

WHICH NON-NATIVE PLANTS ARE INCLUDED IN FLORISTIC ACCOUNTS?

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ABSTRACT

It is suggested that four terms provide an adequate general description of the major categories of non-native plants in our flora: cultivated, persisting, waif, and naturalized. Comparative definitions are given for seven related terms that describe the non-native origin and floristic integration of vascular plant species in North America: adventive, alien, escaped, established, exotic, introduced, and non-native.

RESUMEN

Se sugiere que cuatro términos dan una descripción general adecuada de las grandes categorías de las plantas no nativas de nuestra flora: cultivada, persistente, abandonada, y naturalizada. Se dan definiciones comparativas de siete términos relacionados que describen el origen no nativo y la integración florística de plantas vasculares en Norteamérica: adventicia, extraña, escapada, establecida, exótica, introducida, no-nativa.

Plants are usually included in floristic accounts of the North American flora on the basis of their status either as native or as non-native but integrated into the flora to some degree. For non-native plants, an assessment of their integration is based primarily on reproductive status and dispersive success. The more summary floristic accounts commonly do not provide information necessary for a clear assessment of the degree of floristic integration of non-native plants.

A selection of general statements of intent for major floristic studies (from numerous examined) indicates that a broad range of non-native taxa is treated. Naturalized plants are invariably treated, but the definition of "naturalized" is not consistent, and plants recognized as "waifs" and as merely "persistent" may or may not be included.

Radford et al. (1968) for the Carolinas: "species of vascular plant known to grow without cultivation."

Correll and Johnston (1970) for Texas: "all native and naturalized flowering plants and ferns."

Voss (1972) for Michigan: "all species ... known to grow (or to have grown) outside of cultivation in Michigan, whether originally native or not." See Voss (Preface, 1996) for related comments.

Great Plains Flora Association (1986) for the Great Plains: "all vascular plants known

to occur spontaneously"—"the native members of the flora and those introductions that appear to be permanently established outside of intentional cultivation."

Welsh et al. (1993) for Utah: "All indigenous plant species known to occur in Utah are included in the flora. Introduced plants are also covered, but not so intensively as are the native ones." "This flora attempts to present coverage of all established species, all common adventive taxa, and many of the commonly grown cultivated species."

Gleason and Cronquist (1993) for northeastern United States and adjacent Canada: plants "growing wild" (including—from the text—"often escaped from cultivation," "adventive" and "rarely adventive," "occasionally introduced," and "sparingly established").

Hickman (1993) for California: "plants growing wild in California." "All aliens that have become an integral part of the Californian flora are included. The general policy was not to include (or to note only in passing) waifs or non-reproducing but long-persisting individuals or clones." For non-native species the area of origin is specifically named (e.g., "native to Europe") and a brief description of its habitat, geographic range, and relative abundance is provided, without the use of any further terminology.

Cooperrider (1995) for Ohio: "the native members of these families, the alien plants of these families that have become established or that appear occasionally in the state's flora, and to a lesser extent the families' major cultivated plants."

Flora of North America Editorial Committee (1996) for North America north of Mexico: to be included in full are "all native plants" and "introduced taxa that are naturalized or found frequently outside cultivation;" to be mentioned in the discussion are "naturalized plants now known only as historic records" and "non-native, economically important or extensively cultivated plants that tend not to escape cultivation (e.g., alfalfa)."

Diggs et al. (1999) for north central Texas: "all known native and naturalized vascular plant species A few long-persistent (e.g., *Ficus carica*—the common fig), but apparently non-reproductive taxa have been included because of the likelihood of them being encountered."

Kartesz (1999) for North America north of Mexico: "all known native, naturalized or waif occurrences of vascular plant taxa within the region." Also included, but not explicitly, are non-native taxa recognized as "persisting" (as described below).

Despite the demonstration in the recent Jepson Manual (Hickman 1993) that the floristic integration of non-native plants can be precisely described without specialized terminology, a minimal set of descriptive terms is useful if consistently applied. The four terms below provide an adequate general description of the major categories of non-native plants in our flora.

1. Cultivated

Plants of native and non-native species, across various categories of duration and habit, that are deliberately planted, actively maintained, and grown for ornament, interest, consumption, or other use. These are rarely included in floristic studies (but see Welsh et al.

1993). Native species are sometimes encountered only as cultivated plantings, and these should be distinguished from naturally occurring plants. Another distinction can be drawn by recognizing a *cultigen* (a cultivated plant of unknown or obscure origin) as different from a *cultivar* (a cultivated plant of known origin).

2. Persisting

Perennial plants (woody, suffrutescent, and herbaceous) cultivated for ornament or interest and remaining in place at old home sites, roadsides, etc., without human assistance after the site has returned to a more natural state, sometimes after evidence of associated human presence is decayed or completely gone. Such plants are not reproducing or at least not spreading beyond the original planting. The difference between "cultivated" and "persisting" is primarily a temporal one, referring to the duration of existence, and persisting plants usually are not included in floristic accounts with the same status of native and naturalized species. Because, however, in a sense they grow outside of cultivation, they may appear in unannotated summaries or they may be explicitly described in floristic studies as "persisting."

3. Waif

Plants of non-native species growing outside of cultivation but not maintaining a viable population for more than one or a few seasons. A number of waifs in the North American flora are known only as single historic records; other essentially non-reproductive plants as waifs apparently may be recurrent. Some species reported with new distribution records may become known more precisely as waifs as the site of their reported occurrence is reinvestigated. More than a single season is required to observe the reproductive status of such a plant or population, and some of those initially suspected of being waifs may become naturalized. Waifs may originate from various kinds of natural and human-mediated long-distance dispersal. They may originate from seeds washed out from garden plantings and commonly are found at sites where seeds are mixed with other exotic materials (e.g., ballast dumps, wool mills). Tomato seeds, which pass unharmed through digestive tracts and sewage treatment, are spread in sludge-based fertilizer and may spawn waif plants in repeated cycles. The usage here for "waif" is a good match for its ancient European etymology as "ownerless property, stray, or homeless."

4. Naturalized

Plants of non-native species accidentally or deliberately introduced into the flora, now reproducing and maintaining viable populations from year to year (more than just one or a few seasons), and dispersing without deliberate human assistance beyond the population or populations of original establishment. The degree of naturalization may vary from widespread and abundant occurrence to local establishment (from recent introduction or sluggish reproduction and dispersal). Perhaps the most difficult in interpretation are cultivated plants spreading slightly beyond their original planting—these might be best characterized as waifs, if their reproductive ability is slight (e.g., *Impatiens* spp.),

or they may be "incipiently naturalized" if reproduction and spread appear to be vigorous, even though restricted in area. Species native to North America may become naturalized in areas of the continent other than where recorded as native in the past or present. Some species apparently have a mixture of native and non-native North American populations (e.g., *Achillea millefolium*, *Galium aparine*, and *Prunella vulgaris*).

Associated Terms

In addition to the four terms suggested above to cover the major categories of integration of species and other taxa in the North American flora, various other related terms have commonly been used in floristic works to characterize the origin and integration of such plants. The usage of these terms varies considerably, and without other references that provide comparative definitions in a floristic context, it is hoped that those provided here will contribute toward more consistent application. "Native species," "alien species," and "introduction" are formally defined in the recent Executive Order (U.S. Executive Order 13112). Because of the difficulty in ordering this set of terms in the context of floristic criteria, they are listed here alphabetically.

Adventive—non-native, becoming naturalized either from deliberate plantings or accidental introduction.

Alien—non-native, commonly considered to have originated from a different continent, but not necessarily exclusive of an origin from an ecologically different region of the same continent.

Escaped—non-native, becoming naturalized from deliberate plantings, usually only in a local area or represented by relatively few individuals over the range of naturalization.

Established—non-native, similar to "adventive" and "introduced" but with the implication of being more securely naturalized.

Exotic—non-native, essentially similar to the term "alien," but with stronger implication of an extra-continental origin. In the recently issued "Synonymized Checklist" for the North American flora (Kartesz 1999), exotic species in the continental flora are considered to originate from other continents or from Mexico or Central America.

Introduced—non-native, released accidentally or deliberately into the flora and growing without cultivation, at least for one generation. Similar to "adventive" but with slightly stronger implication of having originated through plants used for horticultural or practical purposes.

Non-native—originating from outside the geographic region of concern, either from a different continent or from an ecologically different area of the same continent. Among a group of terms often used interchangeably (adventive, alien, exotic, introduced, non-native), "non-native" is the most general, at least in the definitions suggested here.

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