

Bartlett's Bioswales: Cleaning Stormwater While Addressing Local Flooding

IAFSM 2022 Conference

1:30 PM | Wednesday, March 9, 2022



**Metropolitan Water
Reclamation District
of Greater Chicago**





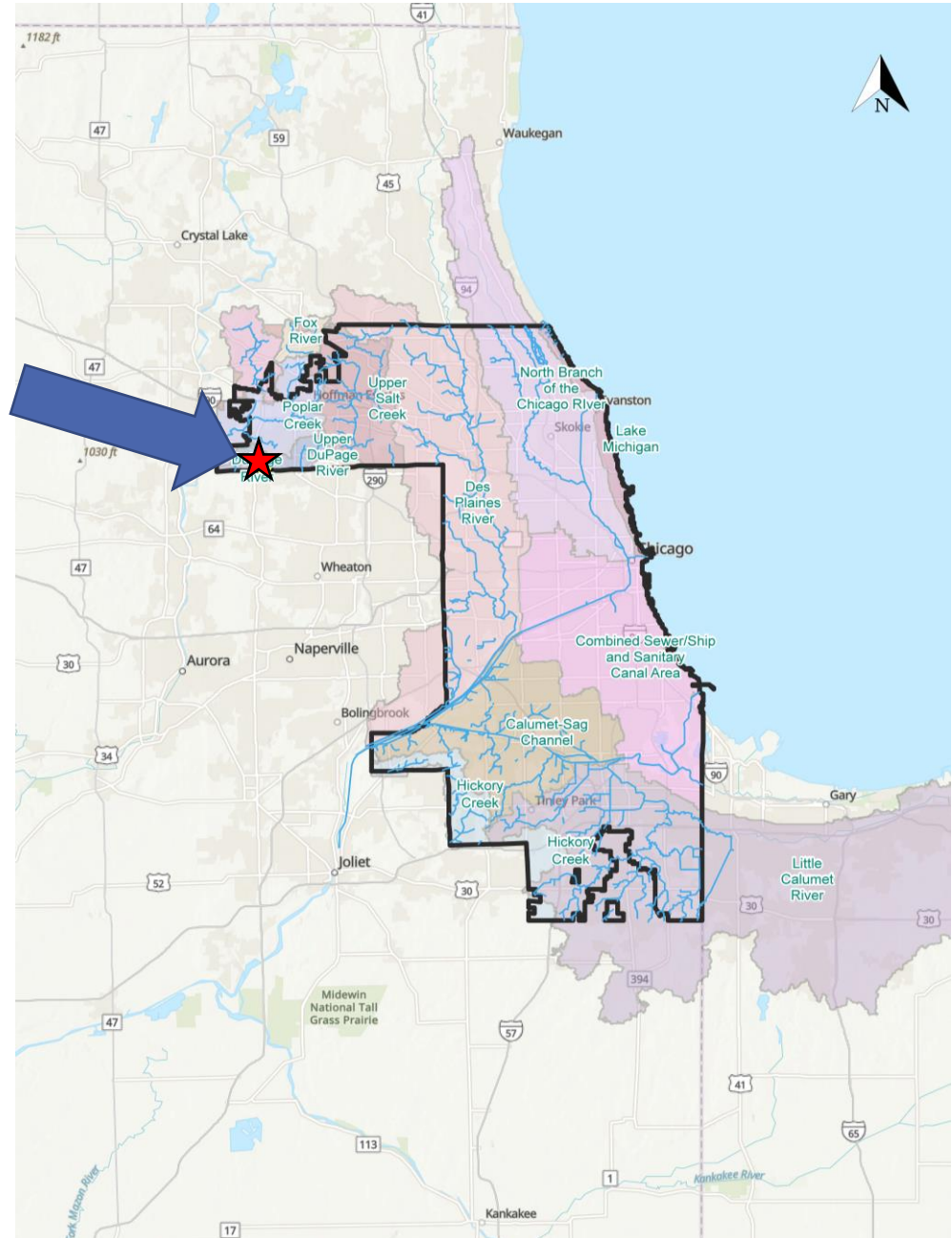
Presenters

John Watson, PE, CFM
Metropolitan Water
Reclamation District of Greater Chicago
Associate Civil Engineer
Stormwater - Green Infrastructure

Erin Pande, PWS, CFM
Engineering Resource Associates, Inc.
Ecological Services Director



Project Area



Tributary Area

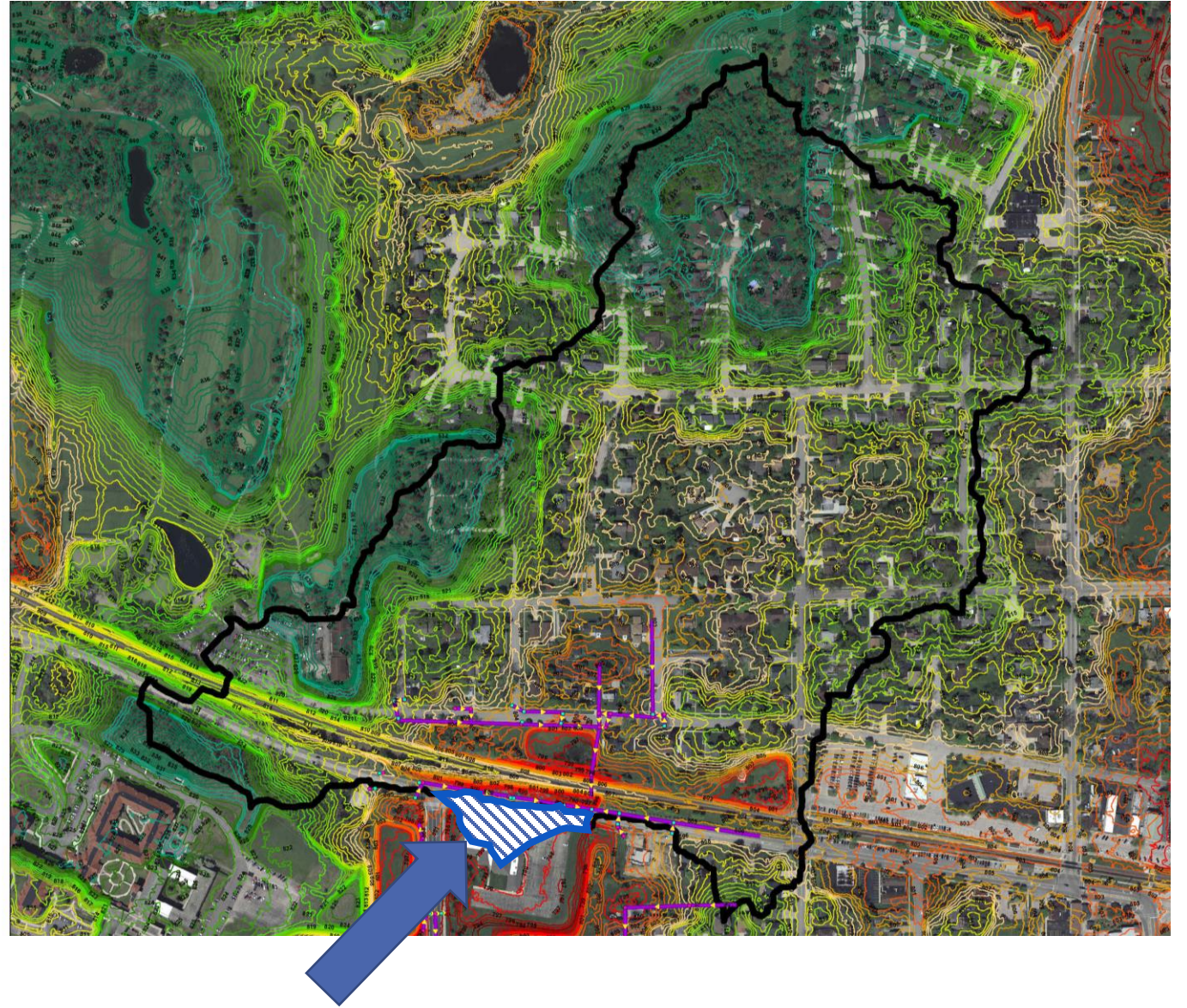




Image Courtesy of Google

Project Area

Village of Bartlett, Cook County, IL



Site Issues

Project Funding

- Total Costs
 - Design - \$35,000; Construction Engineering - \$12,600; Construction - \$240,200
- “Invest in Cook” - Design Funding
 - Cook County Department of Transportation and Highways Funding
 - Available to Governmental Entities and Transportation/Transit Authorities
 - Partial Reimbursement of Engineering Design for Bioswale and Bike Path
 - \$75,000 Awarded to Village
- Village participation
 - Design & Construction Project Management – Tyler Isham, Assistant Public Works Dir.
 - 62.8% of Construction Costs (\$150,850)
- MWRD Green Infrastructure Partnership Opportunity Program
 - Construction funding: \$84,500

MWRD Green Infrastructure Partnership Opportunity Program

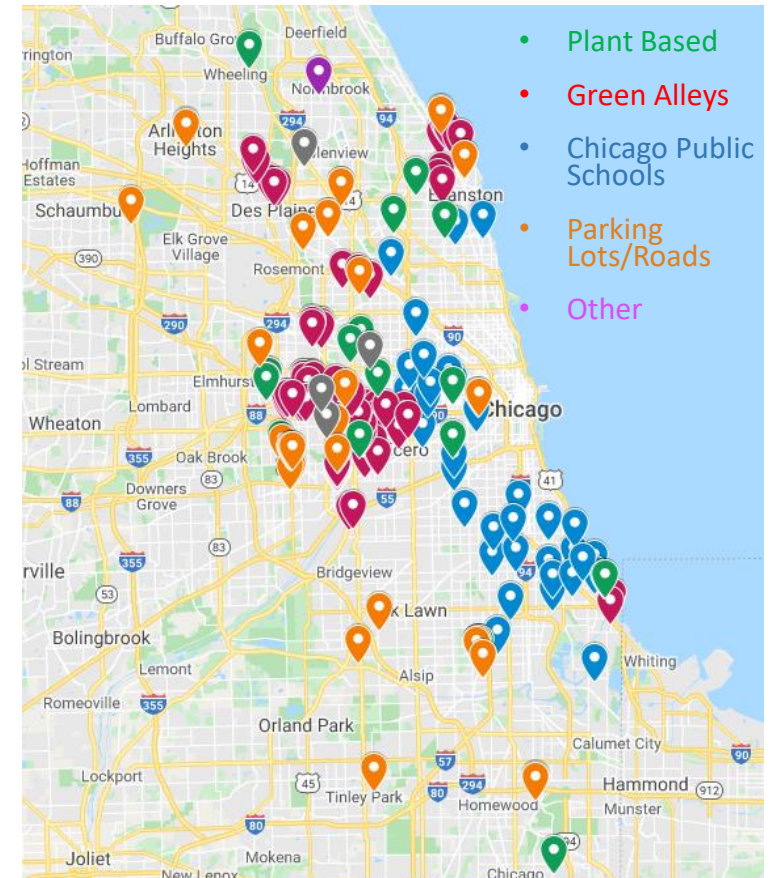
- Annual call for projects, each summer
- Partnering with public agencies, through intergovernmental agreements
- Municipalities, Park Districts, Forest Preserve Districts, Universities and Schools
- Partnerships or conditional reimbursements (not grants): Diversity, Public Ed, Maintenance
- Reimbursed volume cannot be used to satisfy any stormwater permitting requirements
- Design resources and guidance: Design Review, Technical Guidance Manual
 - Upcoming - Green Guide for Professionals
- For more information, see mwrdd.org/services/green-infrastructure



GI Call for Projects

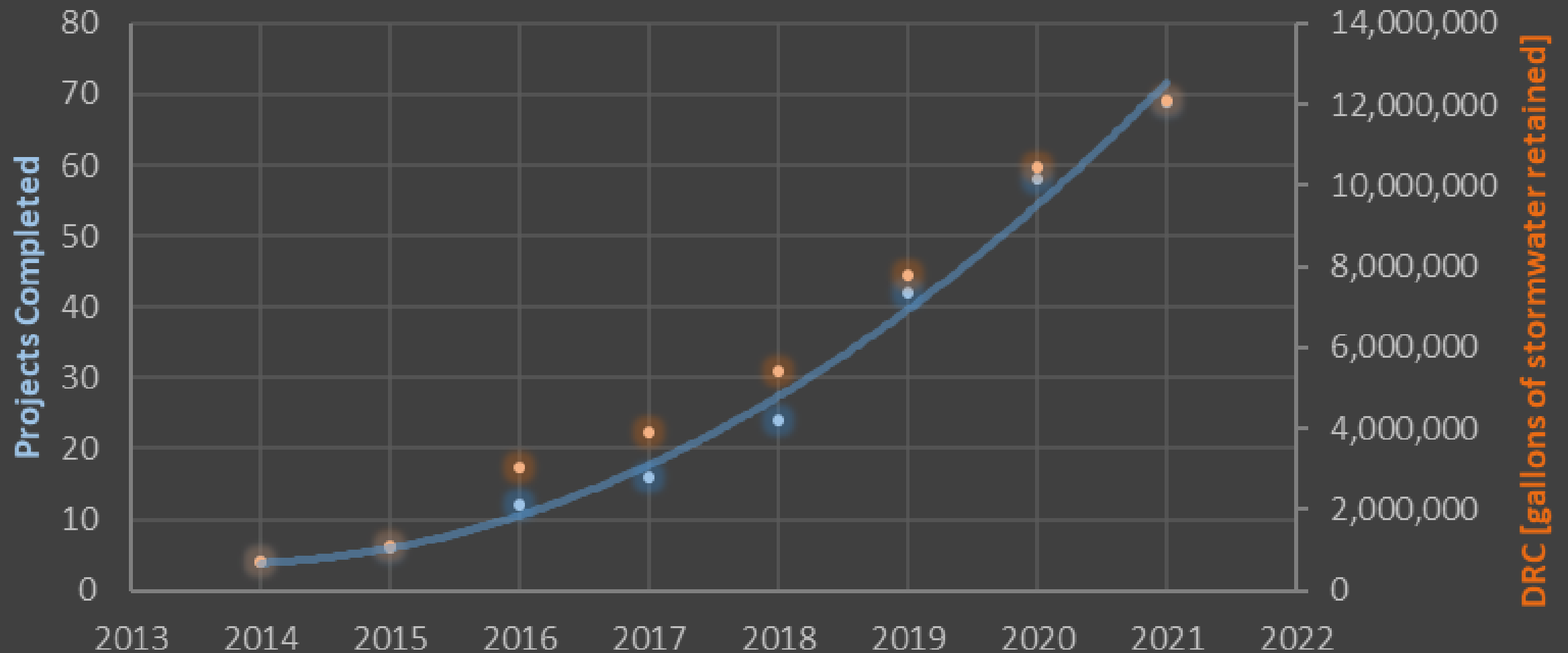
	Average per year	Total
Applications Submitted	40	200
Projects Selected	16.6	83
Estimated Structures Benefitted	956	4781
Estimated Total Construction Costs [Million]	9.26	46.3
Estimated Design Retention Capacity [Million Gallons]	1.76	8.81
Total DRC [MG, since program inception]		12.1

For more information, see mwrdd.org/services/green-infrastructure



MWRD Green Infrastructure Projects

Projects Completed and Design Retention Capacity Over Time



Project Prioritization

- Primary Selection Criteria

- Funding amount per gallon captured
- Structures benefitted
- Project timeframe

- Other factors

- Flooding frequency and severity
- Combined sewer areas
- **Total cost of project**
- Median income of area
- Maintenance resources and experience
- **Visibility/Educational opportunity**
- Past receipt of recent MWRD funding for similar projects
- **Receiving water from adjacent impervious areas**



A DITCH THAT CLEANSSES WATER

THE LANDSCAPE IN FRONT OF YOU IS DESIGNED TO REMOVE SALT AND POLLUTION FROM SURFACE WATER RUNOFF, TURNING A NUISANCE FLOODING AREA INTO A NATURAL ASSET. Instead of channeling stormwater from the parking lot into a drainage pipe, the FILTER STRIP and BIOSWALE work together as a "LIVING DRAIN" to capture stormwater, so that it reduces flooding and leaves cleaner that when it entered.

Plants in the bioswale are **HARDY, STRONG-ROOTED PERENNIALS AND GRASSES** ABLE TO TOLERATE BOTH **WET AND DRY CONDITIONS**. Most of them are native to this region.



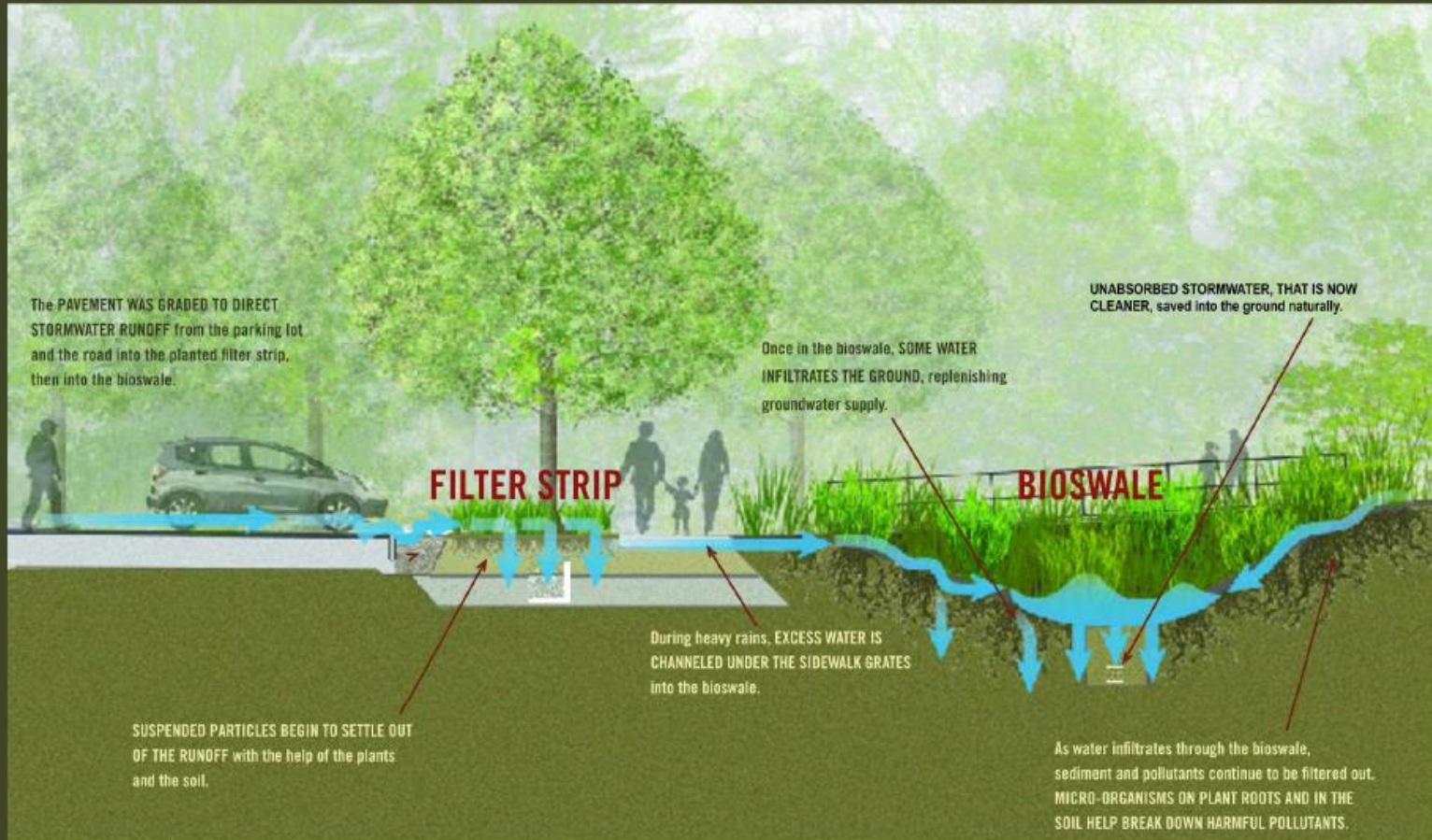
SWITCHGRASS is a dominant plant in the bioswale. We planted seven cultivars with variations in foliage and flower color.



FLOWERING PERENNIALS, including cultivars of sneezeweed, Joe Pye weed, and milkweed (*Asclepias* sp.) were planted to provide continuous seasonal interest.

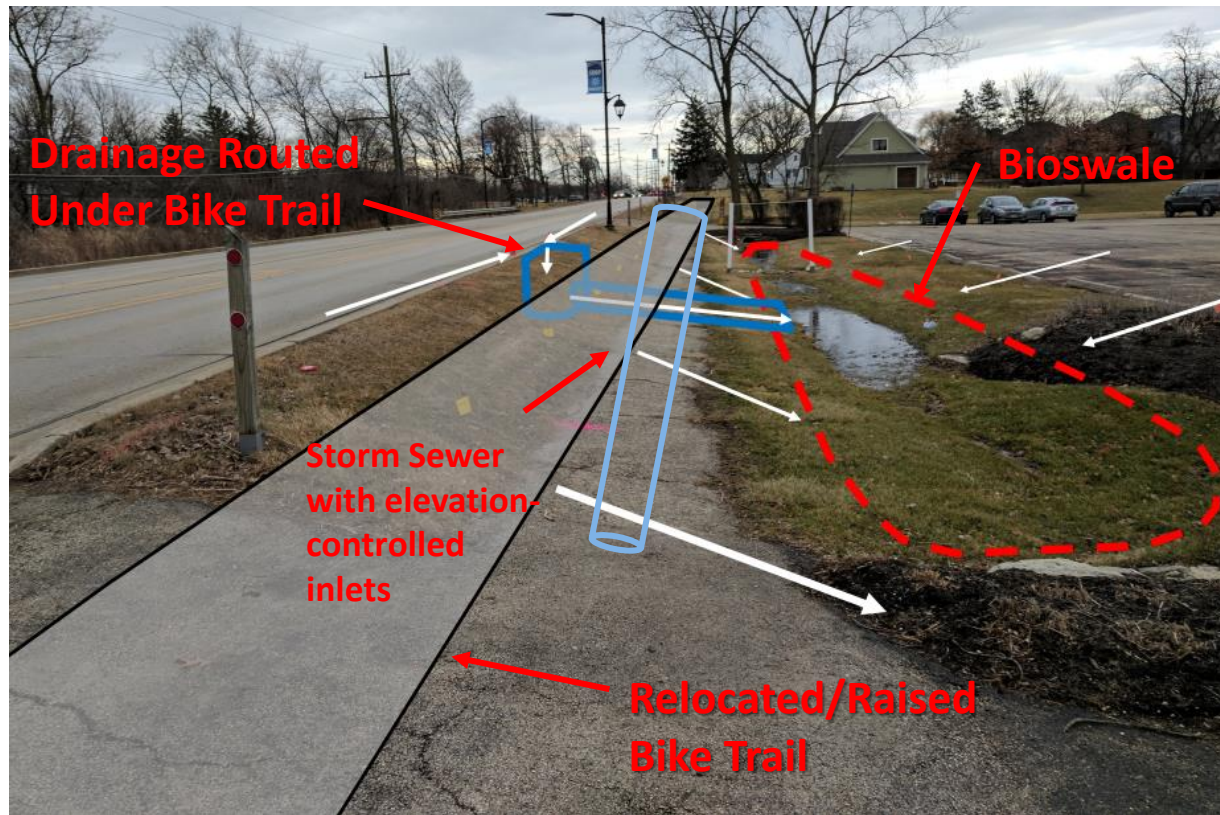


Cardinal Flower
(*Colonia Cardinalis*)



**Metropolitan Water
Reclamation District
of Greater Chicago**





- Initial storm sewer design adjusted to drain only to bioswales to avoid short circuiting, outflows via elevation control into storm sewer
- 17,640 gallons of retention in bioswales
- Outlet pipe raise above swale bottom and reduced in size to allow for small storms to be completely retained, and larger storms to first filter, then slowly release
- Bike path moved higher in elevation and closer to road, meandered around obstacles
- Chimney seals installed on low sanitary sewers
- ADA compliance issues addressed at Devon Avenue
- Overland concrete gutters removed and replaced with bioswales and storm sewers, to optimize a green/grey mix

Engineering Design



- Native seeding only on bioswale banks
- Seed and plugs for shallow ponding area to ensure success
- Plantings in ponding area are mixture of wet and mesic species to account for seasonal and yearly rainfall variations
- Amended soil (50% Topsoil, 50% Sand) and native plants provide pretreatment of suspended solids/sediment, chlorides, phosphorus, metals, and hydrocarbons
- Educational signage will be installed where path connects with church sidewalk
- Trees recently planted by Village for beautification were spaded and replanted

Environmental Design



Native Plantings

- Wet to mesic seed mix and plugs in bioswale
- Low profile prairie seed mix on side slopes

Maintenance Plan

- 3-years of maintenance included in contract
- Long-term maintenance by Village of Bartlett

PERFORMANCE STANDARDS

THE PLANTINGS SHALL BE INSPECTED AT LEAST ONCE PER YEAR (JUNE THROUGH AUGUST) FOR A THREE-YEAR TERM, OR UNTIL COMPLIANCE WITH THE FOLLOWING PERFORMANCE CRITERIA HAS BEEN MET. VEGETATION MONITORING WILL OCCUR BY A MEANDER SURVEY. THE PURPOSE OF THE MONITORING IS TO DETERMINE THE EFFECTIVENESS OF THE RESTORATION AND RECOMMEND CHANGES IN MANAGEMENT IF FAILING. A MONITORING REPORT WILL BE PROVIDED TO THE OWNER BY JANUARY 31ST FOLLOWING EACH INSPECTION. THE REPORT WILL INCLUDE THE SITE LOCATION, MONITORING METHODOLOGY, A SUMMARY RELATIVE TO THE PROPOSED PERFORMANCE STANDARDS, MAINTENANCE PERFORMED DURING THAT YEAR AND RECOMMEND CHANGES IN MANAGEMENT IF THE PLANTINGS ARE FAILING, AND REPRESENTATIVE PHOTOGRAPHS OF EACH PLANTING AREA. AREAS WHICH DO NOT MEET THE ESTABLISHMENT STANDARDS AS DETERMINED BY THE OWNER SHALL BE REPLANTED OR REMEDIATED AT THE CONTRACTOR'S EXPENSE.

1. FIRST YEAR: 90% COVERAGE OF THE COVER CROP SHALL BE ESTABLISHED WITHIN THE FIRST THREE MONTHS. THERE SHALL BE NO BARE AREAS GREATER THAN 0.5 METERS. BY THE END OF THE FIRST COMPLETE GROWING AT LEAST 30% OF THE SPECIES PRESENT SHALL BE NATIVE/NON-INVASIVE OR THOSE OF WHAT WAS PLANTED IN THE PLANTING LIST. ALL TREES SHALL BE ALIVE AND THRIVING.
2. SECOND YEAR: AT LEAST 50% OF THE SPECIES PRESENT SHALL BE NATIVE/NON-INVASIVE OR THOSE OF WHAT WAS PLANTED IN THE PLANTING LIST. THERE SHALL BE NO BARE AREAS GREATER THAN 0.5 METERS. NONE OF THE THREE MOST DOMINANT SPECIES MAY BE NON-NATIVE OR INVASIVE OR CONSTITUTE GREATER THAN 25% AERIAL COVERAGE (INDIVIDUALLY OR CUMULATIVELY) BY THE END OF THE SECOND GROWING SEASON, AND EVERY YEAR FORWARD. ALL TREES SHALL BE ALIVE AND THRIVING.
3. THIRD YEAR: AT LEAST 60% OF THE SPECIES PRESENT SHALL BE NATIVE/NON-INVASIVE OR THOSE OF WHAT WAS PLANTED IN THE PLANTING LIST. THERE SHALL BE NO BARE AREAS GREATER THAN 0.5 METERS. BY THE END OF THE THIRD GROWING SEASON, THE SPECIES PRESENT SHALL EXHIBIT A NATIVE FQI OF 15 OR GREATER AND A NATIVE COEFFICIENT OF CONSERVATISM OF 3.0 OR GREATER. ALL TREES SHALL BE ALIVE AND THRIVING.

MAINTENANCE SCHEDULE

INSTALLATION:

- SPRING – TEMPORARY COVER CROP, PERMANENT SEED, PLUG, AND BLANKET INSTALLATION
- SUMMER – WEED WHIP NON-NATIVE & INVASIVE WEEDS

YEAR 1:

- SPRING – WEED WHIP NON-NATIVE & INVASIVE WEEDS BETWEEN 6/1 AND 7/15
- SUMMER – MONITORING (JUNE 15 THROUGH AUGUST 15)
- FALL – WEED WHIP NON-NATIVE & INVASIVE WEEDS

YEAR 2:

- SPRING – MOW/WEED WHIP AND WICK-APPLY HERBICIDE TO NON-NATIVE & INVASIVE WEEDS BETWEEN 6/1 & 7/15
- SUMMER – MONITORING (JUNE 15 THROUGH AUGUST 15)
- FALL – WEED WHIP NON-NATIVE & INVASIVE WEEDS

YEAR 3:

- SPRING – MOW/WEED WHIP AND WICK-APPLY HERBICIDE TO NON-NATIVE & INVASIVE WEEDS BETWEEN 6/1 & 7/15
- SUMMER – MONITORING (JUNE 15 THROUGH AUGUST 15) & CONDUCT PRESCRIBED BURN
- FALL – WEED WHIP NON-NATIVE & INVASIVE WEEDS

LONG TERM MAINTENANCE: WEED WHIPPING AND SELECTIVE HERBICIDING SHOULD TAKE PLACE ON AN AS-NEEDED BASIS. PRESCRIBED BURNS ARE SUGGESTED EVERY OTHER YEAR STARTING IN YEAR 3 TO MAINTAIN THE PROPOSED ENHANCEMENT AREAS. WITHOUT MAINTENANCE PROCEDURES TO COMBAT NON-NATIVE & INVASIVE WEED SPECIES, NATIVE AREAS OFTEN BECOME OVERRUN BY INVASIVE WEEDS. IT IS IMPORTANT TO NOTE THAT ANY NATIVE AREA THAT HAS BEEN NEGLECTED OF PROPER MAINTENANCE MAY NOT BE AESTHETICALLY PLEASING. LONG TERM MAINTENANCE (AFTER FINAL ACCEPTANCE FOLLOWING YEAR 3) IS THE RESPONSIBILITY OF THE OWNER.

Construction Phase

- Storm sewer installed after pavement removal
- Grading completed for new cross-section



Construction Phase

- Curb cuts replaced with drainage structures
- New curb installed along bartlett road



Construction Phase

- Plugs planted in drifts with close spacing
- External chimney seals installed on sanitary manholes



Construction Phase

- Plug planting completed in June
- Cobbles placed at end sections for energy dissipation



Construction Phase

- ADA improvements made at Devon Avenue intersection



Construction Phase

- Seeding installed with temporary erosion control blanket
- Side curb installed on upstream side to prevent soil washout



Construction Phase

- Goose grid installed to protect plugs
- Seed & plug growth within first two months



Construction Adjustments

- Downstream corrugated metal pipe deteriorated
- New RCP installed with minimal delays



Construction Adjustments

- Sidewalk connection requested by church, outside of detailed survey area
- Sidewalk blocked overland flowpath, corrected with trench drain through sidewalk



Construction Adjustments

- Bioswale retained water longer than anticipated
- Emergent plugs added to areas with more inundation



Emergent Plugs

<u>Common Name</u>	<u>Quantity</u>
Bristly Sedge	100
Chairmakers	100
Rush	100
Blue Flag Iris	100
Total	300

Project Successes



- Cooperation throughout design & construction between Village Church of Bartlett, Village of Bartlett, and MWRD
- Completed by local contractor,
- Village volunteered MBE, WBE, and SBE participation
- Multiple beneficial outcomes: stormwater storage, stormwater treatment, public education, ADA improvement, transportation improvements
- Construction completed on time & under budget despite COVID impacts



**Metropolitan Water
Reclamation District
of Greater Chicago**

Questions & Discussion



John Watson, PE, CFM

- Associate Civil Engineer
- Metropolitan Water Reclamation District of Greater Chicago
- John.Watson@mwrdd.org

Erin Pande, CFM, PWS

- Ecological Services Director
- Engineering Resource Associates, Inc.
- epande@eraconsultants.com