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University of Nebraska – Lincoln Rain Garden Study Plant Performance & Perceptions

Lincoln Post Construction Workshop, 3-21-12
Presenter: Kelly Feehan, UNL Extension Educator
Primary Investigator: Marilyn Liebsch

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UNL Stormwater Programming

- USDA-NIFA Grant
  - Extension (~50%)
    - Meetings, demonstrations, tours, workshops
    - Publications, website, youth education
  - Teaching (~30%)
    - Landscape architecture & design curriculum
  - Research (~20%)
    - Hydrologic function of established rain gardens
    - Assessment of 20 "pilot" rain gardens at Holmes Lake
      - Condition of gardens & plants
      - Perceptions & feedback from garden owners

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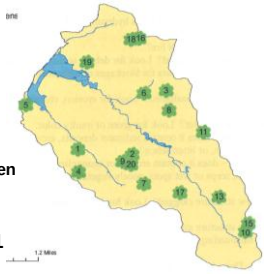
Holmes Lake Rain Gardens

- Pilot program
- Cost share - participants under contract w/ City of Lincoln to:
  - Maintain garden for 5 years
  - Fill out annual surveys
  - Allow city to photograph garden
  - Contact city & installer if problems occur
- 17 single family dwellings; 1 apt. complex; 2 schools



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UNL Rain Garden Study

- Investigators
  - Marilyn Liebsch, graduate student – Primary Investigator
  - Tom Franti, Extension Surface Water Quality Engineer
  - Steve Rodie, ASLA, Landscape Horticulture Specialist
  - Richard Sutton, Landscape Horticulture Professor
- Visual inspection - 18 homeowners agreed to
- Homeowner assessment discussion -14 agreed to
  - Permission protocol and questions approved by UNL Institutional Review Board (IRB#20100911078). Consent form signed.

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Background Information

- Installed 3 years, one 2 years
- Gardens evaluated in mid-summer
- June precipitation 5.99" above normal; July 2.29: above normal

Month	Average	2010 Actual	Difference
June	3.91"	9.90"	+5.99"
July	3.54"	5.83"	+2.29"

- Subsoil: clay loam or silty clay loam; Soil: silty clay loam/clay loam
- Amended with compost

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Visual Inspection

- Street view impression
  - Public view for educational purposes
- Hydraulic impression
  - Is RG functioning? Issues?
- Vegetation assessment
  - Plant survival, appearance
- Site conditions
  - Lawn irrigation, shade trees, etc.
- Side notes
  - Maintenance

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Homeowner Discussion

- Describe current functional rating
- Current aesthetic rating
  - What should/could be done differently?
- If preexisting problem existed, was it solved?
- Plant information available from homeowner
  - Plants replaced? Pest issues?
- Has experience enhanced their knowledge?
- Have they educated others?

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Overall Findings

- Gardens functioning – infiltrating well
- Some maintenance issues
  - Fewer if homeowner a gardener
  - Some related to inlet/overflow maintenance
- Most plants performing well overall
  - 'Woods' Aster least successful
  - Bottom plant issues
- Homeowners generally satisfied with gardens
  - Had a few suggestions for improvement
  - Most had shared information with others
  - Very satisfied if solved preexisting issue

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Rain Garden Function

- 7 infiltrate < 12 hrs.; 4 < 24; two < 36; one > 48
- No standing water at assessment
- Some inlets & overflows slightly misaligned
- Some inlets without hardscape to reduce erosion
- Some channelization & erosion
- A couple needed an additional overflow

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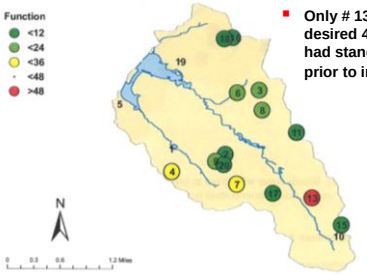
Infiltration Rates



- Only # 13 takes longer than desired 48 hrs. Note: this site had standing water issues prior to installation

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- Runoff from 4 neighboring yards created standing water
- Homeowner added 2 side drains in yard to storm drain
- Running water along south property line
- Volunteer cattails
- 5' wide rock inlet
- No overflow present
- Water runs over turf before entering garden

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Rain Garden Design/Installation

- Size could have been larger
  - Better distribute water & reduce overflow
  - Bank stabilization more of an issue in smaller gardens
  - Bottom plants better in larger gardens
  - Plants needed to be added to berms for stabilization

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Rain Garden Design/Installation

- Turf encroachment - "island" in the lawn
  - Remove or kill sod under berm
  - Locate garden as part of another landscape bed

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Rain Garden Design/Installation

- Better plants where runoff flowed over turf first
  - Lower velocity and volume of water entering garden
  - Possibly standing water for shorter time period

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Vegetation Assessment

- Many nice plants of expected size & condition
  - At least a few in bloom at each assessment
- Sprinkler irrigation negative effects
  - Adding excess water to native plant vegetation
- Shade underestimated on a few
- Could use more diversity in plants; more natives
- Inappropriate plant replacement
  - Species type; too many – overcrowding
- Overmulched
- Bottom vegetation sparser than ideal

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Bottom Plants Missing

- Needs to be examined further
  - Bottom plants vital
  - Garden coverage: 50 – 90%; Bottom coverage: 10 – 50%
  - Most drained in < 12 or 24 hrs.
- Possible reasons:
  - High precipitation in study year
  - Soil properties
  - Individual maintenance
  - Excess use of sprinkler irrigation
  - Plant placement/selection
    - Shade

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Bottom Plants

- **Some Plants Used:**
  - **Swamp milkweed, Siberian Iris, Obedient Plant, Karl Foerster**
  - **Goldenrod, Phlox, Rudbeckia, coneflower, penstemon, Woods Aster**
- **Better choices:**
  - **Chelone, Helenium, Carex, Liatris pycnostachya, Joe-pye weed, cardinal flower, Corkscrew rush (Juncus)**




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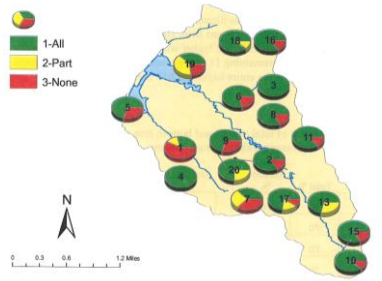
Survival Rating of Plants



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Individual Plant Performance

- **Often listed as "especially nice overall"**
- **Frequently listed as 'gone' or having issues**
- **NOTE:**
  - **Small # of plants observed twice**
  - **Some plants listed as especially nice overall were also listed as having issues or as gone in some gardens**


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Herbaceous Perennials Used

- **Anemone 'September Charm' – 3**
- **Aster 'Purple Dome' - 1**
- **Aster 'Woods Purple', 'Pink' & 'Blue' - 12**
- **Astilbe 'Vision in Red' – 2 (shade only)**
- **Bee Balm (Monarda) 'Fireball' - 1 'Marshall's Delight' - 1**
- **Catmint (Nepeta), Walker's Low' - 1**
- **Columbine (Aquilegia) 'Blue Shades' - 2**
- **Coneflower (Echinacea purpurea) 'Magnus purple' - 5, 'White Swan' -2**
- **Coreopsis 'Zagreb' - 1**

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Herbaceous Perennials Used

- Daylily (Hemerocallis) 'Happy Returns' - 10
- Daylily 'Rosy Returns' – 3, 'Pardon Me' - 1
- Geranium 'Rozanne' - 2
- Goldenrod (Solidago) 'Fireworks' - 11
- Iris siberica 'Caesar's Bros.' 13
- Variegated Iris pallida - 3
- Joe-pye weed (Eupatorim) 'Gateway' - 1
- Liatris 'Floristan White' - 2, 'Kobold' - 1
- Milkweed (Asclepias), swamp - 10

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Herbaceous Perennials Used

- Obedient plant (Phsostegia) 'Miss Manners' - 11
- Penstemon 'Husker Red' - 3
- Phlox 'Volcano pink' - 1 & 'Volcano white' - 1
- Rudbeckia 'Goldstrum' - 8
- Salvia 'Marcus' - 1
- Spiderwort (Tradescantia) 'Red Grape' - 1
- Summersweet (Clethra) 'Hummingbird' - 1

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Grasses & Grass-like Plants Used

- Feather Reed Grass 'Karl Foerster' – 2, 'Avalanche' - 1 (Calamagostris)
- Northern Sea Oats (Chasmanthium) - 2
- Switchgrass (Panicum) 'Northwind'- 3,'Shenandoah'- 5
- Miscanthus (Maidenhair Grass) 'Morning Light' - 3
- Japanese Bloodgrass 'Red Baron' (Imperata) – 2
- Sedge (Carex), Variegated - 2

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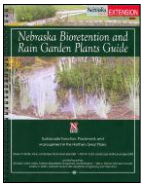
Conclusions



- Proper siting of RG & good design
- Right plant, right place
- Focus on natives & best adapted plants
- Educate homeowners on natives
- Right plant, right maintenance
- Monitor rain garden for:
  - Infiltration
  - Inlet & overflow maintenance
  - Mulch redistribution
  - Turf & weed control (tree seedlings)

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