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Nomenclature and the National Wetland Plant List

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Cover: Carolus Linnaeus in Laponian costume (by Hendrik Hollander, 1853).

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Abstract: The National Wetland Plant List (NWPL) is being revised by the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, and the Natural Resources Conservation Service. This Technical Note describes how changes in botanical nomenclature are being handled in the 2009 revision of the NWPL.

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Contents

Preface	iv
1 Updating the National Wetland Plant List	1
2 Taxonomy versus Nomenclature	3
Example 1	4
Example 2	4
Example 3	4
3 Discussion	6
4 References	7
Report Documentation Page	

Preface

This report was prepared by Robert Lichvar, Remote Sensing/GIS and Water Resources Branch, Cold Regions Research and Engineering Laboratory (CRREL), U.S. Army Engineer Research and Development Center (ERDC), Hanover, NH; and Dr. John Kartesz, Biota of North America Program (BONAP), Chapel Hill, NC.

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1 Updating the National Wetland Plant List

The National Wetland Plant List (NWPL) is being revised by the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service (USFWS), the U.S. Environmental Protection Agency, and the Natural Resources Conservation Service. The current list used for delineation purposes is the 1988 list (referred to here as the 88 list) (Reed 1988), which had undergone an update in 1996 (referred to as the 96 list, as posted in a USFWS draft Web publication) (Reed 1998) but was never finalized. The 88 list is used as part of the wetland delineation process, in the restoration of wetlands, and as a resource of botanical information about wetland plants. The new revision will be based on more precise scientific criteria than previous lists, it will reflect changes in botanical nomenclature, and it will be divided into regions based on ecological rather than political boundaries. Proposed changes from the 88 list will be vetted by botanists and wetland ecologists on regional and national panels using a national database with a Web interface.

In preparation of the new version of the NWPL, we found it necessary to combine the efforts of the 88 and 96 lists into a single list and then bring the combined list into nomenclatural and taxonomic conformity with the most recent taxonomic standards, including the most recent International Code of Botanical Nomenclature (International Association for Plant Taxonomy 2007). Thousands of additional plants have been incorporated into the new version, some of which are newly described taxa while others are wetland plants that had been overlooked in the previous lists. Furthermore, changes and reclassification in certain groups, especially in families such as Asteraceae and Poaceae, have been extensive. Equally extensive are the changes at the infraspecific level, i.e., subspecies that may have been reclassified as varieties or vice versa. Not to be overlooked are the changes that have resulted from merging two or more taxa into one or splitting one taxon into two or more.

The initial 1988 NWPL included 6,728 taxa, mostly at the species level. When the list was updated in 1996, taxonomic interpretation changes, splitting, lumping, and other nomenclatural adjustments generated about 275 “new” infraspecific taxa. These were not all newly proposed wetland taxa, since many represented nothing more than artifacts of modifications

caused by taxonomic changes or nomenclature updating. In January 2009, the NWPL was updated for the third time; it currently includes 9,178 species. Again, changes in taxonomy and nomenclature have generated many additional infraspecific and specific taxa not reported previously.

Because the 1988 NWPL was and still remains the only wetland plant list validated by the U.S. Army Corps of Engineers for wetland delineations, the current NWPL must track and incorporate all nomenclatural changes from both 1988 and 1996 into the 2009 list. In concert with the changes of taxonomy and nomenclature, the corresponding wetland ratings that applied to all 1988 and 1996 NWPL names had to be linked to the 2009 NWPL. Furthermore, because the 2009 NWPL will be used as part of the federal methodology for delineating wetland boundaries and establishing limits of jurisdiction under the Clean Water Act, the current list must track all former wetland plants and their respective ratings.

Therefore, the current 2009 list includes approximately 10,000 accepted taxa. Additionally, it includes approximately 30,000 synonyms (older or previously used scientific names that are no longer viewed as acceptable or accurate based on current standards and ideology). All synonyms are linked to the current names on the 2009 NWPL. By including all of these synonyms, users of the NWPL can track many of these older synonyms that may appear on the previous two NWPLs, as well as names from antiquated floras, florulas, monographs, taxonomic revisions, or other botanical literature, and then equate these synonyms to our currently accepted names.

To facilitate further the users' understanding of names, we present here a few basic concepts of nomenclature and taxonomy, i.e., how names are presented in a standard botanical format, and how or why one might question the changes that have occurred.

2 Taxonomy versus Nomenclature

Taxonomy is the science of classification that uses as one of its most fundamental underpinnings a system of nomenclature (naming). The word *taxonomy* comes from the Greek words *taxis* (meaning “order” or “arrangement”) and *nomos* (“law” or “science”). The Swedish botanist Carolus Linnaeus (1753) is credited with putting into wide usage his binomial (two-name) classification system (one name to indicate the genus and one to indicate the species).

Scientific names, consisting of genus and species, mostly of either Greek or Latin origin, make up the binomial. An example is *Acer rubrum* L., where *Acer* is the genus, *rubrum* is the species, and L. is the author (in this case, Carolus Linnaeus, the individual who named and described the species). Scientific names are fundamental in understanding taxonomy or classification. Taxonomy is a hierarchical system that includes multiple levels, with each level referred to as a rank, beginning at the highest rank of kingdom and terminating at the lowest rank of species or infraspecific taxa (below the species rank). Each rank is represented by a name or epithet, which is referred to as a taxon. Infraspecific taxa, which are most commonly included as subspecies and/or variety, are referred to as “trinomials,” e.g., *Acer rubrum* var. *rubrum*. Here, the abbreviation “var.” stands for variety and in this case for typical variety *rubrum*. *Acer rubrum* has three infraspecific wetland taxa, all at the variety rank, including *Acer rubrum* var. *drummondii*, *A. rubrum* var. *rubrum*, and *A. rubrum* var. *trilobum*.

The logic that determines ranking is predicated on biological concepts supported by scientific research in fields as varied as plant breeding, plant genetics, evolution, pollination biology, and ecology. Today, many current taxonomic treatments for various plant groups have arisen from new interpretations of old classification concepts and are now supported widely by new tools deeply rooted in genetic and molecular biology, often referred to as molecular genetics or phylogenetics. Currently species boundaries are delimited using evolutionary relationships or phylogenies predicated on molecular sequence analyses in combination with morphological characteristics and other biological and habitat features.

Some of the types of taxonomic and nomenclatural updates that have formed the basis of the current 2009 NWPL include the following examples.

Example 1

In 1988 the eastern red cedar was treated as two distinct species: *Juniperus virginiana* L. and *Juniperus silicicola* (Small) L.H. Bailey. It is now believed that these two species should be united as one: *Juniperus virginiana* (the older of the two names), with two varietal expressions, var. *virginiana* and var. *silicicola*. Once these two “species” were merged, the typical expression var. *virginiana* was automatically created when var. *silicicola* was made. The var. *silicicola* is sometimes referred to as the non-typical expression. This practice is applied throughout animal and plant taxonomy, i.e., once a new infraspecific taxon is created, a typical is simultaneously and automatically created.

Example 2

In the 1988 NWPL, a single species of the genus *Acorus* was recognized as a wetland species. Today, however, that single species is now recognized as two distinct species: the newly added *Acorus americanus* (Raf.) Raf. (native to North America) and the pre-existing *Acorus calamus* L. (exotic to North America). Thus, on the 2009 NWPL, each species has a separate wetland ranking, distribution, etc.

Example 3

A third example of taxonomy/nomenclature change is less clear and involves trinomials (Melvin 2007). In the 1988 NWPL, three separate listings of a single species, the red maple (*Acer rubrum* L.), were made, each with a separate wetland rating. With each of these three listings, an inferred (but not listed) infraspecific taxon was assumed to be represented, including *Acer rubrum* var. *rubrum*, *Acer rubrum* L. var. *drummondii* L., and *Acer rubrum* L. var. *trilobum* L. In part because of the confusion that ensued, all three names were expanded in the 1996 NWPL and listed as separate taxa: *Acer rubrum* (typical expression inferred), *Acer rubrum* var. *drummondii*, and *Acer rubrum* var. *trilobum*, the latter two both implied. To further reduce any taxonomic ambiguity, in the 2009 NWPL, we specifically included and named the typical variety *Acer rubrum* var. *rubrum* to the species complex, since it clearly represents the most ubiqui-

tous taxon of the species complex in North America. Therefore, in the current NWPL, we have named all three infraspecific taxa of the red maple as stated above. A similar policy has been adopted for all species where a typical expression exists separately from the listed non-typical expression(s).

3 Discussion

Awareness of taxonomic/nomenclatural changes and their influence on the NWPL is important for those involved in assisting in the updating process now underway. It is critical to understand that all prior scientific names and their wetland ratings in both the 88 and 96 lists are being tracked and have been incorporated into the 2009 list. This is particularly important for wetland species included on the 88 list because there have been many nomenclatural changes since 1988 and the 88 list is still the only wetland plant list authorized by the Corps for wetland delineations nationally. [An exception is the Pacific Northwest; in USFWS Region 9, the Portland District of the Corps used procedures under a public notice protocol to accept a regional revised list (Reed et al. 1993).] Now even the 1996 list is out of date for nomenclature. For day-to-day practical needs, the 2009 Web-based NWPL provides all current scientific names as well as any names formerly applied to the same taxon (synonyms). This allows practitioners in the field who use older floras or who become aware of recent nomenclatural changes to feel confident that the current name is linked back to the former 88 and 96 wetland ratings. Keeping the NWPL updated with current taxonomic and nomenclatural changes based on recent advances in science allows the community of wetland scientists to stay up to date and yet perform field studies that are governed by federal law.

The addition of all appropriate typical infraspecific taxa to the NWPL had another benefit: it allowed us to correct an assumption that was built into both the 88 and 96 lists. When a “non-typical” infraspecific taxon received a wetland rating in the older lists, it was assumed that the “typical” species-level taxon either had the same wetland rating as all other infraspecific taxa under the species or was not even a wetland plant. When there are two or more infraspecific taxa under a species, the assumption that the species-level taxon should have the same wetland rating as all other infraspecific taxa may be wrong. By correcting the nomenclatural presentations on the 2009 NWPL, we will be able to provide distribution maps and biological data specific to both the typical and non-typical infraspecific taxa that are considered wetland plants. This adds about 240 taxa to the NWPL, but in most cases the “typical” expression was already listed as an assumption and had a wetland rating. The result is that the number of wetland species on the NWPL does not change much, but the data associated with taxa are now correctly displayed.

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