


Sustainable Stormwater Green
Infrastructure Practices in the
Illinois River Headwaters
at the
Lake County Central Permit Facility

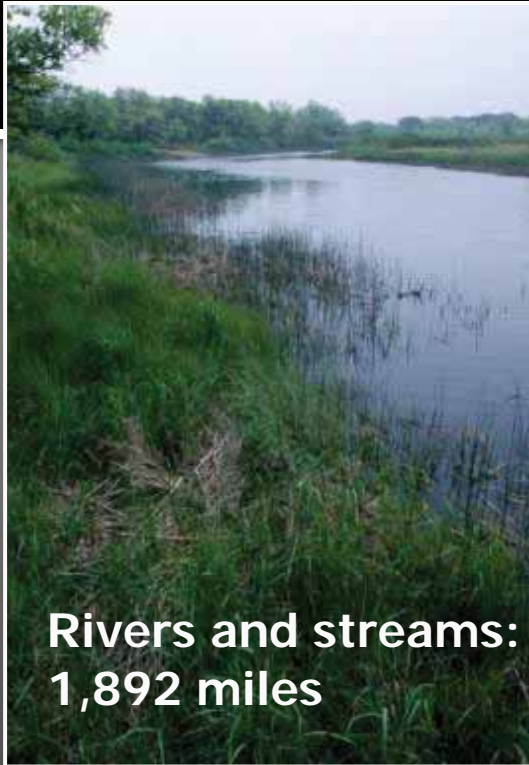


STORMWATER MANAGEMENT COMMISSION

Andrea Cline PWS, CPESC
Water Resource Professional



Picture Lake County . . .



**Rivers and streams:
1,892 miles**



**190+ inland lakes
16,895 total acres**



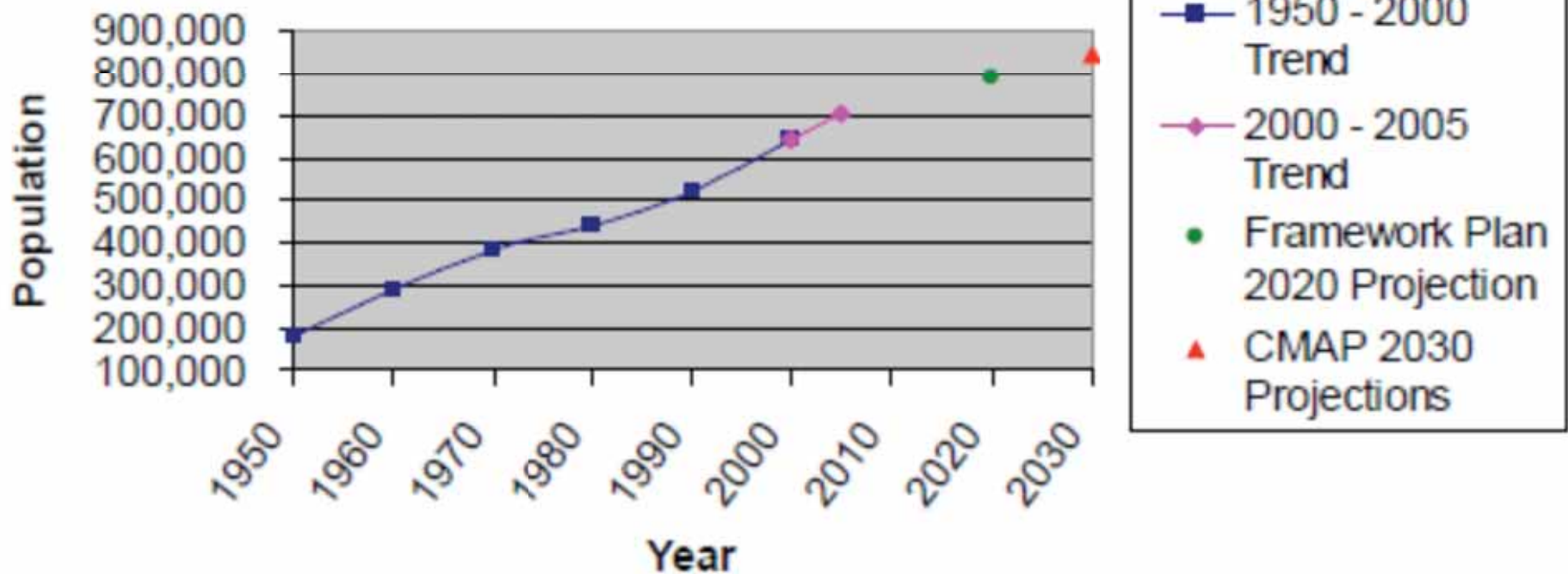
Wetlands: 61,495 acres



**Lake
Michigan
shoreline:
29 miles**

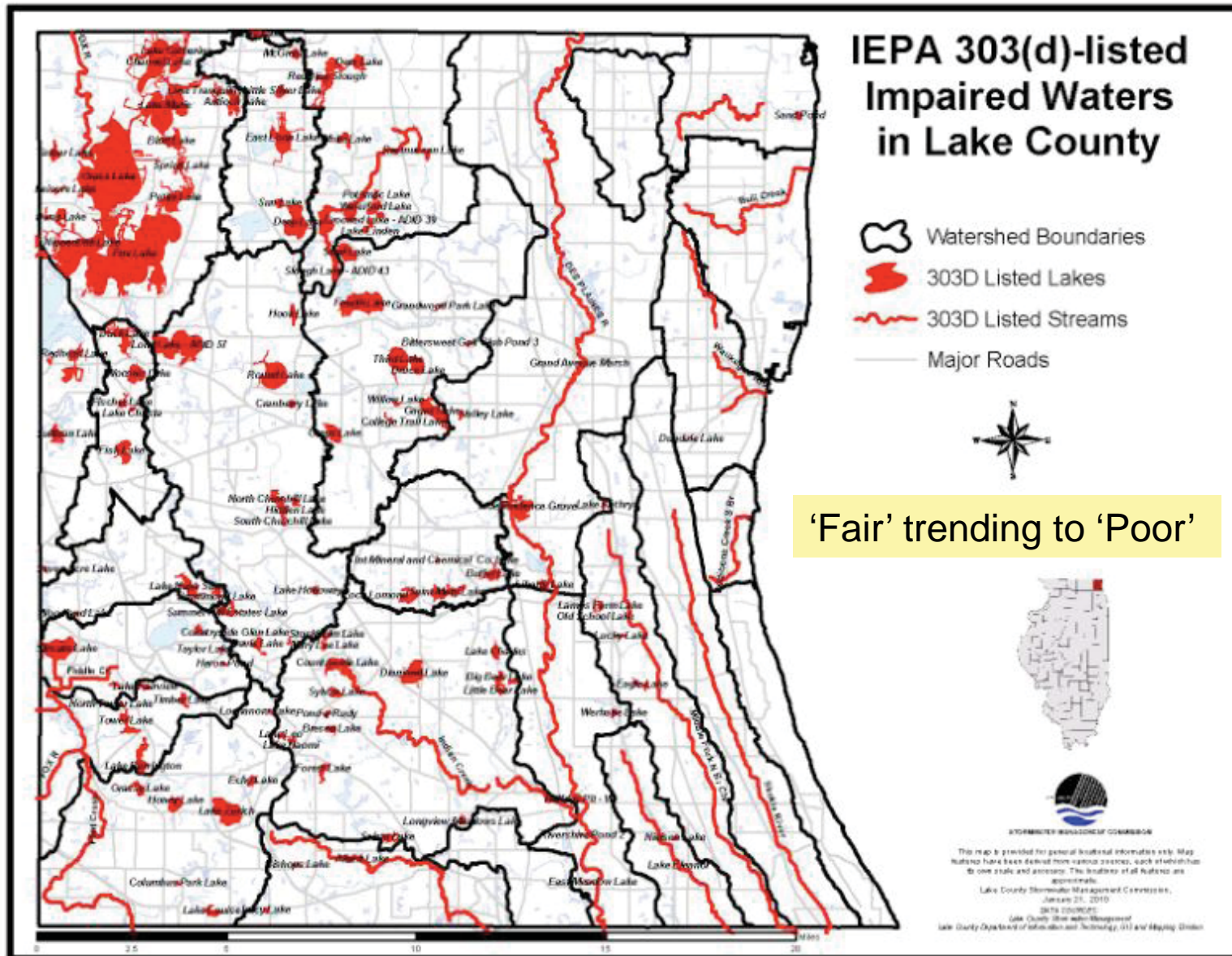
Lake County, Illinois

Population Growth



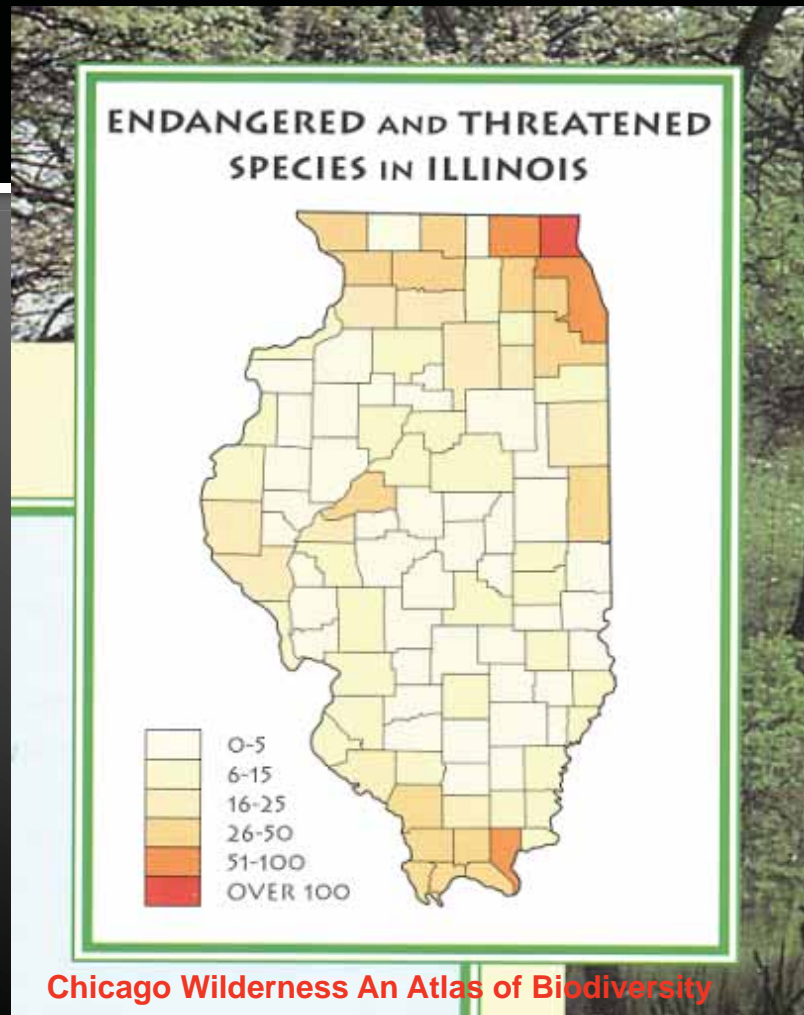
From *Caliper Report*, Lake County IL

Lake County Water Quality



Biodiversity

Lake County is home to more than 130 threatened and endangered species



Lake County Flood Damage

\$5.2 million per year
estimated average
annual damages





STORMWATER MANAGEMENT COMMISSION

Lake County Stormwater Management Commission (SMC)

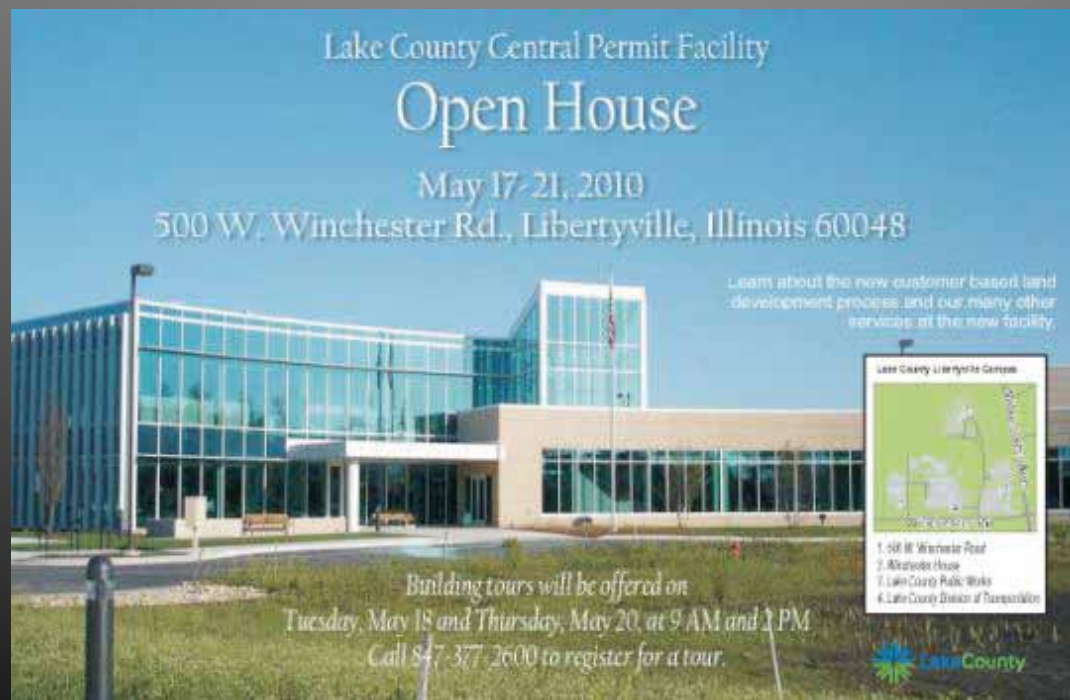
- Established 1991
- County-wide Authority
- Composition:
 - 6 Mayors/Village Presidents
 - 6 County Board Members
 - 18 Supporting Staff (Engineers, Planners, Wetland Scientists, Inspectors)

Moving From Grey to Green

Lake County Central Permit Facility (CPF)

- a green infrastructure case study....

Goal: Sustainable building and sustainable site



CPF Case Study Topics:

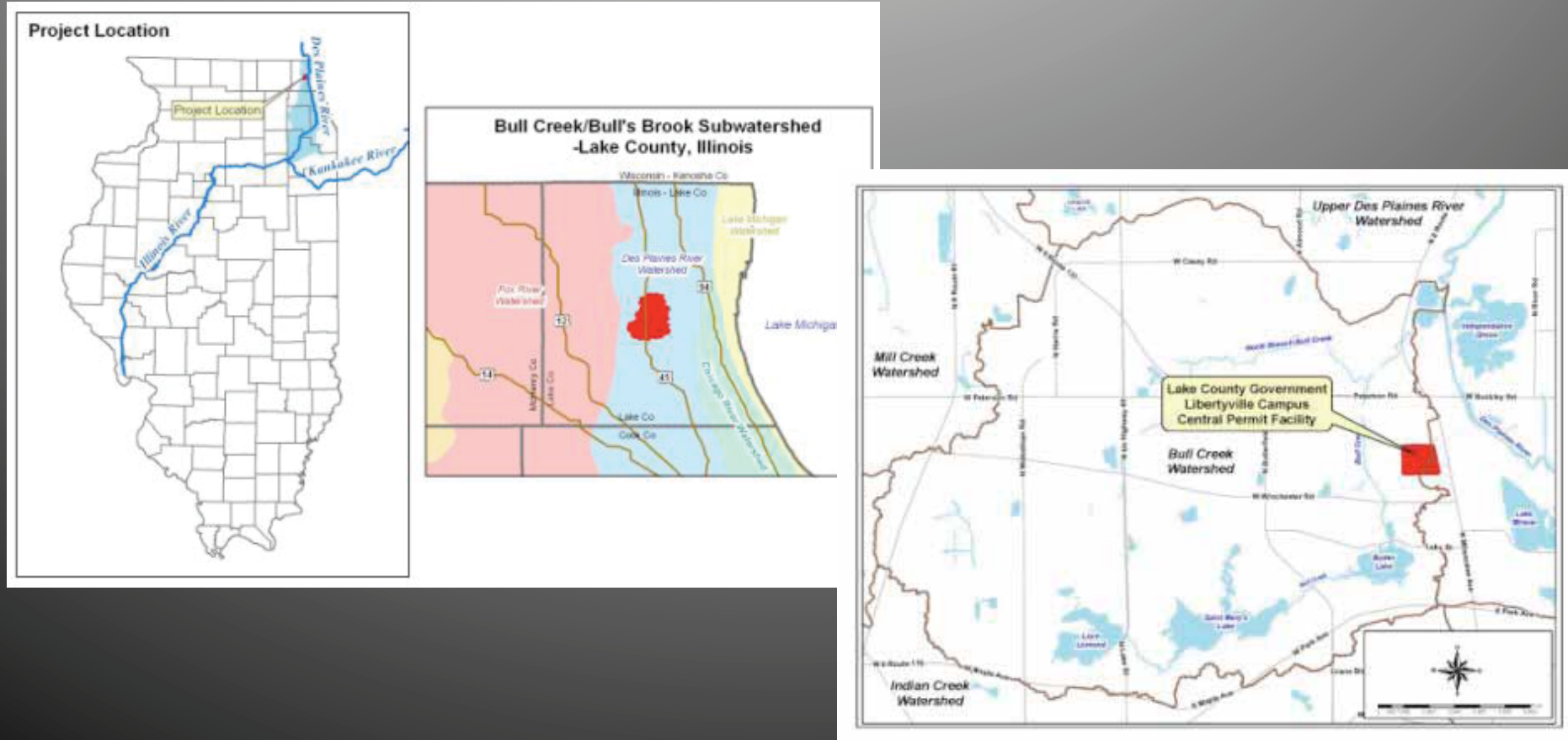
Where does water from the CPF water go?

- Stormwater runoff – the impact of impervious.
- Why did we include green infrastructure BMPs in the design of the facility?
- What kind of BMPs were installed?
- What do they look like?
- How much did it cost and how was it financed?
- Lessons learned (and still learning).



Where does runoff from the CPF go?

Bull Creek-Brook Subwatershed → ... Des Plaines Watershed → ... Illinois River → ...



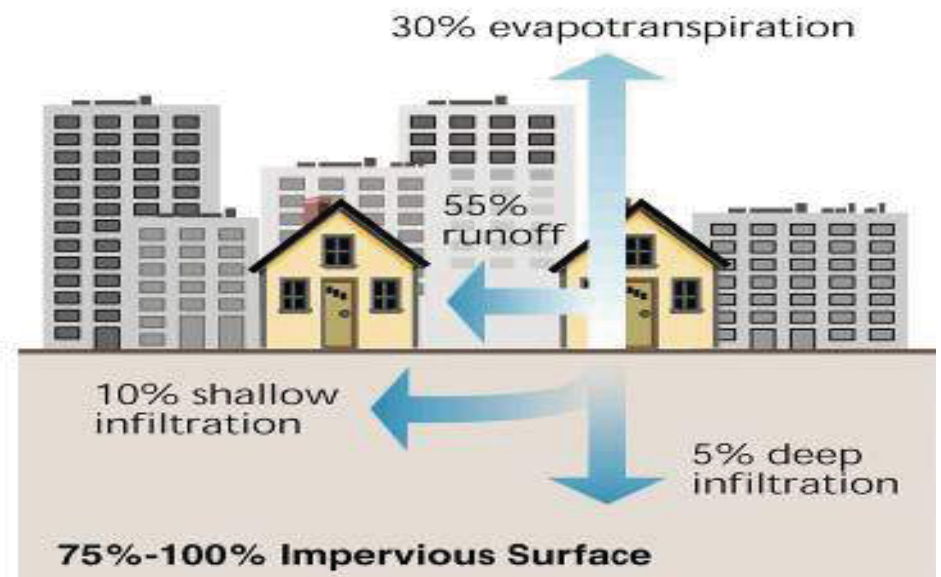
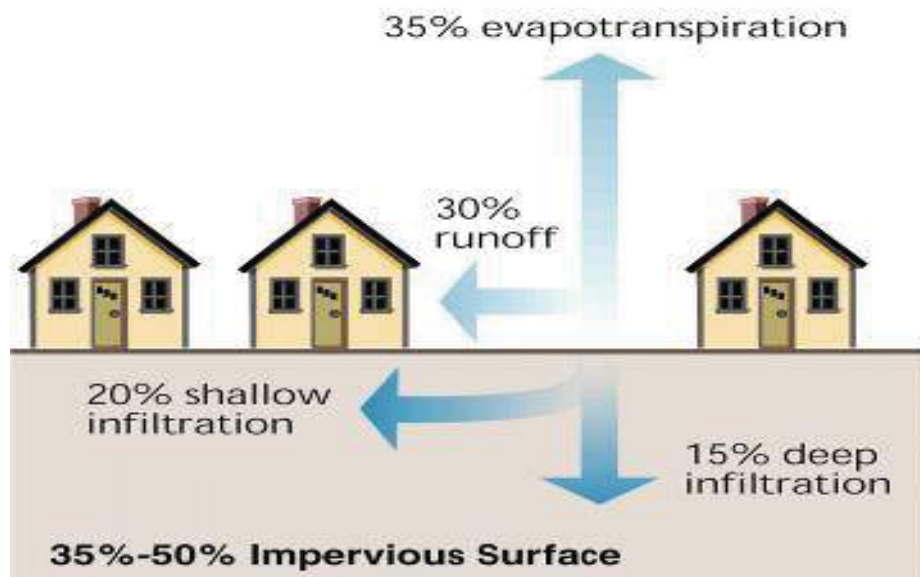
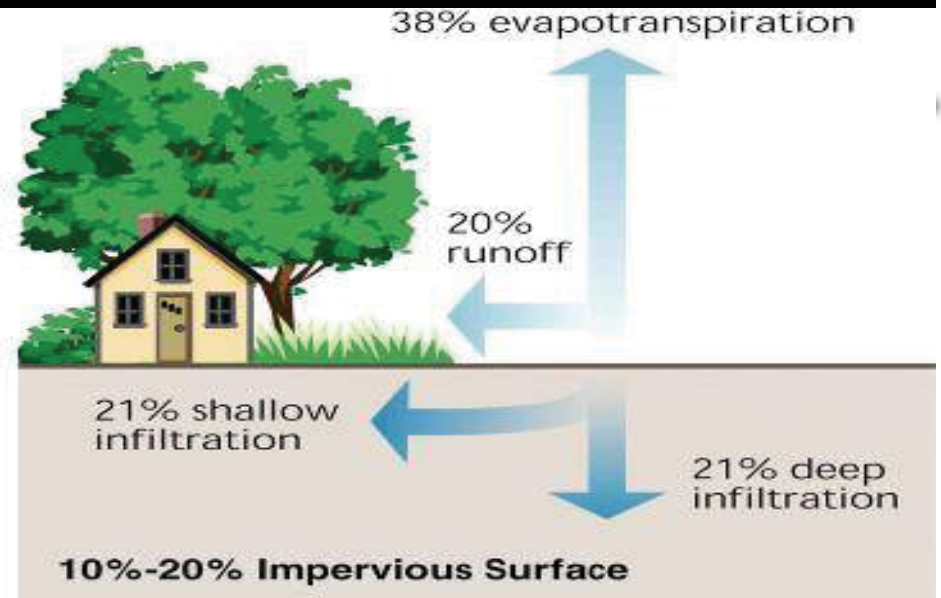
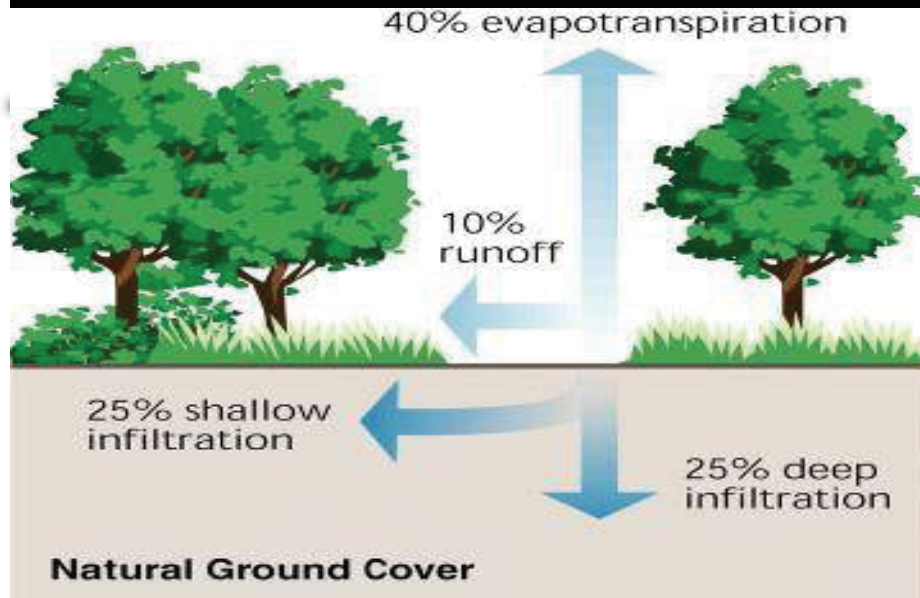
- Bull Creek-Brook: 14 square mile subwatershed of the Des Plaines River
- Des Plaines Watershed: 480 square miles

→ ...Mississippi River → ... Gulf of Mexico



Mississippi River Basin: 1,245,000 sq mi

Impervious Cover and Stormwater Management



Central Permit Facility Stormwater BMPs

Project purpose:

Implement the Bull
Creek watershed plan

Reduce stormwater
pollution

Reduce runoff and
flood damage

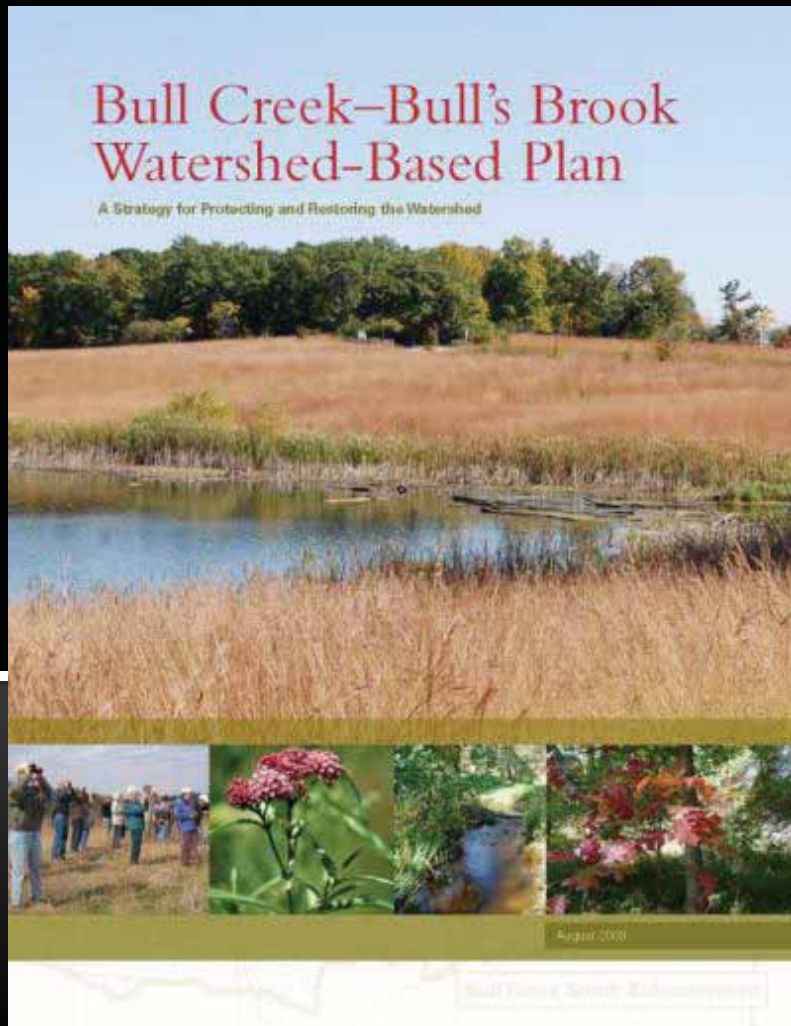
Green infrastructure
demonstration site

Provide leadership by
example



Bull Creek-Bull's Brook Watershed-Based Plan

A Strategy for Protecting and Restoring the Watershed



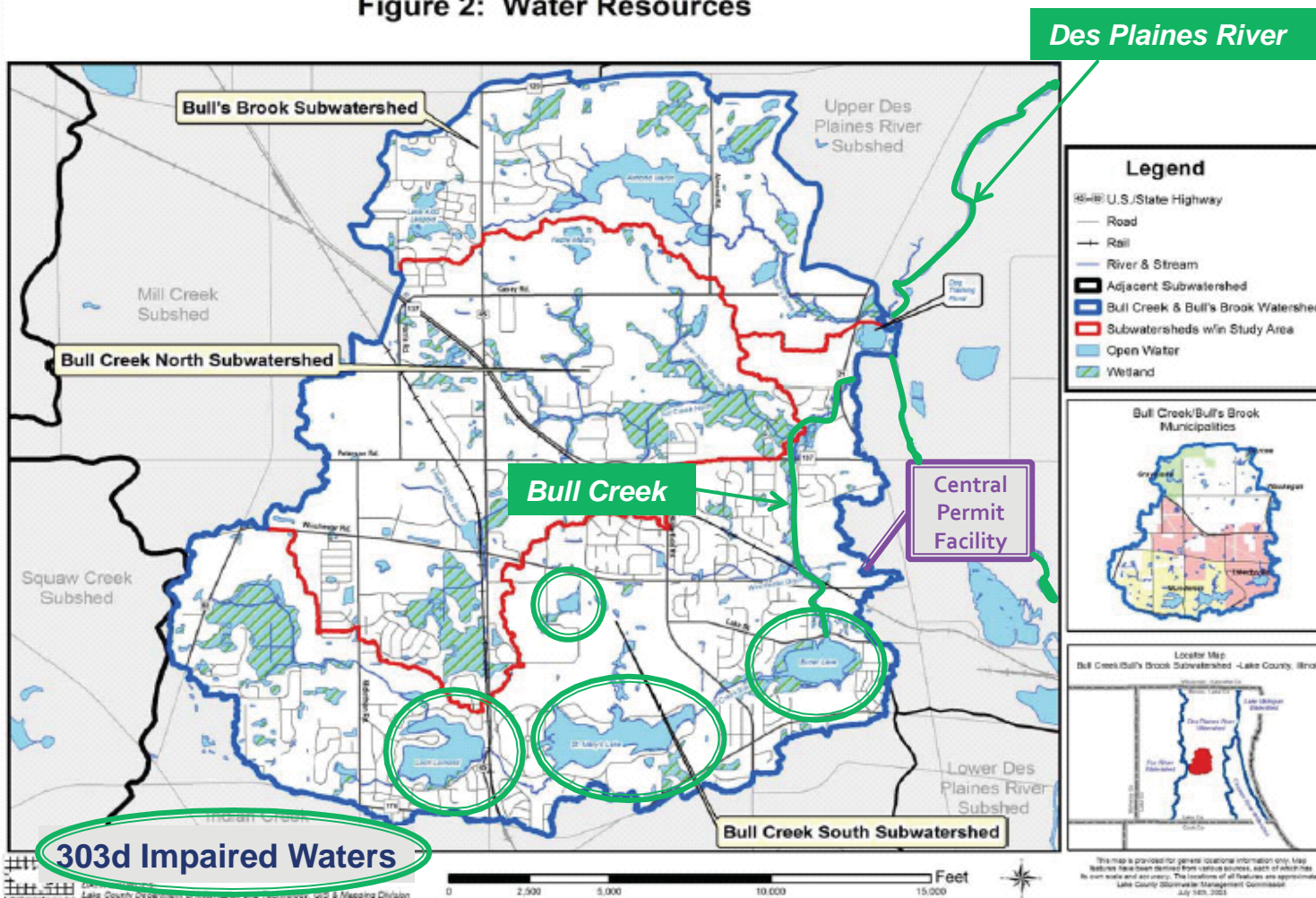
Plan adopted by Lake County in 2009.

Plan goals:

- Protect & restore natural resources
 - Improve overall water quality
 - Reduce flood damage & prevent flooding
 - Protect, restore, & enhance stream health
 - Guide new development and redevelopment to benefit watershed goals
 - Preserve and use "Green Infrastructure"
-
- Develop stakeholders knowledge and stewardship skills
 - Develop and capitalize on funding sources
 - Improve watershed coordination and collaboration

Bull Creek Watershed Impaired Waters

Figure 2: Water Resources



Pollutants

Bull Creek

Total suspended solids
Phosphorus
Arsenic
Manganese
Methoxychlor
Chloride

Des Plaines

Mercury
Polychlorinated biphenyls

Challenges to Bull Creek Watershed Health

- **Runoff intensive development practices** → greater volume of stormwater → pollution, erosion, flooding
- High **nutrient and salt loads** in stormwater
- **Stream erosion** & debris blockage problems
- Four lakes & Bull Creek have **impaired water quality**
- **Lack of knowledge** about pollution prevention and watershed health

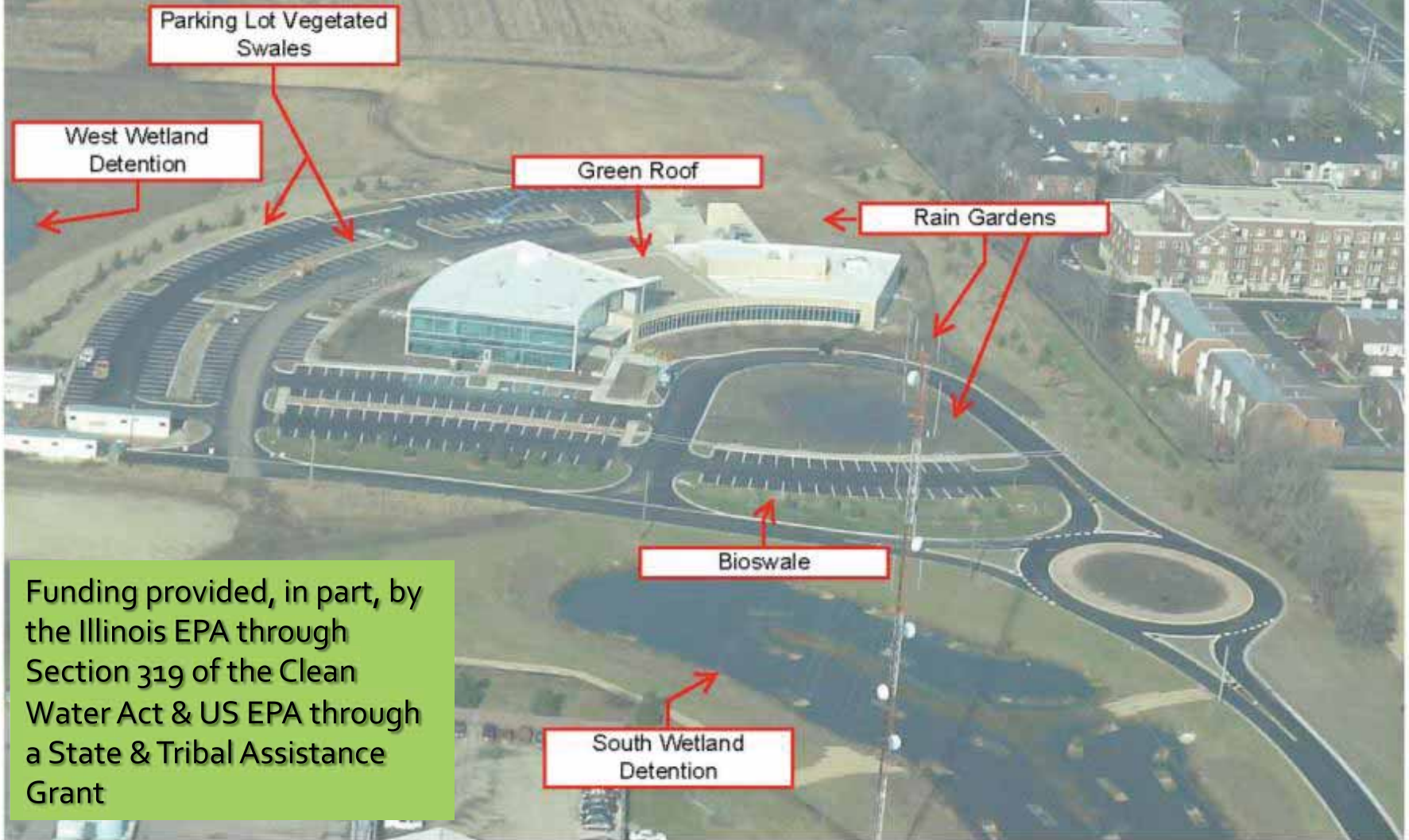


LAKE COUNTY CENTRAL PERMIT FACILITY

Best Management Practices (BMPs)

Site BMP Cost: \$303,421; IL EPA Grant: \$118,584

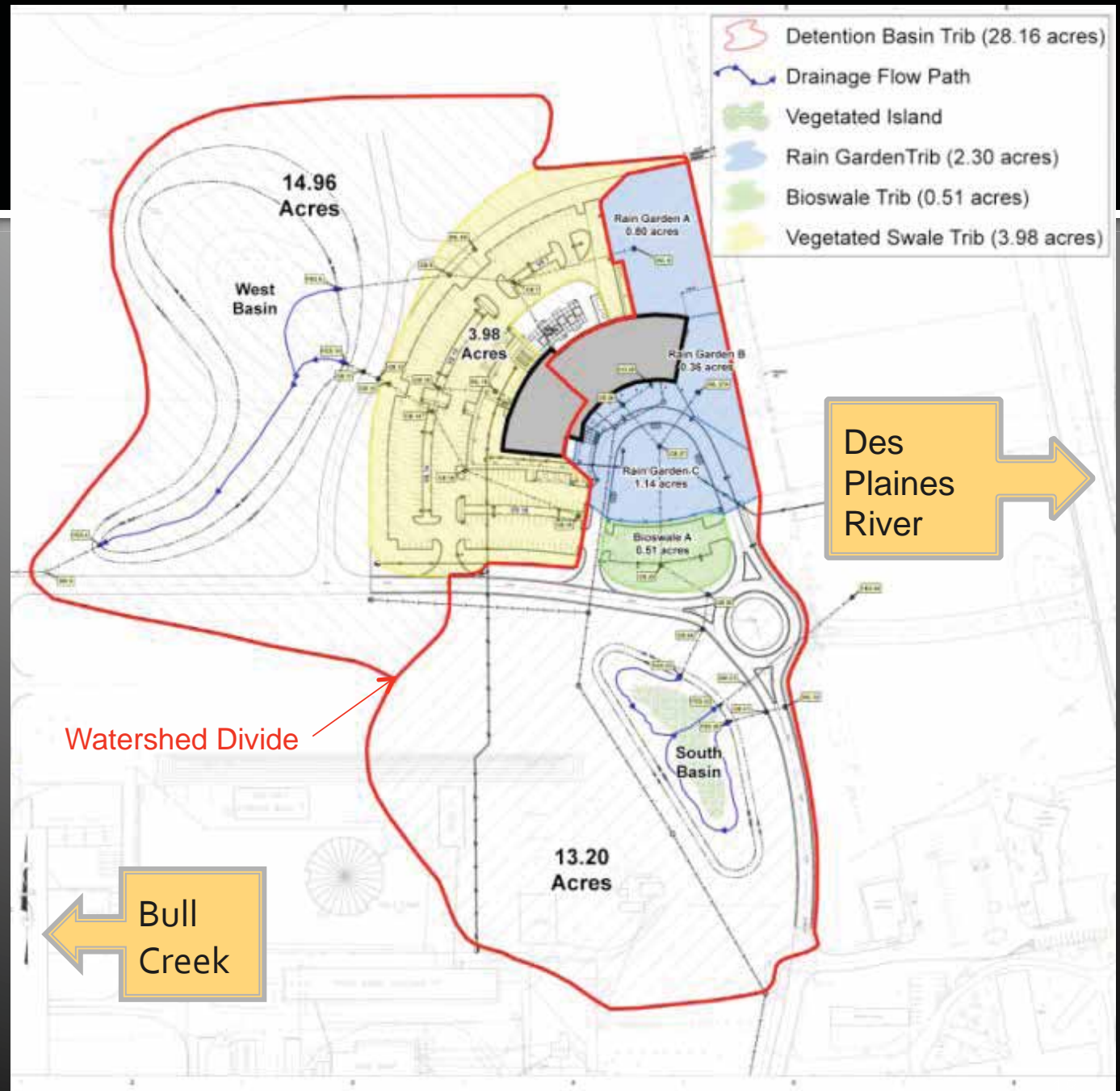
Green Roof Cost: \$309,600; US EPA Grant: \$183,721



Funding provided, in part, by the Illinois EPA through Section 319 of the Clean Water Act & US EPA through a State & Tribal Assistance Grant

Site Drainage

Building: 34,725 sf
Parking: 193,624 sf (5.2 acres)
~5.5 million gallons runoff generated/year

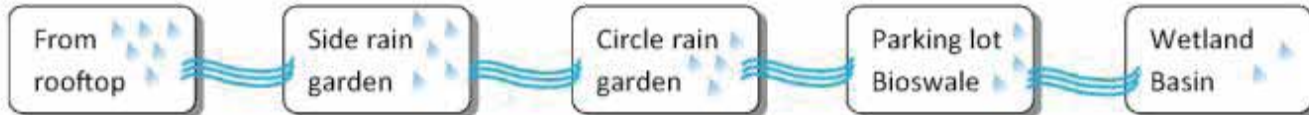


Water Quality Treatment System



Est. Pollutant Reduction

| | |
|------|---------------|
| TSS | 46,086 lbs/yr |
| COD | 7,265 lbs/yr |
| BOD | 1,375 lbs/yr |
| TN | 119 lbs/yr |
| TP | 29 lbs/yr |
| Lead | 11 lbs/yr |



Green Roof

Green roof reduces rooftop runoff & moderates building temperature

Total area: 8,077 SF; Planted area: 5,959 SF

Plants: ~1,700

Cost: \$309,600

Grant: \$183,721





Green Roof

June 2010

&



June 2011

Rain Gardens

Rain gardens capture runoff from the rooftop and the front circle drive

Total area: 42,337 square feet

Plants: 24,168 plugs; 102 shrubs

Total cost: \$77,566



Rain Gardens June 2010

& October
2011



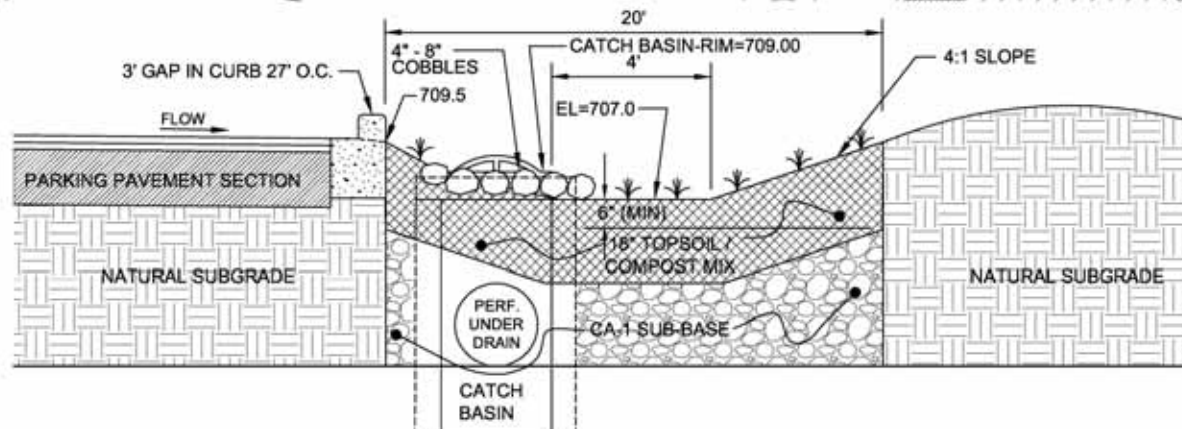
Add-on rain garden
- Hydrology has been modified



Bio-infiltration Swale

The bio-infiltration swale captures runoff from the visitor parking lot

- Total area: 4,830 SF, 180LF
- Plants: 2,248 plugs
- Total cost: \$40,914



**BIO-SWALE CROSS SECTION
(NTS)**



Bio-infiltration Swale June 2010

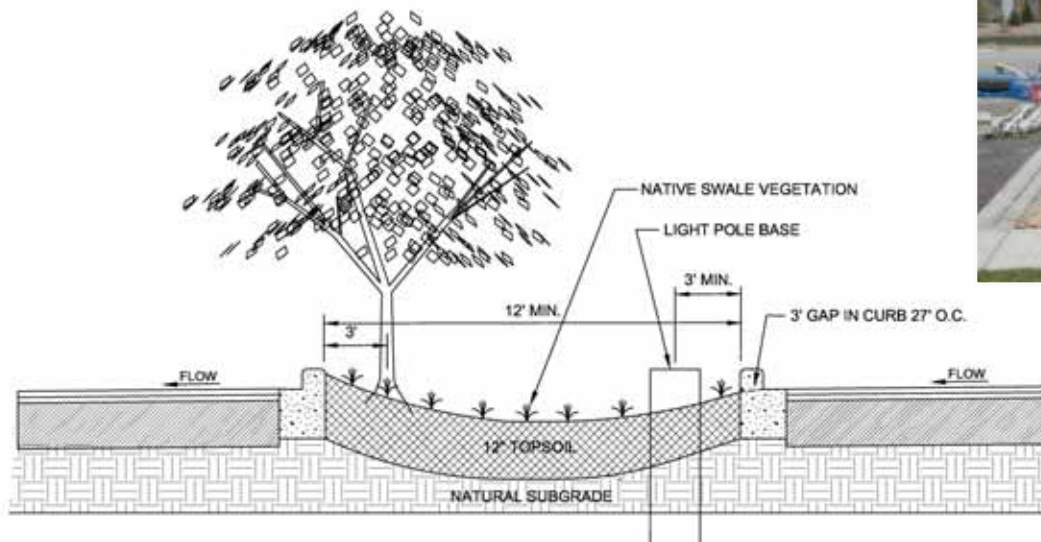


Native Plant Swales

Vegetated swales capture runoff from the parking lots



- Total area: 26,831 SF, 1,350 LF
- Plants: Swale seed mix
- Total Cost: \$69,441



INNER ISLAND VEGETATIVE SWALE CROSS SECTION
(NTS)

Native Plant Swale June 2010



2011: being plugged and re-seeded

Wetland Detention

Wetland Basins are the last BMP in the infiltration and filtration system.

Runoff: south basin captures ~42% of site; west basin captures ~58% of site

Normal water level area: 3.4 acres, 148,104 SF

Plants: 60,610 SF Deep Marsh

10.43 acres (445,650 SF) w/Buffer

Total cost: \$115,500



Wetland
Detention
Basins
June 2010



Education and Outreach...

- lead by example

Active education programs:

Open house (elected officials and public)

Workshops (homeowner associations; engineers and site designers)

Training classes (ex. soil erosion/sediment control; wetland science training; college classes)

Facility tours (ex. Conservation Leadership; US Green Building Council; Association of Military Engineers)

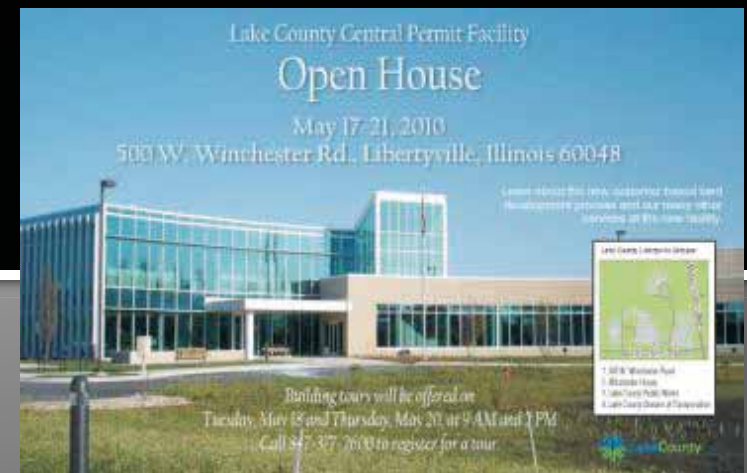
Watershed meetings

Passive education:

Signs in vestibule

BMP signs

BMP Fact Sheet



Some Lessons Learned

BMPs

Plug rather than seed high visibility BMPs using more traditional landscape design with native plants

Add walk paths through long vegetated swales

Challenging to move from turf management to native plant maintenance

- Educate facility managers and staff on best maintenance practices
- Include a planting guarantee in the construction contract
- Plan and budget for extra maintenance during landscape establishment (3-5 yrs)

Educate administration, risk management, building staff, and board so they know what to expect in terms of aesthetics, plant establishment , deicing practices, and stormwater BMP function

Everyone loves the green roof

Questions?

Lake County Central Permit Facility
500 W. Winchester Road, Libertyville, IL 60048

<http://www.lakecountyil.gov/stormwater/>

acline@lakecountyil.gov

Phone: (847) 377-7710

Thank You!

Central Permit Facility Green Building Features

- Building envelope
- Building infrastructure
- Building automation
- Other sustainable features



Building Envelope

Building Envelope is the front line of defense for energy conservation and occupant comfort.

Roof: White PVC Solar Reflectance Index: 108
Vegetated Roof comprises 22% of roof surface

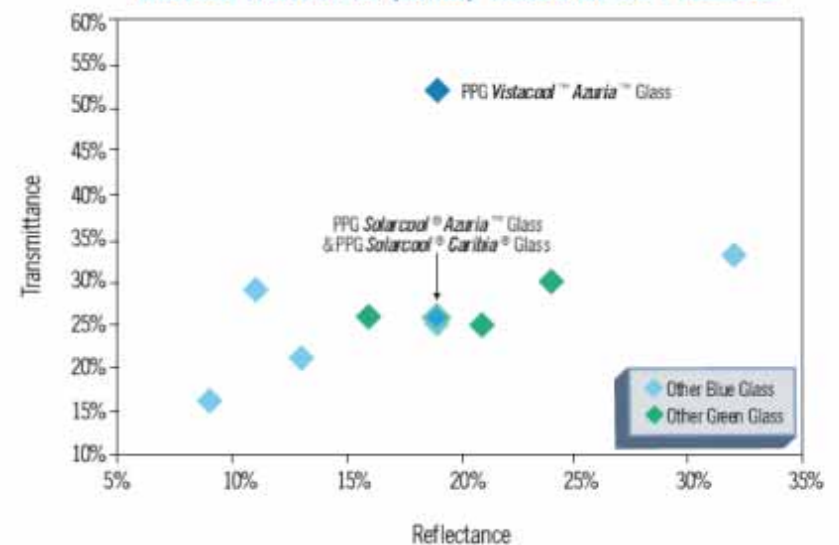


Glazing System: PPG Vista Cool Azuria Glass + Solarban with high performance framing system including sun shades. Reflectance 20% Transmittance 42% U-value 0.27

Perimeter Insulation: Spray Applied Polyurethane Foam Insulation
Integral Vapor Barrier Consistent R-Value



Relationship of Transmittance and Reflectance
Current Reflective (6mm) Tinted Glass Products



Building Infrastructure

Heating Plant Equipment: Buderus Condensing Hot Water Boilers

Cooling Plant Equipment: York Chillers and Cooling Towers



Delivery Systems: Variable volume frequency drives on all pumps and fans

Lab Controls Systems: Phoenix Controls Variable Volume systems including heat recovery



Building Automation

BACnet protocol used to integrate all aspects of building automation. Primary system integrations occurred between Automated Logic, Johnson Controls and Phoenix Systems.

Systems include heating and cooling plant, air handlers and VAVs, lighting control system, pumping systems, fire alarm system, elevator, fume hoods, domestic water system, humidification, computer grade AC, switchgear, generator, and exhaust systems.

Welcome to the
Lake County Central Permit Facility BAS

Basement 1st Floor Office 1st Floor Lab 2nd Floor Office Penthouse



- AHL1
- AHL2
- AHL3
- Chiller Plant
- Return Fan Pump
- BAF Fire Alarm
- Fire Panel
- Gasstronic UPS
- LRI Hot Elevator
- Lobby Lighting

Automated Logic provided the Front End graphics for all systems.

Automated Logic
Contact Us
2008 West Dwyer Avenue, Suite 100
Lincoln, Nebraska 68502
(402) 827-1790

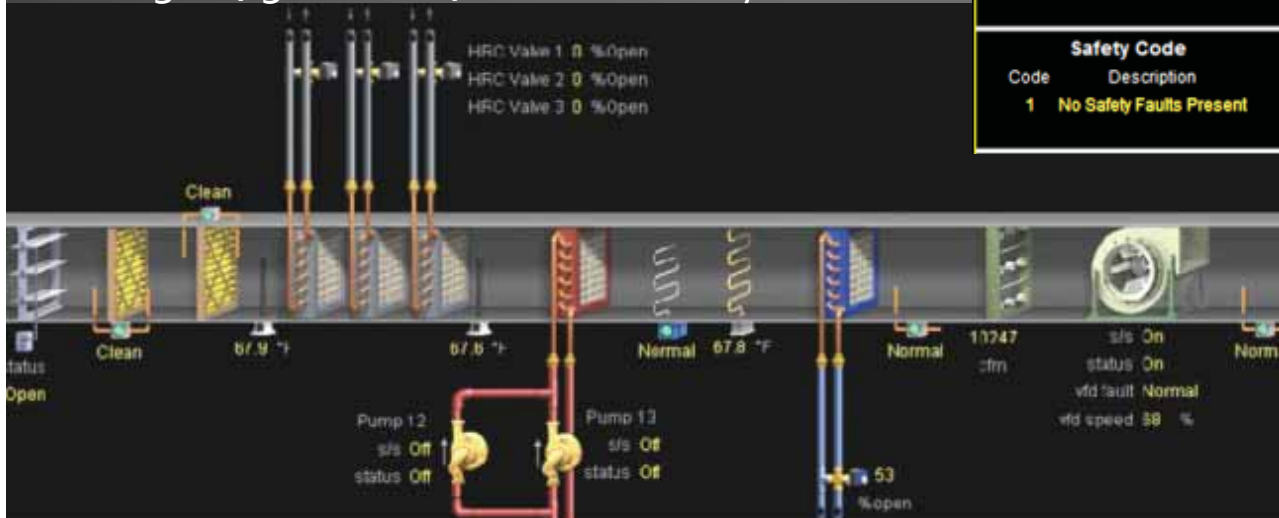
Johnson Controls was responsible for the York Chiller Plant.

Zoomed in view of BACnet Interface.

| Operational Code | |
|------------------|---------------------------|
| Code | Description |
| 3 | Stopped - Remote Shutdown |

| Warning Code | |
|--------------|---------------------|
| Code | Description |
| 1 | No Warnings Present |

| Safety Code | |
|-------------|--------------------------|
| Code | Description |
| 1 | No Safety Faults Present |

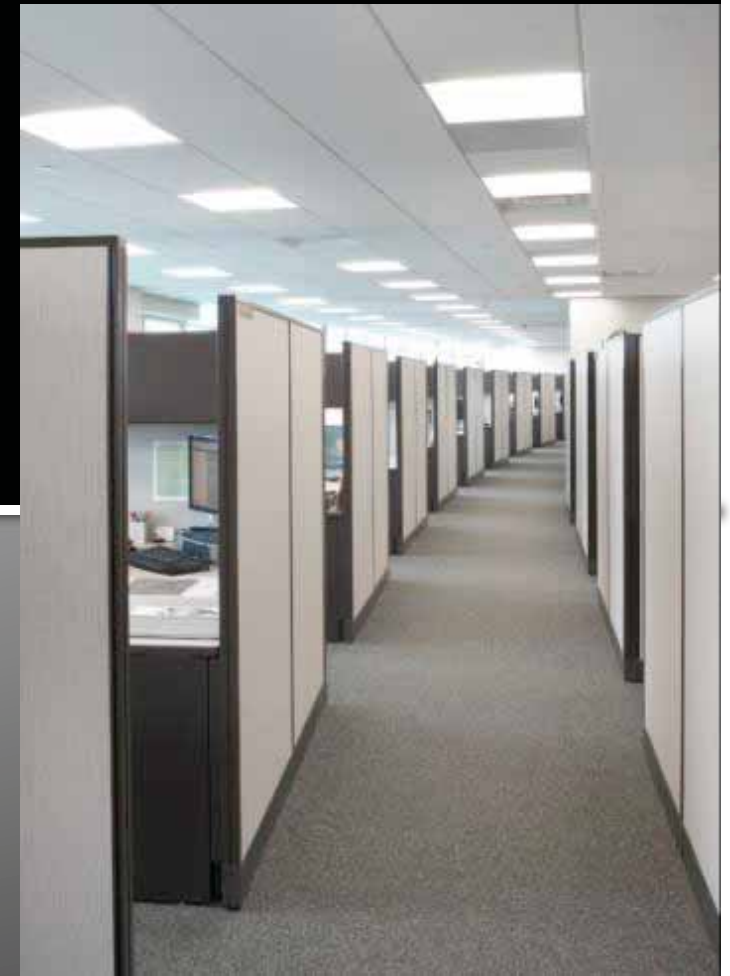


Other sustainable features

Showers and ample bike racks make alternative transportation available to staff and the public

Water efficient plumbing

Zoned lighting with auto turn-off



HON furniture panels include Nature Core construction using rapidly renewable natural fibers for backing material.