

These data come from a long-term study (still in progress as of 2008) of the phenology and abundance of flowering at the Rocky Mountain Biological Laboratory. Metadata for this study reside on the web site of the RMBL: www.rmbll.org, and will be posted to the Digital Repository at the University of Colorado. Individual plots (e.g., Rocky Meadow Plot #7) are 2x2m, and are visited every other day to count all flowers of all species.

These data have been used in the following publications:

Inouye, D. W. and A. D. McGuire. 1991. Effects of snowpack on the timing and abundance of flowering in *Delphinium nelsonii*: in

Saavedra, F., D. W. Inouye, M. V. Price and J. Harte. 2003. Changes in flowering and abundance of *Delphinium nuttallianum* (Ranunculaceae) in

In a related study I have recorded the number of flowers and aborted buds per inflorescence in 5 plots at or near RMBL since 1991;

Date of first flower (day 1 = 1 May)

plots	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
RM 7	?	41	53	?		?	44	47		42	53	51	36	33
AF 9	?		73									69		55
RM 1	50	47	61	40	?	51	55	53	39	55	58	58	44	44
RM 2	43	37	51	36		51	46	45	33	40	51	49	36	37
RM 6	?	35	55	38		?	48	47		42	52	53	40	41
RM 3	43	41	53	40	38	51	51	51	33	48	54	55	42	47
RM 5	50	43	55	40		47	53	53	37	51	58	55	40	47
RM 4	52	45	59	40	44	53	55	53	35	51	54	55	44	47
N	5	7	8	6	2	5	7	7	5	7	7	8	7	8
mean	47.6	41.3	57.5	39.0	41.0	50.6	50.3	49.9	35.4	47.0	54.3	55.6	40.3	43.9
s.d.	4.3	4.2	7.1	1.7	4.2	2.2	4.4	3.4	2.6	5.7	2.8	6.1	3.4	6.8
c.v.	9.0	10.2	12.3	4.3	10.3	4.3	8.7	6.9	7.4	12.2	5.1	10.9	8.3	15.6
	167.6	161.3	177.5	159.0	161.0	170.6	170.3	169.9	155.4	167.0	174.3	175.6	160.3	163.9

If the same peak number of flowers occurred on multiple days, the first date is shown here, but there are comments attached.

Date of peak number of flowers

RM 7	6/23	6/14	7/2	6/7		missed	6/24	6/22		6/20	6/23	6/27	6/15	6/12
AF 9			only 1									7/17		6/28
RM 1	6/27	6/22	6/10	6/21	?	6/27	7/1	6/28	6/14	6/30	7/5	7/3	6/17	6/18

RM 2	6/22	6/14	6/28	6/13		missed	6/24	6/22	6/10	6/22	7/1	6/27	6/19	6/14	
RM 6	6/22	6/12	6/28	6/19			6/22	6/27	6/22		6/24	7/3	6/29	6/17	6/16
RM 3	6/25	6/18	7/2	6/19	6/13		6/24	6/29	6/26	6/14	6/28	7/5	7/3	6/13	6/22
RM 5	6/27	6/18	7/5	6/19			6/24	6/29	6/26	6/10	6/28	7/3	7/1	6/19	6/20
RM 4	6/27	6/22	7/5	6/23	6/15		6/27	7/3	6/30	6/12	6/30	7/5	7/3	6/9	6/22

N	7	7	7	7	2	5	7	7	5	7	7	8	7	7
mean	6/24	6/17	6/28	6/17	6/14	6/24	6/28	6/25	6/12	6/26	7/2	7/2	6/15	6/20

s.d.

c.v.

If the same peak number of inflorescences occurred on multiple days, the first date is shown here, but there are comme

Date of peak number of inflorescences (first da

RM 7	6/22	6/12	6/28	?		missed	6/20	6/20		6/20	only 1	6/27	6/15	6/8	
AF 9			only 1									7/8		6/28	
RM 1	6/25	6/22	7/5	6/15	?		6/27	6/29	6/28	6/14	6/28	7/5	7/3	6/17	6/18
RM 2	6/22	6/14	6/28	6/7			missed	6/27	6/22	6/8	6/20	7/1	6/27	6/19	6/14
RM 6	6/29	only 1	6/28	6/21			missed	6/27	6/22		6/24	6/29	6/27	6/17	6/16
RM 3	6/25	6/18	7/2	6/19	6/11		6/24	6/27	6/26	6/12	6/28	7/3	7/3	6/13	6/22
RM 5	6/27	6/16	6/30	6/19			6/24	6/27	6/26	6/10	6/28	7/3	6/29	6/19	6/20
RM 4	6/27	6/22	7/2	6/21	only 1		6/27	7/3	6/30	6/12	6/30	7/5	7/1	6/9	6/22

N	7	6	7	6	1	4	7	7	5	7	6	8	7	7
mean	6/25	6/17	6/30	6/17	6/11	6/25	6/27	6/24	6/11	6/25	7/2	6/30	6/15	6/20

s.d.

c.v.

Maximum number of flowers counted on any census date

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
RM 7	26	5	20	7		20	63	31		8	4	15	16	15
AF 9	14		1									8		3
RM 1	63	34	62	52	1	27	70	89	29	45	63	64	43	15
RM 2	33	11	23	57		64	191	191	15	301	280	214	108	67
RM 6	21	3	14	24		19	67	64		42	63	37	55	30
RM 3	156	145	179	93	8	298	314	444	261	238	224	218	163	195
RM 5	33	6	42	16		17	40	24	61	22	69	44	35	34

RM 4	60	23	48	54	2	27	79	54	73	90	211	50	46	49
N	8	7	8	7	3	7	7	7	5	7	7	8	7	8
sum	406	227	389	303	11	472	824	897	439	746	914	650	466	408
mean	50.8	32.4	48.6	43.3	3.7	67.4	117.7	128.1	87.8	106.6	130.6	81.3	66.6	51.0
s.d.	46.0	50.9	56.3	29.7	3.8	102.9	99.4	150.1	99.6	115.6	105.3	85.1	51.1	61.7
s.e.	16.3	19.2	19.9	11.2	2.2	38.9	37.6	56.7	44.5	43.7	39.8	30.1	19.3	21.8
c.v.	90.578	156.93	115.72	68.555	103.25	152.667	84.44	117.12	113.46	108.47	80.61	104.74	76.795	120.92

Maximum number of inflorescences with open flowers on any census date

RM 7	9	3	8	6		8	21	9		4	3	6	7	6
AF 9	6		1								?	3	0	1
RM 1	22	14	18	25	?	14	26	32	12	20	27	24	20	9
RM 2	16	5	12	25		31	72	73	7	93	96	53	46	35
RM 6	10	1	7	11		9	20	21		15	20	13	24	15
RM 3	48	44	51	45	3	128	116	131	101	69	74	72	73	93
RM 5	13	3	16	9		9	12	12	23	10	28	17	18	17
RM 4	23	13	17	17	1	13	26	18	26	31	76	28	26	24
N	8	7	8	7	3	7	7	7	5	7	8	8	8	8
sum	147	83	130	138	4	212	293	296	169	242	324	216	214	200
mean	18.4	11.9	16.3	19.7	1.3	30.3	41.9	42.3	33.8	34.6	40.5	27.0	26.8	25.0
s.d.	13.405	15.06	15.192	13.425	1.5275	43.8091	38.107	44.698	38.363	33.53	36.387	23.976	23.132	29.476
c.v.	72.953	127.01	93.487	68.099	114.56	144.653	91.041	105.7	113.5	96.989	89.844	88.801	86.473	117.91

Ratio of Flowers/Stalks

2.8	2.7	3.0	2.2	2.8	2.2	2.8	3.0	2.6	3.1	2.8	3.0	2.2	2.0
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Length of flowering period (days)

RM 7		11	19			27	15		18	14	19	15	17
AF 9			8								19		20
RM 1	19	15	20	21		18	20	15	21	18	21	15	21

RM 2	26	17	23	25			25	17	17	26	22	19	15	17
RM 6		17	17	23			23	19		24	20	17	15	15
RM 3	16	17	18	24	9	19	25	20	23	25	23	19	17	17
RM 5	15	9	24	21		15	18	13	15	15	16	17	13	15
RM 4	17	15	20	24	5	23	21	22	19	22	22	22	19	21
N	5	7	8	6	2	3	7	7	5	7	7	8	7	8
mean	18.6	14.4	18.6	23.0	7.0	19.0	22.4	18.0	17.8	21.6	19.3	19.1	15.6	17.9
s.d.	4.4	3.2	4.9	1.7	2.8	4.0	3.6	3.2	3.3	4.0	3.4	1.7	1.9	2.5
c.v.	23.6	22.2	26.3	7.3	40.4	21.1	15.8	17.6	18.8	18.3	17.6	9.0	12.2	13.8
Total Snowfall in Gothic (cm)														
			1025	985	471	1381	1346	1538	646	1095	1278	1382	1087	1384
Snowpack Depth on 1 May (cm)														
	111.1	154.9	80	0	138.4	129.5	169	0	124.5	175	208	118	137	

Mountain Biological Laboratory by David W. Inouye
University of Maryland.

implications for climate change. American Journal of Botany 78(7):997-1001.
unculaceae) in response to a subalpine climate warming experiment. Global Change Biology 9: 885-894.
these data are probably available at the RMBL web site

Date of first flower (day 1 = 1 May)

1987	1988	1989	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
					120	120	120	121							
33	32	33	41	14	50	32	67	35	33	27	40	29	33		
37	42	38	49	26	56	37	57	41	48	37	47	35	35	20	
33	35	29	49	24	50	32	59	37	38	29	47	33	33	18	
37		31	51	26	52	35	59	39	48	34	56			28	
39	40	33	45	33	54	39	69	43	51	39	52	33	33	28	
39	40	35	49	35	56	41	71	41	51	41	49	33	37		
39	40	38	49	35	58	41	71	43	48	39	49	33	35	26	
7	6	7	7	7	7	7	7	7	7	7	7	6	6	5	
36.7	38.2	33.9	47.6	27.6	53.7	36.7	64.7	39.9	45.3	35.1	48.6	32.7	34.3	24.0	
2.7	3.8	3.4	3.4	7.5	3.1	3.9	6.2	3.0	7.0	5.4	4.9	2.0	1.6	4.7	
7.3	10.0	10.0	7.2	27.4	5.9	10.5	9.5	7.6	15.4	15.3	10.1	6.0	4.8	19.5	
156.7	158.2	153.9	####	167.6	147.6	173.7	156.7	184.7	159.9	165.3	155.1	168.6	152.7	154.3	144.0

linked to the cell (see red triangle in upper right corner of the spreadsheet cell) listing the other date(s); these comments aren't display

Date of peak number of flowers

6/8	6/3	6/2	6/22	5/27	6/23	6/8	7/8	6/10	6/19	6/1	6/13	5/31	only 1	
6/14	6/10	6/10	6/24	6/1	7/3	6/14	7/16	6/22	6/23	6/18	6/25	6/10	6/8	6/1

6/10	6/10	6/2	6/18	5/27	6/27	6/10	7/8	6/12	6/20	6/10	6/21	5/2	6/6	5/28
6/14		6/7	6/20	6/3	6/27	6/12	7/10	6/18	6/23	6/8	6/25			only 1
6/16	6/16	6/10	6/24	6/17	7/1	6/14	7/16	6/20	6/27	6/20	6/25	6/10	6/8	6/1
6/14	6/12	6/7	6/24	6/13	7/1	6/14	7/16	6/20	6/27	6/22	6/25	6/4	6/8	
6/14	6/16	6/16	6/28	6/13	7/1	6/14	7/20	6/22	6/25	6/18	6/25	6/8	6/8	5/30
7	6	7	7	7	7	7	7	7	7	7	7	6	5	4
6/12	6/11	6/7	6/22	6/5	6/29	6/12	7/13	6/17	6/23	6/13	6/22	5/31	6/7	5/30

ments attached to the cell (see red triangle in upper right corner of the spreadsheet cell) listing the other date(s); these comments aren't
Date of peak number of inflorescences (first date of peak)

6/8	6/3	6/2	6/14	5/27	6/23	6/6	7/1	6/10	6/19	6/3	6/13	5/31	only 1	
6/14	6/10	6/10	6/24	6/1	7/3	6/12	7/16	6/20	6/23	6/20	6/25	6/6	6/4	6/1
6/10	6/10	6/4	only 1	5/27	6/25	6/10	7/10	6/12	6/20	6/10	6/21	6/2	6/4	5/28
6/12		6/7	only 1	5/30	6/27	6/12	7/10	6/18	6/20	6/8	6/25			only 1
6/16	6/16	6/10	6/24	6/15	7/1	6/14	7/16	6/20	6/25	6/24	6/25	6/8	6/8	5/30
6/14	6/12	6/7	6/24	6/13	7/1	6/14	7/12	6/18	6/25	6/20	6/25	6/4	6/8	
6/16	6/16	6/16	6/26	6/13	6/29	6/14	7/18	6/18	6/25	6/20	6/25	6/8	6/8	6/1
7	6	7	4	7	7	7	7	7	7	7	7	6	5	4
6/12	6/11	6/8	6/24	6/4	6/28	6/11	7/11	6/16	6/22	6/15	6/22	6/4	6/6	5/30

Maximum number of flowers counted on any census date

1987	1988	1989	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
11	6	2	6	4	3	12	10	20	13	13	7	2	1	
22	20	16	15	8	13	51	76	31	66	26	40	8	4	10
49	10	38	2	3	73	103	220	158	280	90	12	2	3	6
6		7	2	6	20	31	71	61	35	9	3			1
179	92	117	524	59	226	135	129	172	195	50	67	83	73	14
35	21	9	34	8	32	23	56	35	44	28	30	2	6	

34	23	11	73	29	74	44	13	29	33	30	64	13	15	4
7	6	7	7	7	7	7	7	7	7	7	7	6	6	5
336	172	200	656	117	441	399	575	506	666	246	223	110	102	35
48.0	28.7	28.6	93.7	16.7	63.0	57.0	82.1	72.3	95.1	35.1	31.9	18.3	17.0	7.0
59.6	31.7	40.7	191.4	20.6	77.1	45.2	73.1	64.7	101.5	27.6	26.4	32.0	27.9	5.1
22.5	13.0	15.4	72.4	7.8	29.2	17.1	27.6	24.5	38.4	10.4	10.0	13.1	11.4	2.3
124.23	110.75	142.38	204.26	123.47	122.44	79.31	88.949	89.511	106.7	78.488	82.881	174.5	163.91	72.843

ate **Maximum number of inflorescences with open flowers on any census date**

5	2	2	2	3	2	6	4	10	7	6	7	1	1	
0														
9	9	8	8	5	7	22	31	14	20	11	18	4	2	6
27	6	18	1	2	29	53	80	74	122	44	6	1	2	4
3		3	1	4	8	15	27	27	14	6	2			1
90	49	58	216	35	87	65	54	60	68	26	31	35	31	7
17	13	7	18	7	18	14	18	15	22	12	13	1	2	
19	14	6	34	18	30	22	7	12	9	13	23	5	11	4
8	6	7	7	7	7	7	7	7	7	7	7	6	6	5
170	93	102	280	74	181	197	221	212	262	118	100	47	49	22
21.3	15.5	14.6	40.0	10.6	25.9	28.1	31.6	30.3	37.4	16.9	14.3	7.8	8.2	4.4
29.232	17.003	19.848	78.534	12.04	29.071	22.041	27.135	25.979	42.645	13.717	10.356	13.423	11.788	2.3022
137.56	109.7	136.21	196.34	113.89	112.43	78.319	85.947	85.779	113.94	81.369	72.489	171.35	144.35	52.322
2.0	1.8	2.0	2.3	1.6	2.4	2.0	2.6	2.4	2.5	2.1	2.2	2.3	2.1	1.6

Length of flowering period (days)

15	9	3	23	21	11	14	33	21	27	19	5	7	2	none
17	9	19	15	24	18	18	23	23	19	23	17	16	8	19

21	14	26	7	22	21	14	27	23	25	25	15	5	7	17
15		21	7	22	19	16	29	21	15	22	6	none	none	7
17	16	24	22	26	17	18	23	25	18	25	12	15	18	11
13	16	13	15	19	13	14	17	25	16	21	15	9	10	
15	16	17	18	24	18	18	23	21	21	23	15	13	14	9

7	6	7	7	7	7	7	7	7	7	7	7	6	6	5
16.1	13.3	17.6	15.3	22.6	16.7	16.0	25.0	22.7	20.1	22.6	12.1	10.8	9.8	12.6
2.5	3.4	7.7	6.4	2.3	3.5	2.0	5.2	1.8	4.5	2.1	4.8	5.8	6.3	6.9
15.8	25.8	44.1	42.2	10.2	20.9	12.5	20.7	7.9	22.3	9.5	39.3	53.5	64.3	54.9

986 925 1095 1076 692 1469

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Date of first flower (day 1 = 1 May)

2003	2004	2005	2006	2007	N	mean	s.d.	c.v.	earliest	latest
30	18	30	24	18	31	33.4	11.5	34.5	14	67
					4	49.3	9.5	19.2	55	73
32	25	46	30	29	34	42.2	10.6	25.0	20	61
30	18	38	22	18	33	37.8	10.1	26.8	18	59
36	25	46	26	23	29	38.6	10.1	26.1	25	59
38	32	46	28	29	34	43.1	9.3	21.5	28	69
35	32	48	28	27	32	44.8	9.4	20.9	28	71
34	32	48	28	31	34	44.6	9.9	22.3	26	71
					means:					
7	7	7	7	7	28.9	41.7	10.0	24.5	26.8	66.3
33.6	26.0	43.1	26.6	25.0	41.9				24.0	64.7
3.0	6.3	6.7	2.8	5.4	4.3					
9.1	24.2	15.6	10.4	21.5	10.6					
153.6	146.0	163.1	146.6	145.0						

including only years with flowering

used in the PDF version of the file.

Date of peak number of flowers

6/5	5/21	6/9	6/1	5/20
6/15	6/4	6/23	6/7	6/9

6/9	5/31	6/19	6/1	6/4
6/13	6/2	6/21	6/3	6/4
6/15	6/8	6/23	6/7	6/11
6/15	6/4	6/23	6/7	6/6
6/21	6/8	6/27	6/5	6/9
7	7	7	7	7
6/13	6/2	6/20	6/4	6/4

30 May 13 July

t displayed in the PDF version of the file.

Date of peak number of inflorescences (first date of peak)

6/3	5/21	6/7	5/26	5/20
6/11	5/31	6/23	6/7	6/6
6/9	5/27	6/19	6/1	6/2
6/9	6/2	6/19	6/1	6/2
6/13	6/8	6/23	6/7	6/11
6/15	6/4	6/23	6/5	6/6
6/17	6/6	6/25	6/5	6/9
7	7	7	7	7
6/11	5/31	6/19	6/3	6/3

30 May 11 July

2003	2004	2005	2006	2007	N	mean	s.d.	c.v.	minimum	maximum
10	7	8	6	5	31	13.1	12.8	97.7	1	63
					4	6.5	5.8	89.3	1	14
67	51	49	69	49	34	36.7	24.6	67.2	1	89
77	200	282	313	131	33	93.0	96.4	103.7	2	301
17	15	42	50	34	29	28.8	23.6	82.1	1	71
198	266	180	206	105	34	174.2	117.0	67.2	8	524
49	59	73	31	31	32	29.9	16.8	56.4	2	69

111	87	69	40	35	34	46.7	39.5	84.6	2	211	
7	7	7	7	7	means:	28.9	53.6	42.1	81.0	2.3	167.8
529	685	703	715	390		441.5			11.0	914.0	
75.6	97.9	100.4	102.1	55.7		63.2					
64.2	98.0	96.3	113.5	45.1		68.3					
24.3	37.0	36.4	42.9	17.1		26.0					
84.997	100.17	95.889	111.07	81.02		110.6					

					N	mean	s.d.	c.v.	minimum	maximum	
6	4	3	2	1	31	5.7	4.1	71.8	1	21	
					7	1.6	2.3	147.4	0	6	
20	17	17	20	16	34	15.1	8.5	56.3	2	32	
37	90	120	129	63	33	36.9	34.4	93.3	1	122	
8	8	18	21	14	29	11.5	8.4	72.5	1	27	
68	83	50	59	35	34	67.6	42.9	63.5	3	216	
20	25	20	14	14	32	13.5	6.3	47.0	1	28	
38	34	23	15	16	34	19.5	13.9	71.4	1	76	
7	7	7	7	7	means:	29.3	21.4	15.1	77.9	1.3	66.0
197	261	251	260	159		165.4					
28.1	37.3	35.9	37.1	22.7		23.3					
21.575	35.136	39.688	44.217	20.361		25.0					
76.662	94.236	110.68	119.05	89.64		107.0					

2.7 2.6 2.8 2.8 2.5

Length of flowering period

11	11	27	>11	16	24	15.2	7.8	51.3	2	33
					3	15.7	6.7	42.5	8	20
27	24	19	25	22	27	18.2	3.8	21.0	8	24

27	29	25	27	31	27	19.2	6.2	32.3	5	27
21	16	17	21	26	24	16.3	5.7	35.3	6	29
23	23	26	27	26	29	19.3	4.5	23.4	9	26
23	11	17	21	24	27	15.6	3.9	25.0	9	25
29	23	20	23	20	29	18.5	4.5	24.3	5	24
					means:					
7	7	7	6	7	23.8	17.2	5.4	31.9	6.5	26.0
23.0	19.6	21.6	24.0	23.6	17.4					
6.0	7.0	4.3	9.4	4.8	3.8					
26.1	35.6	20.0	39.2	20.5	24.4					

95-97 sum

43

0

173

658

167

496

135

