Dwindling Numbers for an Iconic Insect: A Conservation Biologist Ponders Moving Beyond the Documentation of Declines

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Conservation requires knowledge

- **What** organisms need
- **How** those needs can be met
- **Why** needs aren’t being met
- **What** we must do to assure that they are met

Conservation requires action

Conservation requires hope
Key Points

1. Monarchs have a complex natural history.
2. People are very interested in monarchs.
3. Despite our interest, monarch numbers are declining.
4. There are many reasons for this decline.
5. How should we respond to this “problem with many causes”?
6. We may need to accept the reality that we are facing a “new normal” for monarch numbers.
1. MONARCHS HAVE A COMPLEX LIFE HISTORY
Annual Cycle

(migrating south, overwintering, migrating north, breeding)

2-3 generations
How does Complex Life History Affect Vulnerability?

• More vulnerable to anthropogenic change?
  – Depend on diverse resources across vast landscape

• Less vulnerable to anthropogenic change?
  – Propensity to move could buffer against shifting resources
2. PEOPLE ARE VERY INTERESTED IN MONARCHS
Monarchs are Intensively Monitored

MONITORING PROGRAMS
- NABA: North American Butterfly Association count program
- IL: Illinois monitoring network
- OH: Ohio monitoring network
- Shapiro: No. CA monitoring program
- Weber: MN monitoring site
- MLMP: Monarch Larva Monitoring Project
- MH: Monarch Health
- JN: Journey North
- WWF-Mex: World Wildlife Fund and MBBR in Mexico
- WTMC: Thanksgiving Monarch Counts
- MW: MonarchWatch
- SWMS: Southwest Monarch Study
- CM: Cape May roost monitoring
- LP: Long Point roost monitoring
- PP: Peninsula Point roost monitoring

- Adult Counts (NABA, IL, OH, FL, Shapiro, Weber)
- Tagging MW, SWMS
- Fall Roosts CM, LP, PP, JN
- Fall migration JN, MW
- Breeding & expansion
- Juveniles & parasites MLMP, MH
- Spring migration JN
- Spring migration
- Overwintering Colony counts (WWF-Mex, MBBR, WTMC)
Journey North Reports of First Spring Monarchs
Value of Citizen Science Efforts

Volunteers spent a total of ~86,000 hours (not including travel time) collecting data on monarchs in 2011 (equivalent of ~41 full time field technicians)

Ries and Oberhauser in review
Monarch Breeding Habitat

>7000 registered Monarch Waystations
Education
Willingness to pay survey

People will shell out money for monarchs

October 30, 2013
Conservation This Week

Americans Would Pay $4 Billion To Save Monarch Butterflies

It's an unusually loveable bug, according to a new

American Would Pay to Help Monarch Butterflies

Diffendorfer, Loomis, Ries, Oberhauser et al. 2013
How aware were you that monarch numbers were in decline before reading about it here?

Data from survey conducted by the National Gardener’s Association and analyzed by Leslie Ries
Monarchs are...

Why?

Beautiful
Interesting
Familiar
Impressive
Monarchs as Pollinators
3. DESPITE OUR INTEREST, MONARCH NUMBERS ARE DECLINING
Winter Colony Area Declining: Mexico

Data: WWF-Mexico & the Reserva de la Biosfera Mariposa Monarca (RBMM)
Winter Colony Numbers Declining: US

Western Monarch Thanksgiving Count
Total and Average Abundance Estimates w/ Standard Error of the Means at 76-162 Overwintering Sites from 1997-2013 (Monroe et al. 2014)
The Monarch Migration at Risk


- IUCN Red List: Endangered Phenomenon listing (1983)
4. THERE ARE MANY REASONS FOR THIS DECLINE
Breeding and Migratory Habitat

- US is losing >5000 acres per day to real estate & energy development (Land Trust Alliance 2013).
- Much of this land contained milkweed and nectar plants.
Herbicide-tolerant Crops Effectively Cause Habitat Loss

• In 2000, 34-73 times more monarchs came from agricultural fields than non-agricultural areas (Oberhauser et al. 2001).

• We have lost almost all of this habitat due to herbicide use on “Round-up Ready™” corn and soybean plants.
Adoption of Herbicide Tolerant Crops

% of Total Acreage

- Soybeans
- Corn

Data from USDA NASS
Overwintering Habitat Loss - Mexico

Photos by L. Brower
Overwintering Habitat Loss - CA

In past decade, 62 of 458 historic roosting locations in CA have been lost (Jensen and Black, in press).
Climate Change

- Extreme climate events
  - Winter storms
  - Drought
- Altered habitat location
  - Increased temperature in breeding range
  - Increased winter temperatures in southern US
- Disrupted biotic interactions
  - Changed milkweed/oyamel ranges
  - Altered timing of predators or parasitoids
Other Factors

- Insecticides
- Invasive species: Swallow-worts could serve as monarch “sinks”
- Increased disease incidence?
- Collisions with vehicles?
5. HOW SHOULD WE RESPOND TO THIS “PROBLEM WITH MANY CAUSES”? 
How We should NOT Respond

• Assume that there is nothing we can do, since addressing so many causes is impossible
• Argue about whose fault the problem is
• Assume that it is a waste of time and money to address smaller causes
Conservation Requires Knowledge

• Monitor monarchs to assess population status (document declines and successes)
• Study factors that affect monarch survival, movement, reproductive success
• Study potential impacts of climate change
Conservation Requires Action

- Address habitat loss (nectar/milkweed resources, overwintering sites)
- Plan for climate change
- Educate and advocate
- Support organizations working to preserve monarchs and pollinators
Conservation Requires Hope

- **International**
  - International network of Monarch Reserves (Can, Mex)
  - Sister Protect Areas (Can, Mex, US)
  - North American Monarch Conservation Plan (Can, Mex, US)

- **Mexico**
  - Decrees to protect overwintering sites
  - Sustainable tourism
  - Species at Risk Norm
  - Monarch Fund, *Fondo Mexicano para la Conservación de la Naturaleza, A.C.*
  - WWF-Mexico
  - Red Monarca (18 organizations working in MBBR)

- **US**
  - USFWS Wildlife without Borders
  - USFS and USFS-International Programs
  - Monarch Joint Venture (14 organizations promoting monarch conservation in the US)
  - State Departments of Natural Resources
  - Natural Resources Conservation Service (conservation in ag areas)
  - CA work to protect wintering sites

- **Canada**
  - Species of special concern
  - Federal management plan
Danaus plexippus

- NORTH AMERICAN MONARCH CONSERVATION PLAN
- PLAN DE AMÉRICA DEL NORTE PARA LA CONSERVACIÓN DE LA MARIPosa MONARCA
- PLAN NORD-AMÉRICAIN DE CONSERVATION DU MONARQUE
Monarch Habitat Conservation
Priority Milkweeds for each Region
Milkweed Seed Increase Project
Research and Monitoring
Education

• Citizen Science workshops
• North American Monarch Institutes
6. WE MAY NEED TO ACCEPT THE REALITY THAT WE ARE FACING A “NEW NORMAL” FOR MONARCH NUMBERS
What this Means….

• We may not see repeats of the large numbers that were common a decade ago
• We need to work to maintain public interest in monarchs
• We must do all we can to ensure that the new normal is sustainable
Our Efforts will be Worthwhile

• Monarchs exist in mosaic of rare and pristine, and common and disturbed habitats shared with many other species
• Incredibly interesting organism from which we still have a lot to learn
• Monarch migration is an unmatched biological phenomenon
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