**The Wilbur L. Bluhm Plant Phenology Study**

**Data Structure and Metadata**

Phenological data for all the observed taxa in the study are provided in a Microsoft Excel workbook file. The data are organized as a matrix with taxa specific phenological stages (stage) in rows and study year in columns. Elements contain the first date of observation for a particular taxon x stage combination. Note that the observed stages vary between taxa. Missing elements reflect years for which no observations were made for a particular taxon. Observations for some taxa begin in 1958, but the most comprehensive period of data is from 1996-2016.

The following metadata provide definitions and descriptions of the terms used in the data table, including some more detailed explanation of study methodology. The metadata are also provided as a Microsoft Word document in the data download section.

**A. Columns**

Plant

a. each plant is listed first by its preferred botanical name, then by one or more common name(s) by which it may be known.

b. alternate botanical name(s), in [brackets], may follow the preferred botanical name.

c. see “Nomenclature” below for information on usage.

d. ◄ this symbol denotes one or more sources reporting the plant as invasive.

**Typ** [Growth form and life history information for each taxon]

Ann – annual plant, one that completes its life cycle within one growing season; as used here, a self-sowing annual plant.

bien – biennial plant, a plant that lives for two years, completing its life cycle during the second year.

bulb – as used here, plants that grow underground stems as either bulbs, corms, rhizomes, or tubers.

con – coniferous plant.

dcid – deciduous, a plant that defoliates during winter dormant season.

dioe – dioecious, flowers imperfect, staminate and pistillate flowers borne on different plants (ibid.)

evg – evergreen, retaining foliage throughout the year.

fem – female.

gcv – groundcover, a low growing plant that spreads or spaced close together to cover ground.

mon – monoecious, flowers imperfect, staminate and pistillate flowers borne separately on same plant (from Harris & Harris)

perf – perfect flowers, having both female and male flower parts.

poly – polygamo-dioecious or polygamo-monoecious, mostly dioecious or mostly monoecious, but with some perfect flowers.

prN – herbaceous perennial, a plant that continues to grow during two or more years and having herbaceous characteristics.

shrb – shrub, a woody plant, with several stems, that is shorter than a typical tree (ibid.) tree – a large woody plant, most commonly with a single main stem or trunk (ibid.), occasionally with multiple stems or trunks.

unis – unisexual, having either staminate or pistillate flowers but not both.

vine – a plant with the stem not self-supporting, but climbing or trailing on some support (ibid.)

p [Definition of population from which observations were made.]

P – population of individuals

annuals (Ann) – two or more beds of a taxon at one or more locations; if multiple locations on same property, then locations separated by 200 feet or more.

bulbs (bulb) – two or more plantings of a taxon at one or more locations; if multiple locations on same property, then locations separated by 200 feet or more.

groundcovers (gcv) – two or more beds of a single taxon at one or more locations; if multiple locations on same property, then locations separated by 200 feet or more.

herbaceous perennials (prN) – two or more plantings of a taxon at one or more locations; if multiple locations on same property, then locations separated by 200 feet or more.

shrub (shrb) –more than five shrubs of a taxon at a single location, or two or more shrubs at two or more locations; if locations on same property, then locations separated by 200 feet or more.

tree – two or more trees of a single taxon at one or more locations; if multiple locations on same property, then locations separated by 200 feet or more.

vine – two or more plants of a taxon at one or more locations; if multiple locations on same property, then locations separated by 200 feet or more.

s – single population

annuals (Ann) – a planting or a bed of a taxon at a single location.

bulbs (bulb) – a planting of a taxon at a single location.

groundcovers (gcv) – a bed of a single taxon at a single location.

herbaceous perennials (prN) – a planting of a taxon at a single location.

shrub – five or fewer plants of a taxon at one location.

tree – one tree of a taxon at one location.

vine – one plant of a taxon at one location.

STAGE [stage of plant development]

col – color.

def, defol – defoliated

fl, fls – flower, flowers, or flowering (fl).

fol – foliage.

fr. – fruit, as used, botanically

lf, lvs – leaf, leaves

st. – start

yel – yellow; the color yellow.

defoliated – when all leaves on a single plant or a population of plants have fallen.

max. – maximum; used with flowering, coloring, and fruiting, a more accurate description than the word “full” in most stages; when maximum number of flowers are open, when maximum number of leaves are in autumn color.

purp. – purple; the color purple.

end flower – when last flower on a single plant or a population of plants closes or ends.

start leaf – when first leaf on a single plant or a population of plants shows leaf venation, when applicable.

start flower – when first flower on a single plant or a population of plants opens to reveal flower parts.

n [number of annual observations pertinent to each stage of plant development]

There is often a difference in number of observations of a given taxon within its development stages. There are numerous reasons, some personal, including travel, vacations, and illness. During the first thirty-eight years of data collection observations were made on an infrequent basis, as time permitted. Beginning in 1996 an effort began to make observations on a regular schedule.

And, there are plant reasons. Plants may fail to perform in some years, such as not flowering or not bearing fruit. Fall coloring did not always happen before defoliation. Weather occasionally interfered with a plant’s performance. Since the majority of sites were on public or private locations, over which the author had no control, plants were subject to the practices of the property owner. Cultural practices, such as pruning, irrigation, fertilization, plant removal, and premature dead-heading of flower heads, occasionally caused a plant to perform unexpectedly, if at all. More reasons could be added.

Ave.

Mean date of the total annual observations for each stage of plant development.

Yearly columns

beginning with year 1958, each entry in a column is the date of observation for a specific development stage, or stages, in that year.

**B. Nomenclature**

1. Primary reference for botanical names is *RHS Plant Finder 2016*. Supplementary sources include Baldwin, Bryan, Burrell et.al., Cappiello et.al., Dirr, Evison, Flora of North American Editorial Committee, Hardison, Irish, Jacobson, Kuitert, McRae, Metcalf, Meyers et.al., Small et.al., and Way et.al. See Bibliography for details of each reference.
2. Many sources were used for common names, not all of which are listed in the Bibliography. The *Internet* and local usage were major sources for common names.