



Ecosystems and Climate Change



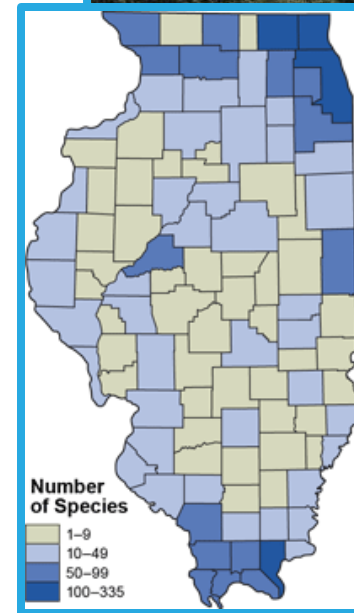
What is an “Ecosystem”?

- All **living things** in a particular area, as well as non-living things with which they interact (air, soil, water, sunlight)
 - Trees/plants
 - Birds
 - Fish
 - Insects
 - Wildlife



Chicago: Urban Area Ecosystem

- Urban forests
- Prairies, savannas, marshes
 - 11% of Cook County consists of protected lands
- Lake Michigan
- High diversity of native species (e.g. plants)
- Wildlife (e.g. hawks, snakes, fox, coyotes)



Populations of Endangered and Threatened Species in IL (IDNR, 1993)



Ecosystems and Climate Change

- Climate is an important environmental influence on ecosystems
- Climate change can alter **where** species live and **how** they interact
 - Potential to fundamentally transform current ecosystems



Ecosystems and Climate Change

- Temperature
- Precipitation
 - When we receive it
 - How we receive it
- Not just weather and climate...
 - Length of day
 - Ice cover



Above: Chicago Botanic Garden

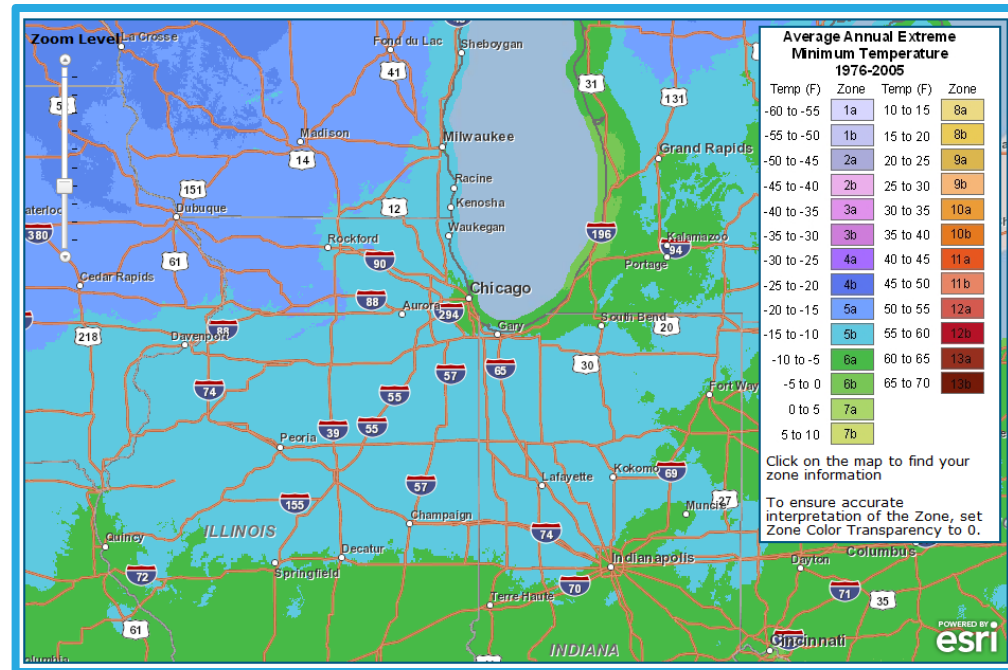


Left: Plant Hardiness Zones (USDA)



Temperature Changes

- Plant hardiness zones
 - Determined by the extremes of winter cold
 - Guides the selection of plants for both ornamental and agricultural purposes
 - Zones are changing as climate warms



Plant Hardiness Zones (USDA)



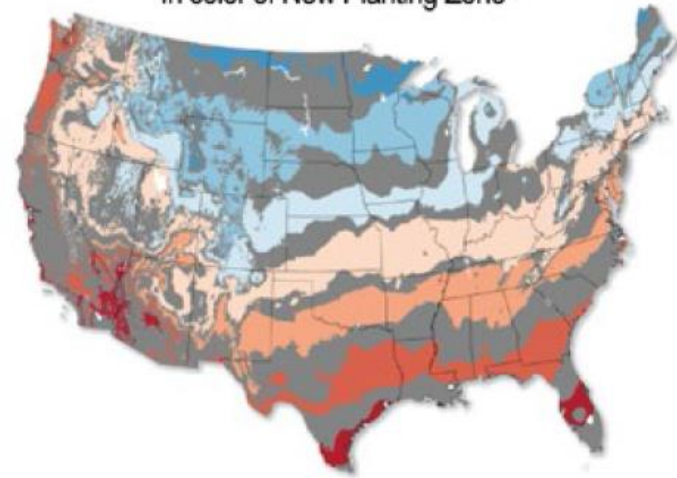
Temperature Changes

Shifts in Plant Hardiness Zones

Zone Changes in Past 10 Years
In color of New Planting Zone



Zone Changes in Next 30 Years
In color of New Planting Zone



Average Annual Extreme Minimum Temperature by Climate-Related Planting Zone

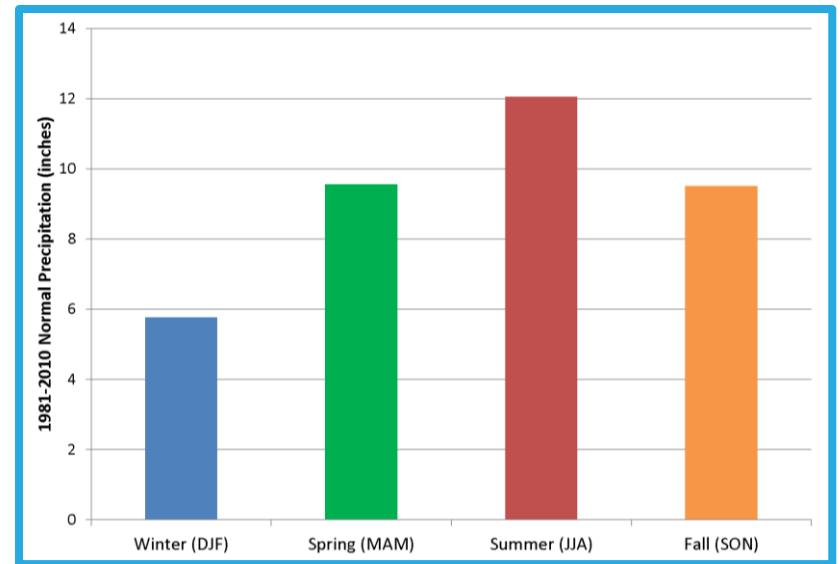


Figure 31. The map on the left shows the change in Plant Hardiness Zones calculated from those based on the 1971-2000 climate to those based on the 1981-2010 climate. Even greater changes are projected over the next 30 years (right). (Figure source: NOAA).



Precipitation Changes

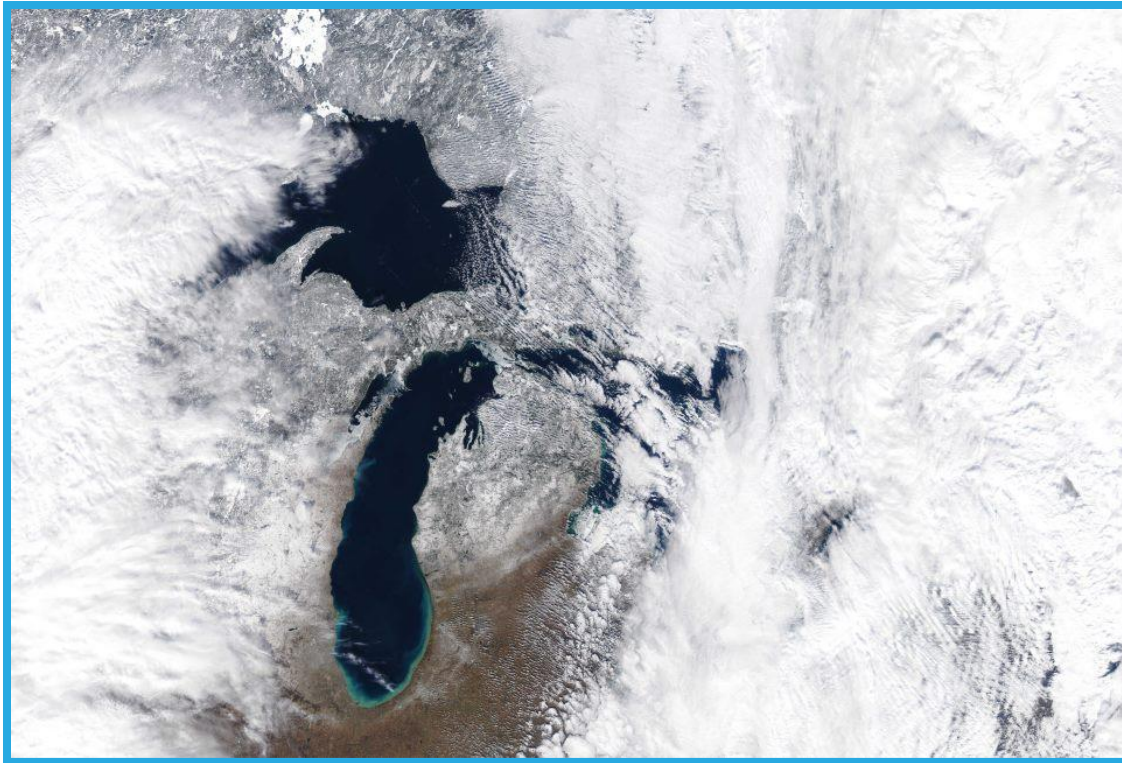
- Seasonal precipitation patterns
- Intensity of precipitation



1981-2010 precipitation normals by season (Chicago O'Hare Airport)



Lake Michigan Changes



- 1973-2010
 - Water warmed by 3.3 °F
 - Winter air temperatures over lake warmed by 2.7 °F
 - Ice cover reduced by 77%

Climate Change Impacts (Examples)	Communities Threatened
Increased storm intensity/frequency will increase non-point source pollution of aquatic systems and wetlands (nutrients, sediments, etc.)	Wetlands, Streams/Rivers, Lakes, Lakeshore
Increased temperatures will promote species that are invasive or act as disease vectors	Prairie Grasslands Savannas Wooded-Communities
Increased temperatures/evapotranspiration will lead to variability in lake levels & promote shifts in the location of coastal and near shore habitats	Great Lakes
Increased temperature will reduce the duration/extent of ice cover on the lakes	
Potential for reduced synchrony with key resources along migration routes may make them more vulnerable.	Mammals

Source: Chicago Wilderness (<http://climate.chicagowilderness.org/>)



NCA Key Messages on Ecosystems

Landscapes and seascapes are changing rapidly, and **species**, including many iconic species, **may disappear from regions** where they have been prevalent or become extinct, altering some regions so much that their mix of plant and animal life will be come almost unrecognizable.



Timing of critical biological events, such as spring bud burst, emergency from overwintering, and the start of migrations, has shifted, leading to important impacts on species and habitats.



The **composition of the Midwest's forests is expected to change** as rising temperatures drive habitats for many tree species northward. **Increased vulnerability due to fire, insect infestation, drought, and disease outbreaks.**



Climate change will exacerbate a **range of risks to the Great Lakes**, including changes in the **range and distribution of certain fish species**, **increased invasive species and harmful blooms of algae**, and **declining beach health.**

