



Summary Report 2007-2011

As we enter our 5th full year for Project BudBurst, our data are showing some interesting trends. In the Chicago area, eight of sixteen species observed have shown significantly accelerated bloom dates. Project BudBurst bloom dates were compared to the data collected by local botanists Floyd Swink and Gerould Wilhelm from 1955 to 1994 while botanizing the region to collect information for their book, *Plants of the Chicago Region*. As shown in the chart below, many species are blooming days to weeks earlier than ever observed by Swink and Wilhelm (Fig. 1). In other regions where we have historical data for comparison with Project BudBurst records, we are also seeing new records. For example, in the Washington DC area, seven of fifty species had PBB observations earlier than any in the Smithsonian Institution dataset collected from 1970-1983. Those species included Black locust (*Robinia pseudoacacia*), Canada thistle (*Cirsium arvense*), Forsythia (*Forsythia x intermedia*), Red columbine, (*Aquilegia canadensis*), Fire pink (*Silene virginica*), Tulip poplar (*Liriodendron tulipifera*) and Spiderwort (*Tradescantia virginiana*). These species accelerated their bloom time from 1-13 days.

Table 1. Comparison of earliest first flowering date for eight species common to the Chicago area. The historical Swink & Wilhelm data were collected from the mid-1950s through 1994, and the contemporary Project BudBurst data reflect observations made between 2007 through 2011.

Plant	Earliest First Flower Observations		
	Swink & Wilhelm (1955-1994)	Project BudBurst (2007-2011)	Days Advanced
Forsythia (<i>Forsythia x intermedia</i>)	April 25	April 1	-24
Spiderwort (<i>Tradescantia obiensis</i>)	May 14	May 3	-11
Dogtooth violet (<i>Erythronium americanum</i>)	April 6	April 1	-5
Red Maple (<i>Acer rubrum</i>)	March 20	March 6	-14
Mayapple (<i>Podophyllum peltatum</i>)	May 1	April 26	-5
Lilac (<i>Syringa vulgaris</i>)	May 3	April 16	-17
Black locust (<i>Robinia pseudoacacia</i>)	May 9	April 20	-19
Bradford pear (<i>Pyrus calleryana</i>)	April 15	April 13	-2



We also have Project BudBurst data collected on seven native species planted on a green roof in Chicago (Fig. 2). Five of those species had greatly accelerated bloom times. Because green roofs can have much different temperature conditions than surrounding natural areas, these bloom dates should not be considered typical of the Chicago region. Nevertheless, they provide an indication of how much plasticity (individual flexibility) exists for bloom date for these species.

Table 2. Phenological records in Chicago from plants grown on a green roof in 2010.

Plant	Earliest First Flower Observations		
	Swink & Wilhelm (1955-1994)	Project BudBurst (2010)	Days Advanced
Bee balm (<i>Mondarda fistulosa</i>)	June 28	May 26	-33
Panic grass (<i>Panicum virgatum</i>)	June 29	May 31	-29
New England aster (<i>Aster novae-angliae</i>)	July 27	June 29	-28
Blue false indigo (<i>Baptisia australis</i>)	May 16	May 7	-9
Foxglove beardtongue (<i>Penstemon digitalis</i>)	May 28	May 26	-2

We've also been able to compare trends in PBB data for particular locations with weather for those regions. Specifically, we selected several species/location pairs where we had observations over 3 or more years and compared those to the average winter and spring temperatures for the states where the observation location occurs. We find that most of our first bloom observations are tracking quite predictably with temperature, although there were a couple of anomalies (Fig. 3). For instance Flowering dogwood (*Cornus florida*) bloomed later in 2010 (a year with an exceptionally warm spring) in Bloomington, IN than in 2009 or 2011 which had similar winters and cooler springs. We saw the same thing with dogwood in Chapel Hill, NC and forsythia in Wheeling, WV that year. Some possible explanations include microsite variation, for example the plants observed in those locations may have happened to be on north-facing slopes or on the north side of a building. Precipitation may have also played a role. Another possibility, albeit unlikely as far north as Indiana, is that the trees/shrubs did not receive enough chilling. Many species require a certain number of "chill hours" before they are able to break dormancy. This adaptation prevents them from breaking bud during brief winter warm spells. If they don't receive enough chill hours, the plants will ultimately recognize spring and break dormancy, but it takes them a lot longer to do so. This phenomenon has been used to explain a delay in spring green up in southern states when the winters are warmer. We hope to have more data to explore this idea after this extraordinarily warm winter and spring many of us are currently experiencing, so please watch your plants and let us know what they're doing!



Table 3. Observation of species bloom dates in various locations compared to winter and spring temperatures for that state. For column headings, WT = winter temperature, ST = spring temperature, BB = data for first bloom opening. For temperatures, BB = far below normal, B = below normal, N=normal, A = above normal, AA = much above normal.

Location	Species	08 WT	08 ST	2008 BB	09 WT	09 ST	2009 BB	10 WT	10 ST	2010 BB	11 WT	11 ST	2011 BB
Bloomington IN	<i>Acer rubrum</i>	N	B		B	A	10-Feb	B	AA	17-Feb	B	A	6-Mar
Bloomington IN	<i>Cornus florida</i>	N	B		B	A	1-Apr	B	AA	6-Apr	B	A	21-Mar
Bloomington IN	<i>Forsythia</i>	N	B		B	A	15-Mar	B	AA		B	A	21-Mar
Chicago IL	<i>Acer rubrum</i>	B	B	10-Apr	B	A	6-Mar	B	AA		B	N	
Chicago IL	<i>Forsythia</i>	B	B	17-Apr	B	A	3-Apr	B	AA	1-Apr	B	N	10-Apr
Golden CO	<i>Amelanchier alnifolia</i>	B	B	27-Apr	A	A	14-Apr	B	N	22-Apr	N	N	16-Apr
Golden CO	<i>Syringa vulgaris</i>	B	B	7-May	A	A	28-Apr	B	N	28-Apr	N	N	19-Apr
Silver Spring MD	<i>Syringa vulgaris</i>	A	N		N	A	19-Apr	B	AA	2-Apr	B	AA	12-Apr
Silver Spring MD	<i>Acer rubrum</i>	A	N		N	A		B	AA	20-Mar	B	AA	17-Mar
Silver Spring MD	<i>Cornus florida</i>	A	N	18-Apr	N	A	10-Apr	B	AA		B	AA	
Silver Spring MD	<i>Amelanchier canadensis</i>	A	N		N	A	7-Apr	B	AA	11-Apr	B	AA	
Missoula MT	<i>Acer rubrum</i>	N	N		N	N	18-Apr	B	N	30-Mar	B	N	
Missoula MT	<i>Amelanchier alnifolia</i>	N	N		N	N	23-Apr	B	N	21-Apr	B	N	8-May
Minneapolis MN	<i>Amelanchier canadensis</i>	N	B		B	N	24-Apr	N	AA	5-Apr	N	B	9-May
Stillwater MN	<i>Mertensia virginica</i>	N	B	7-May	B	N	27-Apr	N	AA	14-Apr	N	B	3-May
Stillwater MN	<i>Syringa vulgaris</i>	N	B	22-May	B	N	11-May	N	AA	26-Apr	N	B	
Lincoln NE	<i>Aquilegia canadensis</i>	B	B		N	N	3-May	B	A	24-Apr	B	B	3-May
Centerville DE	<i>Mertensia virginica</i>	A	N	5-Apr	N	A	10-Apr	B	AA	28-Mar	B	A	
Centerville DE	<i>Cornus florida</i>	A	N	19-Apr	N	A	24-Apr	B	AA	8-Apr	B	A	
Chapel Hill NC	<i>Cornus florida</i>	A	N		N	N	1-Apr	BB	A	5-Apr	B	A	
Clayton WI	<i>Acer rubrum</i>	B	N		B	N		A	AA	1-Apr	N	B	23-Apr
Clayton WI	<i>Syringa vulgaris</i>	B	N		B	N		A	AA	27-Apr	N	B	19-May
Wheeling WV	<i>Forsythia</i>	A	N		N	A	20-Mar	BB	AA	26-Mar	B	A	22-Mar