

Vascular Plant Checklist for Douglas, Ferry and Okanogan Counties in North-central Washington

Compiled by George Wooten, 2017

A checklist of vascular plant taxa was compiled for Douglas, Ferry and Okanogan Counties in North-central Washington in an Excel worksheet format. These plants are collectively referred to here as the “NCW flora”. The NCW flora lies in the North Cascades rainshadow and includes over a hundred miles of the Columbia River channel. The landscape was dominated by Pleistocene glaciation and outwash except on high peaks and in the southern part of Douglas County (Figure 1).

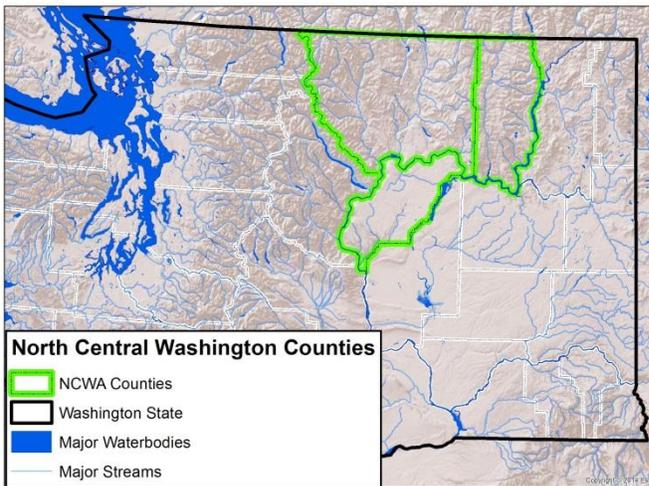


Figure 1. (Clockwise from top left) Okanogan, Ferry and Douglas Counties, Washington state.

The organization of the NCW flora groups families taxonomically and within each family lists species alphabetically by scientific name. The binomial name of each taxon that occurs in the flora is highlighted in bold and indented below it in alphabetical order are the synonyms and infraspecies of that species; the latter are also in bold if they occur in the flora. This arrangement is shown in Figure 2.

NUM	Clade	Family	P	I*	R	Name	SubName	Unaccepted Name	Infra	Synonym
1	Lycopodiophyta: Isoetales	Isoetaceae	P	N		Isoetes echinospora				
2		Isoetaceae		N	R1			Isoetes minima	>Isoetes nuttallii	
3		Isoetaceae	P	N	S	Isoetes nuttallii				<i>Isoetes minima</i>
4		Isoetaceae	P	N		Isoetes occidentalis				
5	Lycopodiophyta: Lycopodiales	Lycopodiaceae	PQ	N	W	Diphasiastrum alpinum				<i>Lycopodium alpinum</i>
6		Lycopodiaceae	P	N		Diphasiastrum complanatum				<i>Lycopodium complanatum</i>
7		Lycopodiaceae		M3				Diphasiastrum sitchense	(unaccepted)	
8		Lycopodiaceae	PQ	N		Huperzia miyoshiana				<i>Huperzia selago</i>
9		Lycopodiaceae	X	M3				Huperzia selago	(misap. NCW)	>Huperzia miyoshiana
10		Lycopodiaceae		N				Lycopodium alpinum	>Diphasiastrum alpinum	
11		Lycopodiaceae	P	N		Lycopodium annotinum				
12		Lycopodiaceae		N				Lycopodium complanatum	>Diphasiastrum complanatum	
13		Lycopodiaceae		N				Lycopodium sitchense	>Diphasiastrum sitchense	
14	Lycopodiophyta: Selaginellales	Selaginellaceae	X					Selaginella densa	(misap. pars)	
15		Selaginellaceae		N				Selaginella densa	var. densa	>Selaginella densa (misap.)
16		Selaginellaceae						Selaginella densa	var. scopulorum	>Selaginella scopulorum

Figure 2. Image scan of the NCW plant list.

Source of the data

The online Consortium of Pacific Northwest Herbaria was the primary source of data for approximately 1,470 accepted binomial species and 450 infraspecies, not counting hybrids. Together with unaccepted names, the list of plants contained approximately 3,621 records for the three counties in this flora.

Other data sources included the Flora of North America (FNA), Washington Flora Plant Checklist (WAFL) which is hosted online by the Burke Museum and University of Washington herbarium (WTU), USDA Natural Resources Conservation Service (NRCS) USDA PLANTS database (PLANTS), Washington Department of Natural Resources (DNR) Flora Quality Assessment (FQA) for Eastern Washington, which was developed from the PLANTS database in 2009, the Flora of Okanogan County (created by George Wooten in 2013 for an Android app written by Bruce Barnes of Flora ID Northwest), Integrated Taxonomic Information System (ITIS), Washington Natural Heritage Program (WNHP), theplantlist.org (TPL), E-Flora BC (EFBC), and state and county Noxious Weed Control Board lists.

The Consortium database was processed to exclude database artifacts and non-specific genera. Family names were standardized as much as possible to match recently named families. The “chi” (χ) character representing hybrid names was converted to the padded character “X”, to simplify automated data processing. Intraspecific names were treated as trinomials, relegating tetranomials to varieties. Intraspecies were designated with the abbreviation “var.” or “ssp.” in the name. Cultivars and forms were included in the database, but were not parsed out in this checklist.

In addition to the Consortium database, 364 species and 84 infraspecies were added to the NCW Flora from other sources, resulting in a list of nearly 4,000 names. These 448 taxa originated as follows:

- 37 taxa originated from lists of Noxious Weeds present within the three counties
- 36 taxa had status under the Natural Heritage Program
- 46 taxa were not specifically listed in the Consortium database, but were either (a) synonyms, or (b) implied binomial species of listed infraspecies or (c) autonyms added questionably when a variety and the binomial were both present or (d) autonyms added questionably when more than one variety was present
- 329 taxa originated from other data sources that were absent from the Consortium database.

Characteristics of the NCW Flora

When originally created in 2015, the NCW flora contained 2,339 names of non-hybrid taxa that are accepted names by a recognized authority, representing 122 families, 608 genera, 1,812 ordinal species and 527 infraspecies. After discounting rank synonyms, there were 1,949 unique taxa at the rank of variety or higher within the flora, exclusive of hybrids. The list also contained 20 hybrids with accepted names. Between 2015 and 2017, a few more names were added and some minor database errors were corrected; otherwise the list remains essentially the same. This checklist was generated by a computer program written to parse, sort and output the NCW flora as a spreadsheet.

Of the 1,812 species in the 2015 flora, about 1,497 (82%) are native within the three counties. The remainder are introduced, or of unknown provenance, or contain both native and introduced varieties. There were 110 taxa classified as rare in Washington by WNHP (Sensitive, Threatened, Endangered or Extirpated). Of these, 20 were infraspecies. There were 31 taxa with WNHP Review status 1 or 2 (the former lacking sufficient location information and the latter having unresolved taxonomy). Of the 1,833 species, 74 are classified as Noxious Weeds in Washington, including 2 as infraspecies in part of the flora.

Nomenclature

The authorities for nomenclature follow the order of precedence: FNA or WNHP > WAFL > ITIS > EFBC > TPL. Author names are contained in a separate database absent from this list.

Of the approximately 2,339 accepted names for taxa, 1,062 follow the nomenclature of FNA, 14 follow WNHP, 1085 follow WAFL, 176 follow ITIS, 1 follows EFBC (*Bromus porteri*), and one follows TPL (*Lupinus lutescens*).

Names of rare plants were retained as given by WNHP, including cases where the names were not in agreement with FNA or WAFL. Some of these taxa are naturally uncommon and are still undergoing taxonomic review.

In cases where FNA names were recently revised, accepted names were assigned consistent with WAFL as the authority instead. The ITIS authority was used primarily for names missing from the FNA or WAFL databases. Many of these were rank synonyms or autonyms. The ITIS database was the most comprehensive of all databases used, containing approximately 121,000 names and citations, and generally favoring more recent treatments. The other two authorities (EFBC and TPL) were used in two cases where the name authority could not be otherwise resolved.

The NCW flora contains over a thousand unaccepted or misapplied names of plant taxa, 888 of which have accepted synonyms. The flora database contains 148 misapplied names (misidentifications and valid taxa absent from the 3-county area). Some of the misapplied names were excluded from this checklist, primarily in cases where misidentification seemed likely for a single uncollected record. In cases where a taxon was segregated into several new taxa, partial misapplication was noted in the name of the synonym as “(misap. pars)”.

Identification of the correct name for misapplied species is an ongoing task that requires reference to maps and historical collection records. In cases where confidence about a location was low, records were scored as questionably misapplied or misapplied in part.

Some infraspecies had records that were rank synonyms of both the subspecies and the variety of the same name. In these cases, the accepted name was given and a note was included that rank infraspecific synonyms were also recorded within the flora. Similarly, orthographic variants were simply noted to occur in the records.

In cases where herbarium records were designated as autonyms, these are noted as synonyms. Where multiple infraspecies occur in a flora, it is important to know whether a record is an autonym in the narrow sense or a species in the broad sense of including other infraspecies. Although seemingly trivial, autonyms provide necessary information during names revisions that may even rise to the level of a new species. Lacking explicitly named autonyms, some historical records could not be assigned to a known taxon. This is particularly important for rare taxa that may not have complete herbarium records.

Some entities were marked as questionable occurrences. Questionable records could arise in several ways, including (a) infraspecies renamed as species, (b) incomplete records or herbarium specimens in poor condition, (c) records lacking enough specific location data to assign provenance within this flora.

Common names are listed for all accepted taxa in the NCW Flora. Common names were developed by joining them from several databases in the order of preference: FQA > WAFL > PLANTS > synonyms of PLANTS > ITIS, and finally by manually editing the 14 remaining records. As of this 2017 version, many of the common names do not reflect local conventions; perhaps a future version could include better representation of local and native names.

The names listed in the NCW flora include about 200 names that were present in the Flora of the Pacific Northwest (Hitchcock and Cronquist 1973), some of which could not reliably be assigned to accepted synonyms, either because they were split into two or more different species, or because they were misapplied to species that do not occur here.

Display of the NCW plants listed in spreadsheet CFlora2017NCW.xlsx

The spreadsheet CFlora2017NCW.xls can be opened with Excel in MS Office 97 through 2010 and viewed with a widescreen monitor. Originally the intent of developing this flora was to print a list of taxa for field use. This was abandoned when it was recognized that such a list would run into dozens of printed pages, even when omitting the synonyms that give the list necessary context. A simple alphabetical list would not be very useful as it would include many unfamiliar names, even to seasoned botanists. The most useful application of this spreadsheet is envisioned as being on a computer or a tablet, however a bound personal copy for the field would be useful in some situations. Of course, users are free to download the spreadsheet and manipulate it as they prefer.

Records are sorted in the spreadsheet by phylogenetic group > binomial name > generic hybrids > interspecific hybrids > infraspecific names. Binomial names of plants that are present in the NCW Flora are listed in bold, sorted alphabetically within each taxonomic group. Under each binomial name is a list of synonyms and infraspecies of that name that occur within the flora, the latter also bold. This arrangement is shown in Figure 2. This format was designed to graphically distinguish ordinal names (sans infraspecies) from infraspecies, by indenting the latter on the row below the ordinal names. Unaccepted names are further indented and italicized, for contrast with the accepted names.

Families in the checklist were grouped into phylogenetic groups. Phylogenetic groups have changed radically throughout the world since 2000, due to the advent of molecular phylogeny or cladistics. The relationships of some taxa is still unclear, and plants with polyphyletic origins complicate attempts to classify them.

Phylogenetic groups were not all ranked to the same hierarchical level, however an attempt was made to aggregate species into manageable groups that were not so large or so small as to be meaningless for classification. The basic unit of phylogenetic grouping was the family. These in turn were typically grouped by the rank of Order (names ending in “..ales”), with notable exceptions. In some cases, the categories were designated as high as the rank of Division (“..phyta”), e.g., for conifers and early land plants. The Angiosperms were subdivided into 3 large hierarchical categories of basal angiosperms, basal eudicots, and eudicots.

In other cases, phylogeny went below the rank of order. Cases where species were classified below the rank of Order were sometimes based on recent and still tentative molecular phylogeny including:

- The Polypodiales, where Order was split into two groups (Polypodiales 1 and Polypodiales 2).
- The unwieldy Superorder Rosanae and Order Rosales are in the process of a thorough revision. Molecular clades were used as categories, distinguished by a terminal “..id” in the singular name, e.g., “Rosids”, “Superrosids”.
- A clade called “Asterids”, includes Cornales, Ericales, Santalales and Menyanthaceae.
- A clade called Campanulids includes Campanulaceae, Dipsacales including Caprifoliaceae and Valerianaceae, Apiales and Asteraceae.
- The composites were classified by tribe (“..eae”).

- The grasses (Poales) were classified by subfamily (“..oideae”)

The phylogenetic sort order developed for this checklist is preserved in the field [NUM], so that it may be restored if users change to a different sort method.

Description of the data fields (abbreviations are listed at the end of this document)

[NUM] Phylogenetic sort order by phylogenetic group > binomial name > generic hybrids > interspecific hybrids > infraspecific names.

[Group] Phylogenetic classification displayed in a modified Englerian sort order. The ranks listed within [Group] are hierarchically listed to a level sufficient to distinguish broad phylogenetic groups recognized by taxonomists. Ranks as high as Division were used for plants with “primitive” characters, such as conifers, while ranks as low as Subtribe were used for plants with “advanced” characters, such as Asteraceae and Poaceae. Names below the rank of family are shown parenthetically. [Group] is displayed in the spreadsheet only when the [Group] name changes from the prior record. Phylogenetic name endings in the plant kingdom are as follows:

Division (..phyta; also referred to as Phylum.

Class (..opsida) This rank was not used here.

Subclass (..idae). This rank was not used here in preference of distinguishing Basal Angiosperms, Eudicots and Monocots.

Superorder (..anae).

Order (..ales) Due to unresolved disagreements about the phylogeny of the Polypodiales, Order was split into two groups along traditional boundaries as in Hitchcock and Cronquist (1973), here named Polypodiales 1 and Polypodiales 2.

Suborder (..ineae).

Clade (..id) Clade names are informal groupings based on molecular phylogeny.

Family (..aceae) The family name is contained in its own field, [Family]. In cases where the family name was recently changed, it is indicated parenthetically in [Group], appended with the characters “->”.

Subfamily (..oideae) This rank was only used for Pteridophytes and the Poaceae.

Tribe (..eae) This rank was only used for the Asteraceae and the Poaceae.

Subtribe (..inae) This rank was only used for the Poaceae.

[P] Presence within the NCW flora:

P = Present

PH = Hybrid (present, accepted)

PQ = Unconfirmed (unverified) or Questionable

X = Excluded

(blank) = Unaccepted names (including unaccepted hybrids)

[I*] Provenance (presettlement range):

I = Introduced in the 3 counties

N = Native within the 3 counties

B = Both native and introduced within the 3 counties, i.e., cultivars, range extensions

Modifiers to the above provenance values are as follows:

Q = Provenance questionable

I R3 = Introduced and extending its range

IQ R3 = Questionably introduced range extension

M3 WA = Misapplied within the 3 counties, but native in WA (one record, *Salix matsudana*, misapplied as the infraspecies)

NQ R3 = Questionably native range extension

[R] Rarity in Washington, according to Washington Natural Heritage Program

E = Endangered

R1 = Review Group 1 - Species for which current information is insufficient to evaluate conservation status

R2 = Review Group 2 - Species of potential concern, but with unresolved taxonomic questions

S = Sensitive

T = Threatened

W = Watch List

X = Considered extirpated

[Binomial] Binomial name shown only for present, accepted ordinal names (*sans* infraspecies) and hybrids. Hybrids are indicated with the character "X". This field is blank for duplicated records used only for listing alternate synonyms. This field is also blank for infraspecific names, which are listed instead in the field [Subname].

[SubName] Binomial name shown only for accepted, present infraspecies and hybrids, otherwise blank. Hybrids are indicated with the character "X"; Infraspecific binomial names were placed in a separate column from the ordinal names to allow indenting the infraspecies below the ordinals.

[Unaccepted Name] This field is only shown for unaccepted names, followed by ">" and the correct synonym, where it is available. Hybrids are indicated with the character "X".

(untitled field) Designation of "ssp." or "var." as necessary for the designation of infraspecific rank.

[Infraspecies] Infraspecific names.

[Synonym] This field indicates unaccepted synonyms, following the text "Synonym =" in the column to the left. Records with more than one synonym are listed alphabetically below the first instance.

Special cases of synonyms are indicated as follows:

(rank syn.) = names differing only in infraspecific rank

(ssp. autonym) = synonyms that are subspecific autonyms

(var. autonym) = synonyms that are varietal autonyms

[CommonName] Common Name(s) separated by commas when more than one name was available.

[Co] County of herbarium record:

DO = Douglas County

FE = Ferry County

OK = Okanogan County

Modifiers to the primary values:

Q = Questionable record

H (e.g., OKH) = Historical record not in herbarium

(parenthesized county abbreviations separated by "OR") – Designates where the county of record was unclear

_ (underscore between the first and second letter of the county abbreviation e.g., O_K). This code was used to indicate observations or herbarium records that appear to be misapplied within a county, without obscuring where the misapplication was.

[SciName] Full scientific name, useful for sorting alphabetically.

[Misap] Additional details for misapplied names:

MisapNCW = SciName is misapplied within the three counties NC Washington Counties, Okanogan, Douglas, Ferry

MisapOK = SciName is misapplied in Okanogan County

MisapWA = SciName is misapplied in Washington

2.. = Unaccepted names that are synonyms of a misapplied name

M2.. = Misapplied names that are unaccepted synonyms of another misapplied entity

Abbreviations in the spreadsheet include:

> Pointer to an accepted name

Misap. – Misapplied, essentially the same as taxa that were misidentified

Pars. – in part

Sp.; ssp.; var. – species; subspecies; variety

Syn.; syns. – synonym; synonyms.