



U.S. product puts fire effects knowledge at your fingertips

by Brad Hawkes, Steve Taylor, and Carolyn Damberger¹

Access to the Fire Effects Information System (FEIS) was granted to users in Canada and this technology transfer note provides information about what is available in the system and how to gain access to it through your PC's modem.

FEIS presents easy-to-understand summaries of technical information on, as of January 1993, about 615 plant species, 34 wildlife species, and 1 ecosystem for the United States. Of these totals, 422 plant species and 28 wildlife species occur in Canada. Unfortunately, the one currently listed ecosystem does not occur in Canada. The breakdown of plant species in Canada consists of 70 trees, 127 shrubs, 128 grasses, sedges, and rushes, 86 forbs, ferns, and fern allies, 2 cacti, 9 mosses, liverworts and lichens.

FEIS can help to:

- plan a prescribed fire to accomplish a desired plant response;
- rehabilitate land;
- prepare fire management prescriptions for park, wilderness, and natural areas;
- plan silvicultural, range, or wildlife habitat

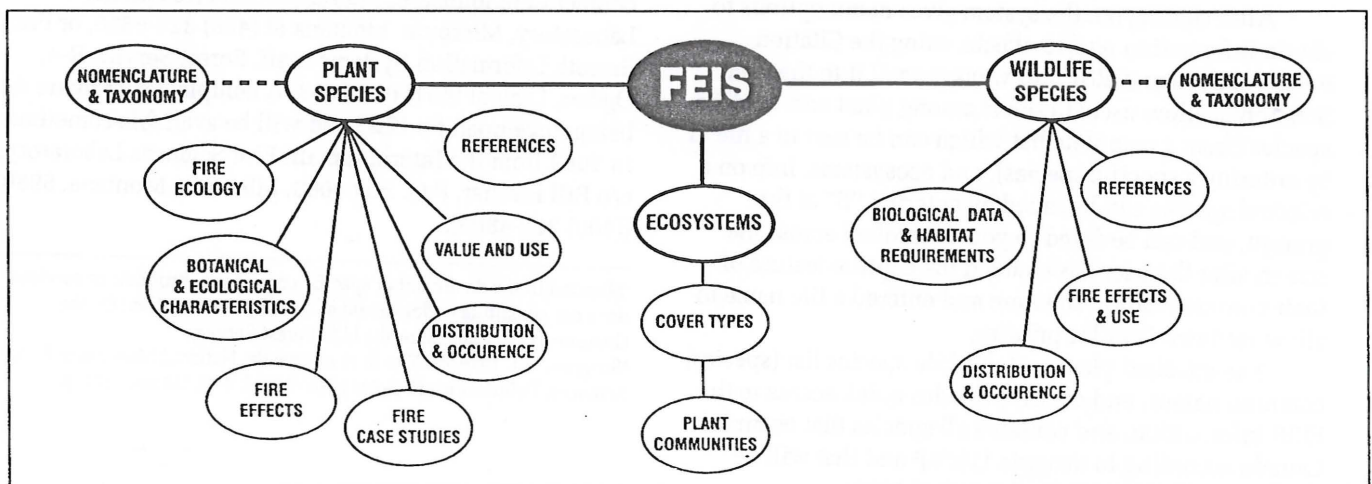
improvement projects;

- prepare a vegetation management plan;
- write an environmental impact statement; and
- prepare a recovery plan for threatened and endangered plants and animals.

FEIS is a "new generation" user-friendly and menu-driven knowledge management tool developed using techniques from the expanding computer field of artificial intelligence, and has a knowledge base which can be accessed through its query program.

Development and implementation in the U.S.

The FEIS was developed by the fire effects researchers at the U.S. Forest Service (USFS) Intermountain Research Station's Fire Sciences Laboratory in Missoula, Montana. The system's software and program were developed in cooperation with the University of Montana. Additional knowledge base development has been supported by a number of U.S. federal agencies. This additional support has allowed more species to be entered than would have been possible otherwise.



Structure of the Fire Effects Information System.

¹May be contacted at Pacific Forestry Research Centre, 506 West Burnside Road, Victoria, B.C.

Accessing and using FEIS

The Fire Effects Information Center (FEIC) is located on a computer operated by the USFS Intermountain Region (R-4) in Ogden, Utah. A PC with modem is required to access the system from Canada. Operating hours are 6 a.m. to 10 p.m., Mountain Standard Time, Monday to Friday, and 24 hours Saturday and Sunday.

Two main emulation packages are available to access the system. The Data General D400 emulation is available on communications packages such as SOFTERM, SMARTERM, and CEO Connect. The VT100 emulation is also supported, which is an option in communication packages such as PROCOM and CROSSTALK¹.

The protocol for both packages is 8 bits, 1 stop bit, no parity. FEIS can handle auto baud rates up to 9600 for asynchronous communications using Xon/Xoff flow control. If the D400 emulation package is used then the following username and password must be entered after you have successfully made connection to the Forest Service computer:

Username: FIRESYS
Password: FIRESYS

If the VT100 emulation package is used then key in:

Username: FIRESYSVT
Password: FIRESYS

Once you have set up the emulation package with the correct protocol then dial up the FEIS using your communication package. The number for users is (801) 625-5474, which is the FEIC located in Ogden, Utah.

After the system username and password are entered, then the system asks for your own username. Enter your first initial, a period, and your last name without spaces, e.g. "B.HAWKES". Case of the letters is not important.

Using the menu system to access FEIS

After signing on, the system gives menu options to obtain information on fire effects, using the Citation Retrieval System (CRS), and ways to mail it to the user. Submenus allow users to select among plant and wildlife species (from a complete list which can be sent to a file or by entering a specific species), and ecosystems. Info on a selected species can be saved by entering "S" at the prompt, and can be faxed to you or scrolled across the screen after the user has enabled the capture feature of their communication software and entered a file name to allow retrieval later for printing.

The attached plant and wildlife species list (species, common names, and codes) provides quick access to the FEIS information, and contains all species that occur in Canada according to Scoggan (1978)² and that will be available in the system by the end of 1993.

The CRS is a database which contains formal references to all literature used in the development of FEIS. References listed in specific species information provide only the author(s) and year of the publication but can be accessed by keyword, author, or citation reference number searches. The CRS assists in preparing a bibliography which then can be viewed or mailed (from CRS or the main menu). The bibliography presently contains over 19,000 titles and can be searched using any of over 100 subject matter keywords. Searches can be done using geographic keywords for forest and range ecosystems, National Park System unit, National Forest and National Grassland, U.S. State, Canadian Province, and country.

A few options require special key sequences on the VT100 emulation package:

Exit/Cancel - hit F1 key then the number 1 twice
Next screen - hit F1 key then the numbers 0 and 4
Previous screen - hit F1 key then the numbers 0 and 3
New line - hit the enter or return key

Additional keys should not be required for obtaining most information from FEIS.

Future expansion and maintenance of FEIS

A number of different U.S. agencies are sponsoring the input of another 150 species. There are no present species that are being sponsored by Canadian agencies. Maintenance of the knowledge base is planned to start in 1994. This means that all species will be periodically reviewed and updated on a systematic basis.

Further information

For general questions about application of FEIS, contact Dave Anderson, Program Manager, Boise Interagency Fire Center at (208) 389-2676. For computer questions, contact Cam Johnston, Intermountain Fire Sciences Laboratory, Missoula, Montana at (406) 329-4810, or Frank Berrett, Information Systems Staff, Forest Service R-4, Ogden, Utah at (801) 625-5693. A complete user manual is being developed for FEIS and will be available sometime in 1993 from the Intermountain Fire Sciences Laboratory, c/o Bill Fischer, P.O. Box 8089, Missoula, Montana, 59807 ((406) 329-4805).

¹Mention in the document of specific commercial products or services does not constitute endorsement of such by Forestry Canada, the Government of Canada, or the U.S. Forest Service.

²Scoggan, H.J. 1978-79. The flora of Canada. National Museum of Natural Sciences, Publications in Botany No. 7 (Vol. 1-4), Ottawa, 1711p.

CANADIAN SPECIES LIST FOR THE FIRE EFFECTS INFORMATION SYSTEM (FEIS)

ANIMALS

Accipiter gentilis (northern goshawk) ACGE
Aix sponsa (wood duck) AISP
Alces alces (moose) ALAL
Ambystoma macrodactylum ssp. *krausei* (Northern Long-toed Salamander) AMMA
Anas acuta (pintail) ANAC
Anas crecca (green-winged teal) ANCR
Anas discors (blue-winged teal) ANDI
Anas platyrhynchos (mallard) ANPL
Anas rubripes (black duck) ANRU
Anas strepera (gadwall) ANST
Anser albifrons (greater white-fronted goose) ANAL
Aquila chrysaetos (golden eagle) AQCH
Asio flammeus (short-eared owl) ASFL
Antilocapra americana (pronghorn) ANAM
Aphelocoma coerulescens (scrub jay) APCO
Athene cunicularia (Burrowing owl) ATCU
Aythya valisineria (canvasback) AYVA
Bison bison (bison) BIBI
Bonasa umbellus (ruffed grouse) BOUM
Brachyramphus marmoratus (Marbled murrelet) BRMA
Branta canadensis (Canada goose) BRCA
Buteo jamaicensis (red-tailed hawk) BUJA
Buteo regalis (ferruginous hawk) BURE
Buteo swainsoni (Swainson's hawk) BUSW
Canus latrans (coyote) CALA
Canus lupus (grey wolf) CALU
Castor canadensis (beaver) CACA
Centrocercus urophasianus (Sage grouse) CEUR
Cervis elaphus (elk) CEEL
Chen caerulescens (snow goose) CHCA
Circus cyaneus (northern harrier) CICY
Clethrionomys rutilus (red-backed vole) CLRU
Colinus virginianus (northern bobwhite) COVI
Cygnus buccinator (Trumpeter swan) CYBU
Cygnus columbianus (tundra swan) CYCO
Dendroica kirtlandii (Kirtland's warbler) DEKI
Falco peregrinus (peregrine falcon) FAPE
Falco mexicanus (prairie falcon) FAME
Falco sparverius (American Kestrel) FASP
Felis concolor (mountain lion) FECO
Felis lynx (lynx) FELY
Grus americana (whooping crane) GRAM
Grus canadensis (sandhill crane) GRCA
Haliaeetus leucocephalus (bald eagle) HALE
Lutra canadensis (river otter) LUCA
Lynx rufus (bobcat) LYRU
Martes americana (marten) MAAM
Meleagris gallopavo (wild turkey) MEGA
Neotoma cinerea (bushy-tailed woodrat) NECI
Odocoileus hemionus (mule deer) ODHE
Odocoileus virginiana (white-tailed deer) ODVI
Ondarra zibethica (muskrat) ONZI
Oreamnos americanus (mountain goat) ORAM
Ovis canadensis (bighorn sheep) OVCA
Pandion haliaetus (osprey) PAHA
Perognathus parvus (Great Basin pocket mouse) PEPA
Phasianus colchicus (ring-necked pheasant) PHCO
Procyon lotor (raccoon) PRLO

Rangifer tarandus (woodland caribou) RATA
Sciurus niger (fox squirrel) SCNI
Scolopax minor (American woodcock) SCMI
Scophiopus intermontanus (Great Basin Spadefoot toad) SCIN
Strix occidentalis (spotted owl) STOC
Tympanuchus cupido (greater prairie chicken) TYCU
Tympanuchus phasianellus (sharp-tailed grouse) TYPH
Ursus americanus (black bear) URAM
Ursus arctos (grizzly bear) URAR
Zenaidura macroura (mourning dove) ZEMA

TREES

Abies amabilis (Pacific silver fir) ABIAMA
Abies balsamea (balsam fir) ABIBAL
Abies grandis (grand fir) ABIGRA
Abies lasiocarpa (subalpine fir) ABILAS
Acer circinatum (vine maple) ACECIR
Acer glabrum (Rocky Mountain maple) ACEGLE
Acer macrophyllum (bigleaf maple) ACEMAC
Acer negundo (boxelder) ACENEG
Acer pensylvanicum (striped maple) ACEPEN
Alnus incana (thinleaf alder) ALNINC
Alnus incana ssp. *tenuifolia* (thinleaf alder) ALNINCT
Alnus rhombifolia (white alder) ALNRHO
Alnus rubra (red alder) ALNRUB
Alnus rugosa (speckled alder) ALNRUG
Alnus viridis ssp. *sinuata* (Sitka alder) ALNVIRS
Arbutus menziesii (Pacific madrone) ARBMEN
Asimina triloba (pawpaw) ASITRI
Betula alleghaniensis (yellow birch) BETALL
Betula occidentalis (water birch) BETOCC
Betula papyrifera (white birch) BETPAP
Betula populifolia (gray birch) BETPOP
Carpinus caroliniana (American hornbeam) CARCAR
Carya cordiformis (bitternut hickory) CARCOR
Carya glabra (pignut hickory) CARGLA
Carya ovata (shagbark hickory) CAROVA
Celtis occidentalis (hackberry) CELOCC
Celtis reticulata (netleaf hackberry) CELREC
Chamaecyparis nootkatensis (Alaska-cedar) CHANOO
Cornus florida (flowering dogwood) CORFLO
Cornus nuttallii (Pacific dogwood) CORNUT
Cornus racemosa (gray dogwood) CORRAC
Cornus sericea (red-osier dogwood) CORSER
Corylus cornuta var. *californica* (California hazelnut) CORCOC
Crataegus douglasii (Douglas hawthorn) CRADOU
Elaeagnus angustifolia (Russian Olive) ELAANG
Fagus grandifolia (American beech) FAGGRA
Fraxinus americana (white ash) FRAAME
Fraxinus pensylvanica (green ash) FRAPEN
Gleditsia triacanthos (honeylocust) GLETRI
Hamamelis virginiana (witch hazel) HAMVIR
Ilex opaca (American holly) ILEOPA
Juglans cinerea (butternut) JUGCIN
Juglans nigra (black walnut) JUGNIG
Juniperus communis (common juniper) JUNCOM
Juniperus occidentalis (western juniper) JUNOCC
Juniperus scopulorum (Rocky Mountain juniper) JUNSCO
Juniperus virginiana (eastern redcedar) JUNVIR
Larix laricina (eastern larch) LARLAR

Larix lyallii (alpine larch) LARLYA
Larix occidentalis (western larch) LAROCC
Liriodendron tulipifera (tulip tree) LIRTUL
Morus rubra (red mulberry) MORRUB
Myrica cerifera (southern bayberry) MYRCER
Nyssa sylvatica (black tupelo) NYSSYL
Ostrya virginiana (eastern hop-hornbeam) OSTVIR
Picea engelmannii (Englemann spruce) PICENG
Picea glauca (white spruce) PICGLA
Picea mariana (black spruce) PICMAR
Picea rubens (red spruce) PICRUB
Picea sitchensis (Sitka spruce) PICSIT
Pinus albicaulis (whitebark pine) PINALB
Pinus banksiana (jack pine) PINBAN
Pinus contorta var. *contorta* (shore pine) PINCONC
Pinus contorta var. *latifolia* (lodgepole pine) PINCON
Pinus flexilis (limber pine) PINFLE
Pinus monticola (western white pine) PINMOT
Pinus ponderosa (ponderosa pine) PINPON
Pinus resinosa (red pine) PINRES
Pinus rigida (pitch pine) PINRIG
Pinus strobus (eastern white pine) PINSTR
Pinus sylvestris (Scotch pine) PINSYL
Platanus occidentalis (sycamore) PLAOCO
Populus angustifolia (narrowleaf cottonwood) POPANG
Populus balsamifera (balsam poplar) POPBAL
Populus deltoides (eastern cottonwood) POPDEL
Populus fremontii (Fremont cottonwood) POPFRE
Populus tremuloides (trembling aspen) POPTRE
Populus trichocarpa (black cottonwood) POPTRI
Prunus americana (American plum) PRUAME
Prunus pensylvanica (pin cherry) PRUPEN
Prunus serotina (black cherry) PRUSER
Prunus virginiana (chokecherry) PRUVIR
Pseudotsuga menziesii var. *glauca* (interior Douglas-fir) PSEMENG
Pseudotsuga menziesii var. *menziesii* (coastal Douglas-fir) PSEMENM
Quercus alba (white oak) QUEALB
Quercus bicolor (swamp white oak) QUEBIC
Quercus garryana (Oregon white oak) QUEGAR
Quercus macrocarpa (bur oak) QUEMAC
Quercus muehlenbergii (chinkapin oak) QUEMUE
Quercus palustris (pin oak) QUEPAL
Quercus prinus (chestnut oak) QUEPRI
Quercus rubra (northern red oak) QUERUB
Quercus velutina (black oak) QUEVEL
Rhamnus purshiana (cascara) RHAPUR
Rhododendron macrophyllum (Pacific rhododendron) RHOMAC
Rhus copallina (flameleaf sumac) RHUCOP
Rhus glabra (smooth sumac) RHUGLA
Rhus typhina (staghorn sumac) RHUTYP
Robina pseudoacacia (black locust) ROBPSE
Salix alaxensis (flatleaf willow) SALALA
Salix amygdaloides (peachleaf willow) SALAMY
Salix arbusculoides (little-tree willow) SALARB
Salix bebbiana (Bebb's willow) SALBEB
Salix exigua (sandbar willow) SALEXI
Salix geyeriana (Geyer's willow) SALGEY
Salix glauca (grayleaf willow) SALGLA
Salix lasiandra (Pacific willow) SALLAS
Salix lutea (yellow willow) SALLUT
Salix nigra (black willow) SALNIG
Salix scouleriana (Scouler's willow) SALSCO
Sambucus cerulea (blue elderberry) SAMCER
Sambucus racemosa (red or black elderberry) SAMRAC
Sassafras albidum (sassafras) SASALB
Sorbus americana (American mountain-ash) SORAME
Taxus brevifolia (western yew) TAXBRE

Taxus canadensis (Canada (American) yew) TAXCAN
Thuja occidentalis (northern white cedar) THUOCO
Thuja plicata (western red cedar) THUPLI
Tilia americana (American basswood) TILAME
Tsuga canadensis (eastern hemlock) TSUCAN
Tsuga heterophylla (western hemlock) TSUHET
Tsuga mertensiana (mountain hemlock) TSUMER
Ulmus americana (American elm) ULMAME
Ulmus rubra (slippery elm) ULMRUB
Vaccinium arboreum (tree sparkleberry) VACARB

SHRUBS

Alnus viridis ssp. *crispa* (American green alder) ALNVIRC
Amelanchier alnifolia (Saskatoon berry) AMEALN
Amelanchier arborea (downy serviceberry) AMEARB
Arctostaphylos columbiana (hairy manzanita) ARCCOL
Arctostaphylos uva-ursi (bearberry) ARCUVA
Artemisia bigelovii (Bigelow sagebrush) ARTBIG
Artemisia campestris (western sagebrush) ARTCAM
Artemisia cana (silver sagebrush) ARTCAN
Artemisia cana ssp. *bolanderi* (Bolander silver sagebrush) ARTCANB
Artemisia cana ssp. *viscidula* (mountain silver sagebrush) ARTCANV
Artemisia frigida (fringed sagebrush) ARTFRI
Artemisia longiloba (alkali sagebrush) ARTLON
Artemisia ludoviciana (Louisiana sagewart) ARTLUD
Artemisia norvegica (boreal sagewart) ARTNOR
Artemisia tridentata (basin big sagebrush) ARTTRI
Artemisia t. ssp. vaseyana (mountain big sagebrush) ARTTRIV
Artemisia tripartita ssp. *tripartita* (tall threetip sagebrush) ARTTRIT
Atriplex canescens (fourwing saltbush) ATRCAN
Atriplex nuttalli (Nuttall's saltbrush) ATRNUT
Berberis nervosa (see *Mahonia nervosa* MAHNER) BERNER
Betula glandulosa (bog birch) BETGLA
Ceanothus sanguineus (redstem ceanothus) CEASAN
Ceanothus velutinus (snowbrush ceanothus) CEAVEL
Chrysothamnus nauseosus (rubber rabbit-brush) CHRNAU
Chrysothamnus viscidiflorus (low rabbit-brush) CHRVIS
Clethra alnifolia (poor man's soap) CLEALN
Corylus americana (American hazelnut) CORAME
Corylus cornuta (bleaked hazelnut) CORCOR
Diervilla lonicera (dwarf bush-honeysuckle) DIELOD
Empetrum nigrum (crowberry) EMPNIG
Gaultheria shallon (salal) GAUSHA
Gaylussacia dumosa (dwarf huckleberry) GAYDUM
Holodiscus discolor (ocean-spray) HOLDIS
Ilex glabra (bitter gallberry) ILEGLA
Juniperus horizontalis (creeping juniper) JUNHOR
Kalmia angustifolia (sheep laurel) KALANG
Lonicera utahensis (Utah honeysuckle) LONUTA
Mahonia nervosa (dwarf Oregon grape) MAHVER
Mahonia repens (Oregon grape) MAHREP
Menziesia ferruginea (menziesia, false azalea) MENFER
Mitchella repens (partridgeberry) MITREP
Pachistima myrsinites (pachistima) PACMYR
Philadelphus lewisii (mock-orange) PHILEW
Physocarpus malvaceus (ninebark) PHYMAL
Purshia tridentata (antelope bitterbrush) PURTRI
Rhus aromatica (fragrant sumac) RHUARO
Rhus trilobata (skunkbush sumac) RHUTRI
Ribes americanum (American black currant) RIBAME
Ribes aureum (golden currant) RIBAUO
Ribes cereum (wax currant) RIBCER
Ribes lacustre (swamp currant) RIBLAC
Ribes montigenum (gooseberry currant) RIBMON
Ribes odoratum (buffalo currant) RIBODO
Ribes setosum (bristly gooseberry) RIBSET

Rosa acicularis (prickly rose) ROSACI
Rosa gymnocarpa (balldhip rose) ROSGYM
Rosa multiflora (multiflora rose) ROSMUL
Rosa woodsii (Wood's rose) ROSWOO
Rubus chamaemorus (cloudberry) RUBCHA
Rubus ideaus (red raspberry) RUBIDE
Rubus laciniatus (evergreen blackberry) RUBLAC
Rubus parviflorus (thimbleberry) RUBPAR
Rubus spectabilis (salmonberry) RUBSPE
Rubus strigosus (red raspberry) RUBSTR
Rubus ursinus (trailing blackberry) RUBURS
Salix barrattiana (Barratt's willow) SALBAR
Salix brachycarpa (barren-ground willow) SALBRA
Salix drummondiana (Drummond's willow) SALDRU
Salix fuscescens (Alaska bog willow) SALFUS
Salix hastata (Halberd's willow) SALHAS
Salix lanata ssp. *richardsonii* (Richardson's willow) SALLANR
Salix lemmonii (Lemmons willow) SALLEM
Salix monticola (mountain willow) SALMON
Salix myrtilifolia (blueberry willow) SALMYR
Salix planifolia ssp. *planifolia* (planeleaf willow) SALPLAP
Salix planifolia ssp. *pulchra* (diamondleaf willow) SALPLNP
Salix rigida var. *watsonii* (see *Salix lutea* SALLUT) SALRIGW
Salix serissima (fall willow) SALSER
Sarcobatus vermiculatus (black greasewood) SARVER
Shepherdia canadensis (russet buffaloberry, soapberry) SHECAN
Symphoricarpos albus (common snowberry) SYMALB
Symphoricarpos mollis (creeping snowberry) SYMMOL
Tetradymia canescens (gray horsebrush) TETCAN
Toxicodendron diversilobum (poison oak) TOXDEV
Vaccinium alaskensis (*alaskaense*) (Alaska blueberry) VACALA
Vaccinium angustifolium (low sweet blueberry) VACANG
Vaccinium caespitosum (dwarf huckleberry) VACCAE
Vaccinium corymbosum (highbush blueberry) VACCOR
Vaccinium globulare (globe huckleberry) VACGLO
Vaccinium membranaceum (black huckleberry) VACMEM
Vaccinium myrsinites (ground blueberry) VACMYS
Vaccinium myrtilloides (velvetleaf blueberry) VACMYT
Vaccinium myrtilus (dwarf blueberry) VACMYR
Vaccinium occidentale (western huckleberry) VAOCC
Vaccinium ovalifolium (ovalleaf huckleberry) VAOVL
Vaccinium ovatum (evergreen huckleberry) VACOVA
Vaccinium oxycoccos (bog cranberry) VACOXY
Vaccinium pallidum (hillside blueberry) VACPAL
Vaccinium parvifolium (red huckleberry) VACPAR
Vaccinium scoparium (grouse whortleberry) VACSCO
Vaccinium uliginosum (bog blueberry) VACULI
Vaccinium vacillans (hillside blueberry) VACVAC
Vaccinium vitis-idaea (mountain cranberry) VACVIT
Viburnum edule (highbush cranberry) VIBEDU
Yucca glauca (soapweed yucca) YUCGLA

FERNS AND FERN ALLIES

Athyrium filix-femina (lady fern) ATHFIL
Botrychium matricariaefolium (camomile grape-fern) BOTMAT
Comptonia peregrina (sweetfern) COMPER
Cystopteris montana (mountain bladder-fern) CYSMON
Dryopteris cristata (Buckler fern) DRYCRI
Equisetum arvense (common horsetail) EQUARV
Equisetum sylvaticum (wood horsetail) EQUAYL
Gymnocarpium dryopteris (oakfern) GYMDRY
Lycopodium alpinum (alpine clubmoss) LYCALP
Lycopodium annotinum (stiff clubmoss) LYCANN
Lycopodium obscurum (ground pine) LYCOBS
Osmunda cinnamomea (cinnamon fern) OSMCIN
Polystichum munitum (western swordfern) POLMUN

Pteridium aquilinum (bracken fern) PTEAQU
Selaginella densa (little clubmoss) SELDEN
Thelypteris noveboracensis (New York fern) THENOV
Thelypteris phegopteris (northern beech-fern) THEPHE
Woodwardia virginica (chain-fern) WOOVIR

FORBS

Achillea millefolium (western yarrow) ACHMIL
Actea rubra (red baneberry) ACTRUB
Amaranthus retroflexus (rough pigweed) AMARET
Ambrosia psilostachya (western ragweed) AMBPSI
Amorpha canescens (leadplant) AMOCAN
Aquilegia canadensis (wild columbine) AQUCAN
Aralia nudicaulis (wild sarsaparilla) ARANUD
Artemisia dracunculus (tarragon) ARTDRA
Asarum caudatum (wild ginger) ASACAU
Asclepias incarnata (swamp milkweed) ASCINC
Aster laevis (smooth aster) ASTLAE
Balsamorhiza sagittata (arrowleaf balsamroot) BALSAG
Camassia quamash (camas) CAMQUA
Castilleja occidentalis (western paintbrush) CASOCC
Castilleja sessiflora (Indian paintbrush) CASSES
Centaurea diffusa (diffuse knapweed) CENDIF
Centaurea maculosa (spotted knapweed) CENMAC
Centaurea solstitialis (yellow starthistle) CENSOL
Cephalanthus occidentalis (buttonbush) CEPOCC
Ceratoides lanata (winterfat) CERLAT
Chamaedaphne calyculata (leatherleaf) CHACAL
Cirsium arvense (Canada thistle) CIRARV
Cirsium vulgare (bull thistle) CIRVUL
Clintonia uniflora (queencup beadlily) CLIUNI
Convolvulus arvensis (field bindweed) CONARV
Coptis groenlandica (goldthread) COPGRO
Cornus canadensis (bunchberry) CORCAN
Corydalis sempervirens (pink coydalis) CORSEM
Cypripedium passerinum (spotted lady's slipper) CYPPAS
Dalea purpurea (purple prairie clover) DALPUR
Delphinium burkei (meadow larkspur) DELBUR
Descurainia pinnata (pinnate tansymustard) DESPIN
Descurainia sophia (flixweed tansymustard) DESSOP
Draba fladnizensis (arctic draba) DRAFLA
Echinacea angustifolia (black sampson) ECHANG
Epilobium angustifolium (fireweed) EPIANG
Epipactis gigantea (giant helleborine) EPIGIG
Erigeron lanatus (wooly daisy) ERI LAN
Erodium cicutarium (cutleaf filaree) ERODIC
Erythronium grandiflorum (glacier lily) ERYGRA
Euphorbia esula (leafy spurge) EUPESU
Euphrasia arctica (northern eyebright) EUPARC
Eurotia lanata (see *Ceratoides lanata* CERLAT) EURLAN
Gentiana glauca (glaucous gentian) GENGLA
Gentiana propinqua (four-parted gentian) GENPRO
Geranium maculatum (wild geranium) GERMAC
Goodyera repens (northern rattlesnake plantain) GOOREP
Grindelia squarrosa (curlycup gumweed) GRISQU
Gutierrezia sarothrae (broom snakeweed) GUTSAR
Hedysarum alpinum (Alpine sweetvetch) HEDALP
Hedysarum americanum (American sweetvetch) HEDAME
Helianthus maximiliani (Maximilian sunflower) HELMAX
Hepatica acutiloba (sharp-lobed hepatica) HEPACU
Lathyrus bijugatus (pinewoods sweetpea) LATBIJ
Ledum groenlandicum (bog Labrador tea) LEDGRO
Leptodactylon pungens (prickly phlox) LEPPUN
Lewisa rediviva (bitterroot) LEWRED
Liatris punctata (blazing star) LIAPUN
Linnaea borealis (northern twinflower) LINBOR

Lupinus caudatus (tailcup lupine) LUPCAU
Lupinus sericeus (blue-bonnet) LUPSER
Lythrum salicaria (purple loosestrife) LYTSAL
Maianthemum canadense (wild lily-of-the-valley) MAICAN
Medicago sativa (alfalfa) MEDSAT
Melilotus alba (white sweetclover) MELALB
Melilotus officinalis (yellow sweetclover) MELOFF
Oplopanax horridus (devil's club) OPLHOR
Osmorhiza claytoni (sweet cicely) OSMCLA
Oxalis montana (common woodsorrel) OXAMON
Oxytropis campestris (crazyweed) OXYCAM
Oxytropis podocarpa (stalked-pod crazyweed) OXYPOD
Oxytropis sericea (whiteweed) OXYPOD
Papaver pygmaeum (alpine glacier poppy) PAPPYG
Parthenocissus quinquefolia (Virginia creeper) PARQUI
Phlox hoodii (Hood's phlox) PHLHOO
Pinguicula vulgaris (common butterwort) PINVUL
Polygonum spp. (smartweed) POLSPP
Potentilla fruticosa (shrubby cinquefoil) POTFRU
Potentilla glandulosa (sticky cinquefoil) POTGLA
Potentilla hippiana (horse cinquefoil) POTHIP
Ratibida columnifera (upright prairie coneflower) RATCOL
Ranunculus gelidus (arctic buttercup) RANGEL
Ranunculus glaberrimus (sagebrush buttercup) RANGLA
Ranunculus pedatifidus (birdfoot buttercup) RANPED
Rudbeckia hirta (black-eyed Susan) RUDHIR
Salsola kali (Russian thistle) SALKAL
Sarracenia purpurea (pitcher-plant) SARPUR
Sisymbrium altissimum (tumblemustard) SISALT
Sisymbrium linifolium (flaxleaf plainmustard) SISLIN
Smilacina stellata (starry Solomon's seal) SMISTE
Solidago canadensis (Canada goldenrod) SOLCAN
Solidago missouriensis (prairie goldenrod) SOLMIS
Sphaeralcea coccinea (scarlet globemallow) SPHCOC
Spiraea betulifolia (white spiraea) SPIBET
Symphoricarpos oreophilus (mountain snowberry) SYMORE
Taraxacum officinale (dandelion) TAROFF
Thalictrum dioicum (early meadowrue) THADIO
Tofieldia pusilla (little false asphodel) TOFPUS
Toxicodendron radicans (eastern poison ivy) TOXRAD
Toxicodendron rydbergii (western poison ivy) TOXRYD
Utricularia intermedia (mountain bladderwort) UTRINT
Vicia americana (American vetch) VICAME
Viola renifolia (kidney-leaved violet) VIOREN
Xanthium strumarium (common cocklebur) XANSTR
Zigadenus paniculatus (panicked deathcamas) ZIGPAN
Zigadenus venenosus (death camas) ZIGVEN

GRASSES, SEDGES & RUSHES

Agropyron cristatum (fairway wheatgrass) AGRCRI
Agropyron dasystachyum (see *Elymus lanceolatus* ELYLAN) AGRDAS
Agropyron desertorum (standard wheatgrass) AGRDES
Agropyron elmeri (see *Elymus lanceolatus* ELYLAN) AGRELM
Agropyron inerme (see *Pseudoroegneria spicata* PSESPI) AGRINE
Agropyron pectiniforme (see *Agropyron cristatum* AGRCRI) AGRPEC
Agropyron riparium (see *Elymus lanceolatus* ELYLAN) AGRRIIP
Agropyron smithii (see *Pascopyron smithii* PASSMI) AGRSMI
Agropyron spicatum (see *Pseudoroegneria spicata* PSESPI) AGRSPI
Agrostis alba (redtop) AGRALB
Agrostis scabra (tickleglass) AGRSCA
Andropogon gerardii var. *gerardii* (big bluestem) ANDGERG
Andropogon gerardii var. *paucipilus* (sand bluestem) ANDGERP
Andropogon halli (see *A. g.* var. *paucipilus* ANDGERP) ANDHAL
Andropogon scoparius (see *S. scoparium* (SCHSCO) ANDSCO
Arctagrostis latifolia (polargrass) ARCLAT
Aristida longiseta (see *Aristida purpurea* ARIPUR) ARILON

Aristida purpurea (red three-awn) ARIPUR
Bouteloua curtipendula (sideoats grama) BOUCUR
Bouteloua gracilis (blue grama) BOUGRA
Bouteloua hirsuta (hairy grama) BOUHIR
Bromus carinatus (California brome) BROCAR
Bromus inermis (smooth brome) BROINE
Bromus japonicus (Japanese brome) BROJAP
Bromus marginatus (mountain brome) BROMAR
Bromus mollis (soft chess) BROMOL
Bromus pumpellianus (Pumpelly brome) BROPUM
Bromus rubens (red brome) BRORUB
Bromus tectorum (cheatgrass) BROTEC
Bromus vulgaris (Columbia brome) BROVUL
Buchloe dactyloides (buffalograss) BUCDAC
Calamagrostis canadensis (bluejoint reedgrass) CALCAN
Calamagrostis montanensis (plains reedgrass) CALMON
Calamagrostis purpurascens (purple pinegrass) CALPUR
Calamagrostis rubescens (pinegrass) CALRUB
Calamovilfa longifolia (prairie sandreed) CALLON
Carex aquatilis (water sedge) CARAQU
Carex bigelowii (Bigelow sedge) CARBIG
Carex capitata (Capitate sedge) CARCAP
Carex concinna (low northern sedge) CARCON
Carex eleusinoides (goose-grass sedge) CARELE
Carex filifolia (threadleaf sedge) CARFIL
Carex garberi (Garber sedge) CARGAR
Carex geyeri (elk sedge) CARGEY
Carex heliophila (sun sedge) CARHEL
Carex lenticularis (Kellogg's sedge) CARLEN
Carex livida (pale sedge) CARLIV
Carex pensylvanica (yellow sedge) CARPEN
Carex petricosa (rock sedge) CARPET
Carex rhodorrhiza (rope-root sedge) CARRHO
Carex rossii (Ross' sedge) CARROS
Carex rostrata (beaked sedge) CARROT
Carex saxatilis (russet sedge) CAR SAX
Carex vaginata (sheathed sedge) CARVAG
Critestion jubatum (foxtail barley) CRIJUB
Cynodon dactylon (Bermuda grass) CYNDAC
Dactylis glomerata (orchardgrass) DACGLO
Danthonia intermedia (timber oatgrass) DANINT
Danthonia spicata (poverty oatgrass) DANSPI
Danthonia unispicata (onespike danthonia) DANUNI
Deschampsia cespitosa (*caespitosa*) (tufted hairgrass) DESCES
Distichlis spicata var. *stricata* (inland saltgrass) DISSPIS
Distichlis stricta (see *Distichlis spicata* var. *stricata* DISSPIS) DISSPI
Eleocharis macrostachya (common spikerush) ELEMAC
Eleocharis palustris (see *Eleocharis macrostachya* ELEMAC) ELEPAL
Elymus ambiguus (see *Leymus ambiguus* LEYAMB) ELYAMB
Elymus canadensis (Canada wildrye) ELYCAN
Elymus cinereus (see *Leymus cinereus* LAYCIN) ELYCIN
Elymus elymoides (bottlebrush squirreltail) ELYELY
Elymus glaucus (blue wildrye) ELYGLA
Elymus innovatus (see *Leymus innovatus* LEYINN) ELYINN
Elymus junceus (see *Psathyrostachys juncea* PSAJUN) ELYJUN
Elymus lanceolatus (thickspike wheatgrass) ELYLAN
Elymus virescens (see *Elymus glaucus* ELYGLA) ELYVIR
Eriophorum vaginatum (sheathed cottonseed) ERIVAG
Eriophorum viridi-carinatum (green-kneeled cottongrass) ERIVIR
Fallugia paradoxa (Apach plume) FALPAR
Festuca arundinacea (tall fescue) FESARU
Festuca idahoensis (Idaho fescue) FESIDA
Festuca microstachys (see *Vulpis microstachys* VULMIC) FESMIC
Festuca megalura (see *Vulpia myuros* VULMYU) FESMEG
Festuca octoflora (see *Vulpia octoflora* VULOCT) FESOCT
Festuca ovina var. *vivipara* (viviparous sheep fescue) FESOVIV
Festuca rubra (red fescue) FESRUB

Festuca scabrella (rough fescue) FESSCA
Hierochloe odorata (sweetgrass) HIEODO
Hordeum jubatum (foxtail barley) HORJUB
Juncus balticus (Baltic rush) JUNBAL
Juncus castaneus (chestnut rush) JUNCAS
Juncus triglumis (three-flowered rush) JUNTRI
Kobresia simpliciuscula (simple kobresia) KOBSIM
Koeleria cristata (prairie junegrass) KOECRI
Leymus ambiguus (Colorado wildrye) LEYAMB
Leymus cinereus (basin wildrye) LEYCIN
Leymus innovatus (boreal wildrye) LEYINN
Lolium multiflorum (Italian ryegrass) LOLMUL
Lolium perenne (perennial ryegrass) LOLPER
Muhlenbergia cuspidata (plains muhly) MUHCUS
Muhlenbergia racemosa (green muhly) MUHRAC
Muhlenbergia richarsonis (mat muhly) MUHRIC
Oryzopsis hymenoides (Indian ricegrass) ORYHYM
Panicum virgatum (switchgrass) PANVIR
Pascopyrium smithii (western wheatgrass) PASSMI
Phalaris arundinacea (reed canarygrass) PHAARU
Phleum pratense (common timothy grass) PHLPRA
Phragmites australis (common reed) PHRAUS
Poa ampla (see *Poa secunda* POASEC) POAAMP
Poa arida (plains bluegrass) POAARI
Poa canbyi (see *Poa secunda* POASEC) POACAN
Poa compressa (Canada bluegrass) POACOM
Poa cusickii (Cusick bluegrass) POACUS
Poa fendleriana (Fendler bluegrass) POAFEN
Poa juncifolia (see *Poa secunda* POASEC) POAJUN
Poa nevadensis (See *Poa secunda* POASEC) POANEV
Poa pratense (Kentucky bluegrass) POAPRA
Poa sandbergii (see *Poa secunda* POASEC) POASAN
Poa secunda (Sandberg bluegrass) POASEC
Psathyrostachys juncea (Russian wildrye) PSAJUN
Pseudoroegneria spicata (bluebunch wheatgrass) PSESPI
Schizachyrium scoparium (little bluestem) SCHSCO
Scirpus americanus (Olney threesquare) SCLAME
Scirpus hudsonius (Hudson's Bay bulrush) SCIHUD
Scirpus robustus (saltmarsh bulrush) SCIROB

Scirpus subterminalis (water bulrush) SCISUB
Scirpus validus (great bulrush) SCIVAL
Sitanion hystrix (see *Elymus elymoides* ELYELY) SITHYS
Sorghastrum nutans (Indiangrass) SORNUT
Spartina alterniflora (smooth cordgrass) SPAALT
Spartina patens (saltmeadow cordgrass) SPAPAT
Spartina pectinata (prairie cordgrass) SPAPEC
Sporobolus airoides (alkali sacaton) SPOAIR
Sporobolus asper (rough dropseed) SPOASP
Sporobolus cryptandrus (sand dropseed) SPOCRY
Sporobolus heterolepis (prairie dropseed) SPOHET
Stipa columbiana (Columbia needlegrass) STICOL
Stipa comata (needle-and-thread grass) STICOM
Stipa richardsonii (Richardson needlegrass) STIRIC
Stipa spartea (porcupine grass) STISPA
Stipa viridula (green needlegrass) STIVIR
Typha angustifolia (narrowleaf cattail) TYPANG
Typha latifolia (common cattail) TYPLAT
Vulpia microstachys (small fescue) VULMIC
Vulpia myuros (foxtail fescue) VULMYR
Vulpia octoflora (sixweeks fescue) VULOCT
Xerophyllum tenax (beargrass) XERTEN

MOSSES, LIVERWORTS & LICHENS

Ceratodon purpureus (fire moss) CERPUR
Cetraria islandica (caribou lichen) CETISL
Cladonia (Cladina) alpestris (see *Cladonia* spp. CLASPP) CLAALP
Cladonia (Cladina) arbuscula (see *Cladonia* spp. CLASPP) CLAARB
Cladonia (Cladina) rangiferina (see *Cladonia* spp. CLASPP) CLARAN
Cladonia spp. (reindeer lichens) CLASPP
Hylocomium splendens (mountain fern moss) HYLSP
Marchantia polymorpha (liverwort) MARPOL
Peltigera apthosa (freckled lichen) PELAPT

MISCELLANEOUS (CACTI)

Opuntia humifusa (prickly pear cactus) OPUHUM
Opuntia polyacantha (plains prickly pear cactus) OPUPOL