

ON TO 2050 COMPREHENSIVE REGIONAL PLAN

Draft
for public
comment

ENVIRONMENT

This PDF only contains text for the chapter named above. Please see www.cmap.illinois.gov/onto2050 for the full draft plan text.

This draft document will be available for public comment from June 15 to August 14, 2018. Submit comments at www.cmap.illinois.gov or by email using the subject line "ON TO 2050 Public Comment" to ONTO2050@cmap.illinois.gov. Or comment by mail to Chicago Metropolitan Agency for Planning, Attention: ON TO 2050 Public Comment, 233 South Wacker Drive, Suite 800, Chicago IL 60606, or by phone to 312-454-0400.

An online version of the ON TO 2050 Draft for Public Comment as well as a downloadable PDF of the plan and its technical appendices can be found at www.cmap.illinois.gov/onto2050. Design will change for the final release of ON TO 2050 in October 2018.

ENVIRONMENT

Bridging natural and built assets

Our rare and diverse natural areas and ecosystems are some of the most valuable and irreplaceable assets in metropolitan Chicago. ON TO 2050 strongly affirms that these natural resources are critical for protecting the quality of our air, land, and water, providing ecosystem services, wildlife habitats, and recreational spaces, contributing to a high quality of life, and supporting a vibrant regional economy. Our abundant water supply has been crucial to attracting people and investment. In addition, the region's extensive green infrastructure network provides invaluable habitat and species diversity, protects environmental quality, aids in flood mitigation, and is an important line of defense against the impacts of climate change. The unique and exceptional landscapes and waterways of greater Chicago, from Lake Michigan and the Chicago River to its oak savannas and prairies, form a key element of our natural and cultural history and are foundational to the region's future. Many regional actors have recently invested millions to expand the region's natural heritage. The return on these investments is significant: It is estimated that our natural assets provide over \$6 billion every year in economic value to the region as "ecosystem services."¹⁶¹

At the same time, our natural resources face many ongoing challenges and new threats. While the region permanently preserved 61,500 acres of natural and agricultural lands from 2001 to 2015, an additional 140,000 acres of such lands were developed -- an area roughly equivalent to the land area of the City of Chicago. Despite increased awareness about the importance of environmental assets, constrained funding at all government levels and competing priorities hinder our ability to adequately protect and enhance them. Climate change, manifesting in our region as more frequent and severe storms, extreme temperatures, and drought, is already significantly affecting our economy, ecosystems, built environment, and people. In particular, the region faces substantial flooding issues, which the intense storms brought by climate change and increased impervious coverage from development will continue to exacerbate. Flooding can cause extensive property damage and reduced water quality.

Many diverse factors influence the extent and form of development, from market forces to tax policy to infrastructure investment. Development at the region's edge necessitates increased water, wastewater, and stormwater infrastructure. It can push demand for groundwater beyond sustainable levels, and affects communities and the resources themselves. The short and long term costs associated with providing infrastructure and services in these locations can be substantial. The impacts of these trends do not affect all residents equally. Vulnerable populations in particular may experience heightened risks, costs, and liabilities, including

¹⁶¹ Chicago Metropolitan Agency for Planning. 2014. "Green Infrastructure Vision Version 2.3 Ecosystem Service Valuation." <https://datahub.cmap.illinois.gov/dataset/green-infrastructure-vision-2-3-ecosystem-valuation>. This project explored ecosystem service values for six services within the CMAP 7-county region: water flow regulation/flood control, water purification, groundwater recharge, carbon storage, native flora and fauna, and recreation and ecotourism.



repetitive flooding, high water rates in low income communities, and compromised infrastructure in areas that are otherwise overlooked by private investment.

ON TO 2050 proposes a comprehensive suite of actions by a range of stakeholders to address these and other environmental issues. It envisions a future where development practices and infrastructure embrace natural landscapes and contribute to healthy ecosystems. In concert with other plan strategies, the environmental recommendations will lead to a region that is more resilient to the anticipated impacts of climate change, particularly flooding, and contributes to worldwide efforts to stabilize our changing climate; has sustainable and clean water resources; preserves high priority agricultural and natural lands while accommodating strategic growth and infill; and helps protect the residents of the region who are most vulnerable to environmental impacts.

The three principles of ON TO 2050 are embedded throughout the *Environment* chapter, which includes strategic recommendations to:

1. Promote **inclusive growth** by growing the ability of vulnerable populations to respond to environmental challenges and improving environmental conditions and access to nature for those populations.
2. Improve **resilience** by planning for anticipated future impacts, protecting residents from risk, and promoting gray and green infrastructure that provides essential services and can adapt to changes in climate and technology.
3. **Prioritize investing** limited financial resources in a strategic and efficient way, maintaining existing infrastructure, and securing new revenues for needed enhancements.

A region prepared for climate change

The effects of climate change will have significant implications for the built environment, economy, ecosystems, and people of this region. We must intensify mitigation efforts while at the same time prepare for and be equipped to recover from the acute shocks and chronic stresses posed by climate change. Reducing greenhouse gas (GHG) emissions will require continued compact infill development, improved pedestrian and bicycle infrastructure, and increased investments in public transit as well as aggressive expansion in renewable energy systems, energy efficiency and retrofits, and electrification of our transportation system. Sound planning and decisionmaking can maximize the crucial role that the region's natural landscapes play in promoting resilience. The region's land and water resources provide ecosystem services that enhance communities' ability to withstand climate-related stresses, and also offer models for expanded green infrastructure that grows our ability to adapt. Planning for climate resilience entails a wide variety of strategies for managing risk, strengthening our built and natural environment, and improving our operational response to specific events. Regional stakeholders, from local elected officials to business leaders, need access to up-to-date data on



climate science to make informed decisions. At the same time, many resilience strategies require coordinated subarea, regional, or statewide action.

Plan for climate resilience

Our climate is changing at a global scale. Climate resilience is the ability of our region and its communities to prepare for and recover from the acute shocks and chronic stresses of climate change by transforming our infrastructure, natural systems, and social structures to be more responsive and adaptable. This will necessitate reenvisioning the way road, water, and energy infrastructure is built and maintained, preserving and protecting natural and agricultural areas, implementing stormwater best management practices, and creating social networks and resources to give residents tools to withstand climate impacts.

In northeastern Illinois, a changing climate translates to more frequent and severe weather events, extreme heat, and drought (see the ON TO 2050 Natural Resources snapshot for more information).¹⁶² Climate change acts as a force multiplier on already existing environmental, land use, economic, transportation, and social challenges, compounding and exacerbating these issues through its impacts. Flooding has already caused major road, rail, and utility outages, disruptions of freight traffic, sewer overflows, and personal and financial stresses for residents and businesses. Heat waves have caused illness, hospitalization, and death in vulnerable communities as well as damage to infrastructure, and drought has had significant adverse effects on the region's agricultural sector, water supply, and natural areas. Increasing temperatures can also lead to greater ozone formation, worsening air quality. The land and water assets that make up the region's green infrastructure network not only support environmental quality, but also provide an important line of defense against many of these negative impacts. Those assets also face challenges from a changing climate and must be protected to ensure continued ecosystem services.

[GRAPHIC TO COME: An informational graphic on climate change impacts will highlight climate impacts, particularly flood damages, including climate projections.]

In addition, the region's gray infrastructure is not prepared for many of today's storms. Most of the region's roads were designed using standards that pre-date the increased number of heavy rain events, freeze-thaw cycles, and hotter and wetter conditions posed by a changing climate. Water and wastewater treatment plants are impacted by flooding, which can disrupt service and pollute surface waters. Increased freeze-thaw events can lead to additional water main breaks and water loss. Energy infrastructure cannot always respond to increased peaks in demand from extreme temperatures, and older facilities may not be built to withstand stronger storms.

¹⁶² Chicago Metropolitan Agency for Planning. ON TO 2050 Snapshot, "Natural Resources" (2018), <http://www.cmap.illinois.gov/onto2050/snapshot-reports/natural-resources>



Concerted, collaborative regional effort on resilience issues is essential to create a climate resilient region and maximize the benefit of investments. Climate issues cross physical and political boundaries, and can be integrated into a variety of planning efforts, such as comprehensive plans, capital improvement plans, green infrastructure plans, watershed plans, and regulatory updates. The region's most vulnerable residents are particularly affected by climate change impacts like increased flooding, transit disruptions, or heat waves, and should be extensively engaged in resilience planning.

[GRAPHIC TO COME: An illustrated graphic will show climate resilience interventions in a subarea of the region.]

The following subsection describes strategies and actions to implement this recommendation.

Incorporate climate resilience and adaptation measures into planning and development

Utilizing planning and development processes is an effective way to implement measures that help protect against climate impacts. Through the LTA program, CMAP is already working to integrate climate change information, such as vulnerability assessments, and recommendations into local planning processes. Other units of government in the region have created standalone plans related to climate change or incorporated these elements into other planning documents. Coordination across units of government responsible for different planning efforts is particularly important. For example, counties typically conduct land use, watershed, stormwater, and hazard mitigation planning, all of which affect climate resilience at the municipal level. And because climate change can disproportionately affect residents within EDAs, as well as the elderly, people with chronic diseases, and those without health insurance, it is critical to meaningfully engage these populations in resilience planning.

CMAP should finalize its approach for integrating climate change and vulnerability into local planning efforts, and employ that approach through the LTA program.

Municipalities and counties should integrate climate impacts and vulnerability into relevant plans and regulations and coordinate with appropriate actors during planning processes.

CMAP, counties, and other partners should support and coordinate pre-disaster planning efforts, including voluntary buyout programs, flood risk assessments, identification and protection of critical facilities, and stormwater planning.

CMAP and partners should identify planning best practices and strategies to meet resilience goals.

All governments should ensure that vulnerable populations are able to meaningfully participate in climate resilience planning through robust community engagement processes.



CMAP and partners should analyze the effects of climate change on vulnerable populations and develop strategies to build resilience for those residents.

Strengthen gray and green infrastructure to withstand climate change

Climate change has already affected the region's infrastructure assets, causing road closures and damages to the transportation system, water and wastewater utility disruptions, and declines in ecosystem services due to habitat degradation.¹⁶³ To continue providing essential services, the region's gray and green infrastructure systems need to be transformed to anticipate further climate changes. Expanding the region's green infrastructure network is an important element of this strategy. From the large scale network of protected natural lands to site-scale interventions with a variety of co-benefits, these strategies can protect the region from the effects of climate change through natural functions such as stormwater management and the mitigation of emissions. Furthermore, biodiverse native ecosystems can also better withstand invasive species, disease, flooding, and drought expected of a changing climate.

New technology and gray infrastructure design and materials also have an important role in ensuring climate resilience. Modernization efforts should promote infrastructure that is based on revised design standards that anticipate future climate conditions and built or retrofitted at comfortable levels of risk tolerance. In addition, as road and transit systems modernize and become dependent on advanced technology, reliable electricity and communications infrastructure will become critical to the ability of the transportation system to function under extreme conditions.

State and local transportation and water infrastructure agencies should review and update design manuals to ensure that current data informs design standards.

CMAP and partners should continue research, analysis, and cross-jurisdictional implementation of resilient natural resource strategies.

Local governments and stewardship groups should promote and/or require native species, habitat restoration, and sustainable landscaping materials and practices, which can achieve multiple regional environmental benefits.

Transportation implementers should determine the vulnerability of transportation infrastructure to climate change impacts and design transportation infrastructure to withstand and adapt to the climate of its intended lifespan.

CMAP should incorporate climate resilience criteria into transportation programming processes.

¹⁶³ National Climate Assessment. 2014. "Transportation." <http://nca2014.globalchange.gov/report/sectors/transportation>.



Service providers should ensure redundant and reliable electricity and communications infrastructure.

Improve the operational response to weather events to ensure mobility

Climate change is already causing more frequent road flooding, snow storms, and heat- and cold-related pavement and communication failures. Inclement weather is currently estimated to cause 15 percent of congestion, increase the number of crashes and delays and reduce road capacity. Approximately half of the days in a typical year have weather conditions that affect driving.¹⁶⁴ Pedestrians and transit users are also affected by inclement weather, and pedestrian infrastructure is often overlooked in weather response activities.

Existing regional strategies to mitigate impacts include traveler information, alerts and advisories, vehicle restrictions such as banning trucks during high winds, road closures, snow and ice control, plowing, and pumping water from flooded locations. IDOT, the Tollway, and Lake County report real-time “road weather” (pavement) information to TravelMidwest, but other counties currently do not. Weather responsive traffic management is also not widely used today, except for closing roads to traffic under severe conditions. As road and transit systems modernize, the same technologies that can improve system safety and reliability can make the system more responsive to weather events. The expansion of intelligent transportation system (ITS) devices and traffic management capabilities will support a variety of weather responsive traffic management strategies, such as variable speed limits to reduce speeds, updating traffic signal timing and plans to support detours and slower speeds, and increasing coverage of emergency vehicle patrols to remove disabled vehicles more quickly. In addition, as the region’s maintenance fleets become equipped with fleet management technology, opportunities for better coordination of snow and ice removal between different jurisdictions will emerge. This will reduce costs and improve the efficiency of these activities.

It will be important to collect and analyze information about how facilities perform under various severe weather scenarios so agencies can develop planned responses and better serve all users of the transportation system. For example, focusing incident management resources on locations that are known to be affected by rain or snow can reduce congestion and secondary incidents. Pavement flooding information has not been collected on a regional basis, and there is no standard pavement flooding reporting system. The impact of flooding on our roadway operations as of today is not known.

CMAP, and IDOT, and the Tollway should work toward implementing a regional, multijurisdictional traffic management center, either virtual or traditional.

¹⁶⁴ CMAP ON TO 2050 Strategy Paper, “Highway Operations Strategy Paper” (2016), <http://www.cmap.illinois.gov/onto2050/strategy-papers/highway-operations>



Transportation agencies should ensure redundant and reliable electricity and communications infrastructure and build redundancy and flexibility into planning for major transportation corridors.

Transportation implementers should expand ITS devices and traffic management capabilities to support weather responsive traffic management strategies.

Transportation implementers should coordinate snow and ice removal across jurisdictions, when possible.

Transportation operators should conduct an analysis of road performance under severe weather conditions to develop planned responses.

CMAP should develop a regional pavement flooding reporting system to help plan for flood events.

Create a more flexible and decentralized electric grid

Distributed energy resources (DERs) are electricity generation sources that are typically smaller than traditional power stations and positioned closer to where electricity is consumed, often on the same site (such as rooftop solar arrays). DERs help to increase the resilience of the energy grid to stresses such as high demand periods, and DERs featuring renewable energy sources have the potential to greatly reduce the GHG emissions associated with energy consumption. Microgrids, which include DERs and can operate independently of the main grid, could also minimize energy service interruptions. They allow key infrastructure to be “islanded” from the larger distribution grid in the event of a broader system disruption, making them suitable for vulnerable facilities such as hospitals, data centers, and wastewater treatment plants. The ON TO 2050 Energy strategy paper provides more detail on energy strategies for CMAP and partners.¹⁶⁵

Energy stakeholders should collaborate to proliferate DERs and maximize their benefits.

Local governments should streamline zoning and permitting requirements for DERs.

ComEd, in conjunction with partners, should continue to assess the potential and role of microgrids, and expand them as appropriate.

CMAP should host public regional data sets related to energy, as available.

The *federal government* should redouble efforts through programs such as the Smart Grid Investment Program that encourage a transition away from centralized electricity

¹⁶⁵ CMAP ON TO 2050 Strategy Paper, “Energy Strategy Paper” (2017), <http://www.cmap.illinois.gov/onto2050/strategy-papers/energy>



generation toward decentralized generation and the “smart grid.”

Diversify agricultural systems to promote resilience

Through its recommendation to “Promote Sustainable Local Food,” GO TO 2040 promoted strategies to facilitate local food production, increase access to healthy food, and raise understanding and awareness of nutrition and food policy. ON TO 2050 reinforces the importance of those strategies, and also recognizes that the region’s agricultural economy will experience disruptions due to climate change. Localized changes in temperature and precipitation will alter crop yields and economic returns. The ability of farmers to adapt to climate change through planting decisions, diversification, resilient strains of crops, land management practices, and emerging technologies will be crucial to ensuring a sustainable agricultural sector in our region. In addition, as crop production patterns shift nationally in response to climate disruption, the role of the region’s agricultural processing sector and its transportation network will likely need to adapt to new products and routes.

Diversifying agricultural production and increasing the amount of food grown locally can help the region respond to climate and distribution changes in the future, particularly if other parts of the country suffer greater climate challenges to agricultural systems. For the agricultural economy to withstand these changes, CMAP and partners should support sustainable land management practices through local planning, fund critical supporting organizations from federal and state resources, and consider the relationship between a resilient agricultural system and infrastructure priorities. Ultimately, an agricultural system that better mimics, enhances, and complements our natural systems and contributes to land and water health would be better for the region and our downstream neighbors.

Counties and local governments should work with chambers of commerce, economic development professionals, stakeholders, and the local or state Farm Bureau to plan for and address the needs of a more diversified agricultural system.

A regional partner should create a platform to strengthen agricultural systems on a variety of fronts, including climate resilience and diversification, infrastructure and logistics, and land protection.

Municipalities, counties, and forest preserve and conservation districts should encourage sustainable land management practices and implementation of the Nutrient Loss Reduction Strategy on agricultural lands.

Local governments should update their plans and development ordinances to reduce barriers to local food production.



Explore a regional climate resilience platform to coordinate initiatives and provide data and resources

Many resilience strategies require coordinated subarea, regional, or statewide action. A regional partnership may be an effective way to ensure coordination of resilience-building activities, policies, advocacy efforts, research needs, and best practices needed to achieve a climate resilient region. Regardless of its ultimate form, this platform can open channels for dialogue, knowledge exchange, and relationship building. Initial efforts to forge such a coalition included the Climate Resilience Resource Group, an ad hoc group that provided feedback to CMAP on development of the Climate Resilience strategy paper, and the Northeastern Illinois Resilience Partnership, which convened after the strategy paper was published to discuss implementation activities.

A sustained regional partnership can also play a role in helping to provide needed climate data and resources and to translate that information for other stakeholders. Regional leaders, from local elected officials to business owners, need up-to-date data on climate science as well as guidance on how to interpret and apply it in their unique contexts. The Illinois Climatologist Office, Illinois State Water Survey, Midwestern Regional Climate Center, and other entities provide high quality historical and projected climate data and climate monitoring. Many stakeholders, however, do not know about these resources or may not understand how data on precipitation or temperature changes can be applied to decision making. CMAP, in partnership with these and other institutions, can play a role in translating climate science to policy making and planning. The agency's work on climate resilience and related impacts has resulted in new regional data about land surface temperature, social vulnerabilities to climate change, and areas susceptible to flooding, which can be shared and incorporated into planning processes.

CMAP and relevant organizations should assess the effectiveness of previous resilience groups and whether a new platform would be helpful for long term resilience building.

CMAP, the Illinois Climatologist Office, Illinois State Water Survey, Midwestern Regional Climate Center, and others should broadcast the existence of climate data and related resources and help translate the utility of these resources to decision makers.

CMAP, the Illinois Climatologist Office, Illinois State Water Survey, Midwestern Regional Climate Center, conservation organizations, and others should downscale regional climate models to facilitate local application, investigate climate impacts on our water and land resources, and pursue the development of other relevant data and research.

Intensify climate mitigation efforts

Climate change is a national and international concern. GHGs form a protective barrier that traps heat and provides a livable climate on earth, but as emissions increase, more trapped heat leads to negative environmental impacts. Burning fossil fuels, clearing forests and prairies, and other human activities have increased GHGs, while natural and human mitigation efforts have



failed to keep pace. Because our own activities contribute to climate change, the region's residents, businesses, utilities, and institutions must actively work to reduce emissions and diminish future impacts. In 2015, the most recent year for which data exists, northeastern Illinois emitted 119 million metric tons of CO₂ equivalent. In total, this amounts to 14 metric tons of CO₂ equivalent per capita from stationary energy, transportation, industry, solid waste, and wastewater. Stationary energy and transportation account for 97 percent of the region's emissions. In 2015, building energy, including natural gas and electricity, was responsible for 69 percent of all GHG emissions in the region. On-road transportation, which includes public, private, and commercial motor vehicles, was the second-largest source of emissions. The differences in the region's built environment, housing density, related energy consumption, and travel behavior help explain the variable emissions across the region.

[GRAPHIC TO COME: A chart will show 2015 Greenhouse gas emissions inventory with indicator targets.]

Creating resilient and livable communities requires intensified efforts to reduce and mitigate emissions that contribute to climate change. GO TO 2040 emphasized climate mitigation as a co-benefit inherent to its recommendations for land use, environment, housing, and transportation. Compact infill development, improved pedestrian and bicycle infrastructure, increased investments in public transit, more efficient consumption of energy, and proliferation of renewable energy generation systems all contribute to climate mitigation, not to mention reduced congestion. In addition, communities can mitigate climate change through carbon sequestration through vegetation and soils. A CMAP-supported Chicago Wilderness study estimating ecosystem service values within the region found that a large tree can remove more than 1,000 pounds of CO₂ per year. In total, the region's green infrastructure contributes to carbon sequestration valued at an estimated \$11.5 million each year.¹⁶⁶ ON TO 2050 calls for conserving 400,000 acres of open space by 2050 and continues to strongly support the climate mitigation strategies of GO TO 2040.¹⁶⁷

Transformative changes in the energy sector -- from closed coal power plants to solar and other renewable industries to fuel efficient vehicles -- offer the promise of substantial reductions in emissions. Regional stakeholders should prepare for and harness these changes to ensure benefits to all residents. Through a socioeconomic lens, research suggests that low income communities spend a disproportionate share of their income on energy costs,¹⁶⁸ and communities of color have historically suffered from greater exposure to the local environmental impacts of energy generation and consumption. Understanding and addressing the financial, environmental, and social needs of these users, as well as other vulnerable groups like seniors, will be critical to avoid perpetuating inequities in the future.

¹⁶⁶ CMAP. 2014. "Green Infrastructure Vision: Version 2.3 Ecosystem Service Valuation." <http://bit.ly/2fjk77S>

¹⁶⁷ GO TO 2040, see "Manage and Conserve Energy and Water Resources"

¹⁶⁸ Energy Efficiency for All. 2016. "Lifting the high energy burden in America's Largest Cities." <http://energyefficiencyforall.org/resources/lifting-high-energy-burden-americas-largest-cities>

ON TO 2050 sets GHG reduction targets in line with global goals to place the world on a “stabilization path,” the approximate emissions trajectory needed to constrain temperatures to a global mean increase of two degrees Celsius above pre-industrial levels. This translates to a reduction of emissions to 80 percent below 1990 levels by 2050. To achieve that goal, the Chicago region, as well as the State and federal governments, will need to intensify climate mitigation in a variety of ways. In addition to the strategies listed here, the array of environmental strategies presented elsewhere in this chapter can help the region mitigate and adapt to climate change. For example, an integrated approach to water resources, where water is conserved and reused, can reduce the energy consumption associated with water treatment, distribution, and wastewater treatment. On the other end of the spectrum, preserving and enhancing the region’s natural areas and retrofitting our built environment with green infrastructure helps retain and expand the natural carbon sequestration services these areas provide.

The following subsection describes strategies and actions to implement this recommendation.

Comprehensively address energy and climate change at the federal and state levels

GO TO 2040 called for a variety of energy and climate change policy actions that are best completed at the federal and state levels, and ON TO 2050 reaffirms the commitment to national GHG reduction targets. In December 2015, 187 countries adopted the universal and legally binding Paris Agreement that calls for key outcomes that support climate action.¹⁶⁹ The U.S. pledged to reduce its emissions 26 to 28 percent relative to 2005 levels by 2025, and 80 percent by 2050. While the Clean Power Plan, the first federal regulation that limits carbon pollution, and other initiatives have stalled,¹⁷⁰ individual states are continuing to push reduction targets from power plant emissions and are taking additional measures such as improving fuel efficiency standards and the carbon content of fuels, reducing industrial emissions, and establishing policies to promote energy conservation and renewable energy. Existing federal and state transportation, housing, and energy policies should be reviewed to better integrate carbon reduction strategies. In addition to federal regulation, innovative market mechanisms for mitigating carbon emissions, such as carbon fee and dividend proposals, have the potential to transform our response to reduction targets.

The federal government should uphold its commitment to the Paris Agreement and continue federal involvement in strategies to achieve these goals, including the expansion of renewable energy and efficiency programs and exploration of market mechanisms for reducing GHG emissions.

¹⁶⁹ United Nations. 2018. “The Paris Agreement.” http://unfccc.int/paris_agreement/items/9485.php

¹⁷⁰ U.S. Environmental Protection Agency. 2017. “Complying with President Trump’s Executive Order on Energy Independence.” <https://www.epa.gov/energy-independence>



The State should continue to implement the Future Energy Jobs Act and other emission reduction policies and programs that promote energy conservation and transition the region to renewable sources.

CMAP should regularly update the GHG inventory to provide critical information to stakeholders on the implementation of emission reduction strategies.

CMAP and partners should create a regional climate action plan to identify further strategies to move toward ON TO 2050's emissions reductions target.

Transform transportation systems to reduce emissions

Electricity generation has diversified to include more low- and zero-emissions sources, with 51 percent of our region's energy coming from nuclear power and four percent coming from wind and solar.¹⁷¹ However, the transportation sector still depends primarily on fossil fuel consumption and emissions. In addition to decreasing vehicle miles traveled, as discussed in the *Mobility* chapter, alternative energy and emissions reduction technology are critical to reducing emissions. Due to increasingly stringent fuel economy standards, vehicles that use conventional gasoline will become more efficient, and more than a quarter of cars and light duty trucks could be powered by electricity and other alternative fuels by 2050.¹⁷² Passenger cars are most likely to be electrified, with a dramatic increase in plug-in and hybrid electric vehicle market share projected by 2050. Transit agencies and local governments are investing in electric vehicles and replacing their fleet with more energy efficient vehicles. Fuel savings from these investments could continue to increase, especially if gas prices rise or carbon fee and dividend proposals are implemented. Improved charging infrastructure is needed to increase adoption rates of electric vehicles. Incentivizing the installation of fast chargers into multi-unit housing developments and near-term investments in publicly available wireless charging stations or electrified roadways can help extend operable ranges of electric vehicles. Expansion of public transit and transit oriented development remains critical to reducing emissions; see the *Make transit more competitive* recommendation in the *Mobility* chapter.

CMAP should continue to fund fleet replacement, such as electric buses and charging stations, through CMAQ.

Transportation agencies should adopt electric vehicles and other innovative emission reduction technologies and plan for integration of solar and charging stations into new projects.

Local governments should review development ordinances to identify ways to promote electric vehicle infrastructure in the transportation system.

¹⁷¹ U.S. Energy Information Administration. 2017. "Annual Energy Outlook 2017." <http://emap.is/2snwnMk>

¹⁷² *Ibid.*



Increase low- and zero-emissions energy generation

Although energy conservation remains a key priority, the region must make a more aggressive shift to renewable energy. Solar, wind, and nuclear energy generation produces little to no emissions compared with traditional fossil fuel-based sources. For electric vehicles to become truly sustainable, the Chicago region would need to make strides toward increasing its percentage of renewable energy generation. Recent updates to the state's renewable portfolio standard are anticipated to accelerate development of wind and solar. The City of Chicago and Cook County, in partnership with energy service providers, have both offered bulk solar programs to reduce prices for users. Utilities and municipalities can work together to remove regulatory barriers and reduce costs of clean energy generation and distribution, from small-scale rooftop solar panels to district energy systems. The development of renewable energy systems goes hand in hand with more decentralized energy generation; for more information see the *Create a more flexible and decentralized electric grid* strategy.

Energy service providers, such as ComEd, should continue to diversify their energy portfolio to include a greater share of renewable sources.

The state and federal governments should continue to advance renewable portfolio standards, and keep pace with technological changes.

Local governments should allow and promote renewable energy systems in zoning, building, design guidelines, and energy codes and explore bulk purchasing options.

CMAP should develop template renewable energy ordinance language and design guidelines for use by local governments.

Integrated approach to water resources

Abundant and high quality water resources play an essential role in sustaining economic prosperity, environmental health, and quality of life. Aquatic systems support an array of ecosystem services, a rich composition of native flora and fauna, recreation, and water purification. Water supplies from Lake Michigan, the Fox and Kankakee Rivers, and shallow and deep bedrock aquifers support the region's industry, households, and energy generation needs. Lake Michigan and the region's waterways also provide one of the great recreational systems in the country, while simultaneously transporting goods, both nationally and globally. Yet despite our status as a water-rich region, we often fail to recognize the real and inherent value of this globally scarce resource. As a result, the region continues to suffer major flood damage on an annual basis, degraded aquatic systems across the majority of the region, and water shortages in areas that are growing the fastest.

A regional goal is to recognize, value, and manage water as a singular resource that could be almost infinitely reusable if managed properly. This applies to our natural aquatic systems, our



built water management infrastructure, and our water supplies, both on the surface and underground. This approach seeks to integrate planning and management of water supply, wastewater, and stormwater in a way that considers the water cycle as a single system in which all water inputs and flows are recognized as potential resources, where efforts are made to enhance these systems rather than simply minimize or avoid impact on the environment, and maximizes the contribution to social economic vitality.

Protect and enhance the integrity of aquatic systems

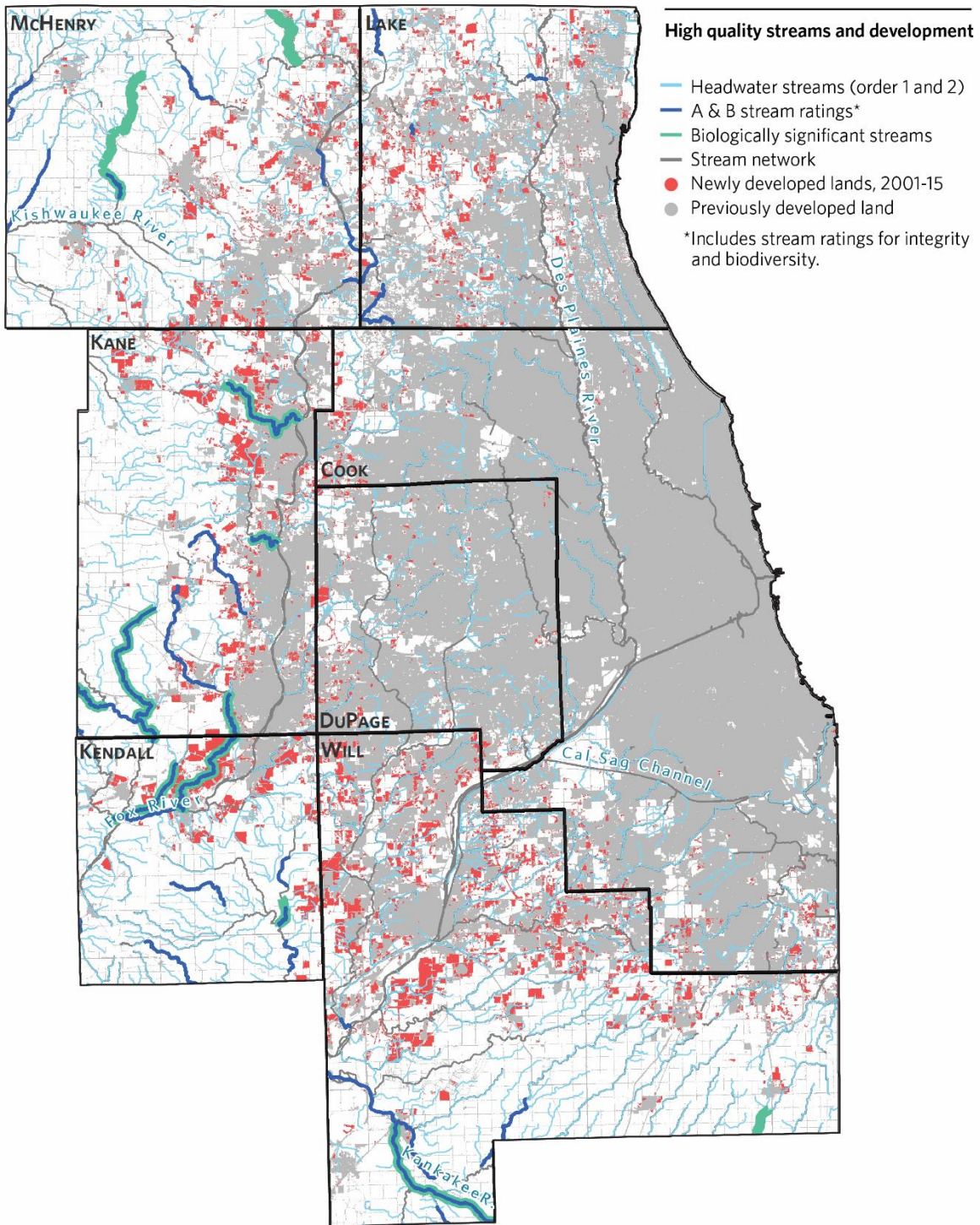
The integrity of the region's aquatic resources refers to the chemical, physical, and biological quality of these systems to support both human and non-human use. Maintaining these systems' health is important not only for communities and residents, but for the economic, ecological, and recreational values that they convey to the region, in monetary terms as well as the ecosystem services they provide. Lake Michigan is the single most significant water resource to the region as a whole, and is inseparable from its integration with the rest of the Great Lakes and the Chicago Area Waterway System. All of the region's stakeholders play a pivotal role in managing the Lake's water quality and supply in partnership with other Great Lakes states and Canada.¹⁷³ It is also important to note that the natural integrity of Lake Michigan's coastal environment is critical, not only for adjacent communities, but as nearshore and coastal habitat and a critical migratory flyway.

[GRAPHIC TO COME: A photo essay of the region's water resources.]

The need for clean, abundant, and reliable water resources tends to be taken for granted until shortages, flooding, or low water quality make the water unfit for its intended use. Though water quality, habitat, and ecological conditions have improved in parts of the region since adoption of the Clean Water Act, the majority of our aquatic, wetland, and riparian ecosystems remain in a poor to moderate state of health due to direct and indirect effects of development, transportation systems, industrial and wastewater discharges, agriculture, and other impacts. Climate change will put additional stress on our water resource systems and infrastructure, as higher water temperatures, more variable and extreme precipitation, and drought cycles alter existing ecological conditions and make habitat inhospitable to native aquatic plants and animals, and more susceptible to non-native and invasive species. More broadly, recognizing that climate impacts on other parts of the nation and world are likely to drive population to the water-rich Great Lakes region, the region should begin to prepare today.

¹⁷³ Great Lakes – St. Lawrence River Basin Water Resources Compact, Public Law 110-342, 122 Stat. 3739 110th Congress, October, 3, 2008. http://www.gsgp.org/projects/water/docs/12-13-05/Great_Lakes-St_Lawrence_River_Basin_Water_Resources_Compact.pdf





Source: Illinois Department of Natural Resources, 2008; Chicago Metropolitan Agency for Planning analysis of land development on agricultural and natural lands from 2001-15.



Our fragmented management of water systems reflects multiple agencies, each with its own separate mission and programs. In addition, other sectors such as public health, energy, agriculture, and transportation make policy decisions that influence water resource outcomes. Some water resource challenges can, in fact, result when an agency takes action in isolation without considering the interconnected nature of those resources. Cumulatively, individual development decisions -- including agricultural practices, the simple clearing of native riparian vegetation, and individual developments -- can have significant and lasting impacts on neighboring communities and downstream resources, including increased stormwater runoff and flooding, reduced water quality, and decreased drinking water quality and availability. For example, the extent of impervious surfaces associated with urban development is highly correlated with the quality of a watershed's streams and other resources. Due to this correlation, impervious surface area serves as an indicator of the biological health and physical integrity of surface waters. Inadequate empirical data about the many factors influencing these resources' health necessitates the use of imperviousness as a proxy. The Watershed Integrity local strategy map illustrates the region's percentage of impervious surface by watershed, while the Stream Quality map shows the location of higher-quality aquatic resources among those that have been assessed. Both maps demonstrate the impact of urban development on aquatic resources. It should be noted that only half of the region's waters have been assessed, and other high quality streams are known to exist. Headwater streams make up a majority of stream miles in the region but have not been assessed, highlighting the need for additional data and monitoring. Most of the remaining higher quality aquatic systems are found in the collar counties, where imperviousness and riparian modifications remain low relative to the rest of the region, and where watershed conditions are more likely to support higher quality streams. Future development in those areas should strive to implement appropriate designs and development practices that protect and enhance these aquatic systems.

[GRAPHIC TO COME: An illustrated watershed diagram highlighting stormwater management best practices to improve water quality.]

Effective water resource management can address some of these challenges and improve the region's natural assets. ON TO 2050 reaffirms the GO TO 2040 recommendation to integrate planning with water resource management, and suggests a conceptual goal of an integrated water resource framework for managing the region's water assets.¹⁷⁴ This framework requires both careful consideration of impacts and coordination among decision makers to protect ecosystem health and sustainability.

¹⁷⁴ The Water Research Foundation defines integrated water resource management as "an integrated planning and implementation approach to managing finite water resources for long-term resilience and reliability, meeting both community and ecosystem needs (Paulson, Broley, and Stephens 2017, 2), while the Water Environment and Reuse Foundation suggests the approach "considers the urban water cycle as a single integrated system, in which all urban water flows are recognized as potential resources, and the interconnectedness of water supply, groundwater, stormwater and wastewater is optimized, and their combined impact on flooding, water quality, wetlands, watercourses, estuaries and coastal waters is recognized" (Howe and Mukheibir 2015, 3.)

The region can advance integrated water resource management in a number of ways. Coordination among existing state and federal programs can identify cost-effective ways to maintain water and wastewater infrastructure while protecting natural assets. Watershed plans help identify cross-jurisdictional solutions and can be expanded beyond water quality goals to address additional water resource objectives. Watershed-based workgroups can bring together communities, agencies, and partners to address water quality resources through watershed monitoring and improvements. Local planning and development practices can ensure that redevelopment improves water quality and that new development not only minimizes impacts but also enhances natural resources with the right approach, standards, and design. Infrastructure decisions in particular can have lasting effects on the sustainable management of water systems, as described in greater detail below and in the other two water related strategies. Updating federal programs is a long-term goal, but the region and state can take more immediate actions to improve coordination and decision making that reflect the interconnected nature of water resources. The ON TO 2050 Water Resources strategy paper includes more details about the challenges to our water resources and how to address them.¹⁷⁵

[GRAPHIC TO COME: A Watershed integrity Local Strategy Map interactive feature will illustrate percent impervious surface by catchment, which is one of many indicators that can be used to assess the quality of aquatic resources. It will highlight policy recommendations for areas with high imperviousness emphasize green infrastructure retrofits and waterway restoration that improves habitat.]

The following subsection describes strategies and actions to implement this recommendation.

Improve water resource management and coordination

Institutional barriers, from the separation of different policy sectors to disconnected decision making across jurisdictions, hinder the region’s ability to sustainably manage water resources. As a result, water resources are often managed in isolation, missing opportunities for more cost-effective, integrated solutions. At the local level, many communities have separate entities managing water supply, stormwater, and wastewater, each with its own governance structure and mission, with limited connection to land use and transportation planning functions. Additional details about shared services and intergovernmental coordination are in the *Governance* chapter.

There are many ways to improve efficiency, effectiveness, and coordination of efforts related to flood mitigation, wastewater, water quality, water supply, and aquatic habitats. Better data collection and analysis regarding the condition of our water resources are an important foundation for integrated water resource management and performance-based decision making based on scientific evidence. Updating federal programs is a long-term goal, but the region and

¹⁷⁵ CMAP ON TO 2050 Strategy Paper, “Water Resources Strategy Paper” (2017), <http://www.cmap.illinois.gov/onto2050/strategy-papers/water-resources>



state can take more immediate actions to improve coordination and decision making. State and local agencies are seeking such opportunities, including cross-jurisdictional efforts to advance the state's Nutrient Loss Reduction Strategy to reduce nitrogen and phosphorous 45 percent by 2015, and new approaches to finance stormwater management projects, including updates to the State Revolving Fund. A comprehensive water planning agenda and funding program at the state level could improve coordination of water resource management efforts.

The State should develop a comprehensive water planning agenda and increase funding levels to fully support programs that integrate water supply, water quality, stormwater, and aquatic habitat objectives.

The State should support and coordinate data collection, tracking, and research among various agencies, including the Illinois Environmental Protection Agency (IEPA), Illinois Department of Natural Resources (IDNR), Illinois State Water Survey (ISWS), Illinois State Water Survey (ISGS), Illinois Natural History Survey (INHS), watershed working groups, and other watershed organizations.

IDNR and IEPA, in partnership with more local and regional organizations, should increase the number of streams surveyed and rated, and work with partners to develop a region-wide index for assessing the quality of headwater streams.

IDNR and IEPA should provide funding for CMAP to prepare an integrated water resource management plan for the region, addressing water quality, water supply, and stormwater management, including a focus on natural areas and green infrastructure, and providing a framework for enhancing coordination and establishing priorities for the region.

CMAP and partners should coordinate a cross-jurisdictional platform to engage local governments, conservation organizations, and community water resource managers to advance integrated, innovative, and watershed-based management across sectors and agencies.¹⁷⁶

CMAP and partners should explore the use of transfers, credits, and water quality and volume trading programs to achieve regional water resource goals.

Local watershed entities should collaborate to ensure that efforts are solving priority watershed challenges and not working at cross-purposes.

The U.S. EPA and federal partners should advance stormwater management reform to better address non-point source pollution and flooding (see *Reduce flood risk to protect people and assets* recommendation.)

¹⁷⁶ American Planning Association. 2016. "American Planning Association Policy Guide on Water." <https://www.planning.org/policy/guides/adopted/water/>.



Incorporate water resource management into local planning

As the primary land use and development authorities in the region, municipalities and counties have significant responsibility to integrate water resource management considerations into planning efforts. The region can accommodate new households and jobs while protecting and enhancing water resources with a variety of best management techniques. Existing natural areas, open spaces, headwaters, high priority lakes and streams, and riparian zones can be protected through land use planning and land acquisition. To maintain and improve water resources, new development should protect natural drainage and hydrology, minimize the impact of impervious surfaces, and provide natural buffers along waterways and waterbodies. At the site-scale, county and municipal development ordinances can encourage or require the use of green infrastructure practices to minimize the impact of impervious surfaces, improve the quality, and reduce the volume of stormwater runoff. Infill and reinvestment in existing developed areas can actually improve water management in older neighborhoods by triggering the installation of stormwater best management practices (see the *Improve natural resources through the redevelopment process recommendation*.)

Local governments should identify and protect water resources -- and the water protective services provided by natural areas, riparian buffers, wetlands, and open space -- through the use of practices that avoid or minimize the expansion of impervious areas and that encourage infill, compact, and contiguous development.

Local governments and other land management entities should prioritize land acquisition and stewardship to maintain and enhance high priority water resources.

Local governments should integrate watershed plan recommendations and other water quality improvements into development ordinances.

Local governments should continue to update stormwater management plans and ordinances to reflect best practices and performance standards for protecting and enhance water resources.

CMAP should continue to integrate water resource management considerations into LTA projects.

CMAP, local governments, and transportation agencies should evaluate the direct and indirect water resource impacts of regionally significant transportation projects and the development they induce, requiring the use of practices that enhance rather than negatively impact water resources.

Local governments should recognize and plan for greater access for recreational uses on waterways and adjacent land.

Create and implement multi-objective watershed plans

Improving the quality of our water resources requires a comprehensive approach to easing the stresses imposed by stormwater runoff, combined sewer overflows, wastewater and industrial



discharges. While watershed plans are an important mechanism for addressing water quality concerns, they typically lack the authority and funding to achieve significant water quality improvement. To date, the most successfully implemented watershed plans are the result of committed watershed groups that include municipal, county, state, and industry leaders collaborating on broad activities to advance water quality and other watershed goals. The DuPage River Salt Creek Working Group and the Fox River Study Group are models that should be extended throughout the region to invest in watershed restoration that addresses water quality concerns. Also, multiple objectives including open space protection, flood control, high-priority pollutants (chlorides and nutrients), and water supply protection can be addressed through watershed planning, and some of the region's entities are already doing so, including implementation of the Nutrient Loss Reduction Strategy. Plan implementation requires a number of actions by watershed stakeholders, including open space protection, changes in development and transportation design, gray and green infrastructure investments, and operational changes to asset management practices.

CMAP, IEPA, stormwater and wastewater managers, and watershed management entities should engage a diverse set of stakeholders in workgroups to plan and implement priority projects that best achieve the goals of watershed plans.

CMAP, watershed organizations, IEPA, and other partners should continue to advance the state of watershed planning science and to develop and help implement watershed plans in the region using the watershed work group approach as one successful model.

CMAP and partners should explore funding and financing strategies to support collaborative efforts -- such as the State Revolving Fund and the use of transfers, credits, and water quality and volume trading programs -- to achieve regional water resource goals.

Wastewater managers, stormwater managers, conservation organizations, and local governments should focus efforts on addressing high-priority pollutants through watershed planning and implementation: nutrients, chlorides, sediment, and emerging pollutants such as pharmaceuticals.

Optimize water infrastructure investment

The region's aging water infrastructure systems -- including drinking water, wastewater, and stormwater -- are in need of significant investment and modernization. Resource managers should consider an integrated water resource management framework that protects, conserves, and reuses water resources. Likewise, an integrated approach can help guide public and private investment to achieve multiple benefits, plan for appropriate growth, leverage multiple funding sources, and improve resilience. Some water managers, such as MWRD, recognize wastewater as a resource, making significant investments to recover nutrients and biosolids from waste streams, direct treated wastewater back into circulation for other uses, and capture excess heat and natural gas as a source of energy. Across the U.S., communities and industries are



identifying uses of rainwater and graywater that can reduce both demands on drinking water and volumes of stormwater and wastewater.

In this era of limited resources, infrastructure investment must be strategic, multi-objective, performance-based, and connected to sound planning that upgrades, rehabilitates, and optimizes the use of existing system capacity. Reinvestment in existing infrastructure before expanding these systems is essential to reduce maintenance and replacement costs over the long term, and to create incentives for infill development that helps capture infrastructure costs. When expansion is considered, long-term asset management and maintenance costs should inform decision making, as described in the *Incorporate market and fiscal feasibility into planning and development process* recommendation of the *Community* chapter. In some cases, the best approach for managing the region's infrastructure systems is to identify collaborative strategies for optimizing investments and efficiencies, including consolidation and service sharing arrangements.

The infrastructure and service recommendations of this *Environment* chapter and the *Governance* chapter include a number of crossover strategies. For example, *Encourage shared services, consolidation of local services, and local government consolidation, Coordinate and cooperate on operating and maintaining the region's infrastructure, and Develop tax policies that strengthen communities and the region.*

The State, local governments, utilities, and water management entities should pursue resource recovery and closed loop systems (use, capture, recovery, and reuse) for water assets, including updating codes and standards to efficiently use clean water and ensure adequate water flow in the region's rivers and streams.

Wastewater managers should continue to explore the use of constructed wetlands and land application to help treat and manage wastewater.

The State should continue to improve the Illinois Clean Water Initiative program criteria and incorporate flexible approaches to achieve water supply, water quality, and stormwater management goals and to better support high need, low resource communities.

The State, CMAP, and local governments should connect infrastructure investments with sound planning, consider long-term asset management and maintenance costs of infrastructure expansion, and prioritize use of infrastructure funds to upgrade, rehabilitate, and optimize the use of existing system capacity before investing in expansion.

CMAP and the IEPA should explore innovative wastewater planning approaches that protect water quality and satisfy other regional planning goals.

CMAP, local governments, and watershed groups should consider the protection of water resources when making wastewater service planning and infrastructure investment



decisions, including separation of combined sewers and strategies to reduce frequency of overflows.

Local governments and other utility service providers should consider shared services, consolidation of local services, and other efficiency strategies in investment decisions to improve community fiscal health and resilience.

Address the unique challenges of Lake Michigan and its tributaries

Lake Michigan and its interconnected system of lakes and tributaries -- the most significant water resources in our region -- face unique challenges. Our location on the Lake Michigan shoreline demands collective action to maintain and enhance the health of our region's main water source and help the state meet its commitments to national and international partners. IDNR should continue to strategically manage the Lake, which currently endures significant pollution from urban, agricultural, and industrial sources. Strategies for addressing these challenges include improving stormwater management, reducing combined sewer overflows, cleaning up polluted lands and harbors, and better managing industrial discharges to the Lake and its tributaries. Our state's nearshore and shoreline habitat exists entirely within the Chicago metropolitan region¹⁷⁷ and is degraded, fragmented, and affected by dynamic lake levels and a changing shoreline, which can affect infrastructure, shipping, property, recreational resources, and sensitive ecosystems. Preventing the introduction of additional aquatic invasive species, which have already affected the Lake's natural ecology and native species dynamics, should be a high priority. The region should be engaged in solutions that help protect the Great Lakes from Asian Carp and other such species while also maintaining the services currently provided by the Chicago Area Waterway System: the Chicago and Calumet Rivers, and the North Shore, Cal-Sag, and Chicago Sanitary and Ship Canals. The "Our Great Rivers" initiative is intended to focus attention and investment on improving these legacy resources, and the Great Lakes and Mississippi River Interbasin Study focused on the interaction between these water systems, should be implemented.¹⁷⁸

CMAP, USACE, IDNR, MWRD, MPC, CCT, and other stakeholders should continue to explore solutions to manage, enhance, and provide access to the Chicago Area Waterways System.¹⁷⁹

Congress should continue to fund investments that maintain the health, recreational use, and economic benefits of Lake Michigan and the Great Lakes, such as the Great Lake Restoration

¹⁷⁷ The Chiwaukee Illinois Beach Lake Plain, the coastline from Kenosha to Waukegan Harbor, has been designated as a wetland system of international importance () by RAMSAR, the Convention on Wetlands intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Ramsar Sites Information Service. 2015. <https://rsis Ramsar.org/ris/2243>.

¹⁷⁸ Great Chicago Rivers. 2018. "Great Rivers Chicago." <http://greatriverschicago.com/index.html>.

¹⁷⁹ United States Environmental Protection Agency. 2017. "Chicago Area Waterway System / Chicago River." <https://www.epa.gov/il/chicago-area-waterway-system-chicago-river>.



Initiative, the Coastal Zone Management program, the Water Resources Development Act,¹⁸⁰ and efforts to prevent invasive species transfer.

CMAP, IDNR Coastal Management Program, Chicago, and coastal communities and landowners should increase efforts to focus and coordinate high-priority coastal issues, such as protecting shorelines and coastal infrastructure, supporting resource-compatible recreational activities and access to Lake Michigan, and restoring natural resources.

IDNR, Chicago and other local governments, and coastal landowners should work together to protect and restore coastal nearshore and shoreline aquatic and terrestrial habitat, ravines, and migratory flyways.

CMAP should work with regional partners to implement or incorporate the Lake Michigan Lakewide Management Plan update into local planning efforts.

Lake County stormwater managers, MWRD, and other wastewater managers should continue to reduce stormwater runoff and combined sewer overflows into Lake Michigan and the region's waterways.

Reduce flood risk to protect people and assets

The significant economic, social, infrastructural, and environmental challenges posed by flooding impair communities' efforts to achieve local and regional goals. Chronic flooding damage can make communities less desirable, as does the flood-related deterioration of building facades, streets and sidewalks, and other infrastructure and property. CNT found that wet basements can decrease property values by 10 to 25 percent and are cited as a primary reason for not purchasing a home.¹⁸¹ According to FEMA, nearly 40 percent of small businesses never reopen after a flooding disaster.¹⁸² Increasing floodwaters also strain our natural and open spaces as streambanks erode, pollutants and invasive species degrade habitat, and groundwater recharge is reduced.

Flooded streets reduce mobility and increase maintenance costs for repair and reconstruction. In addition to the direct costs of delay and reduced access, road and transit closures can cause a cascade of indirect impacts that impair economic productivity, safety, emergency services, bicycling, and walking.¹⁸³ When flooding does occur, it does not affect all populations or

¹⁸⁰ Great Lakes Restoration Initiative. n.d. "Great Lakes Restoration." Accessed May 30, 2018. <https://www.glri.us/>. NOAA Office for Coastal Management. 2016. "The National Coastal Zone Management Program." <https://coast.noaa.gov/czm/>; National Wildlife Federation. n.d. "Water Resources Development Act." Accessed May 30, 2018. <https://training.fws.gov/courses/csp/csp3132/resources/WRDAs/WhatisWRDA.pdf>.

¹⁸¹ Center for Neighborhood Technology, 2014, "The Prevalence and Cost of Urban Flooding: A Case Study of Cook County, IL," http://www.cnt.org/sites/default/files/publications/CNT_PrevalenceAndCostOfUrbanFlooding2014.pdf.

¹⁸² Federal Emergency Management Agency, 2016, "Make Your Business Resilient," <http://www.fema.gov/es/media-library/assets/images/116921>.

¹⁸³ Schwartz, H. G., M. Meyer, C. J. Burbank, M. Kuby, C. Oster, J. Posey, E. J. Russo, and A. Rypinski, 2014: Ch. 5: Transportation. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo,



communities equally. Exposure to flooding risks appears to be greater in populations and communities already facing socioeconomic, demographic, and health challenges and barriers.¹⁸⁴

[GRAPHIC TO COME: An illustrated graphic explaining the differences between urban and riverine flooding.]

While flooding is a natural occurrence, continued urbanization and climate change are leading to more flooding. Development of impervious cover prevents the infiltration of rainwater and generates stormwater runoff, while climate change results in more frequent and intense storm events. Increased stormwater runoff can overwhelm local drainage systems and lead to urban flooding, such as ponding water in streets and yards, basement seepage, and sewer backups. Stormwater eventually flows to rivers and streams and can cause riverine flooding as water flows over riverbanks and into the floodplain. Buildings and roads in floodplains are at greater risk of flooding and can lead to flooding downstream as the natural function of the floodplain is reduced.

From the extensive network of preserved habitat, open space, and wetlands to the engineered detention basins, sewer systems, and Tunnel and Reservoir Plan, the Chicago region has made significant investments in green and gray infrastructure. However, development in significant portions of the region predated modern stormwater management standards, and even current infrastructure design specifications rely on old data¹⁸⁵ and do not account for a changing climate.¹⁸⁶ Some neighborhoods experience flooding after less than two inches of rain -- small storms that, over time, result in significant harm to property and quality of life.

ON TO 2050 reaffirms GO TO 2040's recommendation to integrate planning with water resource management. The region can advance stormwater and floodplain management in various ways that include protecting and enhancing the stormwater services currently provided by natural areas and open spaces; avoiding investments in areas where environmental conditions -- from floodplains to low-lying areas -- pose high risk of urban and riverine flooding; and minimizing stormwater runoff volumes through development regulations and design standards. Integrating stormwater management into larger planning can help coordinate investments and leverage limited resources to address flooding while achieving other

Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 130-149. doi:10.7930/J06Q1V53. <http://nca2014.globalchange.gov/report/sectors/transportation>.

¹⁸⁴ Lowe, Dianne, Kristie L. Ebi, and Bertil Forsberg. 2013, "Factors Increasing Vulnerability to Health Effects before, during, and after Floods," *International Journal of Public Health*, 10, 7015-7067; doi:10.3390/ijerph10127015.

¹⁸⁵ Winters, B. A., J. R. Angel, J.R., Ballerine, C., Byard, J., Flegel, A., Gambill, D., Jenkins, E., McConkey, S., Markus, M., Bender, B.A., O'Toole, M.J., 2015, "Report for the Urban Flooding Awareness Act," Illinois Department of Natural Resources Springfield, IL: <http://hdl.handle.net/2142/78150>

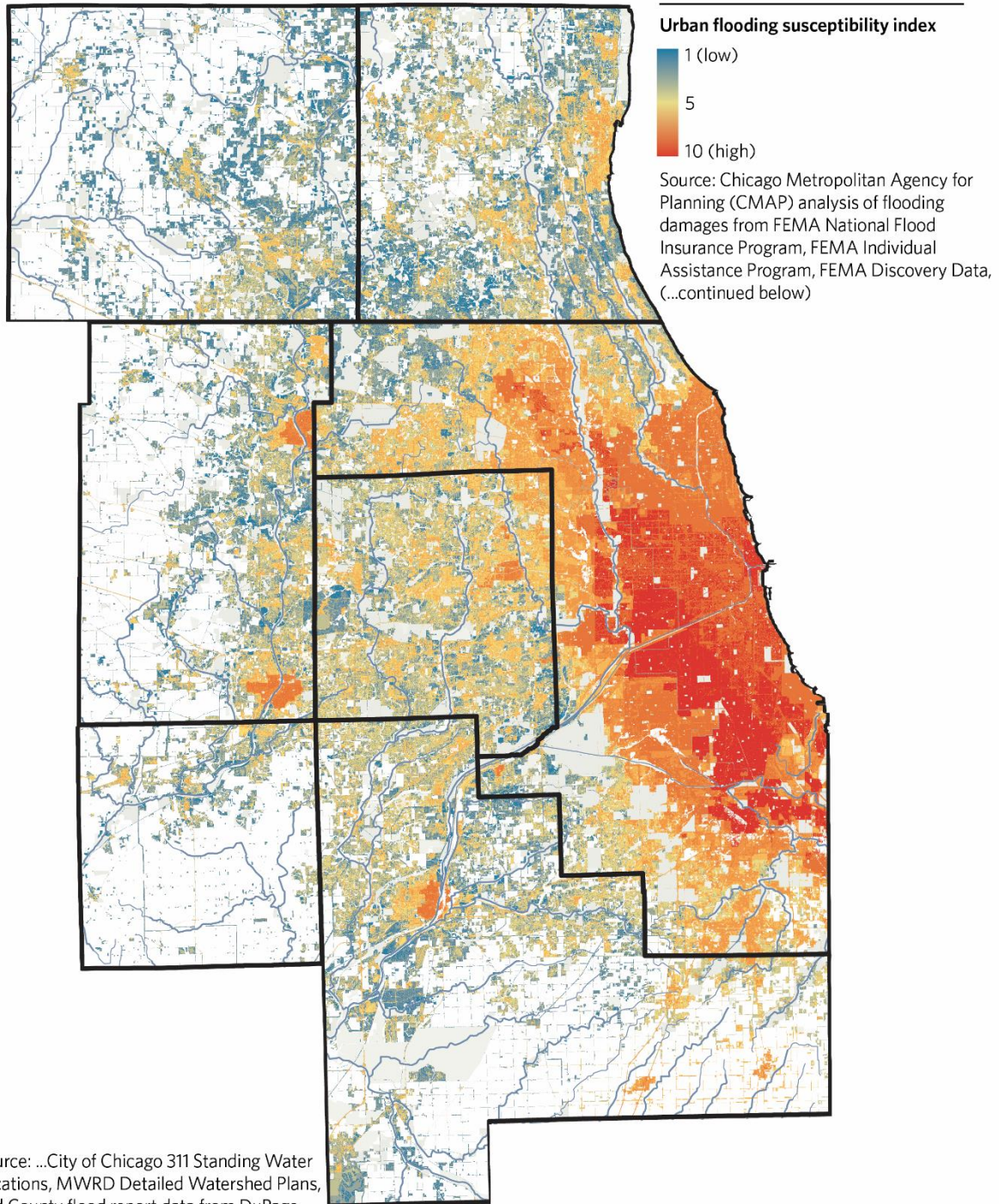
¹⁸⁶ Markus, M., Angel, J., Byard, G., Zhang, C., McConkey, S., Cai, X., Notaro, and Ashfaq, M., 2018, "Communicating the Impacts of Projected Climate Change on Heavy Rainfall using a Weighted Ensemble Approach," *Journal of Hydrologic Engineering*, 23(4).



community goals. CMAP has developed the Regional Urban Flooding Susceptibility Index¹⁸⁷ to help prioritize areas for planning and mitigation investment, particularly in locations with municipal capacity constraints that make it difficult to address these challenges.

¹⁸⁷ CMAP, 2018, "Regional Flood Susceptibility Index," <https://datahub.cmap.illinois.gov/dataset/on-to-2050-layer-flood-susceptibility-index>





Source: ...City of Chicago 311 Standing Water Locations, MWRD Detailed Watershed Plans, and County flood report data from DuPage, Kendall, and Lake, as well as categorical data from CMAP 2013 Land Use Inventory, U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Wall-to-Wall Anthropogenic Land Use Trends (NWALT) 1974-2012, USGS National Hydrography Dataset Plus, 2011 National Land Cover Dataset, NOAA Atlas 14, FEMA National Flood Hazard Layer, MWRD 100-yr Inundation Layer, MWRD Combined Sewer Service Areas, CMAP Combined Sewer Service Areas, LiDAR-derived Digital Elevation Models from Illinois Height Modernization (ILHMP): LiDAR Data, and County hydrology data.



The following subsection describes strategies and actions to implement this recommendation.

Identify and communicate flooding risk

Extreme precipitation events in the central U.S. increased as much as 40 percent between 1979 and 2009 compared to the previous 30 years (1948-1978).¹⁸⁸ Yet many of the region's infrastructure standards and floodplain maps are based on older precipitation data. Reducing the region's exposure to flooding and optimizing long-term investments so that they account for future conditions requires a more current and comprehensive understanding of where and when urban and riverine flooding could occur. Watershed plans, stormwater models, and other studies help the region identify the most effective stormwater solutions, and coordination of these tools can help address problems across jurisdictional boundaries. In the absence of detailed models, the Regional Urban Flooding Susceptibility Index can help convey the potential risk of urban flooding. Residents and business owners making important investment decisions often lack information about flood risk. Ironically, though established to provide affordable flood insurance, repair damaged homes and businesses, and promote floodplain management, the National Flood Insurance Program (NFIP) has the unintended effect of perpetuating development in flood-prone areas. This is particularly true in locations without strong floodplain management regulations that discourage redevelopment. The NFIP does not adequately communicate the level of risk, set premiums to reflect the full risk of loss, or provide options for low income property owners.

ISWS should regularly update precipitation data and explore options to account for future climate scenarios.

FEMA, IDNR, and county stormwater agencies should update floodplain maps to reflect current development conditions as well as current and future precipitation.

County stormwater agencies and municipalities should continue advancing watershed and sewer modeling efforts to identify and increase awareness of areas of riverine and urban flooding risk.

Local governments should collect flooding data and communicate risk and possible solutions to residents and businesses, with particular attention to residents who may be more vulnerable to the impacts of flooding.

CMAP and partners should continue to develop planning tools to understand and plan for urban flooding risk.

The State and real estate community should implement efforts to ensure that the sale of property is informed by accurate flood risk information.

¹⁸⁸ Groisman, P.Y., Knight, R.W. & Karl, T.R., 2012, "Changes in intense precipitation over the central United States," *Journal of Hydrometeorology*, 13, 47-66.



Congress should reform the NFIP to adequately identify and communicate risk.

Improve planning and development to reduce current and future flooding risk

Planning in advance of potential flooding can reduce risks to health and safety as well as costs and damages to private and public property and infrastructure. From hazard mitigation plans to development ordinance updates, many locally implemented best practices could be used broadly throughout the region and can help achieve multiple community benefits, such as increased green space, lower flood insurance premiums, and higher property values. Municipalities can locate development and critical facilities, such as treatment plants, hospitals, and civic institutions, away from floodplains and other floodprone areas. Restoring the natural function of floodplains and wetlands enhances the ecosystem services they provide.

In the Chicago region, all counties have established minimum standards for stormwater management, including limiting the amount of runoff that may be generated by new development or redevelopment. Continued advancements are needed to address urban flooding, incorporate current and projected precipitation data, and streamline volume reduction and green infrastructure techniques, among others.¹⁸⁹ Municipal development ordinances also contain provisions that significantly affect stormwater runoff and management, such as the amount of impervious cover, and building and street design requirements. Local governments can be proactive about addressing flooding challenges by going beyond county requirements to require stormwater best management practices on smaller parcels. Some municipalities in the region, such as Downers Grove, are leading the way in seeking to protect their existing neighborhoods from urban flooding by recognizing and preserving stormwater flow capacity in areas with local drainage problems.

Local governments should continue to update stormwater management ordinances and performance standards to reflect best practices, including green infrastructure solutions, and emerging information about climate change and development trends.

CMAP should convene *county stormwater agencies* and other partners to exchange information about regulatory updates that improve stormwater management.

CMAP and partners should explore the use of transfers, credits, and water quality and volume trading programs to achieve regional water resource goals.

IDNR and local governments should continue to improve floodplain management guidance, techniques, and compliance, and participate in the Community Rating System.

Local governments should update plans and development standards to improve stormwater and floodplain management.

¹⁸⁹ CMAP, 2018, "ON TO 2050 Stormwater and Flooding strategy paper," <http://www.cmap.illinois.gov/onto2050/strategy-papers/stormwater>

CMAP, counties, and other partners should support continued pre-disaster planning efforts, including buyout programs, flood risk assessments, identification and protection of critical facilities, and stormwater planning, and identify opportunities for coordination.

Maintain and invest in gray and green infrastructure

Parts of the region are adequately protected from flood risk, but others have gray and green infrastructure systems that lack adequate capacity for even small storms. Green infrastructure has the potential to improve our flood control and stormwater system while achieving co-benefits unavailable with gray infrastructure solutions. Coordinating green and gray infrastructure solutions into public investments (e.g., streets, parks, schools, and public grounds and facilities) -- as well as encouraging retrofits of private property -- will be essential to improving the stormwater management capacity of our communities. This will allow the region to build a more distributed stormwater management system with greater resilience to disruptions or constraints.

Prioritizing investment in high need, high risk areas will be critical. Watershed plans, modeling efforts, and the Regional Urban Flooding Susceptibility Index, combined with information about vulnerable populations, can help inform regional and local priorities. In some situations, the best long-term solution is to return flood-prone land to open space through acquisition and stewardship, removing people and property from harm's way. Federal resources that historically funded infrastructure improvements may be insufficient as increased sea levels, storm surges, and flooding across the country strain disaster assistance resources. Dedicated revenue streams, such as stormwater utility fees, can support maintenance and expansion of gray and green infrastructure based on a long-term vision.

Local governments should use the Regional Urban Flooding Susceptibility Index, along with other mapping, planning, and modeling efforts to prioritize flood mitigation investments.

Counties, municipalities, and other infrastructure managers should enhance maintenance and monitoring of gray and green infrastructure.

Local governments should develop stormwater utility fees to cover the full costs of stormwater management and improve flood control infrastructure.

Local governments and other land managers should protect and expand open spaces to enhance natural stormwater management while achieving resource management goals.

Local governments should pursue property acquisition and voluntary buyouts to help willing landowners vacate high flood risk areas.

Congress should reform the National Flood Insurance Program to develop long-term solutions for properties that suffer repetitive losses.



Address flood vulnerability of critical transportation assets

Flooding affects the performance and maintenance of the region's transportation network. Retrofitting locations at risk of flooding to handle current and projected rain events can help maintain regional and local mobility and ensure that investments are built to last. The RTA, IDOT, and county transportation agencies are working to identify and plan for areas of the existing transportation system that are vulnerable to flooding. In other states, DOTs and regional planning agencies are conducting vulnerability assessments and improving system resilience with projects recommended in long-range transportation plans.¹⁹⁰ Local governments also need to address flooding vulnerability of their streets and update capital improvement plans and corresponding design standards. As precipitation data and floodplain maps are updated, local and regional vulnerability assessments should be revised periodically to reflect changing conditions. Avoiding construction of new streets and highways in current flood-prone areas is also critical and must be evaluated with future climate conditions in mind.

CMAP and transportation implementers should conduct studies to determine the flood vulnerability of transportation infrastructure and design projects to accommodate the projected precipitation during its designed lifespan.

CMAP and partners should conduct a regional climate vulnerability assessment of the transportation system to inform long-range transportation planning and programming.

CMAP should develop a regional pavement flooding reporting system to help plan for flood events.

Improve stormwater management in transportation projects

As the intensity and frequency of storm events increases with climate change, the region will need strategies to better integrate stormwater management into transportation planning and design. Best practices often include drainage improvements that increase detention capacity or promote infiltration, as well as a series of protective measures to reduce exposure to flood waters. Recently, the FAST Act expanded the scope of statewide and metropolitan transportation planning processes to reduce or mitigate stormwater impacts of surface transportation.¹⁹¹ This provision could enhance how stormwater management is addressed in overall planning efforts as well as individual surface transportation projects. Recent updates to the Surface Transportation Program (STP) program now incentivize the use of green infrastructure to manage stormwater.¹⁹²

¹⁹⁰ U.S. Department of Transportation, Federal Highway Administration, 2018, "Vulnerability Assessment and Adaptation Framework, 3rd Edition," FHWA-HEP-18-020, https://www.fhwa.dot.gov/environment/sustainability/resilience/adaptation_framework/

¹⁹¹ 23 U.S.C. 135 (d)(I) and 23 CFR 450.306 (b)(9)

¹⁹² Memorandum of Agreement between the City of Chicago and the CMAP Council of Mayors regarding the distribution and active program management of locally programmed surface transportation block grant funds under the Fixing America's Surface Transportation Act, October 11, 2017,



Currently, highway and street design and reconstruction requirements do not reflect county-specific stormwater management goals or practices. Instead, they follow state design guidelines, which can limit the ability to implement green infrastructure and other innovative solutions or tailor design to local context and needs. Public rights of way often present good opportunities for green infrastructure. Many of our existing streets experience flooding due to development patterns in the surrounding area, particularly in communities developed prior to modern stormwater management standards. Street flooding could be addressed through infrastructure retrofits in surrounding neighborhoods instead of within constrained rights of way. Projects that comprehensively address stormwater management solutions can improve the performance of our transportation system while also reducing flooding damages in nearby neighborhoods.

Local governments should support continued efforts to better integrate stormwater management into land use and transportation planning projects.

IDOT should update statewide design standards to reflect green infrastructure techniques and precipitation trends, designing transportation infrastructure for the climate of its designed lifespan.

Transportation agencies should construct and maintain projects that can sufficiently manage current and future storm events.

IDOT should support CMAP's stormwater management planning efforts to reduce flooding vulnerability of the transportation system.

Counties and municipalities should update development ordinances and reconstruction practices to improve stormwater management and promote green infrastructure techniques in new and reconstructed streets.

Coordinate and conserve shared water supply resources

Water resources are essential for sustaining economic prosperity, environmental health, and quality of life in the region. The leading sources of water in the region are Lake Michigan, groundwater aquifers, and the Fox and Kankakee Rivers. Access to Lake Michigan water has been critical to regional development and, if well managed, will continue to provide a sustainable supply of water into the future for much of the region. Illinois withdraws, uses, and then diverts Lake Michigan water out of the Great Lakes Basin to the Mississippi River system, a modification which resulted in a U.S. Supreme Court Consent Decree¹⁹³ that governs Illinois withdrawal of lake water, which is managed by the IDNR.¹⁹⁴ Over the years, access to Lake

<http://www.cmap.illinois.gov/documents/10180/127961/2017+STP+Agreement.pdf/6b800a21-59fb-b538-a1c9-fa1342765355>

¹⁹³ Wisconsin v. Illinois, 388 U.S. 426 (1967); 449 U.S. 48 (1980).

¹⁹⁴ 17 ILAC Ch. I, Subch. H, Sec. 3730.



Michigan water has been extended, providing a more sustainable drinking water source. That said, there are limits to the amount of water the state can withdraw, which may limit some communities' ability to access Lake Michigan water.

CMAP is updating the regional water demand forecast of Water 2050,¹⁹⁵ which examined how population and employment, development patterns, climate dynamics, and conservation and efficiency efforts could affect future water usage. Per capita usage has been declining due in part to conservation and efficiency gains, and continued improvements will be necessary to manage the region's water demand. However, the total demand for water is anticipated to increase with population growth and climate change. The location of future water demand will significantly influence whether the region can maintain a sustainable water supply.

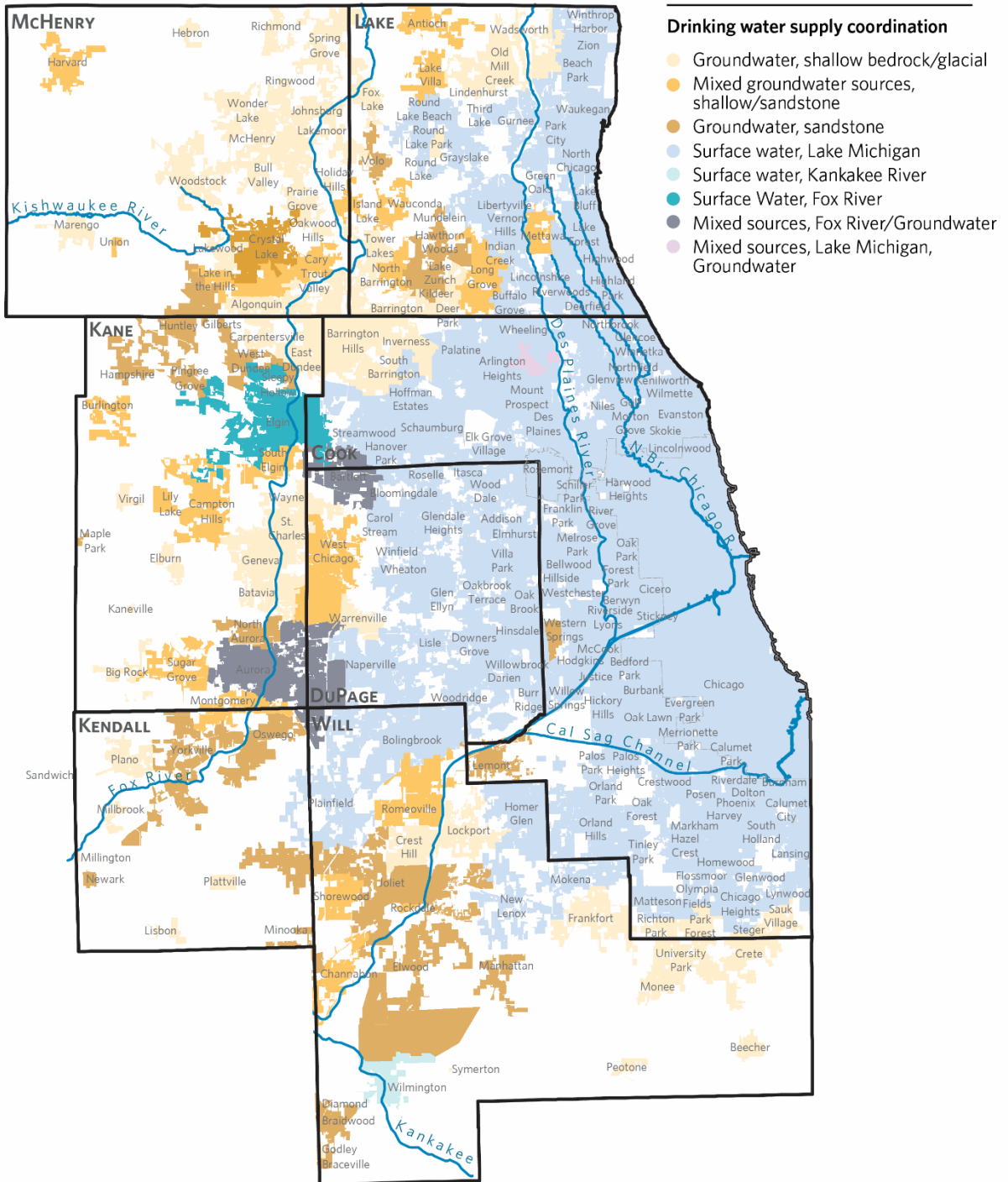
[GRAPHIC TO COME: Map of water use by community, with per capita consumption for 2013 and 2050.]

Population growth and industrial development, particularly in the collar counties, has led to increasing withdrawals from constrained groundwater resources. Continued use of groundwater sources will require coordinated management throughout the region in the future, especially during droughts. In some areas, groundwater is being withdrawn at a rate that exceeds the recharge rate, resulting in decreasing yields, increasing pumping demands, increasing salinity, and the search for alternative water sources, all of which increase the cost of providing water.¹⁹⁶ For example, increasing withdrawals from community water suppliers as well as industrial users in western Will County and northern Kendall County are posing significant risks to the existing quantity and quality of water supply as portions of the aquifer become desaturated. Similarly, shallow aquifer withdrawals in northeastern Kane County and southeastern McHenry County are exceeding the recharge rate, which may result in neighboring wells competing for less water and impacts to nearby streams and rivers dependent on groundwater flows. Land use and transportation decisions affect the amount of water that's available to replenish shallow aquifers as well as the quality of the water that enters our groundwater reservoirs. For example, roads and conventional road and parking lot salting practices are linked to rapidly rising chloride levels in some parts of the region. Water supply management will help to maintain water supplies, support community livability, and mitigate potential conflicts arising from water shortages.

¹⁹⁵ CMAP, 2010, "Water 2050: Northeastern Illinois Regional Water Supply/Demand Plan," <http://www.cmap.illinois.gov/programs/water/supply-planning/water-2050>

¹⁹⁷ U.S. Global Change Research Program, 2014 National Climate Assessment, Water Supply, <https://nca2014.globalchange.gov/highlights/report-findings/water-supply>





Source: Chicago Metropolitan Agency for Planning analysis of Illinois State Water Survey, 2014.



Community water suppliers -- consisting of municipalities, sub-regional authorities, and private companies -- provide an essential service and are key to the region's economic success. They must maintain safe, efficient infrastructure at affordable prices while also managing water use to ensure a long-term supply. This challenging task is often exacerbated by aging infrastructure and strained financial capacity. Mounting infrastructure repair can result in high levels of water loss and delays in replacing lead and copper infrastructure. Some suppliers must also address large shifts in demand, such as new development or the closing of major industries, while others make long-term decisions in the face of near-term supply uncertainties. In addition, local elected officials and residents can be unfamiliar with the complexity of our water supply and the day-to-day challenges faced in continuing to provide clean, safe and reliable water. Low income residents, people of color, and the elderly may be disproportionately affected by deferred maintenance and service costs, which are eventually passed on to consumers. To maintain our quality of life and economic competitiveness, the region should pursue strategies that maintain and improve drinking water infrastructure and protect water sources.

The following subsection describes strategies and actions to implement this recommendation.

Incorporate water supply and demand considerations into local and regional planning

Understanding both the available supply of water and the current and future demand is critical to making informed land use, transportation, and infrastructure investment decisions. Today several different state agencies collect and analyze information about the use and condition of our region's drinking water supply, which can result in redundancy and gaps in planning and responsibilities. A properly funded and coordinated approach could enhance regional understanding of and planning for water supply and demand. For more context, see the *Coordinate and conserve shared water resources* recommendation.

Working together, land use planners and water utility managers can align local planning efforts with current and future water supply constraints. Assessing forecasted demand scenarios in the context of available water supply and infrastructure capacity can inform regional and local planners about the sufficiency of water supply and encourage actions that conserve water, protect supply, and/or pursue alternative drinking water sources. In particular, local water demand forecasts can help bridge land use, transportation, and municipal finance and asset management decisions as development patterns affect water use and also long-term infrastructure maintenance costs. Avoiding expensive capacity expansions can help maintain municipal fiscal stability but requires coordination across municipal departments to reduce water demand. For land use planning techniques to protect water supply, see the *Incorporate water supply and demand considerations into local and regional planning* strategy.

The State should coordinate community water supplier reporting requirements and improve data sharing across agencies and partners.



The U.S. Geological Survey, State, and Counties should fund critical surface and groundwater supply research and expand groundwater quality and quantity monitoring.

CMAP should regularly update the regional water demand forecast in conjunction with socioeconomic forecast updates and incorporate projected impacts of climate change.

Local governments and other community water suppliers should conduct local water demand forecasts and integrate demand management and conservation strategies in land use and infrastructure planning efforts.

Local governments should protect the quantity and quality of water supply sources through open space and recharge area protection, as well as other water pollution control measures.

CMAP and partners should provide technical assistance to communities to incorporate water supply and demand management strategies in local plans, ordinances, and development review processes.

Local governments should consider long-term water availability and infrastructure costs in decisions about large scale water users and the expansion of drinking water services in new development.

CMAP, local governments, and transportation agencies should evaluate, avoid, and minimize the direct and indirect water resource impacts of regionally significant transportation projects and of the development they induce in locations facing water supply constraints.

Strengthen regional water supply management

Illinois groundwater withdrawals are governed under the rule of reasonable use, with no permitting program for withdrawals. Building on the precedent of the Lake Michigan Allocation program, CMAP supports the development of a comprehensive groundwater management program to resolve conflicts and manage withdrawals for long-term sustainability. This will be particularly important in coming years as climate change is expected to diminish the amount and quality of water supplies while also increasing water demand.¹⁹⁷ To implement such a program, critical elements of water supply management will need to be strengthened, including more robust annual and monthly water reporting from communities, to inform the regional groundwater flow model, river water studies, and regional water demand forecast. Communities that coordinate with ISWS to review new public or private well proposals will have a better understanding of potential effects and can plan accordingly to reduce conflicts and shortages.

Communities are already organizing to protect water resources, with examples that include the Northwest Water Planning Alliance (NWPA), the Barrington Area Council of Governments,

¹⁹⁷ U.S. Global Change Research Program, 2014 National Climate Assessment, Water Supply, <https://nca2014.globalchange.gov/highlights/report-findings/water-supply>



and communities and industrial partners in the Joliet area. As groundwater is a shared regional resource, withdrawals require coordination across jurisdictions; management systems can evolve as new information and policies become available. As groundwater-dependent communities face growing challenges due to over-withdrawal and contamination, some might pursue access to Lake Michigan water. As required by their permits, Lake Michigan communities can help make more of the state's limited allocation available to others in the region by increasing conservation and efficiency and reducing water loss. Water 2050¹⁹⁸ and a subsequent CMAP report¹⁹⁹ identified key strategies for water demand management and water loss reduction.

ISWS, IDNR, CMAP, and partners should continue to disseminate information to groundwater-dependent communities on the potential effects of continued groundwater withdrawals and consequences for existing communities and future growth.

Community water suppliers should regularly report water use to the State and consult ISWS on groundwater impacts of new development and wells.

Community water suppliers dependent on constrained supplies should explore ways to coordinate withdrawals and management of shared water resources with neighbors.

CMAP, NWPA, and partners should continue local and sub-regional coordination efforts, promote demand management strategies, and explore the development of plans for existing and future Fox and Kankakee River users.

CMAP and partners should explore the development of a comprehensive groundwater management program.

IDNR and the State Water Task Force should explore and advance specific legislative changes of the state-wide groundwater protection authority as part of a larger effort to improve state management of water resources.

Lake Michigan permittees should follow the Lake Michigan Allocation Program requirements²⁰⁰ to maintain compliance with provisions of the U.S. Supreme Court consent decree²⁰¹ and the Great Lakes Compact.²⁰²

¹⁹⁸ CMAP, 2010, "Water 2050: Northeastern Illinois Regional Water Supply/Demand Plan," <http://www.cmap.illinois.gov/programs/water/supply-planning/water-2050>

¹⁹⁹ CMAP, 2014, "An Assessment of Water Loss among Lake Michigan Permittees in Illinois," <http://www.cmap.illinois.gov/programs/water/supply-planning/loss>

²⁰⁰ 17 ILAC Ch. I, Subch. h, Sec. 3730.

²⁰¹ *Wisconsin v. Illinois*, 388 U.S. 426 (1967); 449 U.S. 48 (1980).

²⁰² Great Lakes – St. Lawrence River Basin Water Resources Compact, Public Law 110-342, 122 Stat. 3739 110th Congress, October, 3, 2008. http://www.gsgp.org/projects/water/docs/12-13-05/Great_Lakes-St_Lawrence_River_Basin_Water_Resources_Compact.pdf



Local governments within the Lake Michigan basin should promote stormwater infiltration to reduce the amount of stormwater runoff that counts toward the allowable allocation.

Municipalities, working with counties and state partners, should develop contingency plans for droughts and other water emergencies that limit the availability of water.

Maintain drinking water infrastructure and manage demand

Investing in long-term maintenance of drinking water systems is an ongoing challenge for many communities.²⁰³ Because water infrastructure is largely an underground asset, its maintenance needs are not as apparent as other community challenges. Addressing deferred maintenance can require substantial funding, and as the region's infrastructure ages and faces increasing impacts from climate change, maintenance needs are anticipated to grow. CMAP supports state efforts to make the Public Water Supply Loan Program more accessible for communities and encourages the prioritization of projects based on realistic water demand projections and maintenance of existing water capacity before new capacity investments. Managing water demand is another way community water suppliers can avoid expensive new expansion projects and focus on maintenance of existing assets. As outlined in Water 2050, foundational demand management strategies include annual water loss audits, full-cost pricing to set appropriate water rates based on infrastructure need, water reuse and conservation programs, and universal metering to accurately account and charge for water usage. For more information on full-cost pricing, see the *Local governments should implement user fees* strategy. Municipalities across the region are also updating ordinances and educating customers about conservation and efficiency in landscaping and watering.

Water affordability is a growing concern in many communities as continuing escalation of service and infrastructure costs translate into rising utility bills. Areas with vulnerable populations, such as low income residents, people of color, and the elderly, are disproportionately affected. Water pricing should be sensitive to the ability of the consumer to pay, yet small utilities with a low income customer base may struggle to achieve the appropriate rate structure that pays for the system. Water utility consolidation is one strategy to address these challenges. The Chicago region has hundreds of community water supply systems, most of which are publicly owned and managed by a municipality. Small water suppliers are more likely to face significant capital constraints for maintenance and upgrades and often struggle to meet state standards. Communities are already exploring ways to gain efficiencies of scale through collaboration and consolidation, and they should continue to investigate potential options among neighboring utilities.

Community water suppliers should implement asset management and water demand management strategies.

²⁰³ CMAP, 2014, "An Assessment of Water Loss among Lake Michigan Permittees in Illinois," <http://www.cmap.illinois.gov/programs/water/supply-planning/loss>



Community water suppliers should utilize the IEPA Public Water Supply Loan Program for low interest loans.

IEPA and partners should continue asset management and water demand management training and support for community water suppliers.

U.S. EPA and the State should continue to advance water conservation, efficiency, and reuse standards in plumbing fixtures and appliances.

Community water suppliers should ensure safe, clean, abundant, and affordable water, and evaluate and address affordability impacts of rate increases on low income customers.

IEPA, IDNR, IDPH, CMAP, and other partners should target assistance to communities facing high maintenance needs and water affordability challenges.

Community water suppliers, particularly those contemplating alternative water sources or large-scale capacity changes, should work with nearby water suppliers to explore costs and benefits of service sharing and utility consolidation.

IEPA, IDNR, CMAP, and other partners should explore strategies, best practices, and appropriate conditions for water service consolidation.

Development practices that protect natural resources

To preserve the region's highest-priority natural and agricultural areas, stakeholders must pursue conservation strategies and also promote reinvestment in existing communities. While preservation decisions are often driven by opportunity, strategic frameworks like the ON TO 2050 Conservation Areas local strategy map and the Green Infrastructure Vision²⁰⁴ can help maximize the benefits of land protection by assisting the coordination of different actors and funding streams, particularly at the region's developing edge. In addition, sensitive development techniques such as conservation design in these locations can help ensure preservation of high quality natural assets as well as continuity and connectivity of natural areas via open space corridors, which is critical to protecting native species and systems.

Reinvestment efforts, which focus growth in areas with existing infrastructure, housing stock, transportation access, and services, can help reduce development pressures on natural and agricultural lands and revitalize disinvested areas as well as remediate brownfields and other barriers to infill development. In fact, redevelopment can significantly improve the environmental performance of communities and reap co-benefits. Integrating green infrastructure into the redevelopment process can result in additional parks and open spaces, tree-lined streets, and stormwater management. Combined, these investments provide places for recreation, habitats for native flora and fauna, air pollutant filtration, flood reduction, urban

²⁰⁴ Chicago Wilderness, CMAP, and The Conservation Fund, 2012 "Green Infrastructure Vision 2.2 Refinement," <http://www.cmap.illinois.gov/programs/sustainability/open-space/green-infrastructure-vision>



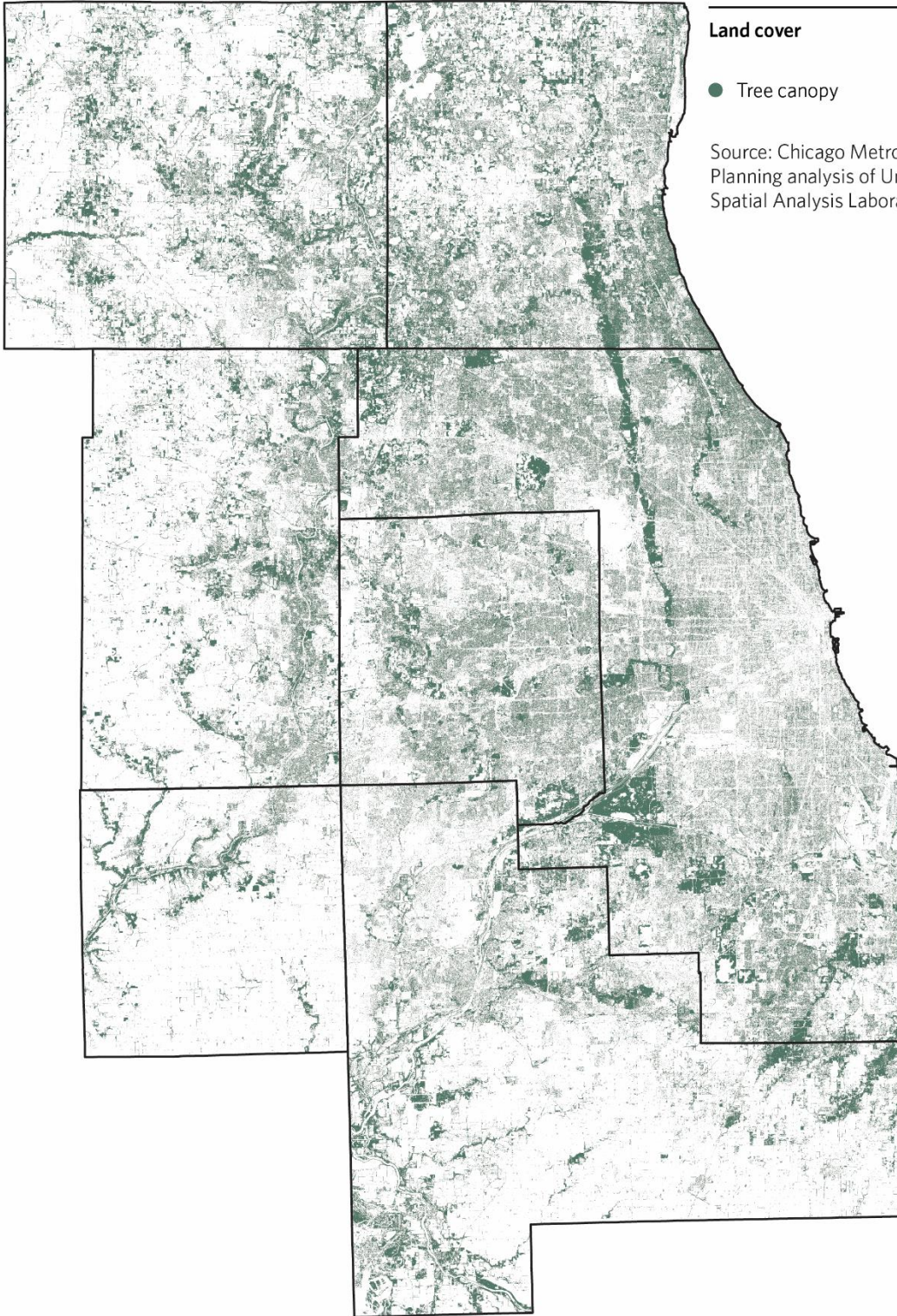
heat island mitigation, and groundwater recharge, while at the same time creating more desirable and resilient communities.

Improve natural resources through the redevelopment process

Infill and redevelopment can provide a variety of benefits, such as leveraging and making efficient use of existing infrastructure and services, promoting walkability, spurring investment in disinvested or stagnant growth areas, and helping to preserve key agricultural and natural lands by accommodating growth in already developed locations. The redevelopment process also presents unique opportunities to conserve, restore, and enhance natural resources at infill locations and to increase climate resilience.

Given that most development happened before the advent of today's best practices, redevelopment can help tackle some of the region's most persistent environmental challenges. For example, remediating brownfield sites when conditions are favorable provides environmental and social benefits; however, current funds for these initiatives are limited. In addition, building renovations and construction of new buildings can result in improved environmental performance through the use of energy- and water-efficient systems and appliances, renewable energy, water reuse, recycled and sustainable materials, and other sustainable approaches.





Land cover

- Tree canopy

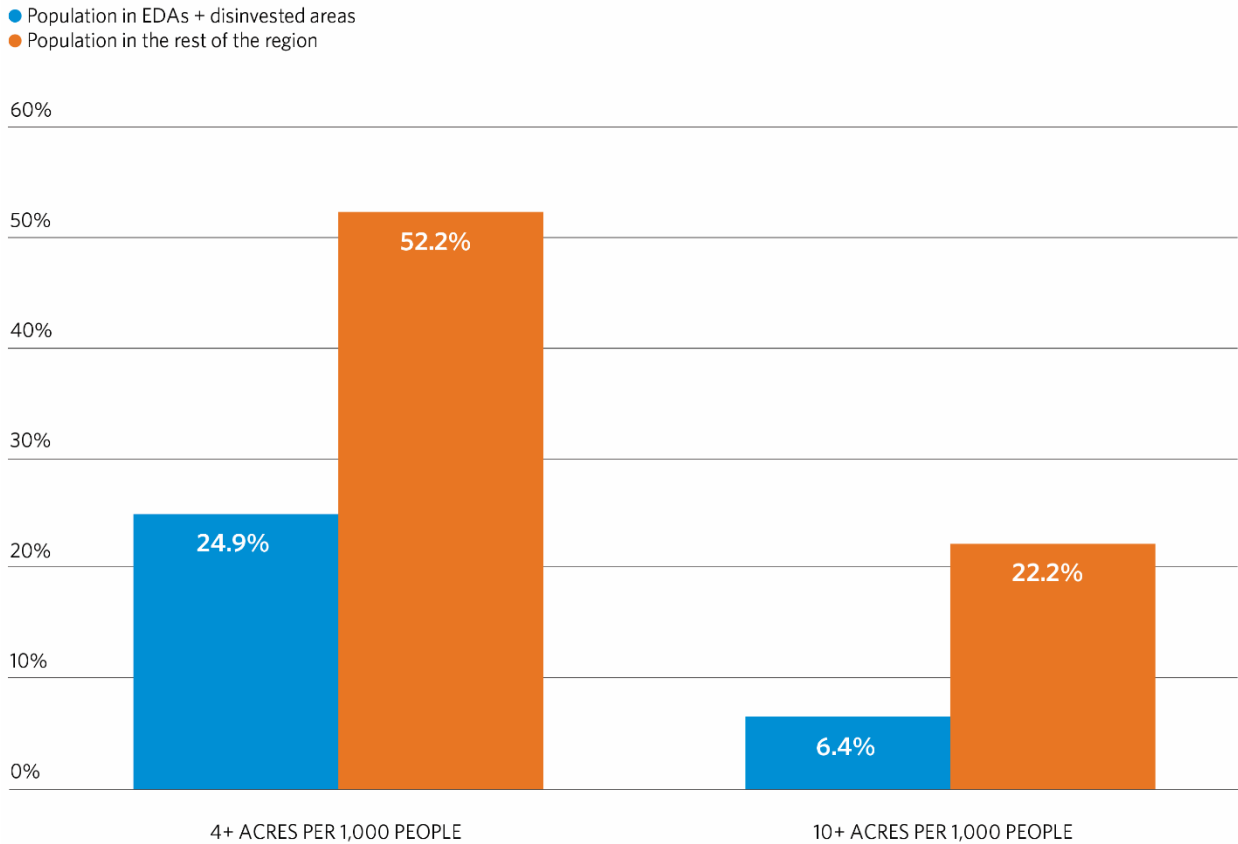
Source: Chicago Metropolitan Agency for Planning analysis of University of Vermont Spatial Analysis Laboratory, 2010.



In addition, strategy development for ON TO 2050 has highlighted other environmental issues related to climate change and flooding, water quality, community greening and placemaking, and impacts to vulnerable populations that are particularly important to address during the redevelopment process. Climate change -- and the associated exacerbation of urban heat island effects and flooding -- underscores the importance of expanding green infrastructure, tree canopy, and other community greening strategies. With regard to underserved populations, review of the GO TO 2040 access to parks indicator revealed that the region's EDAs have far lower access to parks than economically connected areas: in 2013, 28.6 percent of the population in EDAs had access to four or more acres of parkland per 1,000 residents, compared to 53.8 percent in other areas. As EDAs redevelop, making a concerted effort to provide park space will help to reduce this disparity over time.

Access to parks (4+ acres per 1,000 people), within Economically Disconnected Areas (EDAs) and disinvested areas, rest of region, 2013

Source: Chicago Metropolitan Agency for Planning Land Use Inventory 2013 and the U.S. Census Bureau's 2010 Census.



The following subsection describes strategies and actions to implement this recommendation.

Apply sustainable development practices to the redevelopment process

Each redevelopment site represents an opportunity to enhance the environmental performance of a property and contribute to local and regional natural resource enhancement. Many aspects of development proposals, such as building design, landscape choices, and site planning, can improve climate resilience, water conservation, stormwater management, and water quality. Expansion of site-scale greening -- particularly with native and drought- and flood-tolerant landscape materials and trees -- can help to mitigate the urban heat island effect, retain stormwater, and promote carbon sequestration. Avoiding redevelopment in flood-prone areas interrupts the cycle of escalating and recurring damages. Local governments can be proactive about addressing flooding challenges by going beyond county requirements to require stormwater best management practices on smaller parcels. Encouraging green infrastructure practices as the first design option and enabling rainwater harvesting and reuse can help address concerns from neighbors that redevelopment could exacerbate existing stormwater problems.

Despite these real benefits, integration of sustainable practices in redevelopment is often perceived as more difficult or expensive. The most common example is with stormwater, where small sites may be severely constrained from meeting detention requirements. Yet the application of green infrastructure designs like permeable paving or bioswales can be incorporated in a variety of settings. For property owners with space or other site constraints, credits and trading programs can provide flexibility and increase implementation. In the stormwater example, trading programs allow eligible properties to meet a portion of their stormwater requirements by buying “credits” from other property owners. These programs could lead to dramatic improvements, especially if off-site installations are located within the same water- or sewer-shed and the infill site does not create downstream impacts. Municipalities can also take advantage of larger-scale redevelopment efforts to either make adjacent infrastructure improvements that relate to climate resilience, such as burying overhead utility lines, installing street trees, or building sewer capacity or shared stormwater solutions, or require developers to do so.

Local governments should revise zoning, building, energy, and stormwater regulations to ensure sustainable development practices are implemented through redevelopment, retrofits, and adaptive reuse of buildings and property.

County stormwater agencies should follow Cook and DuPage efforts and establish fee-in-lieu programs for detention and volume control for constrained infill sites to address existing flooding and water quality issues.



Address environmental challenges that disproportionately affect specific populations and disinvested areas

As documented by the environmental justice movement, environmental issues tend to have disproportionate impacts on specific populations, including people who are low income, of color, or have limited English proficiency. For instance, these residents are frequently affected by the environmental hazards arising from the disproportionate location of brownfields, landfills, and freight and industrial facilities within their communities. Similarly, research suggests that those who might be at increased exposure to heat waves include people of color, residents with limited English proficiency, those with family income below the poverty line, the elderly, children, and those with existing health conditions.²⁰⁵

Other challenges, ranging from repetitive flooding to lead exposure in drinking water lines, could also be due to a lack of investment and maintenance that are particularly acute in disinvested areas. As infrastructure managers work to balance budgets or address the backlog of deferred maintenance, higher service fees can be particularly difficult for low income residents to absorb. In general, more research is needed to determine the impacts of environmental issues on different population groups and meaningful strategies to address them. Any such effort must deeply engage the affected communities to ensure that solutions reflect local needs.

CMAP and partners should explore the impacts of high-priority issues -- such as climate change, water loss and pricing, repetitive flooding, brownfields, and air pollution -- on vulnerable populations and disinvested areas, while engaging affected populations to collaboratively develop and implement solutions.

CMAP and partners should align green and gray infrastructure investments to address the unique needs of disinvested areas.

Increase community greening efforts and expand neighborhood parks

Community greening involves increasing the amount of green coverage, including recreational or passive park space, community gardens, landscaping and tree canopy,²⁰⁶ and green infrastructure. This can be particularly valuable in walkable downtowns, along major commercial corridors, and in other areas with an extensive impervious surface. Community greening efforts can achieve numerous benefits, including greater climate resilience, stormwater management, habitat, reduced heat island effect, and improved physical and mental health. GO TO 2040 recommended retrofitting developed areas with green infrastructure, which contributes to overall community greening, and these practices were explored in greater detail

²⁰⁵ The U.S. Environmental Protection Agency provides research related to climate vulnerability, see <https://www.epa.gov/heat-islands/heat-island-impacts>.

²⁰⁶ The Chicago Regional Trees Initiative hosts an interactive map to explore the urban tree canopy, see <http://chicagorti.org/interactivemap>.



in the ON TO 2050 Integrating Green Infrastructure strategy paper.²⁰⁷

Local governments, park districts, and other partners should expand and improve access to neighborhood parks and community gardens, particularly in EDAs.

Local governments, park districts, and other partners should incorporate green infrastructure and other green strategies into neighborhood parks, school yards and properties, corporate and office campuses, and other open lands to achieve multiple co-benefits.

Local governments, park districts, and transportation agencies should expand urban forestry efforts to protect existing trees and to increase and diversify the tree canopy.

Local governments, transportation agencies, and landowners should incorporate site-scale green infrastructure, trees, landscaping, etc. into non-park spaces, including street right of ways, parking lots, and private property.

Integrate land preservation into strategic growth efforts

The Chicago region maintains many high quality natural areas and has an incredibly high level of biodiversity. Over 800,000 acres of land make up the region's green infrastructure network and provide an array of ecosystem services, including flood control and carbon sequestration. A recent study estimated that a subset of these services provides approximately \$6.4 billion annually in services that would be either very expensive or impossible to replicate.²⁰⁸ However, because these natural areas are often isolated from one another by agriculture, roads, and development, they face challenges associated with fragmentation, pollution, invasive species, and climate change.

[GRAPHIC TO COME: An illustrated diagram defining green infrastructure at different scales and highlighting the importance of ecological connectivity via cores, hubs, and corridors.]

ON TO 2050 reaffirms GO TO 2040's recommendation to preserve priority natural areas in the region, and adds the goal of capitalizing on the development process to help retain and enhance critical open space. Our progress over the course of this century has been mixed. Natural areas are not widely targeted for protection in local land use plans, and development review processes vary greatly in how they identify and protect natural resources. From a land preservation perspective, 61,500 acres of land were protected between 2000 and 2015, marking a 22 percent increase and progress toward GO TO 2040 targets. Of the approximately \$1.15 billion used to protect natural lands within this time period, nearly 80 percent of funding came from

²⁰⁷ CMAP, 2016, "ON TO 2050 Integrating Green Infrastructure strategy paper," <http://www.cmap.illinois.gov/onto2050/strategy-papers/green-infrastructure>

²⁰⁸ Will Allen, Ted Weber, Jazmin Varela, CMAP Technical Committee, 2014, "Green Infrastructure Vision 2.3: Ecosystem Service Valuation," <https://datahub.cmap.illinois.gov/dataset/green-infrastructure-vision-2-3-ecosystem-valuation>



open space referenda put forth by the region’s forest preserve and conservation districts -- a testament to how valuable conservation efforts are to local voters.²⁰⁹ However, funding for open space protection has dropped dramatically since the 2008 recession, and state funding programs have been delayed or suspended. Funding for land protection and stewardship needs to increase significantly to reach regional goals.

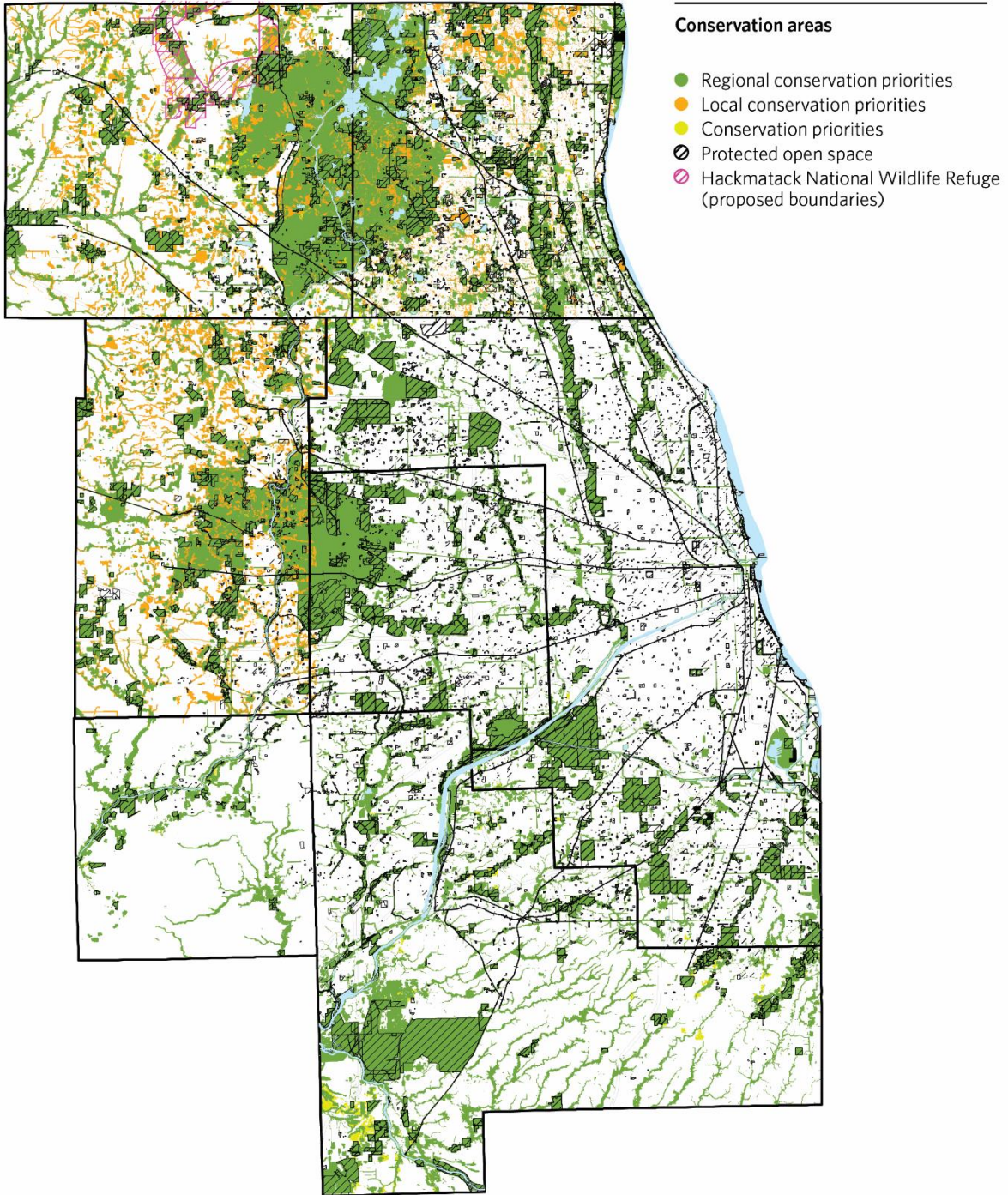
[GRAPHIC TO COME: Photo essay that highlights the agricultural and natural resources in the region, how some of these areas are being developed, and best practices to retain these areas in the future.]

For ON TO 2050, CMAP created the Conservation Areas Local Strategy Map, which presents local and regional conservation priorities and reflects current data on the region’s natural assets. The Conservation Areas map builds on and refines the first-of-its-kind Green Infrastructure Vision,²¹⁰ which continues to serve as a guide for the Chicago region and beyond to pursue an integrated network of natural resources and open spaces.

²⁰⁹ The Trust for Public Land, 2015, “Conservation Almanac,” <http://www.conservationmanac.org/secure/>, The expenditure of \$1.15 billion for the protection of open space occurred from 2001 to 2013.

²¹⁰ Chicago Wilderness, CMAP, and The Conservation Fund, 2012 “Green Infrastructure Vision 2.2 Refinement,” <http://www.cmap.illinois.gov/programs/sustainability/open-space/green-infrastructure-vision>



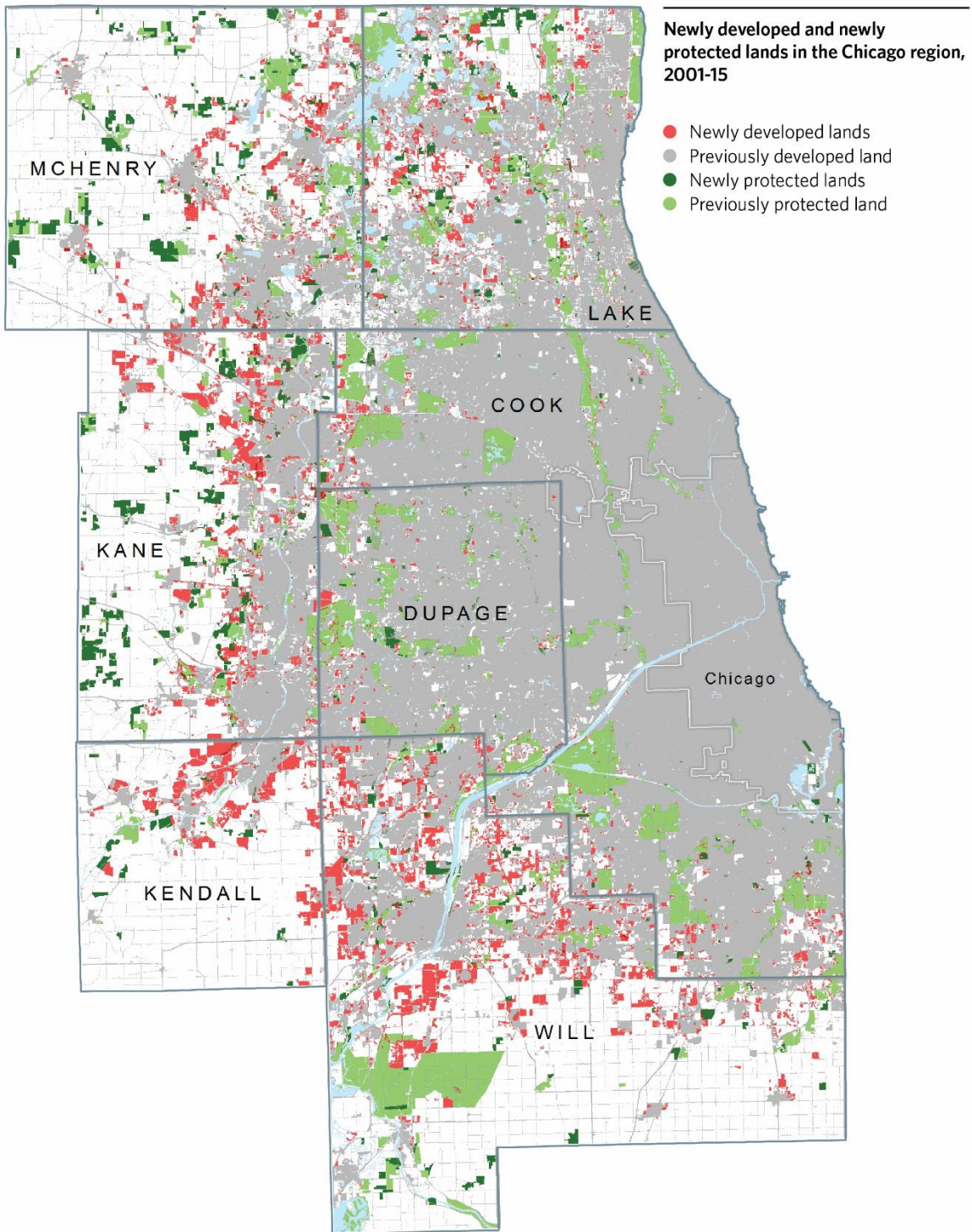


Source: Chicago Metropolitan Agency for Planning (CMAP) analysis of CMAP Land Use Inventory, county forest preserve and open space data, IDNR site data, CMAP Northeastern Illinois Regional Greenways and Trails Plan, Illinois Natural Areas Inventory, Ducks Unlimited and USFWS Enhanced National Wetland Inventory, FEMA floodplain data, Morton Arboretum Oak Ecosystems data, Chicago Wilderness Green Infrastructure Vision 2.3, National Conservation Easement Database, USGS National Land Cover Database, Kane County Green Infrastructure Plan, McHenry County Green Infrastructure Plan, and Lake County Green Infrastructure Strategy.



Agricultural lands do not provide all of the same ecosystem functions as natural areas and can negatively affect water quality and other natural resources when appropriate land management activities are not followed. Yet farmland contributes to the rural character and economies of the region's collar counties and could be a critical regional resource with respect to feeding the region and enhancing land and water resources in the future. Nearly 900,000 acres, or 35 percent of the region's land area, are in agricultural production. Our state's diverse agriculture sector, including all elements of production, processing, and distribution, contributes significant economic strength and employment. As crop production patterns shift nationally, our region's agricultural lands may increase in value and importance. However, despite its economic and cultural contributions, farmland is often perceived as awaiting future development, and few local economic assessments consider the role that agricultural production plays in local economies.





Source: 2001-11 National Land Cover Dataset, 2015 Northeastern Illinois Development Database, 2001/2005/2013 Chicago Metropolitan Agency for Planning Land use Inventory, 2012-15 National Conservation Easement Database, 2014 Kendall County Forest Preserve District Master Plan, 2016 Trust for Public Land Conservation Almanac, and 2016 I-View: Prairie State Conservation Coalition's database of Illinois protected natural lands.

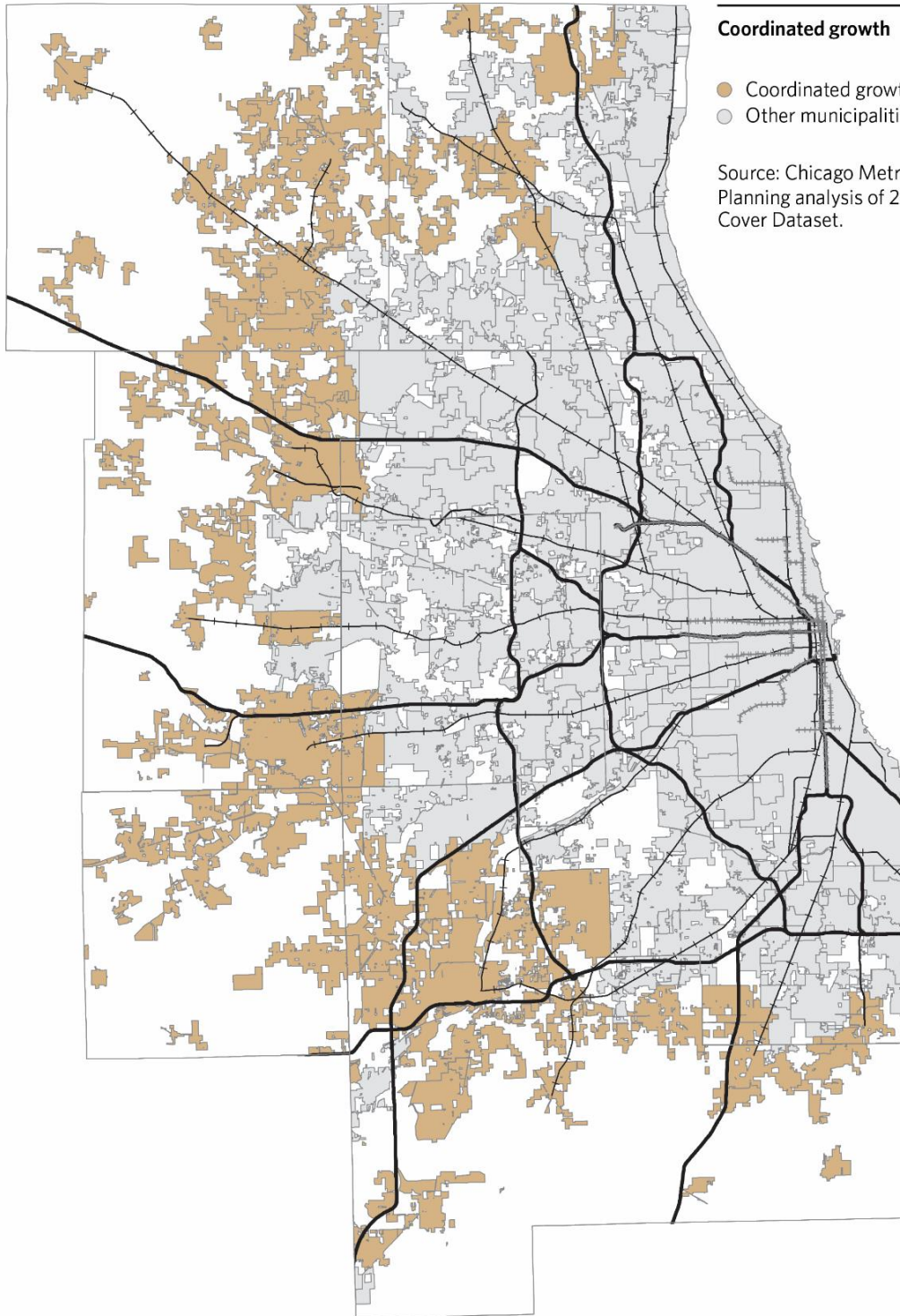


Between 2000 and 2015, the region developed 40,000 acres of natural areas and 100,000 acres of farmland. That represents a 12 percent addition to the region’s overall development footprint during a time when employment remained flat, population increased by only 4.6 percent, and many opportunities for infill development remained untapped. While development can add economic benefits to the region’s communities, it can also diminish natural resources through habitat fragmentation, reduced core habitat size, and indirectly causing the spread of invasive plant and animal species.²¹¹ New development also creates recurring expenses -- for streets, drinking water and wastewater services, and other necessities -- that can cause or exacerbate community struggles to maintain essential infrastructure and services. And despite the unknown economic impact of 100,000 fewer acres of agricultural land in the region, agricultural production can only remain viable if the region has a critical mass of farms and corresponding distribution and processing centers.

While agricultural and natural lands will likely continue to face challenges from national and global forces such as climate change and market trends, development pressure is a significant factor that municipalities and counties have considerable ability to influence. As the region is projected to add more than 1.9 million residents and 700,000 jobs by 2050, ON TO 2050 identifies communities with significant agricultural and natural assets in the Coordinated Growth local strategy map. ON TO 2050 identifies strategies to minimize the potential environmental and fiscal impacts of new development with a goal of maintaining and enhancing the region’s agricultural systems and natural resources. Infill and reinvestment strategies in existing neighborhoods and downtowns can help diminish the pressure for new development of agricultural and natural lands. If such development does occur, it should be located and designed in such a way to avoid impacts, maintain and enhance ecosystem functions and the local agricultural economy, build municipal financial health, and address other community goals.

²¹¹ CMAP, 2016, “ON TO 2050 “Integrating Green Infrastructure strategy paper,”<http://www.cmap.illinois.gov/onto2050/strategy-papers/green-infrastructure> .





Coordinated growth

- Coordinated growth area
- Other municipalities

Source: Chicago Metropolitan Agency for Planning analysis of 2011 National Land Cover Dataset.



The following subsection describes strategies and actions to implement this recommendation.

Protect and steward high-priority natural areas

To plan for and protect high-priority natural areas, such as high quality resources, rare landscapes, and key restoration areas, it is first necessary to define where they exist and how they connect to the regional green infrastructure network. IDNR, county forest preserve and conservation districts, advocacy organizations, local governments, and other regional partners produce strategic plans identifying high-priority natural assets for conservation. GO TO 2040 used the Green Infrastructure Vision (GIV) as a framework for identifying the most important core lands and corridors of our regional green infrastructure network. These plans continue to provide useful planning guidance for the region. Since GO TO 2040's adoption, CMAP has produced a new dataset to help communicate the importance of natural resources and prioritize land acquisition. The Conservation Areas local strategy map is a new aggregation of data that follows the spirit and intent of the original GIV. This local strategy map, which is informed by county green infrastructure plans and other regional data, provides a starting point for regional and local conservation partners to identify areas for land acquisition as well as inform land use plans and development decisions.

Strategic frameworks like the Conservation Areas local strategy map can help maximize the benefits of land protection by coordinating efforts across jurisdictional boundaries to preserve large complexes of natural resources and connect them along greenways and waterways. Given the decrease in state and federal funding in recent years, local funding initiatives --for example, local and county open space referenda -- will likely continue to be the backbone of natural land protection and stewardship funding. Yet additional funding will be needed to achieve natural resources goals, and innovative financing strategies offer further opportunities to fund open space while addressing other regional goals. For example, water quality trading programs can provide cost-effective solutions for achieving water quality goals while protecting land in high priority areas. The region should also explore a regional conservation open space fund, which could focus investments using a performance-based approach to most effectively and efficiently target conservation efforts to address local and regional priorities.

Counties, forest preserve and conservation districts, and municipalities should prepare and update green infrastructure plans to inform local priorities and provide inputs to the Conservation Areas local strategy map, which can inform the next iteration of the GIV.

CMAP, Chicago Wilderness, and other conservation partners should define priority natural resource restoration areas within and between areas identified in the Conservation Areas local strategy map.

Forest preserve and conservation districts, municipalities, and counties should continue to raise essential funding through open space referenda.



The State and federal governments, as well as philanthropic organizations, should continue to fund IDNR and land managers via OSLAD, NAAF, the Coastal Management Program, and other programs to acquire and maintain high-priority lands.

CMAP and partners should explore how innovative financing mechanisms, such as public-private partnerships, transfer of development rights programs, water quality and stormwater volume control trading, GHG credit markets, and expanding the use of the Illinois Clean Water Initiative programs could support open space protection and enhancement efforts.

CMAP, forest preserve and conservation districts, and other conservation partners should explore creating a regional fund for conservation open space.

Forest preserve and conservation districts, counties, and conservation organizations should work with landowners, land managers, to establish and connect large reserves that consist of mosaics of land uses oriented toward conservation, such as the Hackmatack National Wildlife Refuge, Liberty Prairie Reserve, and Prairie Parklands

The State, forest preserve and conservation districts, and private philanthropy should work with land trusts to engage and educate private landowners, accept conservation easements of priority natural lands, and continue stewardship efforts.

Identify and maintain key agricultural lands

Understanding where our most important agricultural assets are located will help facilitate their viability and guide local and regional investment decisions. Key agricultural lands should be identified using a methodology that reflects local conditions and goals within a regional context. This assessment could include criteria related to the soil as well as the markets, facilities, and infrastructure conditions. ON TO 2050 supports GO TO 2040 recommendations that emphasized the need to expand county agricultural conservation easement and protection programs, coordinate with conservation open space preservation efforts, and permit counties to use referenda to raise revenue for agricultural preservation. A farmland protection program with corresponding funding at the state level could provide needed resources to support local and county agriculture goals, especially for key agricultural areas. Innovative strategies -- such as transfer of development rights programs -- offer promise to advance farmland preservation while also addressing other regional goals. Encouraging sustainable land management strategies, either through education efforts or incentivized through innovative trading programs, could help maintain and enhance soil and water resources, see the *Protect and enhance the integrity of aquatic systems* recommendation.

Locally, diversification of our agricultural systems, including the production of a greater variety of products including food, could help the region's farms adapt to changing climate conditions, and make the region more resilient to disruptions in food production systems nationally. This was strongly emphasized as an important regional goal in GO TO 2040. Diversification efforts



can also help keep farms economically viable and retain lands in agricultural production, see the *Diversify agricultural systems to promote resilience* strategy.

CMAP and partners such as the Natural Resource Conservation Service (NRCS), local soil and water conservation districts, counties, the Illinois Farm Bureau, Farm Illinois, and Openlands should work together to identify key agricultural lands and build consensus around those areas as regional priorities for preservation.

The State should establish a comprehensive, statewide farmland protection policy, which could include an agricultural conservation easement program, and provide counties with the authority to fund farmland protection programs through local referenda.

Counties should develop farmland preservation plans and raise funding for agricultural easements.

CMAP and partners should explore how innovative financing mechanisms, such as water resource trading, Illinois Clean Water Initiative programs, and transfer of development rights programs, could support agricultural protection and enhancement efforts.

CMAP and partners such as Natural Resource Conservation Service (NRCS), local soil and water conservation districts, counties, the Illinois Farm Bureau and local chapters, Farm Illinois, and Openlands should promote agricultural practices that protect and enhance land and water resources, as well as the production of a greater diversity of crops, products, and food.

Protect agricultural and natural land through local planning processes

As the region's population grows, valuable agricultural and natural resources will continue to face development pressure, particularly in locations within or adjacent to municipal boundaries, as highlighted in the Coordinated Growth local strategy map. Identifying agricultural and natural lands in local, county, and regional planning and development efforts signals their importance and helps communities recognize the contributions of such lands to local and regional economies, ecosystems, and character. For example, Kane and McHenry counties identify agricultural and natural lands in their future land use maps. While their plans acknowledge that anticipated population growth could result in the conversion of undeveloped land, much of the existing agricultural and natural land cover is anticipated to remain in its current use. These plans also direct new development toward locations with or adjacent to existing infrastructure.

Municipalities and counties can also leverage their regulatory processes to improve the relationship between development and agricultural and natural resources. For example, updating development ordinances can support preservation of valuable natural assets and the corridors between them, and minimize the impact of new development on agricultural and natural resources. Local governments can use a number of different strategies, including agricultural and natural resource zoning districts, modernized definitions and standards relating to agriculture and natural resources, updated protection measures within subdivision



ordinances, and provisions for long-term stewardship of protected open space. Conservation-oriented development and clustering can help preserve natural resources while accommodating broader community goals for development. Even without clustering, development can be designed to protect the existing natural resources and use them as inherent assets of the site.

Local governments should use the Conservation Areas local strategy map and the Key Agricultural Lands local strategy map, when available, to inform local planning and development efforts.

CMAP and partners should quantify the agricultural system's contribution to the regional and local economies to better inform local economic development strategies, land use planning, and transportation investments.

CMAP should refer to the Conservation Areas local strategy map to inform long-range transportation planning and programming.

Local governments should adopt conservation-oriented development standards and avoid development on key natural areas.

Local governments should conduct detailed development site inventories of natural resources and first attempt to avoid, reduce, and then mitigate the natural resource impacts of development through actions such as protecting existing assets and conservation areas.

CMAP should investigate conservation design practices that work best with agricultural activities.

Evaluate future infrastructure costs when considering development expansion

In an era of limited resources, growing communities should carefully weigh the long-term costs of maintaining and replacing infrastructure against the fiscal benefits of new development. A lack of full-cost pricing and declining federal and state support have left many communities struggling to maintain infrastructure already in place. Some municipal costs, including roads, water and wastewater, stormwater, and fire protection, are more dependent on the location and density of development than others. For example, lot size, minimum block length, and street design standards influence the length and width of streets and the corresponding density of development that provides financial support for the eventual maintenance and replacement of those streets. While future land use plans and zoning and subdivision ordinances dictate the development pattern, the planning process rarely factors in the long-term financial impacts of those requirements or considers the costs of that additional infrastructure within the context of the municipality's existing liabilities. Avoiding unnecessary future infrastructure and maintenance costs will enable communities to prioritize investment toward other community objectives. Regarding long-term financial health, communities can minimize their infrastructure maintenance costs by limiting expansion and building more compactly when they do extend roads and sewers to new locations.



Local governments should consider existing road, water, and wastewater infrastructure capacity in decisions about the intensity and extent of new development.

Local governments should review and revise development standards with attention to long-term maintenance costs associated with different development patterns.

Local governments should collect adequate taxes and fees per the findings of fiscal impact analyses to cover the cost of infrastructure and services over the lifespan of new development.

CMAP should explore ways to encourage development standards that minimize long-term maintenance costs and consider incentives for such practices through existing transportation and infrastructure funding programs.



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The Chicago Metropolitan Agency for Planning (CMAP) is our region's comprehensive planning organization. The agency and its partners are developing ON TO 2050, a new comprehensive regional plan to help the seven counties and 284 communities of northeastern Illinois implement strategies that address transportation, housing, economic development, open space, the environment, and other quality-of-life issues.

ON TO 2050 is scheduled for adoption in October 2018.