

Chicago Climate Action Plan Natural Environment Adaptation Working Group Guiding Document: Overview, Priorities, Accomplishments

Working Draft May 2011

Like the Chicago Climate Action Plan (CCAP), this is designed to be a living document that is nimble and adaptive. We intend to update it over time to reflect new work, research and plans.

This document provides an overview of the CCAP Natural Environment Adaptation Working Group and its goals and accomplishments. It is meant to guide the Working Group members, to inform and inspire other actors in the region, and to promote dialogue among all parties promoting adaption to current effects of and preparation for scientifically-based forecasted impacts of climate change.

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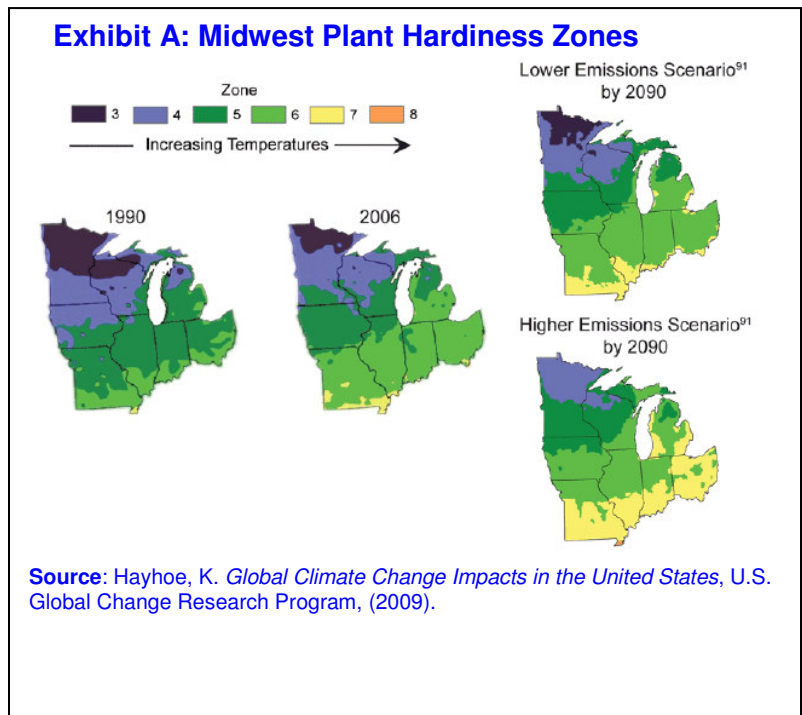
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I. INTRODUCTION

Scientists, businesses and governments around the world are in agreement: climate change is one of the most serious issues facing the Earth today. Greenhouse gas emissions come from both natural and human sources. In the last 50 years, levels of carbon dioxide in the atmosphere have risen 25 percent; levels of methane, an even more potent greenhouse gas, have more than doubled. Because of these increases in heat-trapping gases, under a high-emissions scenario, 2010 predictions show that by the end of the century, Chicago's annual average temperature could increase from the current average of 50° to 59° Fahrenheit (°F), in addition to a range of other impacts. Here are some of the most pressing impacts Chicago can expect from a changing climate:

- **“Migrating seasons” for regional climates:** By century's end, Chicago winter is forecasted to feel similar to Pittsburgh and summers similar to Knoxville or, under high emissions, Baton Rouge.
- **Temperature increase:** Under high emissions, the Midwest may experience 45-85 days over 95° F (35° Celsius) by century's end.
- **Heat-related morbidity:** By 2085, there may be 450-1,200 heat-related Chicago metro-area deaths per year.
- **Changed precipitation patterns:** As compared to the 1961-1990 average, spring and winter in 2070 could have 20-35% more precipitation events; summers could have 10-15% less.
- **Great Lake impacts:** Long-term trends discern, under a high emissions scenario, that the average Lake Michigan level could decrease by up to 1.5 feet by century's end. The Great Lakes could experience an increased likelihood of extreme storms.
- **Plant Hardiness Zone shift:** The Midwest's zones have shifted and could continue to shift ½ to 1 zone every 30 years, (see Exhibit A). From 1990-2006, Northern Illinois shifted how much, representing a 10° F range change in the lowest temperature of the year.



Source: Hayhoe, K. *Global Climate Change Impacts in the United States*, U.S. Global Change Research Program, (2009).

Expected climate impacts such as temperature increases and changing precipitation patterns will impact the natural environment in a variety of ways. As climate changes, the abundance and distribution of plants and animals will change, and is already doing so. Regional biodiversity is already severely impacted by habitat loss and disturbance, invasive species, pollution and other stressors. Climate change will interact with and in some cases exacerbate the negative effects of these existing stressors and it will also introduce new stressors that will further impact the native species in this region. (Source: 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.)

The earth responds slowly to changes in atmospheric gases. For this reason, we will continue to face the consequences of our past, current and future heat-trapping gas emissions. In addition to reducing greenhouse gas emissions in the future, we must also take action by adapting to changes that are already happening and preparing for the changes ahead. The Chicago Climate Action Plan (CCAP) is the City's blueprint for a more sustainable future. The dynamic plan charts our course of how we will reduce our carbon emissions by 25% from 1990 levels by 2020 and prepare to climactic changes already affecting us.

Building on the CCAP, the City formed working groups to delve deeper into helping people, the built environment and the natural environment adapt to the changing climate. This document is meant to reflect the priorities, goals, suggestions and accomplishments of the Natural Environment Adaptation Working Group.

II. WORKING GROUP OVERVIEW

The Chicago Climate Action Plan (CCAP) Natural Environment Working Group is one of three Adaptation working groups under the CCAP implementation task force. The others focus on how to help People and the Built Environment adapt to climate change.

Purpose

The goal of the Natural Environment Adaptation Working Group is to help Chicago's natural environment adapt to climate change by:

- Promoting ecosystem adaptation through new and existing actions and initiatives (by City and partners);
- Ensuring that City initiatives that may affect the natural environment take climate change into account;
- Promoting local and regional dialogue and coordination around urban ecosystem adaptation;
- Promoting research that can inform or enable ecosystem adaptation Chicago and region; and
- Collaborating with the People and Built Environment Adaptation Working Groups to ensure they are considering the natural environment in their work.

Members

Chicago Department of Environment (Convener)
With support from WRD Environmental, Global
Philanthropy Partnership and Civic Consulting
Alliance

Chicago Department of Housing & Economic
Development
Chicago Park District
Chicago Botanic Garden
Chicago Metropolitan Agency for Planning
Chicago Wilderness

The Field Museum
Forest Preserve District of Cook County
ICLEI - Local Governments for Sustainability USA
Illinois Department of Natural Resources
University of Notre Dame
The Nature Conservancy
USDA Forest Service
US Environmental Protection Agency
US Fish and Wildlife Service

2011 Priority Actions

- Define priorities and scope of the Working Group and record the process by which the group strives to meet the goals of its work plan. Document actions already completed to demonstrate progress and share with other cities.
- Create climate-readiness checklist(s) for City project managers dealing with the natural environment to help project managers "ask the climate question" in their day-to-day work. This will help ensure projects are planned and implemented in a way that will help the natural environment adapt to climate change, reduce risk and provide lasting benefits over costs in the long-term.
- Revise tree planting list to reduce plantings of tree species that forecasts indicate will not be viable in the Chicago region within the tree's lifespan due to effects of climate change.
- Coordinate with regional and national efforts to adapt our natural environment to climate change, including Chicago Wilderness' Climate Action Plan for Nature.
- Build the case for decentralized approaches to green infrastructure such as DOE's Sustainable Backyards program and other site-specific resilience measures.

III. GUIDING PRINCIPLES AND EXAMPLE ACTIONS

The City of Chicago and the Chicago region have a long, impressive history of environmental stewardship. Conservation work makes the natural environment more resilient in the face of various stressors, including those related to climate change, yet it is essential that we recognize and adapt to changing circumstances. The priorities (in bold and numbered) listed below represent general themes that we consider essential components of a climate change adaptation program for Chicago. Currently, many of these themes reference actions that include a mixture of (1) traditional conservation actions, (2) conservation actions that have been updated to reflect climate change, and (3) new, climate-inspired actions. However, in part through our Working Group efforts, we hope that the process of “asking the climate question” will be mainstreamed such that all ongoing and future actions will reflect consideration of how climate influences the likely success of conservation actions, so that as a region, we can work together for the greatest possible benefit for the natural environment and the services it provides.

Overarching: Engagement, Communication and Innovation

- 1. Promote consideration of natural environment climate change adaptation within existing actions and initiatives.**
 - Review and update existing natural environment-related action plans from the climate adaptation perspective.
 - Create climate-ready checklists for project managers to facilitate climate-ready open space project management.
 - “Ask the climate adaptation question” of CCAP mitigation efforts that may affect the natural environment, and apply climate-ready checklist where appropriate.
- 2. Raise awareness among different audiences about why and how to help the natural environment adapt to climate change.**
 - Conduct Climate Clinics to inform stakeholders about climate change impacts and steps they can take to adapt. Include a broad range of stakeholders including educators, land managers, municipal leaders and other decision-makers.
 - Document impacts of climate change to ecosystem services and other ecosystem values.
 - Incorporate climate change background and adaptation into existing outreach programs, e.g. how extreme storms and periods of drought make rain harvesting even more important.
- 3. Help stakeholders understand climate change impacts and the latest science.**
 - Establish and promote mechanisms by which stakeholders are continually updated about the latest in climate change impact forecasting, such as University of Notre Dame's “Collaboratory” and National Oceanic and Atmospheric Administration's (NOAA's) regional Climate Service offices.
 - Create “Environmental Profile” maps and data-sets on Chicago's community areas for better City manager decision-making.
 - Encourage use of tools such as NatureServe's Climate Change Vulnerability Index and ClimateWizard tool to help identify plant and animal species that are particularly vulnerable to climate change.
 - Document and disseminate impacts of climate change to ecosystem services and other ecosystem values.
 - Avoid potential negative unintended consequences of adapting to climate change.
- 4. Leverage existing plans and partnerships to achieve goals. Many existing plans are being implemented to improve the health of ecosystems and their resiliency in the face of climate change.**
 - Coordinate with Chicago Wilderness' Climate Change Task Force and the Chicago Metropolitan Agency for Planning's GO TO 2040 Plan.
 - Support Calumet Open Space Reserve (COSR) Plan, the Chicago Nature and Wildlife Plan Update, the Lakewide Area Management Plan (LAMP) and Great Lakes Restoration Initiative Action Plan.
 - Communicate priorities to influential bodies such as Council of Great Lakes Governors and International Joint Commission.
- 5. Track progress toward reducing vulnerability of ecosystems to climate change.**
 - Explore performance measurement methods and tools such as surveillance data, risk reduction, and biodiversity indices.
 - Consider adapting Chicago Wilderness Biodiversity Report Card for city open spaces.

6. **Explore and promote cutting edge long-term solutions. Many innovative strategies are emerging because climate change is a relatively new challenge around the world. We need to carefully evaluate and adopt those that are most relevant and most likely to be successful in our region.**
 - Promote seed banking opportunities and explore new methods of seed banking given climate change.
 - Promote the monitoring of plant phenology (e.g. Project Budburst), encourage educators, citizen scientists, and youth to participate.
 - Promote exploration of assisted migration by Chicago Botanic Garden and others, including offering test sites for pilot projects.
7. **Make reducing sensitivities and threats to wildlife and natural systems a priority. Climate change will interact with and, in some cases, exacerbate the negative effects of existing stressors and will also introduce new stressors that will further impact the native species in this region.**
 - Identify and reduce human-wildlife conflicts, including light pollution, reflective surfaces on buildings (for birds), wind turbines and other barriers, especially those that impact species most likely to be negatively affected by climate change.
 - Consider ways of enhancing green space corridors so that species have opportunities to adjust to climate change naturally (i.e. without direct human intervention).

Land

8. **Promote corridors and connectivity to help species migrate to adapt to climate change. Shifting climates will cause habitat and species to move or be lost. Habitat in the urban landscape serves as unconnected islands and needs modifications that help species migrate between sites.**

- Expand Chicago Wilderness' Green Infrastructure Vision (GIV) map to include Chicago, in an effort to identify and promote corridors and connectivity.
- Continue to promote strategic protection of open space specifically looking for buffers and linkages such as rivers and lakefront corridors.
- Improve understanding of specific habitat needs for different vulnerable species in a changing climate.
- Improve and expand habitat in parks, forest preserves and other publicly-owned property to maintain healthy populations and improve ecosystem resiliency.
- Promote climate-ready habitat expansion on private lands including golf courses, cemeteries and residential yards.

Plant & Animal Species Potentially Impacted by Climate Change:

Species for which our region is near the southern end of their range may be at particular risk. Many familiar and widespread species may no longer survive or breed in Chicago by the end of the century, including:

- Tree swallows
- Black-capped chickadees
- Whitebreasted nuthatch
- House wren
- Yellow warbler
- Scarlet tanager
- Baltimore oriole
- American goldfinch
- Karner blue butterfly
- Paper birch tree
- Black ash
- Quaking aspen
- Big-toothed aspen
- Butternut tree

Source: 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.

9. **Enhance urban forestry management. The urban forest will need to adapt to changing temperatures and increased pest and disease threats. The urban forest has an added mitigation benefit because it serves as a carbon sink and mitigates emissions by reducing energy use.**
 - Revise tree planting lists given expected climate changes.
 - Improve monitoring of tree performance based on planting conditions.
 - Improve soil conditions and maintenance practices so that trees can survive stressors such as higher temperatures and drier conditions.
 - Increase pest and disease watch programs for emerging threats and be prepared for outbreaks with response plans.

10. **Restore and maintain resilient natural areas. Remnant and created natural areas in the urban landscape are highly managed but can be developed for increased resilience with adaptive management strategies.**

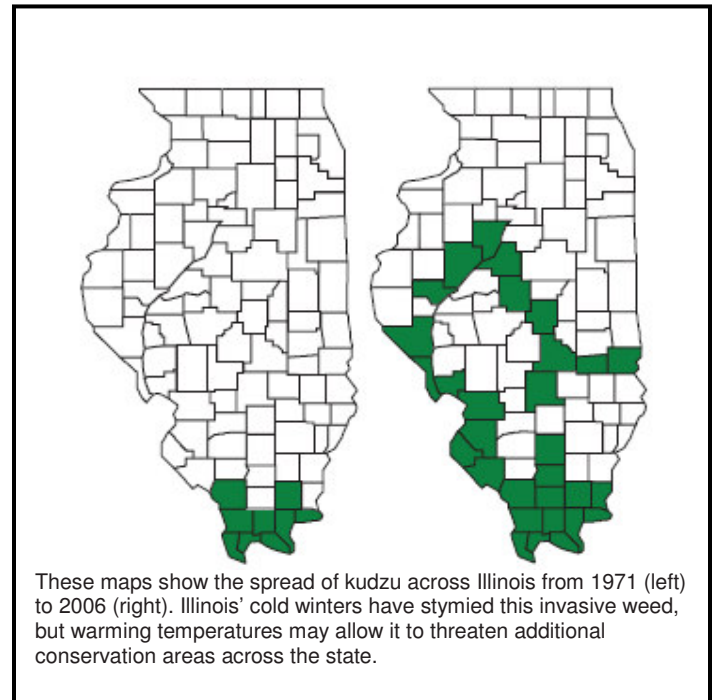
- Create adaptive restoration planting and seed lists of plants that are likely to succeed in the region under climate change.
- Increase availability of native seeds and consider new strategies for collecting seeds from more distant regions given climate change.
- Work with Chicago Wilderness restoration guidelines and best management practices; consider revising in light of climate change and for city sites.

11. Prevent and control terrestrial invasive species. Transitional climate conditions favor weedy or successional species, especially invasive plants. Invasive species are the second most significant impact on global biodiversity after loss of habitat.

- Support the Northeast Illinois Invasive Plant Program (NIIPP) and New Invaders programs.
- Consider what climate change means for the definition of invasive species.
- Consider regulation of additional species given climate change, along with education.

12. Promote ecosystem health in small-scale landscaping. As habitat is reduced through climate change, private lands can support wildlife and provide refuge to local and migrating species through green and built infrastructure.

- Define what gardeners and landscape architects can do to help adapt to climate change.
- Improve environmental performances of existing landscape requirements in the Landscape Ordinance.
- Promote community-managed open spaces that practice sustainable, diverse landscaping.



13. Improve monitoring and maintenance of landscapes (natural and conventional). Although it is difficult to model and monitor the impacts of climate change in an urban setting, we can use the wealth of programs, both professional and citizen-science, to measure the impact and our success in adapting to climate change.

- Increase stewards' participation in regional monitoring programs, especially the state-run Critical Trends Assessment Program, and identify priority areas in city to be covered by existing regional monitors.
- Develop indicators to be used by existing monitoring programs in the Chicago Wilderness region to detect climate impacts, refine projections for impacts, and identify new actions needed. Determine if new monitoring is needed.
- Identify and support maintenance practices that help ensure resiliency of landscapes.

Water

14. Protect water quality in Lake Michigan and Chicago Area Waterways (CAWS) from impacts of more extreme rain events, which may result in increased pollution from combined sewer overflows and stormwater runoff.

- Implement de-centralized stormwater management solutions (small-scale green infrastructure) that have co-benefits, such as native plants, trees, and green roofs.
- Look for ways to improve ecosystem health in studies related to ecological separation of Mississippi and Great Lakes watersheds.
- Improve beach water quality through continued management, research and education.

15. Implement water conservation strategies. Water conservation will be increasingly important with growing water demands due to increased temperatures and periods of drought predicted in the summer.

- Encourage use of low-water landscaping techniques and indoor water-efficient technologies (already underway).

- Support re-use of rainwater and graywater at the large scale.
- Continue to reduce water waste at municipal level, including water main repair.

16. Identify vulnerable ecosystems that may be affected by lake level changes.

- Improve understanding of what species may be affected by lake level changes, and assess vulnerability of current distribution of natural systems to a range of future lake levels (both increases and declines).
- Consider vulnerable species when planning for new lakefront natural areas, such as Northerly Island.

17. Restore and preserve wetlands and inland water bodies to reduce stress on sensitive species from higher temperatures and promote connectivity to allow shifting to cooler habitats. Wetlands' water levels, functionality and ecosystem services may be threatened by higher temperatures and periods of drought.

- Add water control structures to Calumet and other wetlands to regulate water levels and preserve wetlands vital for wildlife habitat.
- Identify "restorable reaches" of our streams and rivers and prioritize those that maximize ecological connectivity.
- Determine areas where Chicago can contribute to health of wetland systems adjacent to but outside city limits.
- Support Metropolitan Water Reclamation District's (MWRD) ongoing efforts to protect isolated wetlands.

18. Update efforts to prevent and control aquatic invasive species (AIS) to incorporate climate change. Increases in water temperatures may make local waterways more habitable to new invasive species.

- Include climate change impacts in risk analysis tools developed to identify species that may become more of a threat given climate change.
- Consider long-term solutions to reduce threat of AIS spread between Great Lakes and Mississippi watersheds in both directions.
- Consider regulation of and education about additional species that may be more of a threat given climate change.

IV. ACCOMPLISHMENTS AND ACTIONS IN-PROGRESS

Listed below is a sampling of the actions that are done with a major motivation or goal of helping our natural environment adapt to climate change, or "climate-inspired actions." There is endless work that is being done across the city that will help our natural environment adapt to climate change but is not done with climate change as a primary motivator.

- Working Group members are drafting climate readiness checklists. (Overarching)
- The 2011 update to the Chicago Nature and Wildlife Plan reflects the need to consider climate change in setting priority actions to protect and expand natural areas across the city. (Overarching)
- Working Group members working with members of the Chicago Trees Initiative have created an adaptive tree planting list. (Land, Overarching)
- Working Group members have created case-studies of climate-ready projects and initiatives including Urban Heat Island Mitigation, Shoreline Protection Program, and Invasive Species Ordinance. (Overarching)

**Traditional Conservation Efforts --
*recognizing the foundation we've built***

The following initiatives reflect just a small portion of the actions occurring in Chicago that will help our natural environment be more resilient in the face of climate change, although most were not set up specifically to address climate change.

- Chicago's Nature and Wildlife Committee prioritizes and tracks actions to improve Chicago's habitat opportunities and other ways to protect and promote wildlife. See Chicago's Nature and Wildlife Plan Update (2011) for a list of dozens of actions.
- The Chicago Trees Initiative, a coalition of government and non-profit agencies, expands and improves Chicago's Urban Forest through tree planting, maintenance, research and outreach.
- Chicago's Bird Agenda works to promote and protect habitat, reduce hazards to birds and manage nuisance species, including promotion of the Lights Out campaign.
- Chicago Wilderness is a regional alliance that restores local nature through four key initiatives—to restore the health of local nature, green infrastructure, combat climate change, and leave no child inside.

- DOE is targeting the 2010-2012 Chicago Sustainable Backyard Program, its green infrastructure education and incentive program, in areas that will receive the highest reduction in flooding risk as well as urban heat island reduction as a result of downspout disconnection and small-scale stormwater best management practices such as rain barrels, native plants and trees. (Water)
- DOE installed a water control structure at Hegewisch Marsh, and received grant funds to install one in Big Marsh, in order to maintain water levels needed for habitat and stormwater management in a changing climate. See box below. (Water)
- The City (Department of Streets and Sanitation – Bureau of Forestry) is creating Tree Space and Soil Volume Design Standards so that trees can survive under increasing stressors including higher temperatures and drier conditions. (Land)
- Chicago is targeting tree-planting programs in areas of the city most impacted by the urban heat island (UHI) effect. More than 6,000 trees were planted in UHI hot spots from 2005 – 2008. (Land)
- DOE included invasive plants that may be a threat in warmer climate scenarios in the Invasive Species Ordinance regulated list. (Land)
- The Chicago Park District is developing a program to strategically increase the over 500 acres of natural areas in parks across the city, connecting these natural areas to other habitat. Other landowners such as the Forest Preserve District of Cook County are restoring natural areas throughout the metropolitan areas, a critical component of promoting corridors and connectivity. (Land)
- Climate change education and adaptation has been integrated into programs including Chicago Center for Green Technology (CCGT), Chicago Conservation Corps (C3) and Greencorps Chicago. For example, since 2009:
 - Over a dozen classes have taken place at CCGT that raise awareness about the importance of helping the natural environment adapt to climate change.
 - Over 25 C3 projects have provided climate resilience through rain barrels, composting and native area stewardship.
 - Over 60 community gardens installed by Greencorps Chicago have included climate-smart measures such as habitat enhancement, tree planting and stormwater absorption.

CASE STUDY: Hegewisch Marsh Water Control Structure



Installation of water control structure at Hegewisch Marsh in 2008. Photo credit: V3 Consultants.



The water control structure enables site managers to adjust water levels for Hegewisch Marsh during periods of drought or high precipitation, thereby maximizing suitable habitat for marsh species. The water control structure intended for Big Marsh also has the potential to reduce or prevent flooding of nearby roads. Photo credit: Jerry Attere.

V. SELECTED RESOURCES

Chicago and region:

- Climate Change and Chicago: Projections and Potential Impacts – Chapter 5 – Ecosystems http://www.chicagoclimateaction.org/filebin/pdf/report/Chicago_climate_impacts_report_Chapter_Five_Ecosystems.pdf
- Chicago Area Climate Change Quick Guide: Adapting to the Physical Impacts of Climate Change http://www.chicagoclimateaction.org/filebin/pdf/Chicago_Quick_Guide_to_Adaptation.pdf
- Biodiversity Recovery Plan Update Addendum DRAFT
- Climate Action Plan for Nature http://www.chicagowilderness.org/pdf/CAPN_Brochure-FINAL_singlepages_WEB_6.21.10.pdf
- Hellmann, J. J., K. J. Nadelhoffer, L. R. Iverson, L. H. Ziska, S. N. Matthews, P. Myers, A. M. Prasad, and M. P. Peters. 2010. Climate change impacts on terrestrial ecosystems in metropolitan Chicago and its surrounding, multi-state region. *Journal of Great Lakes Research* 36(2): 74-85.
- Adding Green to Urban Design www.cityofchicago.org

National/Other cities:

- Ask the Climate Question: Adapting to Climate Change Impacts in Urban Regions http://www.ccap.org/docs/resources/674/Urban_Climate_Adaptation-FINAL_CCAP%206-9-09.pdf
- Advancing Statewide Climate Change Adaptation Strategies (centerforclimateaction.org)
- CAKE: Climate Adaptation Knowledge Exchange <http://www.cakex.org/>
- Climate Change Adaptation Options for Toronto's Urban Forest http://www.cleanairpartnership.org/pdf/climate_change_adaptation.pdf
- *Global Climate Change Impacts in the United States*, U.S. Global Change Research Program <http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf>
- Mitigation-Adaptation Connections, ICLEI <http://www.icleiusa.org/action-center/planning/The%20Mitigation-Adaptation%20Connection.pdf>

Questions or Comments?

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