it from terrestrial types.

This study was set up to document the population status and ecology of trembling aspen and black cottonwood communities on the Blackfeet Indian Reservation as a baseline reference and management tool. Specifically, it addresses community classification, wetland delimitation, successional status, vigor and mortality conditions , and rare plant species.

II. STUDY AREA

The aspen parkland of the Blackfoot Indian Reservation (BIR) consists of a distinct zone of parkland-fescue grassland mosaic between the eastern front of the Lewis Range of the Rocky Mountain Cordillera and the Great Plains. The parkland lies principally within the western edge of the BIR but on south slopes of narrow mountain valleys it advances into the eastern edge of adjacent Glacier National Park and on north-facing valley slopes it extends into the plains. This zone characterized by the prevalence of aspen usually does not much exceed 1,000 vertical feet, from 4,500 to 5,750 feet; exceptional stands can be found above and below these limits due to compensating factors (such as moist conditions associated with steep north-facing slopes of ridge systems set in a plains environment).

Its distribution largely corresponds with surficial geology, namely ground moraines deposited by Pleistocene Epoch, Wisconsin Stage glaciers (see maps in Lynch 1955). The St. Mary Glacier was fed by tributary glaciers from drainages in which now flow Divide, Red Eagle, Swiftcurrent, Boulder, and Kennedy Creeks and extended down the St. Mary Valley for some 36 miles. Marking the eastern extremity of the parkland are the lateral moraines on the western slopes of Saint Mary Ridge and which course up the St. Mary Valley to then extend northeastward, passing around the eastern end of Duck and Goose Lake.

Outwash fans consisting of cobbles and other coarse material formed at the Kennedy, Swiftcurrent, Wild and Divide Creeks. The bottom of the valley north of Lower Saint Mary Lake is filled with coarse material similar to that in the outwash fans. Where soils are well-developed or depth to water table is shallow these coarse materials support trembling aspen, but where a thin soil mantle prevails these coarse materials support *Fescue* (fescue)- and *Agropyron* (wheatgrass)-dominated grasslands.

From Hudson Bay Divide south, aspen parkland covers Wisconsin-age drift in the valley of Cutbank Creek to a short distance west of the Park boundary. South of Two Medicine Valley the parkland grades into a mixture of communities dominated by aspen, conifers, and herbaceous species. These vegetation types occupy ground moraines deposited by the Two Medicine Glacier, which was fed by glaciers originating in the Two Medicine Valley, Marias Pass, and in the valleys stretching south to Heart Butte.

The parkland, especially the moister sites, occupies primarily troughs and depressions in the ground moraine complex on the lower slopes of the valleys mentioned above and similar habitats at the head of the extensive Milk River drainage system. Argillites and limestones are the primary rock types contributing to the glacial till, whereas the bedrock appears to be Cretaceous sandstone.

At the drier, plains portion of its distribution the aspen parkland rather abruptly gives way to rough fescue (*Festuca scabrella*)- and Idaho fescue (*F. idahoensis*)-dominated grasslands of lower elevation, drier sites having thinner soils. Within predominantly forested landscape aspen stands also have relatively narrow transitions to conifer dominated stands. The conifer dominants range from Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*), typical of younger stands and drier environments, to subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*) and hybrid swarms of Engelmann with white spruce (*P. glauca*) that characterize older stands and more mesic environments.

Potentially at least, two orders, nine Subgroups, and thirteen series are represented in our sampling, however, almost all of the soil mapping units that include aspen-black cottonwood are complexes and associations (e.g. Nettleton-Mikesell clay loams); thus it is not possible to distinguish even Orders at the plot level without fully describing a profile. The 37 sample plots occurred over 16 different soil mapping units, including one unit that was mapped as unequivocal wetland, Fresh Water Swamp.

A synopsis of the soils (their taxonomy) on which we found aspen parkland well developed is as follows:

Order level	Subgroup level	Series
Alfisols	Typic Cryoboralf	Loberg, Mikesell, Swifton
Mollisols	Pachic Cryoboroll	Adel, Gallatin,
	Typic Cryoboroll	Babb
	Argic Pachic Cryoboroll	Burnette
	Typic Cryaquolls	Gapo
	Boralfic Cryoboroll	Mord
	Argiaquix Xeric Argialboll	Nettleton
	Calcic Cryoboroll	Hanson, Raynesford
	Typic Calciaquolls	Bear Lake
		Fresh Water Swamp

III. METHODS

Data Collection

From previous field trips to forested lands of the BIR we were well acquainted with the distribution of trembling aspen and black cottonwood stands with respect to landscape position. Scanning orthophoto quads enabled us to identify areas with relatively extensive mature stands in relatively mesic landscape positions (more mesic than the average trembling aspen stand which generally occupies upland and hillslope positions). At areas of extensive trembling aspen we walked the landscape, focusing our search on positions known, or hypothesized, to be associated with a higher than average soil moisture regime. We sought homogeneity of vegetation composition and structure (across a given position) in selecting a representative plot within the stand. In general we attempted to sample stands that appeared to have a plant composition that indicated higher than average moisture regime. Sampling was spread along the whole of the Reservation's parkland (Figure 1) however, certain areas of extensive parkland, such as the vicinity of Kiowa, were more intensively sampled.

All sample plots were circular (37.2 ft radius), 1/10 acre in area. Information regarding location, abiotic site variables and plant composition (canopy coverage) was collected on the Natural Heritage Program Community Survey Form (Appendices G & H). The Community Survey Form is a derivation of the General Plot Data and the Ocular Plant Species Data Forms employed by the USDA Forest Service (Northern Region) as a portion of their ECODATA (USDA 1996) community sampling package. We chose this approach because it provides a state-of-the-art relational data base structure for storage, retrieval, and export to analysis programs and is compatible with methods used by various government agencies collaborating with The Nature Conservancy.

The same size plot was also employed to determine diameter class distribution. Tree size and diameter classes employed were those defined by the U. S. Forest Services' Northern Region: seedlings (>6 in., < 4.5 ft. or < 1 in. d.b.h.), saplings (> 4.5 ft. or > 1 in. and < 5 in. d.b.h.), pole (> 5 in. to < 9.0 in d.b.h.), mature (> 9 in. and < 14 in. d.b.h.), large mature (> 14 in. d.b.h.). Initially all stems greater than 1 in. d.b.h. were counted by 1 inch diameter classes up to 6 in. in diameter and by 2 inch classes for trees with a greater than 6 in. diameter at breast height; later in the study we changed to tallying by 1 inch classes across all stem sizes, realizing this finer resolution did not slow the process and afforded a fine-scale documentation of size class distributions. The coverage of all vascular undergrowth species was tallied by the following canopy cover classes (percent values, see Daubenmire 1959): 0; T = >0 , <1 ; P = ≥ 1 , <5 ; 1 = ≥ 5 , <15 ; 2 = ≥ 15 , <25 ; 3 = ≥ 25 , <35 ; 4 = ≥ 35 , <45 ; 5 = ≥ 45 , <55 ; 6 = ≥ 55 , <65 ; 7 = ≥ 65 , <75 ; 8 = ≥ 75 , <85 ; 9 = ≥ 85 , <95 ; F = ≥ 95 . Photographs to document the general aspect of stand structure and undergrowth composition were taken for all sites. An examination of the stand was conducted for any indicators of hydrological status (e.g. wrack lines,

Trembling aspen ecology: ECODATA sampling plot locations on the Blackfoot Indian Reservation

Montana Natural Heritage Program, March 17, 1997

sediment deposits) as outlined by the "Corps of Engineers Wetlands Delineation Manual" (Environmental Laboratory 1987).

To gain insight as to the time of last major stand disturbance and general age class distribution information we attempted to core at least one healthy appearing (no conks, cankers or obvious signs of root rot) individual from the largest size class represented in the plot; if coring five or six trees on the plot did not result in countable cores we generally discontinued coring. Sometimes coring was continued when healthy specimens, of the same size class as those within the plot, were found outside the plot.

Soil pits were excavated only deep enough to yield information about the degree and extent of soil saturation; generally this was not deeper than 50 cm. (20 inches). The features consistently noted were those pertinent to soil water regime: Distance to and height above water bodies, depth to free water or saturation, whether mottling and gleying were present, the depth at which these phenomena occurred and their strength of expression and depth of calcium carbonate accumulation. Other features were noted as appropriate to the determination of whether soils were hydric or not. Usually these features related to soil texture, shape and strength of peds, and distinctness of horizon boundaries. Soil samples were collected from the following depths (in cm) 0-10, 10-20, and when warranted, 20-30. These samples were air dried and stored for later determination of soil color (hue and chroma), pH and conductivity. Soil series was determined from published soil maps (USDA Soil Conservation Service and USDI Bureau of Indian Affairs 1980) and compared against data collected in the field.

Field notes were taken on types and degrees of diseases and defects present on trees with primary guidance to field identification offered by Hiratsuka et al. (1995), Hagle et al. (1990) and Hinds (1985). Certain of the readily identifiable trunk rots, especially the presence of conks of *Phellinus tremulae* (syn. *Fomes igniarius* var. *populinus*, white trunk rot or white heart rot) and cankers, were systematically noted when tallying trees by size class.

Sensitive plant surveys were conducted on slightly fewer than half the plots inventoried, when a botanist familiar with all search images for sensitive, threatened, and endangered species accompanied the field staff. The process of sensitive species surveys can be summarized as follows; 1) Check for sensitive plant records in and around the project area, 2) Set species search targets and time frames for fieldwork, 3) Survey appropriate habitat at the crucial times of the growing season, 4) Collect information on any sensitive plant populations, also documenting them in photographs and specimens. The Biological Conservation Database (BCD) was searched for all records of special status features, including sensitive species; none of these species are known to be associated with trembling aspen parkland or black cottonwood stands in Glacier County, although elsewhere Montana Plant Species of Species of Concern have been documented in or adjoining trembling aspen (Table 1). Many of

Table 1. Montana Plant Species of Special Concern potentially occurring in or adjoining aspen habitat.

SPECIES COMMON NAME (SCIENTIFIC NAME)	COUNTIES OF DISTRIBUTION
Round-leaved orchis (<i>Amerorchis rotundifolia</i>)	Flathead, Glacier, Lewis and Clark, Lincoln, Pondera, Power, Teton
Short-styled columbine (<i>Aquilegia brevistyla</i>)	Judith Basin, Sweetgrass
Sitka columbine (<i>Aquilegia formosa</i>)	Beaverhead
Craw's sedge (<i>Carex crawei</i>)	Cascade, Pondera, Power, Prairie, Teton
Yellow lady's-slipper (<i>Cypripedium parviflorum</i>)	Flathead, Gallatin, Granite, Judith Basin, Lake, Lewis & Clark, Lincoln, Missoula, Park, Stillwater, Sweetgrass, Tton
Buckler fern (<i>Dryopteris cristata</i>)	Flathead, Lake, Missoula, Ravalli
Giant helleborine (<i>Epipactis gigantea</i>)	Carbon, Cascade, Flathead, Granite, Lake, Madison, Power, Teton
Northern rattlesnake-plantain (<i>Goodyera repens</i>)	Fergus, Flathead, Judith Basin, Meagher, Wheatland
Green gentian (<i>Halenia deflexa</i>)	Flathead, Lincoln
Heart-leaved buttercup (<i>Ranunculus cardiophyllus</i>)	Glacier, Sweetgrass, Toole
Northern buttercup (<i>Ranunculus pedatifidus</i>)	Flathead, Glacier, Granite, Liberty, Toole
Desert groundsel (<i>Senecio ereophilus</i>)	Hill, Park

these species are boreal at their southern limits and the majority are also wetland species.

Throughout this report the scientific plant names are consistent with the older taxonomic treatment of Hitchcock and Cronquist (1984) to facilitate comparison and use with conventional range management, wildlife and forestry references. The scientific and common names of all species found in sampled plots and a rudimentary attempt to synonymize them with the most recent treatments are presented, alphabetized by scientific name within lifeform, in Appendix F.

Data Analysis

Analysis included a combination of ordination, to describe general patterns of communities in relation to environmental gradients, and classification, to ascertain and describe community types. Ordination was performed using detrended correspondence analysis (DECORANA, Hill 1979b); the input data being comprised of species cover (the midpoint values of cover classes) by stand. This is an indirect ordination method in that analysis is performed on the species data alone first and then environmental interpretation is made by superimposing environmental data on the ordination plots and examining the overlay for patterns and correlations. All default options were employed when running the ordination algorithm. Because only the moist to wet end of the moisture gradient for a single formation was the object of study, beta diversity was relatively low and there was no need to stratify the data set based on say, dominant lifeform in the undergrowth layer.

We also applied canonical correspondence analysis (CCA) using the computer program CANOCO (ter Braak 1988). CCA differs from the classical indirect ordination approach because it incorporates the correlation and regression between vegetation data and environmental factors within the ordination itself and thus constitutes a direct ordination. The input data consists of a data matrix of species by quadrats (stands) and a second matrix of environmental variables by quadrats (stands). The resulting ordination diagram thus expresses both the patterns of variation in floristic (or stand) composition and the principal relationships between species (or stands) and each of the environmental variables. We restricted our analysis to environmental variables that best capture wetland status, soil mottling and gleying; other important wetland variables expressing hydrologic status, e.g. depth to water table or saturation, registered too many zero observations for their use as statistical predictors.

Objective classification of vegetation was accomplished using two-way indicator species analysis (TWINSPAN, Hill 1979a); No data transformations were employed and all default options in the TWINSPAN algorithm were used, except that pseudospecies cut levels were set at 0, 5 and 20 percent cover. Insights into species occurrence and probable assemblages suggested by TWINSPAN were combined with field insights

accumulated by the investigator and the plots were then subjectively grouped using STRATA (USDA Forest Service). Existing classifications of vegetation types, particularly of Montana wetland types (Hansen et al. 1995), dictated more the units we recognized than any single source of information. We attempted to make our interpretations fit existing modes of interpretation, in so far as the data would allow.

Analysis of stand structure consisted of plotting frequencies of live and dead stems by size classes to determine visually what might be occurring with tree populations. Patterns of ingrowth and mortality were compared with cases of typical patterns of forest reproduction and senescence (Oliver and Larson 1996) to determine the probable future course of BIR trembling aspen-black cottonwood parkland.

The "Corps of Engineers Wetlands Delineation Manual" (Environmental Laboratory 1987) is currently the document used to assess whether a putative wetland in fact meets wetland criteria. Information collected regarding hydrology, soils and vegetation was tabularized and weighed to determine whether the plot (and not necessarily the whole stand) met wetland criteria.

IV. RESULTS and DISCUSSION

Community Ecology and Classification

We present only the CCA ordination results (biplot) in Figure 2 as one result of data exploration, ascertaining the degree to which the only consistently measurable environmental variables were associated with stand (plot) position in vegetation and environmental space. The resulting ordination (biplot) is a product of the variability of the environmental data, the nominal variables gleying and mottling [positive associations GY, MY; negative associations (GN, MN), the ordinal variables chroma and value and the variability of the plot composition data (species coverages). The ordination diagram (Figure 2) expresses not only the patterns of variation in floristic composition but also demonstrates the principal relationships between stands of vegetation (plots) and each of the environmental variables. The arrows point in the direction of maximum change in these environmental variables across the diagram and their length is proportional to the magnitude of change in that direction.

Thus the plots of the upper left quadrant are positively associated with gleying (GY arrow) and mottling (MY arrow). Note that the plots of this quadrant are all underlined which indicates that they unequivocally satisfy the criteria for "jurisdictional wetland" (see page ____ under Wetland Determinations section for explanation of "jurisdictional wetlands"). The arrows for low chroma and low value are weaker and indicate a few true wetlands plots (that have weak indications of mottling and gleying) that possess very dark (low value rating, high organic matter content) and grey soils (low chroma, lacking color). Soils of these plots (numbers 42, 48, 39) were judged to be incipiently gleied; they were not actually gleied or mottled due to their developing on a coarse-textured substrate (sands and sandy loams) wherein gleying seldom develops due to adequate aeration (oxygen supply).

More than forty years have passed since Lynch (1955) conducted his study of trembling aspen "groveland" ecology. His study recognized three trembling aspen- or black cottonwood-dominated plant associations, *Populus tremuloides*/Symphoricarpos albus, *Populus/Aster foliaceus*, and *Populus / Osmorhiza occidentalis*. We have found the latter two of these associations, named only as *Populus* because they contained both *P. tremuloides* and *P. trichocarpa*, to be undifferentiable and propose merging them. We have documented two additional mesic to wetland associations, *P. tremuloides / Calamagrostis canadensis* and *P. tremuloides/ Cornus stolonifera* as defined elsewhere by Hansen et al. (1995). We also observed three other trembling aspen-dominated forest associations in uplands, *P. tremuloides / Calamagrostis rubescens*, *P. tremuloides / Carex geyeri* (Mueggler 1988) and *P. tremuloides / Symphoricarpos albus* (Cooper and Pfister 1981).

Lynch did not provide a key for plant association identification. Had he attempted to do so, he well may have experienced the difficulty we encountered in trying to separate his types on the landscape. We often encountered stands of pure *P. tremuloides* with *Symphoricarpos albus* dominant in the undergrowth, but mesic- to wet-site indicators (e. g. *Angelica arguta*, *Geum macrophyllum*, *Viola canadensis*, and *Calamagrostis canadensis*) also present and occasionally abundant. Is this a *P. tremuloides*/*S. albus* or a *P. tremuloides*/*O. occidentalis* plant association? Lynch did not employ the indicator concept, that the coverage or mere presence of certain plants is indicative of certain site conditions. Building upon Lynch's work and operating from a much expanded data base of vegetation stands and soils information we are proposing a revision of aspen and black cottonwood synecology for this area. For instance, Lynch did not note finding *Angelica arguta*, *Festuca subulata* or *Schizachne purpurascens*, all of which are important components of many stands we sampled; his sampling intensity or time of sampling was such that these species went unrepresented in the data base. He listed 36 species occurring in the *P. tremuloides*/*Osmorhiza occidentalis* p.a., whereas we have documented, based on 18 more plots than Lynch sampled, an additional 111 species for roughly the same portion of the environmental gradient. Our revision is in the best tradition of "successive approximation" (Poore 1962) that holds ecological conceptions regarding an area can be fine-tuned with additional sampling and analysis as an incremental approach to the most appropriate description or model.

We chose to focus on the wetter end of the moisture gradient represented by the *Populus*/*O. occidentalis*, *Populus*/*A. foliaceus* plant associations because these appeared to be problem areas for type recognition. Lynch recognized the importance of these two plant associations being capable of supporting both *P. trichocarpa* and *P. tremuloides*. He differentiated these two community types based on species dominance in the undergrowth layer, with the stands having greater importance (a higher "index value") for a suite of species defining a particular plant association and distinguishing it from other stand groupings with other suites of species having high index values.

Our analysis indicates that whatever composition might be considered typical for the *Populus*/*Aster foliaceus* p.a. is not borne out in the ordinations (Figure 2); there is no cluster of stands within the ordination that would be defined by the *A. foliaceus* union of species as described by Lynch (1955). Lynch characterizes the landforms or positions occupied by both *Populus*-dominated plant associations as having considerable overlap, including inter-morainal troughs and depressions in glacial drift. Because no indicator species or suite of species or environmental parameters could be identified as unique to this type it was merged with what Lynch termed *Populus* / *Osmorhiza occidentalis* and Cooper and Pfister (1981) described as *Populus tremuloides*-*Populus trichocarpa* / *O. occidentalis*. *Populus trichocarpa* is recognized in the latter association as an important and distinctive component. In this report we have equated it to the name *P. tremuloides* / *Osmorhiza occidentalis* following Hansen et al (1995), who dropped the dual tree designation in their statewide monograph of wetland community

types. We have also accepted the lead of Hansen et al. (1995) in placing *P. tremuloides* before *P. trichocarpa* in the key to plant communities. However, judging by our data and that of others, we perceive that *P. trichocarpa* is more strongly associated with hydric conditions than is *P. tremuloides* and therefore should come first in the key. Hansen et al [1995] have generally constructed their keys on the premise that the wettest types are identified first; perhaps they recognized the fact that *P. tremuloides* is more widespread than *P. trichocarpa* in giving it priority.

¹ Index value is a weighted measure of frequency and vitality, the % of plots in which species is flowering.

What follows is a key to the moist to wet trembling aspen- and black cottonwood-dominated communities of the BIR. Immediately following the key are the descriptions of the moist to wet site plant associations. The written descriptions attempt to characterize the environmental setting, overall composition and structure of the plant associations however, the composition of individual plots can be found in Appendix A, (stand table), the overall average composition for the plant association in Appendix B, (constancy-coverage table), and photographs of representative stands in Appendix J. These appendices employ six letter acronyms, the first three letters of the genus followed by the first three of the specific epithet, as shorthand for the scientific name.

Figure 3. KEY TO LIFEFORM GROUPS AND SELECTED DECIDUOUS FOREST TYPES OF THE BLACKFEET INDIAN RESERVATION

[Plant associations described in this document are in **bold**; their order of presentation in the text follows the order in which they occur in the key. Other wetland/riparian associations are found in Hansen et al 1995, or as noted]

1. Tree canopy cover, single species or combined cover, at least 25% 2
1. Tree canopy cover, single species or combined cover, less than 25%
..... Non-forested types, not treated in this document
2. Coniferous trees present and reproducing successfully (10 or more trees per acre or canopy cover of seedlings/sapling >5%)
..... Coniferous Forest Types (see Hansen et al. 1995 or Pfister et al. 1977)
2. Coniferous trees absent, or if present, then not reproducing successfully or restricted to microsites 3
3. *Populus tremuloides* (trembling aspen) present and reproducing successfully 4
3. *Populus tremuloides* absent or, if present, not reproducing successfully 8
4. *Cornus stolonifera* (red-osier dogwood) or wet site *Salix* spp. (willows, not including *S. scouleriana*) having at least 5% canopy cover, individually or in combination
..... ***Populus tremuloides*/*Cornus stolonifera* plant association**
4. *Cornus stolonifera* and wet site *Salix* spp., individually or in combination, having less than 5% canopy cover 5
5. *Calamagrostis canadensis* (bluejoint reedgrass), *C. stricta* (narrow-spiked reedgrass), *Alopecurus alpinus* (alpine foxtail) or *A. pratensis* (meadow foxtail) either singly or their combined canopy cover at least 5%
..... ***Populus tremuloides*/*Calamagrostis canadensis* Plant Association**

5. *Calamagrostis canadensis*, *C. stricta*, *Alopecurus alpinus*, or *A. pratensis* either singly or their combined cover less than 5% 6
- Figure 3. Continued.
6. *Osmorhiza occidentalis* (western sweet-cicely), *Angelica arguta* (sharp-tooth angelica), *Viola canadensis* (Canada violet), *Heracleum lanatum* (cow-parsnip), *Veratrum viride* (green false hellebore), *Actaea rubra* (baneberry), *Galium triflorum* (sweetscented bedstraw) individually, or in any combination, having at least 5% canopy cover
- ***Populus tremuloides*/*Osmorhiza occidentalis* Plant Association**
6. Site lacking at 5% canopy cover, either singly or in any combination, of the following species, *Osmorhiza occidentalis*, *Angelica arguta*, *Viola canadensis*, *Heracleum lanatum*, *Veratrum viride*, *Actaea rubra*, *Galium triflorum* 7
7. *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (common timothy), or *Agrostis stolonifera* (redtop), their individual or combined canopy coverages at least 5% *Populus tremuloides* /*Poa pratensis* community type
7. Not as above *Populus tremuloides*-dominated community types *
8. *Populus trichocarpa* (black cottonwood), *P. angustifolia* (narrowleaf cottonwood), or *P. deltoides* (Great Plains cottonwood) with a greater canopy cover than other individual tree species 9
8. *Populus trichocarpa*, *P. angustifolia*, and *P. deltoides* having less canopy cover than other individual tree species . (see Hansen et al. 1995 for further coverage)
9. *Populus trichocarpa* with greater canopy cover than either *P. angustifolia* or *P. deltoides* *Populus trichocarpa*-dominated community types*
9. *P. angustifolia* or *P. deltoides* with greater canopy cover than *P. trichocarpa* (see Hansen et al. 1995)

*Other *P. tremuloides*- and *P. trichocarpa*-dominated plant communities (e.g. *P. tremuloides*/*Symphoricarpos albus*) do occur on the BIR and their description can be found in Hansen et al. 1995 or Cooper and Pfister 1981.

***Populus tremuloides* / *Cornus stolonifera* Plant Association**

(POPTRE/CORSTO; trembling aspen/red osier dogwood; 3 plots;
WHTF¹ designation POPTRE / *Cornus sericea*)

Environment: This is the wettest of deciduous forest types we inventoried on the BIR and is the wettest vegetation type, when present, in local landscapes. It was seldom found in patches greater than an acre, though in its stringer form along streams and other water bodies its collective area is clearly greater. Small patches are also located in inter-morainal troughs. Very small fragments were found on mid-, lower-slope, and toe-slope positions; there was no obvious explanation for the high cover of *C. stolonifera* at these positions except to invoke a subsurface source of water due to the complexity of water channeling in slump surfaces. Soils show strong gleying and mottling (except for the sideslope oddities). Adjacent communities were *Salix*-dominated on wetter positions and *Populus tremuloides* / *Calamagrostis canadensis* or *P. tremuloides* / *Osmorhiza occidentalis* on drier, or at least slightly upslope positions.

Vegetation: It is important to note that our key to this community type differs, at least in defining species, from that described by Hansen et al. (1995). We recognize only *Cornus stolonifera* (FACW, see Appendix F) with at least 5% canopy cover as a significant indicator of wetland conditions, but two of the other shrub species (*Prunus virginiana*, *Amelanchier alnifolia*) listed in the key of Hansen et al. (1995) are not associated with wetlands, but rather uplands (Appendix F). For instance, accepting *A. alnifolia* as an indicator would broaden the concept of this type to include relatively dry upslope conditions. *C. stolonifera* cover varies widely and it appeared the higher coverages are associated with wetter conditions. More appropriate alternative indicators for this type are the various wetland *Salix* spp., e.g. *S. boothii*, *S. bebbiana*, *S. geyeriana*, which occur with coverages up to 10% and are definitely associated with wetland conditions.

The overstory is usually dominated by varying proportions of *P. trichocarpa* and *P. tremuloides*, but at least one stand was sampled, and others noted, having *P. tremuloides* as the monospecific dominant. *P. trichocarpa* has a higher cover in POPTRE/CORSTO than in the other moist types, indicating that these sites are in fact wetter. [It should be noted here that we have followed the lead of Hansen et al. (1995) in constructing our key so that *P. tremuloides* comes off before *P. trichocarpa*. But we feel this prioritization is inappropriate because of the two species, *P. trichocarpa* is more strongly associated with wetland conditions (see Appendix F) however, we have bowed to priority and followed Hansen's lead, not wanting to create competing classifications. Where drainages flow out onto the plains there are pure *P. trichocarpa* stands, however, these were not sampled, being beyond the parkland environment. For the mixed species stands there is no clear indication in size class structure of eventual

¹ Western Heritage Task Force of The Nature Conservancy

domination by either species. In sampled stands *Picea* spp. and *Abies lasiocarpa* evidenced only very scattered seedlings and saplings, their cover not amounting to more than 5%. However, during reconnaissance we noted several stands at the prairie-forest juncture having at least 50% cover of coniferous species, predominantly *Picea* spp and low vigor *Abies lasiocarpa*, indicating that at least some of these sites may be climax in shade-tolerant conifers and constitute the *Picea* / *Cornus stolonifera* habitat type.

The graminoid component is invariably dominated by *Elymus glaucous* (blue wildrye) and *Festuca subulata* (bearded fescue) with *Bromus ciliata* (fringed brome), *Alopecurus* (foxtail) spp. and *Calamagrostis canadensis* (bluejoint reedgrass) occurring sporadically with high coverages (Appendix A). It should be noted that *E. glaucous* is the most ubiquitous graminoid of trembling aspen stands across the Intermountain West and Northern Rocky Mountains; often it has the highest cover of any graminoid present. Aggressive, weedy grasses apparently do very poorly here despite the fact that opportunities abound for animals, both domestic and natives, to introduce these species. There are a number of forbs with 100% constancy including *Thalictrum occidentale*, *O. occidentalis*, *Viola canadensis*, *Sanicula marilandica*, and *Geranium richardsonii*. A considerable variety of wetland herbs are present with varying constancy and cover; surprisingly *Angelica arguta* exhibited low constancy but very high coverage for those stands in which it occurred. The only forbs present associated with livestock use or disturbance are *Prunella vulgaris* and *Urtica dioica*.

Other Studies: As we have defined this plant association there are no other comparable regional types described. If one accepts *A. alnifolia* as an alternative indicator of the type as do Hansen et al. (1995), then there are vast extents of the Northern Rocky Mountains and Intermountain West dominated by various permutations of *P. tremuloides* / *C. stolonifera* (see Mueggler 1988). Of these combinations, the *P. tremuloides* / *A. alnifolia* Tall Forb c.t. described by Mueggler (1988) is compositionally most similar to POPTRE/CORSTO, but it is far from being a wetland c.t. as described here. Both Bird (1961) and Moss (1955) indicate that *Populus trichocarpa*, *Cornus stolonifera* and *Viburnum opulus* are commonly associated with moist to wet aspen of southwestern Alberta but neither author provides plant association level descriptions. Almost certainly this plant association is present in southern Alberta, but given the intensive grazing pressure, seeding to introduced pasture grasses and habitat fragmentation associated with oil field development that has transpired in this region almost certainly stand condition has been negatively impacted.

Natural Heritage Program Rank: G3/S3 (Unchanged from Bourgeron & Engelking 1994)

***Populus tremuloides*/*Calamagrostis canadensis* Plant Association**
(POPTRE/CALCAN; trembling aspen/bluejoint reedgrass; 11 plots)

Environment: POPTRE/CALCAN is a minor type on the BIR and would appear to be associated with landscape positions as wet as those for POPTRE/CORSTO, but only infrequently were the two community types noted to occur in a mosaic pattern on the same landscape. Though Hansen et al. (1995) note both types to be well aerated, we speculate that the POPTRE /CALCAN p. a. is less so, occupying finer, more poorly-drained soils. The largest extents of the type were found bordering herbaceous- or *Salix*-dominated wetlands; other positions included inter-morainal troughs, alluvial benches and even toeslopes speculated to receive appreciable subsurface flow. Soils were predominantly loams, silt loams and silty clay loams, usually gleyed (or mottled) to within 15 to 20 cm of the surface.

Vegetation: The usual condition is a closed canopy overstory dominated by *P. tremuloides*, with *P. trichocarpa* being a considerable component on three fourths of the stands; in only two stands did *P. trichocarpa* exceed *P. tremuloides* in importance (canopy cover and basal area). Lynch (1955) also noted that *P. trichocarpa* was not present in all moist-site stands, observing that there was no apparent difference in site parameters and attributing the difference to local stochasticity in seed distribution at the time of establishment. In stands where both species are well represented there is no consistent indication one or the other gaining dominance. *P. trichocarpa* attains larger stem diameters but ultimate heights for both species asymptotically approach about 60 ft. *P. trichocarpa* also seems to be more infested with heart-rot fungal pathogens.

Shrubs are generally poorly represented in the undergrowth, with the exception of *Symphoricarpos albus* and *Rosa woodsii*, the average covers of which are 8 and 4 %, respectively. Shrubs with wetland indicator value include *Salix boothii*, *S. bebbiana*, *S. geyeriana*, *Ribes americanum*, *R. setosum* and *Cornus stolonifera*, but the coverages are low (<5%) and constancy does not exceed 36% for any one of these species.

The predominant aspect of these stands is that of graminoid dominance with the wetland indicators *Calamagrostis canadensis*, *C. stricta*, *Alopecurus alpinus* and *A. pratensis* contributing more than half the cover and *Elymus glaucous*, *Festuca subulata*, and *Phleum pratense* contributing most of the rest. Other wetland graminoids sampled only in this type include *Glyceria striata*, *Carex microptera*, *C. hoodii*, *C. brevior*, and *C. rostrata* (syn. *C. utriculata*). This type differs from POPTRE/CORSTO by having disturbance increasers, *Poa pratensis*, *Poa palustris*, and *Phleum pratense* as a significant undergrowth component in some cattle-influenced stands. Some stands had an appreciable forb component with *Angelica arguta*, *Arnica chamissonis*, *Epilobium ciliatum*, *Geum macrophyllum*, *Senecio foetidus*, *Aster laevis*, *Geranium richardsonii*, *Pedicularis bracteosa*, *Smilacina stellata*, *Lathyrus ochroleucus*, *Galium boreale*, *G. triflorum* and *Fragaria virginiana* having their highest constancy within this plant

association; constancy for the listed species ranged from 36 to 100%. The first five listed forbs are rated by US Fish and Wildlife Service as FACW¹ or wetter.

Other Studies: Other than the description in Hansen et al. (1995) the POPTRE/CALCAN plant association has not been described elsewhere within the region (Northern Rocky Mountains), but it has been described for both Colorado's Front Range (Mutel 1973) and the mountains of the state's south-central area (Powell 1988). Judged on a regional basis it appears to be an incidental type; even two of the six stands attributed by Hansen et al. (1995) to the type have 20% cover of *Alnus incana* making the stands members of POPTRE/CORSTO, rather than POPTRE/CALCAN, in their taxonomy.

Natural Heritage Program Rank: G3/S3 (POPTRE?CALCAN is a relatively uncommon association but threats to it are minimal, at least to the Montana examples, even from overgrazing by ungulates. We have noted few weed problems with the exception of *Urtica dioica*. *Poa pratensis* can also form aggressive clones on these moist to wet sites.)

¹ FACW is wetland indicator status designation assigned by US Fish & Wildlife Service indicating a facultative wetland species that usually occurs in a wetland, i.e. with an estimated probability of 67-99%, but is occasionally found in non-wetlands

***Populus tremuloides/Osmorhiza occidentalis* Plant Association**
(POPTRE/OSMOCC; trembling aspen/western sweet-cicely; 23 plots)

Environment: POPTRE/OSMOCC is the driest community type of the aspen parkland's mesic to hydric associations. It most usually grades to POPTRE/*Symphoricarpos albus* of drier exposures and to POPTRE/CALCAN, POPTRE/CORSTO, or *Salix*-dominated wetlands of moister sites. This plant association occupies a wider range of landscape positions and soils (or positions on soil catena) than either of the associations described previously. The driest positions occupied were sideslopes, from midslope to just below the shoulder break.; these sites are seldom found to have wetland soils. Ostensibly they do not possess wetland hydrology by virtue of their position, but the possibility of subirrigation is present in landscapes possessing slumps and clay lenses (such as the Kiowa area). The moistest positions were stream terraces where POPTRE/OSMOCC exists in complex mosaics with the two wetter trembling aspen types.

All the soils were silt loams or sandy loams and more than 80% of them had negligible rock in the upper 20 to 30 cm of the profile, where 80% of the root mass is concentrated. Several profiles were notably rocky to just below a 3-5 cm thick organic horizon, but these rocky substrates did not condition a distinct vegetation. As observed in the "Jurisdictional Wetlands" section these sites are overwhelming not jurisdictional wetlands, but the rank vegetation often gives an impression to the contrary.

One of the study's goals was to identify easily inventoried features such as wetland indicator plants (or their quantitative representation), perhaps in conjunction with landscape position, that would unequivocally identify wetland sites within this single broadly-defined plant association. Such a suite of species/landscape positions would provide for convenient inventory of wetland (jurisdictional) sites. Unfortunately no such suite of species or site features was identified.

Vegetation: The closed-canopy overstory is usually dominated by *P. tremuloides* with variable amounts of *P. trichocarpa*; in only five stands did *P. trichocarpa* have higher coverage than *P. tremuloides*, whereas in six stands it was completely lacking. Thus the constancy for *P. trichocarpa* is about the same in this association as the others, but its cover averages at least 20 % less. It is in this somewhat drier type that *Picea* is incrementally more successful, but still coverages did not exceed 13 %. In the course of tree coring we gained the impression more sound trees were found in this type than the others.

That this type is transitional to the distinctly upland type POPTRE/SYMALB is seen in the shrub composition where the cover or constancy, or both, is high for a number of upland shrubs, including *Symphoricarpos albus*, *Rubus parviflorus*, *Rosa woodsii*, *Amelanchier alnifolia*, and *Salix scouleriana*. A number of upland shrubs occur only in

this of the three mesic to wet plant associations, including, but not confined to, *Berberis repens*, *Juniperus communis*, *Potentilla fruticosa*, *Spiraea betulifolia*, *Sorbus scopulina*, and *Shepherdia canadensis*.

This association is similar to POPTRE/CALCAN and POPTRE/CORSTO in composition by dominant graminoids (excepting wetland indicators), including *Elymus glaucous*, *Bromus ciliatus* and *Festuca subulata*. However, there are a number of upland graminoids recorded only for POPTRE/OSMOCC, including *Calamagrostis rubescens*, *Stipa occidentalis*, *Melica subulata*, *Bromus pumpellianus* and *Dactylis glomerata*. Species richness of the forb layer is high (73 species). Those species having their highest coverages or constancy in this type are *Veratrum viride*, *Senecio pseudoreus*, *Actaea rubra*, *Aster engelmannii*, *Castilleja miniata*, *Disporum hookeri*, *Erythronium grandiflorum*, *Hackelia floribunda*, *Osmorhiza occidentalis*, *Smilacina racemosa*, and *Viola canadensis*; only the first two named species are typical of wetlands (FACW or wetter, Appendix F). Two other wetland species, *Angelica arguta* (90 % constancy, 5 % c.c.) and *Geum macrophyllum* (72 % constancy, 3 % c.c.) are important across most of the stands of this type. As discussed in more detail in the "Jurisdictional Wetlands" section, despite the dominance of wetland vegetation as determined by the Corps of Engineers method, soils and hydrology more often than not fail to corroborate that these sites are in fact wetlands.

Other Studies: Lynch (1955) was the first to describe the POPTRE/OSMOCC plant association (as *Populus* spp./*Osmorhiza occidentalis*). Cooper and Pfister (1981) slightly augmented the description (calling the type POPTRE-POPTRI/OSMOCC) and provided an initial dichotomous key to forested plant associations, including deciduous-dominated, on the BIR. Hansen et al. (1995) have devised a comprehensive classification for all of Montana's wetland types, of which POPTRE/OSMOCC was considered one; their description was based on 15 plots distributed across western Montana, but centered on the East Front of the Rocky Mountains.

In both site parameters and composition POPTRE/OSMOCC also bears a strong resemblance to the most commonly encountered trembling aspen type in the Intermountain Region, POPTRE/ Tall Forb (Mueggler 1988). Of the nine forb species Mueggler included in the Tall Forb Group (also referred to as guild or union) five (*Aster engelmannii*, *Hackelia floribunda*, *Heracleum lanatum*, *Senecio serra*, and *Osmorhiza occidentalis*) also occur regularly in POPTRE/OSMOCC. Mueggler (1988) considers 10% canopy cover of any one of the Tall Forb Guild species or combination of these species to be sufficient for recognition of the community type. As in POPTRE/OSMOCC the most important graminoid in POPTRE/Tall Forb is *Elymus glaucous*, followed by *Bromus ciliatus* and *Poa pratensis*. Mueggler speculated that many of the communities sampled in this tall forb type constitute a near-climax condition; in other words, the majority of these stands are self-perpetuating as those of the BIR are hypothesized to be. The Intermountain Region tall forb type differs from

POPTRE/OSMOCC is lacking both POPTRI as a co-dominant and any wetland indicator species with a value of FACW or greater. These two types may simply represent regional expressions of a common type or at least define overlapping portions of the environmental gradient with POPTRE/OSMOCC, as defined, extending to wetter conditions on the soil moisture catena.

Natural Heritage Program Rank: G3/S3 (This is a common type within the trembling aspen parklands on the Blackfeet Indian Reservation and extending into the Canadian parklands [though possibly in a somewhat impacted condition with composition altered by the incursion of weedy and non-native species]. Continued threats to the association come from grazing (alteration of composition) and fragmentation through land development and oil exploration and development.)

Wetlands Determinations

We were requested by several BIR resource staff members to make some general observations that might bear on the wetland status of BIR deciduous forests. It appeared that National Wetland Inventory (NWI) maps possibly overlooked their presence in the landscape. Determination of jurisdictional wetlands involves the evaluation of three parameters, soils, vegetation and hydrology; we applied the Corps of Engineers 1987 Manual (Environmental Laboratory 1987) methodology to determine wetland status.

Table 2 and Appendix G (more detailed than Table 2) represent the data transcription of wetland species from raw data forms to synopsis form, treating wetland vegetation by the categories obligate, facultative wet and merely facultative (see Appendix F for full species name, common and scientific, and an explanation of wetland indicator categories), whether soils are hydric or not, and whether or not hydrology is indicative of wetland functions. It should be appreciated that a one-time site visit, especially at the end of summer, is usually insufficient to effectively evaluate some parameters, particularly hydrological ones. Whether the hydrology is that of a wetland is often arrived at through circular reasoning or surrogate variables and not by direct observation of hydrological conditions at the site at a critical time in the cycle. Of the 37 stands inventoried 46% met wetland criteria, though some were borderline cases generally due to uncertainties about either soils or hydrology; some borderline cases were encountered when the wetland vegetation indicators present just met the 50% cutoff mark.

There are some clear trends present in percentages of wetlands present when sites are stratified by vegetation type. Sites typified as POPTRE/CORSTO possessed unequivocal indications of wetland soils, with mottling and gleying always present. The wetland vegetative indicators averaged 68 % (range 60 to 72 %) of the dominant species, of which on average 26 % (range 14-43 %) were FACW class or greater. The landscape settings were primarily adjacent to stream courses and could be inferred to meet hydrological criteria with overbank flow (evidence in wrack lines and silt deposits) and saturated soils for a prolonged period during spring runoff.

Within the POPTRE/CALCAN plant association 27% of the sites are unequivocal wetlands, 64 % equivocal wetlands (91 % wetlands of some status) and 9% non-wetlands. Of the dominant species, wetland indicators comprise from 38 to 100 % and average 68 %; the percentage of species FACW or greater ranges from 18 to 57 and averages 42. Only two stands (18%) within this grouping did not meet the vegetation criteria of more than 50 % of the dominants being wetland species; one of these sites was clearly not wetland but the other lacked only the vegetation criteria, though in terms of indicator species (and not their cover weighted %) a wetland condition clearly

Table 2. Wetland determination results; matrix of sample plots by Jurisdictional Wetland parameters and community type

Plot Number Y, N, ?	Community Type Y, N, ?	OBL Y, N, ?; why	Vegetation (% by Class)			Total Percent Wetland Species	Hydrophytic	Hydric	Wetland	Jurisdictional
			FACW	FAC/FAC+			Vegetation Y, N, ?	Soils	Hydrology	Wetland
96SC0017*	POPTRE/CORSTO	0	20	40	60		Y	Y	Y	Y: no question
96SC0018	POPTRE/OSMOCC	0	12	50	62		Y	?	Y	Y:
96SC0019	POPTRE/CORSTO	0	14	57	71		Y	Y	Y	Y: unequivocal
96SC0020	POPTRE/OSMOCC	0	14	57	71		Y	N	N	N:
96SC0021	POPTRE/CALCAN	0	50	20	70		Y	Y	Y	Y: unequivocal
96SC0022	POPTRE/CORSTO	0	43	29	72		Y	Y	Y	Y: unequivocal
96SC0023	POPTRE/CALCAN	0	50	20	70		Y	Y	Y	Y: unequivocal
96SC0024	POPTRE/CALCAN	0	36	27	63		Y	Y	Y?	Y: questionable
96SC0025	POPTRE/CALCAN	0	29	36	72		Y	Y?	Y?	Y: questionable
96SC0026	POPTRE/OSMOCC	0	25	50	75		Y	N	N	N:
96SC0027	POPTRE/OSMOCC	10	20	40	70		Y	Y	Y	Y: unequivocal
96SC0028	POPTRE/OSMOCC	0	0	50	50		Y/N	N	N	N:
96SC0029	POPTRE/OSMOCC	0	0	57	57		Y/N	N	N	N:
96SC0030	POPTRE/OSMOCC	0	11	33	44		N	N	N	N:
96SC0031	POPTRE/OSMOCC	0	28	28	57		Y	Y	Y?	Y: (equivocal)
96SC0032	POPTRE/OSMOCC	0	20	50	70		Y	N	N	N:
96SC0033	POPTRE/OSMOCC	0	25	37	62		Y	N	N	N:
96SC0034	POPTRE/OSMOCC	0	12	25	37		N	N	N	N:

* Numbering of BIR aspen-black cottonwood plots began at 0017 and extended through 0053

Table 2(Continued). Matrix of sample plots by Jurisdictional Wetland parameters and community type

Plot Number Y, N, ?	Community Type Y, N, ? Y, N, ? why	Vegetation (% by Class)				Hydrophytic Hydric Wetland Jurisdictional Vegetation Soils Hydrology Wetland			
		OBL	FACW	FAC/FAC+	Total Percent Wetland Species	Y, N, ?			
96SC0035	POPTRE/OSMOCC	0	0	40	40	N	N	N	N:
96SC0036	POPTRE/CALCAN	0	33	33	67	Y	?	Y	Y: equivocal
96SC0037	POPTRE/OSMOCC	0	12	50	62	Y	Y	Y?	Y: equivocal
96SC0038	POPTRE/OSMOCC	0	0	60	60	Y	N	N	N:
96SC0039	POPTRE/CALCAN	0	57	29	86	Y	?	Y	Y: equivocal
96SC0040	POPTRE/OSMOCC	0	0	42	42	N	N	N	N:
96SC0041	POPTRE/OSMOCC	0	12	37	50	Y/N	N	N	N:
96SC0042	POPTRE/CALCAN	0	50	50	100	Y	Y	Y	Y: unequivocal
96SC0043	POPTRE/OSMOCC	0	14	43	57	Y	Y	N	N: borderline
96SC0044	POPTRE/OSMOCC	0	12	25	37	N	Y?	Y?	N:
96SC0045	POPTRE/OSMOCC	0	33	11	44	N	Y?	Y?	N:
96SC0046	POPTRE/CALCAN	0	36	9	45	N	Y?	Y	Y: equivocal
96SC0047	POPTRE/OSMOCC	0	20	20	40	N	N	N	N:
96SC0048	POPTRE/CALCAN	0	57	29	86	Y	Y	Y	Y:
96SC0049	POPTRE/OSMOCC	0	12	50	62	Y	N	N	N:
96SC0050	POPTRE/OSMOCC	0	20	40	60	Y	Y	Y	Y:
96SC0051	POPTRE/CALCAN	0	42	8	50	Y/N	Y	?	Y: equivocal
96SC0052	POPTRE/CALCAN	0	18	18	36	N	N	N	N:
96SC0053	POPTRE/OSMOCC	0	0	50	50	N	N	N	N:

obtained. This association represents the strongest expression of wetland plant species, though a small percentage of sites were in fact not jurisdictional wetlands. Some of these sites possessed soils with stronger gleying and mottling and with these conditions occurring closer to the soil surface than was expressed in the POPTRE/CORSTO association. It is quite possible that POPTRE/CALCAN spans, in terms of duration of soil saturation (and associated anoxic conditions), a broader environmental range than does the POPTRE/CORSTO association; clearly this type is found in a greater variety of landscape positions than is POPTRE/CORSTO, ranging from streamside stringers of alluvial terraces to subirrigated toeslopes to glacial depressions.

POPTRE/OSMOCC is cited as a major wetland vegetation type by Hanson et al. (1995), but our sampling of this type indicates that only 22% of the sites were wetlands, some equivocally so; only 3 sites (13 %) were unequivocal wetlands. If vegetation (wetland indicator species) alone is the criterion, then 65 % of the sites qualify as wetlands. This vegetation type had the lowest percentage of wetland indicator species, averaging 55 % of dominant species and ranging from 36 to 75 %. It also had, by far, the lowest average percent composition (13%) of indicators that were at least FACW and 5 sites had no FACW species at all. This vegetation type occupies the widest range of environments, from hill sideslopes to toeslopes to alluvial bottoms. The hillslope positions obviously are not expected candidates for possessing wetland hydrology, unless subirrigation could be inferred from the presence of restrictive layers (e.g. clay lenses) causing near-surface flow. Only one hillslope site had evidence (mottling) of seasonally high water and no obvious soil feature (in a 1.1m deep soil pit) could account for water perching at this position.

Implications of this inventory's results regarding NWI mapping and the extent of jurisdictional wetlands on BIR lands are several. In a quick scan of NWI maps we noted that none of the first 12 sites we had sampled and identified as wetlands were included as palustrine forested wetlands in the NWI mapping. We suggest that, based on community type present and landscape position alone, wetlands maps could be corrected to reflect the much greater contribution of forested wetlands on the BIR; this approach would obviate the excavation of soil pits and hypothesizing about hydrologic regime. It is with a relatively high degree of certainty (85 % plus) that the presence of POPTRE/CORSTO and POPTRE/CALCAN associations indicate wetlands and polygons in which these plant communities occur can be so labeled. The POPTRE/OSMOCC association presents no unequivocal answer that a wetland is present but at least it indicates areas where soil pits should be excavated and the hydrologic regime investigated.

Stand Structure and Successional Status

Figure 4 shows the results of tree coring to establish the age of stand dominants. *Populus tremuloides* and *P. trichocarpa* were not distinguished on this plot due to strong similarities in their height and diameter growth patterns (Moss 1932) and the fact that only two *P. trichocarpa* were successfully bored and counted (with great difficulty). About three quarters of the stands were successfully cored for at least one tree age. To the extent that coring attempted on 5 to 7 dominant trees resulted in failure to extract a readable core, then approximately one quarter of the stands had significant heart rot or other wood defects. Even coring at breast height, as Lynch (1955) cited doing to avoid basal heart rot, was not successful. Coring of *P. trichocarpa* usually resulted in being squirted with a stream of watery fluid in which were borne the core fragments when the extractor was withdrawn.

Populus tremuloides under current climatic conditions in the Intermountain West is known to reproduce via adventitious shoots from roots (sucker shoots) only (exceptions to this reproductive mode are so unusual as to be documented in notes to various botanical journals). Conventional wisdom holds that aspen groves throughout this region have been in place for possibly thousands of years, establishing sometime in late Pleistocene times, or sometime thereafter, when pluvial climates were still in force. Thus ages from trees of the largest size class may represent time since last disturbance or they may simply represent the oldest tree still standing (see discussion of reverse J-shaped curve of size class structure); they do not represent time since stand establishment.

Populus trichocarpa also is also known as a colonizer of disturbed surfaces, usually associated with riparian environments, preferentially establishing as seedlings on fresh alluvium, on point bars or other recently deposited surfaces. Though this species is most commonly found on the BIR in riparian environments, it has a notable presence in the aspen parkland and this is a distinctly uncommon habitat for its occurrence, a pattern generally not found elsewhere in its distribution. It is also capable of reproducing via root sprouting within established stands, though not so prolifically as *P. tremuloides*.

Figure 4 indicates that tree height is moderately correlated with diameter breast height. Tree height, for both *P. tremuloides* and *P. trichocarpa*, even for the largest diameter size classes in the 18 to 24 inch range never exceeded 60 feet. Size classes greater than 18 inches are not shown on Figure 4 because readable cores could never be extracted from specimens this large, almost invariably *P. trichocarpa*. In Lynch's study (1955) of BIR parklands for the *P. tremuloides*/*Osmorhiza occidentalis* plant association the average height of *P. trichocarpa* was 56 feet and *P. tremuloides* 45 feet. From Figure 4 it can be inferred, at least for *P. tremuloides*, that there has been little height growth on a per stand basis in the intervening 45 years between Lynch's study and ours. In fact, average stand height may have decreased due to wind damage. West of Glacier National Park at the same latitude and elevation as the BIR parklands aspen of

Figure 4. Plots of near maximum tree age and height (feet) versus tree diameter at breast height.

70 to 80 feet tall are common. We cite wind as the primary factor influencing tree height because further north (central Alberta) Moss (1932) found on the better sites dominant trees at only 50 years (index age) to be 50 to 60 feet tall, heights never attained at this age by BIR aspen (or black cottonwood). Though Chinook winds blow along the whole of the eastern front of the Rocky Mountain the greatest frequency and strength is registered from Browning to just north of Lethbridge, Alberta (Yoshino 1975); the dessicating and trimming effects of these winds may account for the relatively short stature of BIR aspen stands.

Lynch (1955) cited the mean dbh for dominants of the *P. tremuloides*/*Osmorhiza occidentalis* plant association to be 7.7 and 12.8 inches for *P. tremuloides* and *P. trichocarpa* respectively. From the *P. tremuloides* histogram (Figure 5a) it is clear that this species has matured considerably and of the three stands with the largest size class represented of 7 inches or less, two have *P. tremuloides* as the tree species growing into a *P. trichocarpa*-dominated stand. This leaves but one *P. tremuloides*-dominated stand wherein its largest size class is the same or smaller than the average size dominant reported by Lynch (1955). In the intervening 45 years from Lynch's study to ours it is well within the bounds of extrapolation to project these dominant trees putting on from 2 to 8 inches of diameter growth. From this pattern we can infer there has been little stand structure disturbance overall in the parkland since Lynch's 1952 study (reported in 1955), assuming that neither Lynch nor ourselves have biased sampling by selecting stands with regard to stem size criteria and that both our samples reflect the parkland structure as it then and now exists.

Lynch's average age of dominant *P. tremuloides* in the POPTRE/*Osmorhiza occidentalis* plant association was 78 years in 1952; it is tempting to extrapolate and say that the average age of today's dominants should be 122, plus or minus a few years, but such extrapolation is not justified. It is this oldest/largest class of trees that yielded few readable cores due to heart rot and other maladies and that would have experienced the greatest mortality in the intervening years. We often had to core smaller and ostensibly younger trees to obtain a countable core, hoping it would at least give us a minimum age since disturbance or stand "age". Moss (1932) states that "rarely" do *P. trichocarpa* and *P. tremuloides* exceed 135 and 120 years, respectively; these ages come from trees growing in more favorable environments (inferred from greater tree heights).

The histogram (Figure 5b) showing largest size classes of *P. trichocarpa* present in a stand is bimodal and indicates through the presence of several small size classes that there are some stands with ingrowth of this species into *P. tremuloides*-dominated stands. Lynch (1955) gives no indication of the distribution of maximum dbh size classes, only the average of 12.8 inches; we must infer that the stands with 15, 17, 21, and 23 inch classes present represent those with the expected subsequent diameter increase since Lynch's (1955) study.

Figure 5. Frequency distributions by species for the largest size class represented within each stand, a) for *Populus tremuloides*, b) for *Populus trichocarpa*.

Appendices C, D, and E display the results of the tree species population inventory (tallied by 1 inch size classes in the field) converted to 2 inch classes for ease of presentation and interpretation. The scatterplots (Appendix C) of stem/acre against dbh size classes (2 inch increments) are most easily examined for repeating patterns of reproduction and stand structure; Appendices D and E simply present the same data as Appendix C, but with more detail such as stem number or basal area by species and diameter class.

The most common pattern of size class structure, a negative exponential, or, as referred to colloquially in the literature reverse J-shaped curve (Oliver & Larson 1992), is exemplified by stands 24, 28, 30, 35, 36, 39, 50 and others (Appendix C), though not with so classical a curve form. Within this group of stands are represented all three plant associations and the full range of the wetland gradient. For this set of stands stem numbers per acre are high in the smaller diameter classes and decline precipitously with increasing size classes. Note that the smallest size class spans a range of only 1 inch (breast height diameters >1 and <2 inches) and therefore potentially encompasses many fewer stems than the size classes spanning 2 inches. The narrow span of this class centered on 1.5 inch midpoint accounts for several of the graphs not peaking in the smallest size class as would be expected for this type of distribution. It is these stands with the reversed J-shape frequency-by-size-class structure that often have the largest size classes represented, but with very few stems per acre.

Of all the stands sampled these most closely approximate what may be termed "old growth" or "mature" structure, though stem ages did not exceed 122 years (certainly not old when compared to age potentials of conifers native to BIR lands). This size class structure pattern is also known as "stable" because of an somewhat constant recruitment of stems into the smallest (youngest) classes and a consistent rate of mortality by class. This structure is that expected from self-replacing stands; it is the structure exhibited by mixed-species or monospecific dominant old-growth stands of shade-tolerant conifers. However, the case with *Populus tremuloides* and *P. trichocarpa* is quite different from that of climax conifers because both species are notably shade-intolerant and short lived. Virtually all the stems (the individual trees, known technically as ramets) originating in an aspen stand represent the production of one genetic entity and constitute a clone. Black cottonwood is not as strongly clonal in nature. As mortality claims the older (larger) stems in a stand apical dominance is weakened and the root systems send up suckers; in general, the greater the mortality and lessening of apical dominance, the greater the suckering response.

The other textbook structural pattern evident in our data is the even-sized (even-aged) development exemplified by stands 17, 20, 29, 33, 34, 40, 50 and others (Appendix C). All three plant associations and the full spectrum of wetland conditions are represented in this group of stands. Stem density peaks in one or two size classes; increment coring shows that stems from these highest density size classes (or even three classes) are essentially even-aged, being within 1-12 years of one another; stand ages of the above-cited six stands were respectively, 62, 122, 69, 42, 54, and 96 (no age stand 20) based

on the largest size class with near peak population size. With the exception of stands 29 and 51 (122 and 106 yrs.) these are among the youngest stands in our sample. Mortality has not yet begun to thin out the older age classes (see Appendix A, dead stem density); most mortality is in younger suppressed size classes, which are themselves not very densely populated due to apical dominance of the mature stems. Comparing the oldest stands, 29 (122 yrs) and 51 (106 yrs.), that still exhibit the pulse of post-disturbance reproduction it appears that the greater stem density of stand 29 is responsible for the continued suppression of root sprouting. In contrast stand 51 shows low density in the large classes (half that of stand 29) and moderate mortality across all size classes that possibly accounts for the spurt in suckering.

This successional development in aspen is analogous to classic cases, such as post burn succession with lodgepole pine giving rise to even-aged, sometimes "doghair" dense, stands. The only troubling aspect to the aspen scenario on the BIR is the general lack of evidence for fire, both in the soil (charcoal) and above ground (stumps and downed boles). We speculate that in these moist environments decay of these nutrient-rich softwoods is accelerated relative to what would be expected with conifers, leaving little or no evidence after 50 or more years since the disturbance. Another possibility is that certain of these stands were harvested for firewood; leaving no evidence in the soil or above ground (save for stumps which decay quickly due to their continued connection to the moist soil column).

There are other patterns exhibited in the size class data, such as rather flat curves where numbers drop only slowly with increasing size (age) classes, exemplified by stands 26, 37, 42, and 43 among others. Other stands, such as 19, show spikes in particular size classes for no obvious reasons. One can speculate that some past event may have weakened apical dominance, for example several consecutive years infestation by the western tent caterpillar (*Malacosoma californicum*), allowing a cohort of suckers to become established. Sampling error is another possibility for injecting spikes and valleys in the data; 1/10 acre plots are perhaps undersized for sampling population structure when stem numbers are low or when formerly relatively homogeneous stands begin to fragment with patches of mortality.

An occasional cone bearing Engelmann spruce (*Picea engelmannii*) or hybrid with white spruce (*P. glauca*) was found in these stands but, despite the considerable seed rain, spruce seedling density was generally in the range of only 1-50 per acre. The per stand basal area contribution of spruce was much less than 1 percent. The establishment of *Abies lasiocarpa* (subalpine fir) and *Pseudotsuga menziesii* (Douglas-fir) is occurring at even slower rates than for spruce. At these rates of establishment it would take many hundreds to thousands of years without disturbance for succession to result in spruce or mixed conifer stands.

Most of these moist to wet aspen- and black cottonwood-dominated stands should be viewed as self-replacing. In the wetter of the three plant associations, POPTR/CORSTO and POPTRE/CALCAN, *P. trichocarpa* has higher canopy cover in

the stands in which it is present than it does in the drier POPTRE/OSMOCC plant association. Of the stands wherein both species are present in the seedling to sapling size classes (up to 5 inches dbh) 22% of the stands show *P. trichocarpa* to have higher stem counts, indicating it could possibly be the canopy dominant at a future date. However, scanning the mortality plots (Appendix C) it is obvious that mortality can take out whole size classes, rendering moot speculations about eventual dominance in these mixed species stands. For almost 90% of the stands sampled *P. tremuloides* appears to be the species most successfully replacing itself, regardless of plant association involved.

It should be added parenthetically that in the course of conducting 1997 field investigations relating to grassland ecology that we encountered several mature, moist to wet, aspen-dominated stands on the eastern fringe of the aspen parkland sites wherein *Picea* and *Abies lasiocarpa* were clearly establishing successfully and population structure indicated their eventual site dominance. Thus it appears that with or without periodic disturbance, aspen and non-riparian black cottonwood groves will continue to flourish, but that certain of these trembling aspen-black cottonwood groves will succeed to conifer dominance. At this time we have not identified those predictors that would distinguish climax aspen habitats from those successional to conifers.

One of the more puzzling aspects of the aspen parkland, at least concerning mesic sites, is why rock content is so uniformly low (<5 %), often completely lacking, in the upper portions (upper 20-30 cm) of soil profiles. For mesic sites, virtually all parkland soils (which we textured only by feel) were silt loams to loams, at least in the upper 30 cm of the profile. Some of these rock-free soils may be attributed to resorted glacial deposits which have been deposited along old glacial drainage courses or in lakes or depressions near the retreating ice. However, many of the upslope soils are virtually rock-free as well. We hypothesize that the lack of rock in these profiles (rock is present in conifer-dominated stands and drier aspen stands) is attributable to the upper profile being composed largely of aeolian materials, including volcanic ash. Both Mt. Mazama and Glacier Peak volcanic events are post-Pleistocene and could have contributed ash. Another, much greater source of aeolian material is the glacial drift surfaces that would have been newly created the north and west. In the pluvial climates of post-Pleistocene (post-Glacial) times aspen and black cottonwood, with their cottony, wind disseminated seeds that require prolonged moisture, could have been among the early colonizers of freshly created substrates. These groves would likely have been the tallest and densest vegetation in the landscape; their canopies would have served to create eddy currents and resulted in airborne particles coming out of suspension. The Canadian literature also contains speculations that these sites were first stabilized by grasslands and evolved to aspen forest.

Disease, Defect, Pests

Preliminary data on forest disease and defect was collected following the guide of Hiratsuka et al. (1995) and descriptions of Hinds (1985). No trees were sectioned or their bases excavated to make more definitive identification of agents responsible for heart rots, cankers or insect damage. In the narrative that follows we describe various fungal and bacterial conditions as though they occurred one to a tree but in reality there is generally a complex of infestations associated with a tree; in many cases these infestations have been shown to follow a somewhat predictable successional sequence (Hinds 1985).

Though not explicitly tallied, it is safe to say virtually all cored trees showed some degree of discoloration and softening of interior wood, which can be interpreted as resulting from some form of fungal (or possibly bacterial) infestation. Only two specimens of *P. trichocarpa* were successfully cored and even these had some punky wood. By far the most common bole defect encountered in *P. trichocarpa* we would describe as "wetwood" analogous to this condition as described for *P. tremuloides* (Hinds 1985); this malady was noted very infrequently in *P. tremuloides* cores. Wetwood is caused primarily by invasion of sapwood by bacteria, presumably from initial root infections. In specimens we cored, copious bleeding of a watery sap followed core extraction; we presume that water pools in lumina created from the mass destruction of xylem cells. Other disease symptoms associated with wetwood include branch dieback, crown wilting and premature death.

Phellinus tremulae, the predominant trunk rot or white heart rot fungus of *Populus* spp. in North America, is probably the easiest of the wood decay agents to identify with its distinctive 7-20 cm wide conk having a purplish-brown undersurface. If its presence is accounted for only by conks, then this pathogen occurred in about 32% of the stands, usually on larger (>9" dbh) *P. tremuloides* and infested from 10 to 100% of this species within a given stand. Because sporophores form on only a small fraction of the trees infected (Lynch 1955) it is difficult to gauge the incidence of infestation. In Ontario, 28 to 70% of the trees in 60 to 70 years old stands were infected (Hinds 1985). Its presence renders age coring virtually impossible as the decay column continues for most of the main stem's length; usually the wood is so soft it cannot even be used for pulping. Conks of the *P. tremulae* type were not noted on *P. trichocarpa*.

Only one instance of *Armillaria* "root rot" was found as indicated by honey colored mushrooms and rhizomorphs in the soil and rotted wood at the base of the tree. The mushrooms are produced only in late summer and early fall; the black stringy rhizomorphs (black-string root rot) are always present but for proper identification require excavation in the vicinity of the tree base; basal excavation was beyond the scope of our work and thus this pathogen could have had a much greater presence than we recorded. This pathogen produces rot in roots and tree butts and could explain part of the lack of success in basal tree coring.

Trunk canker is the most obvious disease problem of aspen in the West (Hinds 1985). We noted trunk canker symptoms (lesions, formation of callus tissue, dead bark sloughing, often in long stringy strips, blackened and sooty bark, concentric stem girdling) on many dead and dying *P. tremuloides* and *P. trichocarpa* trees of all size classes, but particularly on smaller to mid-size dbh classes. We made no attempt to identify the fungal species causing these symptoms. This broad group of fungal diseases is cited as the major cause of aspen mortality but we had no way of knowing which among the wide range of fungal diseases present in the sampled stands, including heart rots, root rots, was actually responsible for the deaths of individual trees.

The canopy of one stand was noted to be producing an extremely fine exudate dispersed into the air and deposited on the undergrowth and aspen seedlings. Neither the exact source or causative agent of the aerosol, nor consequences to the stand could be determined.

At the time of sampling none of the sampled stands were infested by western tent caterpillar (*Malacosoma californicum*) and this insect pest was not noted in general reconnaissance. Severe outbreaks have been noted on the BIR with multiple year defoliation, but it is our impression these infestations have not resulted in wholesale mortality.

Animal Impacts

At grove margins some stems have been gnawed by either porcupine (*Erethizon epixanthum*) or snowshoe rabbits (*Lepus americanus*). The aspen groves of the BIR are obviously not under native ungulate pressure, most especially not from elk (*Cervus canadensis*), of the type that has resulted in the wholesale loss of aspen stands in western Wyoming and Yellowstone National Park (Krebill 1972, Kay and Wagner 1994). Even with the extensive Yellowstone fires of 1988 aspen stands have not been able to establish suckers greater than 2 meter in height and are still a target for browsing elk. The situation appears to be quite different on the BIR with the only positive evidence of animal induced mortality to aspen being from beaver (*Castor canadensis*) gnawing and felling trees.

The abrasion of antler felt was the elk (*Cervus canadensis*) damage most frequently observed. This activity left almost all trees of particular stands with wounds to trunks and branches. We also observed wounding to the main stem from gnawing and in several cases mortality resulted from stem girdling. With the exception of girdling, this wounding apparently does not immediately result in loss of stand vigor or health. However, wounding of any kind, from any source, that breaches the bark potentially constitutes an entry point for disease vectors, most especially a whole host of pathogenic fungi. Stands with elk damage had no obviously greater incidence of heart rot or cankers.

It would appear that the very scattered seedlings of *Abies lasiocarpa* (subalpine fir) present in these aspen stands are browsed (portion above snowpack) by some agent, most likely moose (*Alces alces*). The consequence for aspen stands is that this browsing retards the rate, apparently quite slow anyway, at which stands succeed to conifer dominance.

Cattle pressure on stands of these moist environments in late summer can be appreciable; they seek and find both thermal cover and forage. Their impacts constitute the single greatest threat to maintenance of this vegetation type for its biodiversity value, that of a relatively unaltered state. A synopsis of field notes indicates that by mid-August most stands have been entered and trampled. It appears certain that localized areas, including but not restricted to e.g. South Fork of Milk River mostly east of Hw. 89 and lower elevations in the vicinity of Kiowa, have experienced continuous and heavy grazing, which results in yearly forage removal of 80% plus of the standing crop in forb-dominated undergrowth conditions.

We speculate that this intense grazing pressure is responsible for the highly altered composition of the aspen parkland in certain localities, even of these moist to wet stands. In the most highly affected areas we noted the rhizomatous, non-native grasses *Poa pratensis* (Kentucky bluegrass) and *Phleum pratense* (timothy) to have become undergrowth dominants, to the near exclusion of all but relatively unpalatable vegetation such as *Symphoricarpos albus* (common snowberry), *Ribes setosum* (Missouri

gooseberry), *Achillea millefolium* (common yarrow), *Geranium richardsonii* (Richardson's geranium), *Geranium viscosissimum* (sticky geranium), *Ranunculus uncinatus* (little buttercup). In small disturbed areas dense patches of weeds such as *Urtica dioica* (stinging nettle) and *Cirsium arvense* (Canada thistle) have developed.

Field notes taken in the summer of 1996 confirmed previous impressions that several forbs are grazed preferentially by cattle, these being *Angelica arguta* (sharptooth angelica), *Osmorhiza occidentalis* (western sweetcicely), *Heracleum lanatum* (cow parsnip) and *Veratrum viride* (green false hellebore). Based on their position in the landscape we have reason to believe that the areas referred to in the paragraph above would have supported extensive populations of the above-named species, whereas portions of these areas are now converted to a less desirable status. Though coincidental, it is none the less significant that all these heavily-grazed species constitute grizzly bear (*Ursus arctos*) forage as well, their importance varying by season. There is clear overlap in the diets of cattle and grizzly bears and management strategies should address these conflicting needs.

Lynch (1955) speculated that the high sheep numbers that apparently were present in earlier times were responsible for aspen never getting beyond the root sprout stage in aspen openings and at the edge of groves and thus prevented parkland expansion. Though purely speculative, it is quite conceivable that intensive sheep grazing in previous times could be responsible for missing age (size) classes in some stands. We found no sheep pellets in our stands or in the vicinity and noted no evidence for their browsing on aspen sprouts and thus presume sheep numbers have been reduced; we took no data that bear on parkland expansion, or lack thereof.

Rare Plant Species/Floristics

We did not find threatened, endangered, or sensitive plant species in trembling aspen habitat, but do not rule out the possibility. The fieldwork focus on sampling homogeneous stands may overlook the microhabitat features that rare species occupy, inset within the stands and the overall landscape.

Eight tree species, 29 shrub species, 28 graminoids and 82 forbs, ferns, and fern allies combine for a total of 147 vascular plant species found on the sample plots (complete list Appendix F), which is fewer than the number of species than can be expected for the aspen parkland as a whole (considering that the more xeric portions of the moisture gradient were not sampled). Species richness averaged 38 species per plot, which is quite high for forest vegetation east of the Continental Divide in Montana. Coniferous forest types in this same landscape average between 15-27 species per plot. Within drier aspen types, generally fewer than 24 species are recorded per plot. In terms of preserving the diversity of forested habitats, the moist to wet segment of the BIR parkland is a highly significant component of the Rocky Mountain Front.

V. CONCLUSIONS

In the course of a partial summer's field sampling we acquired a data base sufficient to permit refining of the deciduous dominated forest portions of three previous community classifications (Lynch 1955, Cooper and Pfister 1981, Hansen et al. 1995); our classification circumscribes three most mesic to wet community types of the BIR, *Populus tremuloides* / *Cornus stolonifera*, *P. tremuloides* / *Calamagrostis canadensis* and *P. tremuloides* / *Osmorhiza occidentalis*. The BIR wetlands and moist uplands dominated by trembling aspen and black cottonwood communities are uncommon regarding their composition and possibly unique because of the generally high quality of their occurrences. Plant associations characteristic of the wettest sites, *P. tremuloides* / *Cornus stolonifera* and *P. tremuloides* / *Calamagrostis canadensis*, are rated by the Heritage Program as S3 and G3 regarding their rarity, with threats to their long-term existence factored in as well.

The POPTRE/OSMOCC association, rated G2/S2, is ostensibly the most geographically restricted and exceptional of the three community types and also under the greatest threat. Regarding composition and condition we have not established unequivocally that POPTRE/OSMOCC is unique (this would require sampling in the Canadian portion of the parkland) and in fact this community type bears a strong floristic and structural resemblance to and occupies similar habitats, soils, and positions in the landscape as does the *P. tremuloides* / tall forb community type of the Intermountain Region defined by Mueggler (1988). There is approximately a 250-300 mile gap between the northernmost example of *P. tremuloides* / tall forb in the Middle Rocky Mountains and the southernmost occurrence of *P. tremuloides* / *Osmorhiza occidentalis* in the Northern Rocky Mountains. There is a steep floristic cline over this considerable geographic expanse. Despite the more than superficial ecological resemblance of the two communities we believe they are sufficiently different, especially in regard to geographic setting and floristic composition, to regard them as unique types.

Cattle, through excessive grazing, trampling, and weed introduction, have negatively impacted some POPTRE/OSMOCC sites and constitute the greatest ongoing threat to this community, but overall these moister sites are in good condition. We suggest that establishing cattle exclosures, appropriately placed and sized so as to capture a range of aspen-black cottonwood habitat conditions, would be effective in estimating both the impact of cattle through vegetation trends and the overlap between cattle and ungulate or grizzly bear use.

All three community types are climax associations to a degree that appears inversely related to increasing dryness on the moisture gradient. We noted in passing that the drier upland aspen-dominated communities had much more evidence of the incursion of conifers, mostly Douglas-fir (*Pseudotsuga menziesii*). These aspen and black cottonwood stands are self-perpetuating, their tree populations apparently being long-term stable. This is not a unique condition for aspen but is definitely the exception to most successional scenarios in this vegetation type. Fungal and bacterial diseases and

insect pathogens are ubiquitous and limit tree longevity and stand productivity (the tree portion thereof) but the suckering ability of both *Populus* spp. provides a relatively constant source of recruitment to the canopy layer.

An examination of reports and classifications from adjacent areas, which have been less intensively sampled and with somewhat different techniques, indicates that the aspen parkland of the BIR has a relatively severe climate as reflected by the short, wind-trimmed trees and that the undergrowth is especially forb-rich. Species richness averaged 38 species per plot, which is high for forested types. Coniferous community types in this same landscape average between 15 and 27 species per plot. In terms of preserving the diversity of forested habitats alone, this BIR parkland should be a strong focus of efforts.

Additionally, much of the aspen lowland is both subirrigated and in position to receive overland flow and could constitute an appreciable area of palustrine, broad-leaved deciduous, forested wetland in the Cowardin et al. (1977) classification and a "jurisdictional wetland" in the scheme of the "Corps of Engineers Wetlands Delineation Manual" (Environmental Laboratory 1987). We have documented that two plant associations, *P. tremuloides*/*Cornus stolonifera* and *P. tremuloides*/*Calamagrostis canadensis*, are almost invariably associated with wetland conditions. The third association, *P. tremuloides* / *Osmorhiza occidentalis*, occurs as a jurisdictional wetland in about 20 % of the cases. The fact that these plant associations are so predictably associated with jurisdictional wetlands makes them valuable surrogates for mapping wetlands without having to resort to excavating soil pits or hypothesizing about hydrologic regimes. Values typically associated with such wetlands include flood mitigation (floodwater storage), water quality improvement (capture of nutrients and erosion from uplands), storm abatement and aquifer recharge, aesthetics, and perhaps most importantly critical wildlife habitat.

This moist to wet habitat is potentially critical to avian productivity (Tewksbury 1997). It also contains an abundance of grizzly bear foods (herbs), such as sharptooth angelica (*Angelica arguta*), western sweet-cicely (*Osmorhiza occidentalis*), cow-parsnip (*Heracleum lanatum*), glacier lily (*Erythronium grandiflorum*), field horsetail (*Equisetum arvense*). In light of the demise of many stands of whitebark pine (*Pinus albicaulis*) in adjacent Glacier National Park, these aspen parklands may sustain more pressure from the grizzly bear population, though aspen parkland stands generally serve as spring-early summer forage sites and not fall sites, as do the whitebark pine stands. Other wildlife species frequent these habitats but determination of intensity and types of use were beyond this study's scope.

VI. LITERATURE CITED

- Bird, R. D. 1961. Ecology of the aspen parkland of western Canada. Contribution No. 27, Research Station, Canada Department of Agriculture. Winnipeg. Manitoba, Canada. 155 pp.
- Daubenmire, R. 1959. Canopy coverage method of vegetation analysis. Northwest Science 33: 43-64.
- Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1. U. S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 100 pp.
- Hagle, S. K., S. Tunnock, K. E. Gibson and C. J. Gilligan. 1990. Field guide to diseases and insect pests of Idaho and Montana forests. Publication No. R1-89-54. U. S. Department of Agriculture, Forest Service, State and Private Forestry, Northern Region, Missoula, MT. 123 pp.
- Hansen, P. L., R. D. Pfister, K. Boggs, B. J. Cook, J. Joy, and D. K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Miscellaneous Publication No. 54, Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, MT. 646 pp.
- Hill, M. O. 1979a. DECORANA-A FORTRAN Program for detrended correspondence analysis and reciprocal averaging. Ithaca, NY: Cornell University.
- Hill, M. O. 1979b. TwINSPAN - A FORTRAN program for arranging multivariate data in a ordered two-way table by classification of the individuals and attributes. Ithaca, NY. Cornell University.
- Hinds, T. E. 1985. Diseases. In Aspen: Ecology and Management in the western United States. Eds. N.V. DeByle and R. P. Winokur. U. S. Forest Service, General Technical Report RM-119, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. pg. 87-106.
- Hiratsuka, Y., T. Stokes, P. Chakravarty, and D. J. Morgan. 1995. A field guide to classify and measure aspen decay and stain. Special Report 4, Canadian Forest Service Northwest Region, Northern Forestry Centre, Edmonton, Alberta, Canada. 27 pp.
- Hitchcock, C. L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle. 730 pp.

- Kay, C. E. and F. H. Wagner. 1994. Historical condition of woody vegetation on Yellowstone's Northern Range: A critical evaluation of the "natural regulation" paradigm. Ed. D. G. Despain. In *Plants and their environments: Proceedings of the first biennial scientific conference on the Greater Yellowstone Ecosystem*. Technical Report NPS/NRYELL/NRTR-93/XX. 15
- Lynch, D. 1955. Ecology of the aspen groveland in Glacier County, Montana. *Ecological Monographs* 25 (4): 321-344.
- Moss, E. H. 1955. The vegetation of Alberta IV. The poplar association and related vegetation of central Alberta. *Journal of Ecology* 20: 380-415.
- Mueggler, W. F. 1988. Aspen community types of the Intermountain Region. U. S. Department of Agriculture, Forest Service General Technical Report INT-250. Intermountain Research Station, Ogden, UT. 135 pp.
- Mutel, C. F. 1973. An ecological study of the plant communities of certain montane meadows in the Front Range of Colorado. Unpublished Thesis, University of Colorado, Boulder. 77 pp.
- Oliver, C. D. and B. C. Larson. 1996. Forest stand dynamics. John Wiley & Sons, Inc. 520 pp.
- Pfister, R. D., B. L. Kovalchik, S. F. Arno, and R. C. Presby. 1977. Forest habitat types of Montana. U. S. Department of Agriculture, Forest Service General Technical Report INT-34. Intermountain Forest and Range Experiment Station, Ogden, UT. 175 pp.
- Powell, D. C. 1988. Aspen community types of the Pike and San Isabel National Forests in south-central Colorado. U. S. Department of Agriculture, Forest Service, Rocky Mountain Region, Report R2-ECOL-88-01. 254 pp.
- Reed, P. B. Jr. 1988a. National list of plant species that occur in wetlands: North Plains (Region 4). U. S. Fish and Wildlife Service Biological Report 88 (26.4). U. S. Department of Interior, Fish and Wildlife Service, Research and Development, Washington, DC. 64 pp.
- Reed, P. B. Jr. 1988b. National list of plant species that occur in wetlands: Northwest (Region 9). U. S. Fish and Wildlife Service Biological Report 88 (26.9). U. S. Department of Interior, Fish and Wildlife Service, Research and Development, Washington, DC. 89 pp.
- Tewksbury, J. 1997. Riparian forests and avian productivity. Report prepared for U. S. Forest Service, Intermountain Research Station, Missoula, MT. 61 pp.

USDA Soil Conservation Service and USDI Bureau of Indian Affairs. 1980. Soil Survey of Glacier County Area and Part of Pondera County, Montana. Bozeman, MT. 161 pp plus maps and plates.

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

Community	*	1 *	1 *	1 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	3 *
Site	*	1 *	2 *	3 *	4 *	5 *	6 *	7 *	8 *	9 *	10 *	11 *	12 *	13 *	14 *	15 *	

Trees

ABILAS	---	1	---	1	---	---	---	1	---	---	1	1	---	---	---	---
PICEAX	---	---	---	---	10	---	---	3	---	---	---	---	1	---	---	1
PICENG	---	1	1	---	---	---	---	---	1	---	---	---	---	---	---	---
PINCON	---	---	---	---	10	---	---	---	---	---	---	---	---	---	---	---
PINFLE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
POPTRE	70	25	30	90	70	83	50	70	85	70	60	60	40	40	40	80
POPTRI	---	70	70	---	---	---	13	30	20	40	40	50	50	60	---	---
PSEMEM	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Shrubs

AMEALN	1	3	---	1	1	3	4	3	4	2	---	3	---	---	---	1
BERREP	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
BETOCC	3	3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CORSTO	60	20	5	---	---	---	---	---	3	1	---	---	---	---	---	---
CRADOU	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
JUNCOM	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
LOINIV	---	---	12	---	---	---	---	---	---	---	---	---	---	---	---	1
LONUTA	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---
POTFRU	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PRUVIR	3	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---
RHAALN	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
RHAPUR	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
RIBAME	---	---	---	---	---	1	---	---	---	---	1	---	3	---	---	---
RIBLAC	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---
RIBSET	3	---	3	---	---	---	---	1	---	---	---	3	---	3	---	---
ROSACI	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ROSWOO	3	3	2	10	1	3	3	3	2	3	2	7	---	3	10	---
RUBIDA	---	---	---	---	---	3	---	---	---	---	---	---	1	---	---	---
RUBPAR	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---
SALBEB	---	3	3	---	---	4	10	---	---	1	---	---	---	10	---	---
SALBOO	---	2	---	---	2	---	---	---	---	---	---	---	---	---	---	---
SALGEY	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SALIXX	1	---	---	---	---	---	---	---	3	---	1	---	---	---	3	---
SALLUT	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SALSCO	---	---	---	---	2	---	---	---	---	---	---	2	---	---	---	---
SALTWE	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---
SHECAN	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SORSOCO	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SPIBET	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
SYMALB	10	7	13	---	---	10	10	2	4	7	---	3	3	28	63	---

* Cover Synthesis (Stand) Table *

Cover synthesis (stand) table																
Community	*	1 *	1 *	1 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	2 *	3 *	3 *
Site	*	1 *	2 *	3 *	4 *	5 *	6 *	7 *	8 *	9 *	10 *	11 *	12 *	13 *	14 *	15 *
Forbs Continued:																
ARCMIN	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ARELAT	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ARNCHA	---	---	---	---	1	1	4	1	1	---	1	1	3	---	3	---
ASTCON	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ASTENG	---	1	---	---	---	1	---	---	---	1	---	2	---	---	---	---
ASTFOL	---	10	1	---	---	---	---	---	13	1	13	---	---	1	1	---
ASTLAE	---	---	---	---	2	3	---	3	---	---	---	3	2	3	10	3
CAMQUA	---	1	---	---	4	2	---	---	2	1	---	---	---	---	---	1
CAMROT	1	1	---	---	---	---	---	---	1	1	---	1	---	---	---	---
CASLUT	---	---	---	---	---	1	---	---	1	---	---	1	---	---	---	---
CASMIN	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	1
CASRHE	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---
CASLIL	---	1	---	---	---	---	---	---	---	1	---	---	---	---	---	---
CERAST	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CIRARV	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CIRHOO	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CIRSCA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CIRSTU	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
CIRVUL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
DESPIN	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
DISHOO	---	---	4	---	---	---	---	---	---	---	---	---	---	10	---	---
DISTRA	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
EPIANG	---	---	1	---	---	1	---	---	---	---	1	---	---	---	---	---
EPICIL	---	---	---	1	1	1	---	---	1	---	---	1	1	---	2	---
EPILOB	---	1	---	---	---	---	---	---	---	1	---	---	---	---	---	---
ERYGRA	---	---	---	---	---	---	---	---	13	3	---	---	---	---	---	---
FRAVES	1	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
FRAVIR	1	1	---	3	---	10	3	20	10	20	3	3	3	1	1	10
GALBOR	3	---	---	1	---	3	4	1	1	3	1	1	---	1	---	---
GALTET	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---
GERRIC	3	---	---	---	---	1	---	---	---	---	1	---	---	1	---	---
GERVIS	1	10	3	1	1	5	3	3	1	10	1	2	4	2	4	---
GEUMAC	3	---	3	13	7	4	3	1	7	---	4	2	---	4	4	4
HABDIL	---	1	---	---	---	---	---	---	---	---	1	---	2	---	---	---
HABSAC	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
HABUNA	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---
HACFLO	1	---	---	---	---	---	---	1	---	---	1	---	---	1	---	1
HERLAN	---	20	25	---	1	1	---	1	1	---	1	---	40	---	---	4
IRIMIS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
LATOCH	---	---	---	---	1	1	1	1	1	---	3	---	1	---	---	3
LOMDIS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MEDSAT	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MONFIS	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

	Community Site														
Community Site	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Forbs Continued:

OSMDEP	13							1		1			
OSMOCC	1	10	50	2		17	13	1	10		20	2	17
PEDBRA		2			2		1	1	3	20	1	1	
PEDGRO					1								
PERGAI				3								1	
PETSAG		2						1					
PLAMAJ													
POTENT	1												
POTGRA				1									
PRUVUL	3	1	1					1					
PYRCHL		1			1			1	1				
RANUNI	1							1				1	
SANMAR	1	30	1			3	13		13	1	1		3
SENCRA												1	
SENFOE				20	3	13		17		17	1	1	1
SENHYD		3											
SENPSE		10	3	1		10			10	40	23	3	1
SENSER		1						1					
SEWTRI			1					1					
SHIRAC													
SHISTE	1	3		1	2	1	1	1	3	3	1	1	3
SOLGIG					1								2
SONCHU													
STELLA													
STELON						1						1	
STEOCC													
STRAMP		5											
TAROFF	3			1	1	1		1			1	1	3
THAOCC	8	20	4	1	1	1	3	2			1	1	2
THAVEN						1							
TRIREP					1					1			
URTDIO			3			1						2	
VALSIT									1				1
VERVIR			4						3		1		
VICAME	1	1				1		1		3	1	1	1
VIOCAN	3	1	10			1	3		1		1	7	40
ZIGELE										1			1

Ferns & Fern Allies:

[illegible]

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

Community	*	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *
Site	*	16 *	17 *	18 *	19 *	20 *	21 *	22 *	23 *	24 *	25 *	26 *	27 *	28 *	29 *	30 *	30 *

Trees:

ABILAS	3	---	---	---	---	---	1	---	---	---	1	1	---	---	---	---	---
PICBAX	1	1	---	1	1	---	---	---	1	---	3	2	---	---	---	---	---
PICENG	---	---	---	---	---	---	3	---	13	---	---	---	---	---	---	---	---
PINCON	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PINFLE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
POPTRE	90	80	83	83	83	80	55	73	80	50	83	90	50	50	50	38	---
POPTRI	---	---	---	1	1	1	1	2	10	10	20	23	30	20	20	30	---
PSEMEN	---	---	---	3	---	---	---	---	---	---	---	---	---	---	---	---	---

Shrubs:

AMEALN	2	---	3	3	13	2	---	1	3	23	1	1	---	1	---	---	---
BERREP	---	---	---	---	3	1	---	---	1	1	4	4	---	1	---	---	---
BETOCC	---	---	---	---	---	---	---	2	---	---	---	---	---	---	---	---	1
CORSTO	---	---	---	---	1	1	1	---	---	---	2	---	---	---	---	---	3
CRADOU	---	---	---	---	---	---	---	---	---	3	---	---	---	---	---	---	---
JUNCOM	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---
LONINV	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
LONUTA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
POTFRU	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PRUVIR	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---
RHAALN	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
RHAPUR	---	---	---	---	---	---	---	---	---	1	---	---	1	---	---	---	---
RIBAME	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
RIBLAC	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
RIBSET	---	---	---	3	---	---	---	---	---	---	---	---	---	---	---	---	---
ROSACI	---	---	---	---	---	1	---	---	---	1	---	---	---	---	---	---	---
ROSWOO	3	13	1	---	10	---	---	13	13	---	20	10	---	3	---	1	---
RUBIDA	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
RUBPAR	40	---	---	---	---	---	---	27	---	---	---	---	---	---	---	---	30
SALBEB	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SALBOO	---	2	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---
SALGEY	---	2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SALIXX	---	---	---	---	17	---	3	3	---	---	---	---	---	---	1	---	---
SALUTU	---	---	---	---	---	---	---	---	1	---	---	---	---	3	---	---	---
SALSCO	---	---	3	---	---	---	---	3	---	---	7	2	---	---	---	---	1
SALTWE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SHECAN	---	---	---	---	3	---	---	1	---	---	1	1	---	---	---	---	---
SORSCO	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SPIBET	---	---	---	---	---	7	---	---	---	13	---	---	---	---	1	---	---
SYMALB	40	---	30	60	50	30	2	30	30	50	50	60	3	17	---	1	---

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

Community	*	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *
Site	*	16 *	17 *	18 *	19 *	20 *	21 *	22 *	23 *	24 *	25 *	26 *	27 *	28 *	29 *	30 *	*

Graminoids:

AGROST	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
AGRREP	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---
AGRSCL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ALOLP	---	13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ALOPRA	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---
BROCIL	1	3	3	2	2	1	1	---	1	3	1	1	1	20	---	---	---
BROINE	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---
BROPUM	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CALCAN	---	---	1	---	---	3	---	---	---	3	---	---	---	3	2	---	---
CALRUB	---	---	1	---	3	---	---	---	---	1	---	23	---	---	---	---	---
CALSTR	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---
CARBRE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CAREXX	---	---	1	---	1	---	---	---	1	---	---	---	---	---	---	---	---
CARGEY	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CARHOO	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CARMIC	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
CARRAY	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CARROS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CINLAT	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---
DACGLO	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---
DESCES	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---
ELYGLA	7	20	4	30	10	20	40	3	17	20	10	7	27	10	3	---	---
FESSUB	2	---	---	3	---	10	3	---	13	2	3	13	1	1	---	---	---
GLYSTR	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
JUNBAL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MELSUB	---	---	13	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PHLPRA	1	15	1	10	10	---	10	3	3	---	---	---	---	3	---	---	---
FOAINT	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FOAPAL	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---
FOAPRA	---	20	---	10	10	1	---	3	---	1	10	---	---	1	---	---	---
SCHPUR	1	---	---	1	1	---	1	---	17	3	1	3	1	---	---	---	---
STIOCC	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---

Forbs:

ACHMIL	---	1	1	1	---	---	1	1	1	---	---	1	---	---	---	---	---
ACTRUB	---	---	1	---	---	3	---	---	---	1	---	---	1	1	7	---	---
ALLCER	---	1	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---
ALLIUM	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ALLSCH	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ANGARG	1	3	4	3	15	7	15	10	1	1	4	4	7	3	1	---	---
ARABIS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ARAGLA	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ARAHTR	---	---	---	---	---	1	---	---	---	1	---	---	---	---	---	---	---

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

synthesis (stand) table																		
Community	*	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *	3 *
Site	*	16 *	17 *	18 *	19 *	20 *	21 *	22 *	23 *	24 *	25 *	26 *	27 *	28 *	29 *	30 *	30 *	30 *

Forbs Continued:

ARCHIN	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ARELAT	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---
ARCHA	---	1	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---
ASTCON	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
ASTENG	1	---	---	2	---	---	---	1	---	---	---	---	---	1	---	---	4
ASTPOL	---	---	1	---	---	---	1	---	---	---	1	---	---	1	---	---	---
ASTIAE	2	1	---	---	3	2	---	4	1	3	---	1	3	---	7	---	---
CAMQUA	---	1	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---
CAMBROT	1	1	1	---	---	---	---	---	---	---	---	---	1	---	---	---	---
CASLUT	---	---	3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CASMIN	---	---	---	---	---	1	---	---	---	1	---	---	1	---	---	---	---
CASRHE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CASTIL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CERAST	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CIRARV	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CIRHOO	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---
CIRSCA	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---
CIRSIU	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CIRVUL	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---
DESPIN	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
DISHOO	---	---	---	1	---	---	17	1	---	---	1	---	---	17	7	30	---
DISTRA	---	---	---	---	1	---	---	---	---	---	1	1	---	---	---	---	---
EPIANG	---	---	---	---	---	---	---	7	---	---	1	---	---	1	---	---	---
EPICIL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
EPILOB	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ERYGRA	20	---	---	30	---	---	10	---	20	---	10	20	---	---	---	---	---
FRAVES	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---
FRAVIR	10	3	17	3	1	3	3	3	1	---	2	3	---	10	---	---	---
GALBOR	---	1	1	---	3	1	---	1	1	---	1	7	---	1	---	---	---
GALTET	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
GALTRI	---	---	---	---	---	1	---	---	---	3	---	---	7	---	---	1	---
GERRIC	1	3	---	---	3	4	3	10	4	1	4	2	2	3	---	---	---
GERRIS	---	5	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---
GEUMAC	1	---	---	7	1	1	1	3	---	3	1	---	---	---	1	---	---
HABDIL	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---
HABAC	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
HABUNA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
HACFLO	1	1	---	1	1	1	---	---	1	---	1	1	1	---	---	---	---
HERLAN	1	---	---	1	---	43	---	---	---	23	---	---	27	3	20	---	---
IRIMIS	---	---	---	---	1	---	2	---	1	---	1	1	---	3	---	---	---
LATOCH	1	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
LOMDIS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MEDSAT	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---
MONFIS	---	---	---	---	1	---	---	1	---	---	---	1	---	---	---	---	---

* Cover Synthesis (Stand) Table *

[illegible]

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

Community	*	3 *	3 *	3 *	3 *	3 *	3 *	3 *
Site	*	31 *	32 *	33 *	34 *	35 *	36 *	37 *

Trees:

ABILAS	---	---	1	1	1	---	---
PICEAX	---	---	1	---	4	---	---
PICENG	---	---	---	---	---	---	1
PINCON	---	---	---	---	---	---	---
PINFLE	---	---	---	---	---	---	---
POPTRE	50	30	30	30	20	75	9
POPTRI	68	50	50	60	60	---	---
PSEMEN	---	---	---	---	---	---	---

Shrubs:

AMEALN	2	---	3	---	---	1	10
BERREP	---	---	---	---	---	---	---
BETOCC	---	---	---	---	---	---	---
CORSTG	---	1	---	3	1	1	---
CRADOU	---	---	---	---	---	---	---
JUNCOM	---	---	---	---	---	---	---
LONINV	---	---	---	---	---	---	---
LONUTA	---	1	---	---	---	---	---
POTFRU	---	---	---	---	---	---	---
PRUVIR	---	---	---	---	---	3	---
RHAALN	---	---	---	3	---	---	---
RHAPUR	1	---	---	---	---	---	---
RIBAME	---	---	---	---	---	---	---
RIBLAC	---	---	---	---	---	---	---
RIBSET	---	---	---	3	1	1	---
RGSACI	---	---	---	---	---	---	---
RGSWOO	3	---	---	---	1	2	3
RUBIDA	---	---	---	---	---	---	---
RUBPAR	---	20	---	27	---	---	2
SALBEB	---	1	---	---	---	---	---
SALBOO	---	---	1	---	1	---	---
SALGEY	---	---	1	---	---	---	---
SALIXX	---	---	---	1	3	3	3
SALLUT	---	---	---	---	---	---	---
SALSCO	---	---	---	---	---	---	---
SALTWE	---	3	---	---	---	---	---
SHECAN	---	---	---	---	---	---	---
SORSCO	---	1	---	---	---	---	---
SPIBET	---	---	---	---	---	---	---
SYMALB	1	1	17	30	---	10	23

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

Community	*	3 *	3	3 *	3 *	3 *	3 *	3 *
Site	*	31 *	32 *	33 *	34 *	35 *	36 *	37 *

Graminoids:

AGROST	---	---	---	---	---	---	---	---
AGRREP	---	---	---	---	---	---	---	---
AGRSCL	---	---	1	---	---	---	---	1
ALOALP	---	---	1	---	---	---	---	---
ALOPRA	---	---	---	---	1	1	---	---
BROCIL	---	---	3	1	1	1	1	---
BROINE	---	---	---	---	---	---	---	---
BROPUM	---	---	---	---	---	---	---	---
CALCAN	---	---	---	3	---	1	2	---
CALRUB	10	---	---	---	---	---	1	---
CALSTR	2	---	17	---	---	---	---	---
CARBRE	---	---	---	---	---	---	---	---
CAREXX	1	---	---	---	---	---	---	---
CARGEY	---	---	---	---	---	---	---	---
CARHOO	---	---	---	---	---	---	---	---
CARMIC	---	---	---	---	---	---	---	---
CARRAY	---	---	---	---	---	---	---	1
CARROS	---	---	---	---	1	---	---	---
CINLAT	---	---	---	---	---	1	---	---
DACGLO	---	---	---	---	---	---	---	---
DESCES	---	---	---	---	---	---	---	---
ELYGLA	10	3	3	13	3	20	23	---
FESSUB	3	23	---	4	---	10	---	---
GLYSTR	---	---	---	---	---	---	---	---
JUNBAL	---	---	---	---	1	---	---	---
MELSUB	---	---	---	---	---	---	---	---
PHLFRA	1	---	10	---	---	3	3	---
POAINT	---	---	---	---	---	---	---	---
POAPAL	---	---	---	---	---	---	---	---
POAFRA	---	---	17	---	---	---	1	---
SCHPUR	3	---	1	---	---	---	---	---
STIOCC	---	---	---	---	---	---	---	---

Forbs:

ACHMIL	---	---	1	---	---	---	1	---
ACTRUB	1	7	---	2	1	10	1	---
ALLCER	---	---	---	---	---	---	---	---
ALLIUM	---	---	---	---	---	---	---	---
ALLSCH	---	---	---	---	---	---	---	---
ANGARG	1	---	7	4	3	1	---	---
ARABIS	---	---	---	---	---	---	---	---
ARAGLA	---	---	---	---	---	---	---	---
ARAHIR	---	1	---	---	---	---	---	---

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

Community	*	3 *	3 *	3 *	3 *	3 *	3 *	3 *
Site	*	31 *	32 *	33 *	34 *	35 *	36 *	37 *

Forbs Continued:

ARCMIN	---	---	---	---	---	2	---
ARELAT	---	---	---	---	---	---	---
ARNCHA	1	1	---	---	1	---	---
ASTCON	---	---	---	---	---	1	---
ASTENG	3	---	1	2	---	---	---
ASTFOL	---	1	---	---	1	---	10
ASTLAE	---	---	3	1	3	---	---
CAMQUA	---	---	---	---	1	---	---
CAMROT	---	---	---	---	---	---	---
CASLUT	---	---	---	---	1	---	---
CASMIN	---	---	1	---	---	---	---
CASRHE	---	---	---	---	---	---	---
CASSTIL	---	---	---	---	---	---	---
CERAST	---	---	---	---	---	1	---
CIRARV	---	---	---	---	---	---	---
CIRHOO	---	---	---	---	---	---	---
CIRSCA	---	---	---	---	---	---	---
CIRSIU	---	---	---	---	---	---	---
CIRVUL	---	---	---	---	---	---	---
DESPIN	---	1	---	---	---	1	---
DISHOO	---	25	---	---	---	---	---
DISTRA	1	---	---	---	---	1	---
EPIANG	---	---	---	---	---	1	---
EPICIL	---	---	1	1	---	---	---
EPILOB	---	---	---	---	---	---	---
ERYGRA	---	1	---	---	---	---	20
FRAVES	---	---	---	---	---	---	---
FRAVIR	3	---	10	---	10	1	3
GALBOR	2	---	3	---	1	1	1
GALTET	---	---	---	---	---	---	---
GALTRI	---	13	---	1	---	10	---
GERRIC	3	1	17	3	10	10	1
GERVIS	---	---	---	---	---	---	---
GEUMAC	1	1	3	1	2	20	1
HABDIL	---	---	---	---	---	---	---
HABSAC	---	---	---	---	---	---	---
HABUNA	---	---	---	---	---	---	---
HACFLO	---	---	---	---	---	---	---
HERLAN	4	60	---	17	1	18	10
IRIMIS	---	---	---	---	---	---	---
LATOCH	1	---	---	---	---	---	2
LOMDIS	---	---	---	---	---	---	3
MEDSAT	---	---	---	---	---	---	---
MONFIS	---	---	1	---	---	---	---

APPENDIX A. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITIES

* Cover Synthesis (Stand) Table *

Community	*	3 *	3 *	3 *	3 *	3 *	3 *	3 *
Site	*	31 *	32 *	33 *	34 *	35 *	36 *	37 *

Forbs Continued:

OSMDEP	---	---	1	---	---	1	---	---
OSMOCC	27	30	1	13	4	20	30	---
PEDBRA	1	1	2	---	3	---	1	---
PEDGRO	---	---	---	---	1	---	---	---
PERGAI	---	---	---	---	---	---	---	---
PETSAG	---	---	---	---	---	---	---	---
PLAMAJ	---	---	---	---	---	---	---	---
POTENT	---	---	---	---	---	---	---	---
POTGRA	---	---	---	---	---	---	---	---
PRUVUL	---	---	1	---	1	1	---	---
PYRCHL	---	---	---	---	1	---	---	---
RANUNI	---	---	---	---	---	---	---	---
SANMAR	---	---	---	---	---	10	---	---
SENCRA	---	---	---	---	---	---	---	---
SENFEO	1	---	1	---	3	---	---	---
SENHYD	---	---	---	---	---	---	---	---
SENPSE	1	---	1	---	---	---	27	---
SENSER	---	---	---	---	---	1	---	---
SENTRI	---	1	---	3	---	---	---	---
SMIRAC	---	---	---	---	---	---	1	---
SMISTE	3	---	1	1	1	1	1	---
SOLGIG	---	---	---	---	---	---	---	---
SONCHU	---	---	---	---	---	---	---	---
STELLA	---	---	---	---	---	---	---	---
STELON	---	---	---	---	---	---	---	---
STEOCC	---	---	---	---	---	---	---	---
STRAMP	---	---	---	---	---	---	---	---
TAROFF	1	---	1	---	1	---	1	---
THAOCC	10	1	1	3	1	10	10	---
THAVEN	---	---	---	---	---	---	---	---
THIREP	---	---	1	---	---	---	1	---
URTOTO	---	1	---	3	---	3	---	---
VALSIT	---	---	---	---	---	---	---	---
VERVIR	1	3	---	1	---	---	2	---
VICAME	1	1	1	---	1	1	1	---
VIOCAN	1	30	7	20	1	30	30	---
ZIGELE	---	---	---	---	---	---	---	---

Ferns & Fern Allies:

BOTVIR	---	---	---	---	---	---	---	---
EQUARV	1	1	---	1	2	1	2	---
EQUHYE	---	---	---	---	---	---	---	---
FERNXX	---	---	---	1	---	---	---	---

APPENDIX B. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITY TYPES:

Cover Constancy Table: Constancy (Average Abundance) [Range, Minimum - Maximum]

Community	* POPTRE/CORSTO	* POPTRE/CALCAN	* POPTRE/OSMOCC
# Sites	N = 3	N = 11	N = 23

	Trees:		
ABILAS	33 (1) [1 - 1]	36 (1) [1 - 1]	30 (1) [1 - 3]
PICEAX	0 (0) [0 - 0]	27 (5) [1 - 10]	43 (2) [1 - 4]
PICENG	67 (1) [1 - 1]	9 (1) [1 - 1]	13 (6) [1 - 13]
PINCON	0 (0) [0 - 0]	9 (10) [10 - 10]	0 (0) [0 - 0]
PINFLE	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
POPTRE	100 (42) [25 - 70]	100 (65) [40 - 90]	100 (61) [9 - 90]
POPTRI	67 (70) [70 - 70]	73 (38) [13 - 60]	74 (26) [1 - 68]
PSEMAN	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (3) [3 - 3]

	Shrubs:		
AMEALN	67 (2) [1 - 3]	73 (3) [1 - 4]	70 (4) [1 - 23]
BERRER	0 (0) [0 - 0]	0 (0) [0 - 0]	30 (2) [1 - 4]
BETOCC	67 (3) [3 - 3]	0 (0) [0 - 0]	13 (1) [1 - 2]
CORSTO	100 (28) [5 - 60]	18 (2) [1 - 3]	39 (2) [1 - 3]
CRADOU	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (3) [3 - 3]
JUNCOM	0 (0) [0 - 0]	0 (0) [0 - 0]	9 (1) [1 - 1]
LONINV	33 (12) [12 - 12]	0 (0) [0 - 0]	4 (1) [1 - 1]
LONUTA	0 (0) [0 - 0]	9 (1) [1 - 1]	4 (1) [1 - 1]
POTFRU	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
PROVIR	33 (3) [3 - 3]	9 (1) [1 - 1]	9 (2) [1 - 3]
RHAALN	0 (0) [0 - 0]	9 (1) [1 - 1]	4 (3) [3 - 3]
RHAPUR	0 (0) [0 - 0]	0 (0) [0 - 0]	13 (1) [1 - 1]
RIBAME	0 (0) [0 - 0]	27 (2) [1 - 3]	4 (1) [1 - 1]
RIBLAC	33 (1) [1 - 1]	0 (0) [0 - 0]	0 (0) [0 - 0]
RIBSET	67 (3) [3 - 3]	27 (2) [1 - 3]	17 (2) [1 - 3]
ROSACI	0 (0) [0 - 0]	0 (0) [0 - 0]	9 (1) [1 - 1]
ROSWOO	100 (3) [2 - 3]	91 (4) [1 - 10]	65 (7) [1 - 20]
RUBIDA	0 (0) [0 - 0]	18 (2) [1 - 3]	4 (1) [1 - 1]
RUBPAR	33 (1) [1 - 1]	0 (0) [0 - 0]	26 (24) [2 - 40]
SALBEB	67 (3) [3 - 3]	36 (6) [1 - 10]	4 (1) [1 - 1]
SALBOO	33 (2) [2 - 2]	9 (2) [2 - 2]	17 (1) [1 - 2]
SALGEY	0 (0) [0 - 0]	0 (0) [0 - 0]	9 (2) [1 - 2]
SALIXX	33 (1) [1 - 1]	27 (2) [1 - 3]	35 (4) [1 - 17]
SALLUT	0 (0) [0 - 0]	0 (0) [0 - 0]	9 (2) [1 - 3]
SALSCO	0 (0) [0 - 0]	18 (2) [2 - 2]	22 (3) [1 - 7]
SALTWE	0 (0) [0 - 0]	9 (1) [1 - 1]	4 (3) [3 - 3]
SHECAN	0 (0) [0 - 0]	0 (0) [0 - 0]	17 (2) [1 - 3]
SORSOCO	0 (0) [0 - 0]	0 (0) [0 - 0]	9 (1) [1 - 1]
SPIBET	0 (0) [0 - 0]	0 (0) [0 - 0]	17 (6) [1 - 13]
SYNALB	100 (10) [7 - 13]	73 (8) [2 - 28]	91 (28) [1 - 63]

APPENDIX B. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITY TYPES:

Cover Constancy Table: Constancy (Average Abundance) [Range, Minimum - Maximum]

	Community	* POPTRE/CORSTO	* POPTRE/CALCAN	* POPTRE/OSMOCC
	# Sites	N = 3	N = 11	N = 23
Graminoids:				
AGROST	0 (0)	[0 - 0]	0 (0)	[0 - 0]
AGRREP	0 (0)	[0 - 0]	9 (1)	[1 - 1]
AGRSCA	0 (0)	[0 - 0]	45 (1)	[1 - 1]
ALQALP	33 (1)	[1 - 1]	45 (18)	[1 - 28]
ALOPRA	33 (1)	[1 - 1]	45 (8)	[1 - 20]
BROCIL	67 (2)	[1 - 3]	55 (1)	[1 - 3]
BRONE	0 (0)	[0 - 0]	9 (5)	[5 - 5]
BROPUM	0 (0)	[0 - 0]	0 (0)	[0 - 0]
CALCAN	33 (10)	[10 - 10]	55 (28)	[10 - 60]
CALRUB	0 (0)	[0 - 0]	0 (0)	[0 - 0]
CALSTR	0 (0)	[0 - 0]	36 (35)	[1 - 70]
CARBRE	0 (0)	[0 - 0]	18 (1)	[1 - 1]
CAREXX	33 (1)	[1 - 1]	0 (0)	[0 - 0]
CARGEY	0 (0)	[0 - 0]	0 (0)	[0 - 0]
CARHOO	0 (0)	[0 - 0]	27 (1)	[1 - 1]
CARMIC	0 (0)	[0 - 0]	18 (1)	[1 - 1]
CARRAY	0 (0)	[0 - 0]	9 (1)	[1 - 1]
CARROS	0 (0)	[0 - 0]	9 (1)	[1 - 1]
CINLAT	0 (0)	[0 - 0]	0 (0)	[0 - 0]
DACGLO	0 (0)	[0 - 0]	0 (0)	[0 - 0]
DESCES	0 (0)	[0 - 0]	0 (0)	[0 - 0]
ELYGLA	100 (14)	[3 - 30]	100 (15)	[3 - 40]
FESSUB	67 (6)	[1 - 10]	55 (11)	[1 - 27]
GLYSTR	0 (0)	[0 - 0]	9 (1)	[1 - 1]
JUNBAL	0 (0)	[0 - 0]	0 (0)	[0 - 0]
MELSUB	0 (0)	[0 - 0]	0 (0)	[0 - 0]
PHLEPA	67 (1)	[1 - 1]	91 (11)	[1 - 30]
POAINT	0 (0)	[0 - 0]	9 (1)	[1 - 1]
POAPAL	0 (0)	[0 - 0]	9 (20)	[20 - 20]
POAPRA	0 (0)	[0 - 0]	64 (6)	[1 - 10]
SCHPUR	0 (0)	[0 - 0]	27 (2)	[1 - 3]
STIOCC	0 (0)	[0 - 0]	0 (0)	[0 - 0]
Forbs:				
ACHMIL	0 (0)	[0 - 0]	36 (1)	[1 - 1]
ACTRUB	33 (8)	[8 - 8]	27 (3)	[1 - 7]
ALLCER	0 (0)	[0 - 0]	0 (0)	[0 - 0]
ALLIUM	33 (1)	[1 - 1]	9 (1)	[1 - 1]
ALLSCH	0 (0)	[0 - 0]	9 (1)	[1 - 1]
ANGARG	33 (40)	[40 - 40]	100 (14)	[1 - 33]
ARABIS	33 (1)	[1 - 1]	0 (0)	[0 - 0]
ARAGLA	0 (0)	[0 - 0]	0 (0)	[0 - 0]
ARAHIR	0 (0)	[0 - 0]	0 (0)	[0 - 0]

APPENDIX B. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITY TYPES:

Cover Constancy Table: Constancy (Average Abundance) [Range, Minimum - Maximum]

Community	* POPTRC/CORSTO	* POPTRC/CALCAN	* POPTRC/OSMOCC
# Sites	N = 3	N = 11	N = 23

Forbs Continued:

ARCMIN	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (2) [2 - 2]
ARELAT	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
ARNCHA	0 (0) [0 - 0]	82 (2) [1 - 4]	22 (1) [1 - 1]
ASTCON	33 (1) [1 - 1]	0 (0) [0 - 0]	9 (1) [1 - 1]
ASTENG	33 (1) [1 - 1]	27 (1) [1 - 2]	30 (2) [1 - 4]
ASTFOL	67 (6) [1 - 10]	36 (4) [1 - 13]	35 (2) [1 - 10]
ASTLAE	0 (0) [0 - 0]	73 (5) [2 - 13]	61 (3) [1 - 7]
CAMQUA	33 (1) [1 - 1]	36 (2) [1 - 4]	17 (1) [1 - 1]
CAMROT	67 (1) [1 - 1]	27 (1) [1 - 1]	17 (1) [1 - 1]
CASLUT	0 (0) [0 - 0]	18 (1) [1 - 1]	9 (2) [1 - 3]
CASMIN	0 (0) [0 - 0]	9 (1) [1 - 1]	22 (1) [1 - 1]
CASRHE	0 (0) [0 - 0]	9 (1) [1 - 1]	0 (0) [0 - 0]
CASSTIL	33 (1) [1 - 1]	9 (1) [1 - 1]	0 (0) [0 - 0]
CERAST	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
CIRARV	33 (1) [1 - 1]	0 (0) [0 - 0]	0 (0) [0 - 0]
CIRHOO	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
CIRSCA	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
CIRSIU	0 (0) [0 - 0]	9 (1) [1 - 1]	0 (0) [0 - 0]
CIRVUL	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
DESPIN	0 (0) [0 - 0]	0 (0) [0 - 0]	9 (1) [1 - 1]
DISHOO	33 (4) [4 - 4]	9 (10) [10 - 10]	35 (12) [1 - 30]
DISTRA	33 (1) [1 - 1]	0 (0) [0 - 0]	22 (1) [1 - 1]
EPIANG	33 (1) [1 - 1]	18 (1) [1 - 1]	17 (3) [1 - 7]
EPICIL	0 (0) [0 - 0]	64 (1) [1 - 2]	9 (1) [1 - 1]
EPILOB	33 (1) [1 - 1]	9 (1) [1 - 1]	0 (0) [0 - 0]
ERYGRA	0 (0) [0 - 0]	18 (8) [3 - 13]	35 (16) [1 - 30]
FRAVES	0 (0) [0 - 0]	9 (1) [1 - 1]	4 (1) [1 - 1]
FRAVIR	67 (1) [1 - 1]	91 (8) [1 - 20]	78 (5) [1 - 17]
GALBOR	33 (3) [3 - 3]	82 (2) [1 - 4]	61 (2) [1 - 7]
GALTET	0 (0) [0 - 0]	9 (1) [1 - 1]	0 (0) [0 - 0]
GALTRI	33 (3) [3 - 3]	36 (1) [1 - 1]	30 (5) [1 - 13]
GERRIC	100 (7) [3 - 10]	100 (3) [1 - 10]	87 (4) [1 - 17]
GERVIS	33 (1) [1 - 1]	0 (0) [0 - 0]	9 (3) [1 - 5]
GEUMAC	67 (3) [3 - 3]	91 (5) [1 - 13]	74 (3) [1 - 20]
HABDIL	33 (1) [1 - 1]	9 (1) [1 - 1]	0 (0) [0 - 0]
HABSAC	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
HABUNA	0 (0) [0 - 0]	9 (1) [1 - 1]	4 (1) [1 - 1]
HACFLO	33 (1) [1 - 1]	27 (1) [1 - 1]	43 (1) [1 - 1]
HERLAN	67 (23) [20 - 25]	55 (8) [1 - 40]	61 (17) [1 - 60]
IRIMIS	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]
LATOCH	0 (0) [0 - 0]	64 (1) [1 - 3]	48 (2) [1 - 3]
LOWDIS	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (3) [3 - 3]
MEDSAT	0 (0) [0 - 0]	0 (0) [0 - 0]	4 (1) [1 - 1]

APPENDIX B. BLACKFEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD COMMUNITY TYPES:

Cover Constancy Table: Constancy (Average Abundance) [Range, Minimum - Maximum]

Community		*	POPTRE/CORSTO		*	POPTRE/CALCAN		*	POPTRE/OSMOCC		*	
# Sites		*	N = 3		*	N = 11		*	N = 23		*	

Forbs Continued:												
MONFIS	33	(1)	[1 - 1]			0 (0)	[0 - 0]			17 (1)	[1 - 1]	
OSMDEP	33	(13)	[13 - 13]			18 (1)	[1 - 1]			48 (2)	[1 - 3]	
OSMOCC	100	(20)	[1 - 50]			73 (11)	[1 - 20]			100 (15)	[1 - 30]	
PEDBRA	33	(2)	[2 - 2]			64 (2)	[1 - 3]			61 (2)	[1 - 3]	
PEDGRO	0	(0)	[0 - 0]			18 (1)	[1 - 1]			17 (2)	[1 - 4]	
PERGAI	0	(0)	[0 - 0]			9 (3)	[3 - 3]			4 (1)	[1 - 1]	
PETSAG	33	(2)	[2 - 2]			9 (1)	[1 - 1]			0 (0)	[0 - 0]	
PLAMAJ	0	(0)	[0 - 0]			0 (0)	[0 - 0]			4 (1)	[1 - 1]	
POTENT	33	(1)	[1 - 1]			0 (0)	[0 - 0]			0 (0)	[0 - 0]	
POTGRA	0	(0)	[0 - 0]			9 (1)	[1 - 1]			4 (1)	[1 - 1]	
PRUVUL	100	(2)	[1 - 3]			9 (1)	[1 - 1]			22 (1)	[1 - 1]	
PYRCHL	33	(1)	[1 - 1]			27 (1)	[1 - 1]			9 (1)	[1 - 1]	
RANUNI	33	(1)	[1 - 1]			18 (1)	[1 - 1]			17 (1)	[1 - 1]	
SANMAR	100	(11)	[1 - 30]			45 (6)	[1 - 13]			26 (6)	[1 - 17]	
SENCRA	0	(0)	[0 - 0]			0 (0)	[0 - 0]			4 (1)	[1 - 1]	
SENGOE	0	(0)	[0 - 0]			82 (8)	[1 - 20]			48 (1)	[1 - 4]	
SENHYD	33	(3)	[3 - 3]			0 (0)	[0 - 0]			0 (0)	[0 - 0]	
SENPSE	67	(7)	[3 - 10]			55 (15)	[1 - 40]			57 (8)	[1 - 27]	
SENSE	33	(1)	[1 - 1]			9 (1)	[1 - 1]			9 (1)	[1 - 1]	
SENTRI	33	(1)	[1 - 1]			9 (1)	[1 - 1]			13 (2)	[1 - 3]	
SMIRAC	0	(0)	[0 - 0]			0 (0)	[0 - 0]			26 (1)	[1 - 1]	
SMISTE	67	(2)	[1 - 3]			100 (2)	[1 - 3]			87 (1)	[1 - 3]	
SOLGIG	0	(0)	[0 - 0]			9 (1)	[1 - 1]			4 (1)	[1 - 1]	
SONCHU	0	(0)	[0 - 0]			0 (0)	[0 - 0]			4 (1)	[1 - 1]	
STELLA	0	(0)	[0 - 0]			9 (1)	[1 - 1]			0 (0)	[0 - 0]	
STELON	0	(0)	[0 - 0]			9 (1)	[1 - 1]			0 (0)	[0 - 0]	
STEOCC	0	(0)	[0 - 0]			0 (0)	[0 - 0]			4 (1)	[1 - 1]	
STRAMP	33	(5)	[5 - 5]			0 (0)	[0 - 0]			4 (1)	[1 - 1]	
TAROFF	33	(3)	[3 - 3]			64 (1)	[1 - 3]			65 (2)	[1 - 7]	
THAOCC	100	(11)	[4 - 20]			91 (2)	[1 - 3]			91 (6)	[1 - 20]	
THAVEN	0	(0)	[0 - 0]			9 (1)	[1 - 1]			0 (0)	[0 - 0]	
TRIREF	0	(0)	[0 - 0]			18 (1)	[1 - 1]			17 (1)	[1 - 2]	
URTDIO	33	(3)	[3 - 3]			27 (1)	[1 - 2]			30 (2)	[1 - 3]	
VALSIT	0	(0)	[0 - 0]			0 (0)	[0 - 0]			4 (1)	[1 - 1]	
VERVIR	33	(4)	[4 - 4]			27 (3)	[1 - 4]			52 (4)	[1 - 17]	
VICAME	67	(1)	[1 - 1]			55 (1)	[1 - 3]			57 (1)	[1 - 1]	
VIOCAN	100	(5)	[1 - 10]			64 (8)	[1 - 40]			91 (12)	[1 - 30]	
ZIGELE	0	(0)	[0 - 0]			9 (1)	[1 - 1]			0 (0)	[0 - 0]	

Ferns & Fern Allies:												
BOTVIR	0	(0)	[0 - 0]			9 (1)	[1 - 1]			0 (0)	[0 - 0]	
EQUARV	33	(3)	[3 - 3]			45 (2)	[1 - 4]			39 (2)	[1 - 4]	
EQUHYE	0	(0)	[0 - 0]			9 (1)	[1 - 1]			0 (0)	[0 - 0]	
FERNXX	0	(0)	[0 - 0]			0 (0)	[0 - 0]			4 (1)	[1 - 1]	

APPENDIX C. Scatterplots of stem density by 2 inch size classes without regard to species. (Separate plots for live and dead; plots arranged in ascending order of stand number, five stands per scatterplot; see Appendix D for breakdown of stem density by species, size classes, and live versus dead)

Live Stem Density: Stands 17, 18, 19, 20, & 21

Dead Stem Density: Stands 17, 18, 19, 20, 21

APPENDIX C (Continued)

Live Stem Density; Stands 23, 24, 25, 26, 27

Live Stem Density; Stands 23, 24, 25, 26, 27

APPENDIX C (Continued)

Live Stem Density; Stands 28, 29, 30, 31, 32

Dead Stem Density; Stands 28, 29, 30, 31, 32

APPENDIX C (Continued)

Live Stem Density; Stand 33, 34, 35, 36, 37

Dead Stem Density; Stands 33, 34, 35, 36, 37

APPENDIX C (Continued)

Live Stem Density; Stands 38, 39, 40, 41, 42

Dead Stem Density; Stands 38, 39, 40, 41, 42

APPENDIX C (Continued)

Live Stem Density; Stands 43, 44, 46, 47, 48

Dead Stem Density; Stand 43, 44, 46, 47, 48

APPENDIX C (Continued)

Live Stem Density; Stands 50, 51

Dead Stem Density; Stands 50, 51

APPENDIX D (continued) TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES

DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)

	/ >1-2			/ >2-4			/ >4-6			/ >6-8			/ >8-10			/ >10-12			/ >12-14			/ >14-16			/ >16		
SITE NO.	TA'	BC'	OT'	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT
038L'	20			80			330			190			70			10			0								
038D	50			170			40			0																	
039L	140			210			120			80			60			20			10								
039D	60			40			0			0			10			0											
040L	50	0	10	60			440			270			40			0											
040D	10			110			120			10			0														
041L	0			30			190	10		260	40		140	10		30			0								
041D	20	0		60	0		10	0		30	0		0	0		0	10										
042L	0			10			50			30			50	0	10	70			50	0	10	60				10	
042D	30			20			0																				
043L	20			100			230			30	40		0	10		0			0			0	10				
043D	10	20		140	10		10	0		0			0	20													
044L	280	70		510	100		0	130		0	30		0	0		0	40		0	60		0	10		0	10	
044D	40	0		0	60		0	10		0	0		0	10		0	0		0	0		0	10				
045L	NI'																										
045D	NI																										
046L	110	50		330	60		90	40	10	50	0		70	10		60			10								
046D	110	20		70			40	0		0			10														
047L	180	200		60	40	10	20			40			40			10											
047D	0	20		0	10		0	10		20	0		0	10													

L = live trees; D, dead trees

A = trembling aspen (*Populus tremuloides*)

BC = black cottonwood (*Populus trichocarpa*)

OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

NI = not inventoried

APPENDIX D. TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES
DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER TREES PER ACRE)

SITE /	>1-2 /			>2-4 /			>4-6 /			>6-8 /			>8-10 /			>10-12 /			>12-14 /			>14-16 /			>16 /		
SITE No	TA*	BC*	OT*	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT
017L*	0			10			70			160			100			0											
017D	0			10			30			10			0			0											
018L	50			100			60			30			10			50			10								
018D	10			0			0			0			10			0											
019L	0	40		30	30		100	30		40	0		10	0		0	20		0	50		10	20				
019D	0	30		10	20		80	0		0	0		0	0		0	10		0	0							
020L	130			0			40			180			200			40			0								
020D	0			0			70			0			0			0											
021L	30			40			50			50			90			40			0								
021D	0			0			0			20			0			0											
022L	NI*																										
022D	NI																										
023L	70	20		50	20		30	10		30	40		90	90		40	40		40	20		0	0				
023D	0	10		0	0		0	10		0	0																
024L	420			170			0			40			50			10											
024D	0			0			20			90			50			0											
025L	160	40		70	100		0	50		20	40		80	30		20	0		10	0		0	0				
025D	10	0		0	20		0	0		0	10		0	0		10	0		0	0							
026L	80	0		80	80		20	50		10	60		50	30		20	0		0	30		0	0		0	20	
026D	0	0		0	20		0	20		0	10		0	0													
027L	20	70		100	90		30	60		0	120		110	10		50	0										
027D	10	20		10	60		0	30		0	10		0	0		10	0										

* L, live trees; D, dead trees

* TA = trembling aspen (*Populus tremuloides*) * BC = black cottonwood (*Populus trichocarpa*)

* OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

* NI = not inventoried

APPENDIX D (continued). TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES

DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)																											
/ >1-2 /			/ >2-4 /			/ >4-6 /			/ >6-8 /			/ >8-10 /			/ >10-12 /			/ >12-14 /			/ >14-16 /			/ >16 /			
SITE NO	TA ¹	BC ²	OT ³	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT
281	150			390			30			40			90			110			10								
0280	10			20			0																				
0290	10	20		10			60			140			170			0											
0290	40	0		60			80			0			10			0											
0300	50			210			50			10			10			20			10			0			0	10	
0300	30			60			50			0			10			30			10			0			10		
0310	110			90			70			110			160			30			0								
0310	80			40			70			50			0														
0320	180	60		210	40		190	30		260	10		120														
0320	50	10		40	0		20	0		0	0																
0330	10	20		20	10	10	330	0		190	0		30	20		0	10										
0330	10	0		60	0		140	0																			
0340	110			120			370			130																	
0340	10			60			140			20																	
0350	190			430			70			90			70			0											
0350	120			70			50			40			20			30											
0360	230	140		210	70		30	20		10	40		80	50		10	40		0	50		0	40				
0360	0	0		10	30		30	20		0	10		0	30		0	30		0	10							
0370	100	70	10	120	40		30	20		70	20		60	0		10	10		0	50		0	40		0	40	
0370	50	60		10	0		10	0		0	0																

¹ L = live trees, D = dead trees

² TA = trembling aspen (*Populus tremuloides*)

³ BC = black cottonwood (*Populus trichocarpa*)

⁴ OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

⁵ NI = not inventoried

APPENDIX D (continued) TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES
DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)

SITE NO	>1-2			>2-4			>4-6			>6-8			>8-10			>10-12			>12-14			>14-16			>16		
	TA ¹	BC ²	OT ³	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT
038L [*]	20			80			330			190			70			10			0								
038D	50			170			40			0																	
039L	140			210			120			80			60			20			10								
039D	60			40			0			0			10			0											
040L	50	0	10	60			440			270			40			0											
040D	10			110			120			10			0														
041L	0			30			190	10		260	40		140	10		30			0								
041D	20	0		60	0		10	0		30	0		0	0		0	10										
042L	0			10			50			30			50	0	10	70			50	0	10	60			10		
042D	30			20			0																				
043L	20			100			230			30	40		0	10		0			0			0	10				
043D	10	20		140	10		10	0		0			0	20													
044L	280	70		510	100		0	130		0	30		0	0		0	40		0	60		0	10		0	10	
044D	40	0		0	60		0	10		0	0		0	10		0	0		0	0		0	10				
045L	NI ⁴																										
045D	NI																										
046L	110	50		330	60		90	40	10	50	0		70	10		60			10								
046D	110	20		70			40	0		0			10														
047L	180	200		60	40	10	20			40			40			10											
047D	0	20		0	10		0	10		20	0		0	10													

* L, live trees; D, dead trees

¹ TA = trembling aspen (*Populus tremuloides*)

² BC = black cottonwood (*Populus trichocarpa*)

³ OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

⁴ NI = not inventoried

DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)

[illegible]

*L, live trees; D, dead trees

¹ 1A = trembling aspen (*Populus tremuloides*)²BC = black cottonwood (*Populus trichocarpa*)

*OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

* NI - not inventoried

APPENDIX A.
BLACK-FEET INDIAN RESERVATION TREMBLING ASPEN-BLACK COTTONWOOD
PLANT COMMUNITIES

Index for associating particular ECODATA plot numbers with their position in the
Cover Synthesis (Stand) Table

1. POPTRE/CORSTO:

1. NHMTECBR96SC0017 2. NHMTECBR96SC0022 3. NHMTECBR96SC0019

2. POPTRE/CALCAN:

4. NHMTECBR96SC0039 5. NHMTECBR96SC0042 6. NHMTECBR96SC0024
7. NHMTECBR96SC0051 8. NHMTECBR96SC0046 9. NHMTECBR96SC0021
10. NHMTECBR96SC0023 11. NHMTECBR96SC0036 12. NHMTECBR96SC0052
13. NHMTECBR96SC0025 14. NHMTECBR96SC0048

3. POPTRE/OSMOCC:

15. NHMTECBR96SC0035 16. NHMTECBR96SC0040 17. NHMTECBR96SC0045
18. NHMTECBR96SC0028 19. NHMTECBR96SC0038 20. NHMTECBR96SC0034
21. NHMTECBR96SC0029 22. NHMTECBR96SC0053 23. NHMTECBR96SC0031
24. NHMTECBR96SC0041 25. NHMTECBR96SC0030 26. NHMTECBR96SC0032
27. NHMTECBR96SC0033 28. NHMTECBR96SC0027 29. NHMTECBR96SC0049
30. NHMTECBR96SC0043 31. NHMTECBR96SC0044 32. NHMTECBR96SC0026
33. NHMTECBR96SC0047 34. NHMTECBR96SC0037
35. NHMTECBR96SC0050 36. NHMTECBR96SC0018 37. NHMTECBR96SC0020

DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)

[illegible]

L, live trees; D, dead trees

TA = trembling aspen (*Populus tremuloides*)BC = black cottonwood (*Populus trichocarpa*)

OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

NI = not inventoried

APPENDIX D (continued). TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES

DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)

>1-2			>2-4			>4-6			>6-8			>8-10			>10-12			>12-14			>14-16			>16		
TA'	BC'	OT'	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT
150			390			30			40			90			110			10								
10			20			0																				
10	20		10			60			140			170			0											
40	0		60			80			0			10			0											
50			210			50			10			10			20			10			0			0	10	
30			60			50			0			10			30			10			0			10		
110			90			70			110			160			30			0								
80			40			70			50			0														
180	60		210	40		190	30		260	10		120														
50	10		40	0		20	0		0	0																
10	20		20	10	10	330	0		190	0		30	20		0	10										
10	0		60	0		140	0																			
110			120			370			130																	
10			60			140			20																	
190			430			70			90			70			0											
120			70			50			40			20			30											
230	140		210	70		30	20		10	40		80	50		10	40		0	50		0	40				
0	0		10	30		30	20		0	10		0	30		0	30		0	10							
100	70	10	120	40		30	20		70	20		60	0		10	10		0	50		0	40		0	40	
50	60		10	0		10	0		0	0																

trees, D, dead trees
 trembling aspen (*Populus tremuloides*)
 black cottonwood (*Populus trichocarpa*)
 other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)
 not inventoried

DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER TREES PER ACRE)

SITE /	/ >1-2			/ >2-4			/ >4-6			/ >6-8			/ >8-10			/ >10-12			/ >12-14			/ >14-16			/ >16	
SITE NO.	TA¹	BC²	OT³	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC
017L*	0			10			70			160			100			0										
017D	0			10			30			10			0			0										
018L	50			100			60			30			10			50			10							
018D	10			0			0			0			10			0										
019L	0	40		30	30		100	30		40	0		10	0		0	20		0	50		10	20			
019D	0	30		10	20		80	0		0	0		0	0		0	10		0	0						
020L	130			0			40			180			200			40			0							
020D	0			0			70			0			0			0										
024L	40			40			50			50			40			40			0							
021D	0			0			0			20			0			0										
022L	Nl*																									
022D	Nl																									
023L	70	20		50	20		30	10		30	40		90	90		40	40		40	20		0	0			
023D	0	10		0	0		0	10		0	0															
024L	420			170			0			40			50			10										
024D	0			0			20			70			40			0										
025L	160	40		70	100		0	50		20	40		80	30		20	0		10	0		0	0			
025D	10	0		0	20		0	0		0	10		0	0		10	0		0	0						
026L	80	0		80	80		20	50		10	60		50	30		20	0		0	30		0	0		0	20
026D	0	0		0	20		0	20		0	10		0	0												
027L	20	70		100	90		30	60		0	120		110	10		50	0									
027D	10	20		10	60		0	30		0	10		0	0		10	0									

* L, live trees; D, dead trees

¹ TA = trembling aspen (*Populus tremuloides*) ² BC = black cottonwood (*Populus trichocarpa*)

¹ OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*).

^d NI = not inventoried

APPENDIX D. TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES
DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER TREES PER ACRE)

SITE	>1-2		/		>2-4		/		>4-6		/		>6-8		/		>8-10		/		>10-12		/		>12-14		/		>14-16		/		>16	
SHT NO	TA*	BC*	OT*	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	
0171	0			10			70			160			100			0																		
017D	0			10			30			10			0			0																		
018L	50			100			60			30			10			50			10															
018D	10			0			0			0			10			0																		
019L	0	40		30	30		100	30		40	0		10	0		0	20		0	50		10	20											
019D	0	30		10	20		80	0		0	0		0	0		0	10		0	0														
020L	130			0			40			180			200			40			0															
020D	0			0			70			0			0			0																		
021L	30			40			50			50			90			40			0															
021D	0			0			0			20			0			0																		
022L	NI*																																	
022D	NI																																	
023L	70	20		50	20		30	10		30	40		90	90		40	40		40	20		0	0											
023D	0	10		0	0		0	10		0	0																							
024L	420			170			0			40			50			10																		
024D	0			0			20			90			50			0																		
025L	160	40		70	100		0	50		20	40		80	30		20	0		10	0		0	0											
025D	10	0		0	20		0	0		0	10		0	0		10	0		0	0														
026L	80	0		80	80		20	50		10	60		50	30		20	0		0	30		0	0								0	20		
026D	0	0		0	20		0	20		0	10		0	0																				
027L	20	70		100	90		30	60		0	120		110	10		50	0																	
027D	10	20		10	60		0	30		0	10		0	0		10	0																	

* 1. live trees, D. dead trees

TA = trembling aspen (*Populus tremuloides*) * BC = black cottonwood (*Populus trichocarpa*)

* OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

* NI = not inventoried

APPENDIX D (continued). TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES
DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)

	>1-2			>2-4			>4-6			>6-8			>8-10			>10-12			>12-14			>14-16			>16		
SII No	TA'	BC'	OT'	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT
281	150			390			30			40			90			110			10								
028D	10			20			0																				
029L	10	20		10			60			140			170			0											
029D	40	0		60			80			0			10			0											
030L	50			210			50			10			10			20			10		0			0	10		
030D	30			60			50			0			10			30			10		0			10			
031L	110			90			70			110			160			30			0								
031D	80			40			70			50			0														
032L	180	60		210	40		190	30		260	10		120														
032D	50	10		40	0		20	0		0	0																
033L	10	20		20	10	10	330	0		190	0		30	20		0	10										
033D	10	0		60	0		140	0																			
034L	110			120			370			130																	
034D	10			60			140			20																	
035L	190			430			70			90			70			0											
035D	120			70			50			40			20			30											
036L	230	140		210	70		30	20		10	40		80	50		10	40		0	50		0	40				
036D	0	0		10	30		30	20		0	10		0	30		0	30		0	10							
037L	100	70	10	120	40		30	20		70	20		60	0		10	10		0	50		0	40		0	40	
037D	50	60		10	0		10	0		0	0																

1. live trees; D, dead trees

TA = trembling aspen (*Populus tremuloides*)

BC = black cottonwood (*Populus trichocarpa*)

OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

* NI = not inventoried

APPENDIX D (continued) TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES
DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)

	>1-2		/		>2-4		/		>4-6		/		>6-8		/		>8-10		/		>10-12		/		>12-14		/		>14-16		/		>16	
SITE NO	TA ¹	BC ²	OT ³	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	TA	BC	OT	
038L ⁴	20			80			330			190			70			10			0															
038D	50			170			40			0																								
039I	140			210			120			80			60			20			10															
039D	60			40			0			0			10			0																		
040L	50	0	10	60			440			270			40			0																		
040D	10			110			120			10			0																					
041L	0			30			190	10		260	40		140	10		30			0															
041D	20	0		60	0		10	0		30	0		0	0		0	10																	
042I	0			10			50			30			50	0	10	70			50	0	10	60							10					
042D	30			20			0																											
043I	20			100			230			30	40		0	10		0			0									0	10					
043D	10	20		140	10		10	0		0			0	20																				
044L	280	70		510	100		0	130		0	30		0	0		0	40		0	60		0	10				0	10			0	10		
044D	40	0		0	60		0	10		0	0		0	10		0	0		0	0		0	0				0	10						
045L	NI ⁵																																	
045D	NI																																	
046I	110	50		330	60		90	40	10	50	0		70	10		60			10															
046D	110	20		70			40	0		0			10																					
047L	180	200		60	40	10	20			40			40			10																		
047D	0	20		0	10		0	10		20	0		0	10																				

¹ L - live trees; D - dead trees

² TA = trembling aspen (*Populus tremuloides*)

³ BC = black cottonwood (*Populus trichocarpa*)

⁴ OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*)

⁵ NI = not inventoried

APPENDIX D (continued). TREMBLING ASPEN-BLACK COTTONWOOD TREE POPULATIONS BY SITE AND SPECIES DIAMETER CLASSES

DIAMETER CLASSES BY 1 AND 2 INCH INCREMENTS (CELL VALUES, NUMBER OF TREES PER ACRE)

[illegible]^a L, live trees; D, dead trees^a TA = trembling aspen (*Populus tremuloides*)² BC = black cottonwood (*Populus trichocarpa*).

OT = other species, could include Engelmann spruce x white spruce hybrids (*Picea engelmannii* x *P. glauca*), subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*).

^a NI = not interviewed.

APPENDIX E. TREMBLING ASPEN-BLACK COTTONWOOD BASAL AREA BY SITE, SPECIES, AND SAMPLING TECHNIQUE
BASAL AREA (FT²/ACRE)

SITE NUMBER	POPTRE ¹		POPTRI ²		PICENG ³		ABILAS ⁴		PINCON ⁵		TOTAL		TOTAL	
	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD
017	86.7	6.5									86.7	6.5	57	NI
018	66.5	4.1									66.5	4.1	72	25
019	43.0	4.1	88.6	7.3							131.6	11.4	124	NI
020	171.5	9.9									171.5	9.9	156	NI
021	135.8	9.8	22.4	43.9							158.2	53.7	125	NI
022	NI												120	NI
023	115.8	0	96.6	0.1							212.4	0.1	160	NI
024	51.0	47.2									51.0	47.2	65	12
025	64.7	6.1	33.5	5.3							98.2	11.4	85	20
026	44.4	0	114.9	6.9							159.3	6.9	90	NI
027	88.3	10.6	57.1	9.6							145.4	20.2	120	NI
028	142.9	1.4									142.9	1.4	80	NI
029	120.6	19.1	0.2	0							120.8	19.1	60	12
030	45.4	43.3	1.4	0							46.8	43.3	50	25
031	133.3	25.5			31.0	0					164.3	25.5	88	04
032	160.0	5.1	8.8	0.1							168.8	5.2	122	04
033	108.6	20.6	16.3	0	0.7	0					125.6	20.6	72	08
034	85.2	27.2									85.2	27.2	50	10
035	81.0	47.9									81.0	47.9	65	20
036	75.5	4.7	157.9	46.3							233.4	51.0	140	32

¹POPTRE = *Populus tremuloides*; ²POPTRI = *Populus trichocarpa*; ³PICENG = *Picea engelmannii*; ⁴ABILAS = *Abies lasiocarpa*; ⁵PINCON = *Pinus contorta*

**APPENDIX E (cont.). TREMBLING ASPEN-BLACK COTTONWOOD BASAL AREA BY SITE, SPECIES, AND SAMPLING TECHNIQUE
BASAL AREA (FT²/ACRE)**

SITE NUMBER	-----PLOT TECHNIQUE-----										-----PLOTLESS-----			
	POPTRE ¹		POPTRI ²		PICENG ³		ABILAS ⁴		PINCON ⁵		TOTAL		TOTAL	
	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD
037	61.7	2.0	166.1	0.7			0.1	0			227.9	2.7	144	20
038	133.5	14.6							0.1	0	133.6	14.6	85	7.5
039	101.6	6.3									101.6	6.3	72	0
040	155.9	23.5			0.1	0					160.0	23.5	96	0
041	177.5	11.2	17.7	6.0							195.2	17.2	108	12
042	206.8	0.5			4.9	0			9.9	0	221.6	0.5	104	02
043	44.6	6.2	26.1	8.4							70.7	14.6	87	06
044	15.6	0.5	136.8	22.1							152.4	22.6	72	08
045	NI	NI											NI	NI
046	116.3	13.9	3.3	0.2							121.3	14.1	80	04
047	42.6	5.3	121.7	5.8	0.3	0					164.6	11.1	102	0
048	49.0	7.7	123.2	9.8							172.2	17.5	100	10
049	NI												55	65
050	50.2	0.5	96.4	12.5	2.5	0					149.1	13.0	88	16
051	77.8	51.8	2.5	6.2							80.3	58.0	48	08
052	NI												70	40
053	NI												NI	NI
MEAN BASAL AREA	90.4	13.7	40.4	4.5	1.2	0	<0.01	0	0.3	0	132.3	19.6	92	14

¹POPTRE = *Populus tremuloides*; ²POPTRI = *Populus trichocarpa*; ³PICENG = *Picea engelmannii*; ⁴ABILAS = *Abies lasiocarpa*; ⁵PINCON = *Pinus contorta*

Appendix F. Vascular plant species occurring in aspen and black cottonwood stands; arranged by decreasing lifeform size and alphabetically within lifeform and including U.S. Fish and Wildlife Service wetland indicator status by administrative region.

LIFEFORM	SCIENTIFIC NAME	COMMON NAME	REGION 4	REGION 9
1: Trees				
	<i>Abies lasiocarpa</i>	Fir, Subalpine	FACU I	FAC
	<i>Picea engelmannii</i>	Spruce, Engelmann	FAC	_____
	<i>Picea glauca</i> (x <i>engelmannii</i>)	Spruce, White x Engelmann	_____	FACU
	<i>Pinus contorta</i>	Pine, Lodgepole	FAC-	FACU
	<i>Pinus flexilis</i>	Pine, Limber	_____	_____
	<i>Populus balsamifera</i> (ssp. <i>trichocarpa</i>)	Cottonwood, Black	FACW	FACW
	<i>Populus tremuloides</i>	Aspen, Trembling	FAC+	FAC
	<i>Pseudotsuga menziesii</i>	Douglas-fir	_____	_____
2: Shrubs				
	<i>Amelanchier alnifolia</i>	Serviceberry, Western	FACU	FACU
	<i>Betula occidentalis</i>	Birch, Water	FACW	FACW
	<i>Cornus stolonifera</i>	Dogwood, Red-osier	FACW	FACW
	<i>Crataegus douglasii</i>	Hawthorn, Black	FAC	NO
	<i>Frangula (Rhamnus) purshiana</i>	Buckthorn, Cascara	_____	_____
	<i>Juniperus communis</i>	Juniper, Common	_____	_____
	<i>Lonicera involucrata</i>	Honeysuckle, Twin-berry	FAC	NO
	<i>Lonicera utahensis</i>	Honeysuckle, Utah	FACU+	NO
	<i>Mahonia (Berberis) repens</i>	Oregon-grape, Creeping	_____	_____
	<i>Potentilla floribunda</i> (fruticosa)	Cinquefoil, Shrubby	FAC-	FACW
	<i>Prunus virginiana</i>	Chokecherry, Common	FACU	FACU-
	<i>Rhamnus alnifolia</i>	Buckthorn, Alder	FACU	NI
	<i>Ribes americanum</i>	Currant, Black	FAC	FACW
	<i>Ribes lacustre</i>	Currant, Swamp	FAC+	FACW
	<i>Ribes oxycanthoides</i> (setosum)	Gooseberry, Missouri	_____	NI
	<i>Rosa acicularis</i>	Rose, Prickly	FACU	FACU
	<i>Rosa woodsii</i>	Rose, Wood's	FACU	FACU
	<i>Rubus idaeus</i>	Raspberry, Red	FACU	FACU
	<i>Rubus parviflorus</i>	Thimbleberry	FACU+	FACU
	<i>Salix bebbiana</i>	Willow, Bebb	FACW	FACW
	<i>Salix boothii</i>	Willow, Booth	FACW	_____
	<i>Salix geeyeriana</i>	Willow, Geyer	FACW+	OBL
	<i>Salix lutea</i>	Willow, Watson	FACW+	OBL
	<i>Salix scouleriana</i>	Willow, Scouler	FAC	FACU
	<i>Salix tweedyi</i>	Willow, Tweedy's	FACW+	_____
	<i>Shepherdia canadensis</i>	Buffaloberry, Canada	_____	_____
	<i>Sorbus scopulina</i>	Mountain-ash, Cascade	NI	NI
	<i>Spiraea betulifolia</i>	Spiraea, Shiny-leaf	_____	_____
	<i>Symphoricarpos albus</i>	Snowberry, Common	FACU	FACU
3: Graminoids				
	<i>Agrostis scabra</i>	Tickle-grass	FAC	FAC
	<i>Alopecurus borealis</i> (alpinus)	Foxtail, Alpine	FACW	NO
	<i>Alopecurus pratensis</i>	Foxtail, Meadow	FACW	FACW
	<i>Bromus ciliatus</i>	Brome, Fringed	FAC+	FAC
	<i>Bromus inermis</i> (ssp. <i>pumpeianus</i>)	Brome, Pumpelly	_____	_____

LIFEFORM	SCIENTIFIC NAME	COMMON NAME	REGION 4	REGION 9
	<i>Calamagrostis canadensis</i>	Reedgrass, Bluejoint	FACW+	FACW+
	<i>Calamagrostis rubescens</i>	Pinegrass	—	—
	<i>Calamagrostis stricta</i>	Reedgrass, Narrow-spiked	FACW	OBL
	<i>Carex brevior</i>	Sedge, Short-beaked	OBL	FACU
	<i>Carex geyeri</i>	Sedge, Elk	—	—
	<i>Carex hoodii</i>	Sedge, Hood's	NI	NI
	<i>Carex microptera</i>	Sedge, Small-wing	FAC	FAC
	<i>Carex raynoldsii</i>	Sedge, Raynolds'	FACU	NO
	<i>Carex rostrata</i>	Sedge, Beaked	OBL	OBL
	<i>Cinna latifolia</i>	Woodreed, Drooping	FACW	OBL
	<i>Dactylis glomerata</i>	Orchard-grass	FACU	FACU
	<i>Deschampsia cespitosa</i>	Hairgrass, Tufted	FACW	FACW
	<i>Elymus glaucus</i>	Wildrye, Blue	FACU	FACU
	<i>Elytrigia (Agropyron) repens</i>	Quackgrass	FACU	FAC
	<i>Festuca subulata</i>	Fescue, Bearded	FAC	UPL
	<i>Juncus balticus</i>	Rush, Baltic	OBL	OBL
	<i>Melica subulata</i>	Oniongrass, Alaska	FAC	—
	<i>Phleum pratense</i>	Timothy, Common	FACU	FACU
	<i>Poa interior</i>	Bluegrass, Inland	FAC	FAC
	<i>Poa palustris</i>	Bluegrass, Fowl	FACW	FACUW
	<i>Poa pratensis</i>	Bluegrass, Kentucky	FACU	FACU+
	<i>Schizachne purpurascens</i>	False Melic	UPL	FACU
	<i>Stipa occidentalis</i>	Needlegrass, Western	—	—
4: Forbs				
	<i>Achillea millefolium</i>	Yarrow, Common	FACU	FACU
	<i>Actaea rubra</i>	Baneberry	—	—
	<i>Allium cernuum</i>	Onion, Nodding	—	—
	<i>Allium schoenoprasum</i>	Chives	FACW+	NO
	<i>Angelica arguta</i>	Angelica, Sharptooth	FACW	—
	<i>Arabis glabra</i>	Towermustard	—	—
	<i>Arabis hirsuta</i>	Rockcress, Hairy	FACU	—
	<i>Arnica chamissonis</i>	Arnica, Meadow	FACW	—
	<i>Aster conspicuus</i>	Aster, Showy	—	—
	<i>Aster engelmannii</i>	Aster, Engelmann's	—	—
	<i>Aster foliaceus</i>	Aster, Leafy	FACW-	NO
	<i>Aster laevis</i>	Aster, Smooth	—	—
	<i>Camassia quamash</i>	Camass, Common	FACW	—
	<i>Campanula rotundifolia</i>	Harebell	FACU	FAC
	<i>Castilleja lutescens</i>	Stiff Yellowish Indian Paintbrush	FAC	NO
	<i>Castilleja miniata</i>	Greater Red Indian Paintbrush	FAC	FAC
	<i>Castilleja rhexiifolia</i>	Rhexia-leaf Indian Paintbrush	FAC	NO
	<i>Cirsium arvense</i>	Thistle, Canada	FACU+	FACU
	<i>Cirsium hookerianum</i>	Hooker Thistle	—	—
	<i>Cirsium scariosum</i>	Thistle, Elk	—	—
	<i>Cirsium vulgare</i>	Thistle, Bull	FACU	UPL
	<i>Descurainia pinnata</i>	Tansymustard, Pinnate	—	—
	<i>Disporum hookeri</i>	Fairy-bell, Hooker	—	—
	<i>Disporum trachycarpum</i>	Fairy-bell, Wartberry	NI	NI
	<i>Epilobium angustifolium</i>	Fireweed	FACU+	FAC

LIFEFORM	SCIENTIFIC NAME	COMMON NAME	REGION 4	REGION 9
	<i>Epilobium ciliatum</i>	Willow-herb, Common	FACW-	FACW
	<i>Erythronium grandiflorum</i>	Large-flower Yellow Fawn-tilly	FAC	NO
	<i>Fragaria vesca</i>	Strawberry, Woods	—	—
	<i>Fragaria virginiana</i>	Strawberry, Virginia	UPL	FACU
	<i>Galeopsis tetrahit</i>	Hemp Nettle, Common	—	—
	<i>Galium boreale</i>	Bedstraw, Northern	FACU	FACU
	<i>Galium triflorum</i>	Bedstraw, Sweetscented	FACU	FACU
	<i>Geranium richardsonii</i>	Geranium, White	FACU+	FAC
	<i>Geranium viscosissimum</i>	Geranium, Sticky	FACU+	FACU
	<i>Geum macrophyllum</i>	Avens, Large-leaved	FACW+	FACW
	<i>Glyceria striata</i>	Mannagrass, Fowl	OBL	OBL
	<i>Hacketia floribunda</i>	Stickseed, Showy	FACU-	FACU
	<i>Heracleum lanatum</i>	Cow-parsnip	FAC	FAC
	<i>Iris missouriensis</i>	Iris, Rocky Mountain	FACW+	FACW+
	<i>Lathyrus ochroleucus</i>	Peavine, Cream-flowered	—	—
	<i>Maianthemum (Smilacina) racemosum</i>	Solomon's Seal, False	FAC-	FAC
	<i>Maianthemum (Smilacina) stellatum</i>	Solomon's Seal, Starry	FAC-	FAC
	<i>Medicago sativa</i>	Alfalfa	—	FACU
	<i>Mochringia (Arenaria) lateriflora</i>	Sandwort, Bluntleaf	—	—
	<i>Monarda fistulosa</i>	Horsemint	FACU	UPL
	<i>Osmorhiza depauperata</i>	Sweet-cicely, Blunt-fruit	FAC+	—
	<i>Osmorhiza occidentalis</i>	Sweet-cicely, Western	FAC	—
	<i>Pedicularis bracteosa</i>	Lousewort, Bracted	—	—
	<i>Pedicularis groenlandica</i>	Lousewort, Elephant's Head	OBL	NO
	<i>Perideridia gairdneri</i>	Yampah, Gairdner's	FACU	FACU
	<i>Petasites sagittatus</i>	Coltsfoot, Arrowleaf	FACW+	FACW+
	<i>Piperia (Habenaria) unalascentis</i>	Rein-orchid, Alaska	—	—
	<i>Plantago major</i>	Plantain, Common	FAC+	FAC
	<i>Platanthera (Habenaria) dilatata</i>	Orchis, White	—	—
	<i>Platanthera (Habenaria) stricta (saccata)</i>	Bog-orchid, Slender	—	—
	<i>Potentilla gracilis</i>	Cinquefoil, Soft	FAC	FAC
	<i>Prunella vulgaris</i>	Self-heal	FACU+	FACW
	<i>Pyrola chlorantha</i>	Wintergreen, Green	FAC	FACU
	<i>Ranunculus uncinatus</i>	Buttercup, Little	FAC	NO
	<i>Sanicula marilandica</i>	Snake-root, Black	—	—
	<i>Senecio crassulus</i>	Groundsel, Thick-leaved	FACU	OBL
	<i>Senecio hydrophiloides (foetidus)</i>	Butterweed, Sweet-marsh	FACW-	—
	<i>Senecio hydrophilus</i>	Butterweed, Alkali-marsh	OBL	OBL
	<i>Senecio pseudodaucus</i>	Groundsel, Streambank	FACW	FACW
	<i>Senecio serra</i>	Butterweed, Tall	FAC	—
	<i>Senecio triangularis</i>	Groundsel, Arrowleaf	FACW+	—
	<i>Solidago gigantea</i>	Goldenrod, Late	FACW-	FACW
	<i>Stellaria longipes</i>	Starwort, Longstalk	FACW	FACW
	<i>Stenanthium occidentale</i>	Stenanthium, Western	STEOC	—
	<i>Streptopus amplexifolius</i>	Twisted-stalk, Claspingleaved	FAC	OBL
	<i>Thalictrum occidentale</i>	Meadowrue, Western	FACU	NO
	<i>Thalictrum venulosum</i>	Meadowrue, Veiny	—	—
	<i>Trifolium repens</i>	Clover, White	FACU+	FACU
	<i>Urtica dioica</i>	Nettle, Stinging	FAC+	FACW

LIFEFORM	SCIENTIFIC NAME	COMMON NAME	REGION 4	REGION 9
	<i>Valeriana sitchensis</i>	Valerian, Sitka	FAC	_____
	<i>Veratrum viride</i>	False Hellebore, Green	OBL	_____
	<i>Vicia americana</i>	Vetch, American	_____	_____
	<i>Viola canadensis</i>	Viola, Canada	FAC	_____
	<i>Zigadenus elegans</i>	Death-camas, Glaucous	FAC+	_____

5: Ferns & Fern allies

<i>Botrychium virginianum</i>	Grape-fern, Virginia	FACU	FACU
-------------------------------	----------------------	------	------

1 Wetland indicator status designations: OBL (obligate wetland species, those that almost always occur, i.e. with probability >99%, in wetlands under natural conditions), FACW (facultative wetland species those that usually occur in wetlands, i.e. with estimated probability of 67-99%, but is occasionally found in non-wetlands, FAC (facultative species, those equally likely to occur in wetlands, i.e. estimated probability 34-66%, or uplands), FACU (facultative upland species, those that usually occur in non-wetlands, i.e. with an estimated probability of 67-99%) and U (upland species, those found almost always in uplands, i.e. with a probability of >99%). Wetland categories and their values for species are from Reed (1988a and 1988b); for some species no information was available (blank entries in matrix cells).

Appendix G. Application of comprehensive onsite determination method* to selected trembling aspen-black cottonwood stands.

Plot Number: SC017			Plot Number: SC018			Plot Number: SC019			Plot Number: SC020			Plot Number: SC021		
Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.
POPTRE	FAC+	T	POPTRE	FAC+	T	POPTRE	FAC+	T	POPTRE	FAC+	T	POPTRE	FAC+	T
CORSTO	FACW	S	SYMALB	FACU	S	POPTRI	FACW	T	SYMALB	FACU	S	POPTRI	FACW	T
THAOCC	FACU	H	PRUVIR	FACU	S	LONINV	FAC	S	OSMOCC	FAC	H	AMEALN	FACU	S
GERRIC	FAC	H	VIOCAN	FAC	H	SYMALB	FACU	S	SENPSE	FACW	H	SYMALB	FACU	S
OSMDEP	FAC+	H	OSMOCC	FAC	H	OSMOCC	FAC	H	VIOCAN	FAC	H	ROSWOO	FACU	S
-----	-----	---	HERLAN	FAC	H	HERLAN	FAC	H	ELYGLA	FACU	H	SALBEB	FACW	S
-----	-----	---	ELYGLA	FACU	H	ELYGLA	FACU	H	ERYGRA	FAC	H	CORSTO	FACW	S
-----	-----	---	GUEMAC	FACW+	H	-----	-----	---	-----	-----	---	CALCAN	FACW+	H
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	FESSUB	FAC	H
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	ANGARG	FACW	H
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---
-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---	-----	-----	---
Percent of Dominant Spp. That Are:	OBL: 0 FACW: 20 FAC+/FAC: 40	Total % Wetlnd. Spp. 60	Percent of Dominant Spp. That Are:	OBL: 0 FACW: 12 FAC+/FAC: 50	Total % Wetlnd. Spp. 62	Percent of Dominant Spp. That Are:	OBL: 0 FACW: 14 FAC+/FAC: 57	Total % Wetlnd. Spp. 71	Percent of Dominant Spp. That Are:	OBL: 0 FACW: 14 FAC+/FAC: 57	Total % Wetlnd. Spp. 71	Percent of Dominant Spp. That Are:	OBL: 0 FACW: 50 FAC+/FAC: 20	Total % Wetlnd. Spp. 70
Hydroph. Veg. Y: x N:___	Hydric Soil: Y: x N:___	Wtlnd. Hydro. Y: x N:___	Hydroph. Veg. Y: x N:___	Hydric Soil: Y: ? N:___	Wtlnd. Hydro. Y: x N:___	Hydroph. Veg. Y: x N:___	Hydric Soil: Y: x N:___	Wtlnd. Hydro. Y: x N:___	Hydroph. Veg. Y: x N:___	Hydric Soil: Y: ___ N: x	Wtlnd. Hydro. Y: ? N:___	Hydroph. Veg. Y: x N:___	Hydric Soil: Y: x N:___	Wtlnd. Hydro. Y: x N:___
Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: ___ N: x	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___	Jurisdic. Wtlnd. Y: x N:___

*Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987)

Appendix G (Continued). Application of comprehensive onsite determination method* to selected trembling aspen-black cottonwood stands.

Plot Number: SC022			Plot Number: SC023			Plot Number: SC024			Plot Number: SC025			Plot Number: SC026		
Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.
POPTRI	FACW	T	POPTRE	FAC	T	POPTRE	FAC	T	POPTRI	FACW	T	POPTRI	FACW	T
POPTRE	FAC	T	POPTRI	FACW	T	ROSWOO	FACU	S	POPTRE	FAC	T	POPTRE	FAC	T
CORSTO	FACW	S	AMEALN	FACU	S	SYMALB	FACU	S	SYMALB	FACU	S	SALTWE	FACW	S
SYMALB	FACU	S	ROSWOO	FACU	S	RUBIDA	FACU	S	RIBAME	FACW	S	RUBPAR	NC	S
SANMAR	NI	H	SYMALB	FACU	S	SALBEB	FACW	S	ELYGLA	FACU	H	HERLAN	FAC	H
HERLAN	FAC	H	ANGARG	FACW	H	RIBAME	FACW	S	HERLAN	FAC	H	OSMOCC	FAC	H
ANGARG	FACW	H	SENPSE	FACW	H	AMEALN	FACU	S	VIOCAN	FAC	H	VIOCAN	FAC	H
THAOCC	FACU	H	SENFOR	FACW-	H	FESSUB	FAC	H	-----	-----	-----	DISHOO	NI	H
-----	-----	-----	CALCAN	FACW	H	CANCAN	FACW	H	-----	-----	-----	-----	-----	-----
-----	-----	-----	ELYGLA	FACU	H	OSMOCC	FAC	H	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Percent of Dominant Spp. That Are:	OBL: 0 FACW: 43 FAC+/FAC: 29	Total % WetInd. Spp. 72	Percent of Dominant Spp. That Are:	OBL: 0 FACW: 50 FAC+/FAC: 20	Total % WetInd. Spp. 70	Percent of Dominant Spp. That Are:	OBL: 0 FACW: 36 FAC+/FAC: 27	Total % WetInd. Spp. 63	Percent of Dominant Spp. That Are:	OBL: 0 FACW: 29 FAC+/FAC: 43	Total % WetInd. Spp. 72	Percent of Dominant Spp. That Are:	OBL: 0 FACW: 25 FAC+/FAC: 50	Total % WetInd. Spp. 75
Hydroph. Veg. Y: x N:___	Y: x N:___	Y: x N:___	Hydroph. Veg. Y: x N:___	Y: x N:___	Y: x N:___	Hydroph. Veg. Y: x N:___	Y: x N:___	Y: x N:___	Hydroph. Veg. Y: x N:___	Y: x N:___	Y: x N:___	Hydroph. Veg. Y: x N:___	Y: ? N:___	Y: ? N:___
Hydric Soil: Y: x N:___	Y: x N:___	Y: x N:___	Hydric Soil: Y: x N:___	Y: x N:___	Y: x N:___	Hydric Soil: Y: x N:___	Y: x N:___	Y: x N:___	Hydric Soil: Y: x N:___	Y: x N:___	Y: x N:___	Hydric Soil: Y: ? N:___	Y: ? N:___	Y: ? N:___
WtInd. Hydro. Y: x N:___	Y: x N:___	Y: x N:___	WtInd. Hydro. Y: x N:___	Y: x N:___	Y: x N:___	WtInd. Hydro. Y: ? N: ?	Y: ? N: ?	Y: ? N: ?	WtInd. Hydro. Y: x N:___	Y: x N:___	Y: x N:___	WtInd. Hydro. Y: x N:___	Y: ___ N: x	Y: ___ N: x
Jurisdic. WtInd. Y: x N:___	Y: x N:___	Y: x N:___	Jurisdic. WtInd. Y: x N:___	Y: x N:___	Y: x N:___	Jurisdic. WtInd. Y: ? N:___	Y: ? N:___	Y: ? N:___	Jurisdic. WtInd. Y: x N:___	Y: x N:___	Y: x N:___	Jurisdic. WtInd. Y: ___ N: x	Y: ___ N: x	Y: ___ N: x

* Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987)

Appendix G (Continued). Application of comprehensive onsite determination method* to selected trembling aspen-black cottonwood stands.

Plot Number: SC027

Dominant Plant Species	Wetland Indicator Status	Strat.
------------------------	--------------------------	--------

POPTRI	FACW	T
POPTRE	FAC	T
SYMALB	FACU	S
SALLUT	FACW	S
ELYGLA	FACU	H
HERLAN	FAC	H
VERVIR	FACW	H
DISHOO	NI	H
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----

Percent of Dominant Spp.
That Are:

OBL: 10
FACW: 20
FAC+/FAC: 40
Total % Wetlnd. Spp. 70
Hydroph. Veg. Y: x N:___
Hydric Soil: Y: x N:___
Wtlnd. Hydro. Y: x N:___

Jurisdic. Wtlnd. Y: x N:___

Plot Number: SC028

Dominant Plant Species	Wetland Indicator Status	Strat.
------------------------	--------------------------	--------

POPTRE	FAC	T
SYMALB	FACU	S
OSMOCC	FAC	H
FRAVIR	UPL	H
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----

Percent of Dominant Spp.
That Are:

OBL: 0
FACW: 0
FAC+/FAC: 50
Total % Wetlnd. Spp. 50
Hydroph. Veg. Y: x N: x
Hydric Soil: Y:___ N: x
Wtlnd. Hydro. Y:___ N: x

Jurisdic. Wtlnd. Y:___ N: x

Plot Number: SC029

Dominant Plant Species	Wetland Indicator Status	Strat.
------------------------	--------------------------	--------

POPTRE	FAC	T
SYMALB	FACU	S
ELYGLA	FACU	H
HERLAN	FAC	H
OSMOCC	FAC	H
VIOCAN	FAC	H
THAOCC	FACU	H
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----

Percent of Dominant Spp.
That Are:

OBL: 0
FACW: 0
FAC+/FAC: 57
Total % Wetlnd. Spp. 57
Hydroph. Veg. Y: x N:___
Hydric Soil: Y:___ N: x
Wtlnd. Hydro. Y:___ N: x

Jurisdic. Wtlnd. Y:___ N: x

Plot Number: SC030

Dominant Plant Species	Wetland Indicator Status	Strat.
------------------------	--------------------------	--------

POPTRE	FAC	T
POPTRI	FACW	T
SYMALB	FACU	S
AMEALN	FACU	S
SPIBET	NI	S
ELYGLA	FACU	H
FESSUB	FAC	H
HERLAN	FAC	H
THAOCC	FACU	H
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----

Percent of Dominant Spp.
That Are:

OBL: 0
FACW: 11
FAC+/FAC: 33
Total % Wetlnd. Spp. 44
Hydroph. Veg. Y:___ N: x
Hydric Soil: Y:___ N: x
Wtlnd. Hydro. Y:___ N: x

Jurisdic. Wtlnd. Y:___ N: x

Plot Number: SC031

Dominant Plant Species	Wetland Indicator Status	Strat.
------------------------	--------------------------	--------

POPTRE	FAC	T
PICENG	FAC	T
ROSWOO	FACU	S
SYMALB	FACU	S
SENPSE	FACW	H
GERRIC	FACU	H
ANGARG	FACW	H
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----

Percent of Dominant Spp.
That Are:

OBL: 0
FACW: 28
FAC+/FAC: 28
Total % Wetlnd. Spp. 57
Hydroph. Veg. Y: x N:___
Hydric Soil: Y: x N:___
Wtlnd. Hydro. Y: x N:___

Jurisdic. Wtlnd. Y: x N:___

* Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987)

Appendix G (Continued). Application of comprehensive onsite determination method* to selected trembling aspen-black cottonwood stands.

[illegible]

* Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987)

Appendix G (Continued). Application of comprehensive onsite determination method* to selected trembling aspen-black cottonwood stands.

[illegible]

* Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987)

Appendix G (Continued). Application of comprehensive onsite determination method* to selected trembling aspen-black cottonwood stands.

[illegible]

* Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987)

Appendix G (Continued). Application of comprehensive onsite determination method* to selected trembling aspen-black cottonwood stands.

Plot Number: SC052			Plot Number: SCO53			Plot Number:			Plot Number:			Plot Number:		
Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.	Dominant Plant Species	Wetland Indicator Status	Strat.
POPTRI	FACW	T	POPTRE	FAC	T	_____	_____	_____	_____	_____	_____	_____	_____	_____
POPTRE	FAC	T	RUBPAR	FACU	S	_____	_____	_____	_____	_____	_____	_____	_____	_____
RIBSET	NI	S	OSMOCC	FAC	H	_____	_____	_____	_____	_____	_____	_____	_____	_____
SYMALB	FACU	S	ELYGLA	FACU	H	_____	_____	_____	_____	_____	_____	_____	_____	_____
ROSWOO	RACU	S	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
AMEALN	FACU	S	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
SALSCO	FAC	S	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
PHLPRA	FACU	H	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
POAPRA	FACU	H	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
ALOPRA	FACW	H	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
VIOCAN	FAC	H	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Percent of Dominant Spp. That Are:			Percent of Dominant Spp. That Are:			Percent of Dominant Spp. That Are:			Percent of Dominant Spp. That Are:			Percent of Dominant Spp. That Are:		
OBL: 0			OBL: 0			OBL: _____			OBL: _____			OBL: _____		
FACW: 18			FACW: 0			FACW: _____			FACW: _____			FACW: _____		
FAC+/FAC: 18			FAC+/FAC: 50			FAC+/FAC: _____			FAC+/FAC: _____			FAC+/FAC: _____		
Total % Wetlnd. Spp. 36			Total % Wetlnd. Spp. 50			Total % Wetlnd. Spp. _____			Total % Wetlnd. Spp. _____			Total % Wetlnd. Spp. _____		
Hydroph. Veg. Y: _____ N: x			Hydroph. Veg. Y: x N: x			Hydroph. Veg. Y: _____ N: _____			Hydroph. Veg. Y: _____ N: _____			Hydroph. Veg. Y: _____ N: _____		
Hydric Soil: Y: _____ N: x			Hydric Soil: Y: _____ N: x			Hydric Soil: Y: _____ N: _____			Hydric Soil: Y: _____ N: _____			Hydric Soil: Y: _____ N: _____		
Wtlnd. Hydro. Y: ? N: _____			Wtlnd. Hydro. Y: _____ N: x			Wtlnd. Hydro. Y: _____ N: _____			Wtlnd. Hydro. Y: _____ N: _____			Wtlnd. Hydro. Y: _____ N: _____		
Jurisdic. Wtlnd. Y: _____ N: x			Jurisdic. Wtlnd. Y: _____ N: x			Jurisdic. Wtlnd. Y: _____ N: _____			Jurisdic. Wtlnd. Y: _____ N: _____			Jurisdic. Wtlnd. Y: _____ N: _____		

* Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987)

APPENDIX H.
COMMUNITY SURVEY FORM (MTNHP)
GENERAL PLOT DATA:

IDENTIFICATION AND LOCATION:

MANUAL: _____ UNITS: ____ ft. ____ m
 PLOT NO. _____ : MON. ____ DAY: ____ YEAR: ____ EOCODE: _____
 EXAMINER(S): _____
 POT. NAT. COMM. _____ C.T.: _____
 SITE NAME: _____ STATE: _____ COUNTY: _____
 PURP: _____ PREC: _____ QUAD NAME: _____ QUAD CODE: _____
 LEGAL: _____ T; _____ R; _____ S; _____ 1/4S; _____ 4/4; _____ 4/4/4 COMM. SIZE (acres): _____
 LATITUDE: _____ (deg.); _____ (min.); _____ (sec.) LONGITUDE: _____ (deg.) _____ (min.); _____ (sec.)
 PLOT TYPES: _____ PLOT SIZE: _____ RADIUS/LN; _____ WIDTH SURVEY: _____
 PHOTOGRAPHY: _____
 DIRECTIONS: _____

CONSERVATION RANKING:

CONDITION: _____ COMMENT: _____
 VIABILITY: _____ COMMENT: _____
 DEFENSIBL: _____ COMMENT: _____
 RANK: _____ COMMENT: _____
 MANAGEMENT: _____
 PROTECTION: _____

ENVIRONMENTAL FEATURES:

DL: _____ SOIL RPT: _____
 SOIL UNIT: _____ SOIL TAXON: _____
 PARENT MAT.: _____ LANDFORM: _____ PLOT POSITION: _____ SLOPE SHAPE: _____
 ASPECT(°): _____ SLOPE (%): _____ ELEVATION: _____ EROSION POT.: _____ EROS. TYPE: _____
 HORIZON ANGLE: N ____; E ____; S ____; W ____ IFSLP: _____ IFVAL: _____
 SPECIAL FEATURE(S): _____
 GROUND COVER (classes): ____ SOIL + ____ GRAVEL + ____ ROCK + ____ LITTER + ____ WOOD + ____ MOSS + ____ BASAL VEG. + ____ OTHER=100%
 DISTURBANCE HISTORY (type, intensity, frequency, season): _____

RIPARIAN FEATURES: NONE: _____ CHANNEL WIDTH: _____ CHANNEL ENTRENCH.: _____
 SURFACE WATER DEPTH: _____ HEIGHT ABOVE WATR.: _____ DIST. FROM WATR.: _____
 WETLAND FEATURES: NONE: _____ COWARDIN CLASSIFICATION: _____ STANDING WATER
 DEPTH (cm or in., observed): _____ MEAN _____ MAXIMUM _____ AVE. ANN. HIGH WATER (OBSERVED OR ESTIMATE. CIRCLE)
 PONDING EVIDENCE: _____ (A aerial photo, B banded veg. C rocks w/ w/o carbonate coat, D sediment deposition, L rocks w/ and w/o lichen, R herb wrack lines, S water/silt stains)
 DURATION OF INUNDATION: _____ (days, this year)
 CAPILLARY FRINGE: _____ DEPTH TO CAP. FRINGE: _____ THICKNESS CAP. FRINGE: _____ DEPTH to SATURATION (free water)
 ORGANIC HORIZON THICKNESS (cm or in.): _____ MEAN _____ MIN. _____ MAX.; ____ Oa ____ Oe ____ Oi
 SEDIMENT DEPOSITION: _____ COVER (%), _____ DEPTH (cm or in.)

GENERAL SITE DESCRIPTION (landscape features, position in landscape, and position on catena, adjacent c.t.s., disease, etc.):

APPENDIX I. OCULAR PLANT SPECIES DATA:

PLOT NUMBER: _____ NO. SPECIES: _____ PNC: _____
MINIMUM COVER VALUE: _____

TREES: TOTAL CV. _____	MEAN HT. _____	FORBS: TOTAL CV. _____	MEAN HT. _____
TALL CV. _____	MED. CV. _____	MED. CV. _____	LOW CV. _____
LOW CV. _____	GRND. CV. _____	GRND. CV. _____	

SPECIES IDENTIFICATION	HT.	CCC ^{1,2}	SPECIES IDENTIFICATION	HT.	CCC
T 1	/	[]	F 1	/	[]
T 2	/	[]	F 2	/	[]
T 3	/	[]	F 3	/	[]
T 4	/	[]	F 4	/	[]
T 5	/	[]	F 5	/	[]
T 6	/	[]	F 6	/	[]
T 7	/	[]	F 7	/	[]
T 8	/	[]	F 8	/	[]
			F 9	/	[]

SHRUBS: TOTAL CV. _____	MEAN HT. _____	SPECIES IDENTIFICATION	HT.	CCC
TALL CV. _____	MED CV. _____	F10	/	[]
LOW CV. _____	GRND. CV. _____	F11	/	[]
S 1	/	F12	/	[]
S 2	/	F13	/	[]
S 3	/	F14	/	[]
S 4	/	F15	/	[]
S 5	/	F16	/	[]
S 6	/	F17	/	[]
S 7	/	F18	/	[]
S 8	/	F19	/	[]
S 9	/	F20	/	[]
S10	/	F21	/	[]
S11	/	F22	/	[]
S12	/	F23	/	[]
		F24	/	[]
		F25	/	[]

GRAMINOIDS: TOT. CV. _____	MEAN HT. _____	SPECIES IDENTIFICATION	HT.	CCC
MED. CV. _____	LOW CV. _____	F26	/	[]
GRND. CV. _____		F27	/	[]
G 1	/	F28	/	[]
G 2	/	F29	/	[]
G 3	/	F30	/	[]
G 4	/	F31	/	[]
G 5	/	F32	/	[]
G 6	/	F33	/	[]
G 7	/	F34	/	[]
G 8	/	F35	/	[]
G 9	/	F36	/	[]

FERNS AND ALLIED FORMS:	TOTAL CV. _____	MEAN HT. _____	MED. CV. _____	SPECIES IDENTIFICATION	HT.	CCC
	LOW CV. _____	GRND CV. _____		F 1	/	[]
G10	/			F 2	/	[]
G11	/			F 3	/	[]
G12	/			F 4	/	[]
G13	/			F 5	/	[]
G14	/					
G15	/					
G16	/					

BRYOIDS: TOTAL CV. _____	MEAN HT. _____	SPECIES IDENTIFICATION	HT.	CCC
B 1	/	B 2	/	[]
B 3	/	B 4	/	[]
B 5	/	B 6	/	[]
B 7	/	B 8	/	[]

COMMENTS (EODATA) _____

² Tree canopy cover for mature (> 5 in. dbh) and seedlings/saplings (< 5 in. dbh.)
¹ Canopy Cover Classes (Percent Values): 0: T = >0, <1; P = >1, <5; 1 = >5, <15; 2 = >15, <25; 3 = >25, <35; 4 = >35, <45; 5 = >45, <55; 6 = >55, <65; 7 = >65, <75; 8 = >75, <85; 9 = >85, <95; F = >95

Appendix J.

Annotated photographs documenting examples of the *Populus tremuloides* / *Cornus stolonifera*, *P. tremuloides* / *Calamagrostis canadensis*, and *P. tremuloides* / *Osmorhiza occidentalis* plant associations.

Populus tremuloides / *Calamagrostis canadensis* plant association: A multi-aged structure is apparent with *P. tremuloides* dominant in all layers; *C. canadensis* and *Alopecurus alpinus* form a tall sward mostly obscuring the dominant forbs *Angelica arguta*, *Senecio pseudolaureus*, and *Geum macrophyllum*.

Populus tremuloides / *Calamagrostis canadensis* plant association: In contrast to previous stand of this p. a., this stand is primarily two-aged; the canopy is experiencing high mortality. Although the shrub component is significant, three grasses dominate the undergrowth: *C. canadensis*, *Alopecurus pratensis*, and *Poa pratensis*.

Populus tremuloides / *Cornus stolonifera* plant association: Upper canopy is dominated by *P. trichocarpa* with *P. tremuloides* ascendant in the understory; dominating the undergrowth are *C. stolonifera* (shrub layer) and forbs *Angelica arguta*, *Heracleum lanatum* and *Sanicula marilandica*.

Populus tremuloides / *Cornus stolonifera* plant association: Abundant *P. tremuloides* reproduction combined with high coverage of *Cornus stolonifera* and *Symphoricarpos albus* result in a dense understory.

Populus tremuloides / *Osmorhiza occidentalis* plant association: Tree dominance shared between *P. trichocarpa* and *P. tremuloides* on this site that is unequivocally a wetland; the undergrowth is species rich with over 40 represented, the dominants being *Heracleum lanatum*, *Veratrum viride*, and *Elymus glaucus*.

Populus tremuloides / *Osmorhiza occidentalis* plant association: This even-aged wetland stand is dominated by *P. tremuloides* in the overstory. The dominance of herbs *Heracleum lanatum*, *O. occidentalis*, *Elymus glaucus* and others (135% combined cover) obscures the shrubs, which have a combined cover of 40%.

Populus tremuloides / *Osmorhiza occidentalis* plant association: This upland site is approaching autumnal coloration in late August; the undergrowth is dominated by the native rhizomatous grasses *Elymus glaucus*, *Bromus ciliatus*, and *Festuca subulata*, and by the forb *O. occidentalis*.