Potential Effects of Reclaimed Water options on Nitrogen Loading to Tampa Bay

Holly Greening,
Tampa Bay Estuary Program

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Tampa Bay in the 1970s

- Phytoplankton and macroalgae dominated
- 50% loss of seagrass between 1950 and 1980
- Newspapers declared Tampa Bay "dead"
- State-sponsored modeling results indicated little recovery possible even with all nitrogen sources removed due to residual nutrients in the sediments

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Citizen-demanded action

- Citizens in Tampa demanded legislative action despite modeling results
- In 1978, State legislation (Grizzle Figg Act) for Tampa Bay required all wastewater treatment plants discharging in the Tampa Bay watershed to reach AWT standards (3 mg/l TN max) or 100% reuse within 3 years.
- Resulted in a 90% reduction of TN loading from WWTPs.

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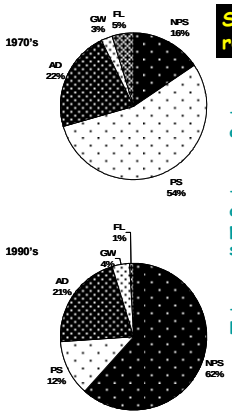

Significant nutrient reductions in late 1970s

-Total nitrogen loading in 1970s about 10,000 tons/year

-Total nitrogen loading 1998-2003 about 4,100 tons/year, due primarily to WWTP reductions starting in 1978.

- Overall nitrogen load reduction and large shift in predominant sources

Reference: Greening and Janicki 2006

250+ projects implemented between 1996-2008

Residential actions

Improved fertilizer handling at ports

Reduced industrial and municipal nitrogen loading to the bay

Reduced atmospheric deposition from power plants

Historic Chlorophyll *a* Compliance

AWT Standards take effect

Stormwater regulations enacted

Consortium actions initiated

- TMDL chl *a* Targets:
  - Hillsborough Bay: 15.0 ug/L
  - Old Tampa Bay: 9.3 ug/L
  - Middle Tampa Bay: 8.5 ug/L
  - Lower Tampa Bay: 5.1 ug/L

Year	Hills. Bay	Old Tampa Bay	Mid. Tampa Bay	Lower Tampa Bay
1974	Red	Red	Red	Green
1975	Red	Red	Red	Green
1976	Red	Red	Red	Green
1977	Red	Red	Red	Red
1978	Red	Red	Red	Green
1979	Red	Red	Red	Red
1980	Red	Red	Red	Red
1981	Red	Red	Red	Red
1982	Red	Red	Red	Red
1983	Red	Red	Red	Red
1984	Green	Green	Red	Green
1985	Red	Red	Red	Green
1986	Red	Red	Green	Green
1987	Green	Red	Red	Green
1988	Green	Green	Green	Green
1989	Green	Red	Green	Green
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1993	Green	Green	Green	Green
1994	Red	Red	Red	Red
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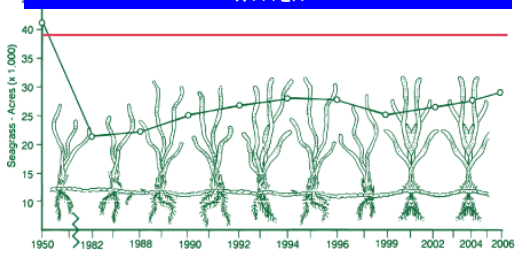
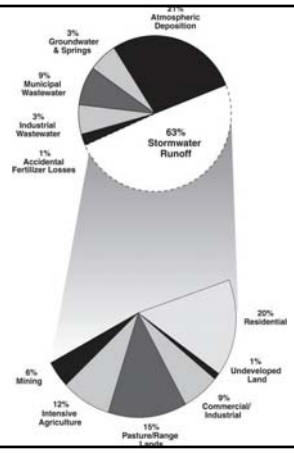
1998	Red	Red	Red	Red
1999	Green	Green	Green	Green
2000	Green	Green	Green	Green
2001	Green	Green	Green	Green
2002	Green	Green	Green	Green
2003	Green	Red	Green	Green
2004	Green	Red	Green	Green
2005	Green	Green	Green	Red
2006	Green	Green	Green	Green
2007	Green	Green	Green	Green

SEAGRASS ACREAGE INCREASES with CLEARER WATER



- Seagrass increase: ~8,000 acres since 1982
- Current rate of increase: > 500 acres per year



2003-2007 nitrogen contributions are distributed among many source types.

Point sources are now minor contributors:

Municipal WWTP 9%

Industrial 3%

All WWTP discharging to TB must meet Grizzle-Figg requirements (3 mg/l)

HF Curren TN load contribution to Tampa Bay

- Existing HF Curren total nitrogen load is 212 tons of TN/year (2003-2007 average)
- Total TN load target to Hillsborough Bay is 1451 tons TN/year
- HF Curren is currently contributing about 15% of the total TN load target for Hillsborough Bay

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Potential Reuse Options: Irrigation

- Residential/commercial landscape irrigation
  - Estimated 90% reduction of TN load to the Bay when compared to direct discharge (USGS studies in St. Petersburg)
  - If all were reused as irrigation, estimated reduction of ~190 tons TN per year

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Benefits and constraints: reclaimed as irrigation

- Potential significant nitrogen reduction to Tampa Bay
- Significant potable water offset
- Distribution is costly, no guarantee that residential customers will hook in
- Customers don't want or need irrigation in wet weather. Requires discharge during these times, or significant storage
- Little enhancement of potable water supply
- May result in increase TN load to streams or lakes in the watershed where used.

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Potential Reuse Options: Discharge to Created Wetlands

Green Cay Created Wetland: Palm Beach

Benefits and constraints: Created wetlands

- Rainfall-independent- all discharge could be received even in wet weather
- Significant nitrogen removal from Tampa Bay. Nitrogen removal could be enhanced by incorporating denitrification into design
- Single pipe
- Requires land for wetland creation
- May not significantly enhance potable water supply, although some enhancement is possible

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Potential Reuse Options: Creation of low-salinity habitat

- Introduction of freshwater reuse in upper reaches of tidal streams to create additional low-salinity habitat
- Low-salinity habitat critical for many bay-dependent fish species
- Used in Texas as fisheries production enhancement

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Benefits and Constraints: Creation of low-salinity habitat

- Creation of priority habitat for Tampa Bay
- Nutrient removal by vegetative uptake
- Potential for additional nutrients delivered to tidal tributaries- may require additional treatment to remove nitrogen
- Unknown- PPCP on juvenile fishes ?
- No potable water benefit

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Potential Reuse Options: Drinking water reservoir

- Nutrient removal directly from Tampa Bay, but increased nutrient input into Reservoir and downstream to Hillsborough River
- May require additional ambient treatment in the Reservoir to control algae concentrations
- Upper Hills. River is impaired for nutrients
- Significant potable water potential

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Summary

- Reuse options can provide nutrient reductions to Tampa Bay
- Some could also provide additional potable supply or potable offsets
- All options have constraints

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