Winter Haven Raingardens: A Case Study to Learn From

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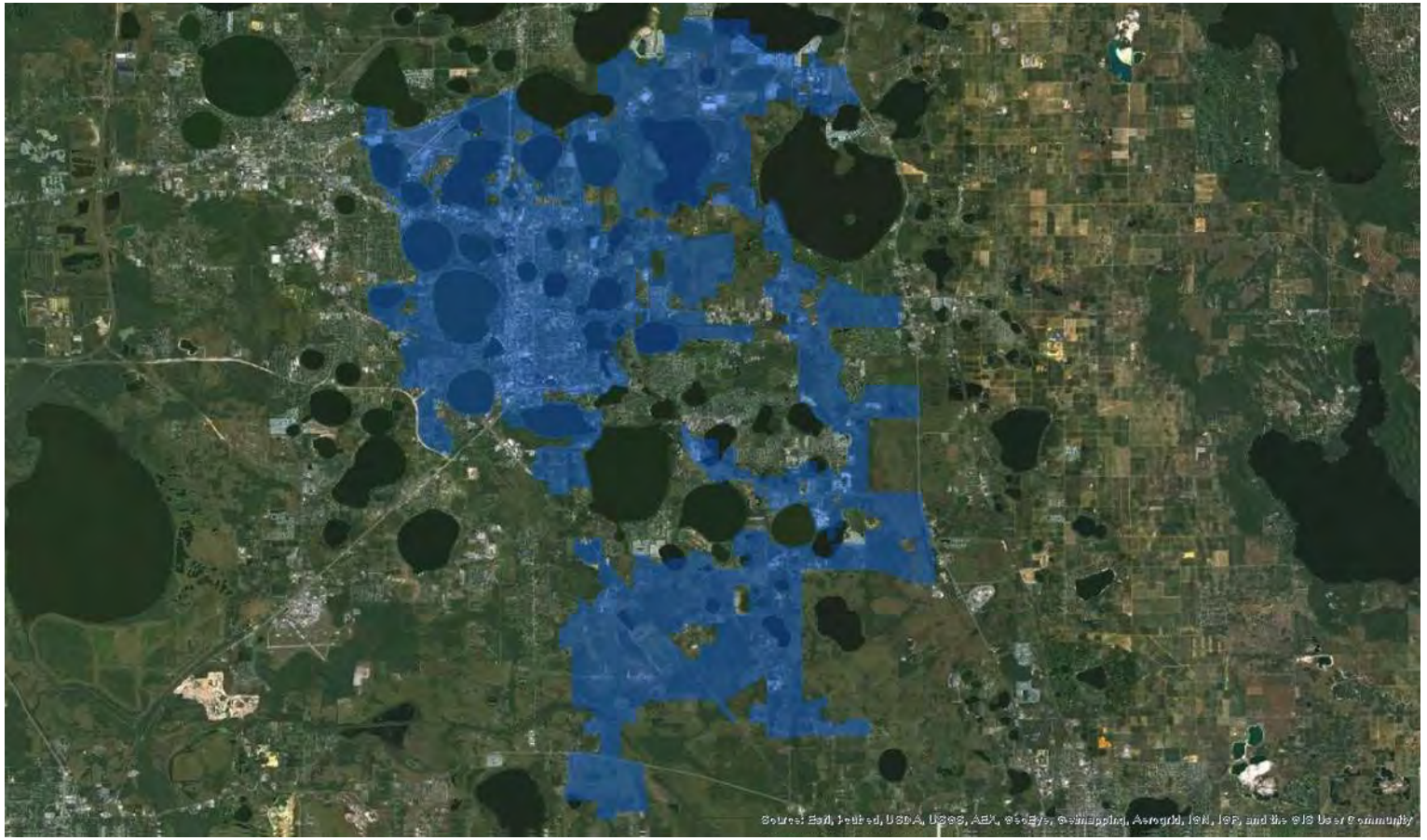
Location at top of Peace River Watershed:



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Background:

The lakes and their health are extremely important to the community and as such it was determined that the minimum standards set by State and Federal agencies, while effective at a broad scale, would not be good enough to meet the needs and desires of the Winter Haven community.

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Background:

"The Current approach to managing water is not sustainable. If future residents want the same or better quality of life, alternatives have to be considered as to how best manage water and land"

- Sustainable Water Resource Management Plan for the Peace Creek Watershed (2010)

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Background:

- Shift in management philosophy:
  - Sustainability
  - Natural infrastructure/systems
  - Science based decision/policy making
  - Adaptability

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Background:

Sustainable development –

"Sustainable development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs."

– Brundtland Commission

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Background:

National Society of Professional Engineers

- Code of ethics
  - Professional obligation
    - *"Engineers shall at all times serve the public interest."*
      - *"Engineers are encouraged to adhere to the principles of sustainable development in order to protect the environment for future generations."*

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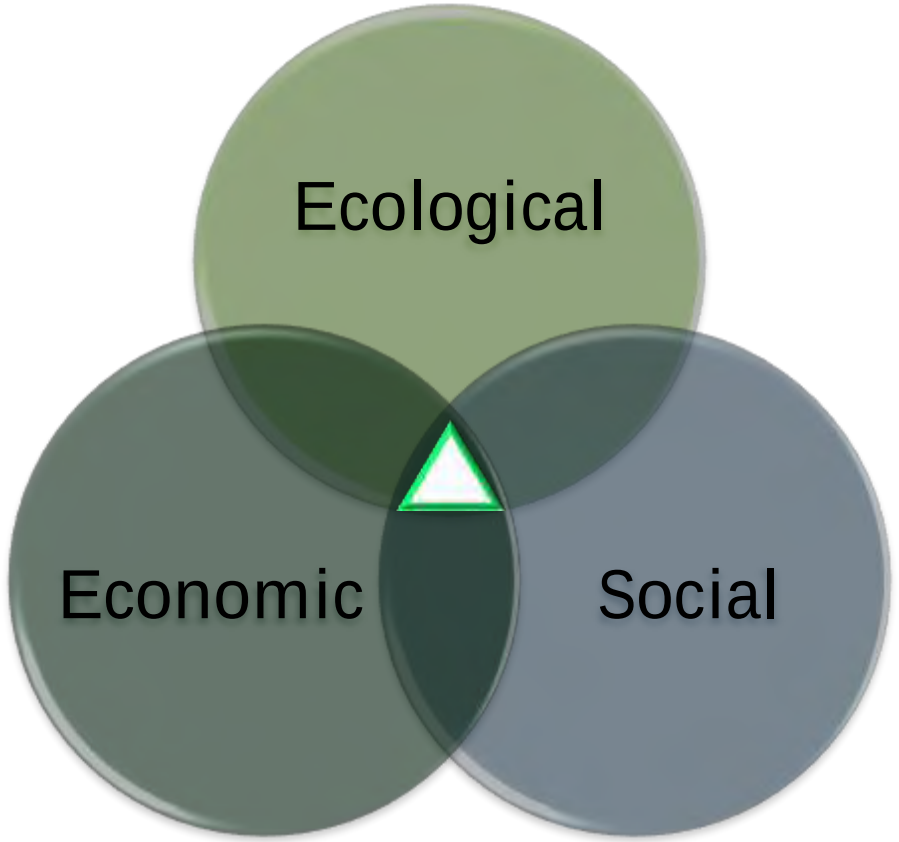
Background:



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Systems Thinking:

System –

"An interconnected set of elements that is coherently organized in a way that achieves something"

-Donella Meadows

- Elements
- Interconnections
- Function or Purpose

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Systems Thinking:

- Function or Purpose
  - Sustainability
    - Triple Bottom Line Examples:
      - Healthy lakes
      - Safe, inexpensive, consistent water supply
      - Flood protection

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Systems Thinking:

- Elements
  - Components that make up the system
  - Can be tangible or intangible
    - Water examples:
      - Lakes
      - Watersheds
      - Stormwater infrastructure
      - Sediment management
      - Regional hydrology
      - Consumptive use
      - Rainfall
      - Streets
      - Trees
      - Yards

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Systems Thinking:

- Interconnections:
  - The relationships that hold systems together
  - More important to begin identifying than the elements.
    - Water examples:
      - How does stormwater infrastructure expand a lakes natural watershed?
      - How does Tree Canopy relate to water quality?
        - Do leaves contribute to sedimentation?
        - Does more canopy reduce runoff?
      - How does stormwater relate to future water supply?
      - How does regional hydrology effect water quality?
      - Does a 2” storm or a 0.01” storm have greater impacts on water quality?

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Projects:

- Low Impact Development (LID)
  - "An approach that works with nature to manage stormwater as close to it's source as possible." -US EPA
  - Rain gardens
  - Exfiltration pipes
  - Storm water parks

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Raingarden:

- Ecologic benefits

  - Water quality improvements
    - Capture of sediment generally including Phosphorus
    - Plants provide a place for Nitrogen cycle to occur
  - Regional hydrologic restoration
    - Plants provide macro pores for infiltration
    - High infiltration soils allow rapid water recharge
  - Wild life habitat
    - Supported by improved regional hydrology and water quality

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Raingarden:

- Social benefits
  - Spurs conversation related to stewardship gaps
    - i.e. who generates the impacts and who benefits from managing them
  - Neighborhood beautification
  - Infrastructure improvement
  - Healthy ecosystems
  - Limits refuse entering lakes

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Raingarden:

- Economic benefits
  - Construction and maintenance cost savings over traditional stormwater systems
  - More cost effective to remove sediment, nutrients and waste prior to entering the lake
  - Healthy ecosystems
  - Improved infrastructure
  - Beautified neighborhoods

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Barriers to Implementation:

- Misunderstanding
- Traffic issues
- Parking issues
- Landscaping maintenance
- Functional maintenance (sedimentation)

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Identify projects:

- GIS as a tool:
  - Soils
  - Depth to water table
  - Existing stormwater issues
  - Space
  - Traffic issues
  - Parking issues
  - Existing stormwater infrastructure
  - Impaired water bodies
  - Proximity to other projects
    - Economies of scale for construction

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Preliminary Design:

- Factors to address:
  - Contributing watershed area
  - Necessary capacity
    - Storm size to capture (0.5” or .1”)
  - Nutrient Capacity
  - Relation to existing stormwater system
  - Percolation rates
  - Depth to water table
  - Soil amendments
  - Maintenance cycle for sediment removal (watershed specific)
    - Study historic maintenance logs where possible.

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Funding:

- Compounded benefits garner:
  - Community support
  - Grant funding
  - Public Private partnerships

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Final design:

- Things to keep in mind:
  - Adjacent slope
  - Depth
  - Line of sight
  - Traffic
  - Irrigation
  - Landscaping (xeric and inundated)
  - Flow vs. landscaping
  - Maintenance strategy
  - Possible sedimentation from existing watershed

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Publicity/education:

- Work with the surrounding community
  - During design
  - Prior to construction
- Study metrics and communicate benefit
- Encourage others to reach out to you if interested
- Create communication pieces to explain the compounded benefits to people
- Show people the projects

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Before:

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During Construction:

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Immediately After:

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After Grow In:

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Before:

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Before:

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Before:

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During Construction:

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Immediately After:

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Before:

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During Construction:

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Immediately After:

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After Grow In:

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Others:

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5 - years later?

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Things To Consider:

- Inlet design
  - Multiple small vs. singular large
- Outflow design
  - Does it run into a structure that fits with the aesthetics
- Landscaping
  - Will these plants handle all conditions (including velocity)
  - Will the plants selected bloom throughout the year
- Other runoff
  - Is there a way to incorporate other runoff into this project
- Multiple LID's (treatment trains)
  - Ex: perforated pipes in a rain garden to increase capacity
- Maintenance
  - How will this be resorted when the time comes. Can the accumulated sediment be removed easily? With minimal disturbance to the landscaping?

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Conclusion:

- We're still learning about LID's
  - Have proven to be very reliable tool for keeping sediment out of lakes
  - More variables to consider than traditional systems
  - Different maintenance issues
  - Most efficient metrics to measure effectiveness?
  - Be prepared for some trial and error
  - Just one tool in the toolbox
- Communicating the compounded benefits is key