

# Data Overview: Predicting Future Springs

A. K. Ettinger, E. M. Wolkovich and the Predicting Future Springs Working Group

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## 1 Overview of the phenological data

This is a quick description of the data we will use at our working group. The goal of our working group is to understand (the) underlying cause(s) of the recent finding that results obtained from observational versus experimental studies make radically different predictions for future plant phenology (Wolkovich et al. 2012). The underlying cause of this discrepancy is currently unclear, and to address this we have compiled phenology and climate data for experimental and observational studies.

There are two main files with the phenological data, one file with the experimental climate data, and a folder with temperature data for the observational sites. They can all be downloaded at <https://github.com/AileneKane/radcliffe>. The phenology data files and experimental climate data file are found in the "radmeeting" folder. The temperature data for the observational sites are found in the "Observations/Temp."

```
> setwd("~/GitHub/radcliffe")
> obsdata <- read.csv("radmeeting/obspheno.csv", header=TRUE)
> expdata <- read.csv("radmeeting/exppheno.csv", header=TRUE)
> expclim<-read.csv("radmeeting/expclim.csv", header=TRUE)
```

We'll walk through the experimental data first. We selected experimental studies that used active warming methods (including above-canopy heating, as well as combined air and soil warming methods) to apply temperature treatments. We additionally limited studies to those that either/both: 1) applied atleast 2 different levels of warming, in addition to controls; and/or 2) measured soil moisture or humidity in all treatments. In many cases those studies that measure soil moisture also manipulate precipitation/moisture through an experimental treatment (i.e. drought and/or increased precipitation treatments).

### 1.1 Experimental data

```
> head(expdata)
```

	site	plot	event	year	genus	species	doy	genus.species
1	marchin	1	bbd	2011	Acer	rubrum	88	Acer.rubrum
2	marchin	1	bbd	2011	Acer	rubrum	83	Acer.rubrum
3	marchin	1	bbd	2011	Acer	rubrum	96	Acer.rubrum
4	marchin	1	bbd	2011	Acer	rubrum	79	Acer.rubrum
5	marchin	1	bbd	2011	Acer	rubrum	83	Acer.rubrum
6	marchin	1	bbd	2011	Acer	rubrum	80	Acer.rubrum

The phenology data file has the following columns:

site: the first author's name (usually)

plot: the plot or chamber number, given by the author; this can be used to identify the treatment with the "expclim.csv" file, which contains plot and treatment codes, and the "expsiteinfo.csv" file, which contains details on the experimental treatment. For full details on each experiment, see the individual site folders in the "Experiments" folder.

event: phenological event (bbd=first leaf budburst date, lod=first leaf out date, lud= first leaf unfolding date, ffd=first flower date, ffrd=first fruiting date, sd= first seeds dispersing date, col=first date leaf coloration observed, sen=first date senescence observed, drop=leaf drop)

genus and species:

doy: day of year that the phenological event first occurred

Each row is an observation of an individual or plot (whatever the finest scale of observation for that study)

The experimental data come from 9 different sites (see "expsiteinfo.csv" file for details).

## 1.2 Observational data

Next, the observational data.

```
> head(obsdata)
```

	site	plot	event	year	doy	date	genus	species	scrub	varetc	cult
1	fitter	<NA>	ffd	1954	130	1954-05-10	Acer	campestre	0	NA	NA
2	fitter	<NA>	ffd	1955	131	1955-05-11	Acer	campestre	0	NA	NA
3	fitter	<NA>	ffd	1956	137	1956-05-16	Acer	campestre	0	NA	NA
4	fitter	<NA>	ffd	1957	121	1957-05-01	Acer	campestre	0	NA	NA
5	fitter	<NA>	ffd	1958	128	1958-05-08	Acer	campestre	0	NA	NA
6	fitter	<NA>	ffd	1959	129	1959-05-09	Acer	campestre	0	NA	NA

The observational data come from 15 sites (see XX file for details).

```
> unique(obsdata$site)
```

```
[1] fitter harvard hubbard konza niwot mikesell concord mohonk marsham
[10] fargo washdc bolmgren gothic uwm rousi
15 Levels: bolmgren concord fargo fitter gothic harvard hubbard konza ... washdc
```

```
> table(obsdata$site, obsdata$event)
```

	bbd	ffd	fld	L75mdoy	L95mdoy	lod	lud
bolmgren	0	1622	0	0	0	0	0
concord	0	9320	0	0	0	0	0
fargo	0	4725	0	0	0	0	0
fitter	0	13721	0	0	0	0	0
gothic	0	162352	0	0	0	0	0

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harvard	483	284	0	0	0	0	0
hubbard	72	0	0	0	0	72	0
konza	0	3403	0	0	0	0	0
marsham	0	2131	660	0	0	0	0
mikesell	445	0	0	0	0	549	554
mohonk	0	673	0	0	0	0	0
niwot	648	371	0	0	0	0	0
rousi	1021	147	0	0	0	0	0
uwm	414	0	0	415	415	0	0
washdc	0	7455	0	0	0	0	0

### 1.3 Species