



Making the Case for Climate Action



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Agenda

- Role of botanic gardens
- Cases to be made for climate action
- What action looks like
 - Institutional Commitment
 - Environmental Justice
 - Programs
 - Operations
 - Collections & Conservation
- Making your own case for climate action



North American Botanic Garden Strategy For Plant Conservation

2016-2020



Summary of Objectives and Targets

This section offers a condensed view of the North American Botanic Garden Strategy for Plant Conservation, as an overview of all objectives, targets, and subtargets, and to allow quick reference for interested readers.

Target	Description	Page
Objective A. Understanding and documenting plant diversity		
A1	All botanic gardens in North America with the capacity for programs in plant systematics will review and contribute to the achievement of the CGSO Target 1 to have a complete online flora by 2020. Botanic gardens will contribute to their respective national flora projects and, where relevant, help document the floras of other parts of the world.	15
Subtarget 1	A working group will be convened to facilitate the reporting and compiling of existing comprehensive national and North American plant facts related to various categories of plant diversity including native, agricultural, horticultural, and medicinal plants.	15
A2	All botanic gardens with the capacity will review and contribute to assessments of the conservation status of plant species, using criteria and standards developed by NatureServe and the IUCN.	16
Subtarget 1	Botanic gardens will support and coordinate efforts, identify gaps, recruit expert contributors, and set priorities for assessing threats to plant species in taxonomic groups and regions where they work.	16
Subtarget 2	The number of botanic garden staff participating in threat assessment working groups and projects will increase.	16
Objective B. Conserving plant diversity		
B1	Botanic gardens will work collaboratively to support in situ conservation of threatened natural areas, habitats, and ecosystems locally, regionally, and internationally.	19
Subtarget 1	All botanic gardens in Canada and the USA will support local, national and international in situ conservation.	19
Subtarget 2	At least 40% of Mexican botanic gardens will participate in in situ conservation programs for areas of high biodiversity and at least 60% of threatened species in Mexico will be protected in situ as set forth in the EMVC Target 2.	19
B2	Botanic gardens will expand ex situ conservation efforts and partnerships.	19
Subtarget 1	75% of threatened native plant species in Canada and the USA will be maintained in botanic garden ex situ collections (as plants, tissues, or seeds) with appropriate genetic representation to support restoration and managed according to national and international standards, such as those of the Center for Plant Conservation.	19

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They're sweet (philadelphica) female (platanus) seeds (to be *ex situ* since BGC's Garden)

Case Study 1: *Memelilaria hirsuta* Wurdemann Conservation Efforts at the Caderny Regional Botanic Garden

Sheela Merari Aguilera, Emilio Sánchez Martínez, Jordin Golubev, Riquelme and María Magdalena Hernández Martínez, Jardín Botánico Regional de Cadereyta "Ing. Manuel González de Cosío", Cadereyta de Montes, Querétaro, México
 "Laboratorio de Ecología, Sistemática y Fisiología Vegetal, Universidad Autónoma Metropolitana Xochimilco, México City, México

The southeastern end of the Chihuahuan Desert hosts an important amount of endemic Cactoaceae taxa. *Memelilaria hirsuta*, sometimes known as "pall ball", is a critically endangered monospecific species. Studies developed by the Cadereyta Regional Botanic Garden (CRBG) show that only a few hundred individuals survive in its native habitat. Regeneration pathways and population dynamics are not fully known. The CRBG has collected seed samples, developed a propagation protocol and established a pilot nursery in which will produce more seedlings, eventually, could support restoration of the species to its native habitat. The CRBG has also established a plot to monitor status of this species for germination and further complemented with the establishment of an **ex situ** nursery in the vicinity of the production at "El Asfóforo", a small town in the vicinity of the species' distribution area. At this nursery site, local youths can learn about the relevance and importance of their region's native flora.



In situ and *ex situ* conservation of *Memelilaria hirsuta* (Wurdemann) led by the Cadereyta Regional Botanic Garden

North American Botanic Garden Strategy For Plant Conservation 2016-2020 | 21



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Public Gardens Sustainability Index

Environmental Sustainability

Sustainable environmental development (planet) refers to the development of natural ecosystems in ways that maintain the carrying capacity of the Earth and respect the non-human world. Public gardens have an opportunity to minimize their ecological footprint by creating sustainability-centered operations where decisions are based on the ways and means to minimize our impact on the environment.

Environmental sustainability means supporting, conserving, enhancing and/or regenerating vital physical environmental fundamentals and processes (e.g. energy, water, clean air, habitat, healthy soils, biodiversity) and/or reducing negative impacts on them (e.g., habitat loss, invasive species, greenhouse gas, and non-biodegradable waste).

Social Sustainability

Sustainable social development (people) is aimed at the development of people and their social organization, in which the realization of social cohesion, equity, justice and wellbeing plays an important role.





Cleveland Botanical Garden

100 Million Visitors Per Year
1.5 Million Educated – Majority K-5



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national pollinator
garden network



Other Network Partners



Explore pollinator resources of these Federal Agencies



2016
MIAMI

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NOT THESE “EXPERTS”



Christianconservatives.net



Youtube.com



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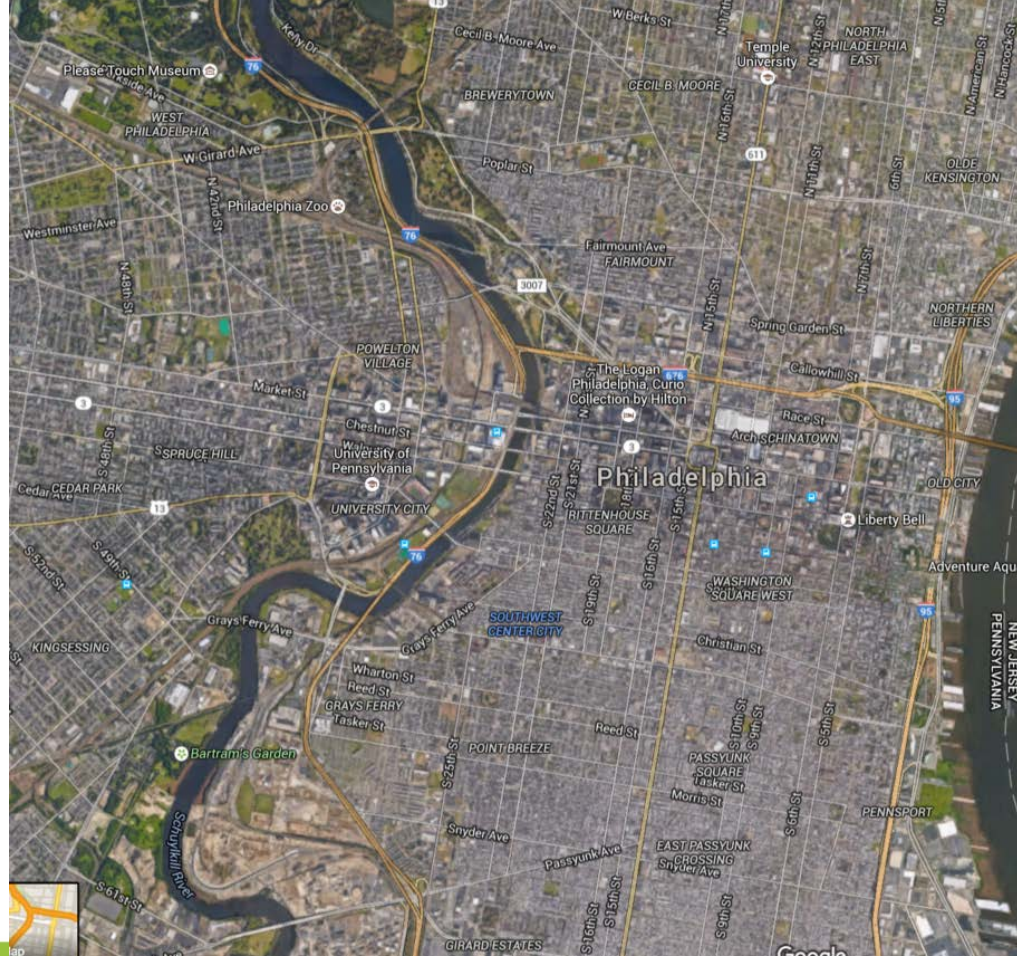


Do We Matter?

Are We Relevant?

*How Can We Possibly
Have an Impact?*

OF COURSE WE CAN!



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Cases for Climate Action

- Environmental Justice
- Programmatic
- Operational
- Collections & Conservation
- Institutional Commitment





Institutional Commitment



CHICAGO BOTANIC GARDEN



The Chicago Botanic Garden believes that climate change is a real threat to plants and is taking action to help flora adapt to a changing climate and to reduce the impact of the changes.



Environmental Justice

- Jennifer Schwarz Ballard – Chicago Botanic Garden
- Sonja Skelly – Cornell Plantations



Environmental Justice

Climate change is
a justice issue;
it amplifies
existing inequities.

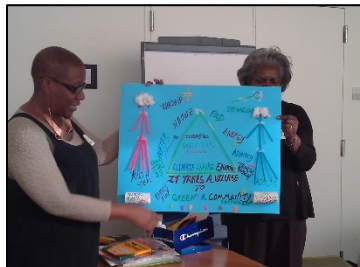




An asset based approach to climate action...

- starts with communities
- involves people
- is responsive
- recognizes, respects, and utilizes the assets present in every community

is a strategy for sustainable, community-driven development



connect

community + climate + action

connectcca.org



Migration Stories: Monarchs and Me



Faith in Place & Covenant United Church of Christ

– South Holland, IL

Goal: Nurture Environmental Stewardship in Communities of Color Migration stories workshops and Climate 101 events connect African American heritage with climate positive traditions using ecological and personal stories. (Photos: Veronica Kyle & Velma Pate)

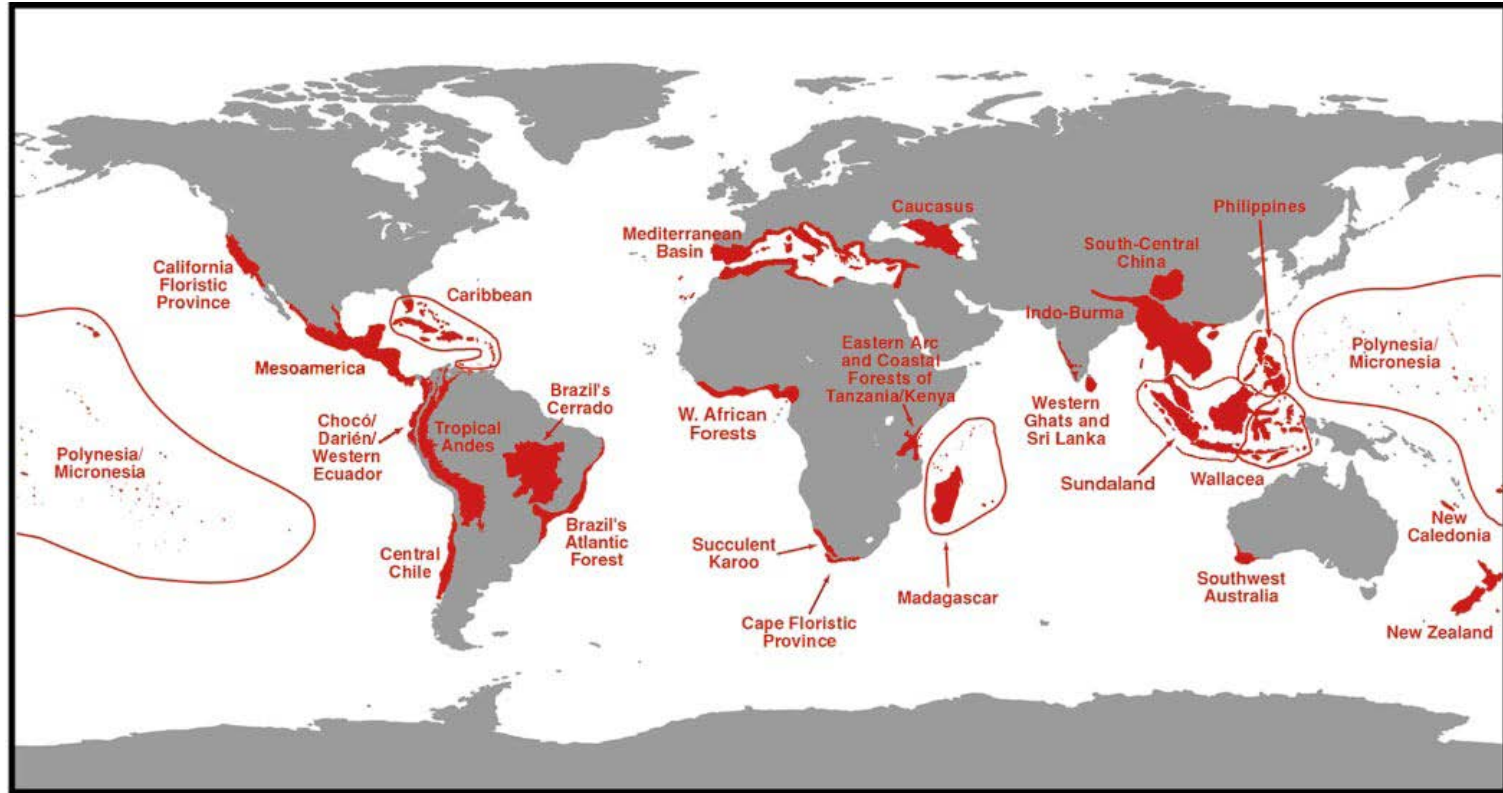
Linking cultural and ecological migration stories makes meaningful community connections



Traditional lifestyle practices find new significance across generations in the context of climate change



Biodiversity Hotspots



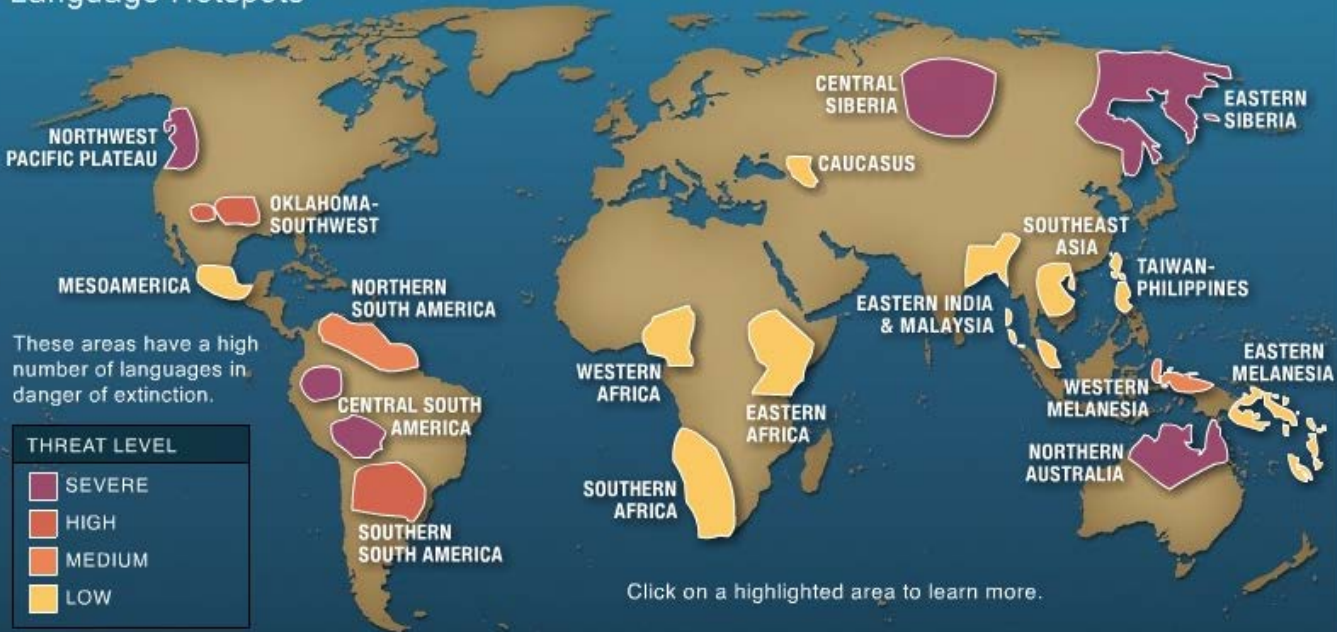
From: Myers et al., *Nature* 403: 853-858 (2000)

Language Extinction Hotspots

Enduring Voices Saving Disappearing Languages

ABOUT THE PROJECT GLOSSARY RESOURCES

Language Hotspots







Programming & Exhibits

- Sonja Skelly – Cornell Plantations
- Sarada Krishnan – Denver Botanic Gardens





Welcome to the CLIMATE CHANGE DEMONSTRATION GARDEN

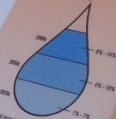
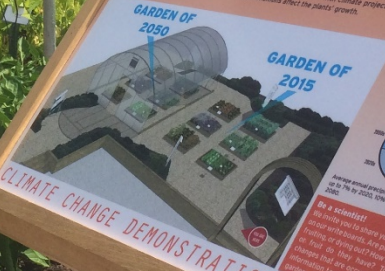
Climate scientists project average annual temperatures in central New York will rise, with more and longer hot days and more average annual precipitation is projected to increase with a greater likelihood of extreme precipitation.

As temperatures rise, plants may be affected by earlier temperatures and precipitation changes, we are using these plants to experiment how the plants perform inside and outside of it.

While we can't control climate change, we are modifying conditions inside the high tunnel throughout the year to track the temperature and adjusting watering patterns consistent with climate projections for 2050. Each day our team monitors on how these conditions affect the plants' growth.



Climate models project a decrease in annual precipitation and an increase in the number of days with temperatures above 90°F by 2050.



Annual precipitation is projected to increase by 17% by 2050, 10% by 2050 and up to 14% by 2050.

Be a scientist!
We invite you to share your observations on our website. If plants are flowering or not, do they have to die? Our information tool packet throughout the garden.

CLIMATE CHANGE DEMONSTRATION GARDEN

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GARDEN OF 2050

Increased frequency, intensity and duration of rain events along with an increase in the number of days over 90 degrees are projected for central New York. The range varies depending on the amount of greenhouse gases added to the atmosphere.

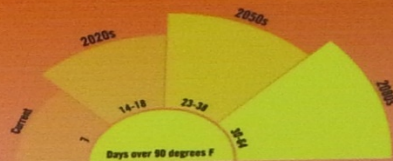
8/13 - 8/17: HEAT WAVE!

DAY TEMPS 13° HOTTER THAN
TODAY'S TEMPERATURES

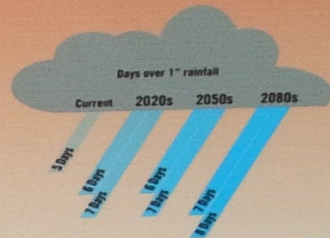
How do you think
the plants feel? - They
can't escape!



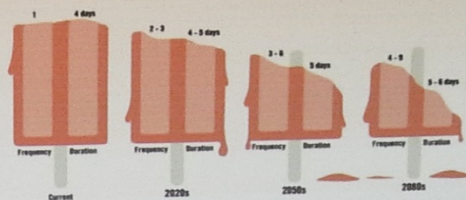
We are modifying the temperature and water patterns inside so they are similar to projected conditions for temperature and precipitation in 2050. Compare the same plants growing inside and outside of the high tunnel and share your observations after you exit.



Climate models project between 23 and 38 days over 90°F in 2050.



Climate models project up to 7 days of rainfall over one inch in 2050.



Climate models project an increase in the frequency and duration of heat waves, with up to 6 heatwaves lasting 5 days in 2050.

CLIMATE CHANGE DEMONSTRATION GARDEN

Making a Case for Climate Action through Phenology

Sarada Krishnan
Denver Botanic Gardens



Phenology Programs

- Project BudBurst
 - Geared toward educational groups
- National Phenology Network (USA-NPN)
 - Standardization of data
 - Central clearing house for phenological data
 - Nature's Notebook
 - Citizen Scientist portal of USA-NPN
 - and others...



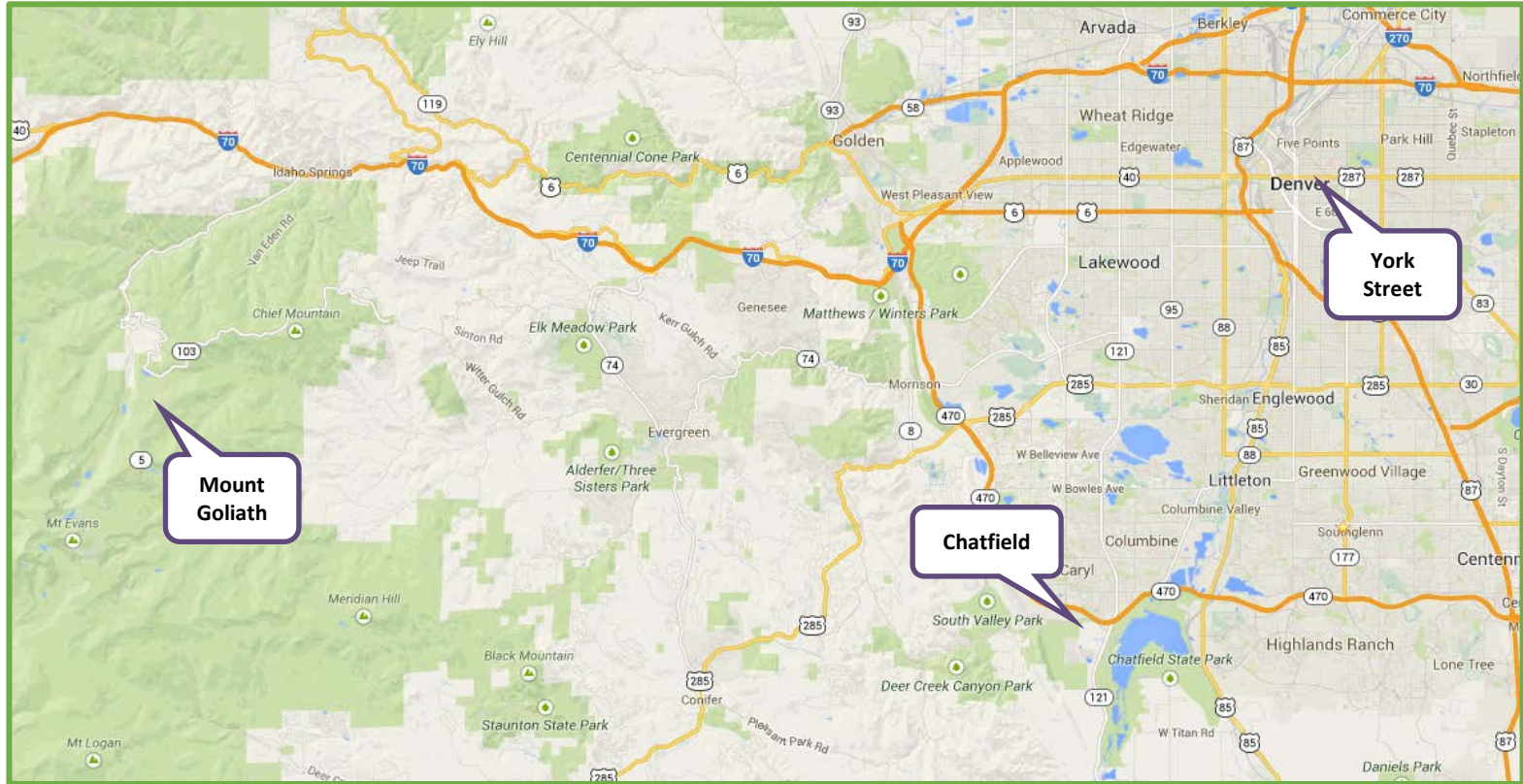
- Joint project with National Phenology Network (USA-NPN)
- Consists of multiple Phenology Walks at different sites.
- We currently have three Walks: York Street, Chatfield, and Mount Goliath.
- We plan on adding more over time.

Scan this code for a map of this and the other Phenology Walks,



Look for this logo on plant signs

Phenology Trail Locations

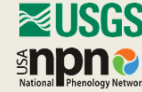




Key to Map

Letter	Species	Cultivar Name
A	<i>Pinus ponderosa</i> -1	
B	<i>Populus tremuloides</i> -1	
C	<i>Aquilegia caerulea</i> -1	
D	<i>Syringa vulgaris</i> -1	"Sensation"
E	<i>Syringa vulgaris</i> -2	"Kravitsky"
F	<i>Syringa vulgaris</i> -3	"President L"
G	<i>Pinus ponderosa</i> -2	
H	<i>Achillea millefolium</i> -1	"Hope"
I	<i>Amorpha canescens</i> -1	
J	<i>Bouteloua gracilis</i> -1	
K	<i>Yucca glauca</i> -1	
L	<i>Achillea millefolium</i> -2	
M	<i>Bouteloua gracilis</i> -2	
N	<i>Chamerion angustifolius</i> -1	
O	<i>Bouteloua gracilis</i> -3	
P	<i>Syringa vulgaris</i> -4	
Q	<i>Yucca glauca</i> -2	
R	<i>Amorpha canescens</i> -2	
S	<i>Populus tremuloides</i> -2	
T	<i>Aquilegia caerulea</i> -2	
U	<i>Achillea millefolium</i> -3	
V	<i>Populus tremuloides</i> -3	
W	<i>Pinus ponderosa</i> -3	
X	<i>Yucca glauca</i> -3	
Y	<i>Aquilegia caerulea</i> -3	
Z	<i>Amorpha canescens</i> -3	

Deciduous plant phenophases



Breaking leaf buds

Leaves

Increasing leaf size

Colored leaves

Flowers or Flower Buds

Open Flowers

Fruits

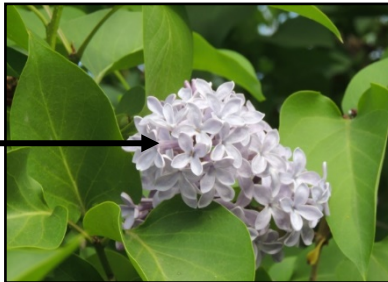
Ripe Fruits

Recent fruit or
seed drop



Syringa vulgaris
“Mrs. W.E. Marshall”

Breaking leaf buds
All leaf buds broken
Open flowers
Full flowering
End of flowering





Syringa vulgaris (common lilac)			
Phase	No. 1	No. 2	No. 3
Breaking leaf buds	Y N ?	Y N ?	Y N ?
All leaf buds broken	Y N ?	Y N ?	Y N ?
Open flowers	Y N ?	Y N ?	Y N ?
Full flowering	Y N ?	Y N ?	Y N ?
End of flowering	Y N ?	Y N ?	Y N ?

For each phenophase listed, click: **y** if the phenophase was occurring; **n** if the phenophase was not occurring; or **?** if you were not certain of the species or occurrence of the phenophase. If you did not look for the phenophase, leave blank. Once you click "submit observations" your observations will show in blue, but may be edited ([more info](#)).

Select the site where your plant is located. Site: **Denver Botanic Gardens** ▾

Review submitted observations: ◀ 3 columns ▶ ▶ 1 column ▶ ◀ 0 ▶

SUBMIT OBSERVATIONS

ENTER MORE DATA

Date / Time

- ⤴ Report your contribution of time
- ⤴ Report your animal observation methods
- ⤴ Report on snow

[Close All](#) [Open All](#)

▼ common lilac-1(dup)

	02/13/2014	<u>Circle all no</u> <u>Delete</u>	<u>Circle all no</u> <u>Delete</u>	<u>Circle all no</u> <u>Delete</u>
Do you see breaking leaf buds?	Y N ?	Y N ?	Y N ?	Y N ?
Do you see all leaf buds broken?	Y N ?	Y N ?	Y N ?	Y N ?
Do you see open flowers?	Y N ?	Y N ?	Y N ?	Y N ?
Do you see full flowering?	Y N ?	Y N ?	Y N ?	Y N ?
Do you see end of flowering?	Y N ?	Y N ?	Y N ?	Y N ?
Comments	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

⤴ common lilac-2

⤴ lilac-3 'President Lincoln'

white fir	cheatgrass	yellow avalanche-lily	purple loosestrife	Kentucky bluegrass	Scouler's willow
subalpine fir	buffalograss	California poppy	creeping barberry	Jacob's-ladder	black elderberry
Rocky Mountain maple	bluejoint	spynstar	feathery false lily of the valley	Japanese knotweed	blue elderberry
bigtooth maple	hedge false bindweed	leafy spurge	paradise apple	balsam poplar	red elderberry
boxelder	trumpet creeper	Arizona fescue	alfalfa	eastern cottonwood	hardstem bulrush
common yarrow	water sedge	Idaho fescue	yellow sweetclover	Fremont cottonwood	panicked bulrush
garlic mustard	Bigelow's sedge	Virginia strawberry	buckbean	quaking aspen	russet buffaloberry
gray alder	giant red Indian paintbrush	white ash	seep monkeyflower	honey mesquite	compassplant
annual ragweed	snowbrush ceanothus	green ash	wild bergamot	American plum	climbing nightshade
cuman ragweed	common hackberry	yellow fritillary	single delight	pin cherry	silverleaf nightshade
Saskatoon serviceberry	yellow star-thistle	firewheel	Eurasian watermilfoil	chokecherry	Missouri goldenrod
Utah serviceberry	spotted knapweed	honeylocust	yellow pond-lily	bluebunch wheatgrass	scarlet globemallow
leadplant	curl-leaf mountain mahogany	western rattlesnake plantain	American white waterlily	Douglas-fir	rose spirea
big bluestem	fireweed	common sunflower	tufted evening primrose	eastern pasqueflower	alkali sacaton
Colorado blue columbine	pipsissewa	orange daylily	stiff goldenrod	Stansbury cliffrose	common snowberry
wild sarsaparilla	Canada thistle	common cowparsnip	devil's-tongue	antelope bitterbrush	mountain snowberry
greenleaf manzanita	bull thistle	needle and thread	tree cholla	Gambel oak	white heath aster
kinnikinnick	lanceleaf springbeauty	orange hawkweed	alpine mountainsorrel	sagebrush buttercup	New England aster
sand sagebrush	miner's lettuce	oceanspray	switchgrass	upright prairie coneflower	Red Rothomagensis lilac
big sagebrush	blackbrush	jewelweed	Virginia creeper	common buckthorn	common lilac
spider milkweed	bunchberry dogwood	scarlet gilia	western wheatgrass	smooth sumac	tamarisk
swamp milkweed	redosier dogwood	saltmeadow rush	gilia beardtongue	golden currant	common dandelion
showy milkweed	beaked hazelnut	oneseed juniper	firecracker penstemon	black locust	red clover
butterfly milkweed	purple prairie clover	Utah juniper	Palmer's penstemon	watercress	white clover
garden asparagus	shrubby cinquefoil	Rocky Mountain juniper	arctic sweet coltsfoot	prickly rose	Pacific trillium
fourwing saltbush	Queen Anne's lace	eastern redcedar	silverleaf phacelia	Nootka rose	wheat
arrowleaf balsamroot	tufted hairgrass	oxeye daisy	reed canarygrass	Woods' rose	stinging nettle
garden yellowrocket	darkthroat shooting star	bitter root	common reed	Himalayan blackberry	thinleaf huckleberry
dwarf birch	eightpetal mountain-avens	twinflower	mallow ninebark	cutleaf blackberry	golden crownbeard
paper birch	eastern purple coneflower	cardinalflower	Engelmann spruce	thinleberry	prairie ironweed
sideoats grama	common water hyacinth	bigseed biscuitroot	lodgepole pine	pussy willow	banana yucca
blue grama	broadleaf helleborine	twinberry honeysuckle	twoneedle pinyon	greyleaf willow	soapweed yucca
black mustard	rubber rabbitbrush	Tatarian honeysuckle	limber pine	Goodding's willow	mountain deathcamas
field mustard	tall cottongrass	Arnold Red honeysuckle	ponderosa pine	diamondleaf willow	



Operations

- Sonja Skelly – Cornell Plantations
- Jennifer Schwarz Ballard – Chicago Botanic Garden









Buildings



CHICAGO BOTANIC GARDEN



Operations

Energy



Waste



Water



Center for Alpines in Cultivation

Survey:

- What alpines are in cultivation
- Origin of genetic material

Goal:

- Germplasm sharing to widen the genetic diversity in cultivation



Make your Case

- Make Your Case (20-30 min)

In 3 minutes:

- ✓ Connect with your audience
 - ✓ Give them a hook
 - ✓ Solve the problem for them
 - ✓ Call to action
- Shark Tank (15 min)





Thank you

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