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Annual Variation, Time Lags, And Relationships Between Success In The Watersheds And Responses In The Gulf – Keeping Things In Perspective

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National Water-Quality Assessment Project

U.S. Department of the Interior

U.S. Geological Survey

Overview

- USGS water-quality monitoring in the Mississippi-Atchafalaya River Basin (MARB)
- Seasonal variability in nutrient loading
- Annual variability in nutrient loading
- Spatial variability in nutrient loading
- Variability in nutrient contributions from different source waters
- Variability in the relation between nutrient loads and the size of the hypoxic zone

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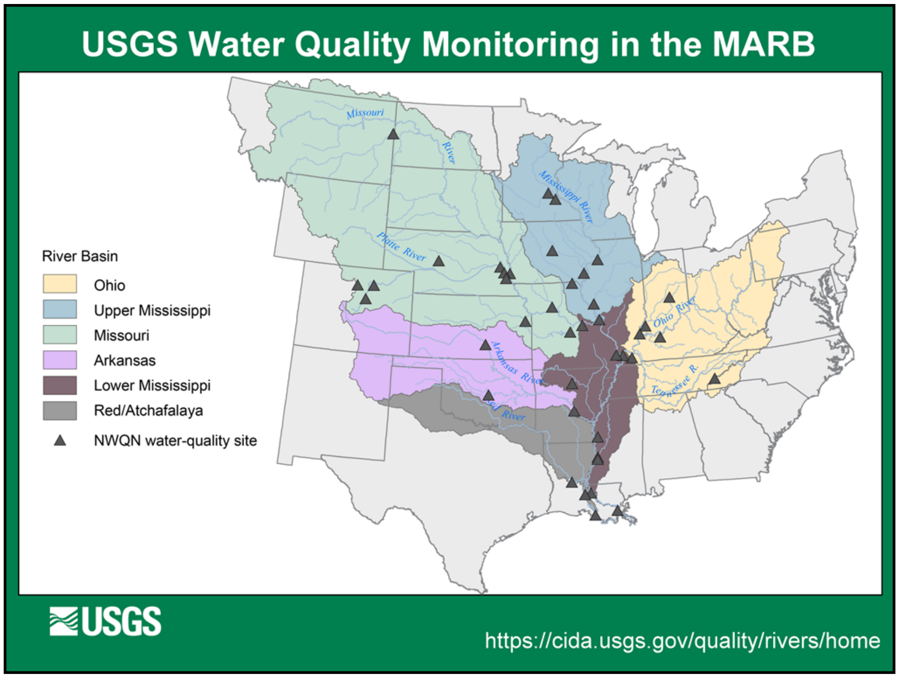
Assessing the impact of nutrient reductions on the size of the Gulf of Mexico hypoxic zone is complicated by the great number of sources of variability in the relation between nutrient loading and hypoxia.

I'm first going to briefly describe the USGS water-quality monitoring network in the Mississippi – Atchafalaya River Basin and then I'm going to talk about several sources of variation that may impact our ability to see reductions in the size of the hypoxic zone in the Gulf of Mexico due to reductions in nutrient discharges from point or non-point sources.

Nitrogen has been shown to be the key predictor of the size of the hypoxic zone in the Gulf of Mexico so my examples use total nitrogen. See Turner, R.E., Rabalais, N.N., and Justic, D., 2006, Predicting summer hypoxia in the northern Gulf of Mexico-Riverine N, P, and Si loading: Marine Pollution Bulletin, v. 52. p. 139–148. https://doi.org/10.1016/j.marpolbul.2005.08.012

Nutrient load data used in this presentation are as reported by the U.S. Geological Survey (Streamflow and Nutrient Flux of the Mississippi-Atchafalaya River Basin and Subbasins Through Water Year 2016 available at https://toxics.usgs.gov/hypoxia/mississippi/flux_ests/index.html).



USGS National Water Quality Network—114 sites sampled nationally with emphasis on larger rivers. 41 of the sites are in the MARB.

One primary objective of the NWQN is to determine the status and trends of loads and concentrations of contaminants, nutrients, and sediment in the Nation's large rivers, including loads to selected major estuaries. The Gulf of Mexico is one of these.

Two sites are used to compute loads to GOM (Mississippi River at St. Francisville, LA and Atchafalaya River at Melville, LA). [Mississippi River flow is bifurcated at Old River control structure located about where the LA/MS border stops running along the Mississippi River. Approx. 2/3 of flow continues down Mississippi River while the remaining 1/3 is diverted to the Atchafalaya River.]

Period of record for Total Nitrogen is 1975-present for St. Francisville site and 1980-present for the Melville site. Nitrite+Nitrate data goes back to mid-1960s at St. Francisville site.

Information available at MARB loads web site (https://nrtwq.usgs.gov/mississippi_loads/#/) and Water Quality Tracking web site (https://cida.usgs.gov/quality/rivers/home)

Seasonal Variability in Nutrient Loads

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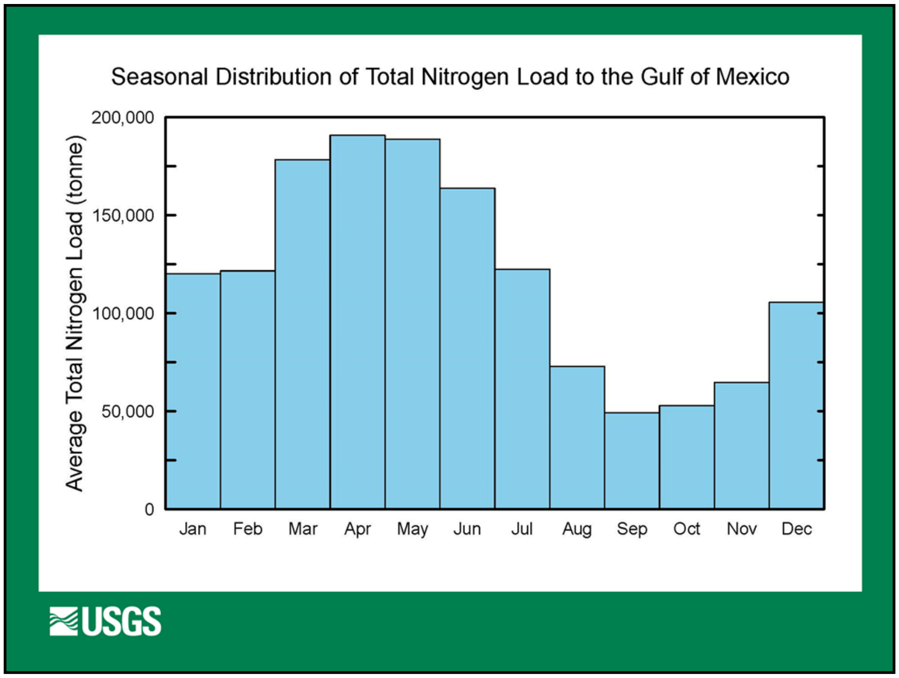


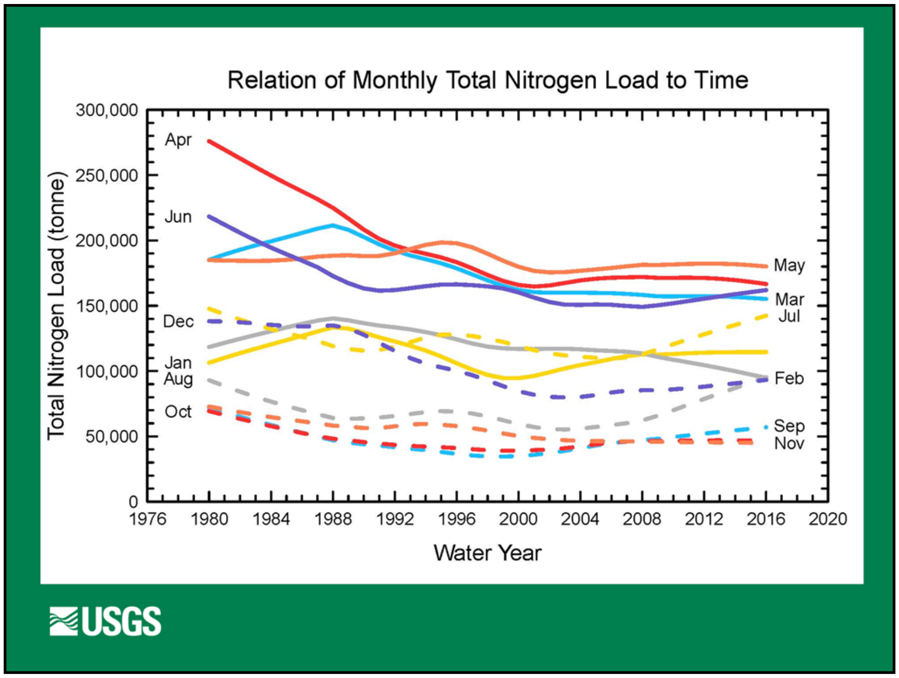
Nutrient loading to the Gulf of Mexico has a pronounced seasonal pattern. I'm going to be discussing loadings in terms of May load as this has been found to be the best predictor of the size of the summer hypoxic zone for any given year. It is currently used as the driver for the annual forecasts of the hypoxic zone size. (See following references.)

Turner, R.E., Rabalais, N.N., and Justic, D., 2006, Predicting summer hypoxia in the northern Gulf of Mexico-Riverine N, P, and Si loading: Marine Pollution Bulletin, v. 52. p. 139–148. https://doi.org/10.1016/j.marpolbul.2005.08.012

Obenour, D.R., Michalak, A.M., Zhou, Yuntao, and Scavia, Donald, 2012, Quantifying the Impacts of Stratification and Nutrient Loading on Hypoxia in the Northern Gulf of Mexico: Environmental Science and Technology, v. 46, no. 10, p. 5489–5496. DOI: 10.1021/es204481a

Turner, R.E., Rabalais, N.N., and Justic, D., 2012, Predicting summer hypoxia in the northern Gulf of Mexico-Redux: Marine Pollution Bulletin, v. 64, no. 2, p. 319-324. https://doi.org/10.1016/j.marpolbul.2011.11.008

Donald Scavia, Scavia, Bertani, Isabella, Long, Colleen, Wang, Yu-Chen, and Obenour, Dan, 2017, 2017 Gulf of Mexico Hypoxia Forecast: online at http://scavia.seas.umich.edu/wp-content/uploads/2017/06/2017-Gulf-of-Mexico-Hypoxic-Forecast.pdf)



The relation between May load and the size of the hypoxic zone is only correlative. However, given that, what overall impact do reductions in nutrient loadings in other months have on the size of the hypoxic zone? For instance, what effect does the downward trend in nitrogen loads during December have on the size of the hypoxic zone the following summer?

Lines shown are lowess smooth drawn through the individual monthly loads.

Annual Variability in Nutrient Loads

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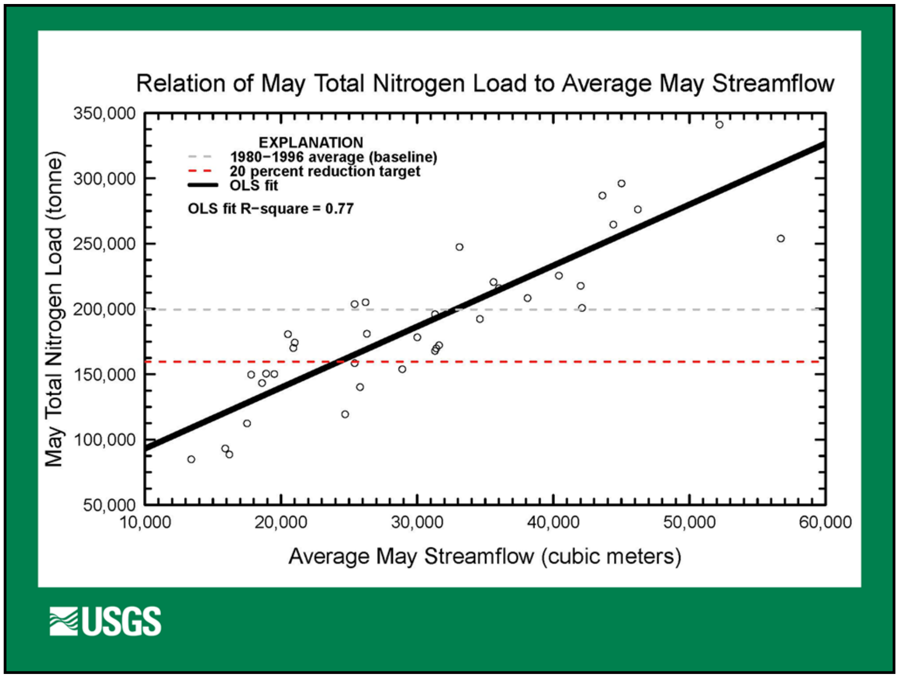
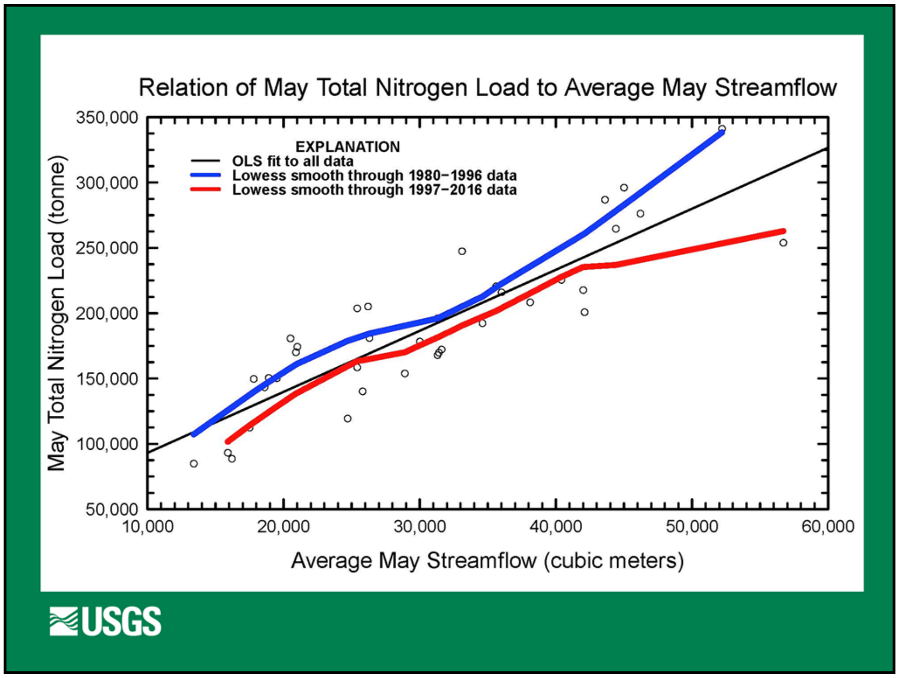


Runoff is by far the dominant factor affecting nutrient loading to the Gulf of Mexico (accounting for over ¾ of the annual variation in nutrient loads). All other factors combined account for less than one-quarter of the variation.

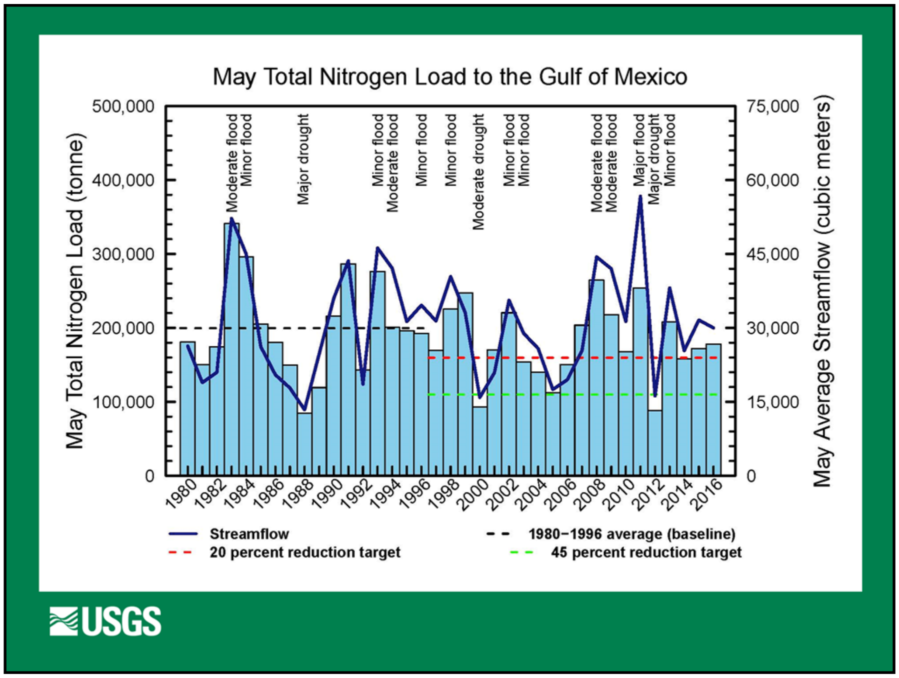
This means it will be somewhat difficult to affect changes in nutrient loads to the Gulf of Mexico without shifting this relation downward. That is, less nitrogen needs to be transported for a given amount of runoff.

Every 10,000 m^3 increase in streamflow results in about a 50,000 tonne increase in total nitrogen load. It so happens that 50,000 tonnes happens to be a little more than the size of the 20 percent reduction target in nitrogen loading (prorated to May). Donner and Scavia (2007) expressed this as: "During a wet year, an N reduction of 50-60%—close to twice the recommended target-is required to meet the goal of reducing the hypoxia zone to less than 5,000 km2 in size."

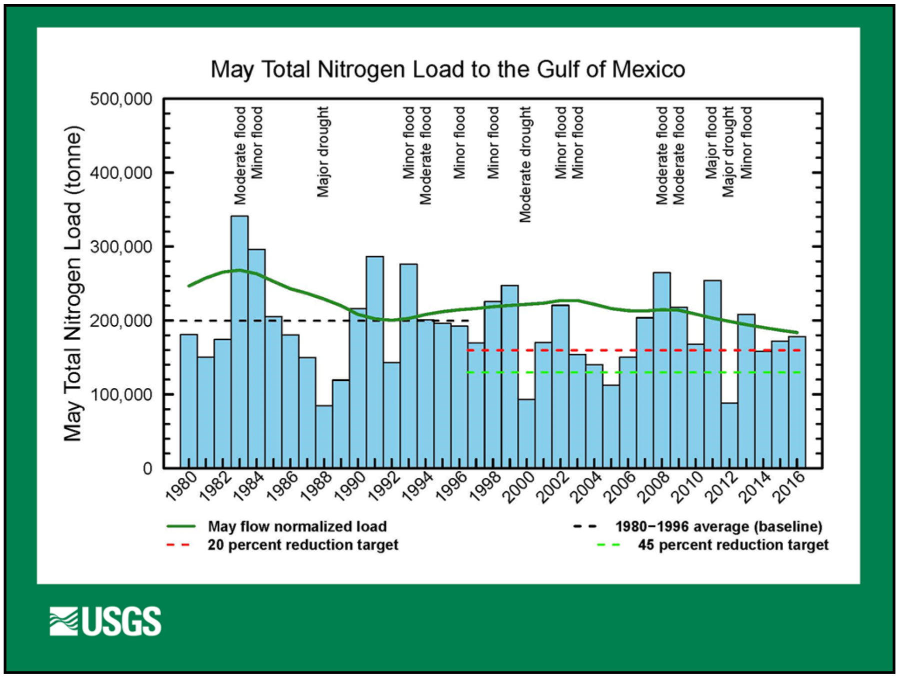
Donner, S.D., and Scavia, Donald, 2007, How climate controls the flux of nutrient by the Mississippi River and the development of hypoxia in the Gulf of Mexico: Limnology and Oceanography, v. 52, no. 2, p. 856-861. DOI: 10.4319/lo.2007.52.2.0856



The good news is that there is some indication that the downward needed shift in the relation between load and streamflow is happening. This is evident by comparing the difference in the relation between load and streamflow for the periods 1980-1996 and 1997-2016



During a few years, the nutrient load is below the reduction goal. However, that is primarily because streamflow is low in those years. As previously shown, load is heavily correlated with streamflow. Thus annual variation in load is heavily influenced by variation in streamflow. These variations in load would be happening even if we weren't doing anything at all in the Mississippi River watershed.



Flow normalized loads provide an estimate of how loads are changing due to everything else happening in the watershed except for changes in streamflow (e.g. human activities in the watershed). Flow normalized loads for May are much less variable from year to year, showing some progress in reducing nitrogen runoff.

We estimate annual and monthly nutrient loads using empirical statistical models. As such there is uncertainty in the estimates. Typically, confidence intervals for monthly load estimates are within about plus or minus 20 percent of the mean load. Thus, the proximity of the 2016 estimate to the 20 percent reduction target should be interpreted with caution.

The flow normalized loads are from application of the USGS WRTDS model. See the following for information on WRTDS:

Hirsch, R.M., Moyer, D.L., and Archfield, S.A., 2010, Weighted Regressions on Time, Discharge, and Season (WRTDS), with an application to Chesapeake Bay River inputs: Journal of the American Water Resources Association, v. 46, no. 5, p. 857-880. DOI: 10.1111/j.1752-1688.2010.00482.x

Sprague, L.A., Hirsch, R.M., and Aulenbach, B.T., 2011, Nitrate in the Mississippi River and Its Tributaries, 1980 to 2008: Are We Making Progress?: Environ. Sci. Technology, v. 45, no. 17, p. 7209–7216. DOI: 10.1021/es201221s

R package EGRET: https://cran.r-project.org/web/packages/EGRET/index.html

Spatial Variability in Nutrient Loads

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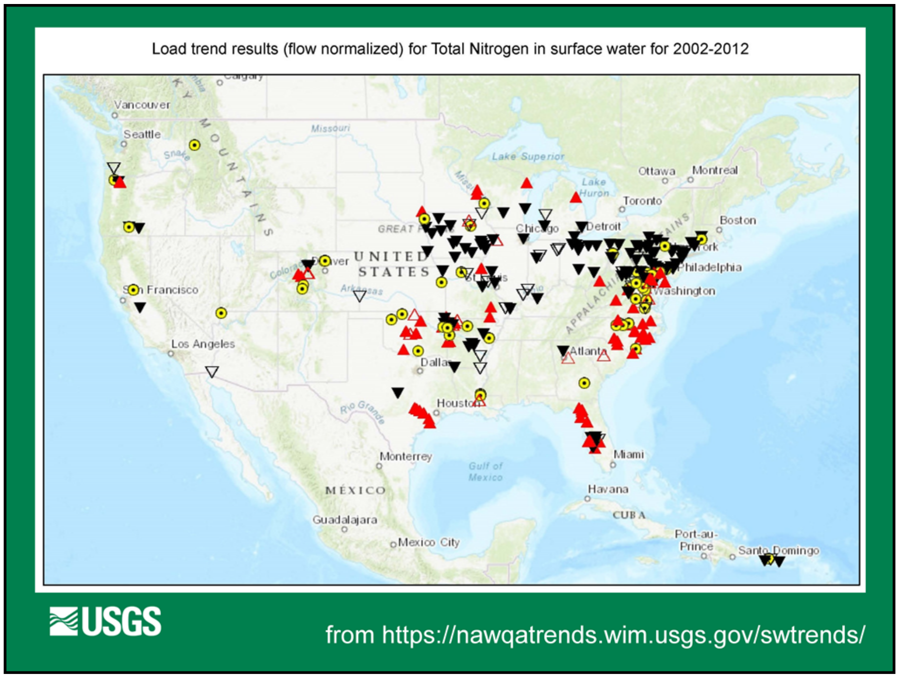


This map shows trends in flow normalized total nitrogen loads at a number of sites across the country from 2002-2012.

Trend results

Solid up arrow = Likely up

Open up arrow = Somewhat likely up

Circle with dot = About as likely as not

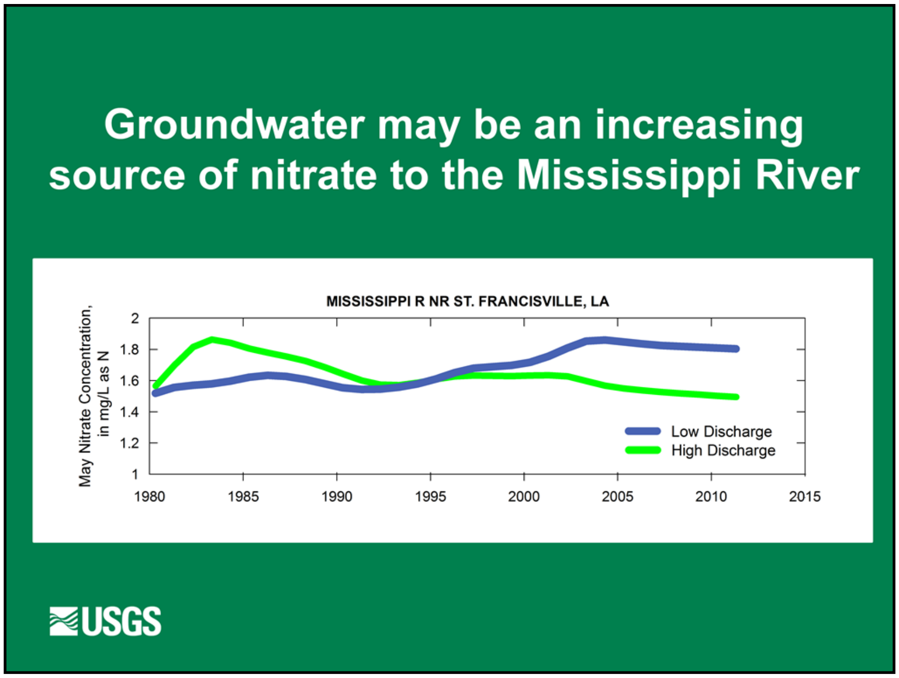
Open downward arrow = Somewhat likely down

Solid down arrow = Likely down

While the trends at a number of sites in the Mississippi River watershed are downward, this is not universally true. Sites with upward trends may be offsetting those with downward trends by the time nutrients reach the GOM.

Data from: Oelsner et al., 2017, Water-quality trends in the Nation's rivers and streams 1972-2012—Data preparation, statistical methods, and trend results: U.S. Geological Survey Scientific Investigations Report 2017-5006, http://dx.doi.org/10.3133/sir20175006 (https://nawqatrends.wim.usgs.gov/swtrends/)

Variability in Nutrient Contributions from Different Source Waters

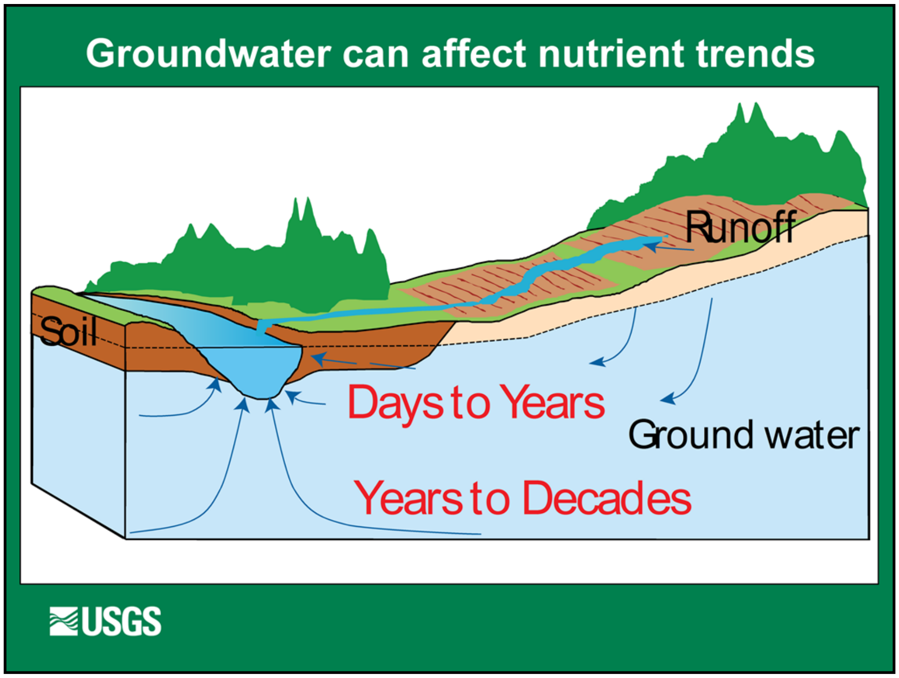


This figure shows nitrate concentrations at the outlet of the Mississippi River between 1980 and 2012 at high streamflows (75th) in May. Nitrate is the largest component of total nitrogen in the Mississippi River and accounts for virtually all the nitrogen entering the river via ground water. During high streamflows, surface runoff is a major source of nitrate to the river. The concentration decline at high streamflows may be evidence that some progress has been made at reducing nitrate in surface runoff.

In contrast, there has been an increase in nitrate concentrations at low streamflows (25th) in May, when more of the water in the stream is derived from groundwater inflows. This increase is evidence that nitrate concentrations in groundwater may be increasing and contributing to increasing concentrations in the Mississippi River.

The peak concentration in SW occurred in the early 1980s. The peak on GW concentrations occurred in the mid 2000s. This may indicate an average several decade residence time for nitrate in groundwater in the MARB.

However, nitrate coming from ground water is a much smaller contributor to total nitrogen loads than surface runoff.



A source that's often overlooked when evaluating the causes of nutrient trends is the transport of nutrient to rivers through groundwater, which occurs on a different time scale than surface runoff. After nitrogen is applied to the land surface, it can reach rivers quickly by overland flow. Or, it may travel to a stream or river very slowly in groundwater. Depending on the path the groundwater takes, it can take anywhere from days to centuries for nitrate to reach a river. This delay between changes on the land surface and changes in river quality can lead to inaccurate allocation of pollution among sources in TMDLs and misunderstanding about the effectiveness of management practices.

Because of the slow movement of nitrate through groundwater to rivers, the recent increases we have been seeing at low streamflows may be a reflection of fertilizer application and other land management practices from many years ago. For the same reason, the full effect of today's management practices may not be measurable in these rivers until many years in the future.

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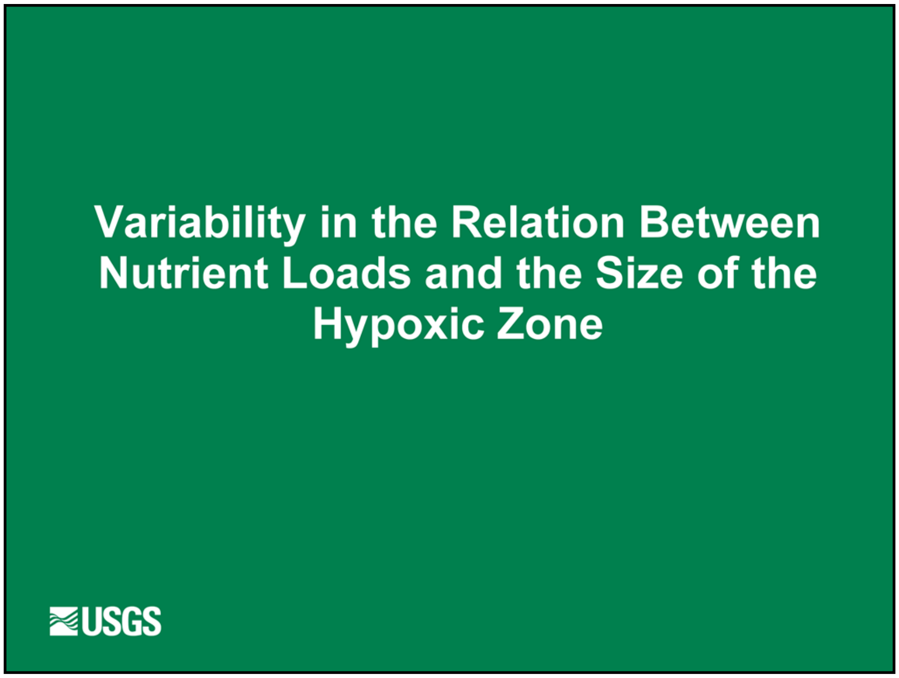
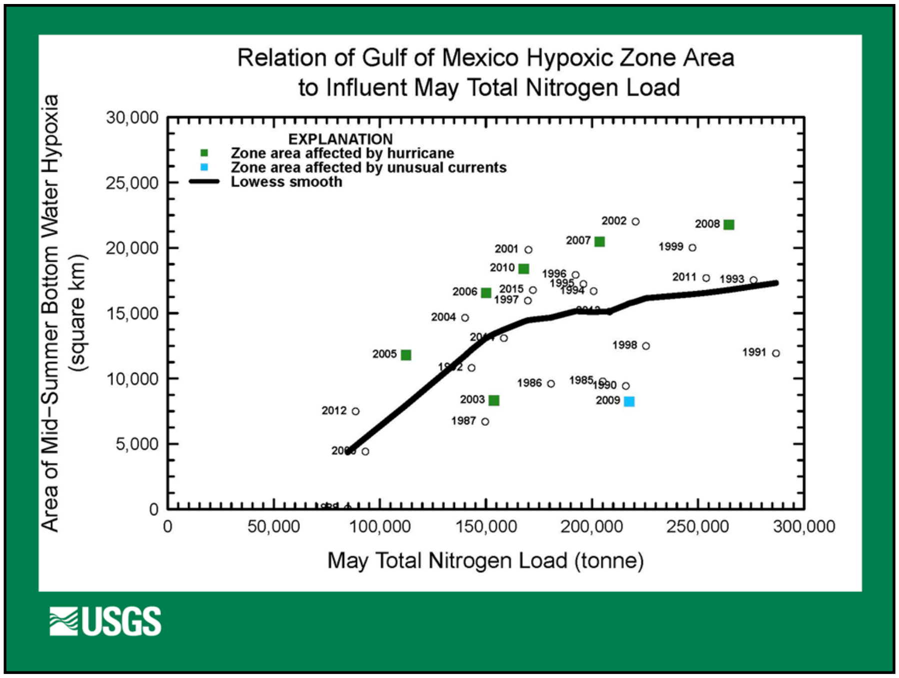
Schematic from Jim Tesoriero (USGS)



Source of data for bottom mid-summer hypoxic zone area is LUMCON (Louisiana Universities Marine Consortium) https://gulfhypoxia.net/research/shelfwide-cruises/#Size



There is a also great deal of variability in the relation between influent nutrient load and hypoxic zone area.

The extent of the hypoxic zone is greatest in summer which follows the season with the greatest nutrient and water discharge from the Mississippi River.

PRIMARY FACTORS AFFECTING HYPOXIA FORMATION AND EXTENT

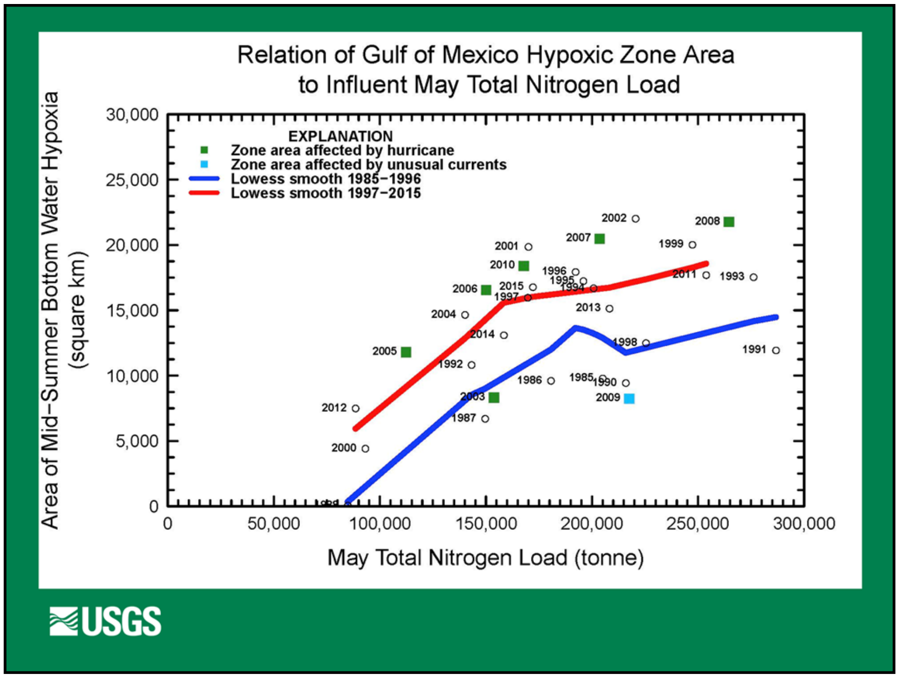
- Phytoplankton production and water column stratification. Both of these are related to water and nutrient discharge from the Mississippi River Basin. [from Obenour and others (2013)]
- Nutrient loads stimulate phytoplankton production and freshwater discharge creates stratification. The primary production results in organic matter that settles and is decomposed by bacteria consuming oxygen. [from Obenour and others (2013)]
- Stratification (resulting from freshwater overlaying salt water) limits reoxygenation of bottom waters. [from Obenour and others (2013)]

OTHER FACTORS AFFECTING HYPOXIA EXTENT

- The "east–west distribution of hypoxia is influenced by alongshore current velocity, which can vary interannually in response to prevailing winds“ [from Obenour and others (2013)]
- "hurricanes and strong tropical storms ... tend to mix the water column and create smaller hypoxic areas." [from Scavia and others (2013)]
- "the presence of relatively strong currents from the west “piling up” hypoxic waters ... reducing measures of areal extent" [from Scavia and others (2013)]

Obenour, D.R., Scavia, Donald, Rabalais, N.R., Turner, E.R., and Michalak, A.M., 2013, Retrospective Analysis of Midsummer Hypoxic Area and Volume in the Northern Gulf of Mexico, 1985–2011: Environmental Science & Technology, v. 47, no. 17, p. 9808–9815. doi: 10.1021/es400983g

Scavia, Donald, Evans, M.A.,, and Obenour, D.R., 2013, A Scenario and Forecast Model for Gulf of Mexico Hypoxic Area and Volume: Environmental Science and Technology, v. 47, no. 18, p. 10423–10428. DOI: 10.1021/es4025035



Further, the relation between nutrient load and hypoxic zone seems to have shifted since the 1980-96 benchmark was established. Prevailing thought is that the shift is due to increasing sediment oxygen demand. Sediment oxygen demand is the amount of dissolved oxygen removed from the water column as a result of bacterial decomposition of organic matter on the sea floor.

Turner and others (2008) "The potential size of the hypoxic zone for a given nutrient load has increased as a result and has doubled from 1980 to 2000."

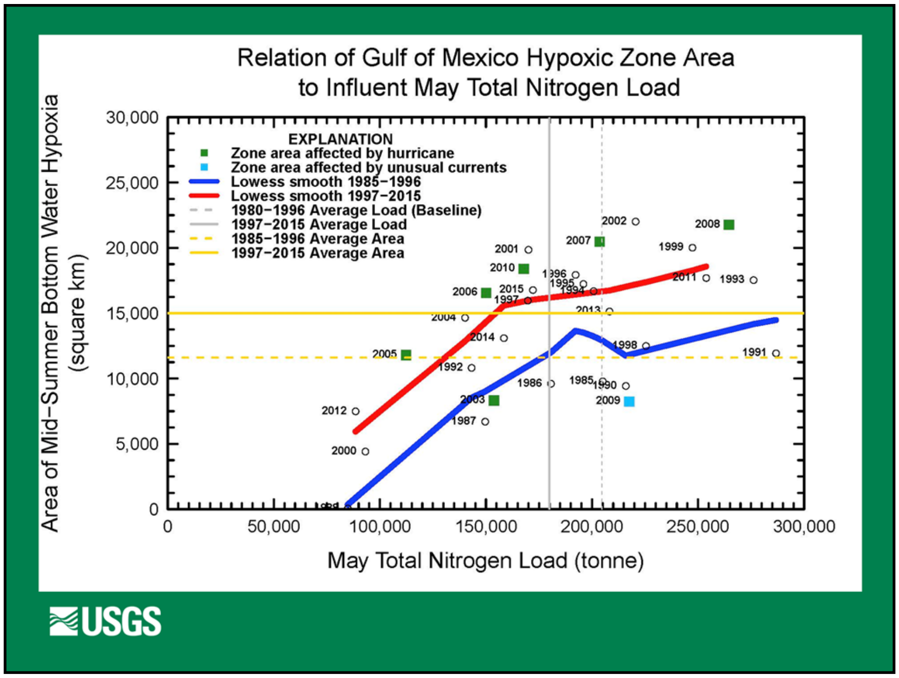
McCarthy and others (2013) "Sediments accounted for 25 ± 5.3% of total below-pycnocline respiration, and … suggests that high sediment oxygen consumption is driven by abundant, fresh organic material and regulates bottom-water oxygen concentration" [Pycnocline = a layer in an ocean or other body of water in which water density increases rapidly with depth]

Yu and others (2015) "Our results suggest that the combination of physical processes (advection and vertical diffusion) and sediment oxygen consumption largely determine the spatial extent and dynamics of hypoxia on the Louisiana shelf."

McCarthy, M.J., Carini, S.A., Liu, Zhanfei, Ostrom, N.E., and Gardner, W.S., 2013, Oxygen consumption in the water column and sediments of the northern Gulf of Mexico hypoxic zone: Estuarine, Coastal and Shelf Science, v. 123, p. 46–53. doi: 10.1016/j.ecss.2013.02.019

Turner, R.E., Rabalias, N.N., and Justic, Dubravko, 2008, Gulf of Mexico Hypoxia-Alternate States and a Legacy: Environmental Science and Technology, v. 42, p. 2323-2327. DOI: 10.1021/es071617k

Yu, L., Fennel, K., Laurent, A., Murrell, M.C., and Lehrter, J.C., 2015, Numerical analysis of the primary processes controlling oxygen dynamics on the Louisiana shelf: Biogeosciences, v. 12, p. 2063-2076, doi:10.5194/bg-12-2063-2015



Even though the average influent load has decreased after 1996 by about 10 percent, the average size of the hypoxic zone has increased by about 20 percent. Also, it is likely that the size of the hypoxic zone would be even larger without the reductions seen in nitrogen loading.

Progress and Limits on Understanding

- We are making progress in reducing nitrogen loading to the Gulf of Mexico (as evidenced by the downward shift in the relation between nitrogen loads and streamflow and the downward trend in flow normalized nitrogen loads).
- One thing we are missing is the ability to say why at the large watershed scale. We are lacking detailed information on things like fertilizer application and timing, best management practices (e.g. no-till, cover crops, buffer strips) and changes in tile drainage practices at this scale.

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Summary of Why We May Not Yet be Seeing Results in the Gulf of Mexico

At least two factors contribute to our inability to see the effect of nutrient reduction from the land on reductions in the size of the hypoxic zone:

- **One is the issue of signal to noise. The signal (reduced nitrogen loads) is there but it may take some time to overcome the noise (variability) in the system before it is detectable.**
- **The second is the lag time that will be needed before some sources of hypoxia have worked themselves out of the system. Among these are accumulated sediment oxygen demand in the Gulf and possibly nitrate loading from groundwater.**

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The bottom line message is we need to stay the course in reducing nitrogen loadings to the Gulf. It took time for the problem to manifest itself and it will take time to solve it.

Questions?

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ILLINOIS NREC

Illinois Ag's Investment in Nutrient Research

Julie Armstrong, NREC Executive Director

NREC Refresher

- Created in 2012 through state statute
  - Pursue nutrient research & Educational programs
  - Ensure adoption and implementation of practices that:
    - Optimize nutrient use efficiency
    - Ensure soil fertility
    - Address environmental concerns with regard to fertilizer
- Funded by $.75/ton assessment on bulk fertilizer sold in Illinois
- Collaboration between ag, environmental groups, and state agencies

ILLINOIS NREC

Research Investments

- Since 2012, NREC has invested over **$12 Million** in Nutrient Research
- NREC works with our stakeholders to annually identify research priorities
- Proposals are then sought from research organizations to conduct the research vital to answering the questions related to nutrient use

Illinois NREC and the Illinois NLRS

- NREC goals closely align with those of the NLRS and research priorities align closely with objectives outlined in the strategy
- Many of the NREC funded projects are focused on providing peer-reviewed research to the nutrient loss reduction activities outlined in the strategy.

Maximize Efficiency. Minimize Loss. Mitigate Negative Impacts.

Research Priorities

- **Nitrogen & Phosphorus Management**

N Management Systems	Release and/or tie-up of nitrogen	Cover Crops
P Application systems	Lit Review of published P loss research	Practices to reduce P loss

- **Tile & Conservation Systems**

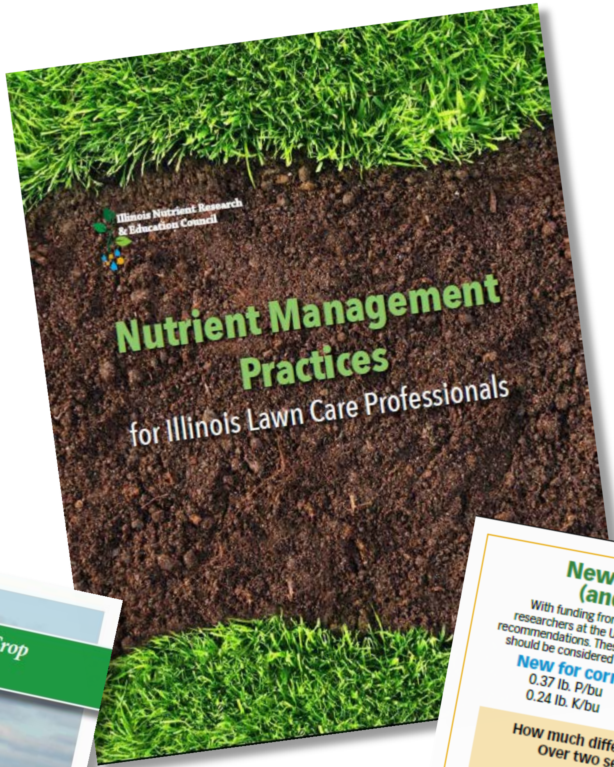
Drainage	Edge of Field Practices

- **Outreach & Education**

Research Investments

- With support from Illinois Farm Bureau, we also funded the USDA-NASS Farmer Survey and have prioritized the continued support of that important tool in reporting NLRS progress

Deliverables



New numbers for more efficient (and effective) use of P and K

With funding from the Illinois Nutrient Research and Education Council (NREC), researchers at the University of Illinois have updated the P and K removal levels and recommendations. These new numbers match more accurately current crop removal and should be considered when calculating the amount of crop removal fertilizer to apply.

New for corn
0.37 lb. P/bu
0.24 lb. K/bu

New for soybeans
0.75 lb. P/bu
1.17 lb. K/bu

New for wheat
0.47 lb. P/bu
0.28 lb. K/bu

How much difference will using the new numbers make? Over two seasons, one with 200-bushel corn and the next with 60-bushel soybeans:

P removal using the old book values comes to 137 lb. P_2O_5 per acre
P removal using the new values comes to 119 lb. P_2O_5 per acre
(13 percent less P removed)

K removal using the old book values comes to 134 lb. K_2O per acre
K removal using the new book values comes to 118 lb. K_2O per acre
(12 percent less K removed)

Taking regular soil samples is an important tool in preventing nutrient loss and adjusting to capture more value in your soil.

More detailed information can be found at http://bulletin.ipm.illinois.edu/?p=3967

ILLINOIS NREC
Illinois Nutrient Research and Education Council
www.illinoisnrec.org
309-212-0047

ILLINOIS NREC

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  - Receive our Monthly Investment Insights

Advancements in Point Source Nutrient Removal Treatment Technology *at MWRD*

November 29, 2017

Outline

- Sidestream Phosphorus Recovery at Stickney
  - Ostara®
  - WASSTRIP®
  - Results
- Other District Recovery Initiatives
  - Algal Nutrient Removal
  - Advanced Technologies
    - Microvi

P Recovery Process

Principle of Operation

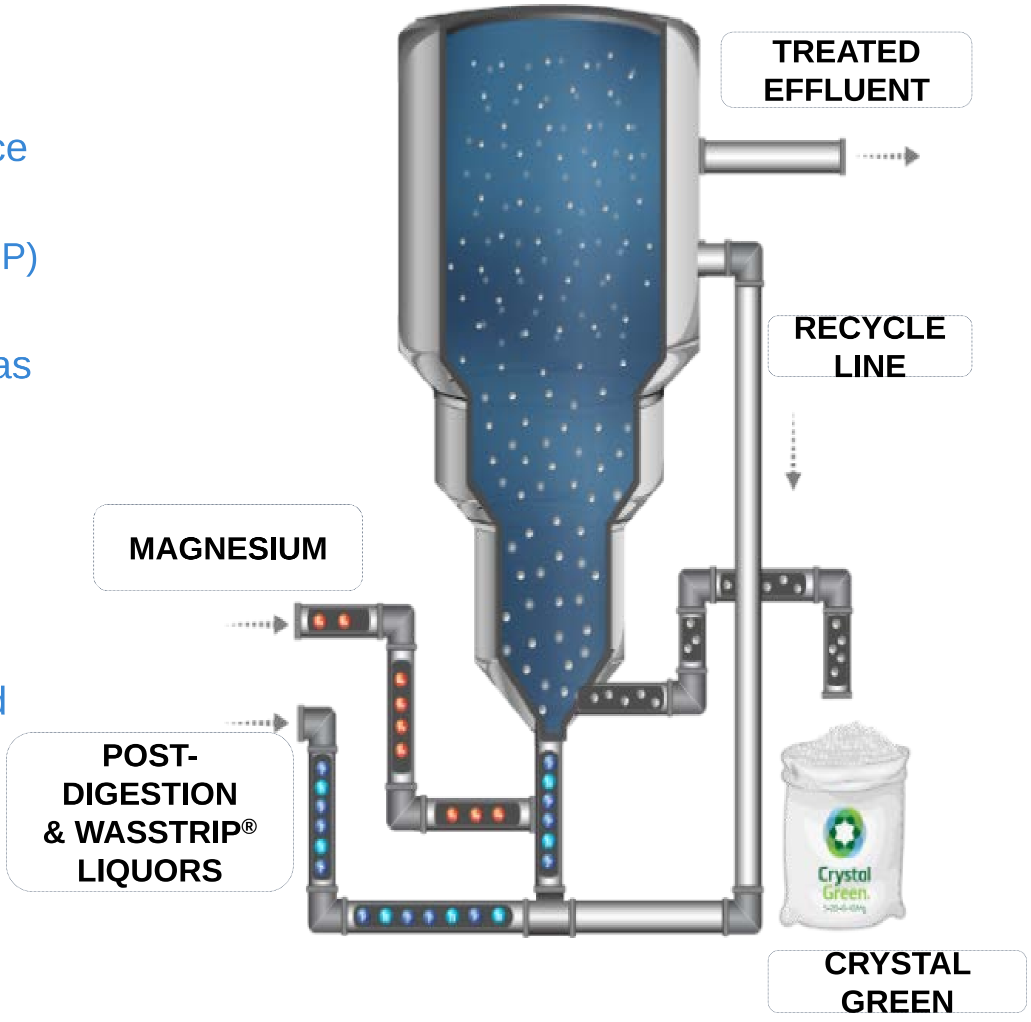
- Use of centrate and P-rich streams in WWTPs as feed
- Streams pumped upward through the bottom of the reactor
- Supersaturation conditions as driving force
  - Inject NaOH to raise pH to 7.7
  - Inject MgCl2 at a molar ratio of 1.1:1 (Mg:P)
  - Spontaneous crystal nucleation occurs
- Deposition on surface of crystals occurs as chemical driving force reduces
- Crystals grow through this precipitation
  - Pellets recycled for further growth

Recovered Product

- High purity struvite (99.5% struvite)
- Composed of Phosphorus, Nitrogen, and Magnesium

  $MgNH_4PO_4{\bullet}6H_2O$
- Utilized as a slow release fertilizer –

  5-28-0+10%
- Enhanced efficiency fertilizer
- Reduces risk of nutrient run-off



P recovery-Stickney WASSTRIP®

- Principle of Operation
  - Engineered P release of WAS.
  - Carbon for release can come from primary sludge fermentate, external source, or endogenously.
  - Liquid portion from reactor (high in P & Mg) blended with centrate (high in NH_3) before entering P recovery reactor.
- Benefits
  - Increases P recovery
  - Reduces struvite formation in digesters
  - Reduces P content in biosolids
  - Less Mg addition to P recovery process

P Recovery at SWRP

Construction Dates

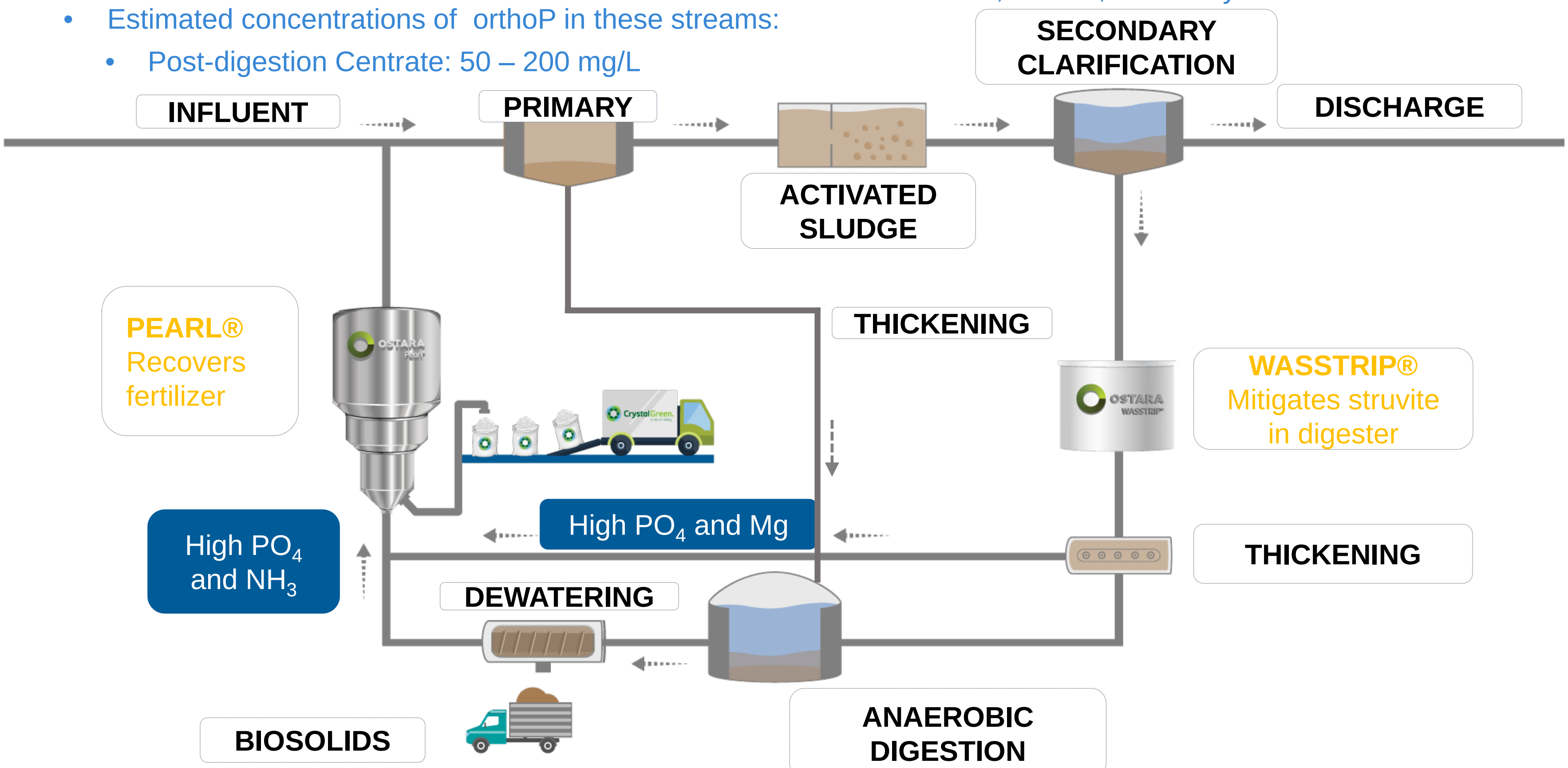
- Startup of P Recovery Facility: 5/2016
- WASSTRIP Facility: Expected Dec 2017

Description of SWRP Facility

- 3 Pearl 10,000 reactors at SWRP
- Sized to accept both post-digestion centrate and pre-digestion centrate (from WASSTRIP)
- Estimated concentrations of orthoP in these streams:
  - Post-digestion Centrate: 50 – 200 mg/L
  - WASSTRIPATE: 58 – 75 mg/L
    (avg & max from benchscale experiments)

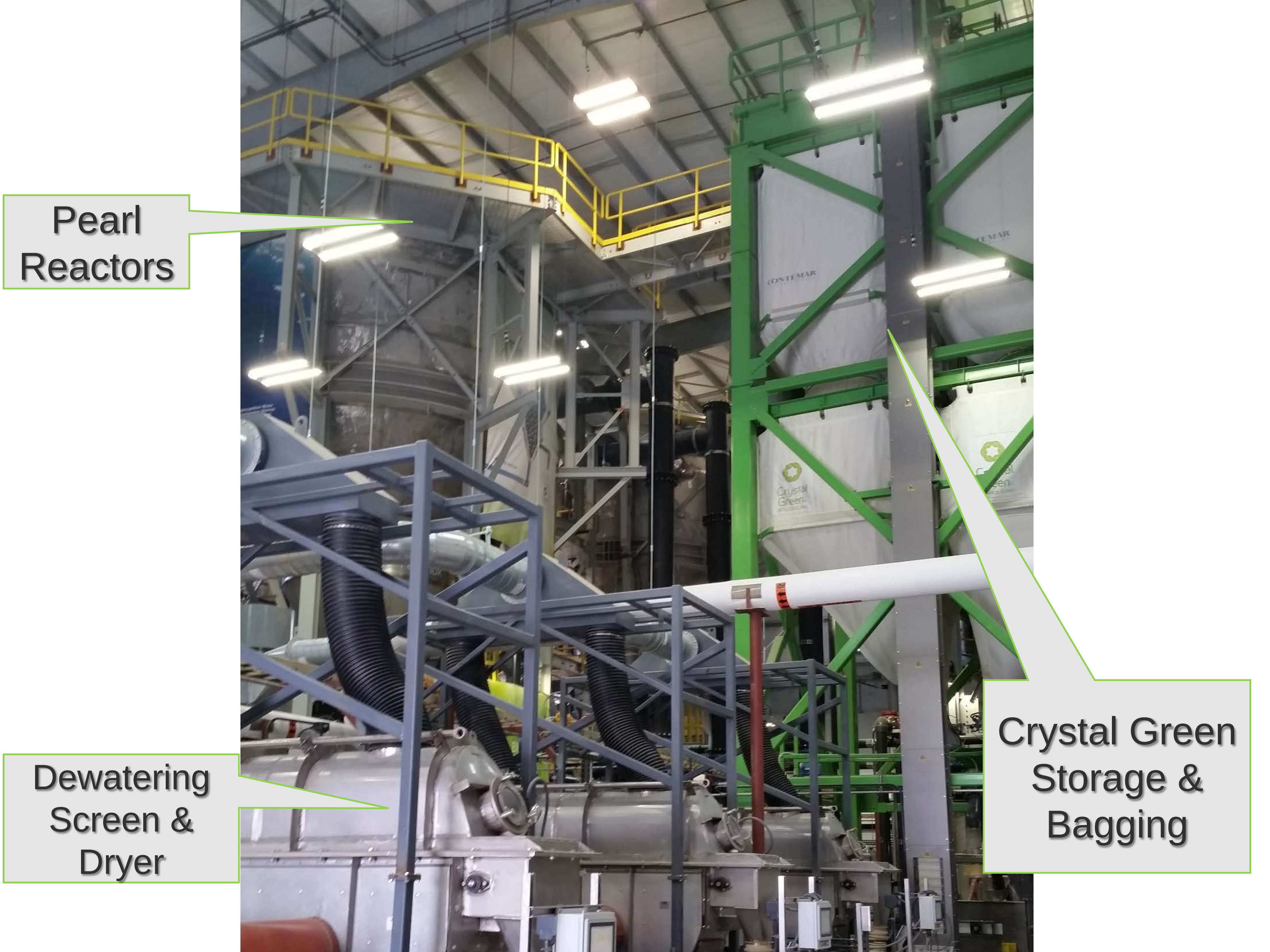
Based on loading to facility, estimated production:

- With post-digestion centrate alone:
  2,200 tons/year fertilizer
- With post-digestion centrate + WASSTRIPATE
  7,700 – 9,600 tons/year fertilizer



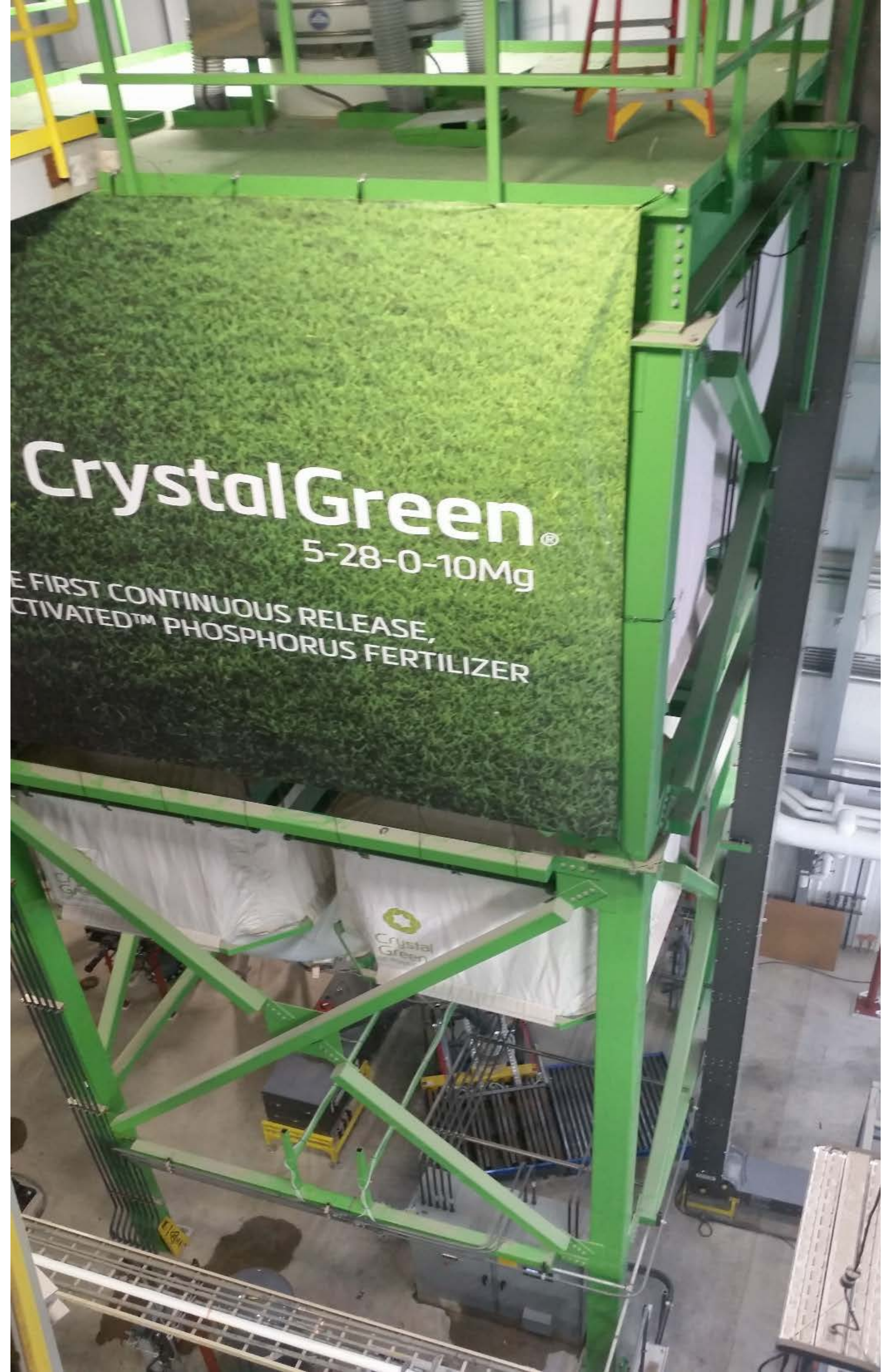
COMPARISON OF MODEL OUTPUTS

Scenario		EFFLUENT TP		RECOVERED TP	
		mg/L	lbs/day	lbs/day	% of Inf TP
Baseline	Current configuration	0.6	3500		
Baseline_no Al	No Al or Fe in influent	1.5	8200		
Mod_Baseline	New Primaries, new GCT, and dedicated WAS thickening	0.9	5100		
Option 1	Post Digestion	0.6	3300	1900	9
Option 2	WASSTRIP and Post Digestion	0.3	1700	6300	28
Option 3	P recovery from LASMA	0.6	3600	2200	10
Option 4	Options 2 and 3 Combined	0.2	1400	7300	32


Pearl Reactors
Crystal Green Storage & Bagging
Dewatering Screen & Dryer


OSTARA
Crystal Green

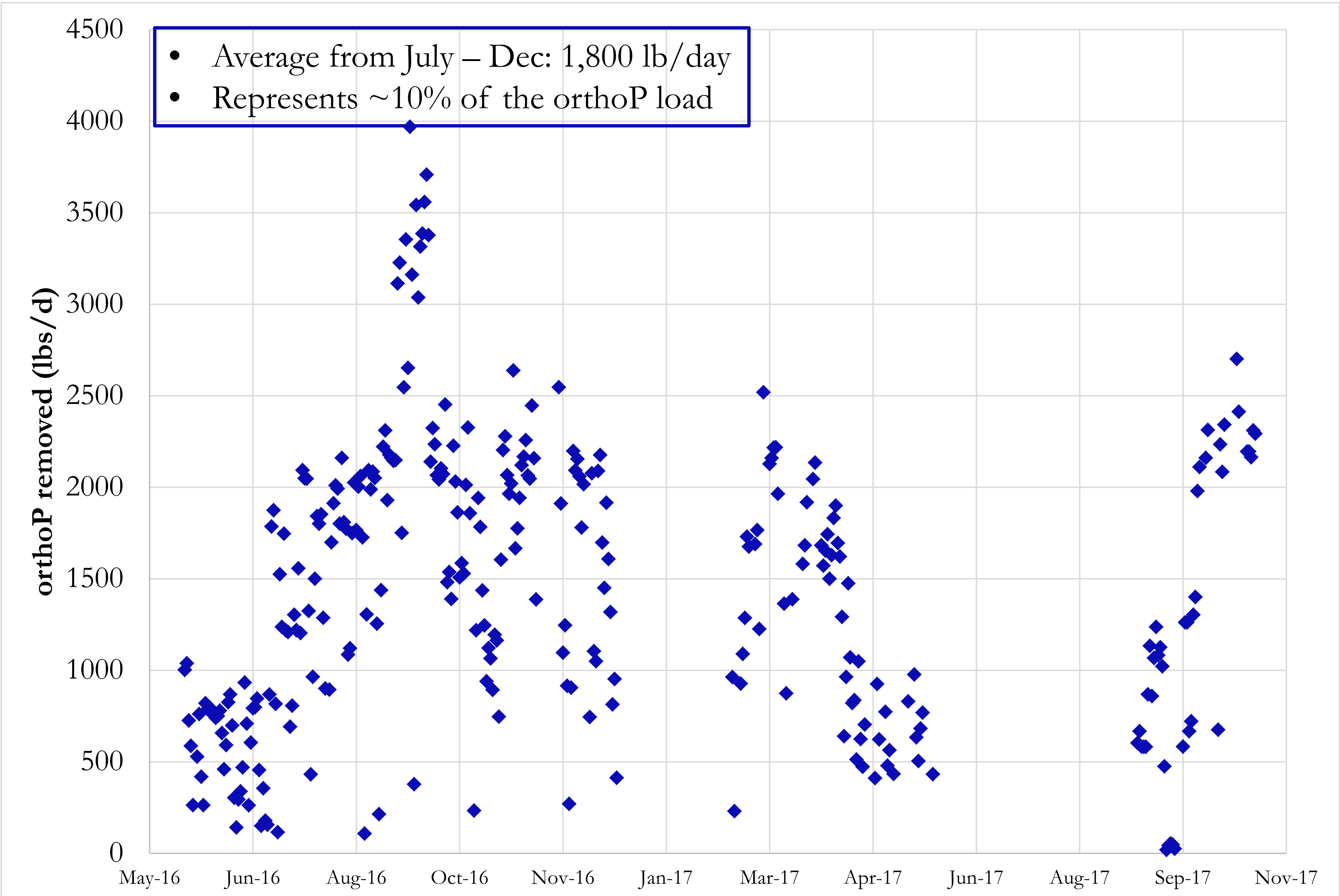

CrystalGreen
5-28-0-10Mg


CrystalGreen®
5-28-0-10Mg
FIRST CONTINUOUS RELEASE,
PHOSPHORUS FERTILIZER

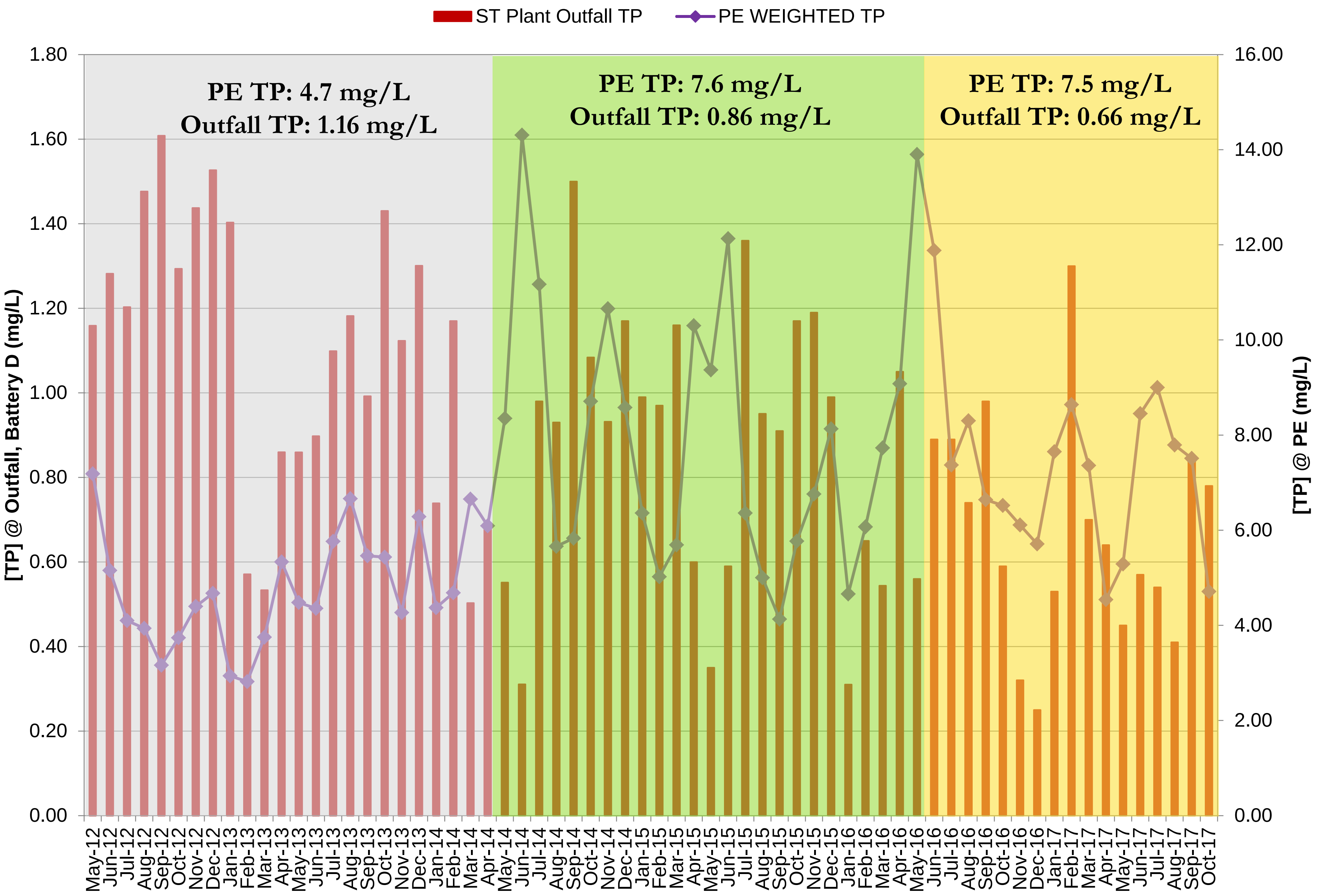

LIBERTY


SWRP Phosphorus Recovery System
Contract 11-195-AP
Black & Veatch Construction, Inc.
11401 Lamar Ave.
Overland Park, KS 66211
View Direction: NE
Location:Inside PRB
Work: Bagging Rack
Photo No.:IMG_0460
Crystal Green
All Ways Green
06/08/2016 14:49

Pounds of orthoP Removed Daily from Post-Digestion Centrate



Stickney EBPR Progress – Monthly Means



Algal Nutrient Removal

Algae-Revolving Algae Biofilm Reactors

- Attached growth, polyculture biofilm on a wide belt
- Success using SWRP post-digestion centrate and O'Brien concentration tank overflow prompted new study w/ 10 ft high belt
- One year study:
  - Continuous flow, Plant effluent
  - HRT of 6-8 hours
  - Phase with artificial light
  - Phase with CO_2 addition

Algal Nutrient Removal

HARVESTING ALGAE BIOMASS

Harvested Biomass

Pellets processed
from algae biomass

Advanced Technologies-Microvi

- MicroNiche™ technology is a suite of products that target specific pollutants for removal by way of biocatalysts that are self-contained stable communities of mature organisms.

Advanced Technologies-Microvi

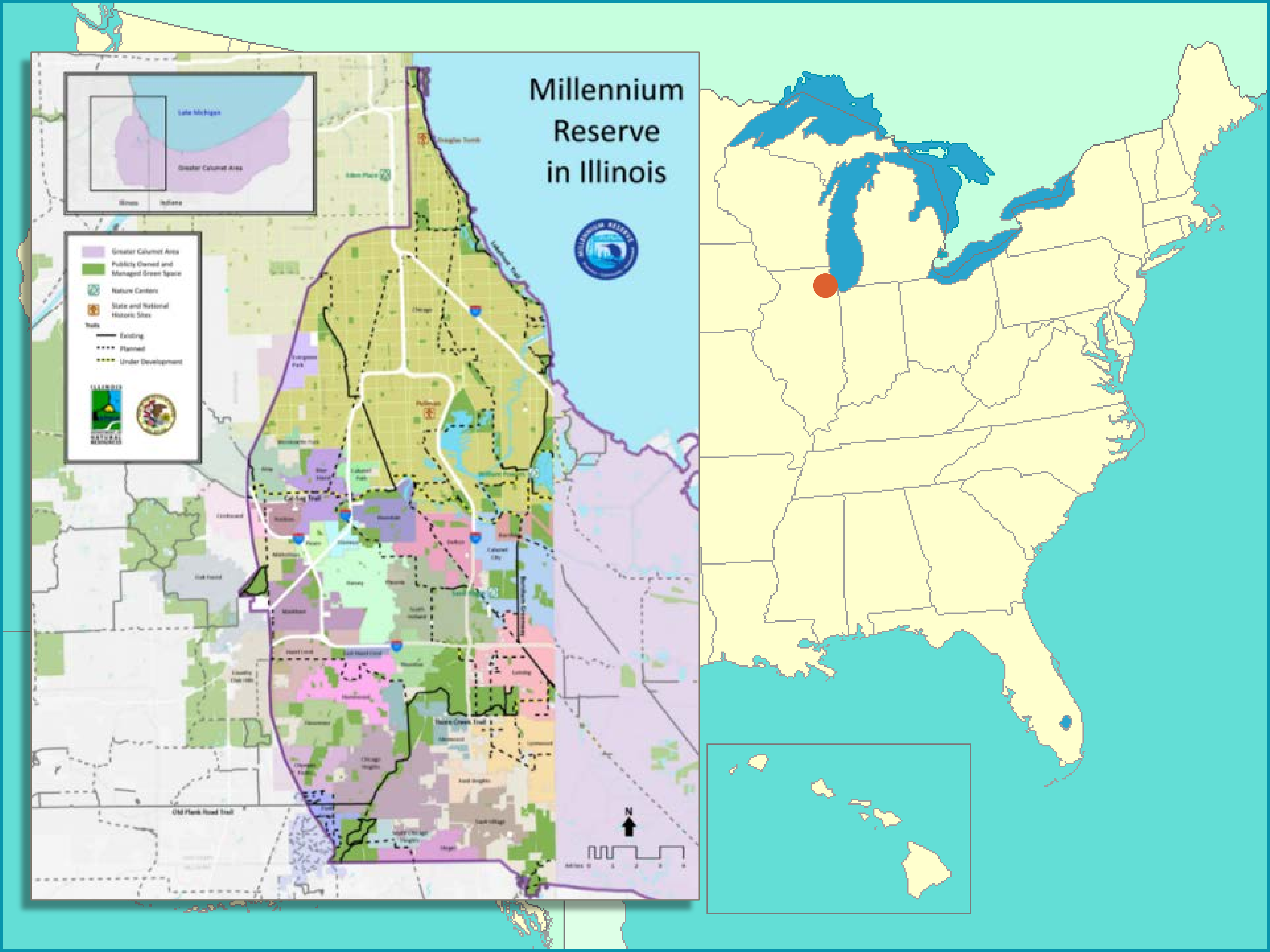
- Potential advantages
  - Growth and decay decoupled in organisms unlike AS
  - Less tank volume
  - Equivalent of 45,000 mg/L MLSS
  - Up to 95% reduction in secondary sludge
  - Up to 35% reduction in operational costs
  - Increased oxygen transfer compared to AS
  - Robust and can be retrofitted into current tankage

Questions?

Y. Mwende Lefler
yvonne.lefler@mwrd.org

Developing Effective Stormwater Cooperation: *Calumet Stormwater Collaborative*

Danielle Gallet
Metropolitan Planning Council
NLRS Workshop: November 29, 2017


Millennium
Reserve
in Illinois
Lake Michigan
Greater Calumet Area
Illinois
Indiana
Greater Calumet Area
Publicly Owned and Managed Green Space
Nature Centers
State and National Historic Sites
Trails
Existing
Planned
Under Development
N

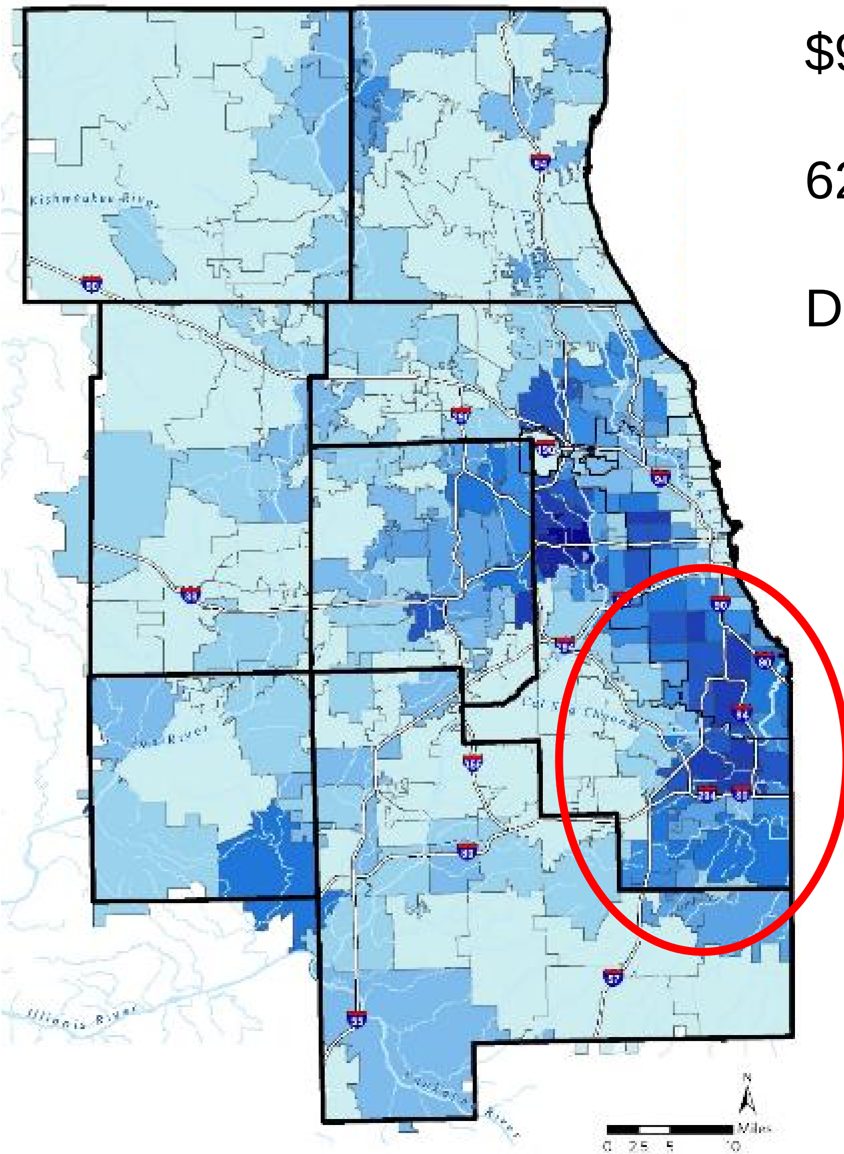
The Issue: urban flooding

The Impacts: damage payouts

$907 million in flood relief from 2003 to 2015

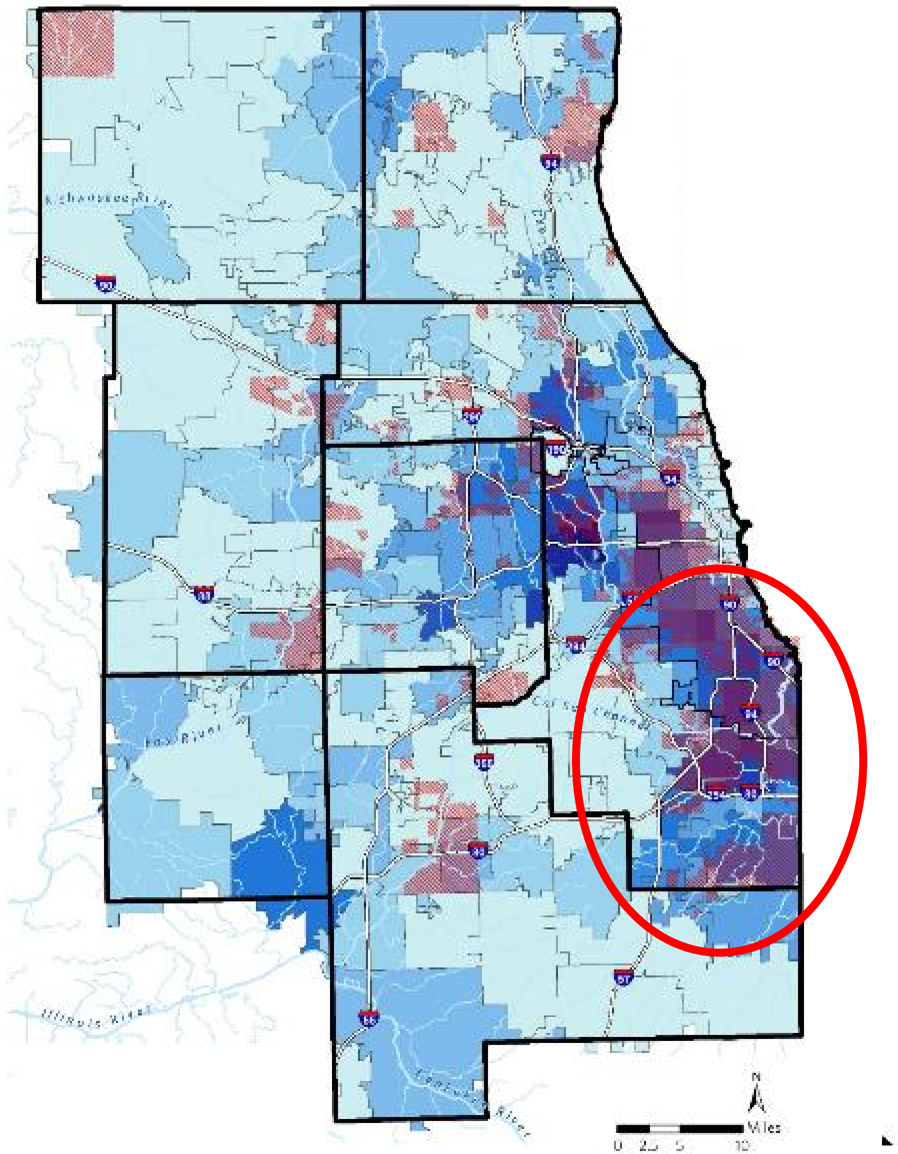
62% occurred in Cook County

Damages are likely higher



Total flooding damage payments associated with NFIP, IA, and SBA programs per 2010 household by zip code in the Chicago region from 2003 to 2015.
Source: CMAP

The Impacts: vulnerable populations



Below 60% of regional median income by household size

AND

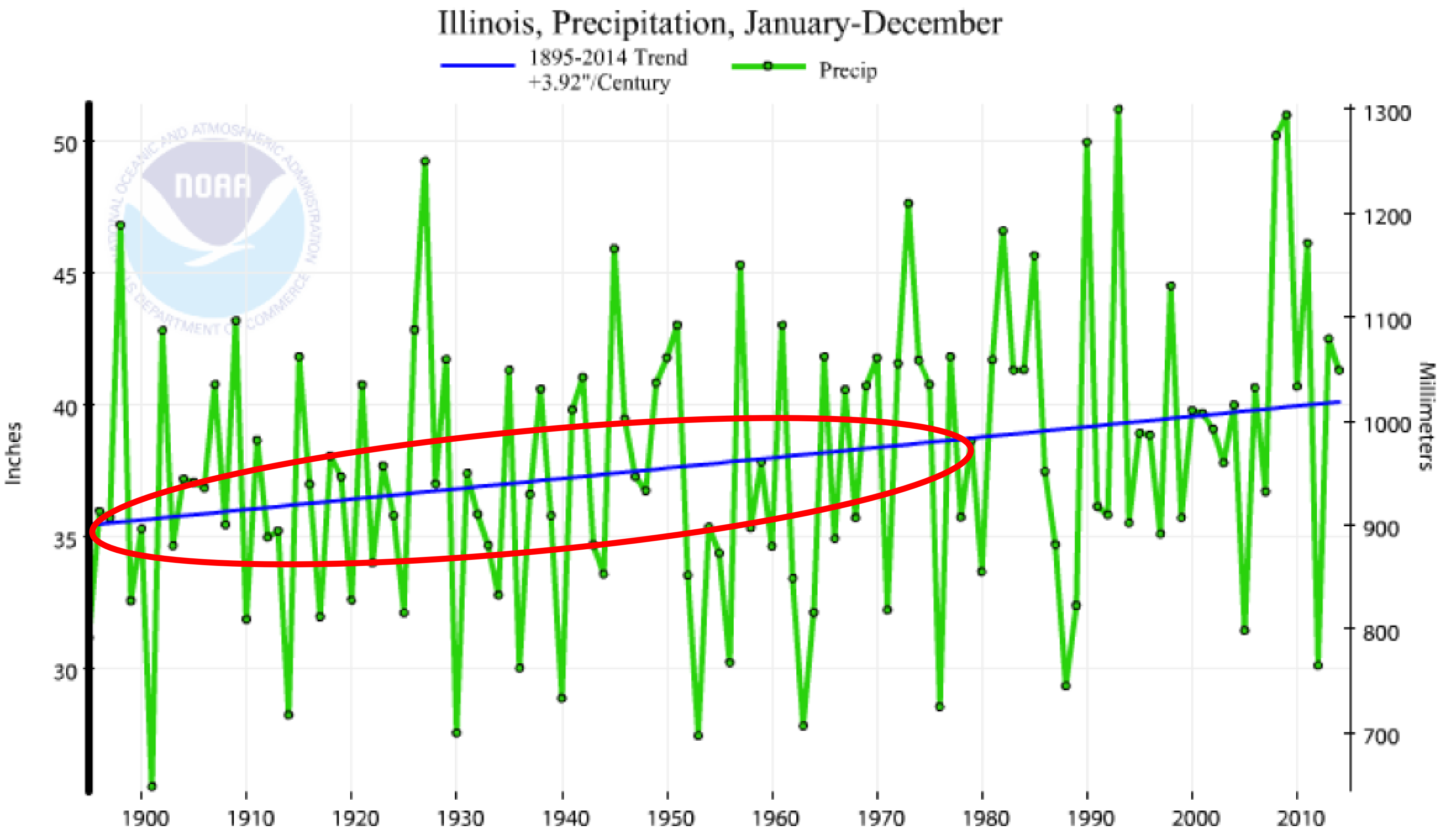
Greater than regional average non-white population

OR

Greater than regional average limited-English proficiency population

- Economically Disconnected Areas
- $0.00 - $40.00
- $40.01 - $100.00
- $100.01 - $200.00
- $200.01 - $350.00
- $350.01 - $600.00
- $600.01 - $850.00
- $850.01 - $1,200.00
- $1,200.01 - $1,800.00
- $1,800.01 - $3,000.00
- $3,000.01 - $5,881.20

Climate Change: increasing precipitation



Calumet Stormwater Collaborative (CSC)

Mission Statement

The Calumet Stormwater Collaborative builds intergovernmental and cross-sector *partnerships to increase the effectiveness of stormwater management initiatives* for the communities and ecosystems of the Calumet region through knowledge sharing, coordination and deployment of interventions at appropriate scales.

CSC Members

Government Agencies

Cook County
Cook County Land Bank Authority
Illinois Department of Natural Resources
Illinois Environmental Protection Agency
Illinois-Indiana Sea Grant
Metropolitan Mayors Caucus
Metropolitan Water Reclamation District of Greater Chicago
South Suburban Mayors and Managers Association
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency

NGOs

Center for Neighborhood Technology
Chicago Wilderness
Delta Institute
Elevate Energy
Faith in Place
Foresight Design Initiative
Friends of the Chicago River
Historic Chicago Bungalow Association
Metropolitan Planning Council
Morton Arboretum
OAI Chicago Southland/Highbridge
Openlands

Planning, Land Managers + Academics

Chicago Metropolitan Agency for Planning
Chicago Park District
Forest Preserves of Cook County
University of Illinois at Chicago
University of Illinois Urbana-Champaign

Communities

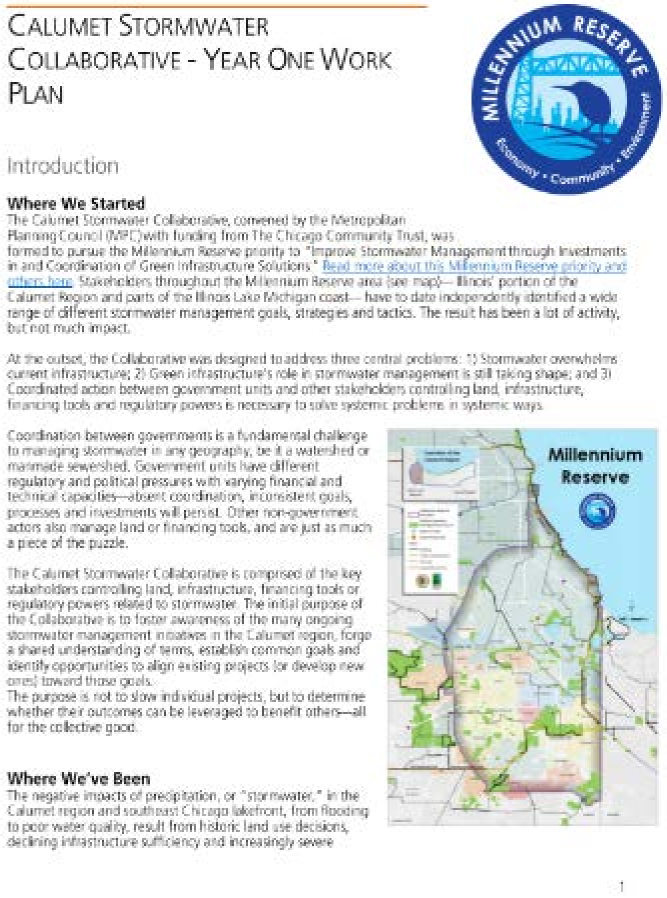
Calumet City
City of Blue Island
City of Chicago
Village of Homewood
Village of Midlothian
Village of Park Forest
Village of Steger

Private Companies

Baxter & Woodman
CDMSmith
CH2M
Christopher B. Burke Engineering
Environmental Design International
Geosyntec Consultants
Robinson Engineering

CSC Overview

- Convening since April 2014
- Yearly work plans
- Regular meetings of all stakeholders
- Work groups with specific initiatives



CALUMET STORMWATER COLLABORATIVE - YEAR ONE WORK PLAN

Introduction

Where We Started

The Calumet Stormwater Collaborative, convened by the Metropolitan Planning Council (MPC) with funding from The Chicago Community Trust, was formed to pursue the Millennium Reserve priority to "Improve Stormwater Management through Investments in and Coordination of Green Infrastructure Solutions." Read more about this Millennium Reserve priority and others here. Stakeholders throughout the Millennium Reserve area (see map)— Illinois' portion of the Calumet Region and parts of the Illinois Lake Michigan coast— have to date independently identified a wide range of different stormwater management goals, strategies and tactics. The result has been a lot of activity, but not much impact.

At the outset, the Collaborative was designed to address three central problems: 1) Stormwater overwhelms current infrastructure; 2) Green infrastructure's role in stormwater management is still taking shape; and 3) Coordinated action between government units and other stakeholders controlling land, infrastructure, financing tools and regulatory powers is necessary to solve systemic problems in systemic ways.

Coordination between governments is a fundamental challenge to managing stormwater in any geography, be it a watershed or manmade sewershed. Government units have different regulatory and political pressures with varying financial and technical capacities—absent coordination, inconsistent goals, processes and investments will persist. Other non-government actors also manage land or financing tools, and are just as much a piece of the puzzle.

The Calumet Stormwater Collaborative is comprised of the key stakeholders controlling land, infrastructure, financing tools or regulatory powers related to stormwater. The initial purpose of the Collaborative is to foster awareness of the many ongoing stormwater management initiatives in the Calumet region, forge a shared understanding of terms, establish common goals and identify opportunities to align existing projects (or develop new ones) toward those goals.
The purpose is not to slow individual projects, but to determine whether their outcomes can be leveraged to benefit others—all for the collective good.

Where We've Been

The negative impacts of precipitation, or "stormwater," in the Calumet region and southeast Chicago lakefront, from flooding to poor water quality, result from historic land use decisions, declining infrastructure sufficiency and increasingly severe

Structure

Calumet Stormwater Collaborative Monthly Member Meetings

Data & Modeling Work Group

Planning & Policy Work Group

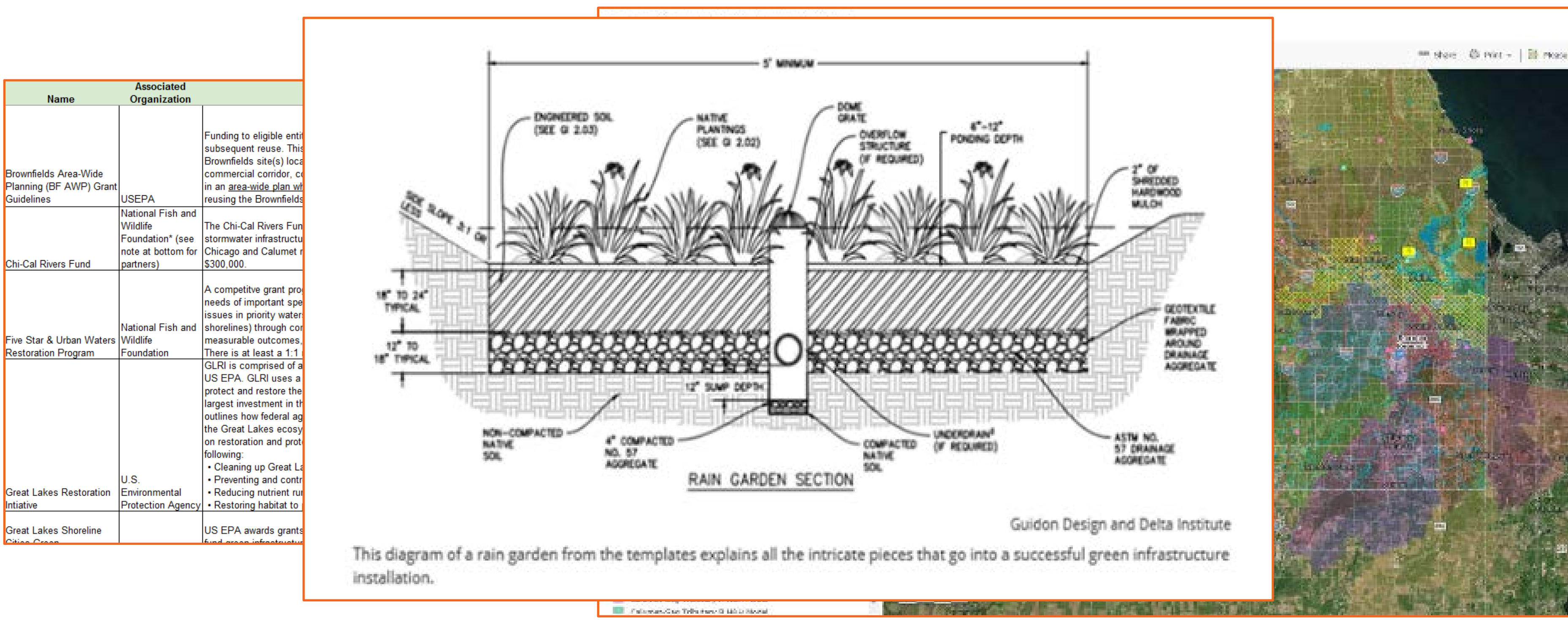
Education & Engagement Work Group

Training & Maintenance Work Group

Achievements

1. Creating tools + sharing data

- Repository to capture joint knowledge of collaborative
- Regional mapping viewer + data extents layers
- Green infrastructure design guidelines



Achievements

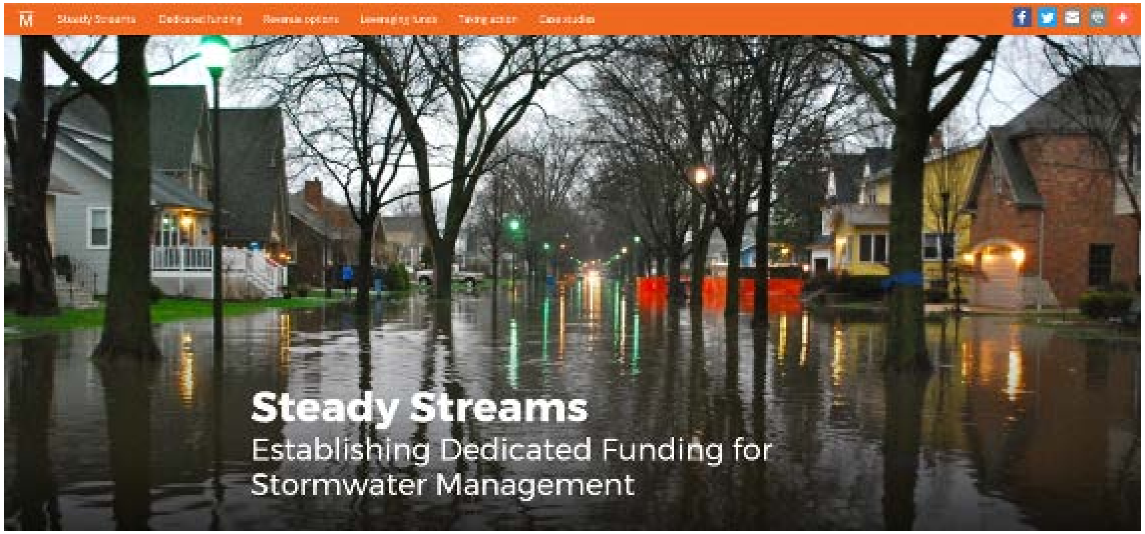
2. Expanding education + engagement

- Community engagement process + local community workshops
- Needs assessment for training + maintenance of green infrastructure
- Sharing lessons learned + providing trainings

Achievements

3. Leveraging funding sources

- Complete Streets Project: local technical assistance grant
- Section 319 Watershed Plans: community eligibility for grant
- Local Revenue Funding: dedicated revenue streams

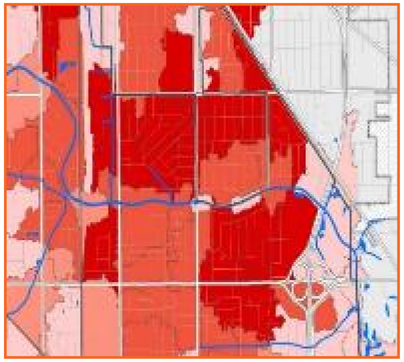


https://www.metroplanning.org/steadystreams

Achievements

4. Expert review of member projects

- Planning-level stormwater analysis
- Regional modeling framework
- Investigating stormwater detention credit trading



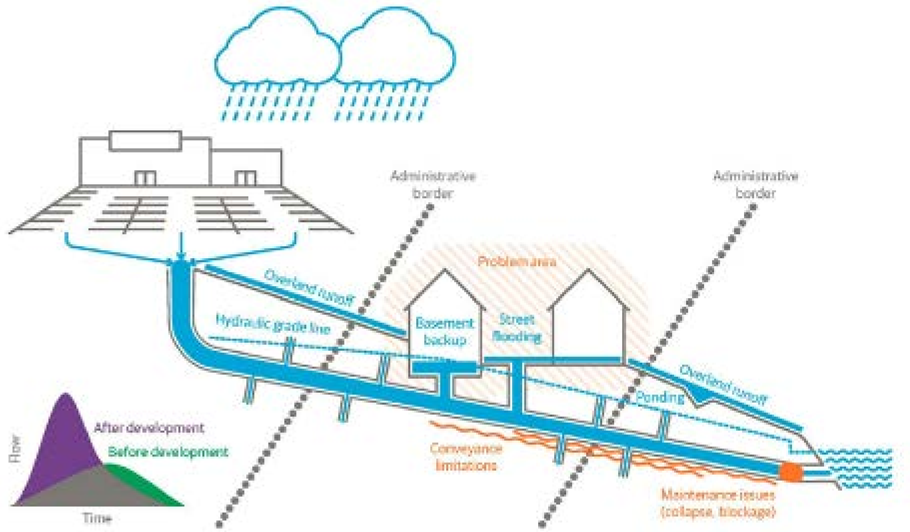
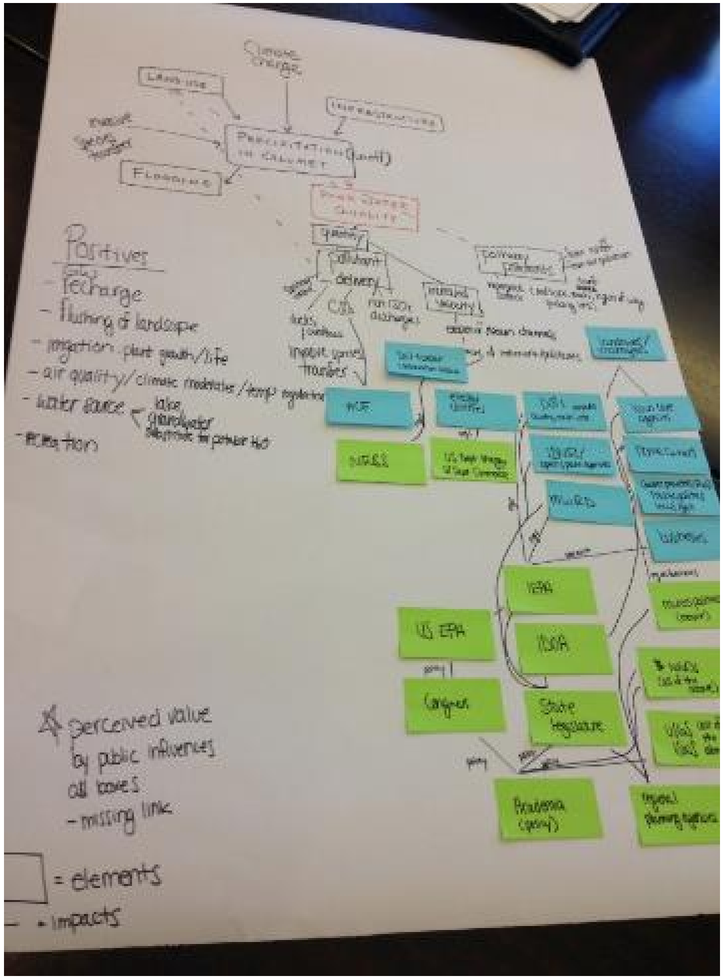


Figure ES-1. Drainage System Schematic
Because stormwater runoff often crosses boundaries, solutions require collaboration.

Tips for building + sustaining collaboration

1. Have the right mix of stakeholders

2. Go slow to go fast



3. Fun & inspiring – create VALUE

Thank you!

Danielle Gallet, MPC

dgallet@metroplanning.org