GREEN INFRASTRUCTURE VISION

VERSION 2.3 ECOSYSTEM SERVICE VALUATION

GIV 2.3 Ecosystem Service Valuation
Final Report Appendices

Appendix A: Project Technical Committee

- Will Allen, Director of Strategic Conservation Planning, The Conservation Fund
- Nora Beck, Senior Planner, CMAP
- Martin Jaffe, Associate Professor, College of Urban Planning and Public Affairs, University of Illinois at Chicago
- Jeff Mengler, Senior Project Scientist, Hey and Associates, Inc.
- Dr. Kent Messer, Associate Professor, Department of Applied Economics & Statistics, University of Delaware
- Jason Navota, Principal, CMAP
- Margaret Schneemann, Water Resource Economist, Illinois-Indiana Sea Grant
- Jazmin Varela, Strategic Conservation Planning Information Manager, The Conservation Fund
- Ted Weber, Strategic Conservation Planning Science Manager, The Conservation Fund
- Patty Werner, Planning Supervisor, Lake County Stormwater Management Commission
- Nancy Williamson, Regional Watershed Coordinator, Illinois Department of Natural Resources
- Louise Yeung, Assistant Planner, CMAP

- Public Workshop Materials
  - Workshop Agenda
  - Attendee List
  - Feedback Forms (blank originals, scanned responses, and transcribed)
  - Presentation (PPT)
- Literature Review
- User Guide for GIV 2.3 with GIS layers and models

Additional materials (products generated by the project but obsolete in terms of content)

- ✓ Steering Committee Meeting Agendas
- ✓ Draft Literature Review shared at Public Workshop
- ✓ Public Workshop Reference Guide handouts
- ✓ Public Workshop large format maps (PDF)

Appendix B: Public Workshop Agenda

GREEN INFRASTRUCTURE VISION

VERSION 2.3 ECOSYSTEM SERVICE VALUATION

Public Workshop

Monday, August 18, 2014, 10:00am – 2:00pm CT
Chicago Metropolitan Agency for Planning
233 S. Wacker Drive, Chicago, IL 60606

BACKGROUND

The Conservation Fund, with support from the Chicago Metropolitan Agency for Planning (CMAP), is conducting an ecosystem service valuation of the GIV landscapes in CMAP's seven-county region. The project will quantify the ecosystem and economic benefits of the region's green infrastructure. This iteration of the GIV aims to (1) measure the many ecosystem services provided by green infrastructure, such as flood reduction, air and water pollutant removal, biodiversity, and carbon sequestration, and (2) capture the monetized value of those ecosystem functions to communities. By gaining a better understanding of the specific benefits and value of the region's green infrastructure assets, the leaders and decision-makers in the Chicago Wilderness community will be equipped with more refined data to inform local environmental actions and guide strategic decision-making across the region.

This workshop aims to solicit feedback from local experts in order to develop a refined GIV 2.3 version that will be most useful for the region's conservation leaders. The results of the workshop will determine the services that will be ultimately examined for the region.

WORKSHOP AGENDA

10:00am – 10:15am 1. Welcome and Introductions
- Louise Yeung – Chicago Metropolitan Agency for Planning

10:15am – 11:45am 2. Project Overview
- Will Allen, Ted Weber, Jazmin Varela – The Conservation Fund
  - Define ecosystem services and describe previous project examples
  - Quick review of GIV 2.2 and technical approach to valuation
  - Preview materials: draft literature review, reference guide, map gallery, feedback forms

11:45am – 12:30pm 3. Working Lunch
- Review draft literature review, reference guide, map gallery, feedback forms

12:30pm – 1:30pm 4. Fill out feedback forms

1:30pm – 2:00pm 5. Facilitated Wrap-up Discussion and Adjourn

Appendix C: Workshop Participants

Last Name	First Name	Organization
Mengler	Jeff	Hey and Associates, Inc.
Swick	Dan	The Delta Institute
Anderson	Jim	Lake County Forest Preserves
Vick	Justin	MWRD
Kircher	Dave	Forest Preserve District of Cook County
Mulvaney	Chris	Chicago Wilderness
Scott	Lydia	The Morton Arboretum
Berg	Dick	Illinois State Geological Survey
Stotz	Doug	Field Museum
Derby Lewis	Abigail	Field Museum
Luther	Kathy	NIRPC
Williamson	Nancy	Illinois Department of Natural Resources
Bouman	Mark	Field Museum
Schneemann	Margaret	Illinois-Indiana Sea Grant
Johnston	Mark	The Field Museum
South	David	West Monroe Partners
Phillips	Katrina	Alliance for the Great Lakes
Mitchell	Debra	Smith Group JJR
Malec-McKenna	Suzanne	Chicago Wilderness
Heistand	Glenn	Illinois State Water Survey
Flegel	Amanda	Illinois State Water Survey
Byers	Steve	Illinois Nature Preserves Commission
Durnbaugh	Aaron	Loyola University
Jaffe	Marty	University of Illinois at Chicago (UIC)
Novotney	Mike	Lake County
Leigh	Kerry	Natural Land Institute
LeBlanc Fisher	Cherie	US Forest Service
Megquier	Bob	Openlands
Miller	Karen	Kane County/FREP
Anderson	Paul	IIT
Kruller	Kindy	Forest Preserve District of Cook County

Appendix D: Workshop Feedback Forms

Water Flow Regulation / Flood Control (1 of 6)

1. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

2. What do you believe are the most valuable metrics to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

3. Within the CMAP 7-County region, what do you believe are the best opportunities are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

4. Which studies from the draft literature review do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any other studies or resources that may be helpful in estimating the value of this service in the CMAP region?

5. Any other thoughts?

Water Purification (2 of 6)

6. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

7. What do you believe are the most valuable metrics to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

8. Within the CMAP 7-County region, what do you believe are the best opportunities are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

9. Which studies from the draft literature review do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any other studies or resources that may be helpful in estimating the value of this service in the CMAP region?

10. Any other thoughts?

Groundwater Recharge (3 of 6)

11. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

12. What do you believe are the most valuable metrics to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

13. Within the CMAP 7-County region, what do you believe are the best opportunities are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

14. Which studies from the draft literature review do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any other studies or resources that may be helpful in estimating the value of this service in the CMAP region?

15. Any other thoughts?

Support Native Flora and Fauna (4 of 6)

16. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

17. What do you believe are the most valuable metrics to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

18. Within the CMAP 7-County region, what do you believe are the best opportunities are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

19. Which studies from the draft literature review do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any other studies or resources that may be helpful in estimating the value of this service in the CMAP region?

20. Any other thoughts?

Recreation and Ecotourism (5 of 6)

21. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

22. What do you believe are the most valuable metrics to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

23. Within the CMAP 7-County region, what do you believe are the best opportunities are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

24. Which studies from the draft literature review do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any other studies or resources that may be helpful in estimating the value of this service in the CMAP region?

25. Any other thoughts?

Carbon Storage (6 of 6)

26. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

27. What do you believe are the most valuable metrics to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

28. Within the CMAP 7-County region, what do you believe are the best opportunities are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

29. Which studies from the draft literature review do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any other studies or resources that may be helpful in estimating the value of this service in the CMAP region?

30. Any other thoughts?

Water Flow Regulation / Flood Control (1 of 6)

31. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

- Reduction of stormwater flows
- Reduction of peak discharges
- Reduction of combined sewer system costs
- Reduction of flood damage
- Sustainability, loss avoidance, mitigation, long term planning, identifying funding opportunities, establishing partnerships
- From the CW perspective, it is to prevent further damage to native ecosystems from flooding etc. and to not dry up natural systems. But it helps us "sell" it if we can also relate it to reduce flood damages to the human environment.
- The cost of flood damage, especially the increase in food damage due to climate change (more frequent and intense storm events)
- Runoff pollution (increased with climate change)
- The risks and costs associated with contamination of drinking water sources
- The simple most important issue for most stakeholders. Flood control is a powerful selling point. Harder to sell, but critical for habitat integrity
- Human impacts
- Development
- Quality of life for humans and wild life
- Flooding will be reasonable with property owners and decision makers
- Prevent BAV, create value of permeable systems, smaller footprints, creator recognition of impacts beyond footprint
- A large amount of this region was originally wetland/swamp. This is very flood prone
- To increase infiltration throughout watersheds stabilize and enhance regional streams to reconnect to floodplains
- Avoid costs associated with flood damages, including riverine and depressional flooding , as well as sanitary/combined sewer back ups
- Maintain watershed hydrology so as to prevent stream down cutting and erosion and all of the negative impacts of hydro modification (e.g., increased sediment/pollutant loads, loss of habitat, loss of riparian vegetation, etc.)
- Natural systems are the least costly and most efficient way to control flooding
- Supports other services such as groundwater recharge and biodiversity
- To restore wetland habits
- To reduce economic damage caused by flooding
- To reduce erosion and to maintain meandering natural wetland areas
- The GIV has included nearly all of the interconnected wetlands and riparian zones that serve this ecological services
- With SWAT conversations happening and also increased stormwater issues (climate-driven) it's on peoples' minds. Careful about it relative to biodiversity issues

- Potential to mitigate flooding/stormwater impacts in a less expensive way that also has multiple co-benefits
- Lost economic values take to land use change
- Flooding costs
- Eventual regulatory issues with Gulf of Mexico?
- This ES makes the GIV relevant to local government and local citizens who can easily identify with this issue
- Opening up our floodplains and doing local treatment and infiltration rather than just storage with flow alternation
- Climate change is causing more intense storms therefore more flooding
- Property damage
- Minimization of need for gray infrastructure
- Green infrastructure plays a big role in flood control, without the costs of engineered solutions. There are times when the green space is prepared to be control to engineered flood control without considering its present value for such\
- This has an immediate direct economic value to people, so they easily be messaged as a meaningful value of 61 to people
- GIV is extreme storm events in the coming decades make this service increasingly critical
- This is how most people are dramatically impacted in over region
- This is the issue for the region in terms of gathering people's attention for GI. Wide spread impacts, worsening impacts, affects lots of people's homes, people see-on-the-ground effects of climate change and severe rain events
- Reduced property cost/loss
- Reduced social service/flood recovery/emergency
- Reduced infrastructure cost (or voided tax/fee costs)
- Reduced insurance costs to homeowners
- Directly benefits society by pr

32. What do you believe are the <u>most valuable metrics</u> to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

- Cost of creating and operating wetlands vs engineered wastewater treatment systems
- Flood loss prevention and mitigation. It is cheaper and more sustainable to avoid flood losses (residential, commercial, etc.) then to repair and rebuild in the same location. Identify areas that need mitigation and relate improvements to green infrastructure to the value of flood avoidance and reduction. This is a key metric to the Federal Emergency Management Agency
- Avoided costs is important for this one
- But replacement costs if existing GIS is lost is very key
- Reduction of flood damage and combined sewer system costs, the costs of treating water, the costs of treating water, the time and costs spent by residents and communities dealing with flooding
- Reduction of flood damage
- Reduction of stormwater floods
- Reduction of soil erosion/contaminant transparent
- Gallons absorbed
- Gallons intercepted

- Flow through natural systems- above ground
- Land impacted as % of each if rainfall has created a permit system
- Basement flooding
- Wetland efficiency
- Reduction of peak flows- steady stream flows increased in filtration
- Reduced number of flood events
- Number of new protected areas in watersheds
- Costs both avoided and replacement, for flood damages and stormwater (i.e.. flood control) infrastructure construction, design, and maintenance
- Costs to restore degraded stream systems already degraded due to land use change and the resulting hydromodification
    i. Ultimately, these costs are/ will be borne by the taxpaying public in this or future generations as/if goal of the clean water net continues to be pursued through regulatory means
- Avoided costs
- Infrastructure costs
- Relatively constant water flow without major storm spikes
- Reduction in number of flooding issue areas
- To make this "service" relevant to decision-makers; it is important to discuss this metric in terms of flood control. It is important to show- as you've done- that an acre of wetland can store 1.5 million gallons of water. To emphasize this—perhaps show loss of flood storage if wetlands were lost in Des Plaines River watershed or for NE IL
- Reduction of flood damage
- Metric showing economic benefits
- Gain infrastructure approaches to mitigating stormwater
- Traditional grey infrastructure
- Metrics listed are area specific
- Fox/Desplaines river areas—reduction of flood damage
- Calumet/Chicago River—reduction of peak flow combined discharge
- HG areas—soil erosion
- Reduction of peak discharges and encouraging the infiltration and ground water infiltration. Reducing the casts is what is also going to sell this service. Volumes of water and flow water combined. Flood plains need to be restored to their functionality. Using conservation practices and BMP's in more urban/suburban areas (green infrastructure practices)
- Reduction of flood damage
- Reduction of combined sewer system costs
- Flood damage protection is the easiest to sell to the public and decision makers
- Reduction of flood damage; reduction of peak flows
- Reduced CSO's
- Reduction of soil erosion
- Reduction of flood damage
- Normalize by storm events (baseline is changing)
- Avoided flooding cleanup costs, reduced number of flooding events
- Compare to cost of gray infrastructure equivalent
- Money saved by damage avoided

33. Within the CMAP 7-County region, what do you believe are the <u>best opportunities</u> are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

- Buy-outs of flood-prone structures and conversion of these areas to natural flood plain. This has the cumulative effect of reducing future flood losses at the bought out property, reduction of flooding potential upstream and downstream because of the extra storage volume for the stream to use, and increase of natural habitat for wild life
- The opportunities to protect existing services for this function are across the "collar counties" or the outer ring of CW- but it is because there is little existing left in the more urban core as seen on the map. So it may be more important in the areas where there is less of it left. Opportunity is needed and comparisons can be made brutal costs in area with GI vs without GI
- CNT's Rain Ready Program (Pilot projects in Chatham and Midlothian)
- Green Infrastructure/ low impact development projects in communities that experience frequent flooding
- Policies to reduce impervious surfaces, minimize total disturbed, area, etc. (requirements, incentive programs, etc.)
- Review history/ costs of flooding problems at developed sides, use that information as a tool out undeveloped sites
- Opportunities for collaboration- municipal, township, HOA, etc.
- Green valleys; swails; wetlands—constructed or natural to keep rainwater out of strong sewers and minimize flooding
- Constructed green infrastructure, rain gardens, permeable pavement, green roof, grey water storage and reuse
- Undeveloped head water areas—JA #1—North Control Lake County. Green infrastructure practices like rain gardens in existing and new developments
- Large-scale wetland complex recreation or restoration
- Existing regulations- for the most part- already address minor and major flood counts by requiring (on new development and redevelopment sides) stormwater detention. However , these stormwater management criteria don't adequately address hydro modification- the changes caused to hydrology by land use change- to protect stream channel integrity inclusion of runoff volume reduction criteria – similar to those criteria in place in coastal GA and VA, MD, would help better protect natural resources/ lands already providing these ecosystem services
- Reduce the acres of lawn on public and private land
- Update codes throughout the region to keep rain where it falls
- Provide incentives for rain harvesting
- Avoid projects that undermine protecting our water supply
- Protect existing high quality areas with buffering and protecting from runoff
- Re-meander streams
- Improve ground water uptake in flooding prone areas
- Adopt policy that pays forest preserve districts for converting publically-owned lands that is currently in agriculture to wetland/restored communities. MWRDGC should pay FP District Cook County to do this vs reliance on deep funnel/grey infrastructure projects
- Connect with the SWAT project, especially Des Plaines and Midlothian
- Working with MWRD
- Policy- No flood plain development

- Projects- removal of problematic development out of flood prone areas
- Locations- Des Plaines river flood prone areas, Midlothian Creek, Fox River flood prone areas
- Locally with smaller projects incorporated within the watersheds rather than large projects. Encouraging infiltration locally rather than big regional projects. Restoration of stream corridors separate in the head waters of all the… (Not sure what the rest of the sentence says)
- Along the Des Plaines River and Salt Creek
- Policies requiring prioritization of GI over gray infrastructure
- Protecting, preserving and restoring floodplains
- The SE part of Cook County does the highest of undeveloped land that could be protected as open space and remodeled to show the flood benefits, instead of being developed and trying to find locations for flood protection in a built landscape
- Reduction of impervious surface coverage, especially in upper drainages (e.g. McHenry, Lake County) of Fox and Des Plaines Rivers
- Wetland restoration; restoration of natural areas broadly
- GI projects in areas with highest percentage of impervious surface(e.g. high soil volume design for urban trees along streets, parkways, boulevards etc.; low percentage of turf grass to native systems along right of ways
- Add stormwater value outside of identified areas (show potential value of adding rain gardens, grass roots, etc.)
- Large and small GI projects targeted to flood- prone areas. Include things like tree planting in GI planning, not just naturalized detention basins

34. Which <u>studies from the draft literature review</u> do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any <u>other studies</u> or resources that may be helpful in estimating the value of this service in the CMAP region?

- FEMA's Hazus tool is a way to estimate damage costs to structures based on depth of flooding. US Corp of Engineers has depth damage curves established as well as the Illinois Department of Natural Resource Office of Water Resources
- Not going to be able to offer much here. But be aware that CW is working on a "white paper" regarding stormwater management recommendations to protect biodiversity
- CNT has information on flood damage payouts that could be useful
- It must be very site specific; it's the local stake holder value
- Those studies that emphasize Midwestern landscapes. Are there studies that show value of BMPs on site/neighborhood/regional basis?
- Studies that evaluate avoided/replacement costs relative to an alternative locally based approach. Flood plain studies for restoring flood plain functions and taking of flood plains
- There was a study for the 80s that tried to quantify flood control benefits of the CCFP, done by Sheaffer and Roland. (Names could be wrong?)
- I don't have the expertise to comment on this

35. Any other thoughts?

- IDNR-OWR might be a good resource to partner with on the floodplain and stormwater issues. Illinois Association of Flood plan and stormwater management (IAFSM) is a good resource to tap into for professional's who deal with floodplain and stormwater issues daily
- Flood control will also benefit ecosystems /damage by being innovated by too much water at a time
- Mitigation of high flow in local small stream and river would be extremely beneficial to streams/river ecology. It is better to keep habitat and monphology
- Concerns of local government primarily revolve around the cost to maintain infrastructure and cost to comply with regulations. This information (produced by this project) needs to be presented in a way that addresses these local government challenges
- Place this context of Lake Michigan and the great lakes
- How well will GIV work for water control? Is the resolution high enough?
- Returning floodplains to their original functions
- Control making suggestions connecting open space/functional landscape and flooding attention. Peak storms will increase and the need for green and gray infrastructure will increase.

Water Purification (2 of 6)

36. What do you believe are the <u>most important reasons</u> for protecting the Green Infrastructure Vision to maintain this ecosystem service?

- Reduction of N.P, sediment, bacteria and other pollutants for drinking water, fishing, aquatic health
- Again from CW perspective to prevent from further impact to biodiversity and nature ecosystems due to poor water quality. But to "sell" to general public—relate it back to drinking water supply, full contact (swimming), etc.
- Cost savings provided by the avoidance of expensive gray infrastructure and purification devices/machinery
- Providing a reliable source of clean drinking water
- Management of N.P. sediment (plus associated contaminants/to protect receiving waters)
- Quality and streams and lakes wildlife habitat
- Avoid need to treat all run-off. Prevent polluting of water, especially of nutrient loadings
- Road runoff carries man contaminants which could be filtered out by green infrastructrure
- People drink it and aquatic biodiversity depends on it
- Avoid costs associated with the degradation (i.e., loss of designated uses) and restoration of aquatic resources – lakes, streams and wetlands- as well as groundwater resources (e.g. drinking and irrigation water)
- The restoration of these degraded resources are/will be borne by the taxpaying public as CWA continues to be implemented and TMDLs continue to be developed
- Clean water is essential to survival of world's population
- Seems to be the basis of biodiversity and ecosystem health
- Improved public health
- Enjoyment and use of the regions lakes and rivers
- Water purification is important for recreational use of streams and labs
- Restoring wild life corridors for aquatic supply

- The GIV has included nearly all the wetlands/open spaces that provide this ecological function
- Dam removal on rivers for water quality improvements: Fox(and fox river study group)
- Desplaines river (Hoffman dam and others removed
- Fish passage
- Clean water is easily and identifiable service that everyone wants and will provide public support for the GIV. Relate this to public health
- Lake Michigan is a limited resource
- It is costly to treat waste water
- For those who rely on surface water
- Cost to aquatic ecosystems of nutrient pollution resulting in dead zone , etc.
- It is what everyone cares about. This resonates with all audiences for obvious reasons of public health and quality of life. There will be a large system failure of this function is not in place, both on the wildlife and the people side
- As a model for the rest of the world
- The benefit is more subtle, hard to communicate, hard for people to appreciate. Your mostly talking about stormwater purification, right? Important to convey that. I guess other surface waters too.
- Recreational water quality equals public health
-

37. What do you believe are the <u>most valuable metrics</u> to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

- Forest filtration and buffering remains N.P. sediments and other pollutants
- Wetland filtration of N.P. and sediments
- People relate easily to concerns about clean water so direct avoided costs and replacement costs should be relatively direct and easy
- Avoidance of treatment costs, the efficiency of wetland at removing nutrients and contaminants, the cost of dealing with a situation like the one in Toledo
- Nutrients
- Sediment
- Bacteria
- Chemical loads in waterways and lakes and ponds—especially salt
- Water diverted (Not in sewer system) per inch of rainfall, or water extracted
- Chicago was a wetland and is now XX% impermeable surface—Mitigating human impact
- Water quality sampling to identify troubled areas
- Biological assessment of all aquatic systems
- There is a bunch of valuable data that can be used to make the case for protecting this ecosystem service including:
    i. Costs, both avoided and replace, for loss of designated uses and design, construction and maintenance of stormwater/water/wastewater infrastructure needed to provided
    ii. Cost to restore stream systems and other water resources already degraded impaired
- Cost of water purification
- People will pay a lot for this service—i.e. sales of bottled water
- Slow to adopt or resistance to legislation allowing grey water use
- Total suspended solids (TSS), Nitrogen, phosphorous
- Temperature

- Toxic Pollutants
- I think metrics that show the dollars and cents contrast between these ecological services vs gray infrastructure would be most valuable. You have great example of conventional $4.36/1,000 gal vs $0.63/1,000 gallons for wetland construction
- Reduction of pollutants
- Again—MS4 communities need to be addressing their local water quality issues
- We need to tie into this (i.e. stream buffers and fecal col sound bite)
- Fish studies—improvement in water quality = reemergence of biodiversity in stream conversely—fish consumption warnings
- Reduction of NPCL, sediment, etc. are easily measureable and there is a lot of data within the state and federal regulatory framework to support this
- Reduction of pollutants for drinking water, swimming, fishing, aquatic life
- Reduction of treatment costs
- Reduction of N pollution that leads to gulf dead zone by GI cost relative to gray infrastructure to remove. Total cost of that grey infrastructure to deal with problem
- Higher value in ground/surface water areas (non Lake Michigan)
- Pounds of stuff removed annually is good, (although low members like 4 numbers of P per acre year sounds insignificant) Avoided costs of water treatment is also good but hard to pull down percent of wetlands/forest/prairies lost already
- Lost money beach closures
- Lost economic value from health impacts of contaminated waste
- Added cost of drinking water treatment
- Added cost of dredging due to sedimentation

38. Within the CMAP 7-County region, what do you believe are the <u>best opportunities</u> are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

- Ma be important to distinguish parts of the region where drinking water is from groundwater vs Lake Michigan vs rivers
- Policies requiring higher standards for nutrient reduction in agricultural and urban runoff
- Projects to restore tributaries and protect wetlands
- Identify and protect highest quality streams and habitat
- Identify upstream, urban stormwater sources and implement local controls/management
- Education of land owners and managers principal ordinances
- Comprehensive plans very important in built environment
- Buffering all aquatic systems with native vegetation concentrated application of BMP's in areas of most impact
- From 2 stormwater/wastewater perspective, there is already a framework that can be used to protect this ecosystem service (and the natural resources/lands that provide it) the CWA and TMDL program, which says that water quality has to be protected/restored and sets specific targets to be attained. These targets have to be attained through infrastructure retrofits, water quality trading, and various other strategies some of which need to be further defined and

developed but the protection of natural lands and their restoration can be a key element of such efforts

- Public education
- Better understanding of groundwater recharge areas
- In urban areas its about implementing best management practices curb-cuts, swales, rain gardens, etc.
- In rural its about protecting meandering streams and restoring natural stream flow and protecting waterways from runoff erosion and contamination
- Incorporate BMP on all levels of GIV; local neighborhood and regional layer. Use cost-share and other means to finance these projects that lie within GIV. Convert these lands that are in public domain (agricultural fields) to restored landscapes
- Throughout the region
- Policies that require prioritization of GI over gray infrastructure
- In areas that are on well water where people understand the link between there water supply and the benefits of healthy ecosystems
- Lake Michigan (water for much of region) Rivers in Mississippi basin (affect Gulf of Mexico) for the Mississippi basin priority has to be reducing agricultural pollution meaning reduction in nitrogen fertilizer and the restoration and creation of watersheds along those drainages
- This ultimately has to be tied into AG practices but increase the percentage of GI opportunities to intercept stormwater and store it where it lands ideal. Doing it in areas with high percentage of impervious surfaces carried be a way to prioritize, as well as areas adjacent to coastal zone. Take out dams, were feasible
- Small scale constructed and restored wetlands along existing waterways. Habitat restoration projects at all scales, all ecosystem types
- Repair corridors

39. Which <u>studies from the draft literature review</u> do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any <u>other studies</u> or resources that may be helpful in estimating the value of this service in the CMAP region?

- I think case studies from Milwaukee, Seattle, and Portland would be most relevant
- Public health research
- Need to expand the regulatory framework for cleaning water
- Not my area of expertise
- There should be studies on economic cost of beach closures in the Great Lakes and on added cost of treat drinking water due to algal blooms or other problems

40. Any other thoughts?

- Water purity of next use
- Can get businesses to pay for 1st
- They can capture value of ecosystem services created/enhanced
- Take out the dams
- Include human health impacts

Groundwater Recharge (3 of 6)

41. What do you believe are the <u>most important reasons</u> for protecting the Green Infrastructure Vision to maintain this ecosystem service?

- Supply of water to groundwater rather than surface runoff
- To protect the ecosystems themselves as many are dependent on adequate, clean groundwater. Though again a large part of the region relies on gw for drinking water
- Allowing water to become groundwater instead of runoff helps to protect our public water supply and saves money that would be needed to treat runoff
- Its vital for economic development of the collar counties; that makes an easier sell. For most regional stakeholders, however, it will be hard
- Better understanding of our aquifers and how they impact quality of life for humans and wildlife
- Water lost not (changed) requires creator extraction from other sources will have effects on ecosystems from greater extraction
- To evaluate quantity and quality of groundwater
- To uncertain role of groundwater and water intersections
- A human can survive only 3 days without water
- Replenishing ground water aquifers protecting ground water dependent natural communities
- Many communities rely heavily or solely on groundwater and aquifers for drinking water
- An abundant supply of clean, fresh water is estimated for the survival of the worlds population
- Some counties depend on it for recharging their aquifers
- Also important for maintaining the natural flow of rivers to maintain minimum water levels
- As an alternative to stormwater runoff
- Community sustainability for the future
- Water supply—going to deep
- Aquifers and dealing with radon and barium removal cost
- Ground water discharges into streams and lakes creating its baseflow. As the water table lowers it affects the stream boatflow and its water quality
- Lake Michigan is a limited resource
- For those who rely on groundwater
- The amount of impervious areas continues to rise. High quality ecosystems are tied to high quality ground water
- The interplay between groundwater recharge and reducing flooding. Both have similar strategies to improve
- Given the expectation of high storm events and drought, with land use change and high demand of water resources, this issue rises to the top in terms of maintaining alivable community for people and nature
- Another tough one to communicate in region where Lake Michigan water is available for all uses
- Water demand in communities outside Great lake basin is growing faster than GW supplies
- Economics growth requires water
- Aquatic ecosystems require clean ground water for base flow

42. What do you believe are the <u>most valuable metrics</u> to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

- Wetland function with stormwater storage
- Price of water supply from other sources and loss of other ecosystem e.g. recreation

- Price of public water supply, the value of the filtration provided when water infiltrates to aquifers instead of becoming run off
- Related to stormwater control and quality, specific metrics here would be decrease in runoff/ increase in infiltration
- Chemicals in aquifer
- Fluctuation in aquifers
- Percent of water contained in watershed
- Most important metric is measuring recharge
- Aquifer levels increase of infiltration rates
- This is the increased infrastructure costs associated with developing, treating, and maintaining deeper wells, treatment systems, etc.
- Number of protected areas where groundwater can recharge removal of suspended solids and pollution more detailed information about soils factored in to equation
- Condition of our aquifers (shrinking/increasing)
- Minimum stream levels and stream gauges
- Those metrics that show current/ projected uses of ground water over time and the projected point at which ground water is no long available if current land uses don't change
- Price of public water supply is important to scale by water supply source (lake Michigan vs ground water vs surface)
- Reduction of surface runoff
- Aquifer recharge rates
- Stream base flow gages
- Supply of water to ground water rather than surface runoff
- Again areas tied to groundwater for water supply that is more critical. Understanding how Lake Michigan is influenced by groundwater recharge could make the water supply metric valuable to most of the region
- Need anecdotal info about what happens when aquifers are depleted
- Higher value in good/surface metric areas
- Cost of new drinking water
- Cost of water conservation measures
- Cost of new wells (in rural private homeowners)
- Increased cost/fees

43. Within the CMAP 7-County region, what do you believe are the <u>best opportunities</u> are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

- Western counties that rely on gw and where aquifers are better understood
- Policies to require on-site management of stromwater, demonstration projects for on-site management and infiltration of stormwater
- As noted above it will be a hard sell to stakeholders who rely on Lake Michigan. Therefore, the best opportunities are collar counties with high development expectations
- Reduction use in slat
- Reduction in fertilizers
- Increased recharge areas
- Don't forget about built environment
- This is limited her for the deep aquifers but what is critical is restoring historical groundwater flow regimes for natural community diversification along the wet, wet-mosic, dry continuum

- There are number of strategies that neeed to be employed; these are fairly well outlined in CMAPs water supply research and report
- Protect land at a scale sufficient to recharge ground water
- Protect the right lands
- Larger-scale restoration projects
- In urban developing more projects designed to hold sotrmwater in wetland swales that can also be used as natural areas for recreation and animal corridors
- Make the case for those counties that draw their water from wells (particularly shallow wells) that their long-term viability is directly tied with ability of open space to recharge the ground water
- Cost of going deeper for water, for both muni and private wells
- Aquifer sensitivity areas
- Discourage development on aquifer recharge areas
- Less pervious surface and more reliance on groundwater for water supply
- Any projects that un-compact urban soils, add green
- May find allies with regional water compact parties

44. Which <u>studies from the draft literature review</u> do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any <u>other studies</u> or resources that may be helpful in estimating the value of this service in the CMAP region?

- Get with ISGS/ISWS folks
- McHenry county groundwater study by IL Geologic survey
- Other resources could be engineering studies that are wanting to quantify the effect of infiltration BMPs for stormwater management
- Try American water works association for cost of new public water supply wells a Illinois state water survey

45. Any other thoughts?

- This is one that requires more education when speaking with decision makers, residents, etc.
- Make the case that we don't know how important infiltration from Chicago area is to Lake Michigan basin
- Include human health impacts

Support Native Flora and Fauna (4 of 6)

46. What do you believe are the <u>most important reasons</u> for protecting the Green Infrastructure Vision to maintain this ecosystem service?

- Maintenance of ecosystem functions
- Protection of habitat
- I go with the notion of we don't know yet—we can throw away any of the parts
- The flora/fauna underlie much of the rest of the ecosystem services but can believe it should be preserved for its own value
- Native flora and fauna are more resilient to our climate and predicted climate changes, helping ensure biodiversity and habitat even udner stress from climate change in the far and near future. They provide services such as erosion control, that hold a high value
- Vital to support diversity/resilience of ecosystems
- Potentially important role in C storage
- Quality of life for wildlife

- Loss of biodiversity
- Create additional economic value, biodiversity, flyway paths
- I believe people are happier and have a higher quality of life the more they are interested with flora and fauna
- Increasing newlands under protection
- Increasing level of restoration, remediation, recreation and management on existing and newlands
- Collaboration with neighbors near natural areas to provide for protection and enhancement of buffer areas
- The presence of native flora and fauna, particularly native flora, natural lands/within natural resource are what will allow them to provide a maximum return on investment with regards to water flow regulation/flood control, water purification, all recharge, carbon storage
- Resilience to effects of climate change
- These value to human population
- Ethical and moral reasons
- Connectivity and which is super important for wildlife corridors to support flora and fauna
- Maintain and improve diversity
- The GIV shows the locations of the regions significant natural resources and shows the landscape linkages/other opportunities to expand and connect these areas
- A core value of CW
- Part of our regions natural heritage
- To support CW biodiversity recovery plan
- The role of these plants and animals in all of the other functions
- Should have their service
- To maintain, restore or improve the health of the land, air and water
- To maintain a improve the biodiversity
- To mitigate and adapt to climate change
- This is the main purpose of most of the open space in the region
- The region is know for its ecological value on a worldwide scale
- GI will become even more crucial with continuing climate change
- People understand or need to understand the uniqueness of our material heritage. Just like you don't want your city or town like all the others, you don't want material areas look like everyone else
- These are our neighbors. They are the natural history and identity of this region historically

47. What do you believe are the <u>most valuable metrics</u> to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

- Ecosystem contributions in economic value
- Value of healthy ecosystems in terms of flooding, drought or pests
- Use some the newer healthcare benefits type and willingness to pay
- The price of dealing with consequences of invasive species take over and loss of habitat/habitat degredation, the cost of caring for non-native species in comparison to natives, which require less care, and the cost of services such as erosion control that native flora provide
- Measures of diversity, but who are the metrics for
- Management metrics can be very different from metrics used to convince stakeholders
- Reduction in social values- crime, community interaction

- Loss of specific species
- There must be studies of psychology/quality of life related to amount of interaction with local flora and fauna
- Acres protected, quality of those acres
- Number of species, number of critical species
- Status of natural communities
- Status of imperiled species
- Probably best metric that the presence of native flora and fauna supports and maintains ecosystem function and diversity without these species, natural lands/areas/resources will not provide full extent of ecosystem services they could provide
- Number of Illinois nature preserves in 7 county region
- How much of ecological network is protected year after year
- How well are our core areas connected to each other
- Metrics that specifically show that healthy ecosystems that support good species diversity and lower frequency of invasive also provide number of ecological services did more recreation and ecotourism
- Value of open space referenda
- Total dollars spent on mitigating species or economic impact/damage from species in our region
- Connectively habitats
- Protection of wildlife habitat
- Maintenance of ecosystem functions and resilience
- Use for entertainment and recreation
- Value of pollination services provided by native insects
- Value of diverse ecosystems in providing the other ecosystem services
- How are species of concern doing?
- Number of plant/animal/species, FQI
- Value based on size
- Avoided cost of invasive management

48. Within the CMAP 7-County region, what do you believe are the <u>best opportunities</u> are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

- We need to use GIV 2.2 to help us decide, broadly, where that is in order to meet the BRP goals
- Invasive species control, hydrological separation, policies that require the planning of native species, projects involving habitat restoration
- Identify prime habitat that is threated with development and that has a stakeholder group likely to buy the argument
- Community connectivity
- Preservation of high quality natural areas
- Don’t forget about built environments
- Detention, then restoration/replacements
- Lake County forest preserve has committed to protecting three 10,000-acre complexes in and around Lake County
- Restoration throughout the forest preserves and conservation districts
- Establish wildlife corridors and greenways

- The Illinois Wild Life Action Plan provides goal recommendations as well for a series of large, protected lands
- Integrate cost studies
- Coordinated land protection by major land conservation agencies
- Stream improvement
- Land trusts and NGOs
- Park districts
- Forest preserve districts
- Private land owners
- Large and/or connected habitat areas
- Policies to protect an encourage native flora and fauna
- Increasing the size of hubs and improving corridors between hubs
-
- Cooperated and school campuses as opportunities
- Making sure barriers don't exist that can prohibit native landscaping
- This is another one that can be hard to make a case for especially because of cost of restoration
- Show the value of adding biodiversity value outside of identified areas

49. Which <u>studies from the draft literature review</u> do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any <u>other studies</u> or resources that may be helpful in estimating the value of this service in the CMAP region?

- I wish I knew
- The nature conservancy could be a good resource for information on the value of native flora and fauna and the cost of invasives, habitat degradation, etc.
- Open space referenda in 7 county area
- 1 billion since 1975
- Calculate open space commitment with tax additions for average house that people voted to tax themselves on

50. Any other thoughts?

- As noted in comments during workshop- most important function/service to CW
- Overlooked potential: urban agriculture; biofuels
- Include human health impacts
- Add regional tree canopy

Recreation and Ecotourism (5 of 6)

51. What do you believe are the <u>most important reasons</u> for protecting the Green Infrastructure Vision to maintain this ecosystem service?

- Social benefits of outdoor nature based experiences like hiking and camping
- Because recreation and ecotourism build support for natural areas and biodiversity—it builds the support and stewards for tomorrow
- Supports our economy, encourages small businesses to open or continue running

- Promotes an inherent value of the lakes, rivers and other resources and increases knowledge about these resources
- This ecosystem service is probably most important as a lever/tool to convince stakeholders. If more people are physically engaged with their environment, they will perceive higher value
- Support and wildlife
- Importance to people
- Provides economic driven for other values
- Increased tourism and income
- A well designed project will help educate and introduce the general public to inherent value
- We are dependent upon it for our health and welfare
- This can be more easily understood/grasped by local decision-makers/elected officials if they are provided with data on how this ecosystem service supports the local economy, creates local jobs
- Open space has a positive impact on public health
- Opportunities to engage diverse audiences that reflect the diversity of improved property value
- The GIV portrays a connected landscape that probably supports the most ideal recreation venues and sites that are aesthetically pleasing and provide habitat for an interesting array of plans and animals
- Important economic drive
- Important to the quality of life and health
- Provide corridors with multiple benefits for people
- Health
- Education about the value of protecting our environment
- Economics development so money is available to preserve the environment
- Open space provides recreation opportunities and relief from the built landscape
- The fact that Native flora and Fauna are the base of much of the value of GI to this ecosystem service. This is a clear direct benefit of GI to people
- This is something everyone can understand and almost everyone can benefit from
- To show that economically, these resources are comparable with other cultural amenities such as museums, Navy Pier, and other publicly valued services
- Public health
- Economic development
- Revenue from liscences

52. What do you believe are the <u>most valuable metrics</u> to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

- Money spent on nature based locations and ecotourism
- Public value of outdoor location areas for quality of life, health and fitness

- Actual money spent in region related to various resources
- Willingness to pay
- Distance traveled and money spent on recreation/ecotourism, surveys of how many/how often people would visit sites for recreation/ecotourism, collecting data on beach use and use of other recreation sites/natural areas
- Direct and indirect expenditures can be used to convince stakeholders and decision-makers
- Proximity to populations proximity to transportation
- Health for human obesity
- Per capita; length of stay; expended return visits
- Education
- Any data that can be provided about how the ecosystem services supports the local economy/provides local jobs will be most valuable to getting local decision-makers/elected officials on board
- Spent on land acquisition for public open space identify and spent locally on recreation equipment and services for number of people who visit protected lands
- Number of licenses sold for fishing/hunting
- Number of boats registered
- Visits to natural areas
- What would it cost today to establish that lakeshore and parks and/or the forest preserves
- Various studies showing the economic benefits channel from nature—recreation
- Human health numbers?
- Number of individuals exposed to educational opportunities
- Money spent on nature based recreation
- The economies of nature based creation are pretty compelling
- Many spent pursuing recreation and ecotourism, but also time people spend on these pursuits
- The Chicago area publically owned lands have no entrance fees means that the realized monetary value of these ecosystem service is much lower than it could be
- Tourism dollars, cost of traveling further to find the same opportunities if those in our region are lost
- Higher value in open space poor areas
- Higher value in high income areas
- Increased property value
- Tourism revenue

53. Within the CMAP 7-County region, what do you believe are the <u>best opportunities</u> are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

- Where are current hot spots
- Around regional resources
- More projects like elevated bike path, more funding for protecting areas from development and reserving them for public recreation
- Proximity to people

- Whole region
- Implement GO TO 2040 goal of 400,000 acres of protected lands identify and defeat projects that undermine this goal
- Implement large-scale land protection projects
- Establish greenways
- Millennium reserve
- Continue to connect the bike trails across region
- Connects from the forest preserves to Chicago Park District
- Continue to celebrate Lake Michigan and provide easy access to the lake for all
- Calumet Projects undertaken by Chicago Park District
- Millennium Reserve/Calumet Region
- GIV can provide framework neighborhood locations for integrating nature directly into local communities a neighborhoods for GI "benefits including alternate transportation corridors
- Lake Michigan, rivers and creeks, forest preserves and other protected lands
- Lakefront, major rivers, palos area, prairie parklands
- Actually comment about lack of entrance
- There's always tension between preserving material resources and adding recreation infrastructure in parks and material areas
- Apply the risk of one of our major amenities being impacted by a Governor's project
- Include paddling—I think there is some economic literature on this I will ask around

54. Which <u>studies from the draft literature review</u> do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any <u>other studies</u> or resources that may be helpful in estimating the value of this service in the CMAP region?

- Friends of Chicago River study by Shailich et al
- David Allen from the University of Michigan has collected data and created maps of the frequency of beach visits, use of shoreline and lake for birding and boating, differentiated by county for the Great Lakes region
- University of Illinois study on crime reduction effect of trees and open spaces
- Economic study for Pullman National Park, Chicago Park Districts new development
- I think Illinois Sierra Club has done some numbers for Chicago area on birding/fishing/recreation
- Just a caveat about over-using contingent valuation studies which can be controversial, even in academic circles
- Value of beaches
- Real estate value
- I am checking with Indiana dunes learning center for some studies on the Science education

55. Any other thoughts?

- The hunting—fishing community rarely interacts with the conservation community—we need to work together
- Need to identify value of creation
- Take out the dams
- Careful thought needs to be given onto how this conveyed, as pressure is sometimes part on open space providers to convert natural areas into recreation centers
- Much of the ecotourism and some of the recreation is dependent on the Native Flora and Fauna

Carbon Storage (6 of 6)

56. What do you believe are the <u>most important reasons</u> for protecting the Green Infrastructure Vision to maintain this ecosystem service?

- Reduction of CO2 and associated climate affects
- To help minimize climate change
- Maintaining or increasing this ecosystem service can help us build resilience against climate change which will help maintain all other services and maximize their benefits to the region
- In this region there could be connections among storage, buffer strips for water quality, and bio fuels
- Air quality
- Mitigate/prevent GCC
- Entrance soil value without fertilizers
- The amount of CO2 put into the atmosphere within the CMAP 7-county region must be huge—2 large airports x millions of communities
- To make ecosystems resilient to possible impacts of climate change extreme weather patterns and other human induced impacts
- The need of slow climate change and the impact climate change will have on the existing built environment and existing infrastructure
- Reduce global warming
- Reduce long-term problem of climate change by fixing more carbon and storing it long term
- The GIV identifies the regions open space that, for the most part, represent areas where carbon storage has occurred and where new opportunities exist through habitat restoration
- A huge regional point to be made about the climate mitigating aspects of the ecological network
- Important to recognize the role that our natural areas play in mitigating climate change
- Climate change is happening now and we cant afford not to utilize the carbon mitigating capacity of natural areas
- Relate it to public health
- Climate change clean air
- Health
- Great co-benefit of the restoration and conservation work we do but we really don’t manage for carbon, per se
- Ties directly into climate change and provides tangible route for people to do things to contribute to reducing that problem
- Things are clearly out of balance in carbon management but the effect scale up and area hard to track back to sources
- Financing opportunity
- Increase Resilience

57. What do you believe are the <u>most valuable metrics</u> to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

- Forest or tree removal of CO2 per year from the atmosphere
- Avoided costs from impacts of climate change
- Predictions for costs associated with climate change such as increases in flood damage
- Value of trees removing carbon from atmosphere

- C storage for some groups of stakeholders it would be a hard sell; may need to tie- in to other values
- Percentage of CO2
- How plants can lower
- How soils and plants sequence
- Soil c-value change
- Mitigate regions carbon footprint
- The current ecological health of our natural communities—the healthy they are the more resilient the can be
- Education of atmospheric CO2 and associated greenhouse gases and the associated climate effects
- Regional resilience to climate change cost for storm damage clearings
- Amount of standing biomass
- Amount of carbon sequestration via natural area types
- Show carbon storage in terms of what people can understand
- Chicago area might be ready enough to restart market price of carbon conversation but avoided cost is probably necessary first
- Would be great to have better info on deep rooted prairie plants
- Air quality
- Asthma research and data
- Amount of greenhouse gas emissions over time
- Number of respiratory illnesses
- Amount of carbon storage capacity over time
- Carbon storage in soil
- Effects of climate change on summer temps and extreme weather events are the way into getting Chicago people interested
- This one is tough to communicate
- Cost of carbon, new EPA rules will redefine value for carbon state by state
- Avoided cost of emission reductions

58. Within the CMAP 7-County region, what do you believe are the <u>best opportunities</u> are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

- I'd like to see better equitable numbers for prairies/savannas compared to forests to decide
- Protection of forests through land easements/land acquisition projects
- Tree planning in schools and communities
- Policies to require mitigation by developers when reducing tree cover, disturbing vegetation
- Prairies and forests with multiple benefits beyond C storage
- Built environment opportunities to plant trees
- Use iTree information for urban trees and forest of the Chicago Region
- Region-wide and beyond
- Protect the 400,000 acres called for the GO TO 2040
- Protect our largest carbon sinks
- Create more green space

- Convert agricultural land to prairies/woodlands. These area agricultural land already in public ownership
- Provide the resources for agencies to dos and manage
- Urban forests, urban trees need to be included in this metric
- Policies to encourage protection of areas that store the most carbon expansion of areas that sequester carbon
- Encouraging greening, replace lawns worth trees and native plants
- Maybe the new climate/carbon emission regulations will create a new carbon market. Could it be part of Illinois targets

59. Which studies from the draft literature review do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any other studies or resources that may be helpful in estimating the value of this service in the CMAP region?

- For all services noted in the discussion, the integrated services are important. How can the region integrate to set the most value? Maybe the best solution is to invest outside a community
- CO2 sequestration study currently underway—contact Robert Fahey
- Tom Simpson From McHenry County Conservation District had nod assessments on carbon storage for different types of natural areas, such as wetlands

60. Any other thoughts?

- The Regional Tree Initiative will be mapping carbon at a higher resolution. Is this the best use?
- Include health impacts

Appendix E: Presentation

GREEN INFRASTRUCTURE VISION

VERSION 2.3 ECOSYSTEM SERVICE VALUATION

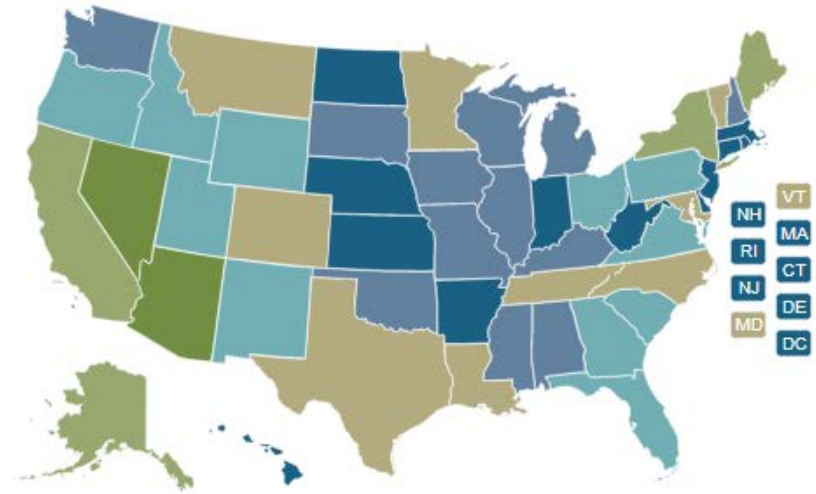
THE CONSERVATION FUND

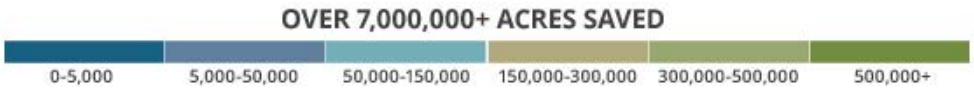
Chicago Metropolitan Agency for Planning

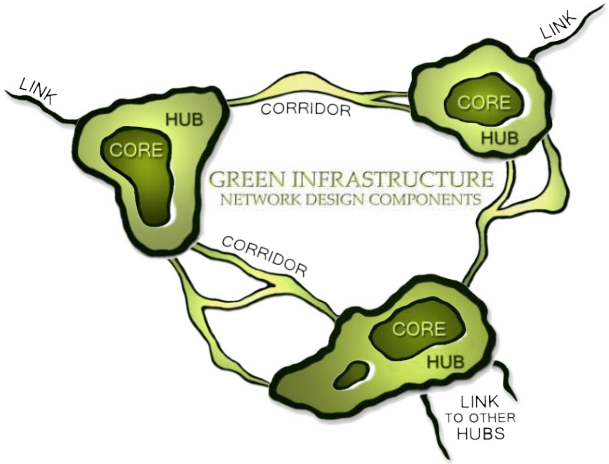
Chicago Wilderness

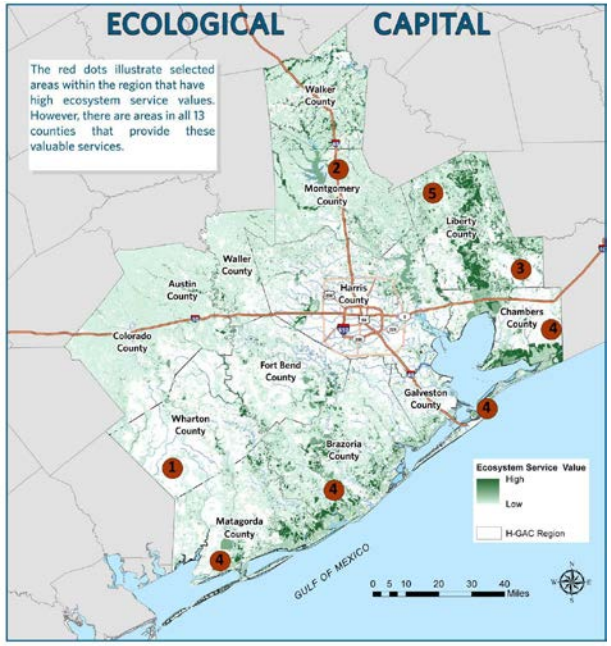
August 18, 2014

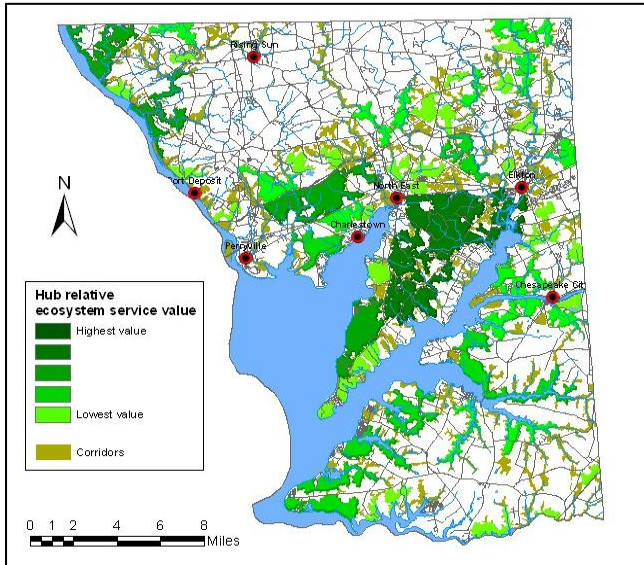
THE CONSERVATION FUND











Project Team

THE CONSERVATION FUND

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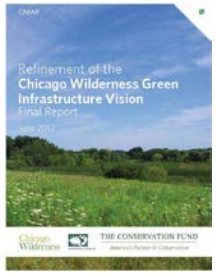
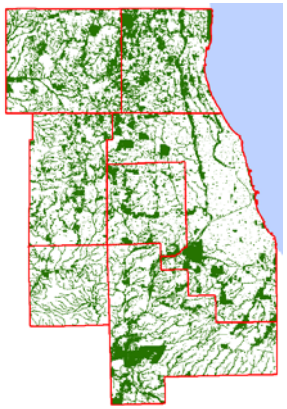




Chicago Wilderness Biodiversity Recovery Plan

Chapter 1

Executive Summary

Chicago Wilderness and Its Biodiversity Recovery Plan

1.1 Introduction

1.1.1 Chicago Wilderness: who we are, what we are accomplishing.

"Chicago Wilderness" refers to nature and to the people and institutions that protect it. Chicago Wilderness is 200,000 acres of protected conservation land—some of the largest and best surviving woodlands, wetlands, and prairies in the Midwest. It is also the much larger matrix of public and private lands of many kinds that support nature in the region along with the people who protect and live compatibly with it.

Many of the surviving natural communities of the Chicago region are of national and global significance for conservation. The region is blessed with both richness and opportunity for its conservation. Yet research indicates that we are experiencing a steady decline in both native species and communities. For example:

- In a review for this plan, the Chicago Wilderness Science and Land Management Teams found that more than half of the major community types of the region were at the highest level of conservation concern due either to the small amount remaining or to the poor ecological health of the remaining examples.
- A 1995 survey of DuPage County forest preserves revealed that 80% of its natural areas had declined to poor health (Applied Ecological Services 1995).

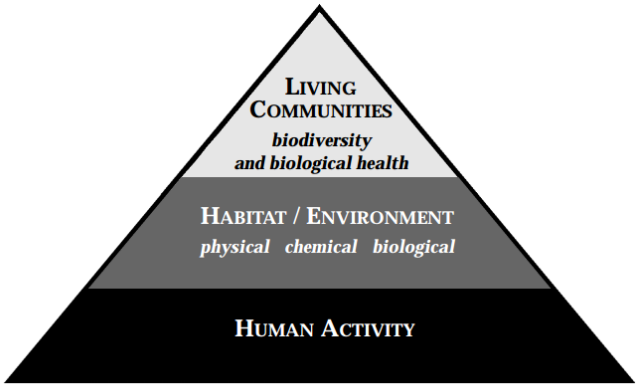


Figure 3.1 Ecosystem health and human activity

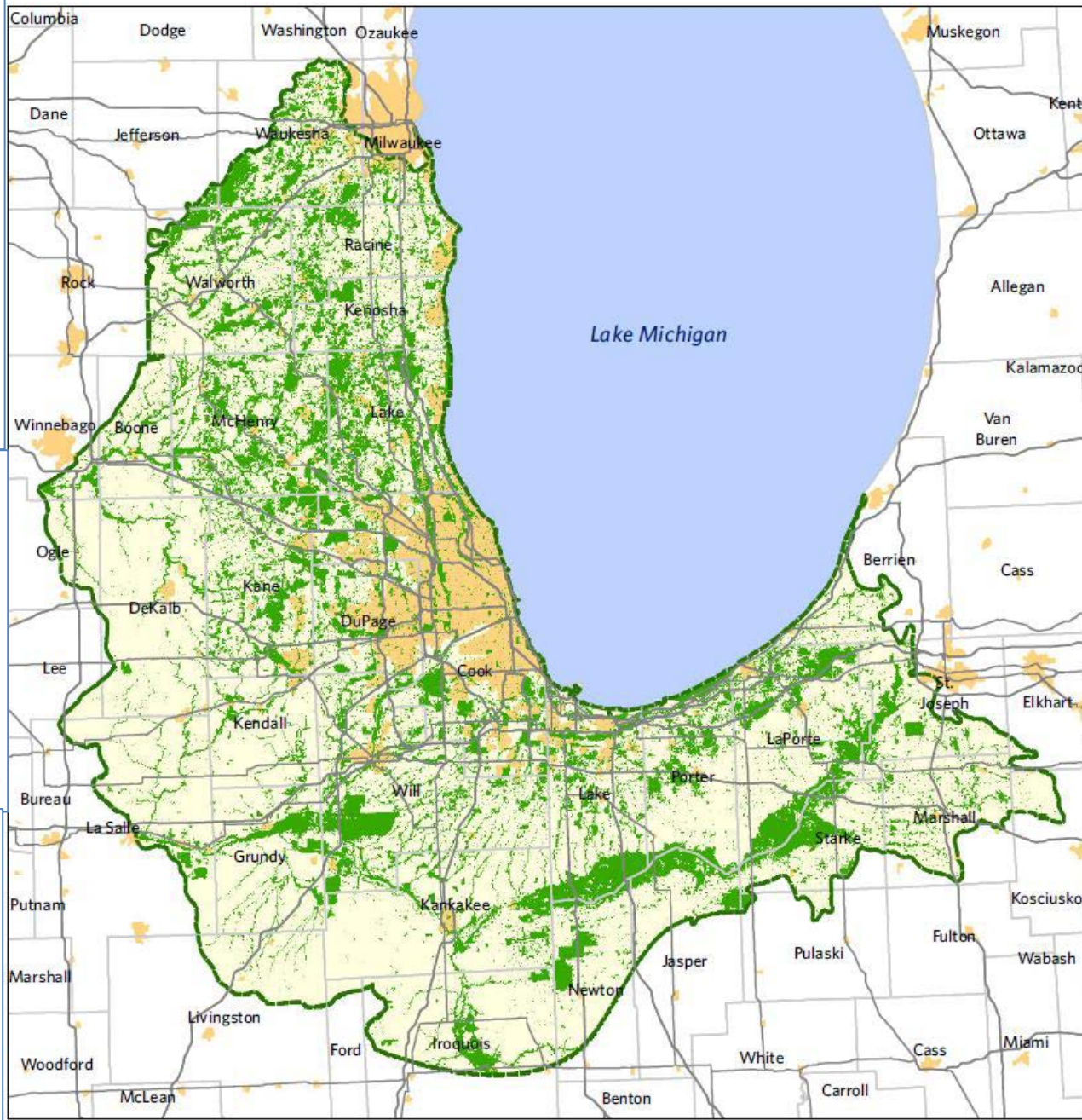
Chapter 8

Preserving Land and Water Resources for Biodiversity

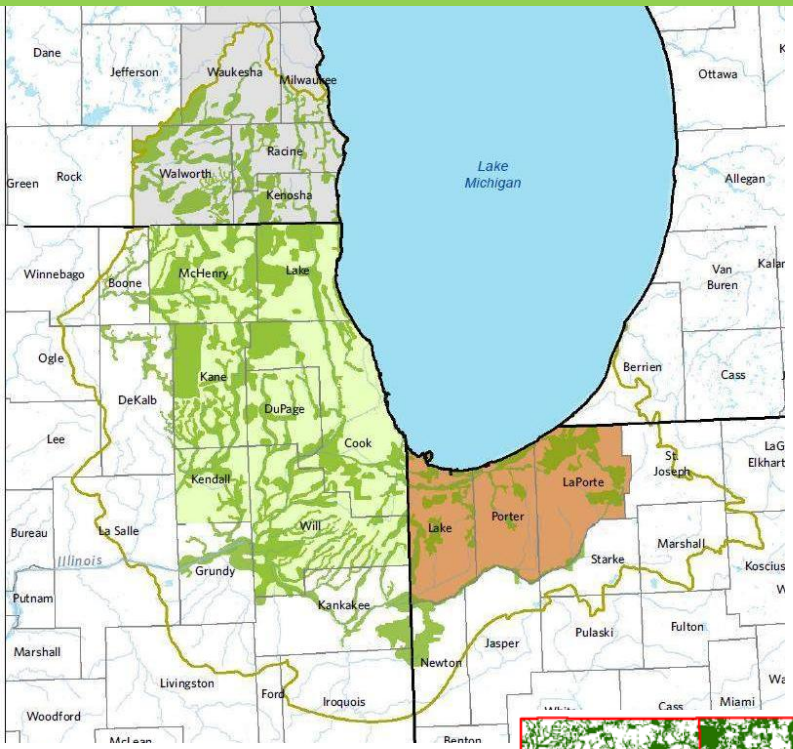
8.1 Introduction

The previous chapters reviewed the types of natural communities found in the Chicago Wilderness area and the goals and actions needed to sustain them. As noted in Chapter 3, the natural areas of the region can be seen as

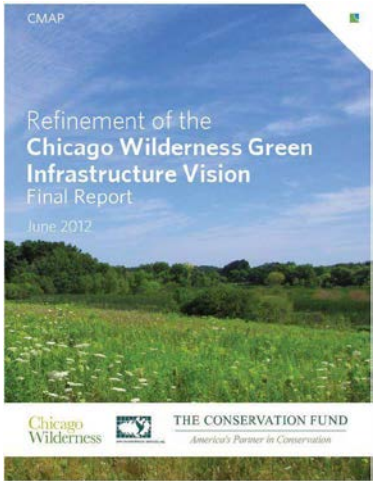
Ownership of natural areas in the Chicago Wilderness region is a mix of public and private. The core of Chicago Wilderness consists of public land permanently dedicated to the conservation of nature. However, as human use of the land intensifies, the choices made by private landowners become increasingly important. Land management by private owners can strongly affect the course of events in nearby public natural areas. Fortunately,

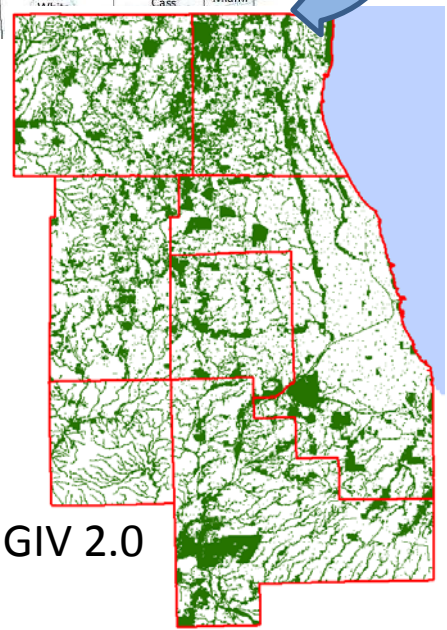


CW GIV: A Brief History



GIV 1.0

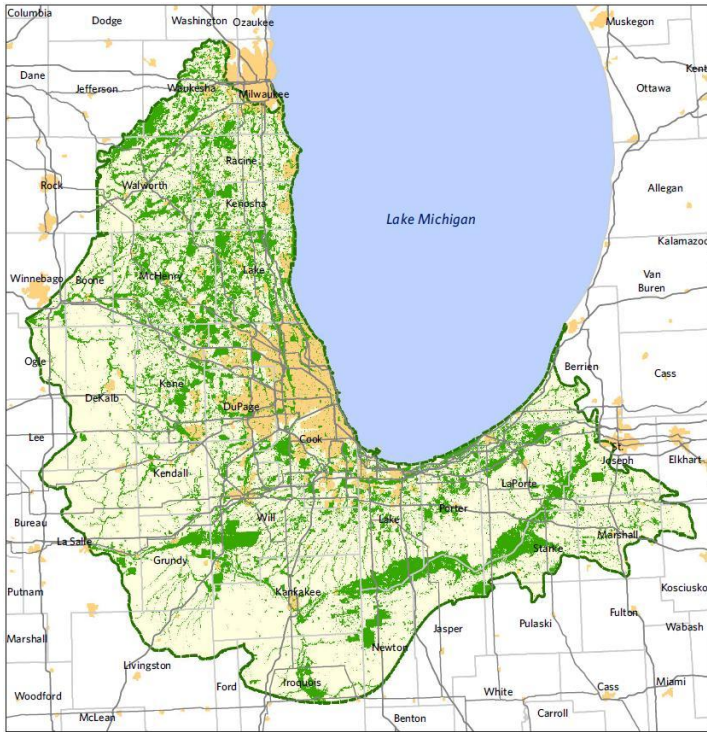




GIV 2.0

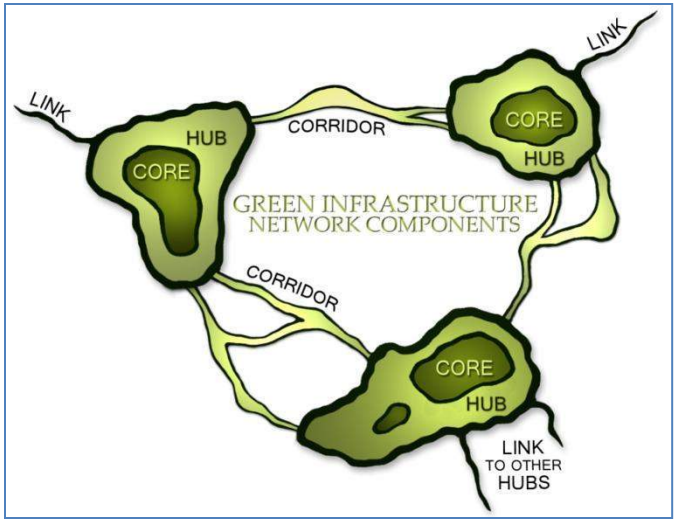
HISTORY

1. 2004 – GIV 1.0
2. June 2012 – GIV 2.0
3. November 2012 – GIV 2.1
4. Current Version – GIV 2.2



GIV 2.2

GIV 2 Network Layers



GIV Features

Core Areas

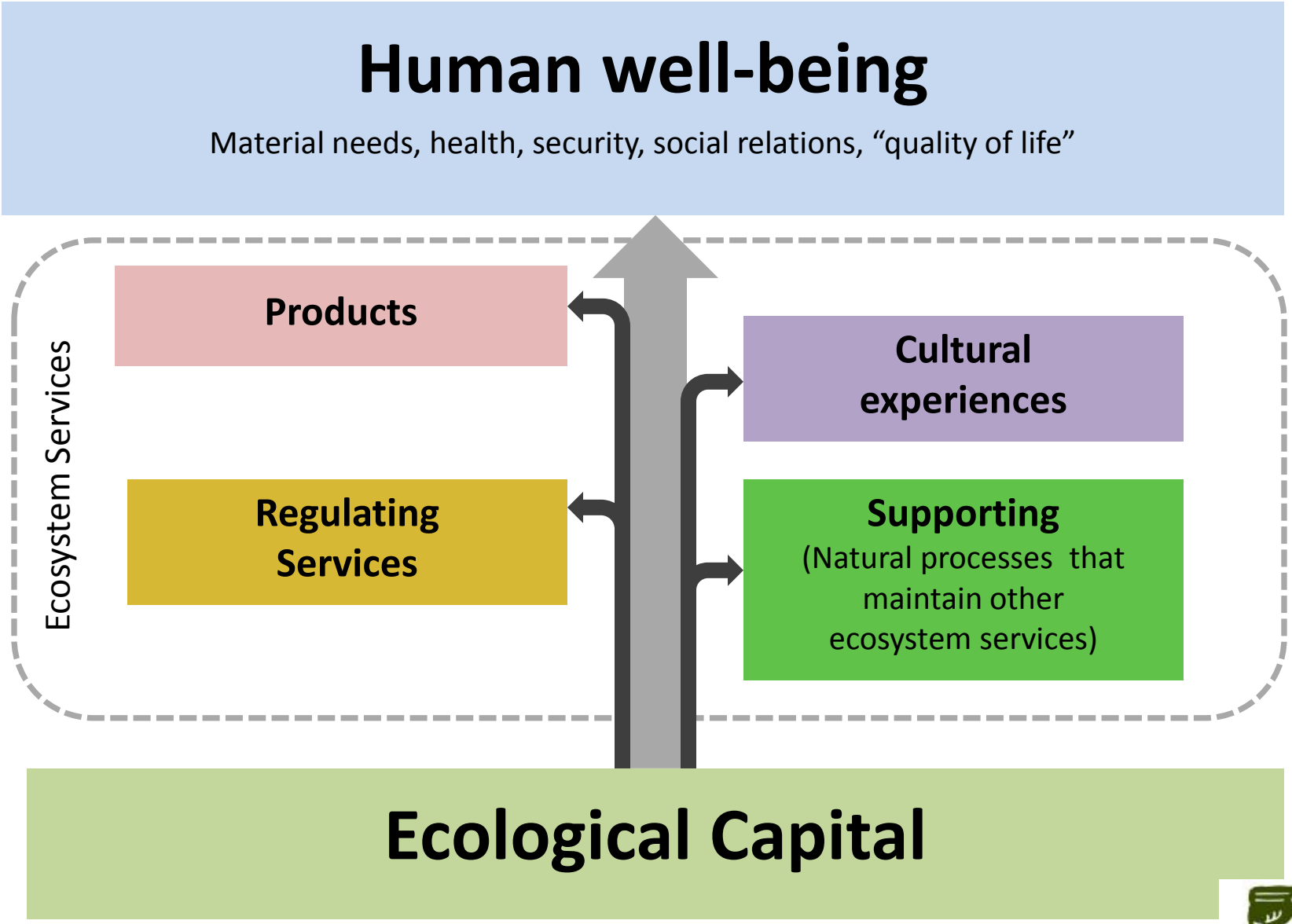
Functional Connections

Restoration Building Blocks

Composite Layers

	Attribute	Protocol Layer
GIV landscape features		
	Core woodland/forest designated areas	Woodland/Forest Layers 3a & 3b
	Core woodland/forest	Woodland/Forest Layer 4
	Core prairies	PGS Layer 1
	Core savannas	PGS Layer 2
	Core wetland designated areas	Wetland Layers 4a & 4b
	Core wetlands	Wetland Layer 5
	Core lakes and streams	Steams/Lakes Layer 3
Functional connections		
	Woodland/forest corridors	Woodland/Forest Layer 7
	Wetland corridors	Wetland Layer 8
	Undeveloped NHD+ stream buffer	Steams/Lakes Layer 2
	Undeveloped freshwater systems	Steams/Lakes Layer 5
Restoration building blocks		
	Woodland sites	Woodland/Forest Layer 5
	Pre-settlement woodland/forest	Woodland/Forest Layer 6
	Grassland blocks	PGS Layer 3
	Pre-settlement prairie/grassland	PGS Layer 4
	Pre-settlement savanna	PGS Layer 5
	Prairie/grassland corridors	PGS Layer 7
	Wetland sites	Wetland Layer 6
	Wetland complexes	Wetland Layer 7
	NHD+ raster buffer	Steams/Lakes Layer 1
	Freshwater systems	Steams/Lakes Layer 4
Composite layers		
	GIV 2.1 ecological network	Hub Layer 1
	Protected lands raster	Hub Layer 2
	GIV 2.1 composite	Hub Layer 3

What are Ecosystem Services?



Adapted from 2010 Ecological Footprint Atlas

HOUSTON WILDERNESS

GREEN INFRASTRUCTURE VISION

VERSION 2.3 ECOSYSTEM SERVICE VALUATION

✓Given existing peer reviewed science, GIV Version 2.2 can help estimate the monetized social benefit of conservation in comparison with the investments required to protect land.

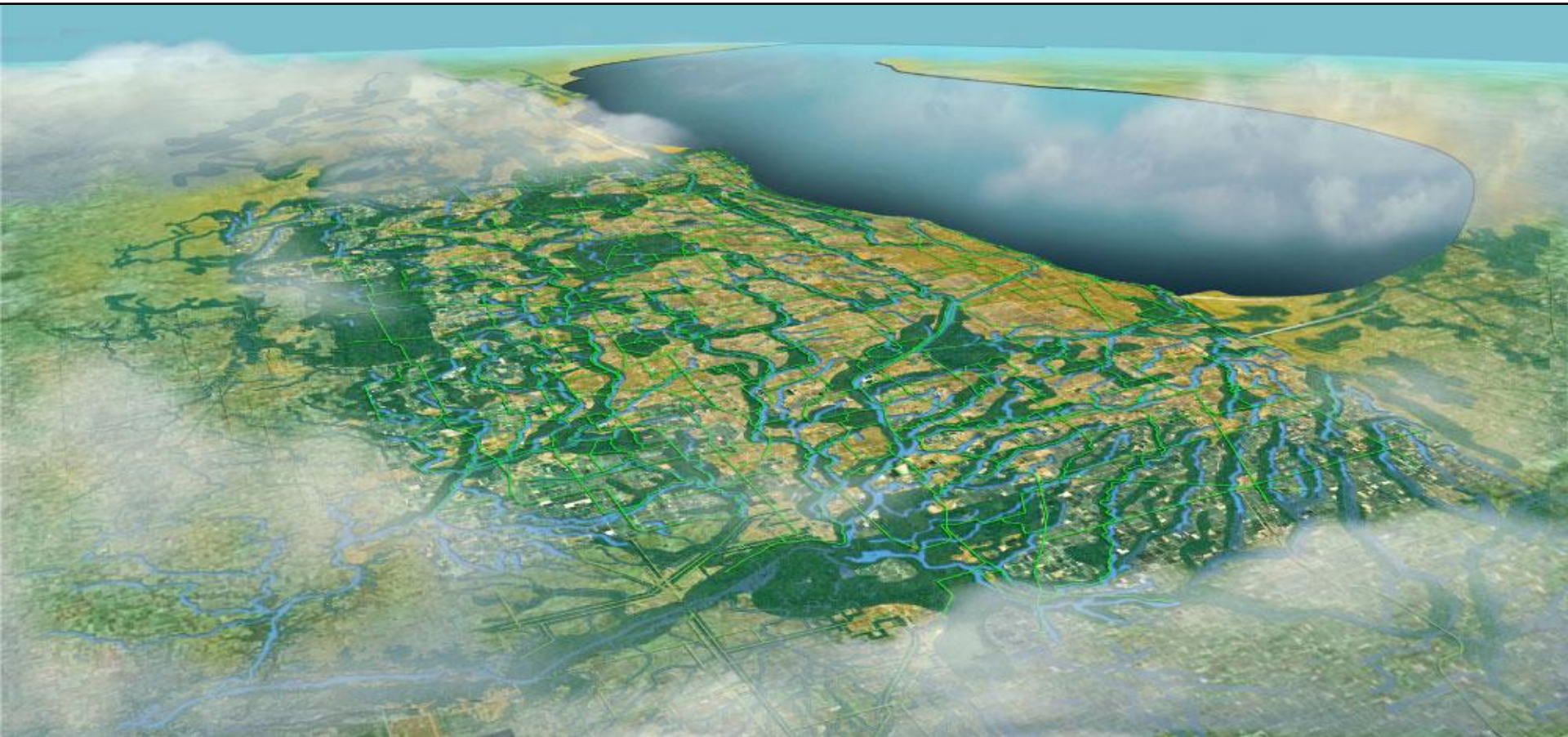
✓ Balmford et al. (2002) found that if the values of ecological services are considered, the benefits from conserving natural land gives a return on investment of at least 100 to 1.

✓GIV 2.3 will be useful in identifying the most strategic locations for CMAP and its partners to implement the land conservation goals of the GO TO 2040 metropolitan Chicago comprehensive regional plan.

CMAP Comprehensive Plan

CMAP GoTo 2040 Plan

✓Increase Conservation Open Space from 250,000 to 400,000 acres
✓Prioritize direct land protection within the green infrastructure network
✓Include green infrastructure connectivity in open space grant programs



Technical Approach

1. Review and evaluate the ecological economics literature for estimated ecosystem service valuations

GREEN INFRASTRUCTURE VISION

VERSION 2.3 ECOSYSTEM SERVICE VALUATION

Ecosystem Services Literature Summary

Introduction

Forests, wetlands, prairies, water bodies, and other natural ecosystems support our existence. They provide services like cleaning the air, filtering and cooling water, storing and cycling nutrients, conserving and generating soils, pollinating crops and other plants, regulating climate, sequestering carbon, protecting areas against storm and flood damage, and maintaining hydrology and water supplies (Costanza et al. 1997). These resources also provide marketable goods and services like forest products, fish and wildlife, and recreation. They serve as vital habitat for wild species, maintain a vast genetic library, provide scenery, and contribute in many ways to human health and quality of life.

Technical Approach

2. Convene a public workshop on ecosystem service valuation for Chicago Wilderness members and other key stakeholders in the CMAP region.

Chicago Wilderness GIV Ecosystem Services Feedback Form – August 2014

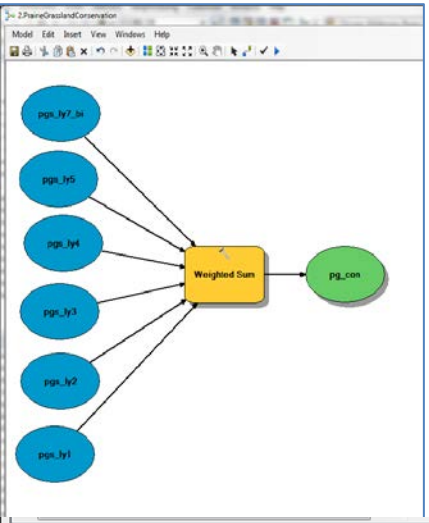
Water Flow Regulation / Flood Control (1 of 6)

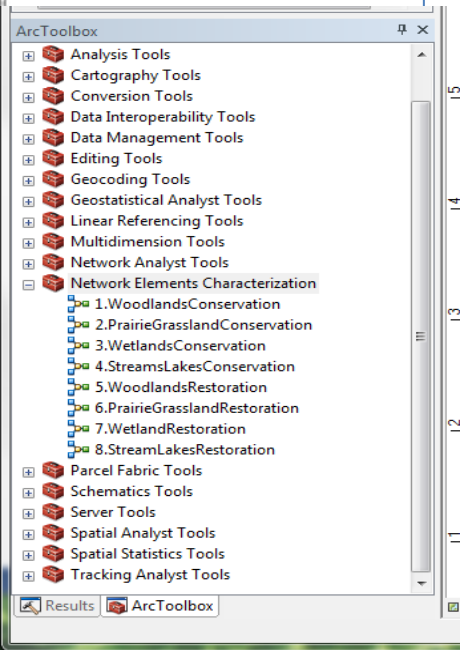
1. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

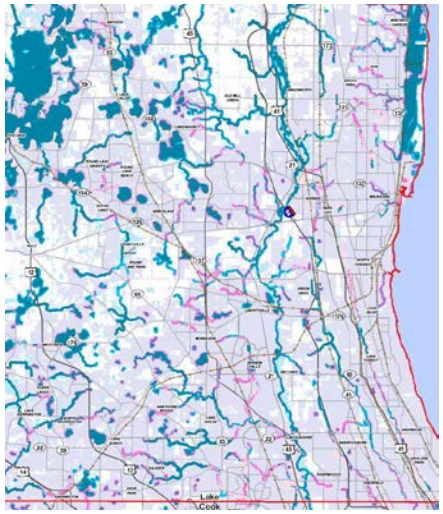
2. What do you believe are the most valuable metrics to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

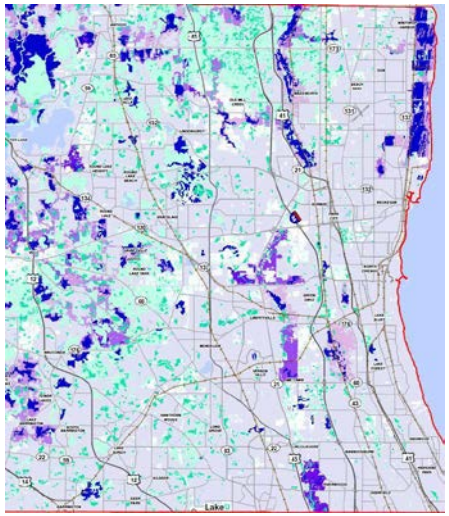
Technical Approach

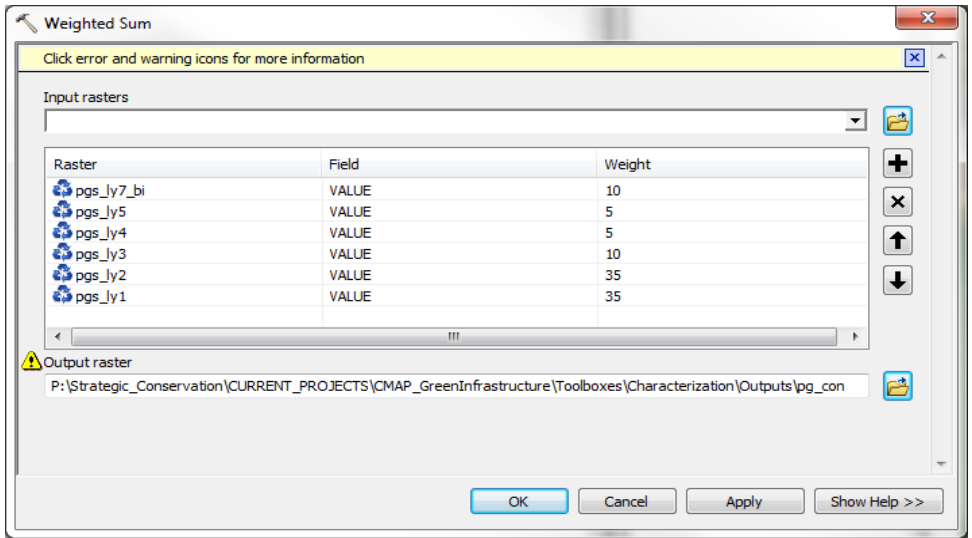
3. Apply the ecosystem service values spatially on the GIV version 2 map layers



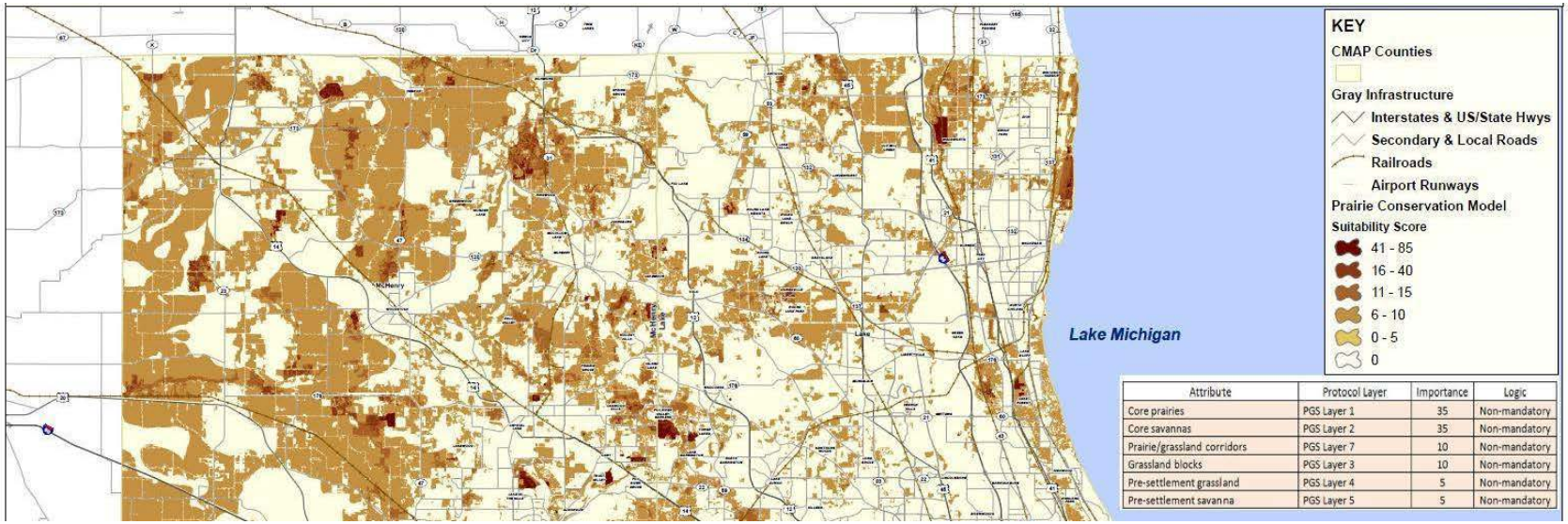




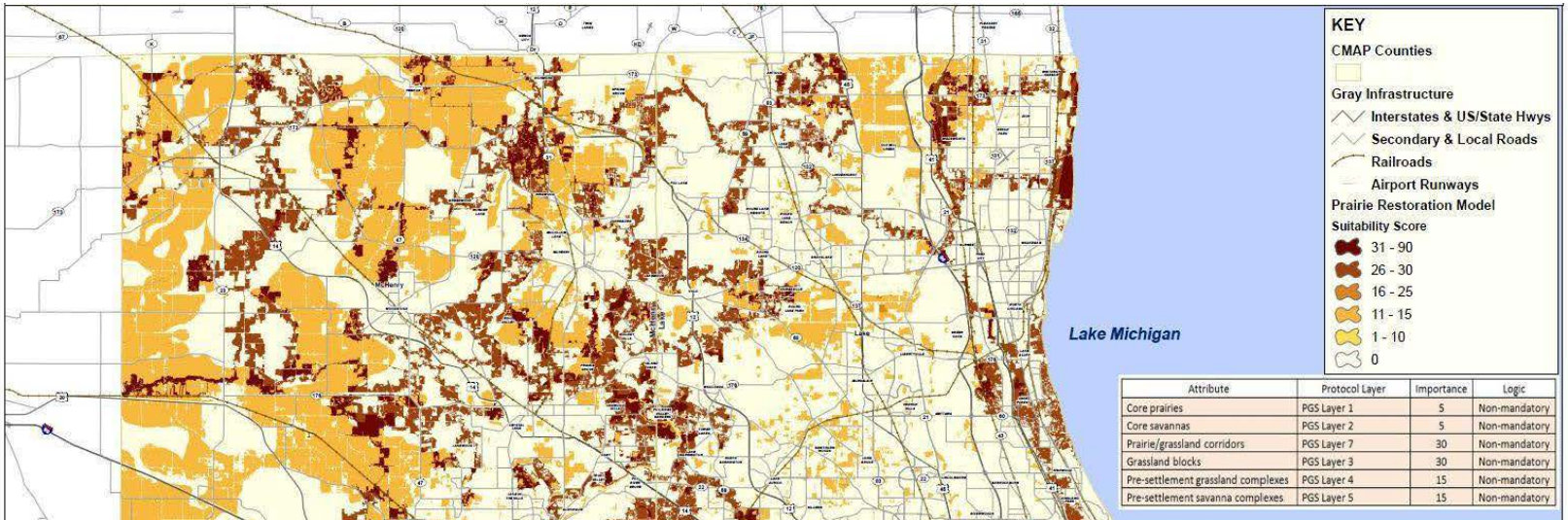




4. Visualize and explain the ecosystem service values of the GIV version 2 for the CMAP region



Attribute	Protocol Layer	Importance	Logic
Core prairies	PGS Layer 1	35	Non-mandatory
Core savannas	PGS Layer 2	35	Non-mandatory
Prairie/grassland corridors	PGS Layer 7	10	Non-mandatory
Grassland blocks	PGS Layer 3	10	Non-mandatory
Pre-settlement grassland	PGS Layer 4	5	Non-mandatory
Pre-settlement savanna	PGS Layer 5	5	Non-mandatory



Attribute	Protocol Layer	Importance	Logic
Core prairies	PGS Layer 1	5	Non-mandatory
Core savannas	PGS Layer 2	5	Non-mandatory
Prairie/grassland corridors	PGS Layer 7	30	Non-mandatory
Grassland blocks	PGS Layer 3	30	Non-mandatory
Pre-settlement grassland complexes	PGS Layer 4	15	Non-mandatory
Pre-settlement savanna complexes	PGS Layer 5	15	Non-mandatory

Agenda for Today

- ❑ Review draft literature review and ecosystem service valuations (Ted)
- ❑ Review map gallery and GIV layers (Will)
- ❑ Review feedback forms (Will)
- ❑ Use working lunch to review workshop materials
  - ➢ TCF staff and CMAP steering committee members will be available to answer any questions you may have
- ❑ After lunch, please fill out feedback forms and turn them in.
- ❑ At 1:30, we will begin a wrap-up discussion that will highlight next steps and project milestones

➢ **QUESTIONS?**

Review ecosystem service valuations

1. Relationship between GIV layers and ecosystem services
2. Process used to select ecosystem services to map
3. Examples of previous ecosystem service mapping project (Houston, Chesapeake Bay)
4. Highlights from draft literature review
5. Process for assigning ecosystem service values to GIV

1. Green Infrastructure and Ecosystem Services

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Value of Hubs, Cores, Corridors

- Reduces habitat fragmentation and patch isolation of natural systems
- Preserves interior habitat and reduces edge habitat
- Improves resiliency from disturbances and climate change
- Provides a framework for habitat restoration and enhancement
- Provides efficient way to protect ecosystem services

Ecosystem services (MARC/AES 2013)

- Regulating and Supporting
  - Water Flow Regulation
  - Water Purification
  - Erosion Control
  - Groundwater Recharge
  - Air Purification
  - Microclimate Moderation
  - Carbon Storage
  - Wildlife Population Stabilization
  - Pollination
  - Pest & Disease Control
- Provisioning
  - Food Production
  - Fiber Production
  - Game & Fish Production
  - Genetic & Wild Materials
- Cultural
  - Recreation & Ecotourism
  - Rare Species & Habitats
  - Spiritual & Aesthetic

2. Selecting ecosystem services to map

Ecosystem Service	Description
REGULATING & SUPPORTING	
Hazard Amelioration	
Water Flow Regulation / Flood Control	Maintain water flow stability and protect areas against flooding (e.g., from storms).
Water Purification	Maintain water quality sufficient for human consumption, recreational uses like swimming and fishing, and aquatic life.
Erosion Control and Sediment Retention	Maintain soil and slope stability, and retain soil and sediment on site.
Groundwater Recharge	Maintain natural rates of groundwater recharge and aquifer replenishment
Air Purification	Remove particulates and other pollutants from the air
Climate	
Microclimate Moderation	Lower ambient and surface air temperature through shading
Regulation of Water Temperature	Moderate water temperature in streams
Carbon Storage	Sequester carbon in vegetation and soils, thereby reducing atmospheric CO_2 and global climate change
Biological	
Support Native Flora and Fauna	Maintain species diversity and biomass
Pollination	Provide pollinators for crops and other vegetation important to humans
Pest and Disease Control	Provide biota which consume pests and control diseases
Provisioning	
Food Production	Production of plant or fungal-based food for human consumption
Game and Fish Production	Production of wild game and fish for human consumption
Fiber Production	Production of wood and other natural fibers for human use
Soil Formation	Long-term production of soil and peat for support of vegetation and other uses
Biochemical Production	Provision of biochemicals, natural medicines, pharmaceuticals, etc.
Genetic Information	Genetic resources for medical and other uses, including those not yet realized

2. Selecting ecosystem services to map

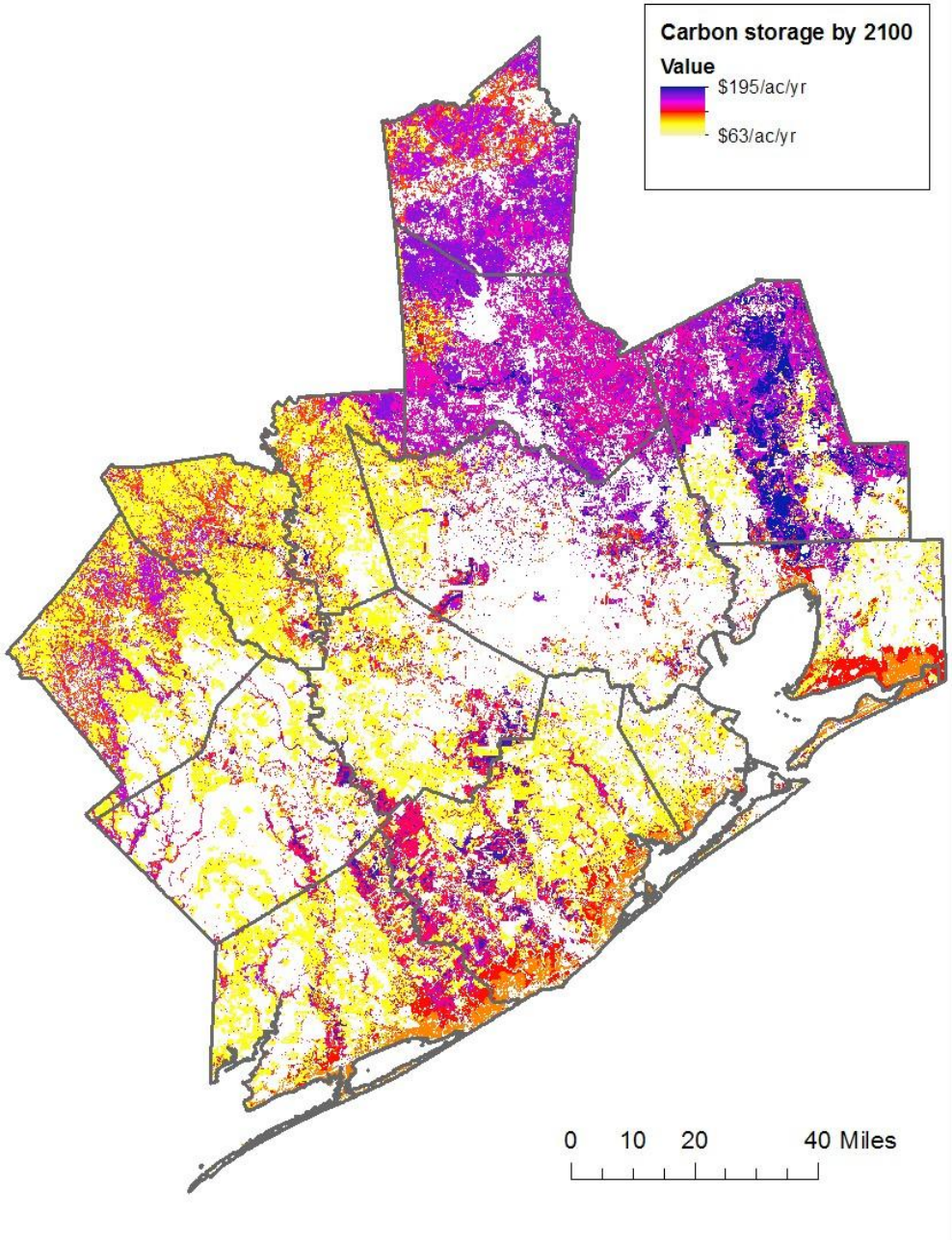
Ecosystem Service	Description
Cultural	
Recreation and Ecotourism	Outdoor, nature-based experiences like hiking, birding, hunting, camping, etc.
Savings in Community Services	Savings in community services from not converting natural land to houses
Increase in Property Values	Provide attractive location for homes and businesses
Science and Education	Existence of natural systems and areas for school excursions, advancement of scientific knowledge, etc.
Spiritual and Aesthetic	Aesthetic enjoyment or spiritual or religious fulfillment
Bequest value	The value placed on knowing that future generations will have the option to utilize the resource.
Existence value	The non-use value of simply knowing that particular resources exist, even if they are not used.

Total list
24

Researched
9

To be mapped
6

3. Ecosystem services mapping examples: Houston



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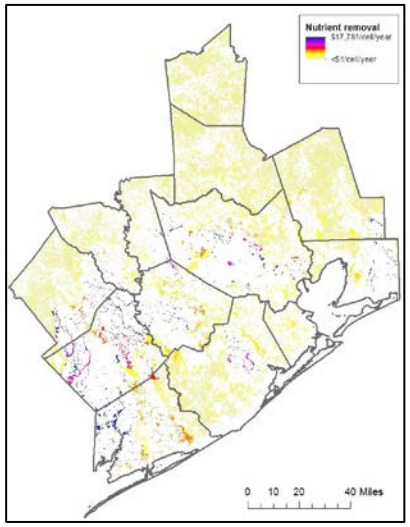
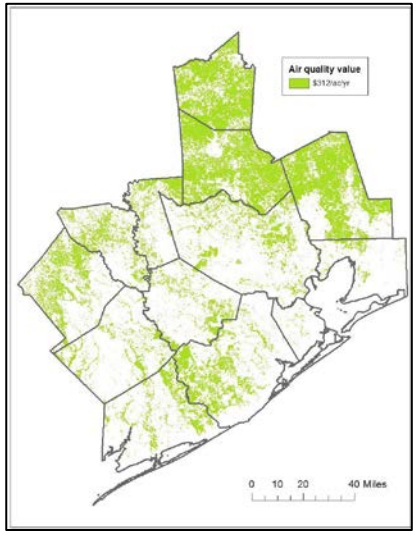
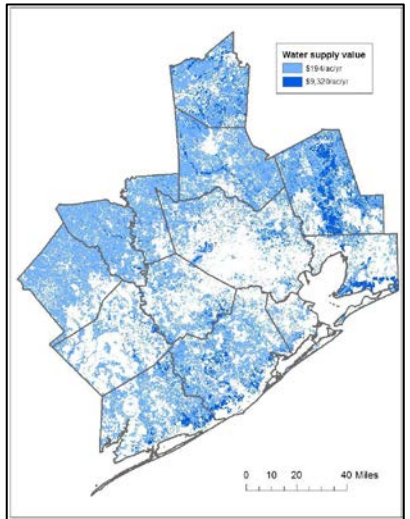
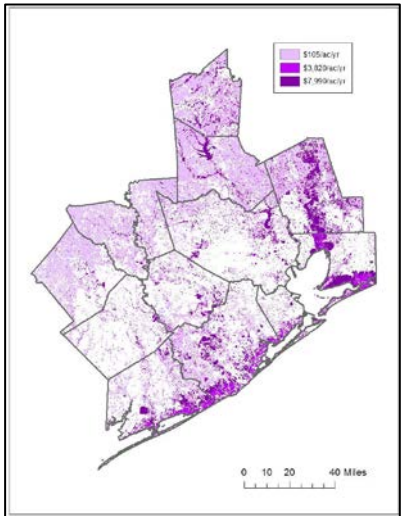
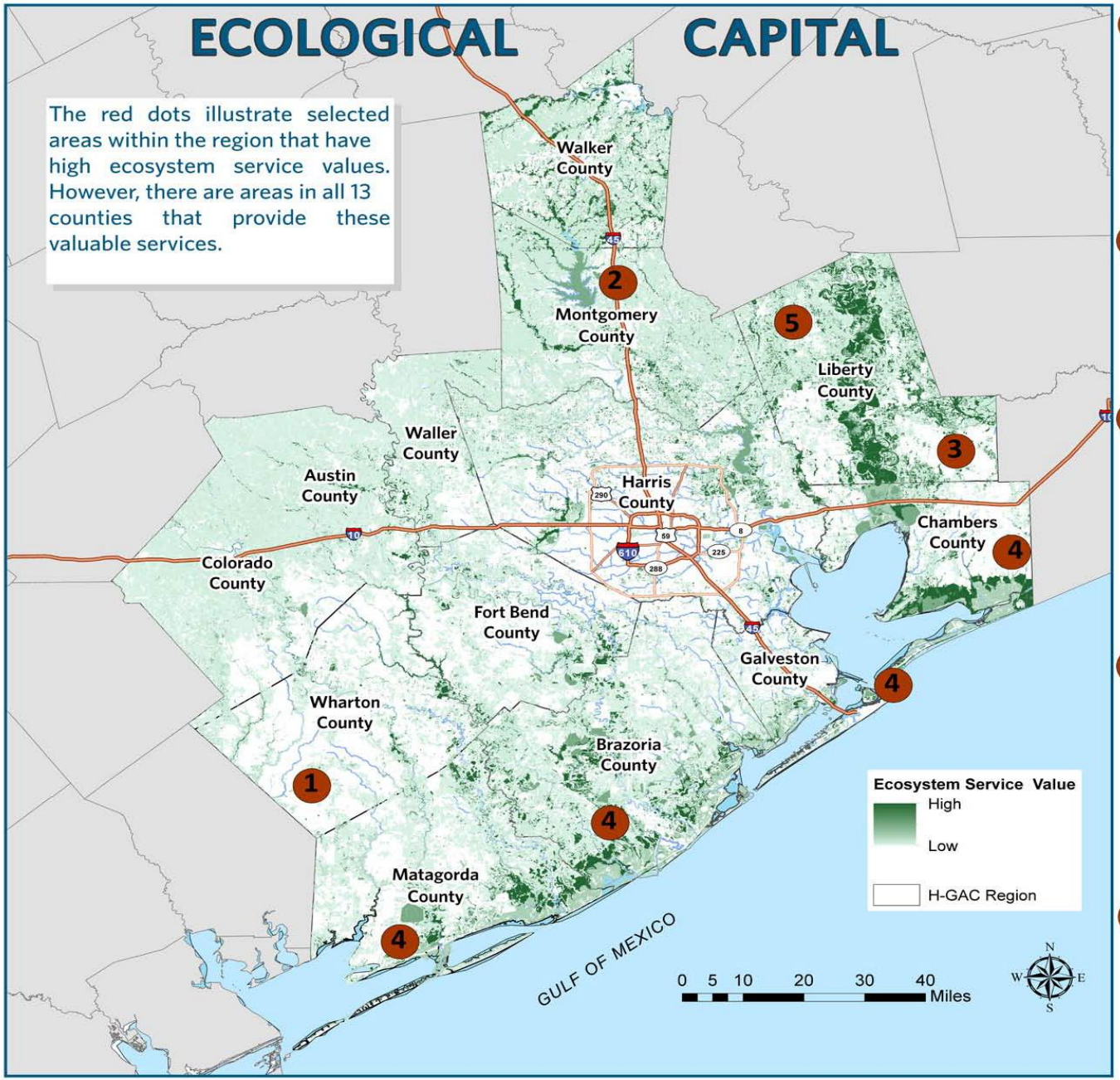








3. Ecosystem services mapping examples: Houston



1 **Water Quality:** In Wharton County, riparian lands are providing valuable nitrogen removal services that help clean the water.

2 **Air Quality:** In Montgomery County, heavily forested areas help purify the air.

3 **Water Supply:** Chambers and Liberty Counties store water. The regions gets drier as you move westward towards the line where evaporation exceeds precipitation. This is exacerbated by drought.

4 **Stormwater Regulation/Flood Protection/ Erosion Control:** All coastal counties, including Chambers County, offer protection against tidal and stormwater flooding.

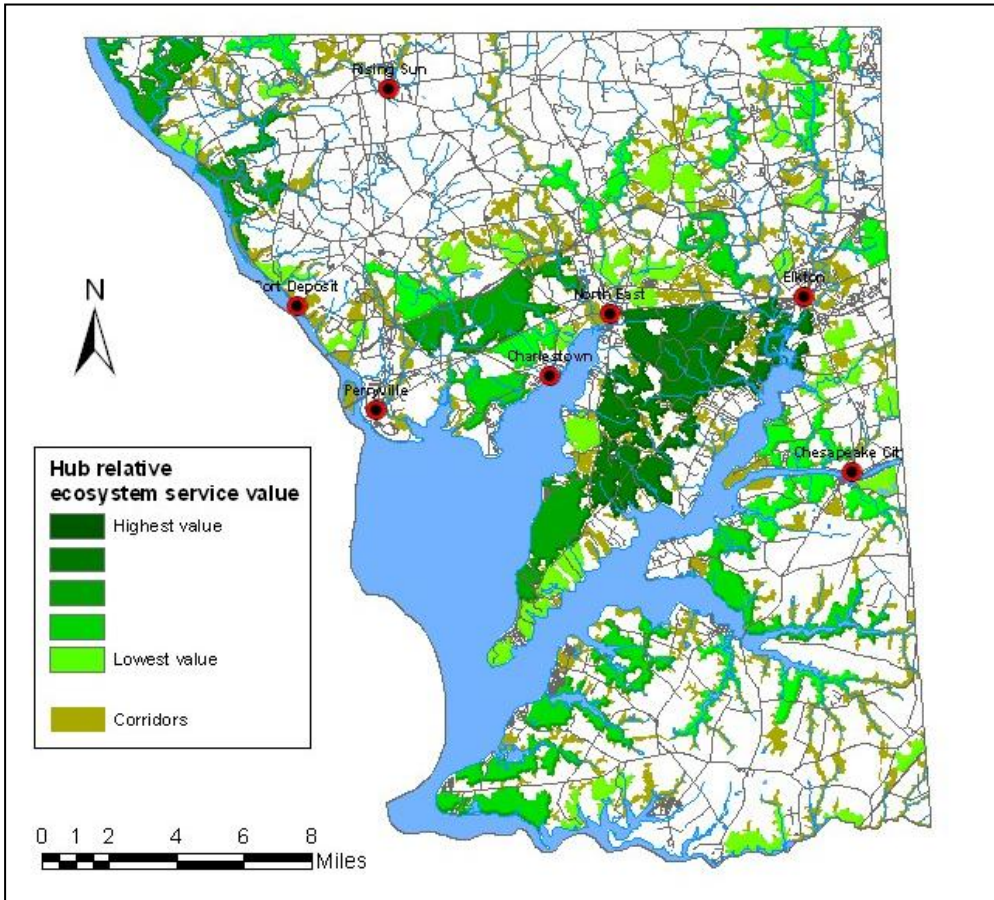
5 **Carbon Sequestration:** The Trinity River bottomlands and wetlands of Liberty County capture carbon. These areas also provide numerous other benefits to society and wildlife..

3. Ecosystem services mapping examples: Cecil County MD

TABLE 4: Estimates of ecosystem service values from forests and wetlands in Cecil County

Area	Area (acres)				
	Upland forests	Riparian forests & wetlands	Non-riparian wetlands	Tidal marsh	Estimated value (2006$/yr)
Cecil County	60,050	25,370	633	1,857	$2.1 billion
Cecil Green Infrastructure	45,446	19,620	563	1,724	$1.7 billion
% Services from GI Network	76%	77%	89%	93%	81%

- **Green Infrastructure core areas, hubs, and corridors in Cecil County comprise 32% of land but provide approximately 81% of the county's ecosystem service benefits.**



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4. Highlights from draft literature review

Ecosystem Service	Description
Water Flow Regulation / Flood Control	Maintain water flow stability and protect areas against flooding (e.g., from storms).
Water Purification	Maintain water quality sufficient for human consumption, recreational uses like swimming and fishing, and aquatic life.
Groundwater Recharge	Maintain natural rates of groundwater recharge and aquifer replenishment
Support Native Flora and Fauna	Maintain species diversity and biomass
Recreation and Ecotourism	Outdoor, nature-based experiences like hiking, birding, hunting, camping, etc.
Carbon Storage	Sequester carbon in vegetation and soils, thereby reducing atmospheric CO_2 and global climate change

Below are some talking points drawn from the literature review.

All Green Infrastructure Vision (GIV) Landscapes

- **Natural ecosystems contribute at least $2 billion per year in economic value to a 6-county area around Chicago.**
- **$60 million (3% of the Chicago region's total) in economic value provided by natural ecosystems is lost annually due to land use change.**
- **Land conservation provides at least a 100 to 1 return on investment if the values of ecological services are considered.**
- **Ecosystem resistance and resilience to stresses depends on species composition and diversity. Diverse ecosystems are more likely to contain species tolerant to disturbances like flooding, drought, or pests.**

4. Highlights from draft literature review

Ecosystem Service	Metrics	Types of economic analyses
Water Flow Regulation / Flood Control	Reduction of flood damage, Reduction of stormwater flows, Reduction of peak discharges, Reduction of combined sewer system costs, Reduction of soil erosion	Avoided cost, Replacement cost
Water Purification	Reduction of N, P, Cl^-, sediment, bacteria, and other pollutants for drinking water, swimming, fishing, aquatic life, and other uses.	Avoided cost, Replacement cost
Groundwater Recharge	Supply of water to groundwater rather than surface runoff	Avoided cost, Replacement cost, Price of public water supply
Carbon Storage	Reduction of atmospheric CO_2 and associated climate effects	Avoided cost, Market price of carbon
Support Native Flora and Fauna	Protection of wildlife habitat Maintenance of ecosystem functions and resilience	Willingness to pay (contingent valuation)
Recreation and Ecotourism	Money spent on nature-based recreation (hunting, fishing, birding, hiking, etc.)	Surveys of money expended on nature-based recreation

5. Process for assigning ecosystem service values to GIV

ECOSYSTEM SERVICE		LANDSCAPE TYPE			
		Woodlands / Forest	Prairie / Grassland / Savanna	Wetlands	Lakes/ Streams
Water Flow Regulation/ Flood control	Max.	$49,000	$13,900	$43,000	$31,740
	Median	$815	$6,951	$4,900	$900
	Min.	$11	$2	$1	$388
	# estimates	10	2	15	3
Water Purification	Max.	$1,300	$57	$79,800	
	Median	$1,025	$57	$3,429	
	Min.	$750	$57	$170	
	# estimates	2	1	12	N/A
Groundwater Recharge	Max.	$269		$37,120	$986
	Median	$269		$2,479	$669
	Min.	$269		$11	$38
	# estimates	1	0	14	5
Carbon Storage	Max.	$1,960	$184	$175	
	Median	$133	$82	$136	
	Min.	$32	$5	$100	
	# estimates	12	4	3	0
Support Native Flora and Fauna	Max.	$591		$14,819	$1,749
	Median	$535		$1,480	$20
	Min.	$319		$70	$1
	# estimates	3	0	7	3
Recreation and Ecotourism	Max.	$754	$1	$11,049	$23,284
	Median	$48	$1	$1,434	$2,229
	Min.	$6	$1	$37	$2
	# studies	13	1	15	8
TOTAL	Max.	$53,874	$14,142	$185,963	$57,760
	Median	$2,825	$7,091	$13,857	$3,818

Woodlands/Forest Landscape

Core Woodlands / Forest

F4

Woodland/Forest Sites

F5

Presettlement Woodland/Forest Complexes

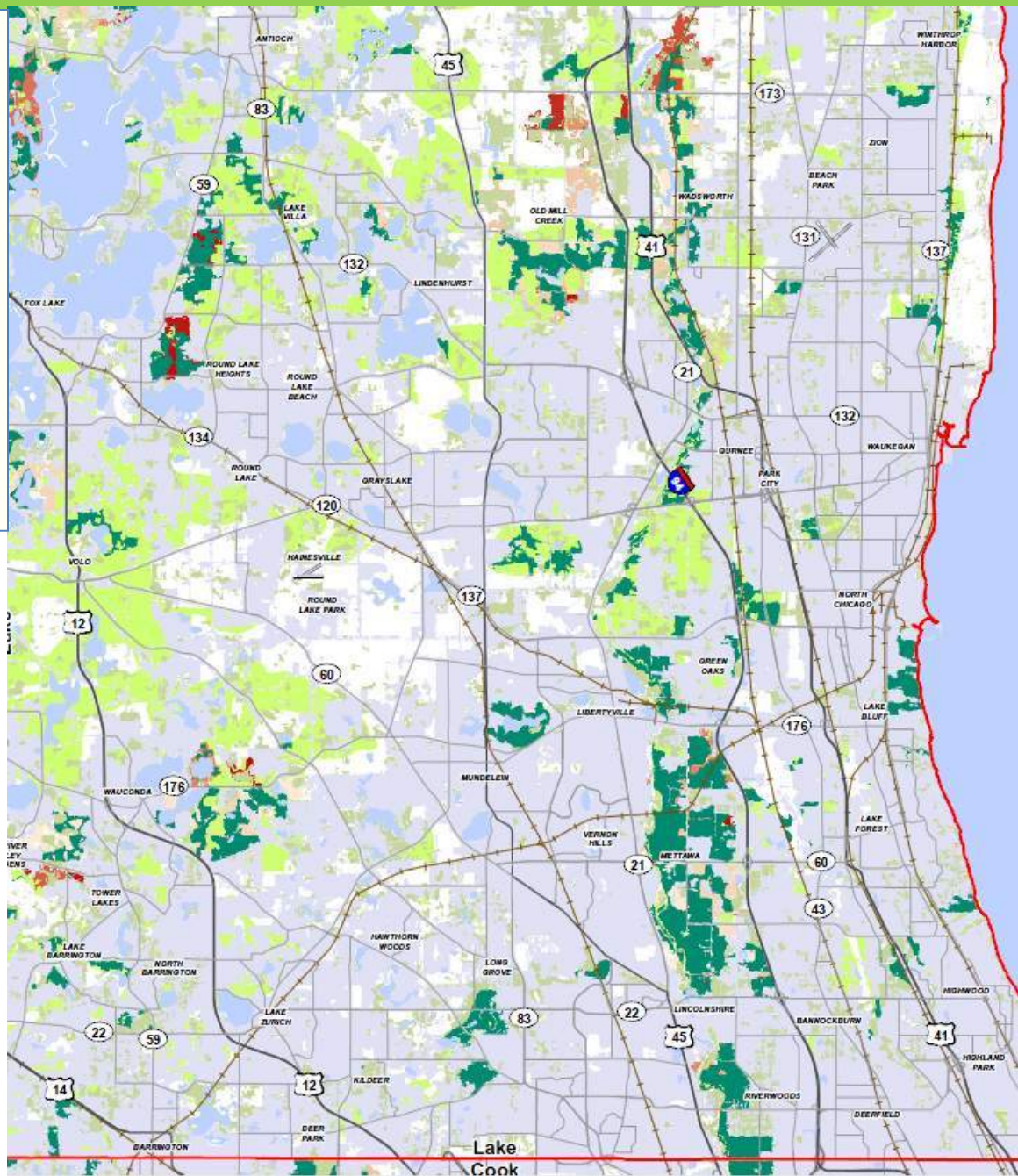
F6

Woodland/Forest Corridors (F7)

Functional Connectivity

Higher

Lower



Prairie / Grassland / Savanna Landscape

Core Prairie

PGS1

Core Savanna

PGS2

Potential Grassland Blocks

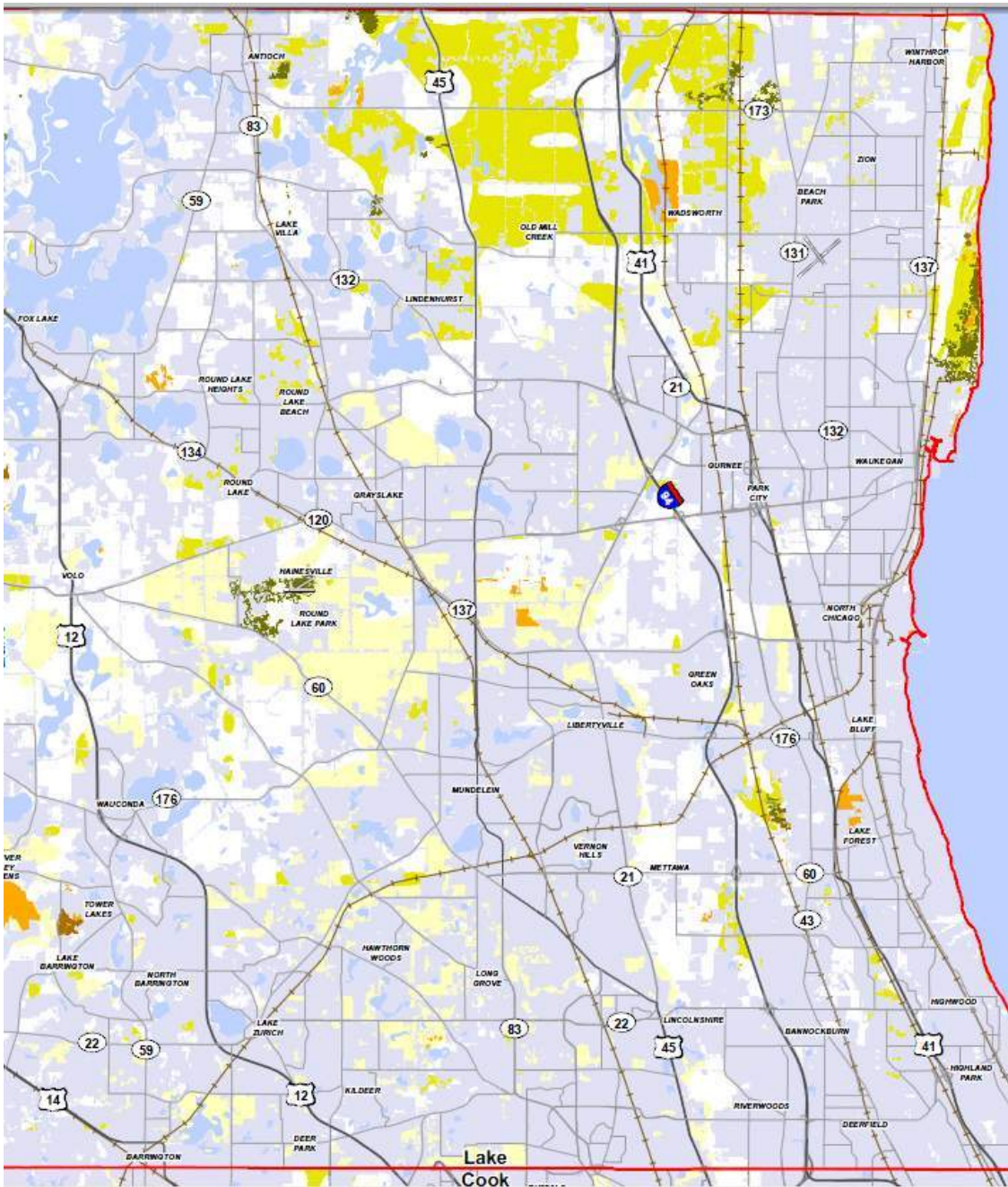
PGS3

Pre-Settlement Prairie/Grassland Complexes

PGS4

Pre-Settlement Savanna Complexes

PGS5



Wetlands Landscape

Core Wetlands

W5

Wetland Sites

W6

Wetland Complexes

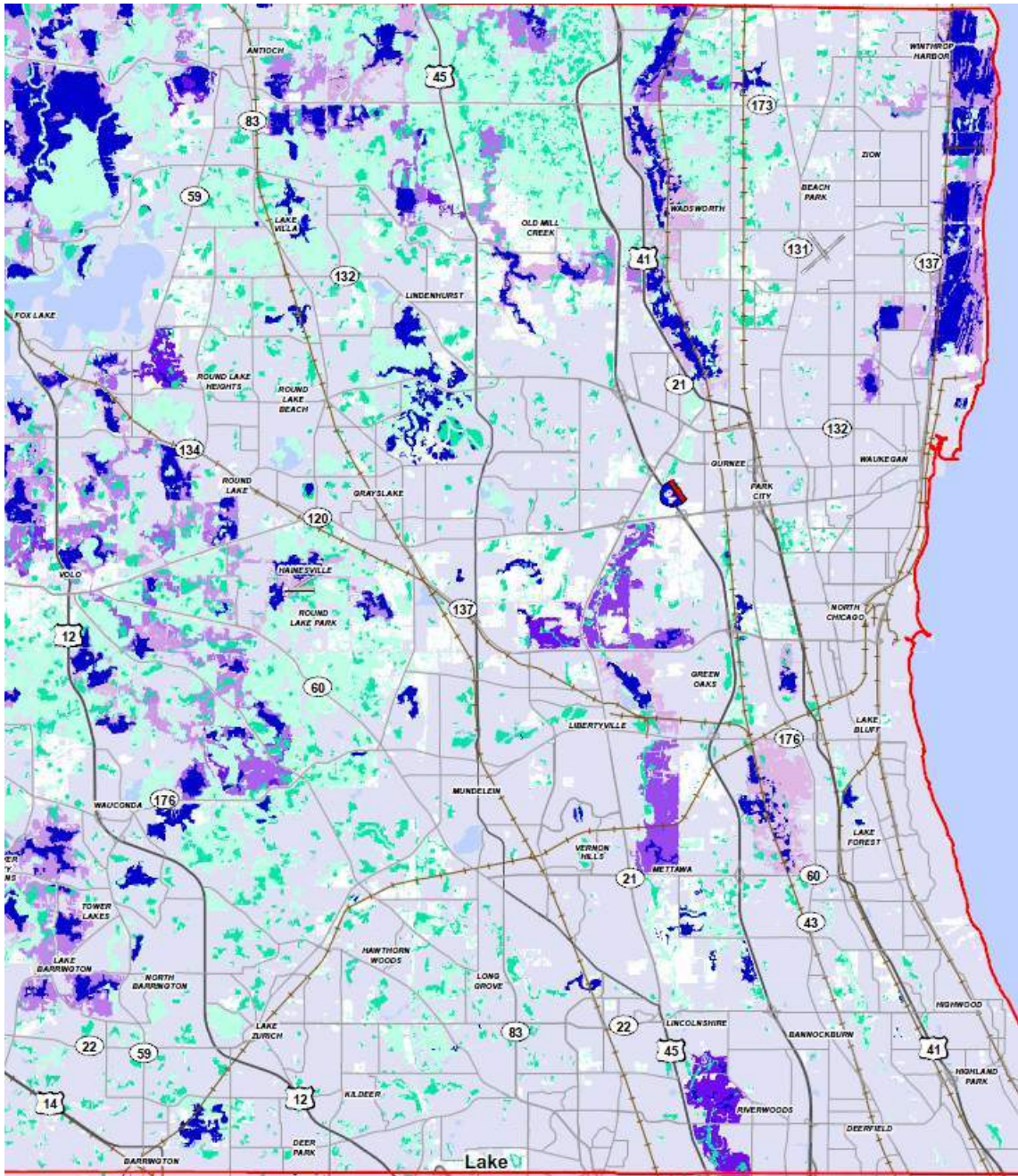
W7

Wetland Corridors (W8)

Functional Connectivity

Higher

Lower



Streams and Lakes Landscape

Core Streams and Lakes

SL3

Undeveloped Stream Buffer

SL2

Undeveloped Freshwater Systems

SL5

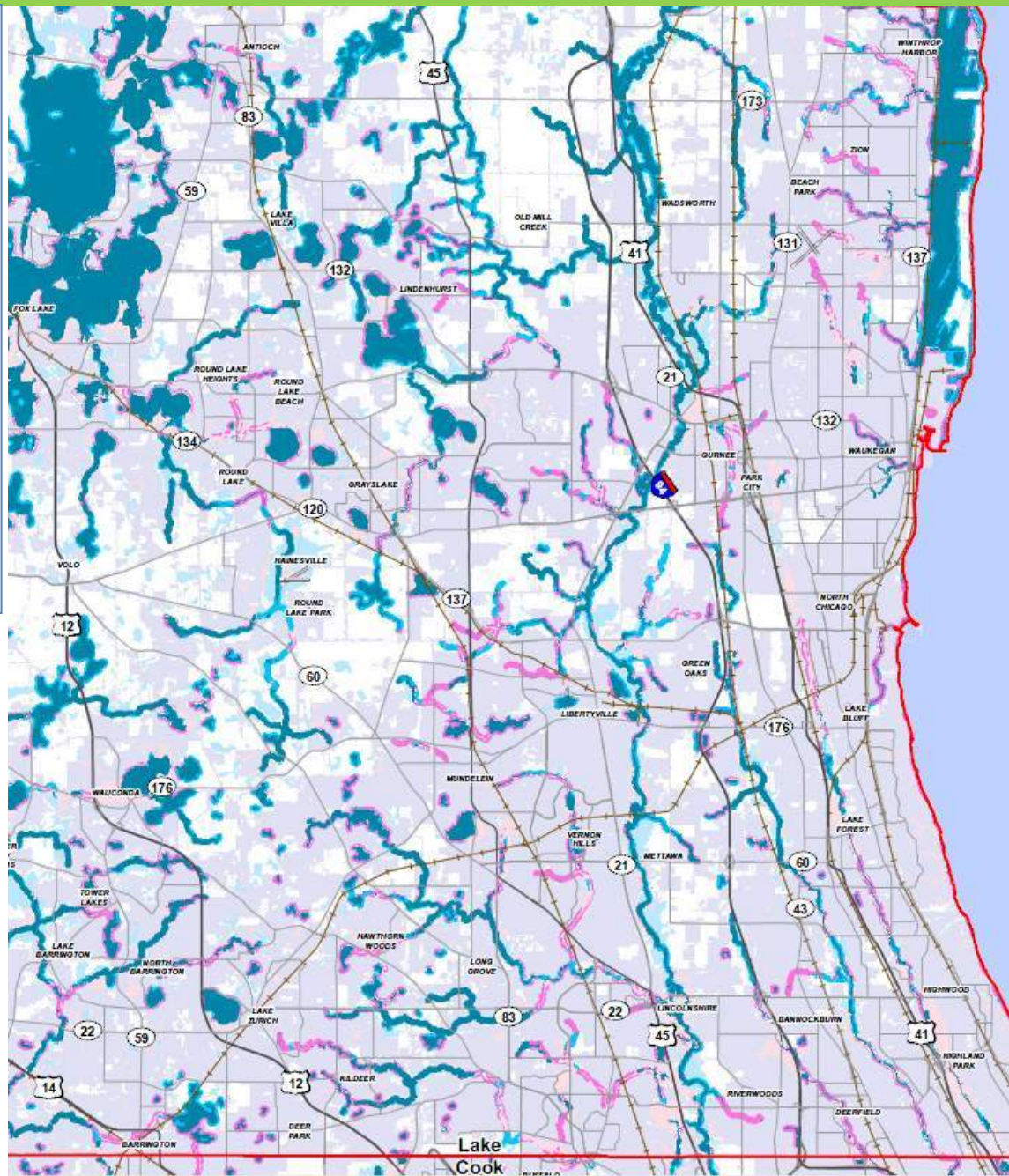
Freshwater Systems - Restoration Potential

SL4

Developed Stream Buffer

SL1 NHD+ Buffer

Other Open Water



Recreation and Ecotourism Landscape

CMAP Regional Trails

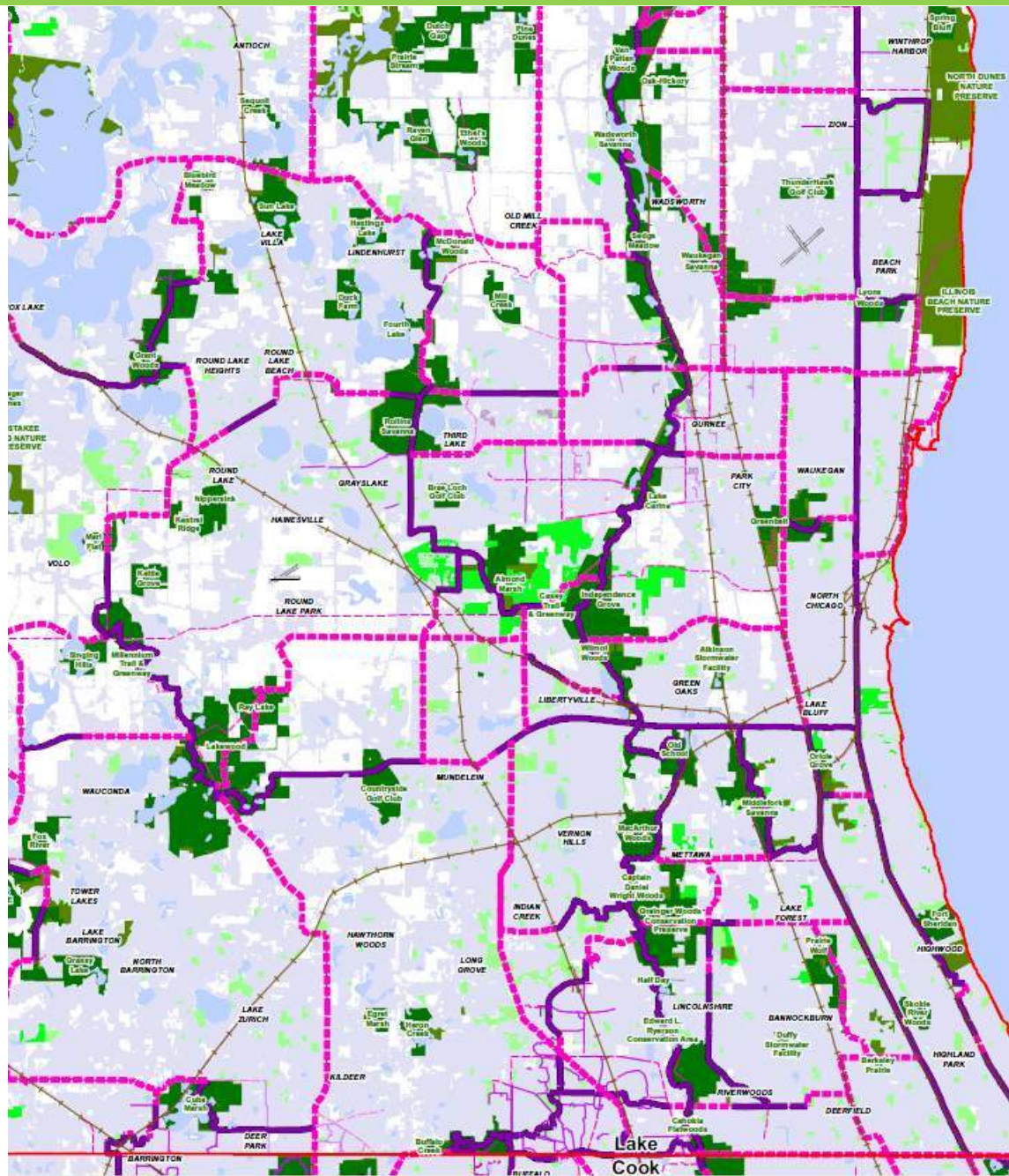
- Existing & Programmed
- Planned & Future

County and FPD Paths and Bike Lanes

- Existing
- Future

Municipal Paths and Bike Lanes

- Existing
- Future

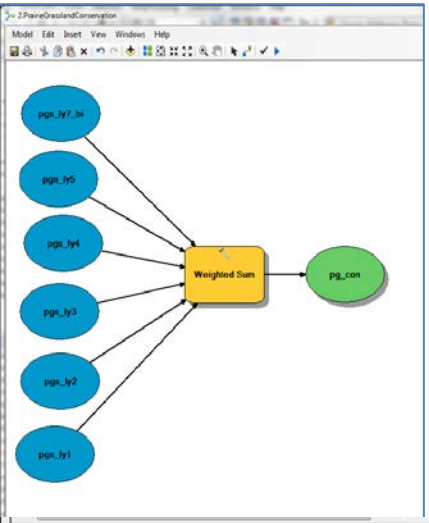


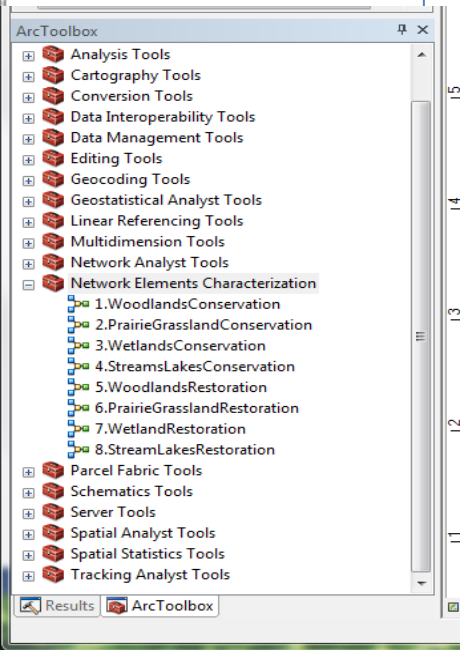
GIV Crosswalk

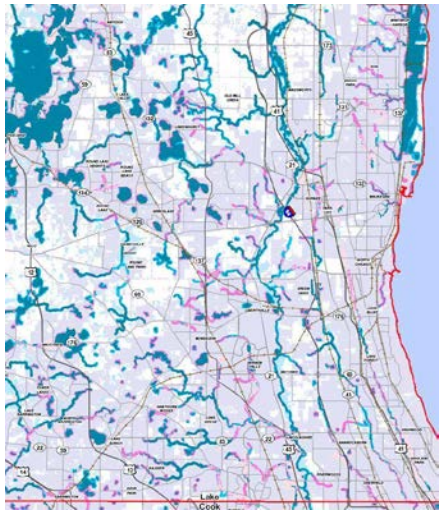
GIV Landscapes	Crosswalk GIV Layer	GIS Model Reference
Woodlands/Forest		
	Core woodland/forest designated areas	**Woodland/Forest Layers 3a & 3b**
	Core woodland/forest	**Woodland/Forest Layer 4**
	Forest Sites	**Woodland/Forest Layer 5**
	Woodland/forest corridors	**Woodland/Forest Layer 7**
Lakes and Streams		
	Undeveloped NHD+ stream buffer	**Steams/Lakes Layer 2**
	Core lakes and streams	**Steams/Lakes Layer 3**
	Undeveloped freshwater systems	**Steams/Lakes Layer 5**
Prairie/Grassland/Savanna		
	Core prairies	**PGS Layer 1**
	Core savannas	**PGS Layer 2**
	Grassland blocks	**PGS Layer 3**
Wetlands		
	Core wetland designated areas	**Wetland Layers 4a & 4b**
	Core wetlands	**Wetland Layer 5**
	Wetland sites	**Wetland Layer 6**
	Wetland complexes	**Wetland Layer 7**
	Wetland corridors	**Wetland Layer 8**

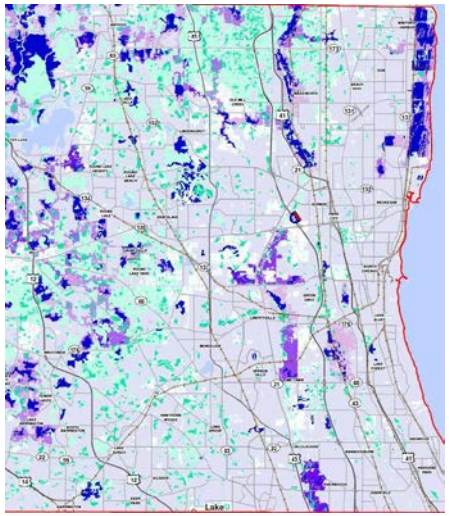
Technical Approach

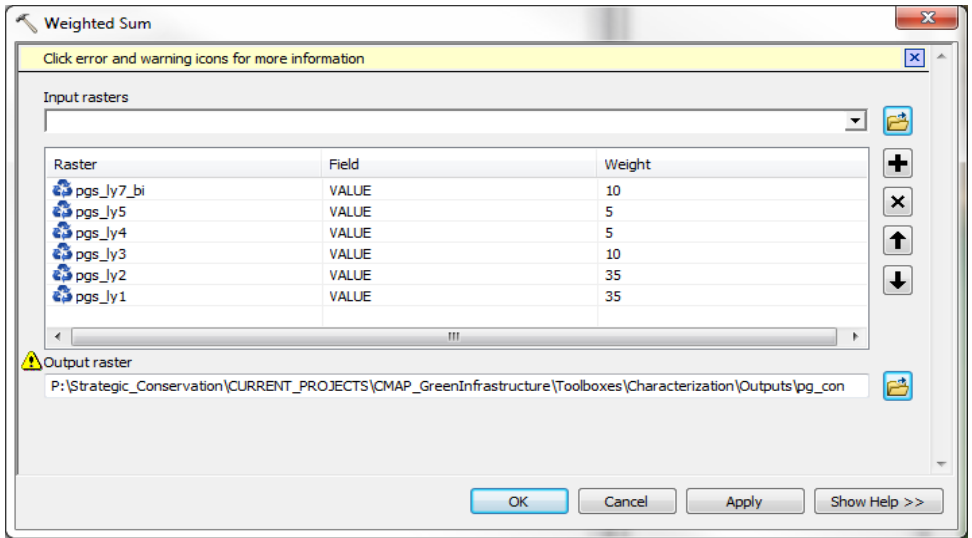
Apply the ecosystem service values spatially on the GIV version 2 map layers





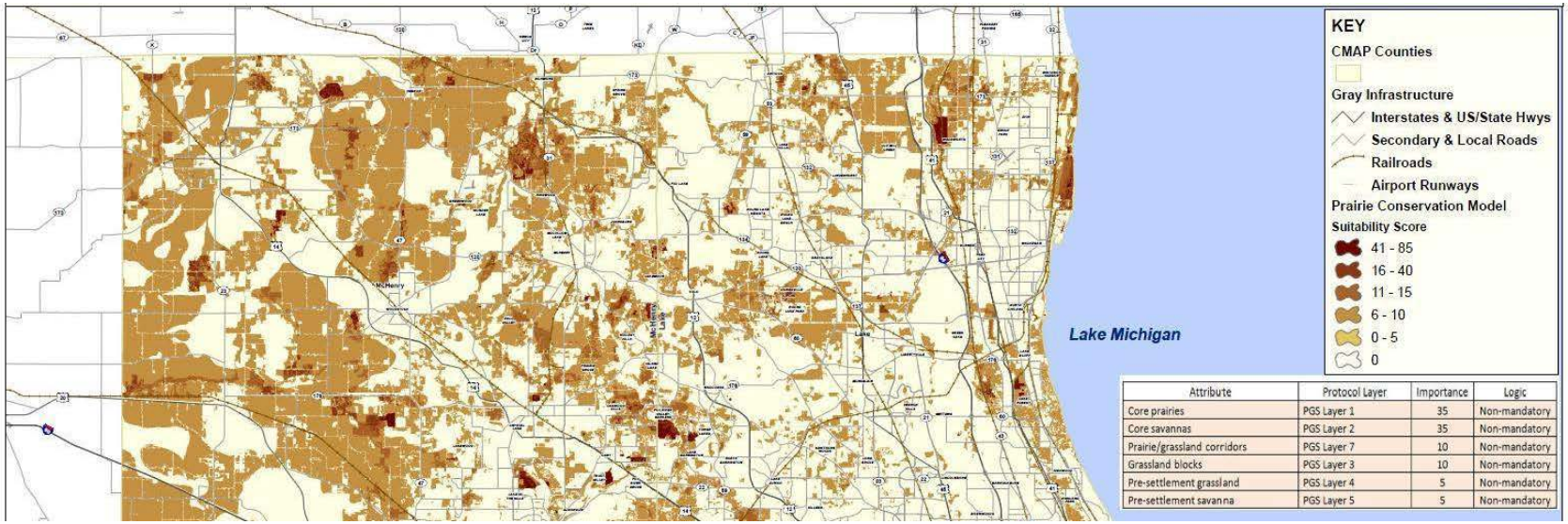




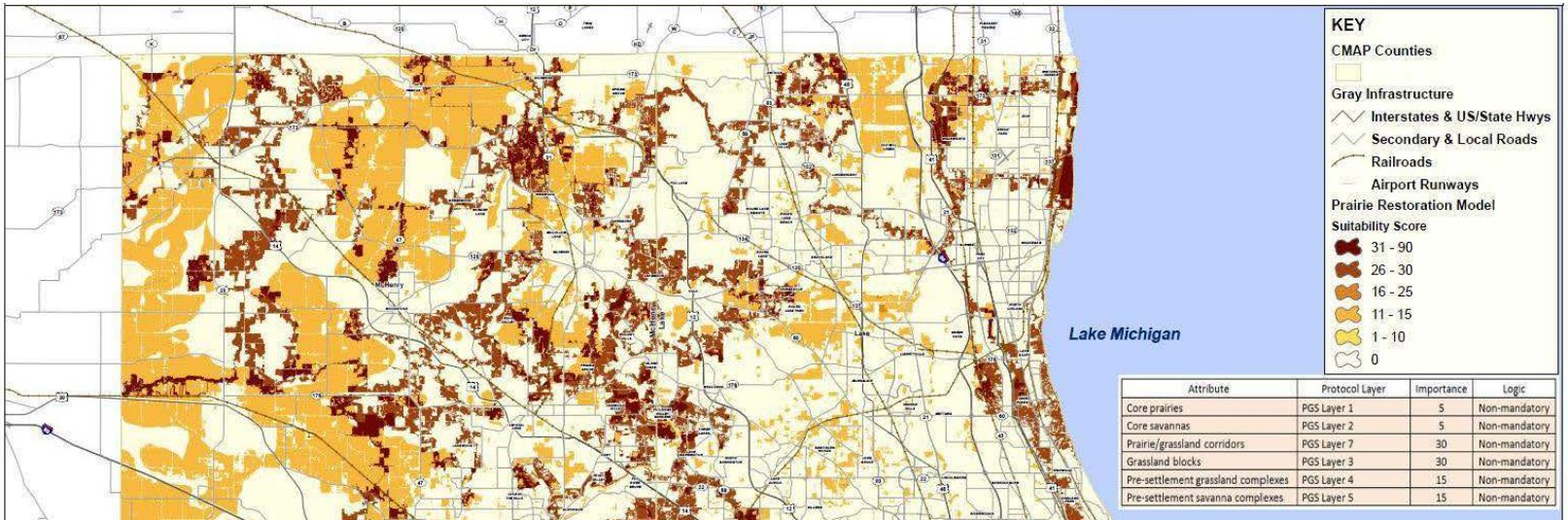


Technical Approach

Visualize and explain the ecosystem service values of the GIV version 2 for the CMAP region



Attribute	Protocol Layer	Importance	Logic
Core prairies	PGS Layer 1	35	Non-mandatory
Core savannas	PGS Layer 2	35	Non-mandatory
Prairie/grassland corridors	PGS Layer 7	10	Non-mandatory
Grassland blocks	PGS Layer 3	10	Non-mandatory
Pre-settlement grassland	PGS Layer 4	5	Non-mandatory
Pre-settlement savanna	PGS Layer 5	5	Non-mandatory



Attribute	Protocol Layer	Importance	Logic
Core prairies	PGS Layer 1	5	Non-mandatory
Core savannas	PGS Layer 2	5	Non-mandatory
Prairie/grassland corridors	PGS Layer 7	30	Non-mandatory
Grassland blocks	PGS Layer 3	30	Non-mandatory
Pre-settlement grassland complexes	PGS Layer 4	15	Non-mandatory
Pre-settlement savanna complexes	PGS Layer 5	15	Non-mandatory

Feedback Forms

Water Flow Regulation / Flood Control (1 of 6)

1. What do you believe are the most important reasons for protecting the Green Infrastructure Vision to maintain this ecosystem service?

2. What do you believe are the most valuable metrics to make the case for protecting this ecosystem service within the Green Infrastructure Vision? (see the Talking Points for ideas)

3. Within the CMAP 7-County region, what do you believe are the best opportunities are to protect this ecosystem service? (e.g. types of projects, locations, policies, etc.)

4. Which studies from the draft literature review do you believe are the most useful/relevant to help estimate the value of this ecosystem service in the CMAP region? Are you familiar with any other studies or resources that may be helpful in estimating the value of this service in the CMAP region?

The Rest of Today

- Use working lunch to review workshop materials
  - TCF staff and CMAP steering committee members will be available to answer any questions you may have
- After lunch, please fill out feedback forms and turn them in.
- At 1:30 (or before), we will begin a wrap-up discussion that will highlight next steps and project milestones

- **QUESTIONS?**