BRINGING SCIENCE TO LIFE

How to create successful education-research collaborations

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Workshop Goals & Objectives

- Learn from examples of three different successful education-research partnerships
- Identify common challenges to partnerships and offer strategies to address those challenges
- Generate and share ideas and a plan for engaging scientists and the public in botany and horticulture at your organization

THE SCIENCE CAREER CONTINUUM

An education-science collaboration supporting Chicago Public School students in achieving science careers

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Associate Vice President, Education
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The Science Career Continuum

- Science First (13-16)
- College First (16-19)
- Internships (college)
  - Research
  - Recent graduate
- Graduate degree programs





Program Components

- Academic Support
  - Field and lab based, student driven experiences
  - College credits for participation
  - College and career preparation
- Community Support
  - Parent education and support
  - Multi-layer mentorship structure
- Financial Support
  - Student stipends
  - College credits

Research-Education Collaboration

- Multi-layer mentorship structure
  - High school, undergraduate, graduate and professional research staff
- Field and lab based, student driven experiences
  - Teens contribute to ongoing research projects carried out by Garden scientists
  - Participate in both field work and laboratory analyses
- College and career preparation
  - Learn what schooling and expertise needed for different types of research careers
  - Experience what “a day in the life” of a research scientist or horticulturalist looks like.

Challenges & Strategies for Success

Challenges

Relationships

- Developing appropriate and meaningful research projects from ongoing work
- Providing appropriate guidance and direction for teens
- Interacting with teens in an effective and supportive way

Logistics

- Fitting into research and fieldwork schedules
- Fitting in with other professional commitments

Strategies for Success

- Mentor training
- Multi-tiered mentoring system
- Ongoing, close communication with mentors
- Setting and enforcing professional behavioral expectations for teens
- Mentor appreciation
- (Long-term) Creation of a culture and expectation of mentoring for newly hired research staff.
- Ongoing assessment and revision of program structure to fit with researcher schedules

PROJECT BUDBURST AND FLORAL REPORT CARD

Engaging Citizen Scientists in Climate Change Research

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Project BudBurst

- A national citizen science campaign, managed by NEON, to collect phenological data on plants; CBG is a collaborator
- Web based
- No special equipment or instruments needed to participate
- Entry points for all skill levels
- Can report on any plant species

Educational Goals

- Increase awareness of phenology as an area of scientific study
- Increase awareness of the impacts of changing climates on plants and the environment, and
- Increase science understanding and appreciation by engaging participants in the scientific process.

Research-Education Collaboration

- PBB was initially designed as an education/outreach project, but collaboration with scientists was important to insure data are useful and reliable
- All data are reviewed by scientists and made available freely on website
- "My BudBurst" allows personal archived data over time
- Types of comparisons are demonstrated for potential users
  - Comparison with existing and historical phenological data sets
  - Comparisons with existing climate data

Historical phenology records (1950-1994) compared to PBB records (2007-2011)

Species	**Earliest First Flower Observations**		
Common name (*Genus species*)	**Swink & Wilhelm (1994)**	**Project BudBurst**	**Days Advanced**
Forsythia (*Forsythia x intermedia*)	April 25	April 1	-24
Spiderwort (*Tradescantia ohiensis*)	May 14	May 3	-11
Dogtooth violet (*Erythronium americanum*)	April 6	April 1	-5
Red Maple (*Acer rubrum*)	March 20	March 6	-14
Mayapple (*Podophyllum peltatum*)	May 1	April 26	-5
Lilac (*Syringa vulgaris*)	May 3	April 16	-17
Black locust (*Robinia pseudoacacia*)	May 9	April 20	-19
Bradford pear (*Pyrus calleryana*)	April 15	April 13	-2

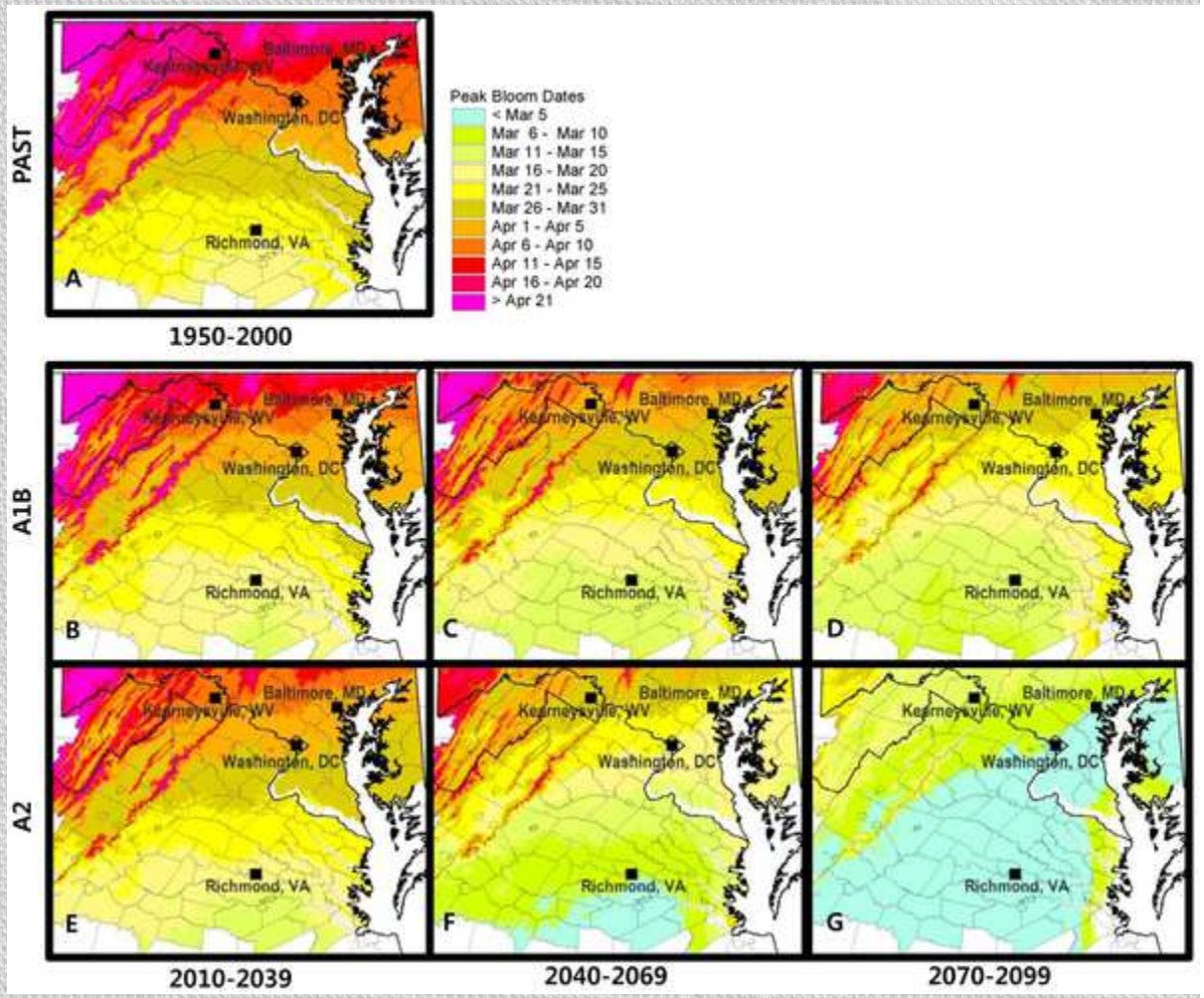
Use of PBB data to study phenology differences between native and exotic species

- Wolkovich and Cleland asked if phenological differences contributed to the success of invasive plants
- They found exotic species leafed out earlier than natives supporting the theory that they benefit from "seasonal priority effects"
- This supports approach of targeting management early in the season

Wolkovich and Cleland. 2011. The phenology of plant invasions: a community ecology perspective. Front Ecol Environ 9: 287-294.

Using PBB data to predict cherry blooms

Chung et al. used PBB and other data sets to create models to predict the phenology of cherry bloom time under climate change



Chung U., Mack L., Yun J.I. & Kim S.-H. (2011) Predicting the timing of cherry blossoms in Washington D. C. and Mid-Atlantic States in response to climate change. *PLoS ONE* 6(11), e27439

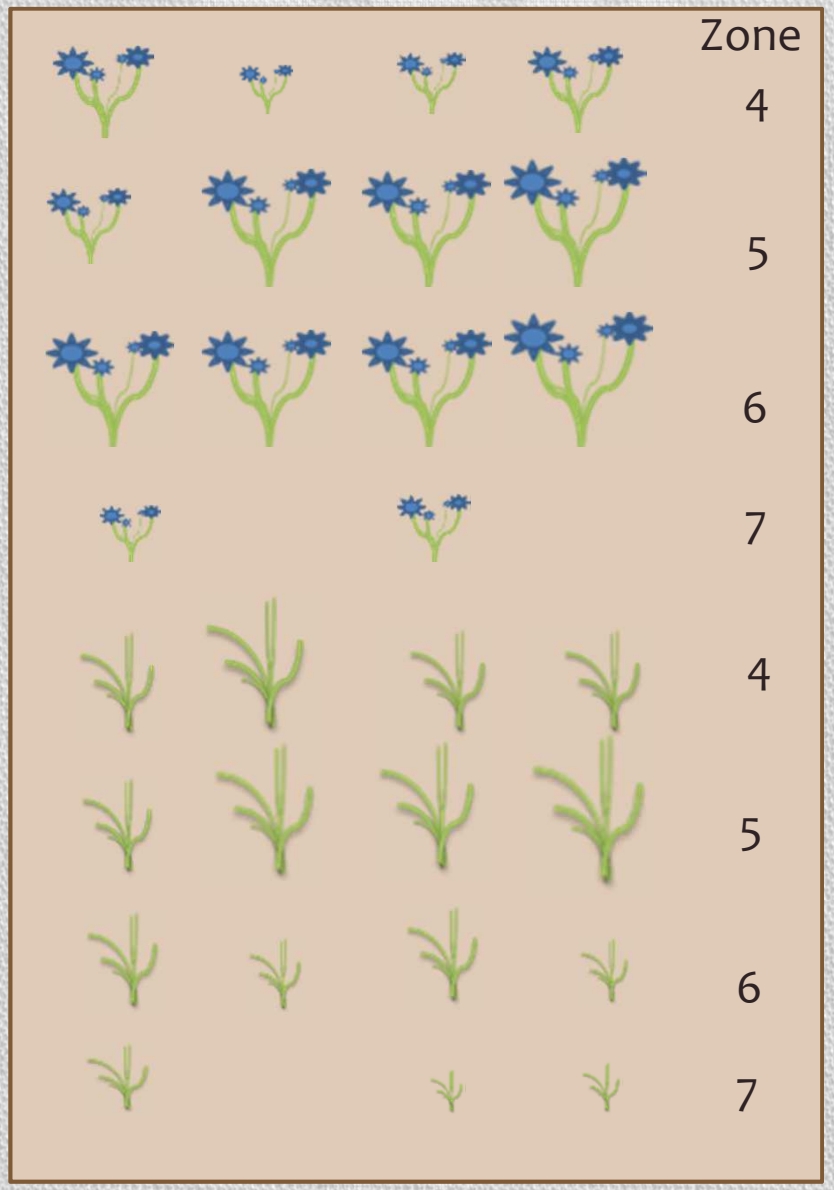
Floral Report Card

- "Experimental" Project BudBurst
- Uses cloned plants collected along a latitudinal gradient and planted at several BGs

Asks several questions, including:

- Do plants do best in their "home" climate zone?
- Do some species respond better to living in a different climate than others?

Also provides some QA/QC for PBB, as well as a demonstration to engage visitors



Challenges & Strategies for Success

Challenges

- Keeping volunteers engaged
- Ensure data quality

Strategies for Success

- Reduce barriers (allow any plant, any phenophase); No cost; Special campaigns; Use data and acknowledge participants!
- Online plant and phenophase guides with pictures; Cell phone entry; Scientific review with FRC data for verification

www.budburst.org

Participating in *Project BudBurst* can provide you and your family with an engaging outdoor experience and provide data that are useful to scientists studying climate change impacts on plants.

BRINGING PLANTS TO THE PEOPLE:

An Education and Science collaboration in hands-on Botany with the public

With **Jennifer Doubt**, National Herbarium of Canada Curator

Maggie Kilian
Head of Education
Royal Botanic Garden
Edinburgh

What

What

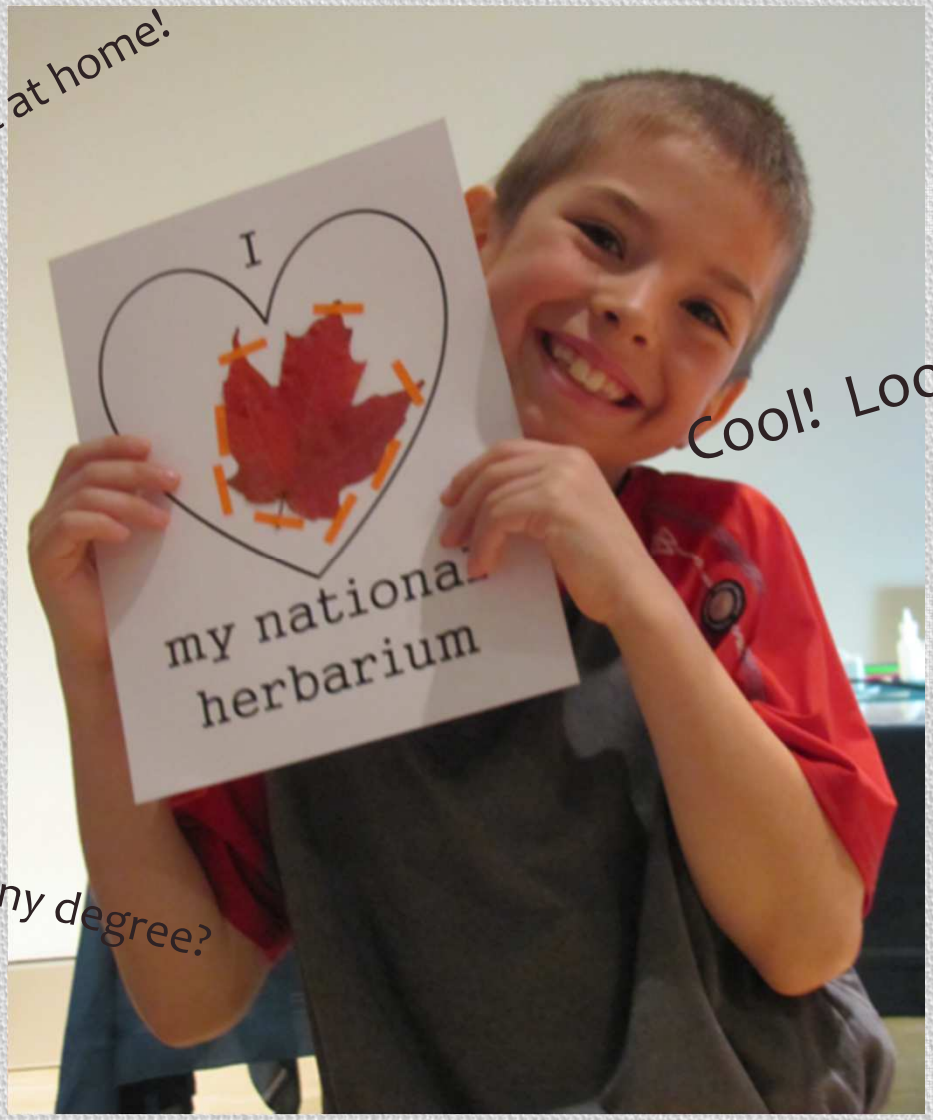
Why

- Try out the model of scientists working with the public
- Enhance the visitor experience
- Inspire Canadians to care for the plant world
- Bring the Herbarium to the public
- Highlight the Botany team's work in the Arctic
- Increased volunteer engagement at a different location
- Mount more herbarium specimens

Successes

What are you doing?

Hey, we could do that at home!



Cool! Look at this, Mommy!

Do you need a botany degree?

Challenges

Where are the toilets?

Where's the movie?

Where are the bugs?

Tools and Resources

- Great ideas!
- Desire to collaborate
- Great volunteers
- Management buy in
- Piloting
- Audience observation
- "get your brilliant idea in front of the public" session
- The plants and herbarium specimens themselves

Creating your own collaboration

Part 1: Dreaming

- *Exploring the possibilities*

Part 2: Identifying Resources and Challenges

- *What do you need to make it happen?*

Part 3: Visioning

- *Finding solutions*

Part 4: Making it Real

- *Outlining the Program*
- *Defining Roles*
- *Creating a successful collaboration*
- *Evaluation*