The Chicago Wilderness Climate Action Plan for Nature:

Mitigation & Adaptation Strategies for Biodiversity Sustainability

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What is Biodiversity?

3 Levels of Biodiversity

1)Genes
2)Species
3)Ecosystems

- ***Genetic diversity*- the genetic variability among individuals within each species or population**
- ***Species diversity*- the number & abundance of different species in a region or ecosystem**
- ***Ecological diversity*- the variety of ecosystems**
- ***Functional diversity*- variety of functions such as energy flow & matter cycling needed for survival of species & communities**

Why is Biodiversity Important?

- *Genetic diversity*: the most basic component for long-term species survival (*ability to adapt*) & the continued evolution of new species.

"If natural selection is the paintbrush of evolution, then genetic diversity is its palette"

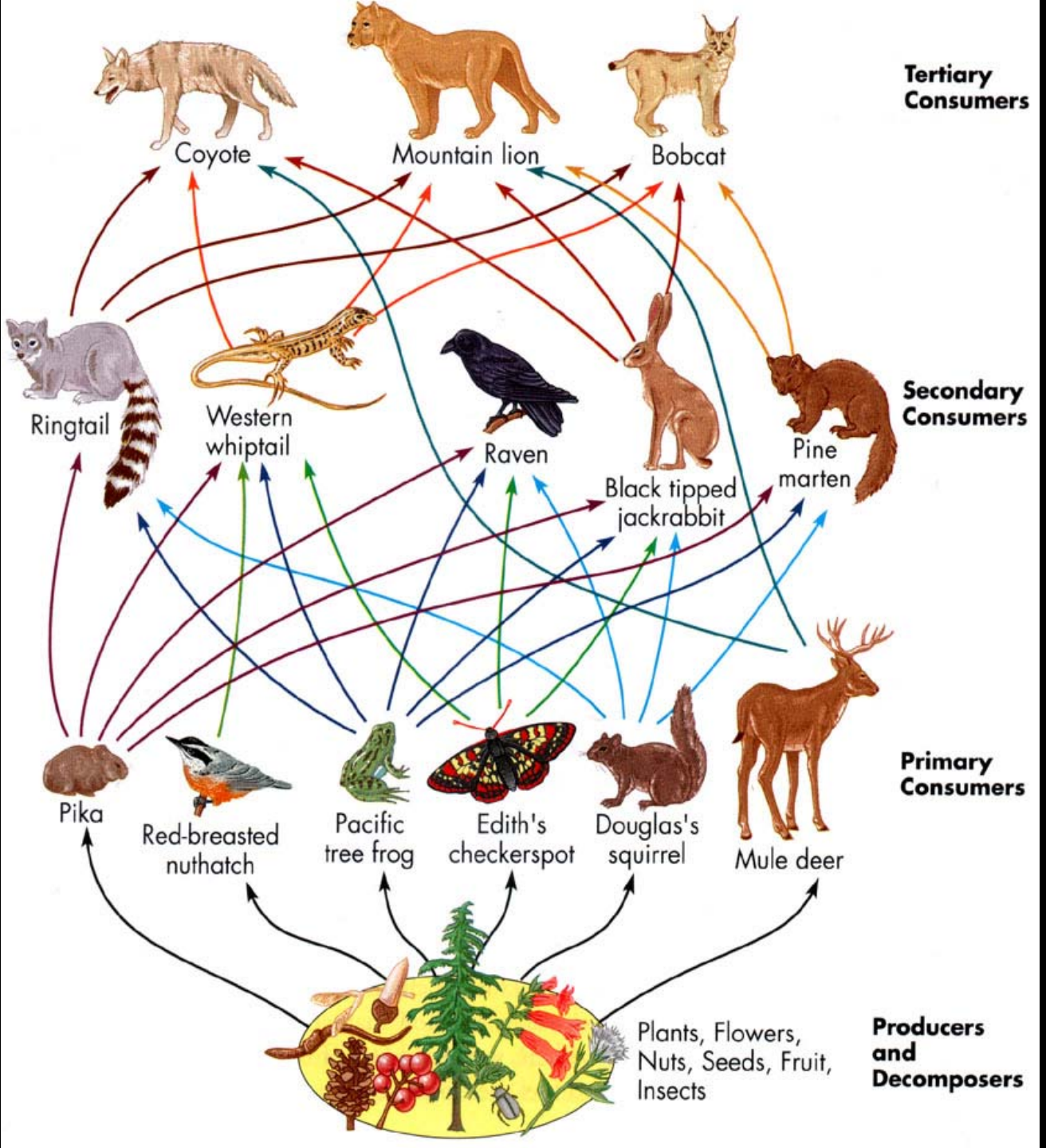
-J.A. Bailey

(2001)

Why is Biodiversity Important?

- *Species diversity*: plant, animal, & insect species interact & depend upon one another for what each offers e.g., food, shelter, oxygen, soil enrichment

- Species' abundance & distribution are dynamic, relative to a variety of factors, including climate
- As climate changes, the abundance & distribution of plants & animals also will change



- **Maintaining a wide diversity of species in each ecosystem is necessary to preserve the "web of life" that sustains all living things**

Why is Biodiversity Important?

- ***Ecosystem/functional diversity*: provides the conditions & drives the processes that sustain the global economy**

Understanding the benefits & services biodiversity provides

- **United Nations Development Program**
  - ✧ Generation of soils, maintenance of soil quality
  - ✧ Maintenance of air quality
  - ✧ Maintenance of water quality
  - ✧ Pest control
  - ✧ Detoxification & decomposition of waste
  - ✧ Pollination & crop production
  - ✧ Climate stabilization
  - ✧ Prevention & mitigation of natural disasters
  - ✧ Provision of food security

http://www.undp.org/biodiversity/biodiversitycd/bioImport.htm

What is the economic value for ecological services?

=

Why is Biodiversity Important?

"It is reckless to suppose that biodiversity can be diminished indefinitely without threatening humanity itself."

-E.O. Wilson

What are the major threats to Biodiversity?

1. Habitat destruction
2. Invasive species
3. Pollution
4. Over-harvesting (e.g., hunting)

Climate Change- a threat amplifier

Weather vs. Climate

- Weather: conditions of the atmosphere over a short period of time

- Climate: how the atmosphere "behaves" over relatively long periods of time, characterized by patterns of temperature, precipitation, humidity, wind and seasons

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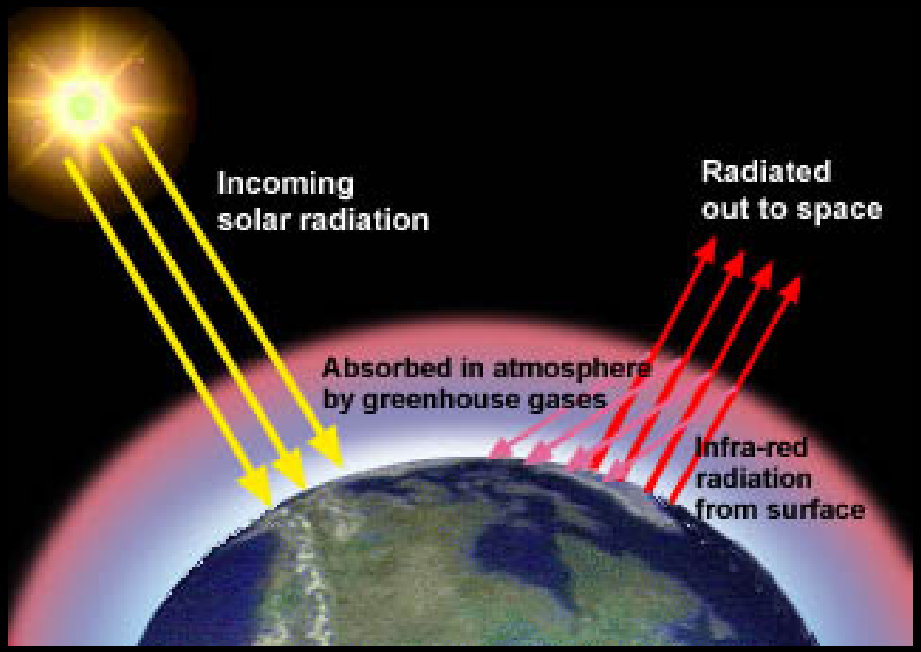
"Climate Change" is about changes in long-term averages of daily weather

What is “Global Warming”?

Source : www.linfield.edu

What is “Global Warming”?



Increasing global temperatures due to increasing levels of Green House Gases (GHG’s) in our atmosphere which magnifies the “green house effect”

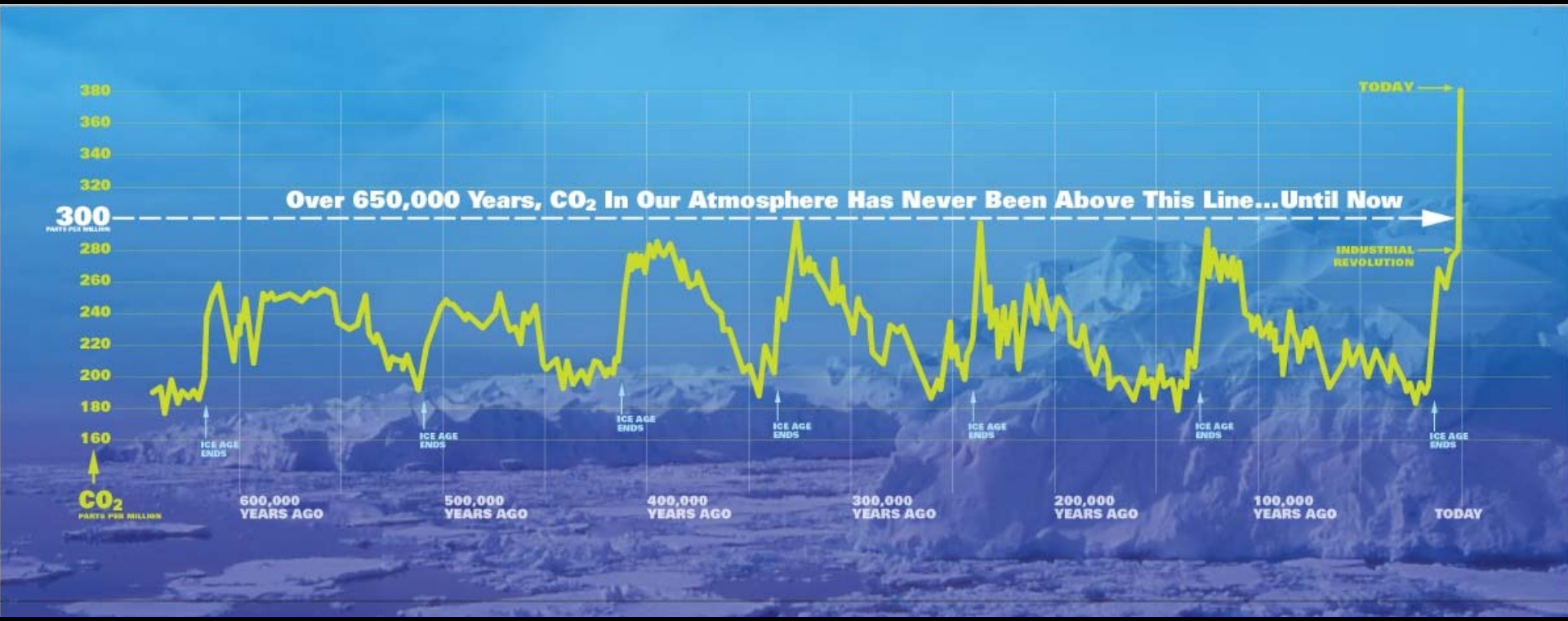
What is “Climate Change”?

Weather: conditions of the atmosphere over a short period of time

Climate: long-term patterns of temperature, precipitation, humidity, wind & seasons

- **“Climate Change” affects more than just a change in the weather, it refers to seasonal changes over a long period of time**

Atmospheric CO2 Levels Through Time



CO2 expected to increase 40% worldwide by 2030 if ways are not found to require mandatory emission reductions as the global economy recovers and continues to expand

US Energy Information Administration May 2009

A Changing Climate Globally

- ✧ Higher temperatures
- ✧ Changing landscapes
- ✧ Wildlife at risk
- ✧ Rising seas
- ✧ Increased risk of drought, fire & floods
- ✧ Stronger storms & increased storm damage
- ✧ More heat-related illness & disease
- ✧ Economic losses

A Changing Climate Globally

✧ Higher temperatures

During the 20th century, Earth's average temperature rose 1 degree Fahrenheit to its highest level in the past four centuries – believed to be the fastest rise in a thousand years

A Changing Climate Globally

✧ Higher temperatures

Projection: average surface temperatures could increase by 3-10 degrees Fahrenheit by the end of the century

* Impact both land & water temperatures

Be careful of averages…

A Changing Climate in Illinois

- Increased duration & intensity of heat waves in summer, with higher levels of humidity & evaporation
- Milder winters with fewer extremely cold days
- A longer growing season, with fewer frost days
- Changing patterns of rain and snowfall; overall, somewhat more rain may fall, but in fewer rain events of greater intensity
- Ratio of snow to total precipitation is expected to decrease
- Increased frequency of extreme weather events, leading both to more frequent & severe dry spells; more flooding fro heavy rains
- Changes to water resources including reduced water levels in streams, wetlands & lakes; more frequent flooding due to heavier rain events & lower water quality
- Reduced ice cover on area lakes, including Lake Michigan, with generally warmer water temperatures

Citation: the Chicago Wilderness consortium. 2008. *Climate Change And Regional Biodiversity: A Preliminary Assessment and Recommendations to Chicago Wilderness Member Organizations. the Chicago Wilderness consortium, Chicago il*

Impacts of Climate Change To Illinois

Expected impacts on regional biodiversity in a variety of direct & indirect ways:

- **Changes in the timing of natural events such as blooming, leaf drop, nesting & egg laying, migration, onset of hibernation, etc.**
- **Loss of suitable habitat for some species & increases in habitat for other species**
- **Gradual shifting of mobile species (generally northward) as temperatures increase**

Northern red oak leaves photo courtesy of the Kentucky Division of Forestry

Citation: the Chicago Wilderness consortium. 2008. ***Climate Change And Regional Biodiversity: A Preliminary Assessment and Recommendations to Chicago Wilderness Member Organizations. the Chicago Wilderness consortium, Chicago il***

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- **Loss of suitable habitat for some species & increases in habitat for other species**
- **Gradual shifting of mobile species (generally northward) as temperatures increase**
- **Disruption of ecological communities due to differential responses of species to climate change**
- **Disruption of predator-prey relationships & other inter-specific relationships**
- **Increased threats from invasive species, insects & disease pathogens**

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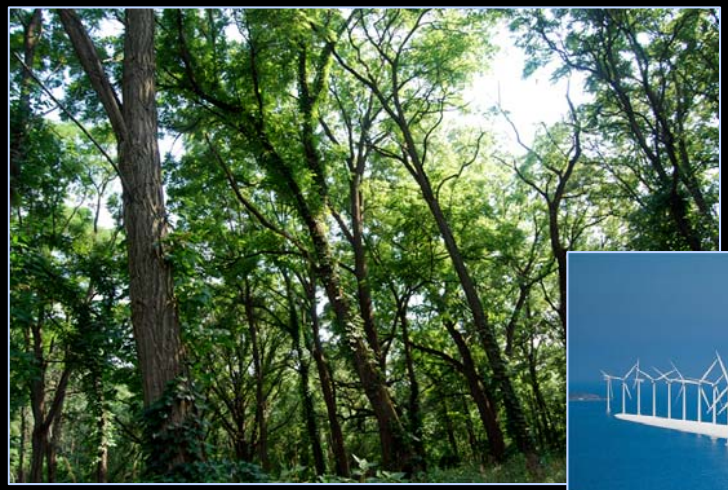
Responses to Climate Change: Mitigation vs. Adaptation

Mitigation

- Slowing the process of global climate change by lowering greenhouse gas levels in the atmosphere

- Planting trees that absorb CO2 from the air and store it in the soil or in their trunks and roots = carbon sequestration



Responses to Climate Change: Mitigation vs. Adaptation

Adaptation

- **Developing ways to protect people and places by reducing their vulnerability to climate impacts**

- **Building seawalls or relocating buildings to higher ground to protect against increased flooding due to storms; increasing genetic diversity, assisted migration**

Why Adaptation?

✧ CO2 has ~120 year atmospheric residency time

➢ Even if ALL emissions were stopped IMMEDITATELY, climate would continue to warm for a century, or more

➢ Some climate change is inevitable…We must *adapt* to these changes, & employ mitigation actions to reduce magnitude of future changes

CHICAGO CLIMATE ACTION PLAN
OUR CITY. OUR FUTURE.

City of Chicago Climate Action Plan

ENERGY EFFICIENT BUILDINGS

Buildings and related energy sources account for approximately 70 percent of all city emissions and are the primary target for our reductions. Key opportunities here are improving the energy efficiency of residential, commercial, and industrial buildings. Learn more...

CLEAN AND RENEWABLE ENERGY SOURCES

Clean and renewable energy sources include higher standards for fossil fuel plants and replacing energy from fossil fuel plants with renewable energy. Learn more...

IMPROVED TRANSPORTATION OPTIONS

Transportation accounts for 21 percent of all GHG emissions in the city. We need to reduce the amount people drive (measured in vehicle miles traveled or VMT) and improve fuel efficiency. Learn more...

REDUCED WASTE AND INDUSTRIAL POLLUTION

Waste and Industrial Pollution account for a much smaller share of Chicago's emissions, but we must change our waste and industrial processes to achieve our emissions reduction goal. Learn more...

ADAPTATION

Adaptation is crucial to ensure that the city can manage the changes that will come because of the levels of GHGs already in the atmosphere. The Plan identifies the steps required – and some already taken. Learn more...

GOAL

- **80% reduction in GHG emissions from 1990 levels by 2050**
- **25% reduction by 2012**

www.chicagoclimateaction.org

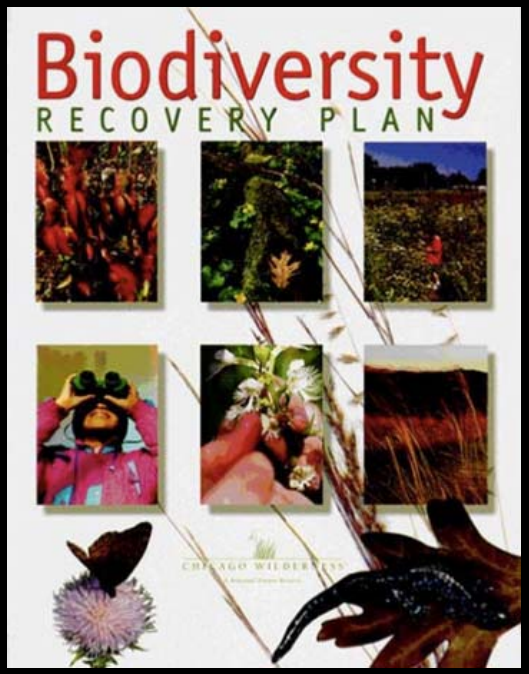
Chicago Wilderness Alliance

- Chicago Wilderness Alliance (CW): consortium of over 220 public & private organizations dedicated to preserving biodiversity in the greater Chicago metropolitan region (Chicago Wilderness Region)

Chicago Wilderness

Over 360,000 acres of protected open space

Chicago Wilderness Biodiversity Recovery Plan



GOALS of the BRP

- Status of biodiversity in the region
- Overview of threats facing each natural community
- Recovery goals & strategies for species, communities, landscapes
- Recommend conservation actions & communication strategies

Chicago Wilderness Biodiversity Recovery Plan

- Determined status & level of conservation concern for each natural community
  - Amount remaining
  - Condition
  - Biological Importance
  - Significance for global conservation

- Created tiered list of natural community conservation targets for CW region
- Identified broad, long-term recovery goals & conservation actions for high priority communities & animal assemblages

Chicago Wilderness Biodiversity Recovery Plan

Green Infrastructure Vision (GIV)

- ✧ **Map-based interpretation of goals outlined in the BRP**

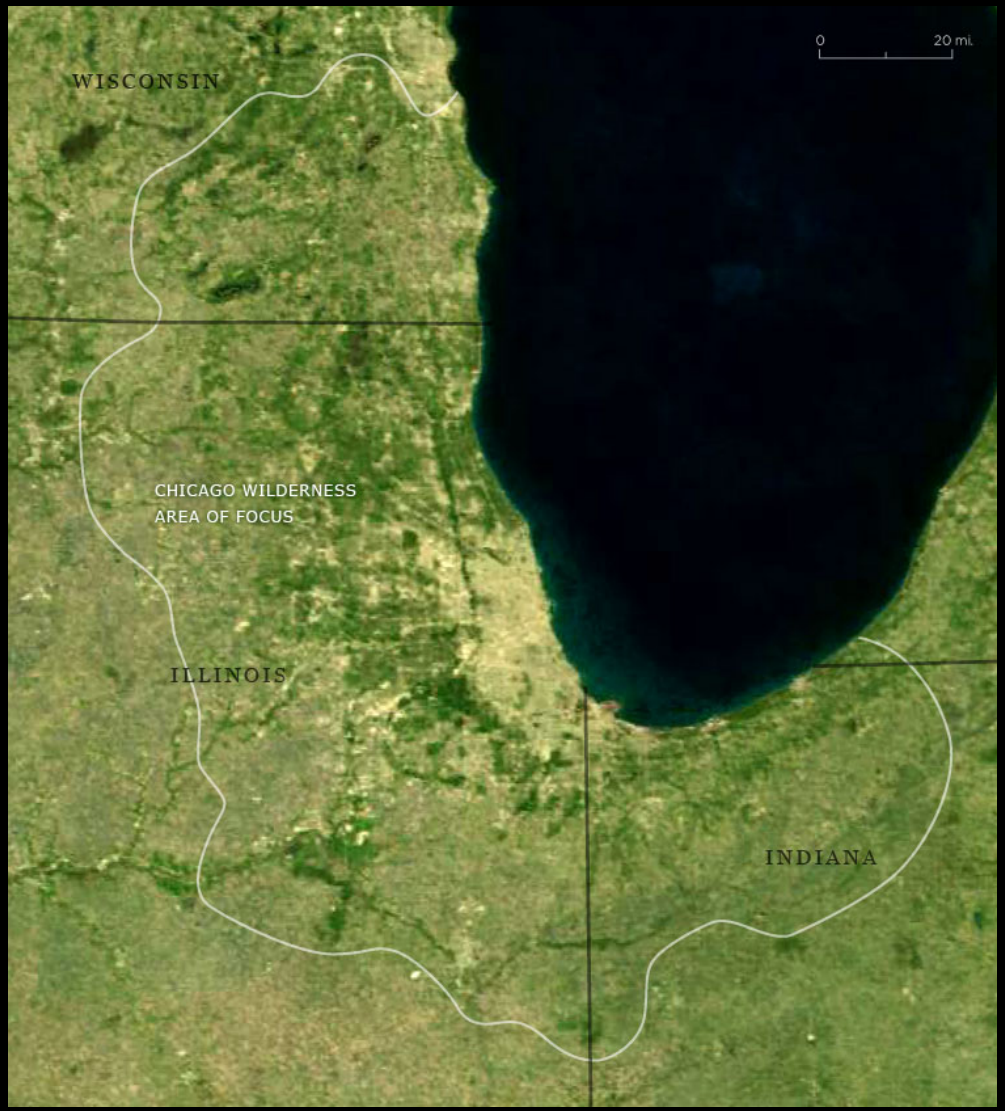
- ➢ **Identifies 1.8 million acres of "Resource Protection Areas" surrounding 360,000 acres of protected land within CW landscape**

Chicago Wilderness Biodiversity Recovery Plan

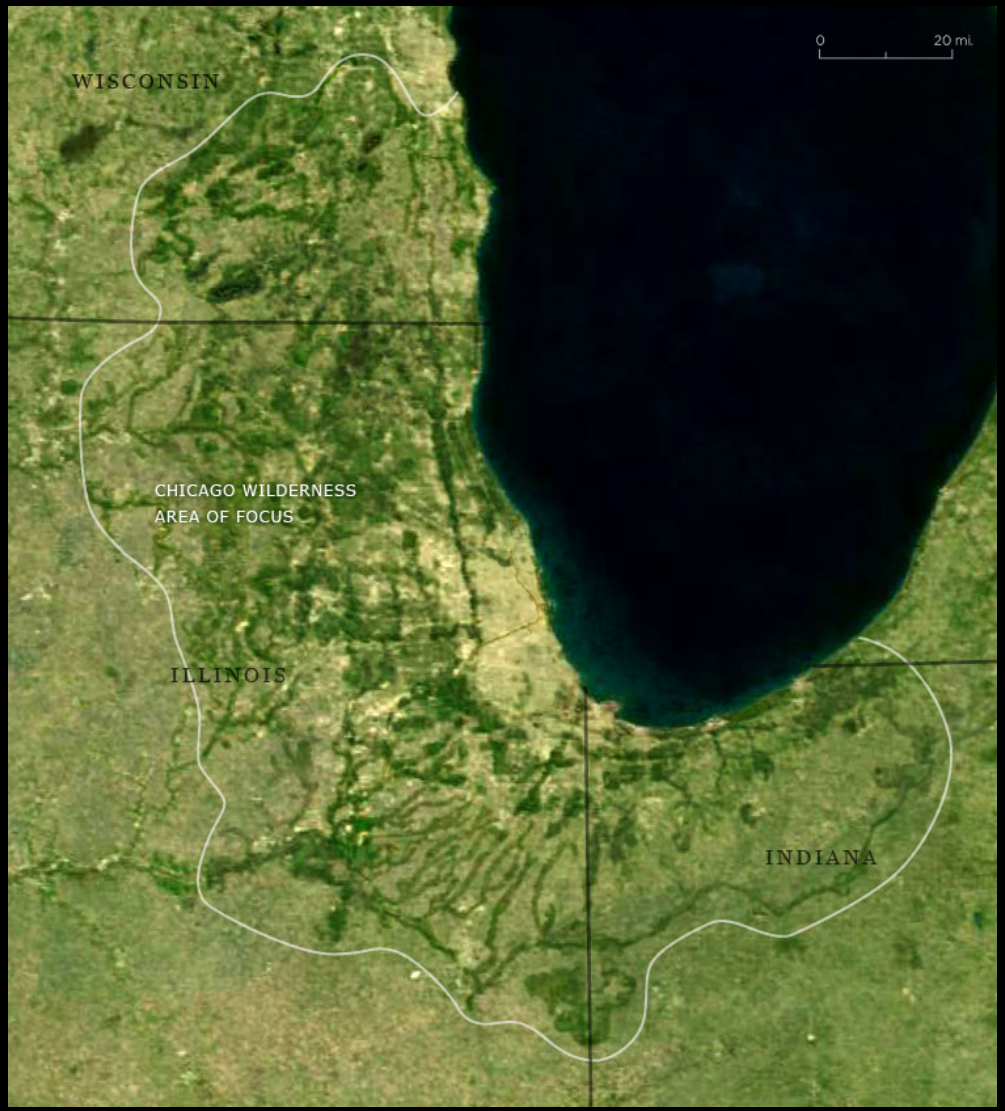
Green Infrastructure Vision (GIV)

- **The 140 Resource Protection Areas serve as opportunities to focus on:**
  - **land acquisition**
  - **expand restoration on private land**
  - **promote greenway connections**
  - **conservation easements**
  - **conservation design practices**
  - **agricultural preservation**
  - **protection of sensitive groundwater recharge areas**
  - **implementation of wastewater reclamation alternatives**
  - **protection of stream and wetland buffers**

Chicago Wilderness
Green Infrastructure Vision



Chicago Wilderness
Green Infrastructure Vision



Linking Climate Change to the BRP & GIV

Climate Change Update to the Biodiversity Recovery Plan – the Climate Action Plan for Nature

- What is it?
  - A collaborative project to review how the conservation targets identified in the BRP, and the threats to these communities, may be affected by climate change

Linking Climate Change to the BRP & GIV

Climate Change Update to the Biodiversity Recovery Plan – the Climate Action Plan for Nature

What are the goals?

1. Identify and understand the specific ways in which conservation targets, and the threats to these targets, will be affected by climate change

2. Examine whether strategies needed to promote biodiversity adaptation due to climate change differ from current biodiversity restoration and conservation strategies

3. Outline what actions can be taken to help natural communities adapt to the current and future climatic changes

Linking Climate Change to the BRP & GIV

Climate Change Update to the Biodiversity Recovery Plan – the Climate Action Plan for Nature

What is the process?

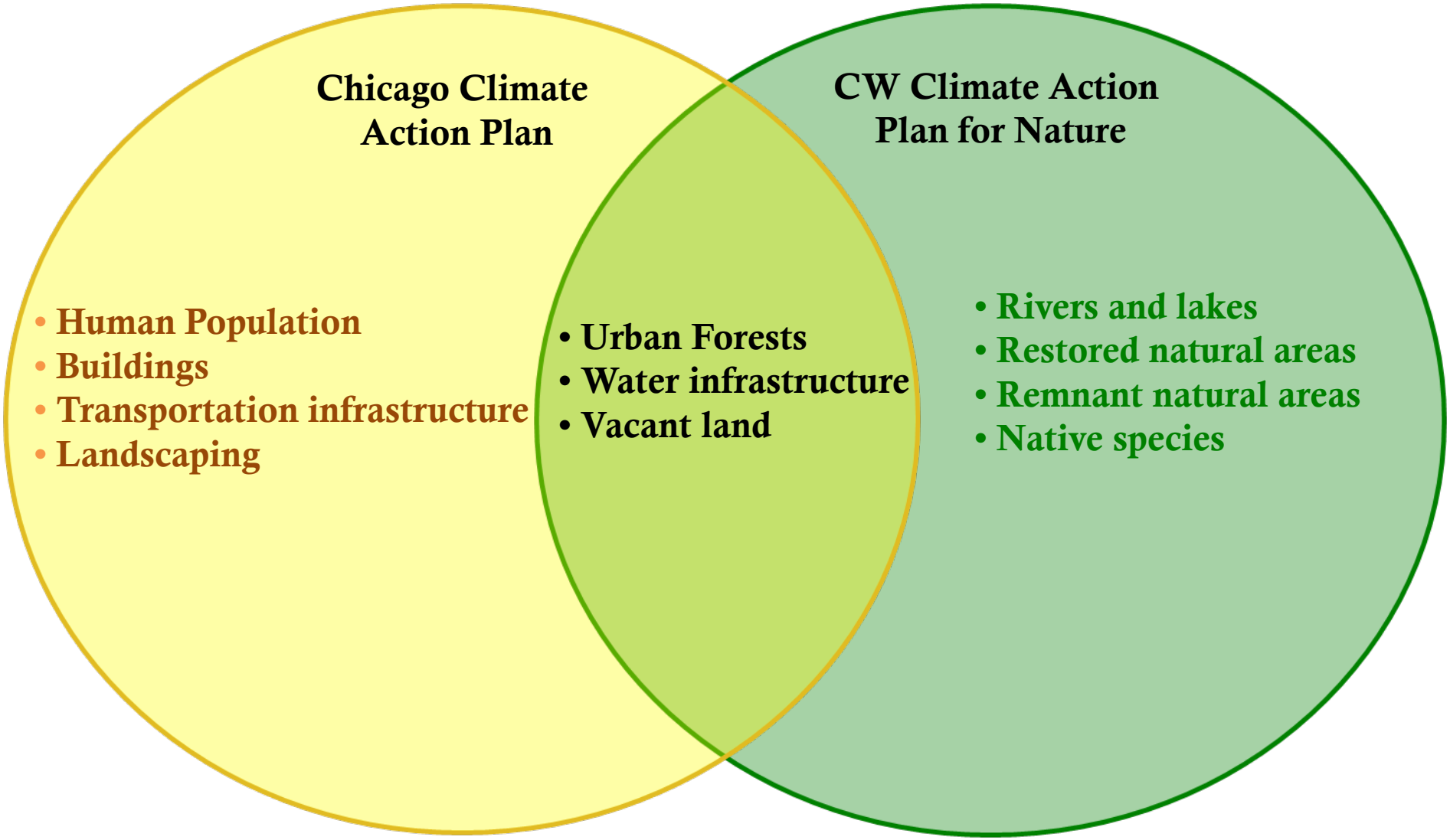
1. Composite information from CW Congress and 2 workshops (Feb, July 2009), one of them devoted to stormwater

2. Input and feedback from members of the CW Climate Change Task Force

3. Input and feedback from regional/local experts in climatology, ecology, biology, genetics, environmental science, and natural resource and land management

4. Input and feedback from CW teams and task forces

Chicago Wilderness & City of Chicago Plan Complimentary Attributes



CAPN & Water Strategies

- Adaptation Strategy 2c: Promote Resilient Land and Waterscapes for Biodiversity
  - ACTIONS for Protected Areas and Corridors include:
    - Assess resiliency of preserves and current preserve designs to withstand site-level disruptions in species dispersal and shifting microenvironments.
    - Increase connectivity by strategically reducing barriers to dispersal of native aquatic species.
    - Increase recognition in regulatory & conservation communities of the need to restore all stream segments.

CAPN Goal #3

- Anticipate and plan for increased impacts to aquatic biodiversity from altered stormwater, groundwater, and drought regimes.

CAPN Strategy 3a: Stormwater

- Strengthen direct linkages between stormwater management and biodiversity conservation especially in relation to climate change impacts.

- Make aquatic biodiversity a target of stormwater management.

CAPN Strategy 3a: Stormwater

ACTIONS:

- Develop a dialogue with stormwater planners to assess where and when imput is most effective as new plans are devised.
- Promote an integrated approach to water resource management for biodiversity conservation and CC resiliency using watersheds as the organizing framework.
- Identify and promote effective site-level demonstrations of ecosystem based approaches to stormwater management. Use these demonstrations to educate/communicate with audiences on the climate-adaptive benefits of ecosystem based approaches.

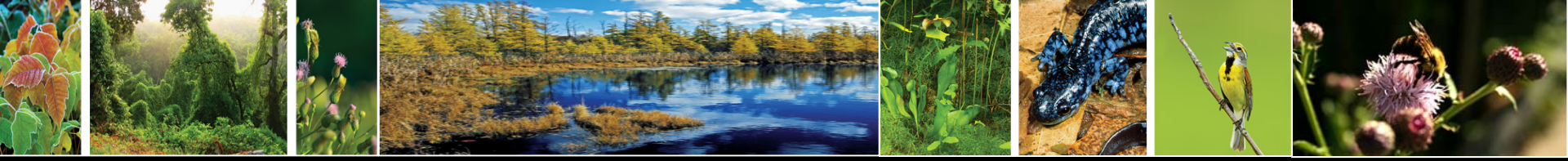
CAPN Strategy #3b: Groundwater and Drought

- Increased temperatures, increased drought and decreasing lake levels will put greater pressure on groundwater resources leading to higher rates of water extraction and related impacts to priority aquatic, wetland and riparian systems.

- Another concern is infiltrated stormwater that carries pollutants that are mobile in groundwater and can affect surface systems.

CAPN Strategy #3b: Groundwater and Drought

- Work with local officials, municipal water suppliers and county stormwater management commissions to implement the CMAP Regional Water Supply Plan and stormwater BMP's to reduce stress on the region's shallow aquifers and their associated aquatic and terrestrial ecosystems.
- Determine minimum stream base-flow requirements needed to sustain healthy aquatic ecosystem functions for priority river and stream segments within the region.
- Reduce groundwater draw downs by promoting use of native landscaping.



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Images from CW 2009 Winter publication: Pitcher plant, Dave Jagodzinski; Blue-spotted salamander, Michael Redmer; Dickcissel, Rob Curtis; Poison ivy, Dave Jagodzinski; Kudzu, Eric Secker; Canada thistle, Dave Jagodzinski; Volo Bog, Jack Graham