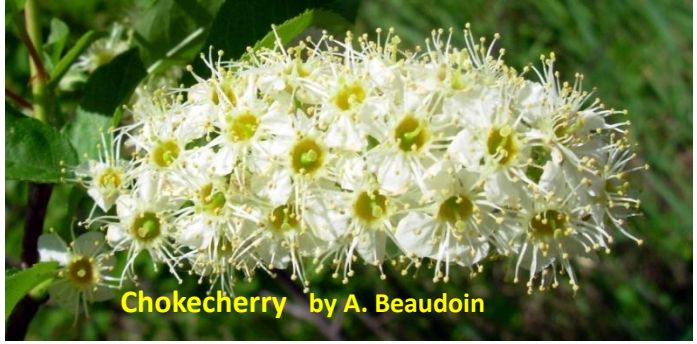
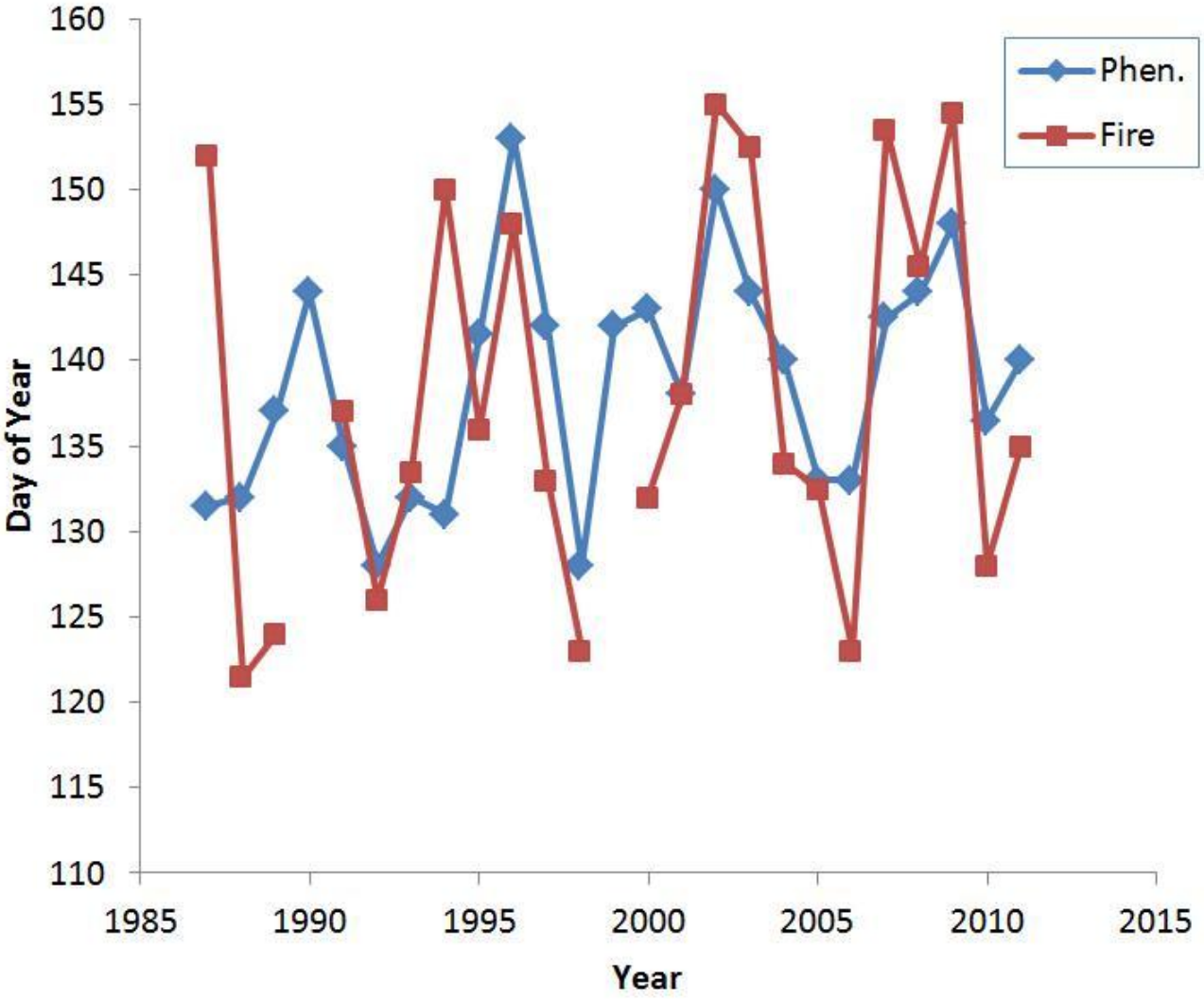


WESTERN PARTNERSHIP FOR WILDLAND FIRE SCIENCE

With leaves comes rain! Predicting the end of spring fire season

By Elisabeth Beaubien, Mike Wotton (University of Toronto), Xianli Wang and Mike Flannigan
Department of Renewable Resources
University of Alberta, Edmonton

Wildland Fire Conference, Halifax
October 8, 2014


160
155
150
145
140
135
130
125
120
115
110
Day of Year
1985
1990
1995
2000
2005
2010
2015
Year
Phen.
Fire


NASA


Ed Kaiser Edmonton Journal


LOW
MODERATE
HIGH
EXTREME
FIRE DANGER
Nrcan.gc.ca

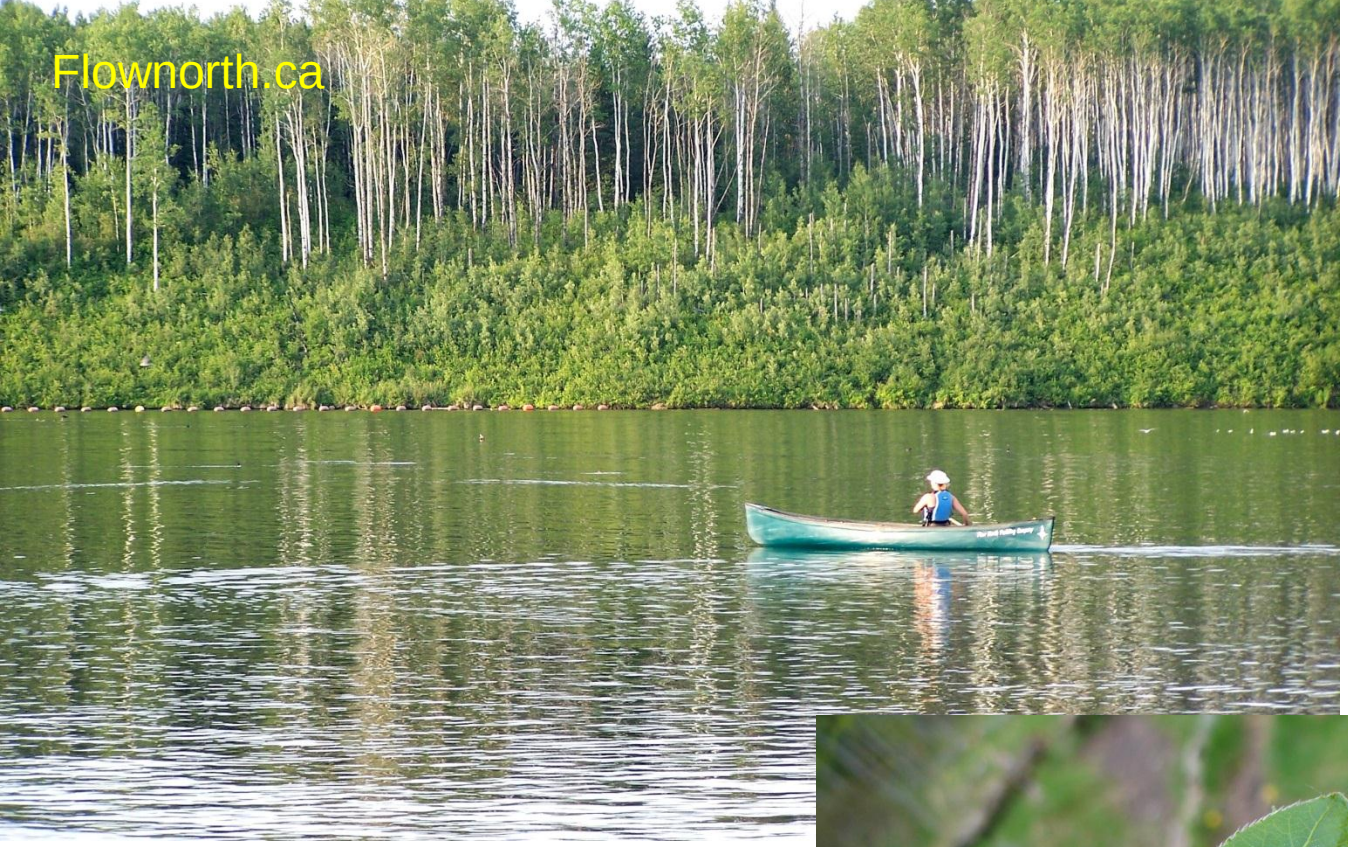
Start of spring fire season

Forest is snow free

One of earliest plant events = pollen shed from aspen catkins

April 13, 2008

Edmonton, Alberta



End of spring fire season

Greenup =

Leaves emerged in forest

Hogg, E.H.,D.T. Price and T.A. Black. 2000. *Postulated feedbacks of deciduous forest phenology on seasonal climate patterns in the western Canadian interior*.

J. Climate 13: 4229–4243.

the science of phenology
“the study of the seasonal timing of life cycle events”

What is Canada PlantWatch?

plantwatch
ENGAGING CITIZENS IN SCIENCE

Joint Effort: uOttawa LAURIER Inspiring Lives. Nature CANADA David Suzuki Foundation

and PlantWatch coordinators in most provinces and territories

Purpose: PlantWatch involves Canadians of all ages in tracking the plant response to climate change.

It encourages stewardship and respect for nature, and raises awareness of science and the environment.

These citizen science data are also useful for decision making in many economic sectors: forestry (fire models, pest control, seed collection timing), agriculture, health, remote sensing, etc.

What do PlantWatch citizen scientists do?

plantwatch

Go outside in spring and observe:

first and mid-bloom dates of selected plant species, which vary across Canada,

leafing dates of certain trees,

and then report these dates and locations by mail, email, or at: **www.plantwatch.ca**

Alberta PlantWatch

- 1987 to present (27 years)
- dates for flowering and leafing for 26 plant species
- observations from a volunteer network of 100-200 people annually

12 species selection criteria, which include :

Pinus contorta

Lodgepole pine

Fragaria virginiana or *vesca*

Wild strawberry

Species are
- widespread
- easy to identify
- and bloom quickly

Taraxacum officinale

Dandelion

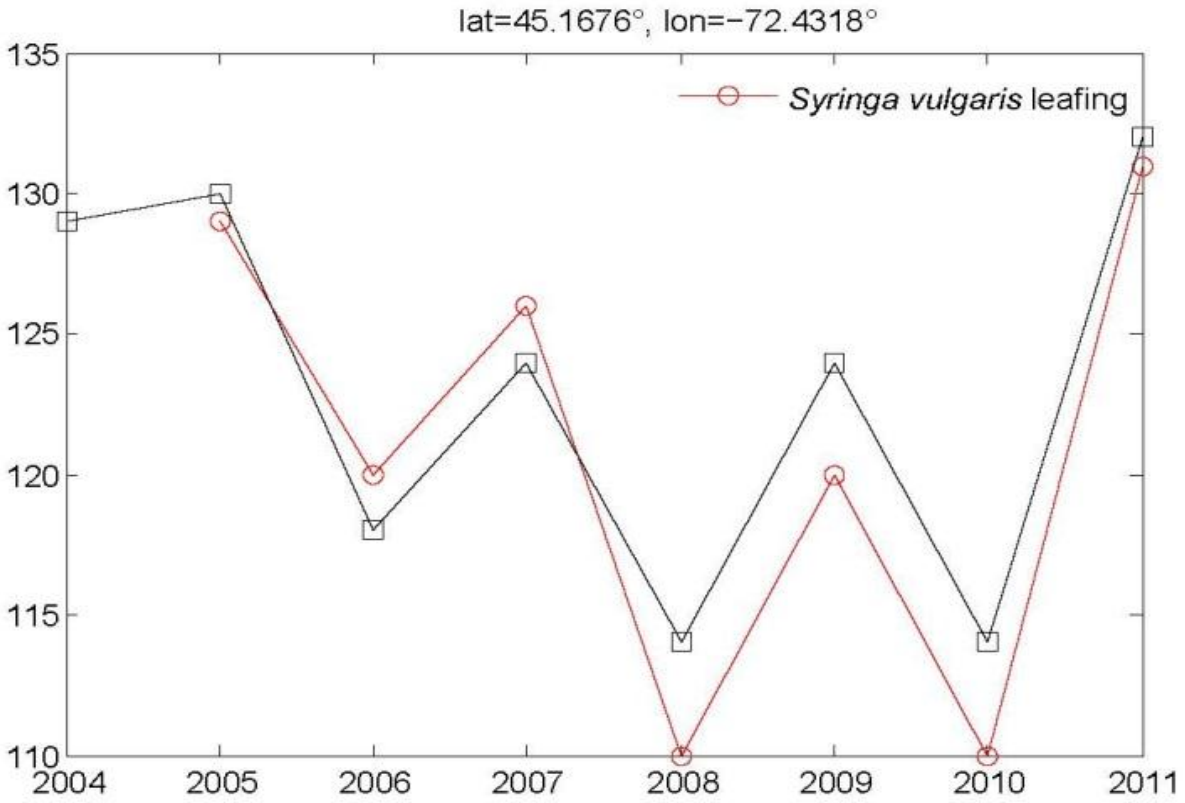
Temperature = the main driver in spring

"The timing of spring development of perennial plants in temperate zones of the earth is largely driven by accumulated temperature above a threshold value"

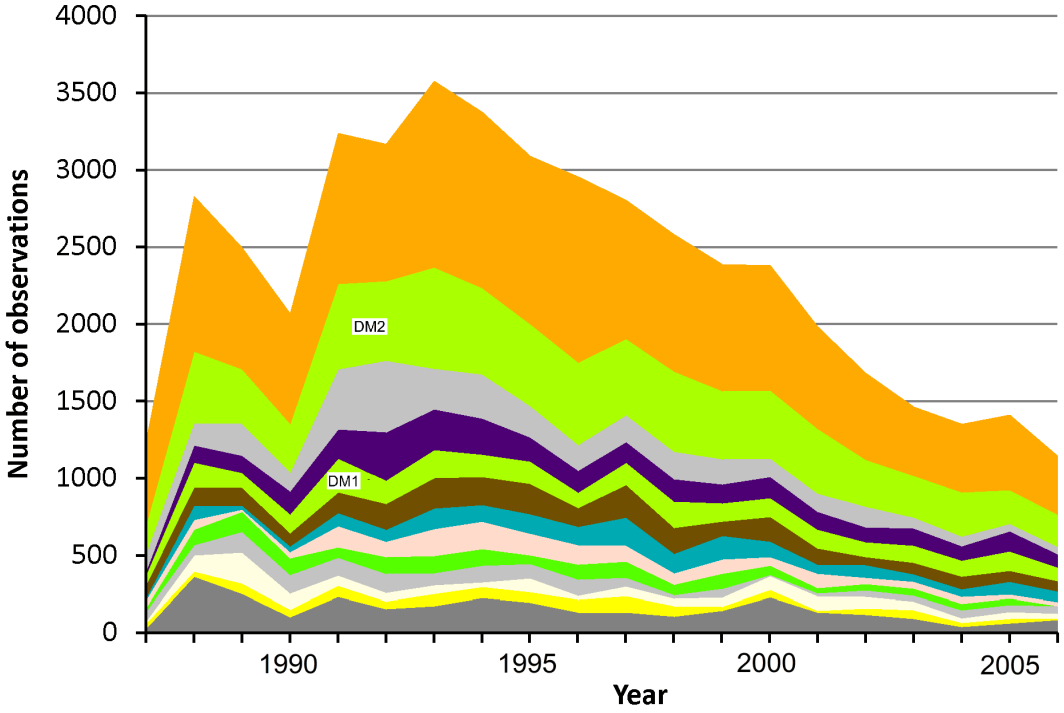
(Rathcke and Lacey 1985)

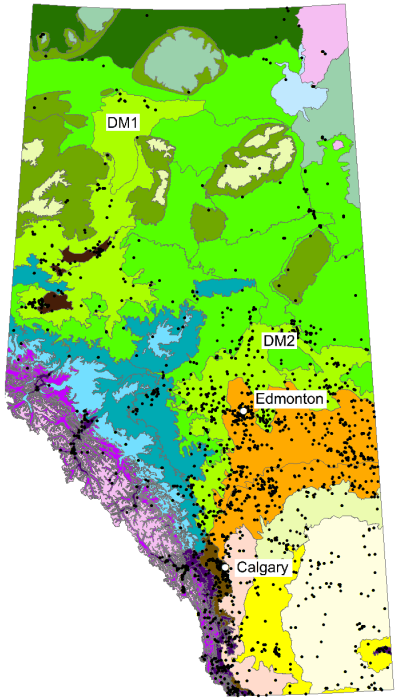
Spring timing data is useful for decision-making in :

Remote sensing timing for green up matches PlantWatch dates for common purple lilac



Submitted paper: “Comparing land surface phenology with leafing and flowering observations from the PlantWatch citizen network” by Nicolas Delbart, Elisabeth Beaubien; Laurent Kergoat; Thuy Le Toan

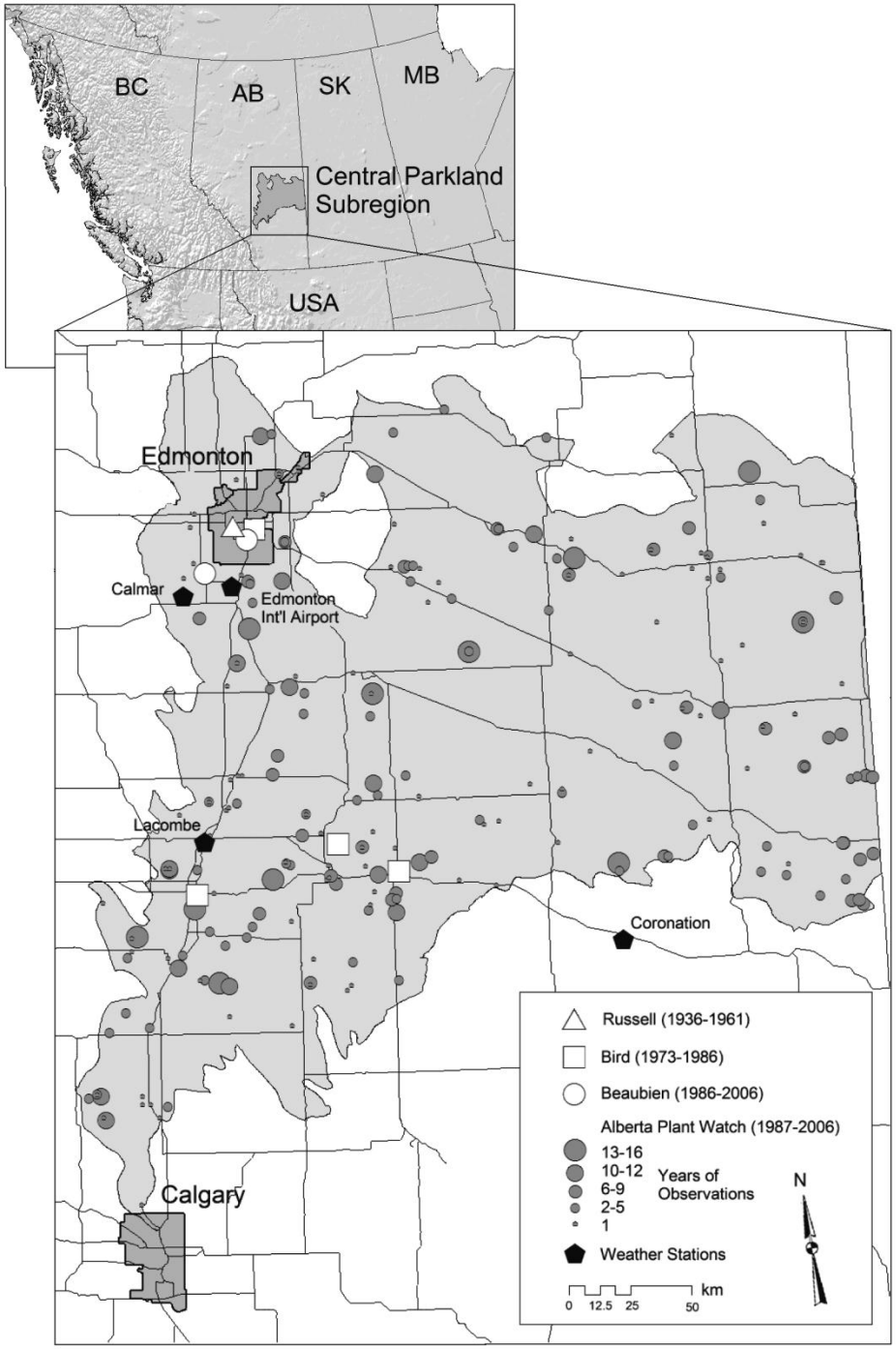




Alberta Natural Regions

- Central Parkland
- Dry Mixedwood (DM2)
- Calgary
- Montane
- Dry Mixedwood (DM1)
- Foothills Parkland
- Lower Foothills
- Foothills Fescue
- Central Mixedwood
- Edmonton
- Dry Mixedgrass
- Mixedgrass
- All other ecosystems

Beaubien E., Hamann, A. 2011. *Plant phenology networks of citizen scientists: recommendations from two decades of experience in Canada.* International Journal of Biometeorology 55: 833-841

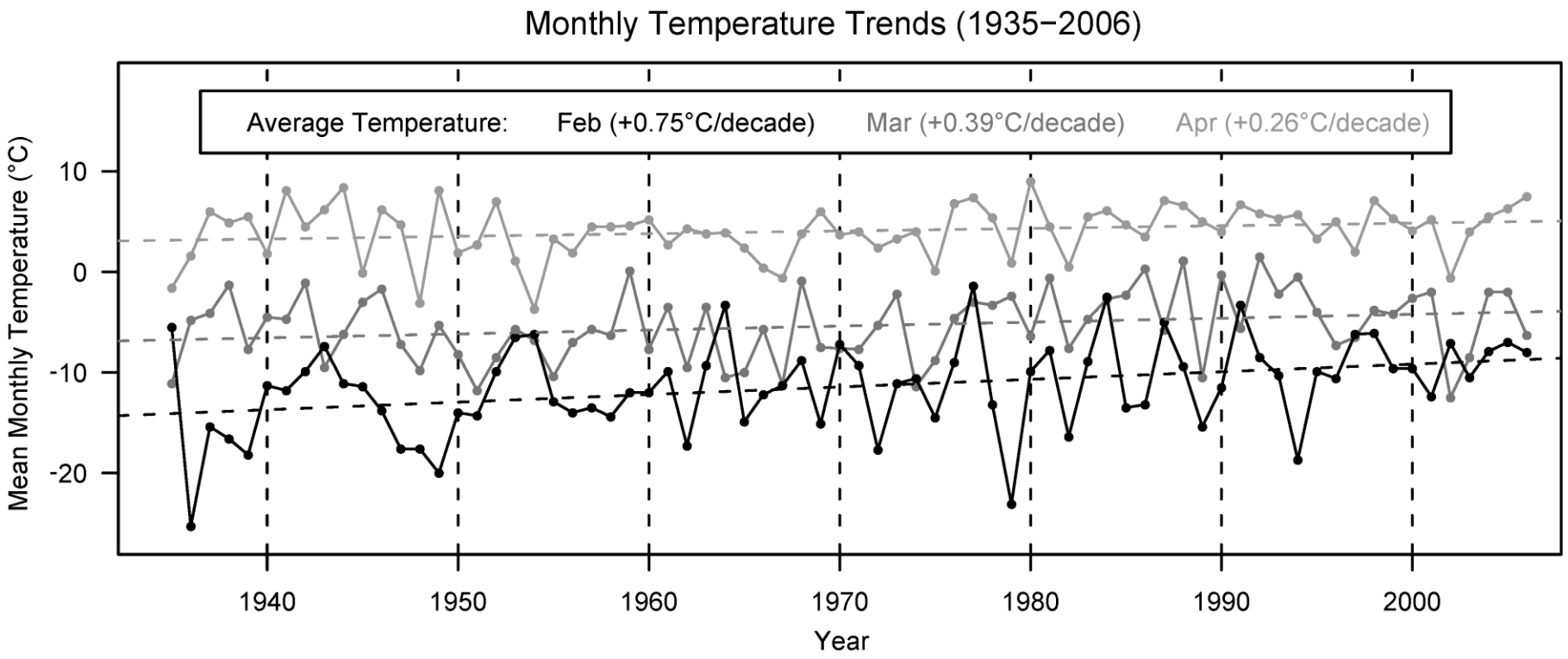


Central parkland study area in Alberta, western Canada

Beaubien E., Hamann, A. 2011. *Spring flowering response to climate change between 1936 and 2006 in Alberta, Canada.*

BioScience 61: 514–524.

Winter-Spring Temperatures



Populus tremuloides

Anemone patens

Prunus virginiana

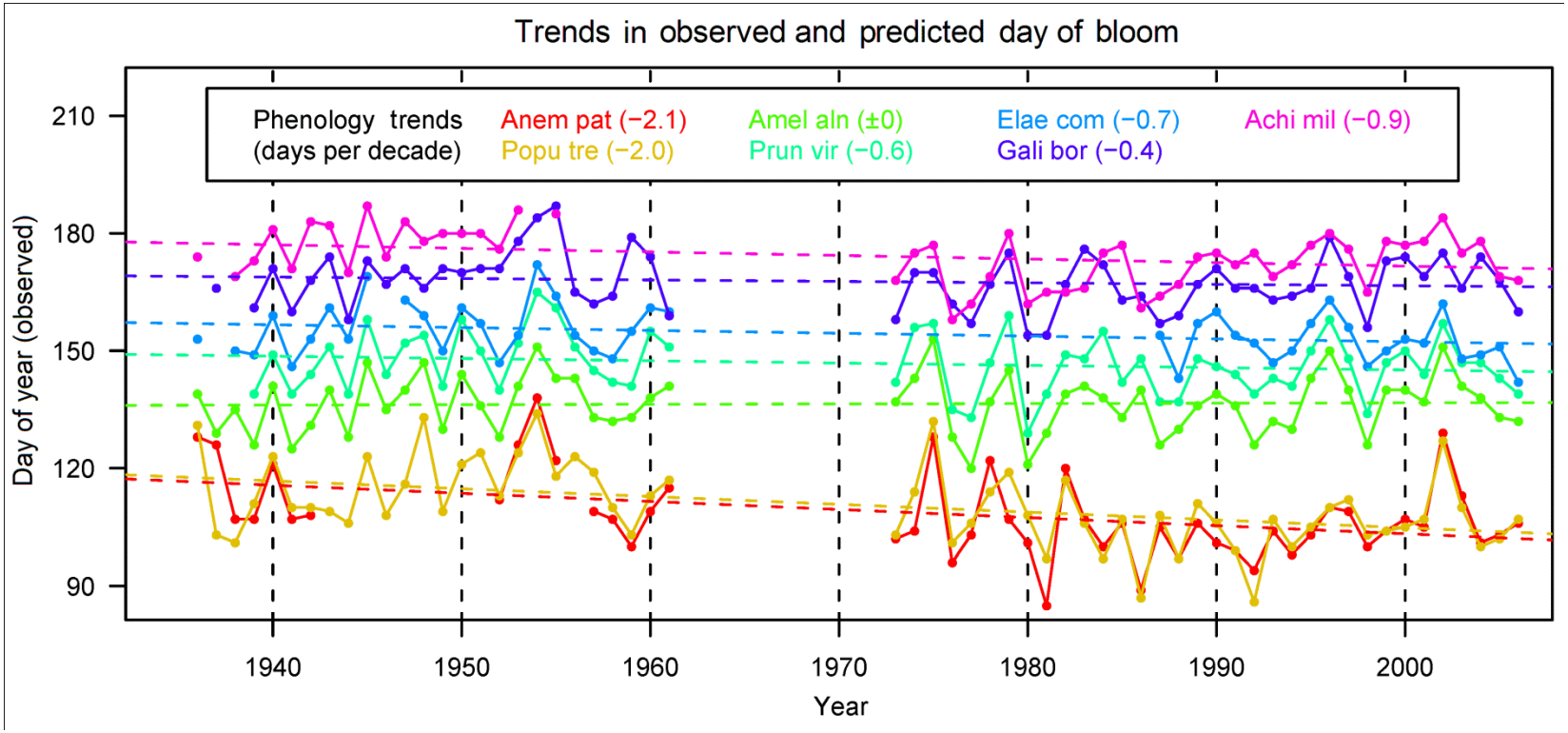
Elaeagnus commutata

Amelanchier alnifolia

Achillea millefolium

Galium boreale

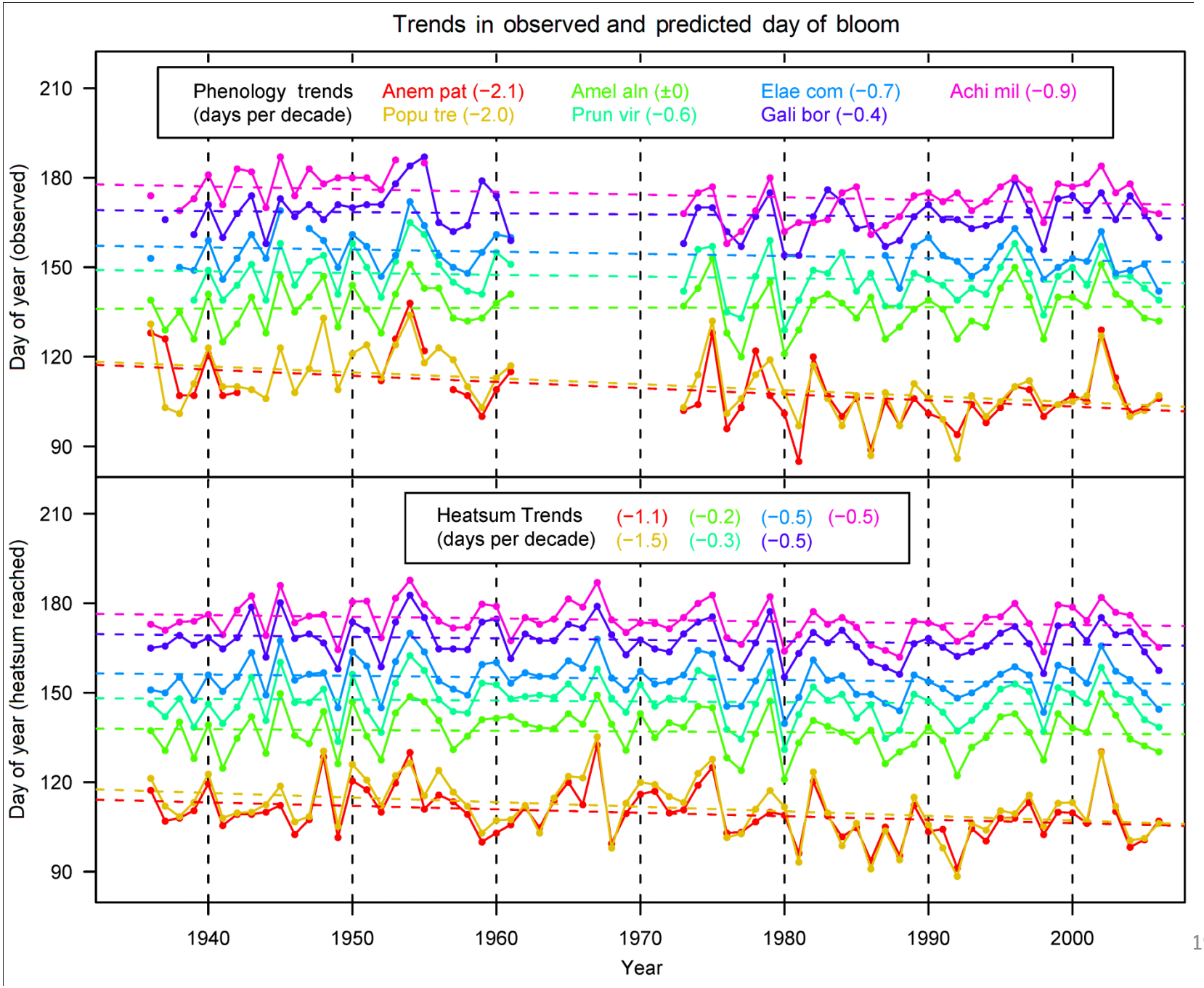
Photos: Linda Kershaw

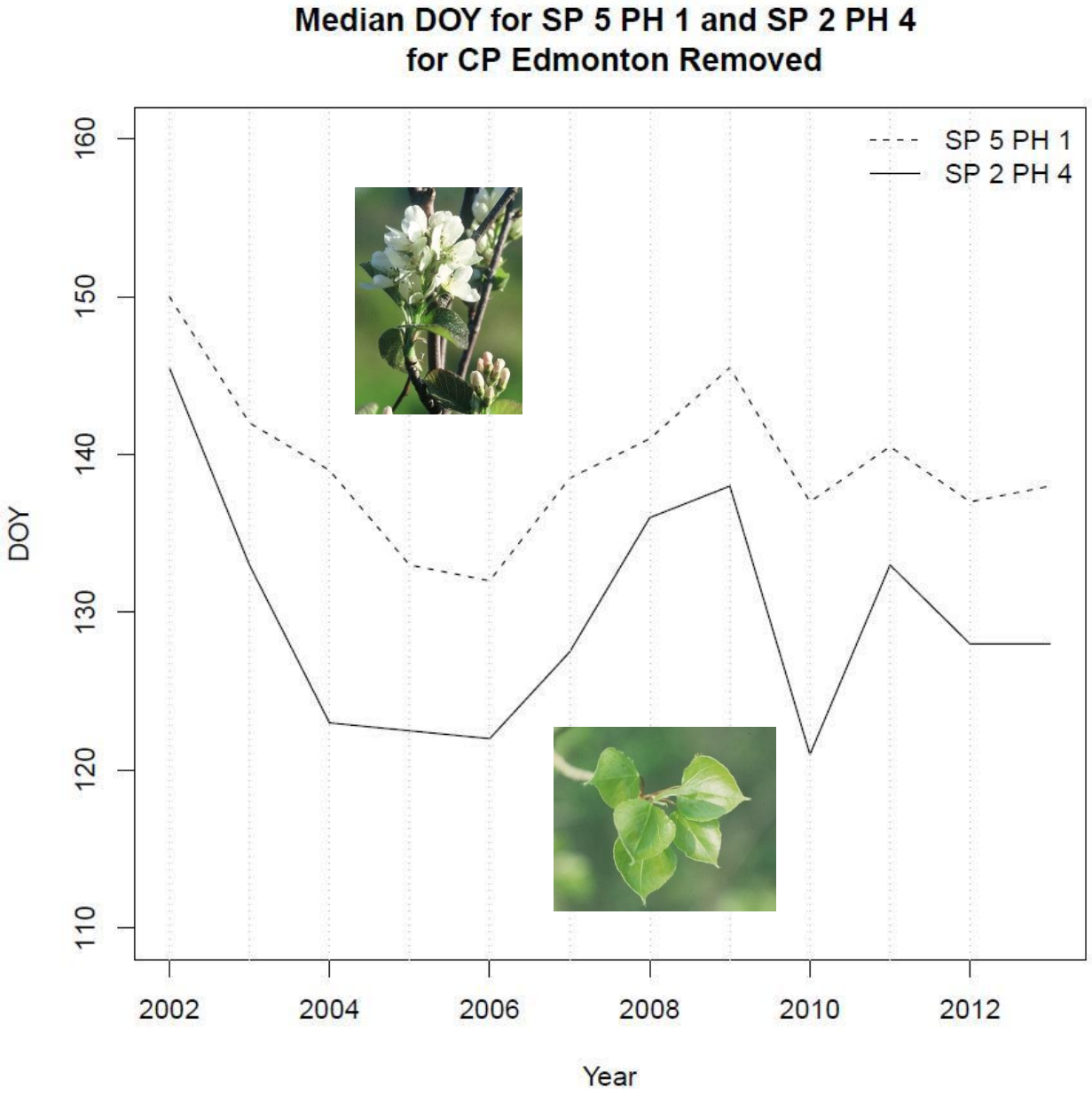


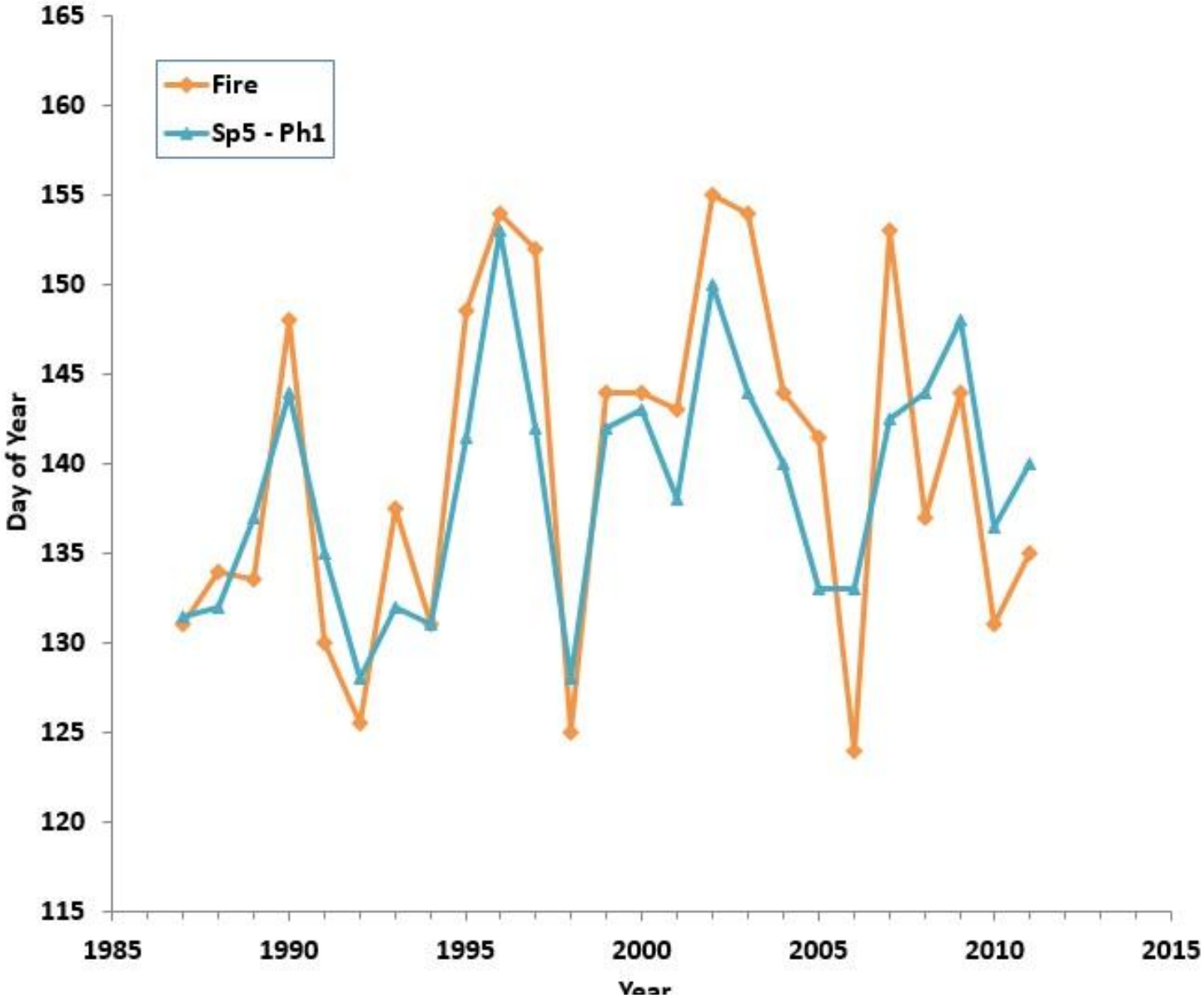
Including historic observations, data span is 7 decades: 1936 to 2006

Spring plants bloom in a predictable sequence.

The timing is largely driven by temperature

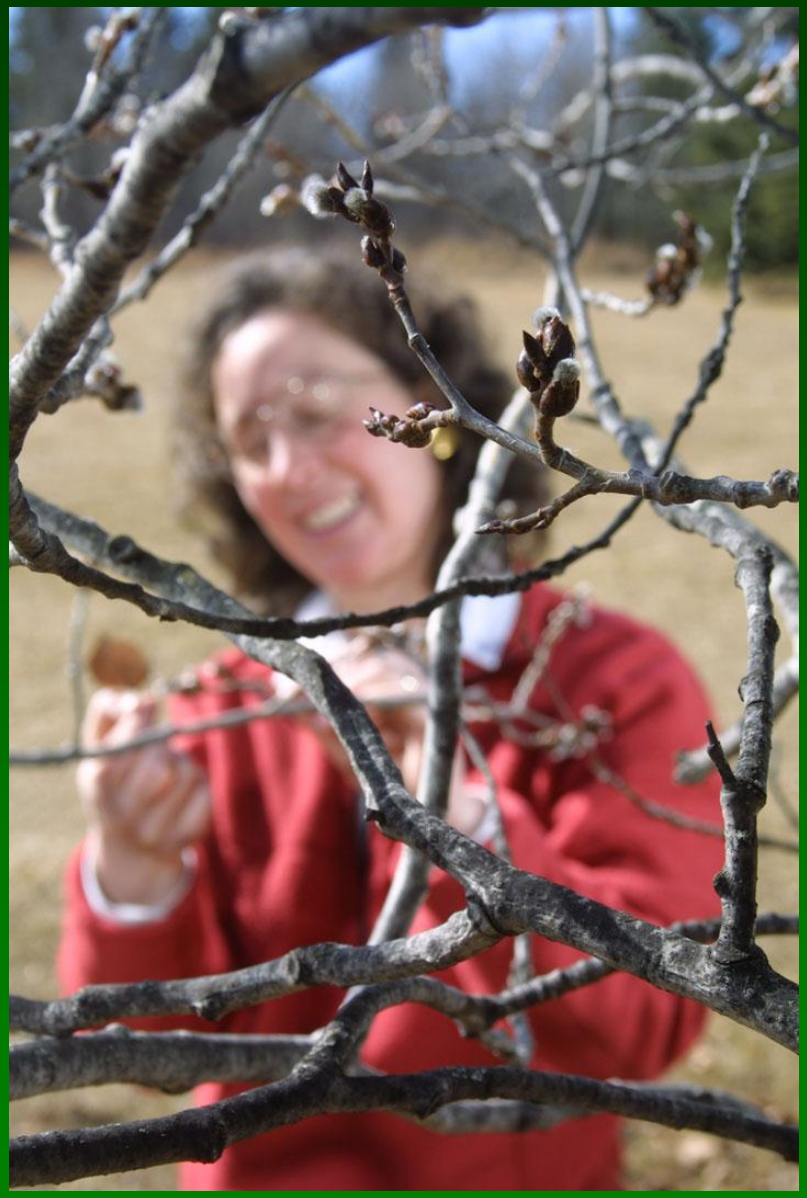

Trends in observed and predicted day of bloom
Phenology trends
(days per decade)
Anem pat (−2.1)
Popu tre (−2.0)
Amel aln (±0)
Prun vir (−0.6)
Elae com (−0.7)
Gali bor (−0.4)
Achi mil (−0.9)
Day of year (observed)
Heatsum Trends
(days per decade)
(−1.1)
(−1.5)
(−0.2)
(−0.3)
(−0.5)
(−0.5)
(−0.5)
Day of year (heatsum reached)
210
180
150
120
90
1940
1950
1960
1970
1980
1990
2000
Year


Median DOY for SP 5 PH 1 and SP 2 PH 4
for CP Edmonton Removed
SP 5 PH 1
SP 2 PH 4
DOY
160
150
140
130
120
110
2002
2004
2006
2008
2010
2012
Year


Fire
Sp5 - Ph1
Day of Year
165
160
155
150
145
140
135
130
125
120
115
1985
1990
1995
2000
2005
2010
2015
Year

To track environmental change we need to gather data on spring phenology :

the simplest,
most sensitive,
and
easily-observed
biotic response to climate change.



Acknowledgements

University of Alberta: Dr. Mike Flannigan, Dr. Andreas Hamann, Dr. Xianli Wang

University of Toronto: Dr. Mike Wotton

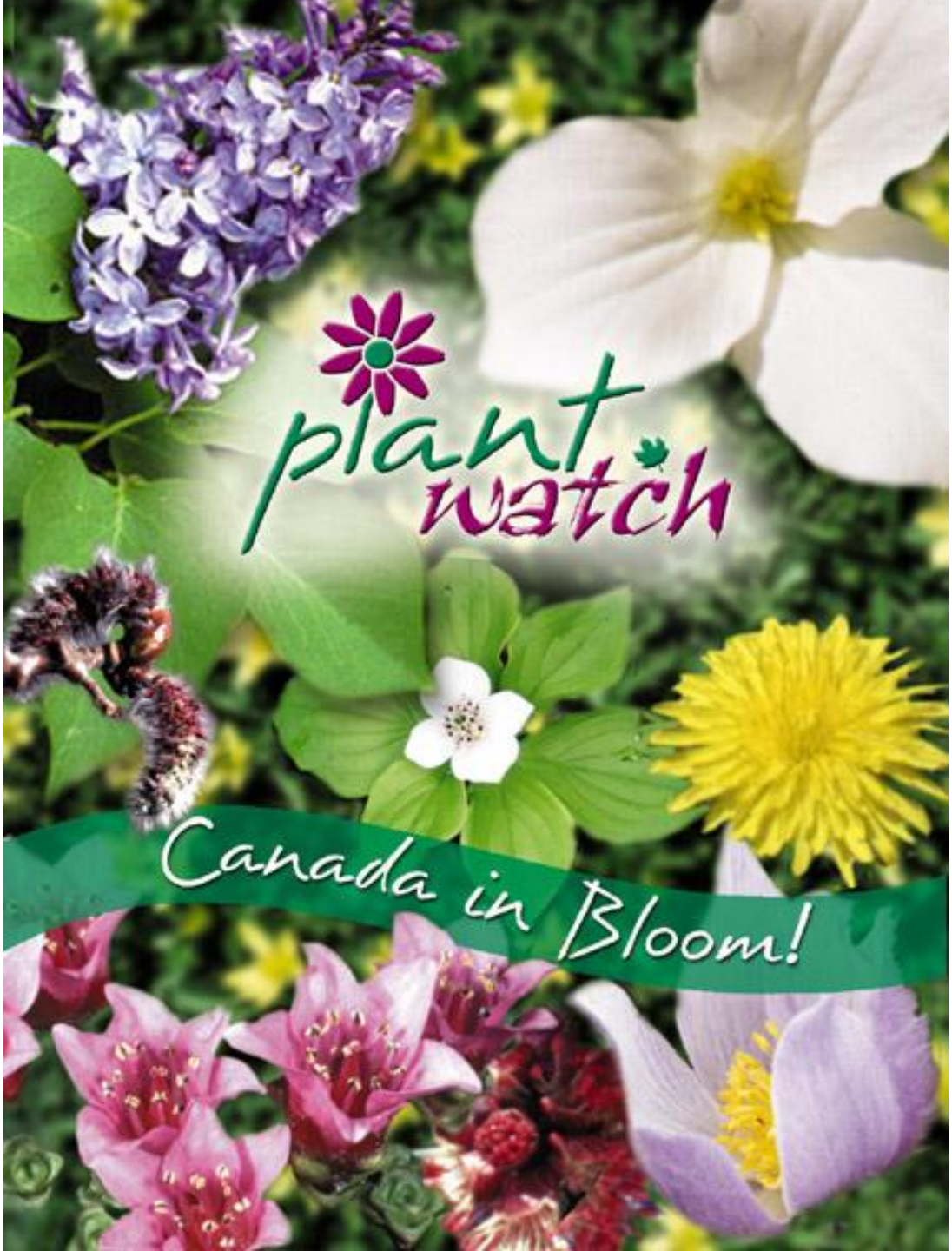
Funding: Alberta Innovates, NSERC Discovery, Alberta Ingenuity

Observers: over 650 Alberta PlantWatch volunteers

Colleagues: Ginny Marshall, Francois Nicolas-Robinne, Wankui Zhou

PlantWatch assistants since 1991:

include: Ania Radziszewski, Karla Williamson, Trevor Lantz, Laura Frost, Krista Kagume, Malcolm Coupe, Colleen Nordlund, Tara Stewart, Carmen von Conrad


plant watch
Canada in Bloom!