

*Evaluating Citizen Science:
Emerging principles and practices for the
21st century*

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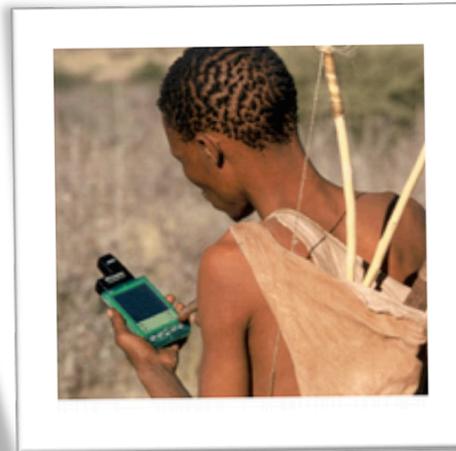
birds.cornell.edu



*A membership institution interpreting and conserving the earth's biological diversity through research, education, and **citizen science** focused on birds*

Citizen Science

Members of the public and professional scientists
engaged in collaborative research
to generate new science-based knowledge



Also Known As ...

participatory action research

Community-based
monitoring

community science

civic science

volunteer monitoring

local and traditional knowledge

public participation in scientific research

Current State of Citizen Science

Growing interest in citizen science

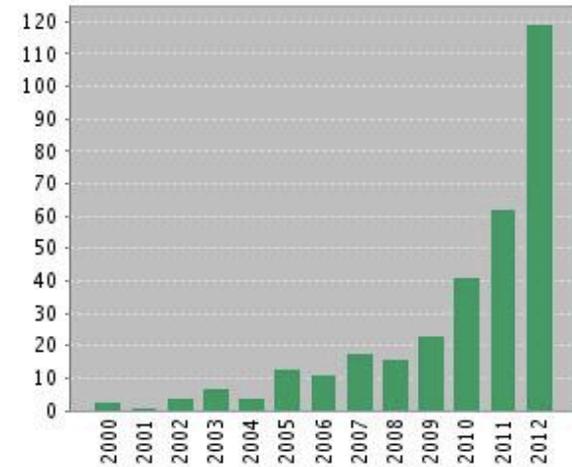
- International conferences
- Special issues in leading journals
- 1200+ papers using CS data
- White House Champions of Change

Growing need for measuring/ documenting the impacts of CS



Evaluation

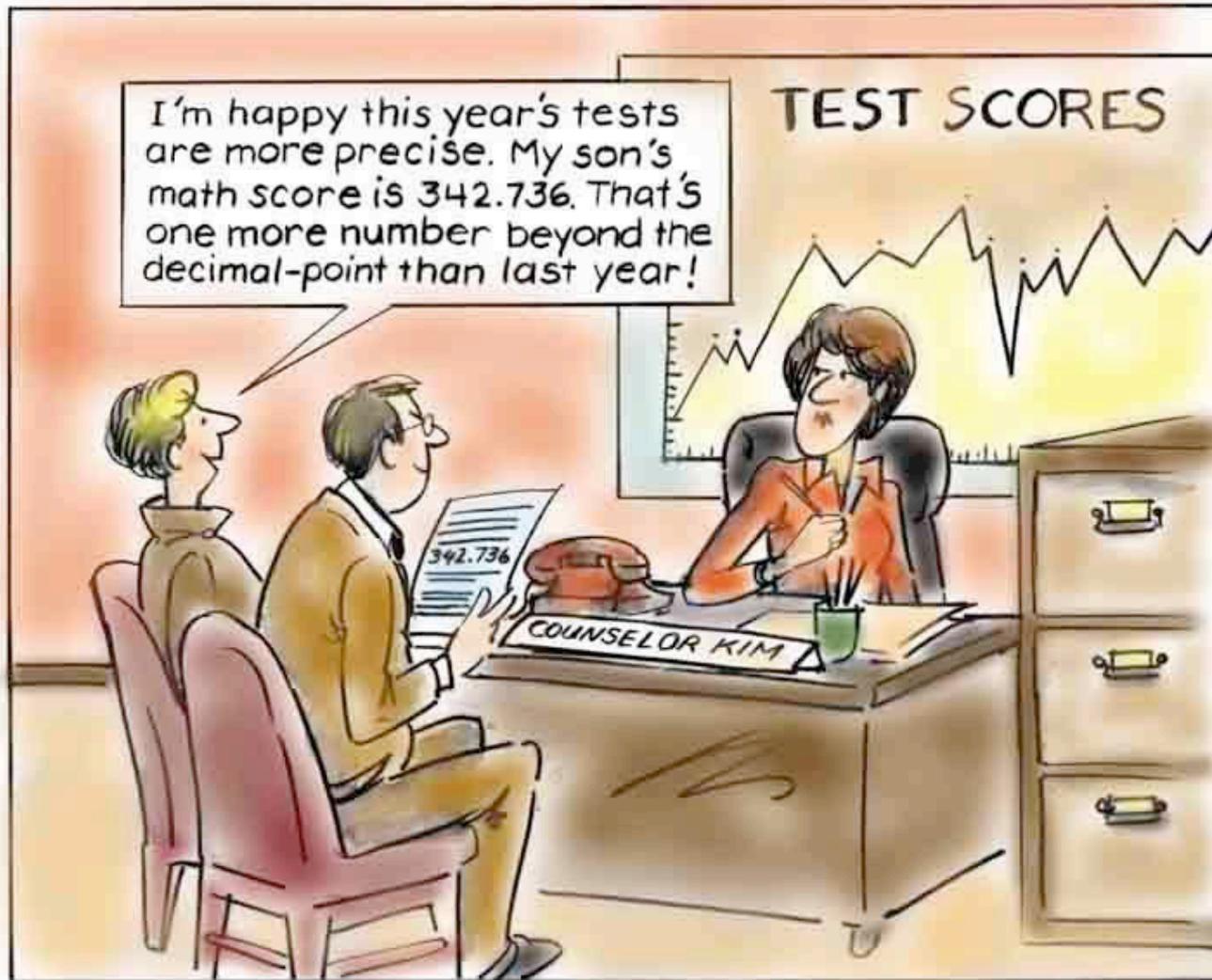
Published Items in Each Year



Evaluation is not . . .

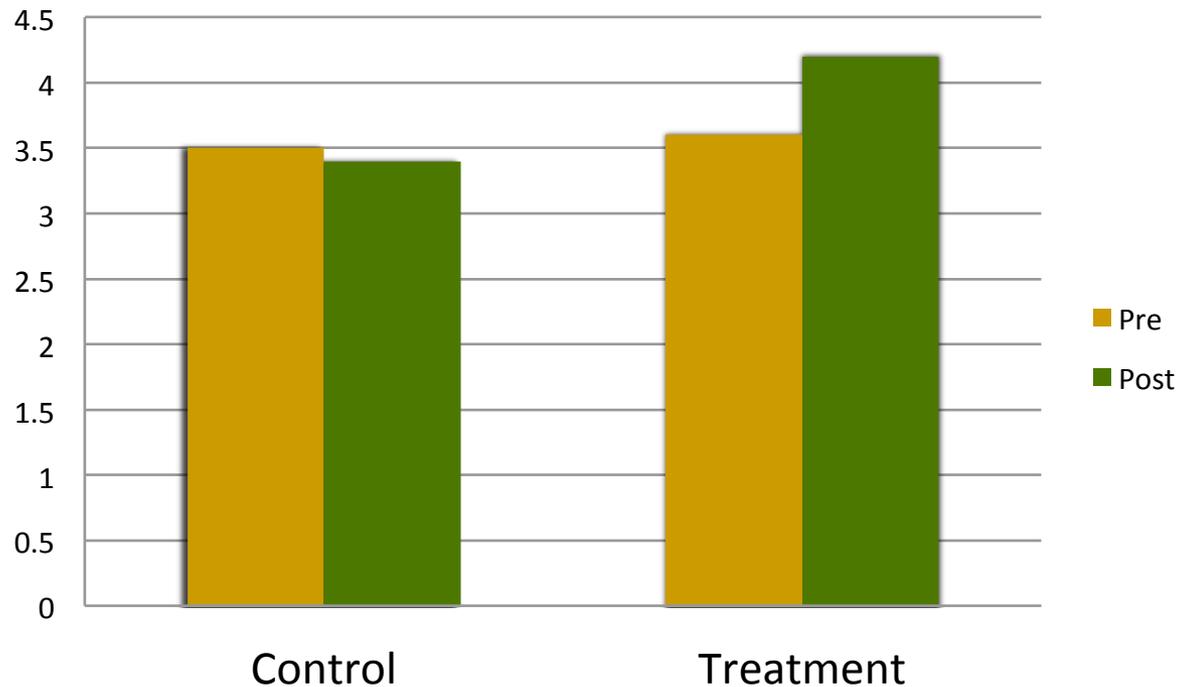


Evaluation ≠ Assessment



Evaluation ≠ Survey

Behavior Change Comparing Pre-Survey to Post-Survey



Evaluation \neq Research



Different goals, audience, end products

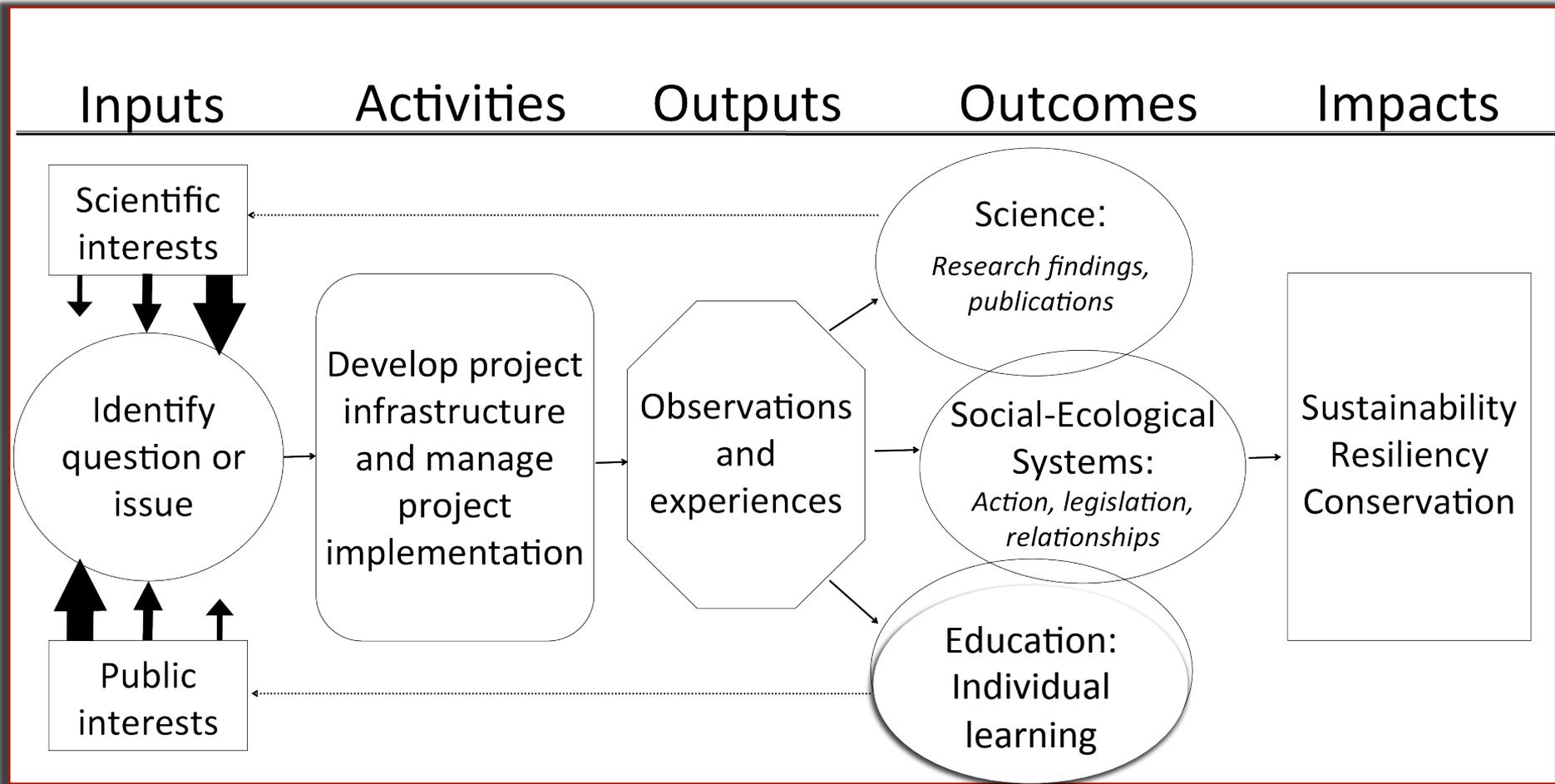
Evaluators are not...



Evaluation is . . .

the systematic collection of data
to determine strengths and weaknesses
of programs, policy, products,
so as **to improve their overall
effectiveness.**

Operational Framework



Shirk et al. 2012

Scientific Objectives



documenting range shifts
(Bonter et al. 2011)



identifying potential mismatches
(Batalden et al. 2007)



identifying vulnerable species
(Crimmins et al 2008, 2009)



health planning
(Levetin and Van de Water 2008)



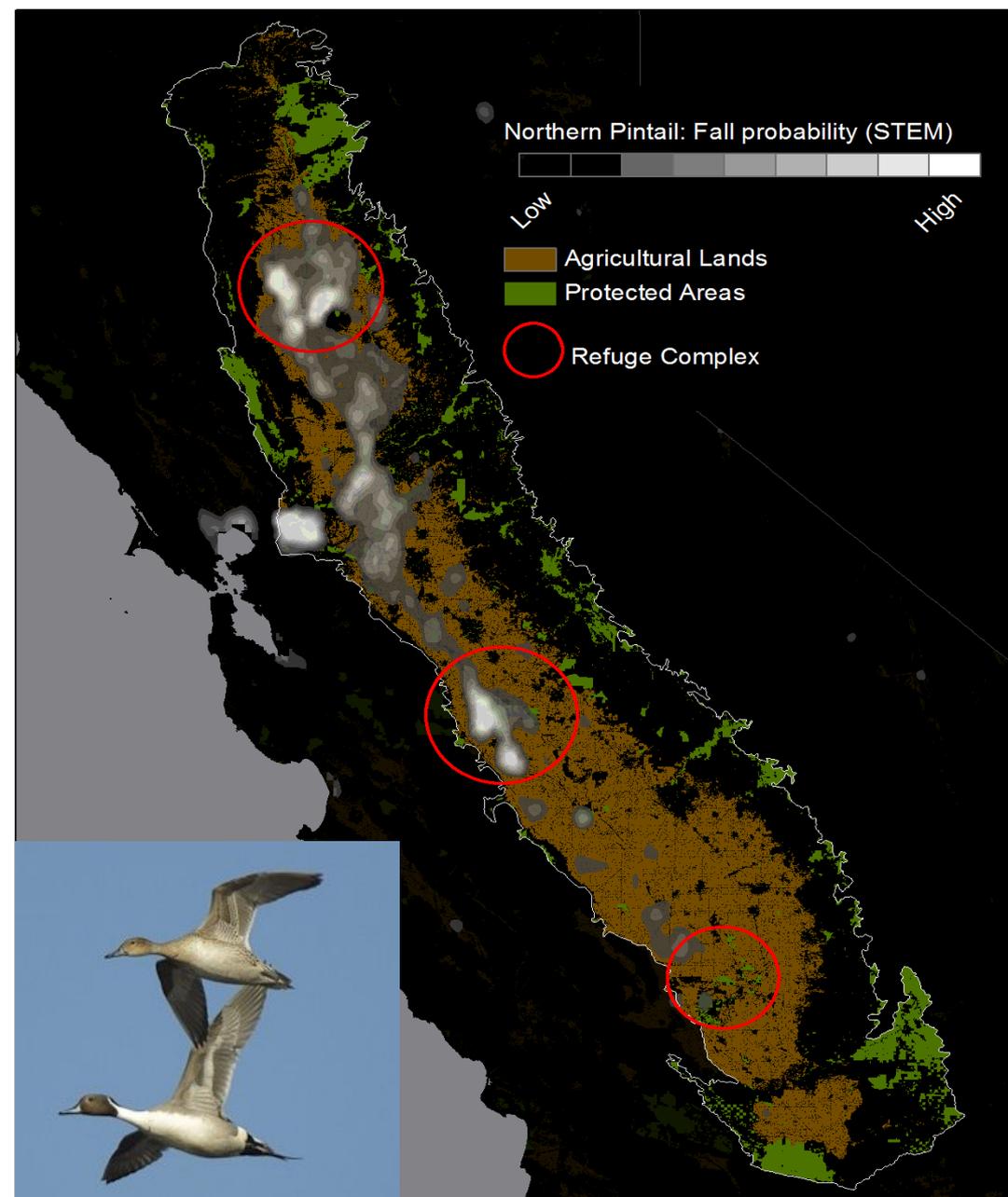
anticipating effects on water sources
(e.g., CoCoRaHS)

Research &
Policy

Research Indicators

- Publications
- Evaluation of data quality
- New technologies
- Accessibility and utility of data
- Increased understanding of natural systems
- Data informing management decisions, regulations
- Early detection
- Interdisciplinary collaborations
- Grad students, dissertations

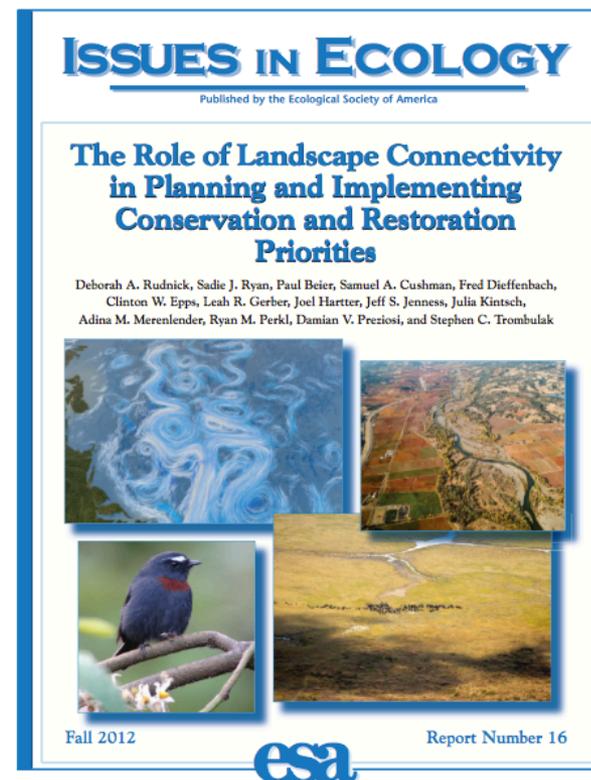




- *140 million observations*
- *Global*
- *99% of all known sp. Reported*
- *Data used to manage migration pathways (rice fields) in central CA.*
- *Over 90 publications*

Policy Indicators

- Inclusion of local expertise
- Utility of data
- Time to decision
- Local capacity building
- Policies and management plans
- Legislation passed
- Enforcement and adoption of plans, legislation, etc.



Adapted from Danielsen et al. 2008, Conservation Biology



By collaborating with citizens, natural resource management agencies and environmental organizations, COASST works to translate long-term monitoring into effective marine conservation solutions.

Individual Learning



engage critical thinking
(Trumbull et al. 2000)



science learning, skill acquisition
(Kountoupes and Oberhauser 2008)



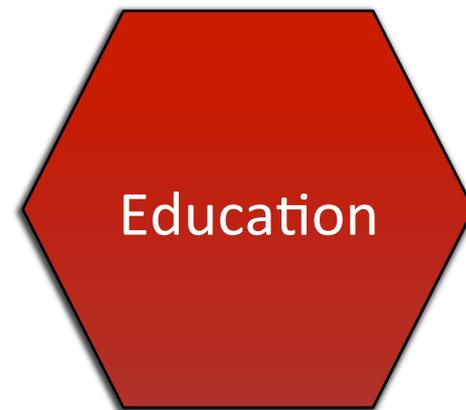
environmental stewardship
(Evans et al. 2005)



interest, efficacy
(Crall 2010)



citizen empowerment
(Kolok et al. 2011)





Educational Indicators

Framework for Evaluating Learning Outcomes



Citizenscience.org



DEWISE Scales

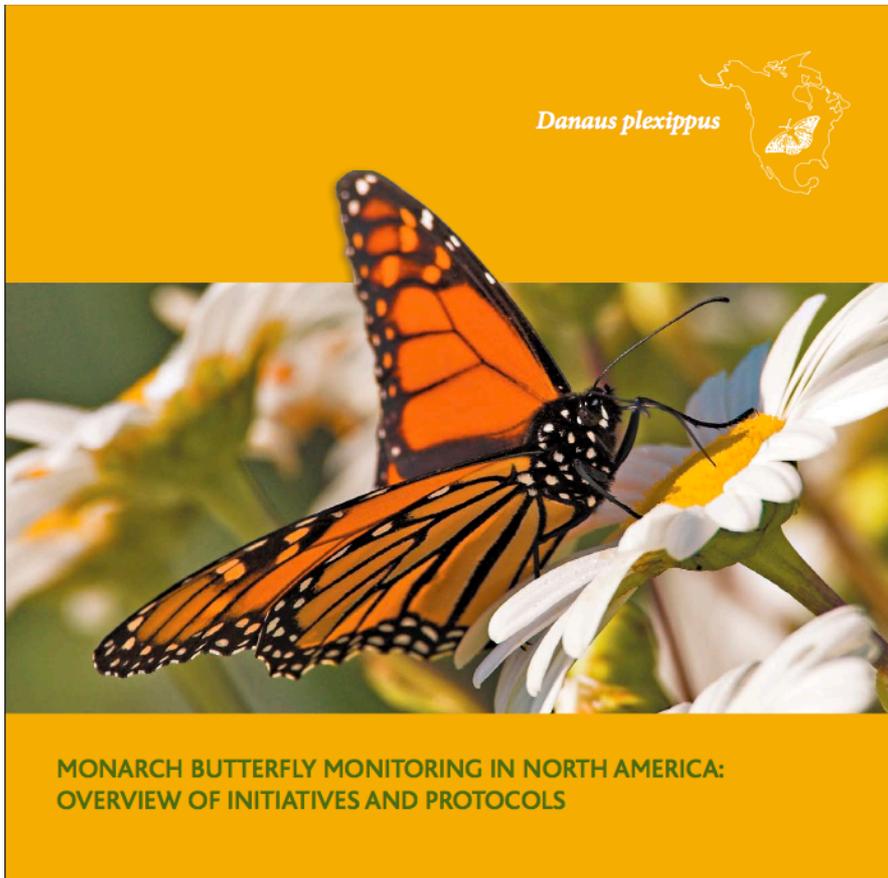
- Interest in Science and Nature (adult version)
- Interest in Science and Nature (youth version)
- Nature Relatedness Scale*
- Self-Efficacy for Science*
- Self-Efficacy for Environmental Action*
- Motivation for Science*
- Motivation for Environmental Action*
- Perceptions of Science Scale
- Skills of Science Self-Report*
- Data Interpretation Quiz
- General Environmental Stewardship Scale
- Behavioral Intention Scale*

**customizeable*



Monarch Larva Monitoring Project

MLMP Volunteers: Advocates for Monarch Conservation



"Lots of stories but not enough time right now. Have to get milkweed seeds ready to give away at Purdue's Bug Bowl."

Since being involved in the MLMP, volunteers have protected their monarch sites by placing land in preserves, easements, or trusts to ensure it will stay a monarch habitat rather than fall victim to development. Volunteers have also protected monarch habitat by influencing policy makers and land managers to change practices, such as mowing, limiting pesticide and herbicide use, and invasive plant removal.

Results of the survey demonstrated that MLMP volunteers not only contribute to long-term data collection, but they also take direct actions to conserve the monarch butterfly in its larval stage as well as its amazing migration. We're thrilled that MLMP volunteers are becoming active voices for monarchs in their communities!

The Great Sunflower Project

Pollinator Habitat Challenge

- Habitat Pollinator pilot study pre assessment
- Participants given a “habitat score”
- Habitat Pollinator pilot study post assessment
- Compare data from pre/post habitat assessment
- Do habitat assessments differ pre-post?
- Are more bees reported this year vs. last year?



Social-ecological Impacts



social capital
(Overdevest et al. 2004)



community capacity
(Ballard et al. 2008)



environmental justice
(Wing et al. 2008)



species management
(Delaney et al. 2006)

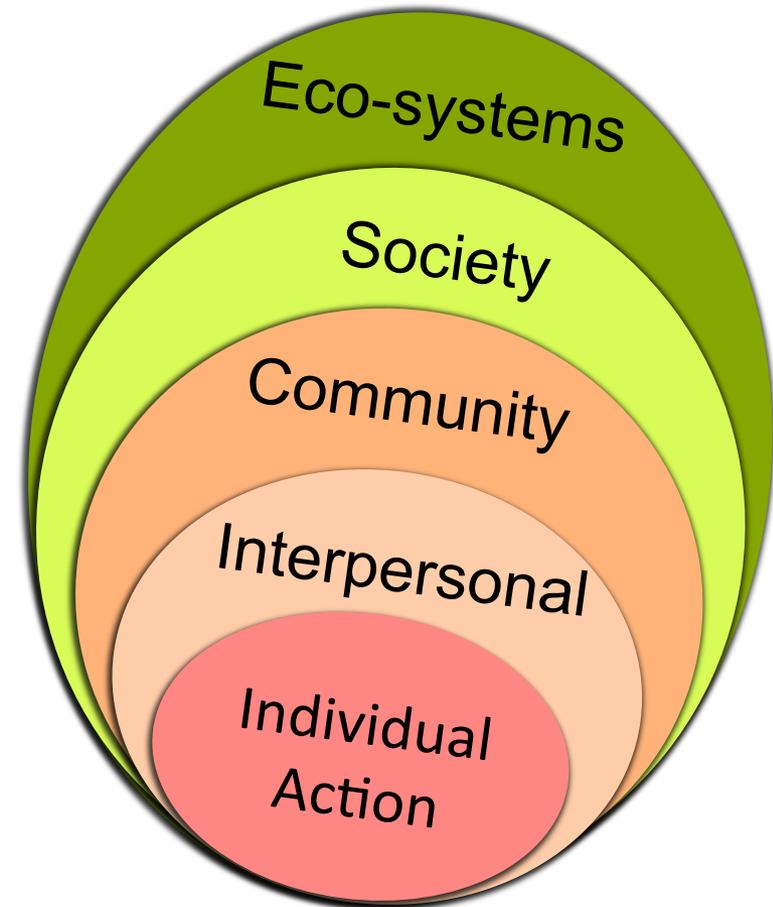


disaster and conflict resiliency
(Tidball and Krasny 2012)



Social-ecological Indicators

- Community buy-in and support
- Social capital
- Economic impacts
- Environmental justice
- Increased trust
- Species management
- Disaster and conflict resiliency

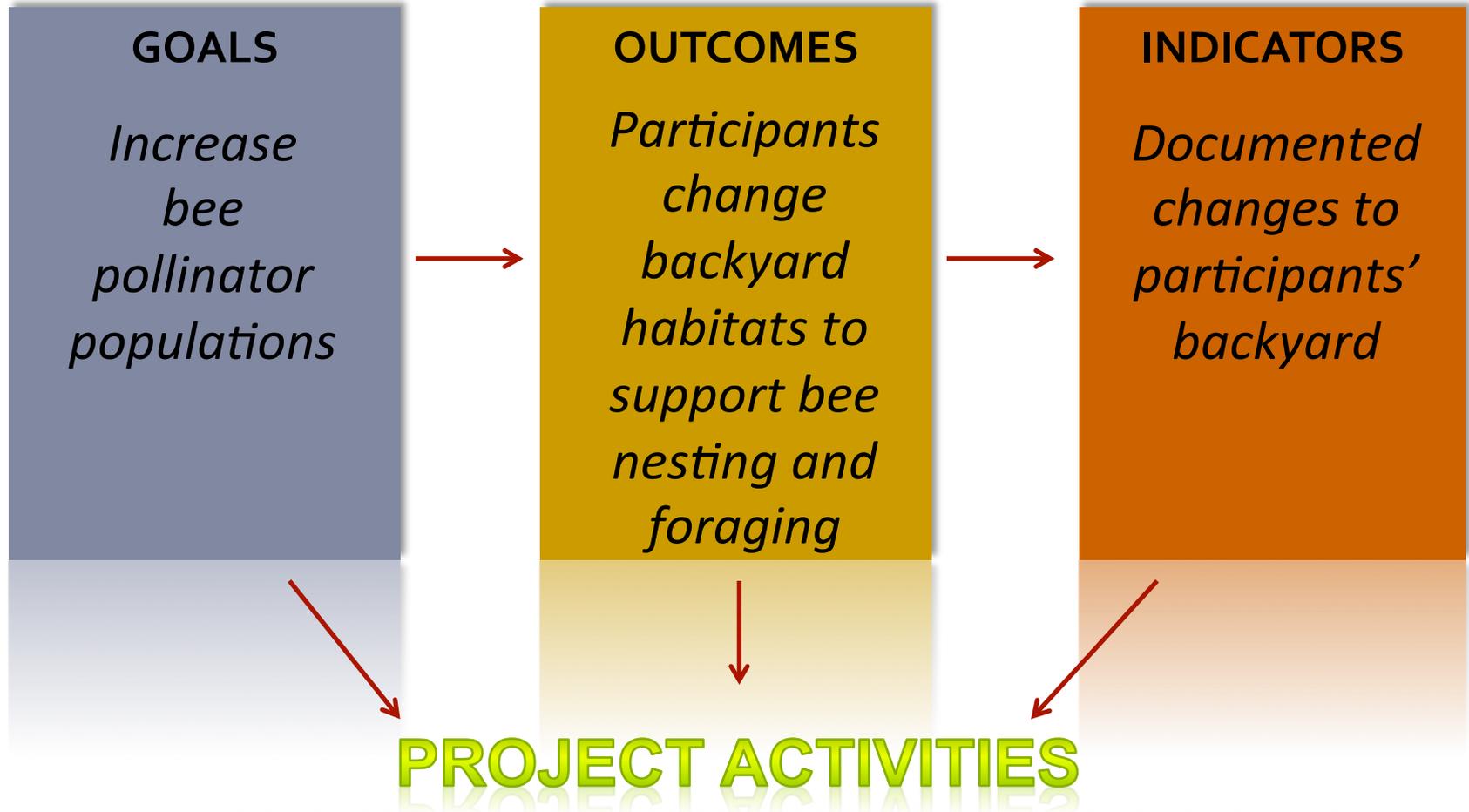


Sea turtle conservation

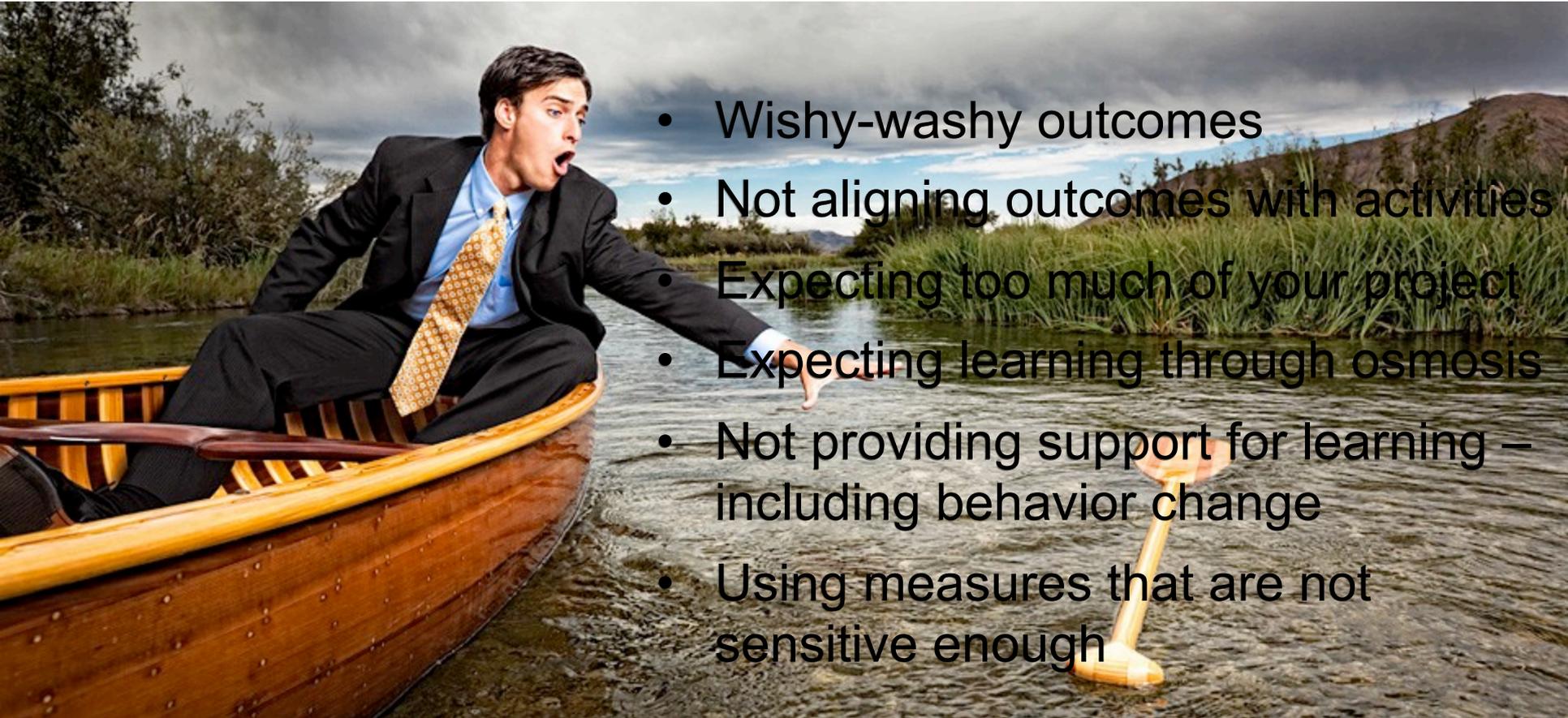


Tools for Evaluators

Goals, Outcomes, & Indicators



Common Pitfalls in Developing GOI's



- Wishy-washy outcomes
- Not aligning outcomes with activities
- Expecting too much of your project
- Expecting learning through osmosis
- Not providing support for learning – including behavior change
- Using measures that are not sensitive enough

Articulate Program Theory

Inputs

- Project team
- Materials
- Infrastructure
- Partners
- Funding

Activities

- Learn protocol
- Observe
- Collect data
- Submit data
- Communicate with others
- Explore data

Outputs

- Publicly accessible data
- Data visualization tools
- Volunteer effort/hours
- Exposure to science

Outcomes

- Increased capacity for youth dev.
- Expanded community network & learning opps
- Increased knowledge of best practices

Impacts

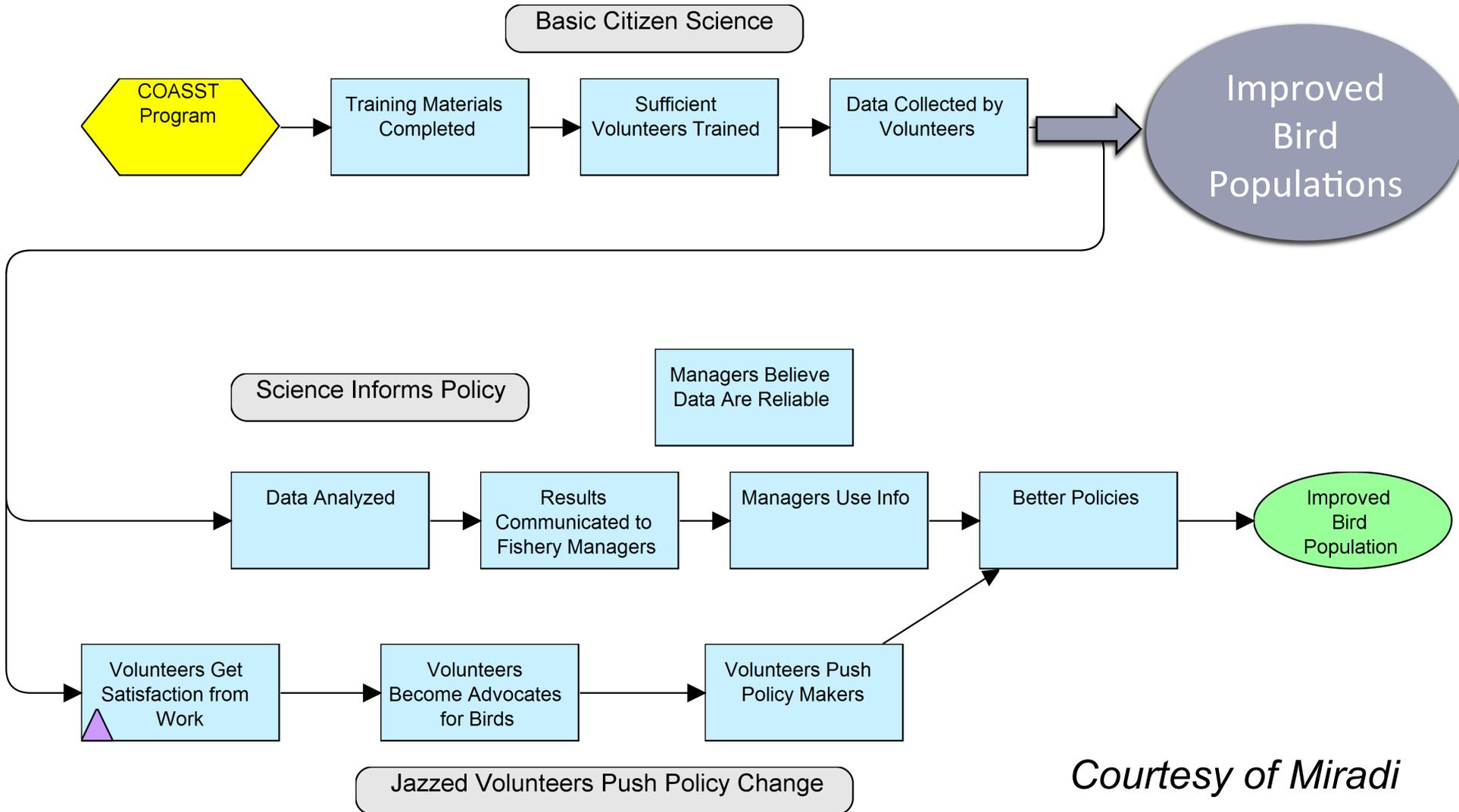
- Increased social capital
- Improved relationships with science orgs/NGOs
- Improved habitat for birds

Testing Assumptions >> Results Chain

“A results chain is a tool that shows how a project team believes a particular **action** it takes will lead to some desired **result**. More specifically, for conservation projects, a results chain represents a team’s **assumptions** about how project or program **strategies** will contribute to reducing important threats, **leading to the conservation** of priority targets.”

-- Foundations of Success

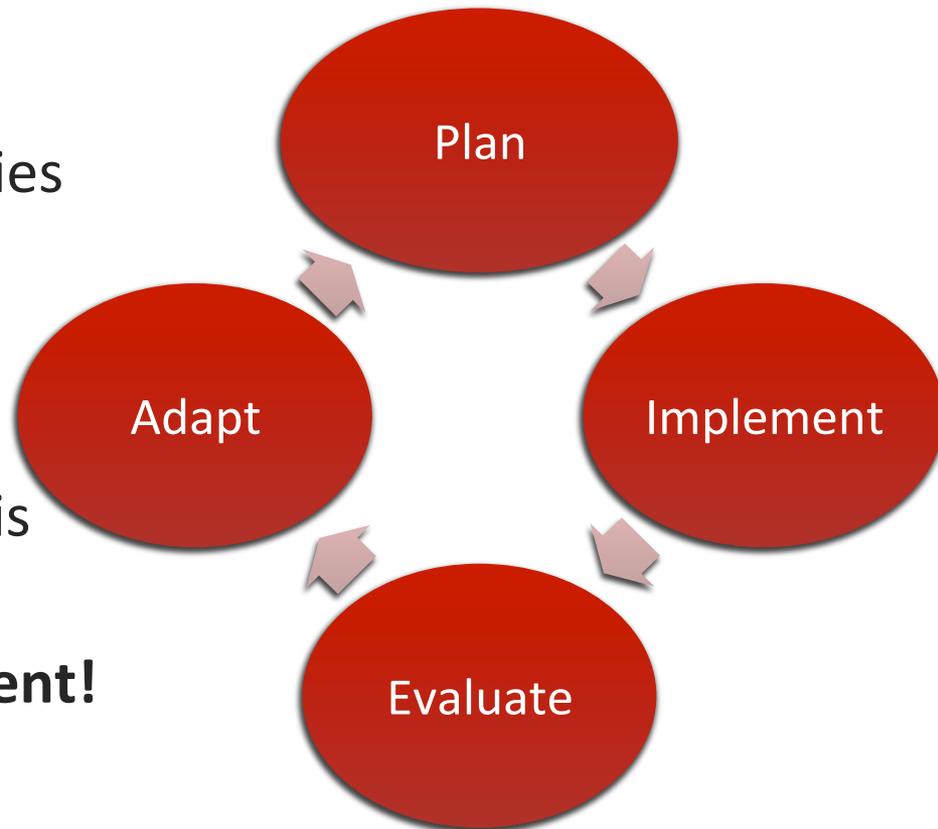
Results Chain



Planning for Success

Adaptive management cycle

- Build evaluation into program design
- Align goals – outcomes – activities
- Identify measurable indicators
- Measure change at multiple points in time
- Encourage evaluations of what is important, not just urgent
- **Document! Document! Document!**



Margoluis et al. 2009, Bliss 2001

Thank you!

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