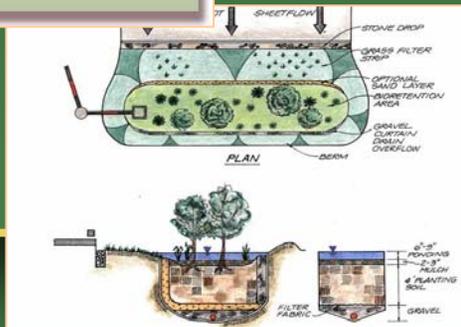
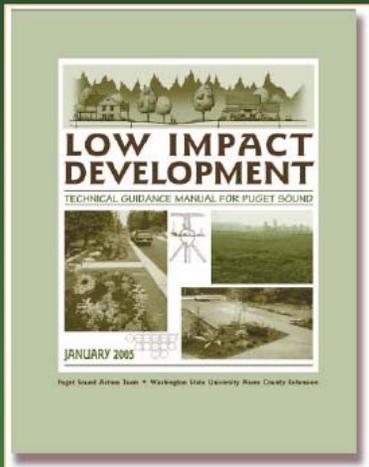


Low Impact Development in TMDL Programs

November 16, 2006

Gary Goforth, P.E., Ph.D.*



PHOTOS: RIVERSIDES STEWARDS ALLIANCE



PHOTO: JOAN IVERSON NASSAUER



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* <6% impervious lot

Will TMDLs affect you?

- *Hundreds* of “impaired” Florida water bodies for which TMDLs must be adopted
 - Multiple TMDLs per water body, e.g., DO and TP
- Cost impacts (conceptual estimates)
 - DEP consultants: \$3.49 billion to address urban runoff and septic tanks (2002)
 - Florida Stormwater Association \$1-\$5 billion (2002)
 - City of Tallahassee \$7,500 - \$35,000 per acre (2002)



USEPA's Guidance Manual for TMDL Implementation Plans

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Overview

- **Low Impact Development Basics**
- **TMDL Background**
- **Possible Applications of Low Impact Development in TMDL Programs**



Low Impact Development



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Low Impact Development (LID)

- LID attempts to model nature and match predevelopment hydrology through infiltrating, storing, filtering, evaporating, and detaining runoff.
 - Rainwater is a resource, not a waste product – and is a vital part of maintaining the ecosystem
- LID treats rainfall on-site by attempting to integrate control into site and building design in order to maintain hydrological function.



Model LID Principles

- In 1996, the Maryland-based Center for Watershed Protection convened a Site Planning Roundtable of diverse interests involved in planning, designing, and building new communities.
- This group worked for nearly two years to develop a set of 22 model development principles.
 - *The Smart Watershed Benchmarking Tool*
www.cwp.org/Downloads/ELC_SWBT.pdf



MASSACHUSETTS LOW IMPACT DEVELOPMENT TOOLKIT

Low Impact Development

Principles, Techniques, and Implementation



Slide show
prepared by:



In coordination with:



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www.mapc.org/regional_planning/LID/LID_Toolkit_Slide_Show.ppt

Numerous LID Manuals on the Web

- *LID Technical Guidance Manual for Puget Sound*

www.psat.wa.gov/Programs/LID.htm

- **LID Design Resource**

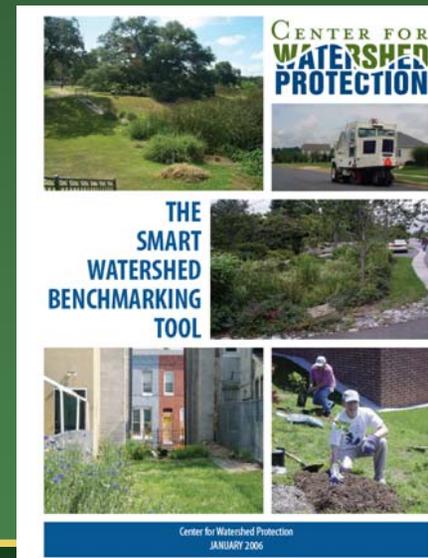
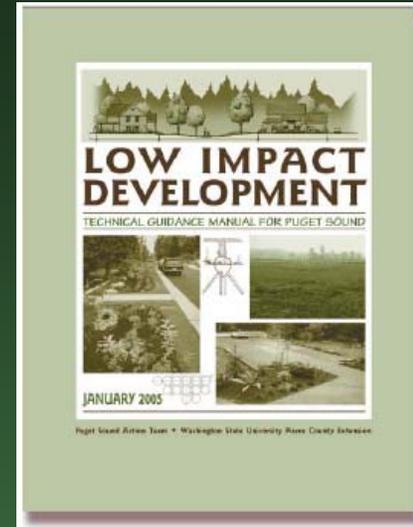
www.lid-stormwater.net

- **Low Impact Development Center**

www.lowimpactdevelopment.org

- Wealth of LID information available

229,000 hits on recent Google search!



Total Maximum Daily Loads



What is a TMDL?

Sections 403.031 and 403.067 define a TMDL as the maximum amount of a pollutant that a water body or water segment can assimilate from all sources without exceeding water quality standards.

The TMDL shall also account for seasonal variations and include a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.



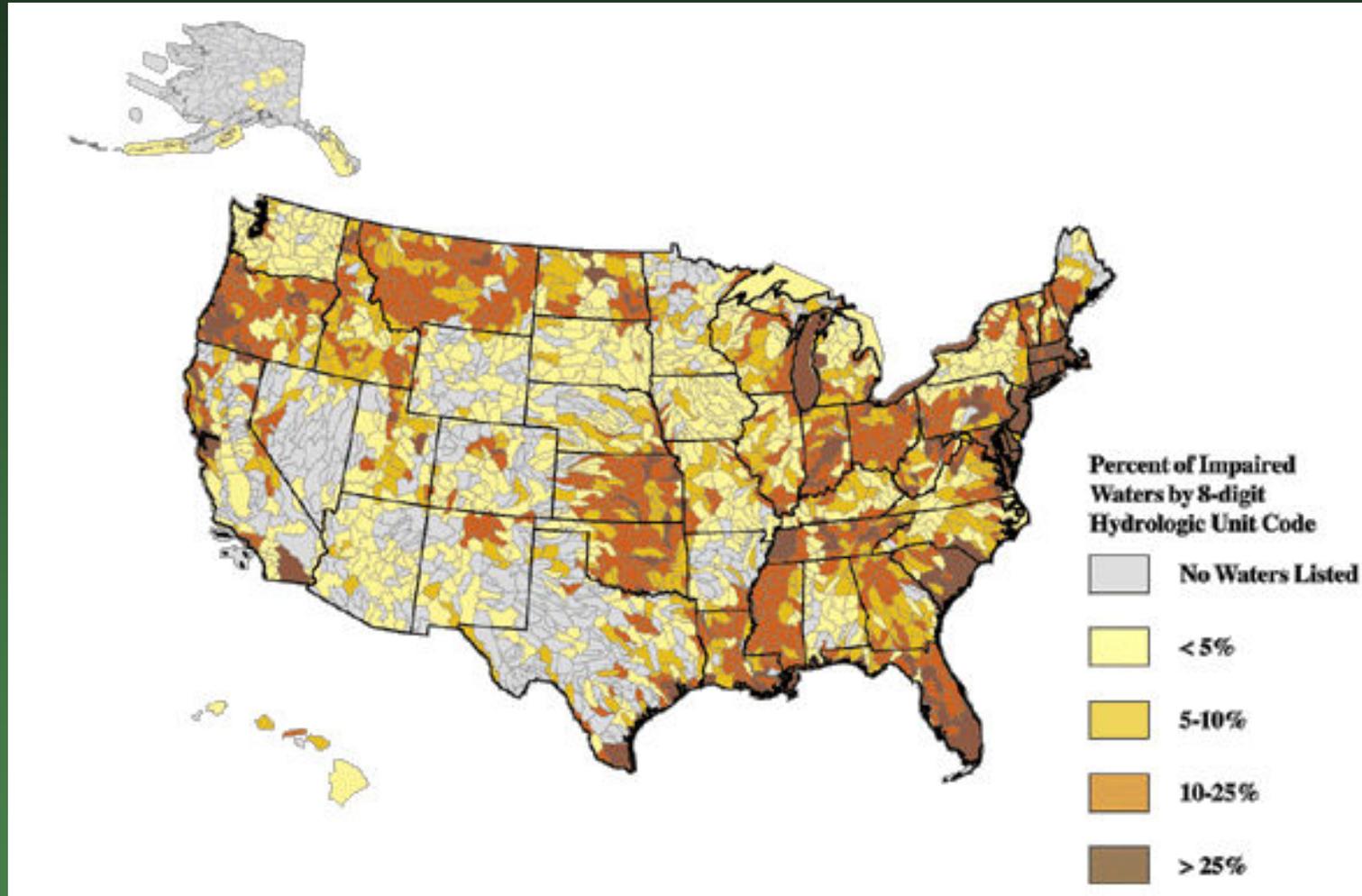
What's the difference between a TMDL and a Water Quality Standard?

A "water quality standard" is defined as

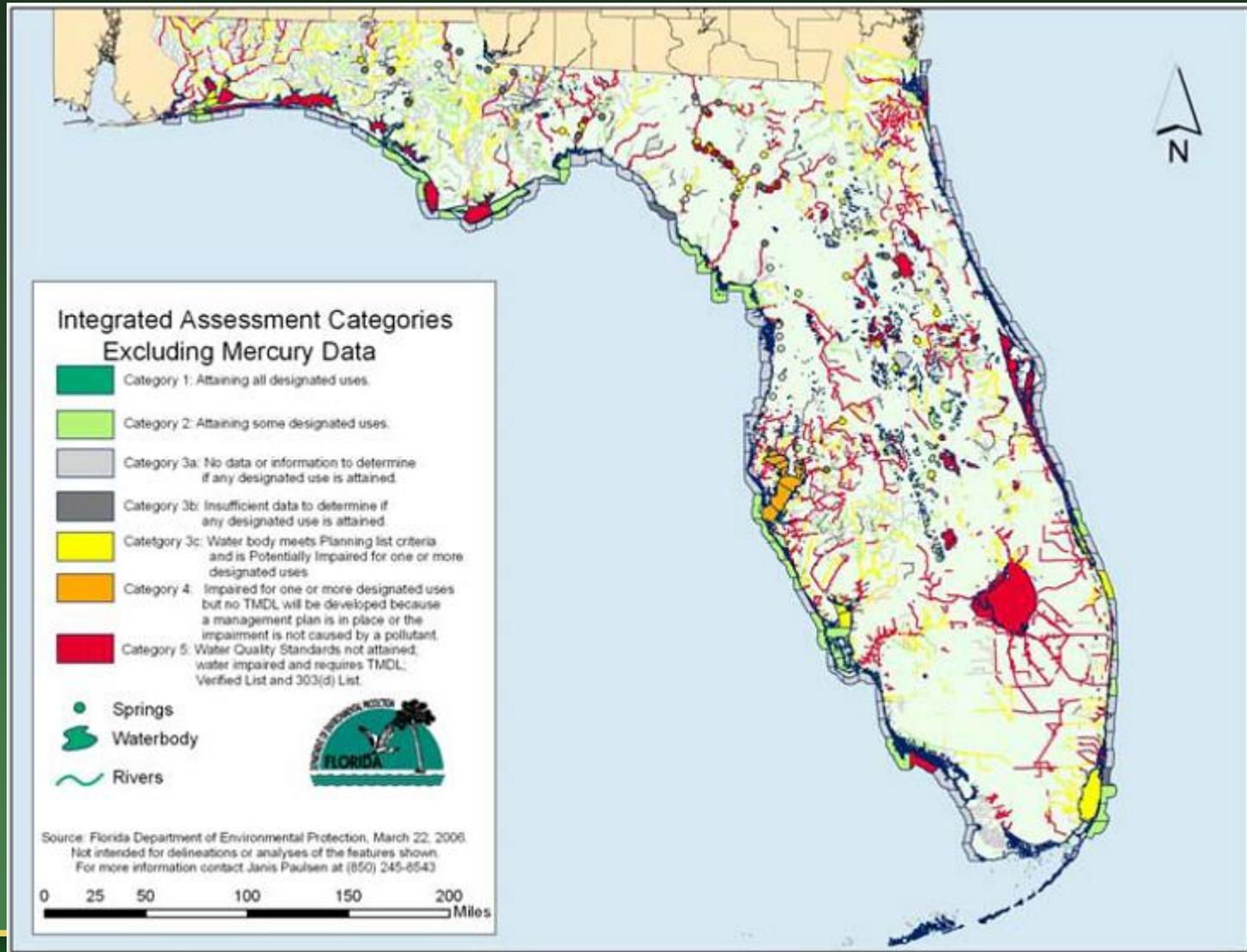
1. the designated present and future beneficial use of a water body, such as Class I relating to potable water supply use, or Class III relating to recreation, propagation and maintenance of fish and wildlife, etc.; and
2. the numerical and narrative criteria applied to those classifications; and
3. Florida's anti-degradation policy; and
4. the moderating provisions contained in Chapters 62-4 and 62-302, such as mixing zones and site specific alternative criteria. Rule 62-302.200(30), F.A.C.



Atlas of America's Polluted Waters

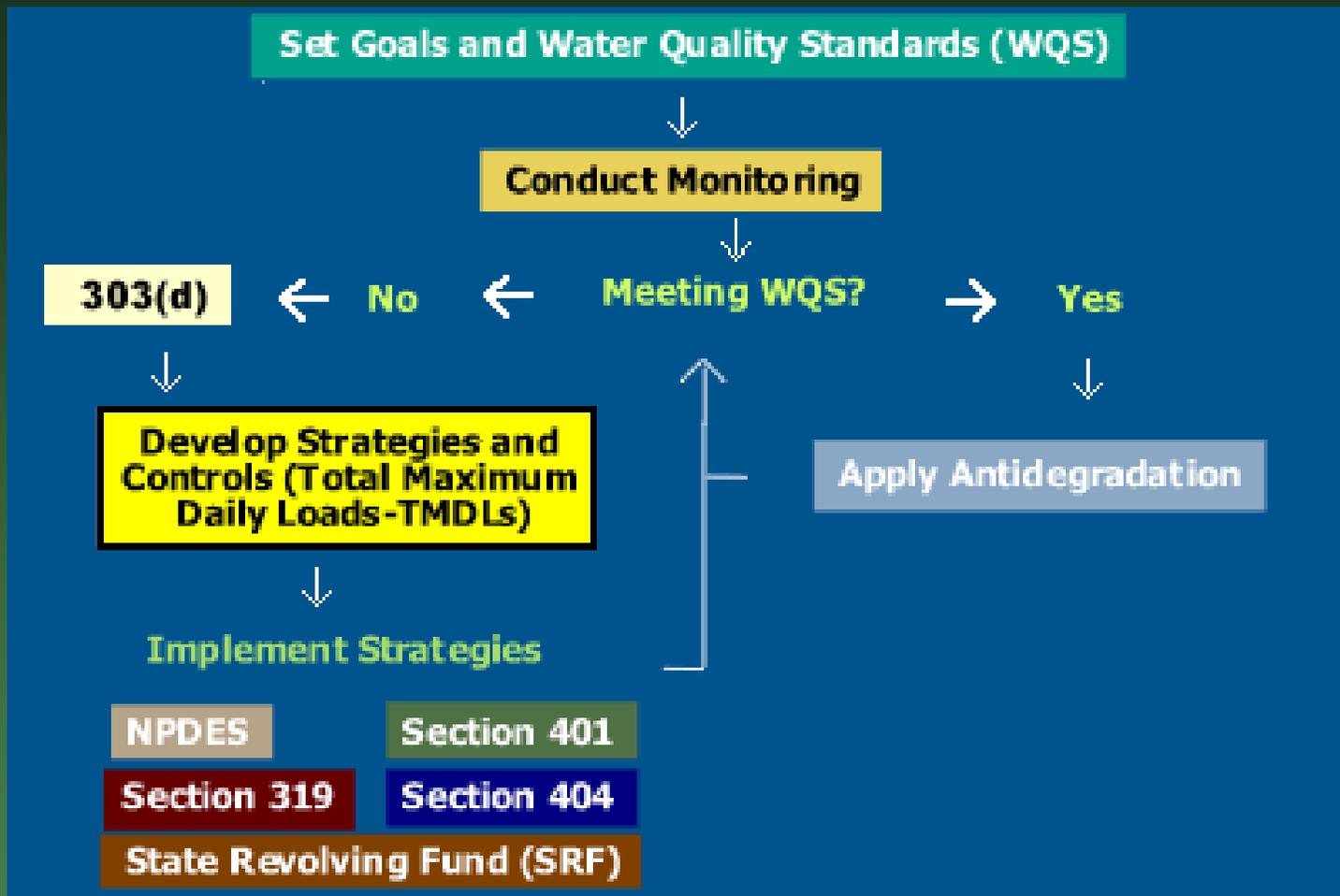


Low Impact Development in TMDL Programs



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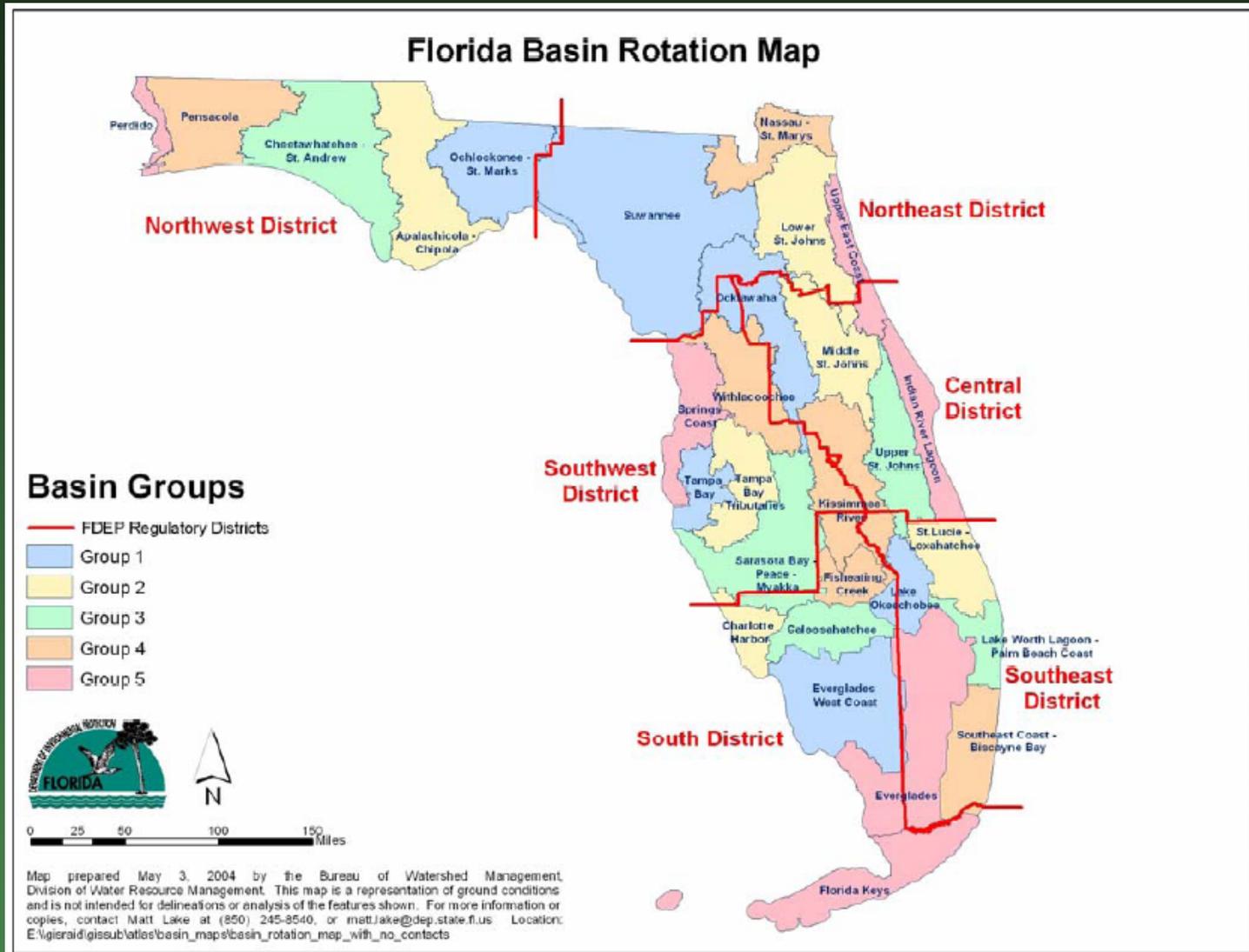
Also – Sec. 320 – National Estuary Program



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From EPA website: www.epa.gov/watertrain/cwa/index.htm

Low Impact Development in TMDL Programs



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Low Impact Development in TMDL Programs

■ **Phase 1:** Preliminary Evaluation of Water Quality

■ **Phase 2:** Strategic Monitoring and Assessment to Verify Impairments

■ **Phase 3:** Development and Adoption of TMDLs

■ **Phase 4:** Development of a Basin Management Action Plan to Achieve TMDLs

■ **Phase 5:** Implementation of the Plan and Monitoring of Results

Basins by Group and DEP District Office

DEP District	Group 1 Basins	Group 2 Basins	Group 3 Basins	Group 4 Basins	Group 5 Basins
NW	Ochlockonee-St. Marios	Apalachicola-Chipola	Choctawhatchee-St. Andrews Bay	Pensacola Bay	Perdido Bay
NE	Suwannee	Lower St. Johns		Nassau-St. Marys	Upper East Coast
Central	Ocklawaha	Middle St. Johns	Upper St. Johns	Kissimmee	Indian River Lagoon
SW	Tampa Bay	Tampa Bay Tributaries	Sarasota Bay-Peace Myakka	Withlacoochee	Springs Coast
S	Everglades West Coast	Charlotte Harbor	Caloosahatchee	Fisheating Creek	Florida Keys
SE	Lake Okeechobee	St. Lucie-Loxahatchee	Lake Worth Lagoon-Palm Beach Coast	Southeast Coast Buscayne Bay	Everglades

Basin Rotation Schedule For TMDL Development and Implementation

Year	00	01	01	02	02	03	03	04	04	05	05	06	06	07	07	08	08	09	09	10
Group 1	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Group 2		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4
Group 3			Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3
Group 4				Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2
Group 5					Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1
1st Five-year Cycle - High Priority Water											2nd Five-year Cycle - Medium Priority Water									



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www.dep.state.fl.us/water/tmdl/cycle.htm

www.florida-stormwater.org/pdfs/tmdlmanual.pdf

No TMDL Required If:

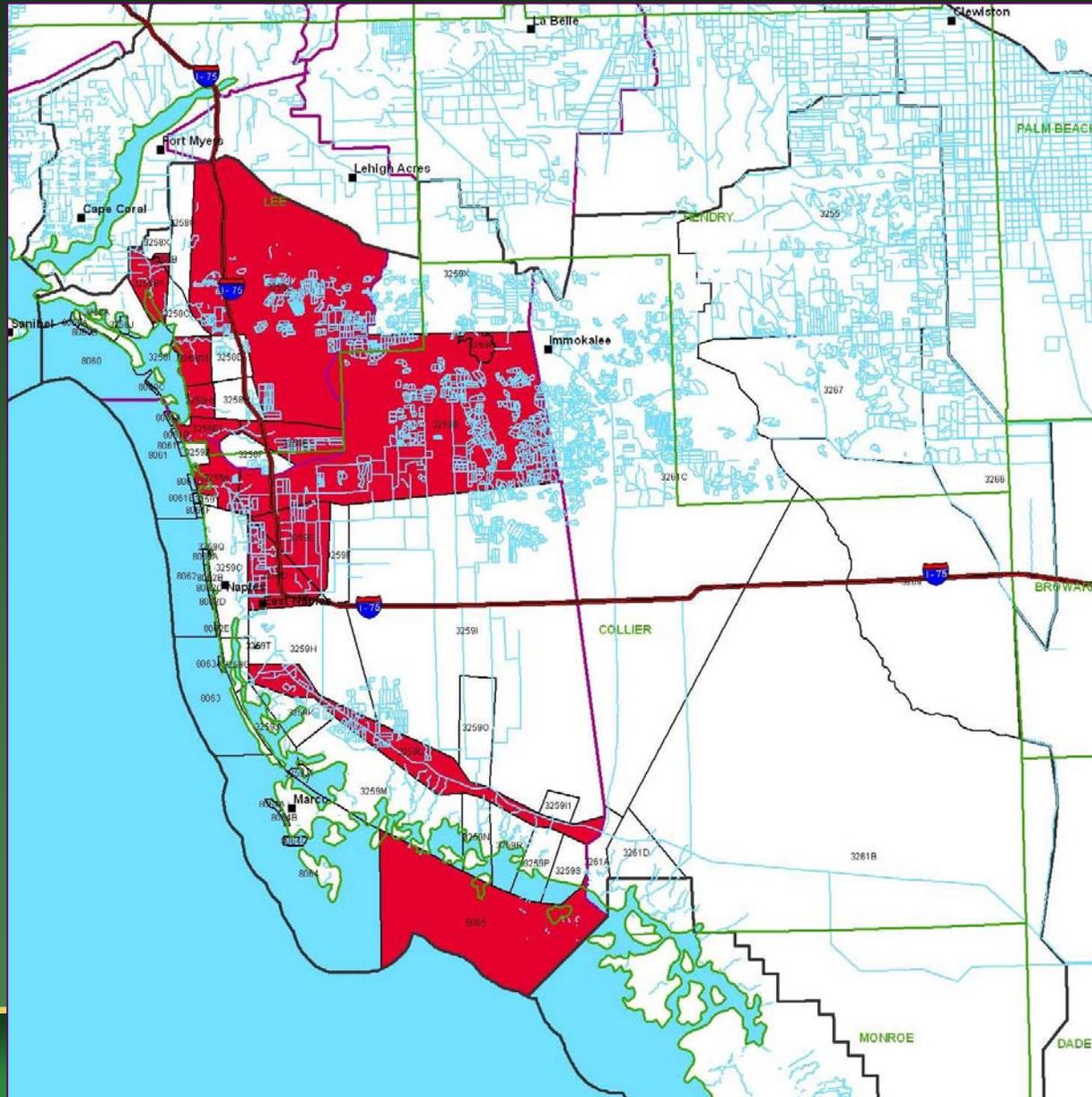
- (a) technology-based effluent limitations and other pollution control programs under local, state, or federal authority, including Everglades restoration activities pursuant to § 373.4592, which are designed to restore such waters for the pollutant of concern would result in attainment of water quality standards; or
- (b) the impairment of such waters is due solely to activities other than point and nonpoint sources of pollution.



Low Impact Development in TMDL Programs

Everglades West Coast

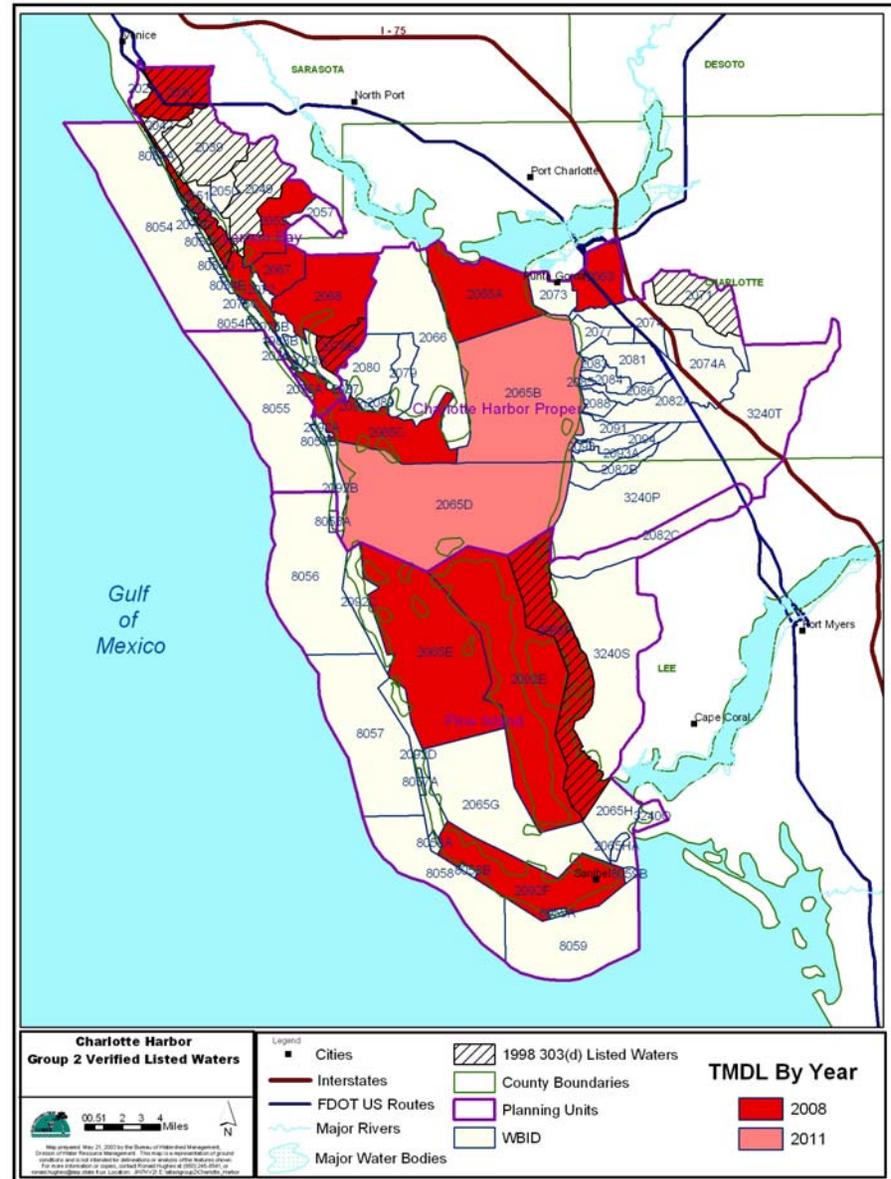
Group 1 Basin
Verified Impaired
Waters and
Segments of
water bodies



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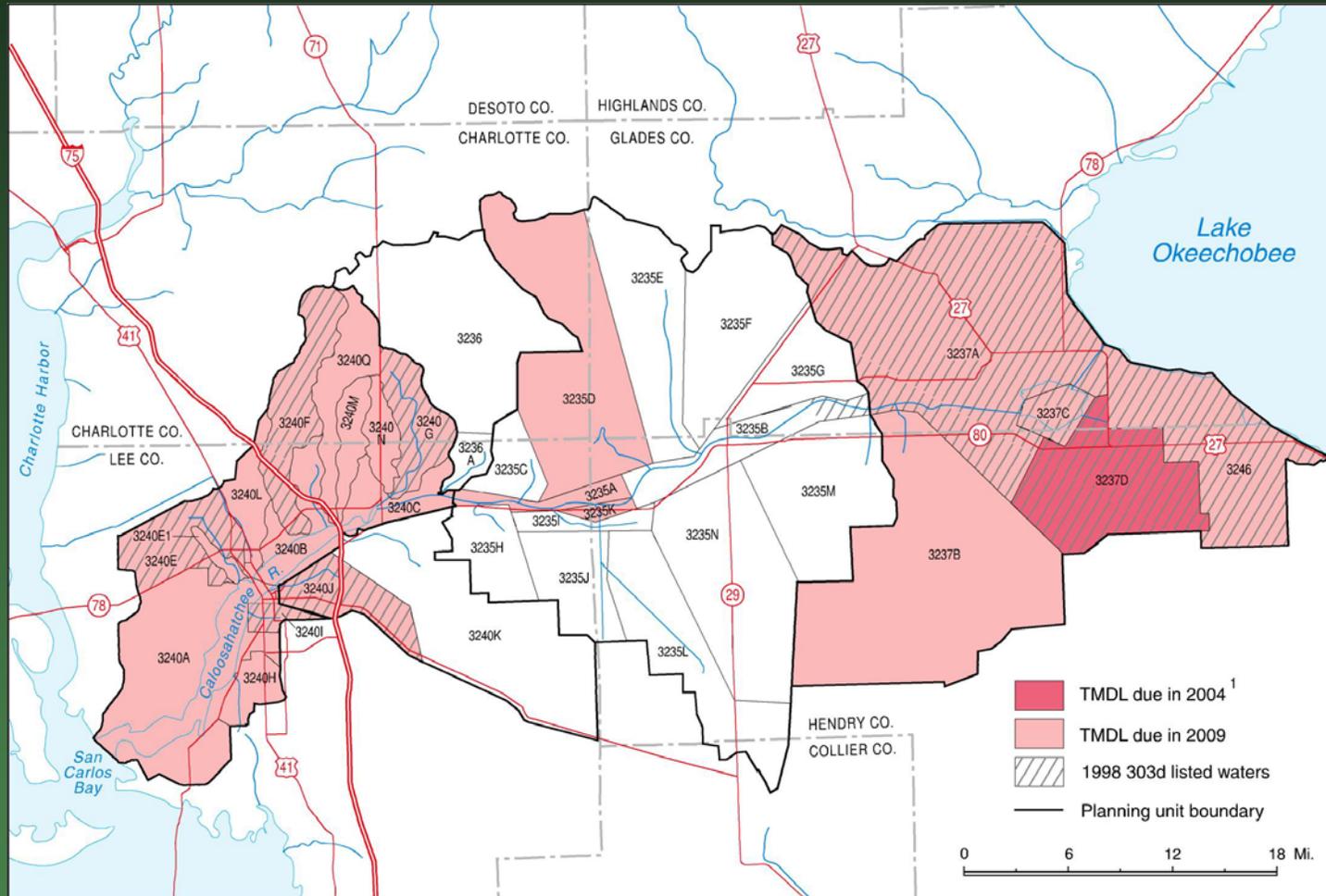
Charlotte Harbor

Group 2 Basin
Verified Impaired
Waters and
Segments of
water bodies



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Caloosahatchee River Basin - Group 3 Basin



¹ Note: WBID 3237D has a highpriority TMDL due in 2004, and a medium priority TMDL due in 2009.



Pat Fricano (FDEP) Watershed Coordinator

- Southwest Florida and Lake Okeechobee Basins
 - (850) 245-8559
- Pat's Points to Ponder:
 1. Nutrient reduction is critical – especially nonpoint source stormwater.
 2. Outside of nutrients and DO, coliform bacteria is the other “big issue”. Surface water to ground water connections – which is particularly problematic in areas with high water tables and septic systems.
 3. Fresh water volume reduction – and its not just Lake Okeechobee.



How Are TMDLs Implemented?

Federal Law:

The CWA is silent with regard to TMDL implementation (as opposed to adoption). However, EPA NPDES regulations require point source permits to be in accordance with TMDLs. Non-point source permitting is unclear.

State Law:

Florida has a very aggressive TMDL Statute, Section 403.067, Florida Statutes, that mandates their implementation.

Increasing attention as deadlines loom; significant statutory amendments in 2005.



How Are TMDLs Implemented?

DEP and WMDs are obligated to incorporate TMDLs into their discharge permits.

Critical question faced by the water management districts and local governments: what is the appropriate level of involvement in development of TMDLs, allocations and Basin Management Action Plans?



Basin Management Plan Development

- Objective: DEP to work with local stakeholders to develop a BMAP to specify how goals will be achieved
 - recommending activities,
 - establishing who is responsible for implementation,
 - establishing a schedule for implementation, and
 - noting how the effectiveness of the plan will be assessed.

- Specific tasks include:
 - Coordinate with DEP staff in other program areas and local stakeholders to draft a BMAP
 - Identify appropriate regulatory and voluntary programs
 - Conduct at least one public workshop to discuss the draft BMAP
 - DEP to formally adopt the BMAP



Possible Applications of LID in TMDL Programs



Possible Applications of LID in TMDL Programs

- **In General:**
 - **Everyone developing, or permitting development, can apply LID**

- **Proactive approach to TMDLs**
 - **Institutionalize**
 - **Incorporation into Basin Management Action Plans (BMAPs)**



Possible Options for LID Implementation by Local Governments

- Municipal Separate Storm Sewer Systems permit strategy
- Public works capital programs
 - Stormwater system upgrades - rain gardens, porous pavement, etc.
 - Minimize infrastructure; safety and vector control benefits
 - Possible reduction in maintenance and replacement costs
 - Practices that don't require input or participation by the property owner include recharge areas, drainage courses, buffer zones, infiltration swales, and open drainage systems.
- Perception is critical
 - Advertise “green” infrastructure so that people can recognize it from the beginning as something that they like and value
- Ordinances and bylaws





LID IMPLEMENTATION

Stormwater/LID Bylaw

Replace the “patchwork” of stormwater codes with a single set of local standards

Establish Stormwater Permitting Authority to review all projects over a certain size

Specify performance standards

Utilize expert review when necessary

Permit/promote the use of LID techniques

Require a maintenance plan



Potential LID Requirements and Incentives Issaquah, Washington (3/30/06)

■ LAND USE CODE

1. Impervious surface limits (Credit for Green roof)
2. Parking requirements
3. Open space preservation and native growth protection and restoration
4. Transfer of Development Rights (TDR)
5. Landscape Code: Soil restructuring, native soil retention and stockpiling

■ CRITICAL AREAS CODE

6. Critical aquifer recharge area (CARA)
7. Critical areas and buffers (streams, wetlands, steep slopes)

■ CLEARING & GRADING CODE

8. Reference LID and stock pile of native soil



Potential LID Requirements and Incentives of Issaquah, Washington (concluded)

■ STORMWATER MANAGEMENT AND UTILITY CODES

9. Flow control (Pre-developed condition)
10. Water quality treatment
11. Infiltration
12. Stormwater LID requirements for new development

■ STREET STANDARDS

13. Reduced impervious surfaces through deviations to standards:

■ OTHER

14. Permitting
15. Public Recognition
16. Education



Model ordinance and example ordinances
available at

www.stormwatercenter.net “Ordinances”



LID Implementation by Water Management Districts

- Public works capital programs
- Coordination with Dept. of Agriculture and Consumer Services and DEP regarding non-agricultural nonpoint source control
- Coordination with landowners in development of Basin Management Action Plans (BMAPs)
- Environmental resource permits - obligated to incorporate TMDLs into discharge permits
 - Retain “pre-development” storm volumes on-site
 - Perhaps retention of highest rain event that is ecologically desirable (10-yr, 25-yr or 100-yr)
 - Integrated into water conservation program
 - Groundwater recharge – coupled with consumptive use permits?



DEP Incorporation of LID

- **Coordination with local governments, water management districts, DACS, the public in developing BMAPs**
- **Development of stormwater rules**
- **Just ask Eric!**



Wealth of LID Implementation Information Available

- **Florida Stormwater Association**
www.florida-stormwater.org
- **Center for Watershed Protection**
www.cwp.org
- **Stormwater Manager's Resource Center**
www.stormwatercenter.net



Low Impact Development in TMDL Programs

Florida DEP, Bureau of Watershed Management TMDL Program

www.dep.state.fl.us/water/tmdl/index.htm

Identification of Impaired Surface Waters Rule

www.dep.state.fl.us/water/tmdl/docs/AmendedIWR.pdf

2004 305(b) Report www.dep.state.fl.us/water/docs/2004_Integrated_Report.pdf

Criteria for Surface Water Quality Classifications

www.dep.state.fl.us/legal/rules/shared/62-302t.pdf

Basin Status Reports www.dep.state.fl.us/water/tmdl/stat_rep.htm

Water Quality Assessment Reports

www.dep.state.fl.us/water/tmdl/stat_rep.htm

Allocation Technical Advisory Committee (ATAC) Report

www.dep.state.fl.us/water/tmdl/docs/Allocation.pdf

U.S. Environmental Protection Agency Region 4: Total Maximum Daily Loads in Florida

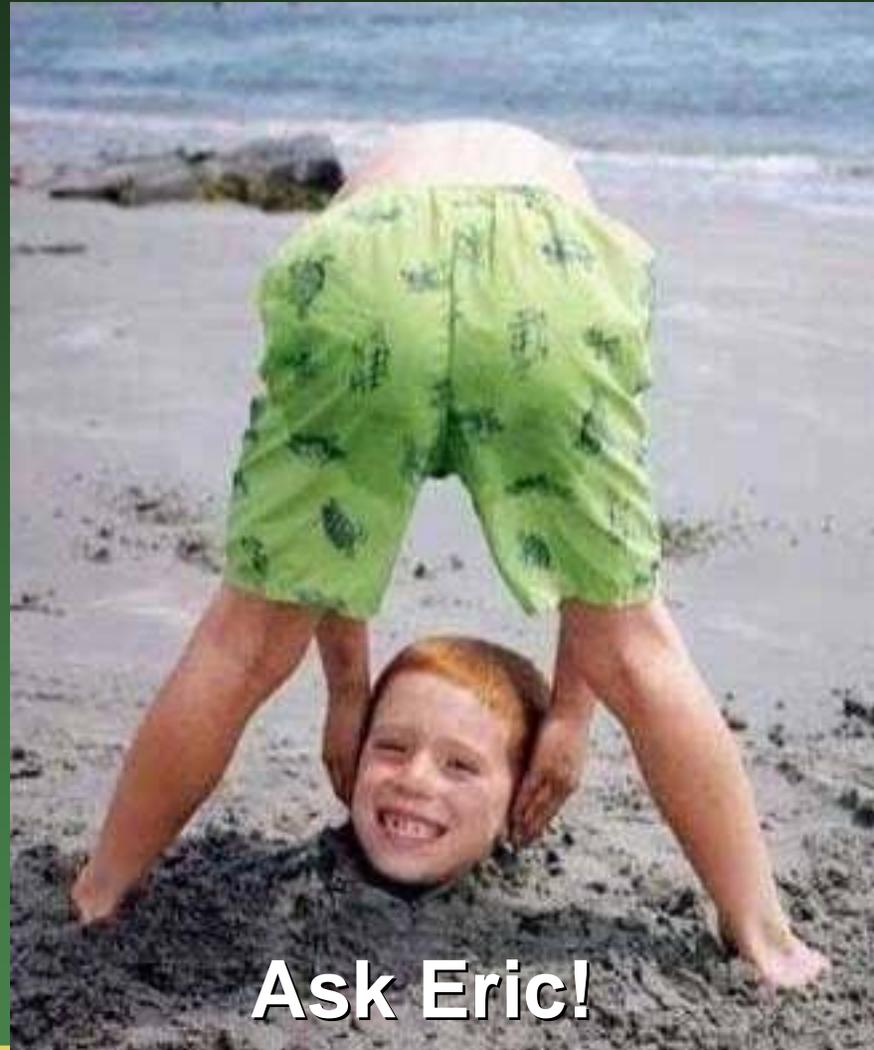
www.epa.gov/region4/water/tmdl/florida/



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Low Impact Development in TMDL Programs

Any questions?



Ask Eric!



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Potential Low Impact Development

Requirements and Incentives

Issaquah, Washington

March 30, 2006



Low Impact Development in TMDL Programs

OVERVIEW OF POTENTIAL LID (Low Impact Stormwater Development) REQUIREMENTS AND INCENTIVES (Revised March 30, 2006 draft)

LID ^a Technique	LID in Existing Code			Enhanced LID Policy			Implementation	
	Mandatory	Voluntary	Incentive for Voluntary	Mandatory	Voluntary	Incentive for Voluntary	Effectiveness ^b	Schedule / Priority / Lead
LAND USE CODE								
1. Impervious surface limits (18.07.360) Credit for Green roof calculations	Maximum impervious limits based on zoning: - LD Res.: 30-40% - MF Res.: 50% - Commercial: 65% - CBD: 85%	None	n/a	Change "purpose & intent" of impervious surface for open space/ green landscaping area	Lowered impervious surface limits in exchanged for increased development density	Increased density with open space preservation (exclusive of critical areas)	Moderate – may conflict with zoning and land use objectives.	2006 - 2007 / Planning LID Recommendations from the AHBL study will be reviewed and incorporated where appropriate
2. Parking requirements	None	None	n/a	Reference: LID Stormwater Code Reduced parking requirements?	None	n/a	Moderate – may conflict with zoning and land use objectives.	2006 - 2007 / Planning
3. Open space preservation and native growth protection and restoration	None (except: Critical area code requires NGPE designation)	Varies – negotiated through development agreements	Open space preservation in exchanged for increased development density and/or changed use	Require open space with native vegetation: - Urban residential: 35% - Non-residential: 10%	Make developer agreement process easier for small sites.	Increased density with open space preservation (exclusive of critical areas)	Moderate – may conflict with zoning and land use objectives.	2006 - 2007 / Planning LID Recommendations from the AHBL study will be reviewed and incorporated where appropriate
4. Transfer of Development Rights (TDR)	None	TDR program - selling of development rights to reduce density in or adjacent to critical areas	Landowner receives payment based on market price of TDR credits.	None	Expand TDR program	More properties qualify for TDR	High – reduces development near critical areas where it could have greatest impact.	2006 - 2007 / Planning TDR program in process
5. Landscape Code: Soil restructuring, native soil retention and Stockpiling of top soil	None	None	n/a	Soil preparation and restructuring for all landscaping (not including native retention areas). Rehabilitation of all soils disturbed by construction (outside of native growth retention)	None	None	High – improves ability of soils to infiltrate rainfall, with no impact on density/zoning standards	2006 - 2007 / Planning The landscape code is scheduled to be amended in 2006
CRITICAL AREAS CODE								
6. Critical aquifer recharge area (CARA)	Recharge 90% of stormwater volume (2-yr event) in CARA Zones 1-3 (proposed)	None	None	None address higher standards through LID stormwater code	None		High – maximizes infiltration in areas where it has most beneficial effect to aquifer	Spring 2006 / Planning Council (Peter/LUC)
7. Critical areas and buffers (streams, wetlands, steep slopes)	Preservation of critical areas and buffers, with density credits allowed to compensate land owner	None	n/a	Reduction in density credits?	None	n/a		Spring 2006 / Planning Council/LUC (Peter)
CLEARING & GRADING CODE								
8. Reference LID and stock pile of native soil (and criteria is in the Land Use Code)	None	None	n/a	See above	See above	See above	High – improves ability of soils to infiltrate rainfall	2006-2007 / PWE Code amended to cite LUC



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www.ci.issaquah.wa.us/Files/POTENTIAL%20LID%20REQUIREMENTS%20AND%20INCENTIVES%203-30-06.pdf

Low Impact Development in TMDL Programs

LID ^a Technique	LID in Existing Code			Enhanced LID Policy			Implementation	
	Mandatory	Voluntary	Incentive for Voluntary	Mandatory	Voluntary	Incentive for Voluntary	Effectiveness ^b	Schedule / Priority / Lead
STORMWATER MANAGEMENT AND UTILITY CODES								
9. Flow control	Pre-developed condition: existing site conditions (1998 KC storm manual) Peak flow standard: Level 1 (2-yr and 10-yr) in valley, and Level 2 (50% of 2-yr to 50-yr) hillsides	None	Stormwater code allows for recharge in any location, at developers option.	Assume forested pre-developed condition for all new and replaced impervious surfaces (2005 KC/Ecology storm manuals). Subject to legal review of vesting issue. Peak flow standard: Level 2 all areas.	None	n/a	High – flow control/detention minimizes impacts to receiving waters, although at high cost particularly for redevelopment projects.	Fall 2006 / PWE Council/ Utilities Committee (Kerry) as part of 2005 Stormwater Manual adoption
10. Water quality treatment	Water quality treatment per Ecology manual - TSS: 80% treatment - Phosphorus: 50% treatment	None	n/a	No change – more effectively addressed in other stormwater management and LID actions (i.e., reduction in impervious surface, infiltration)	Case-by-case evaluation in large projects as part of SEPA / Developer Agreements		Low – no options available for improving treatment BMPs.	No action needed
11. Infiltration	None. Stormwater code doesn't require infiltration.	Storm fee reduction for facilities meeting high standards (infiltration of >10-year event)	Reduction of storm fee for infiltration: - 30% for 10-yr event - 40% for 50-yr event - 50% for 100-yr event (note: <u>no</u> developers have applied for this incentive).	Make infiltration mandatory for flow control City-wide unless site conditions make it infeasible Adopt CARA infiltration City-wide through LID Stormwater Code – See #12.	Make financial incentives more attractive.	Additional reduction of storm fee for infiltration, or reduction of stormwater capital facility charge.	High – mandatory requirements would be very effective. Incentives may also work, but participation is low and may impact Storm Utility revenue.	Fall 2006 / PWE Council/ Utilities Committee (Kerry) as part of 2005 Stormwater Manual adoption
12. Stormwater LID requirements for new development: - Dispersion - Bioretention (rain garden) - Vegetated roof - Rainwater harvesting	None	Rainwater harvesting: reduction in fee for rain barrels on downspouts (state law)	Rainwater harvesting: 10% reduction in storm fee	Adopt mandatory LID requirements in Stormwater manual, in order of preference (see footnote c): - Full dispersion of all runoff, assuming adjacent NGPE is available. - Full infiltration of all runoff, assuming favorable soils. - Pervious pavement for at least 50% of parking and sidewalks, or other approved LID design in an equivalent amount.	Incentive-based LID credits, depending on site conditions (see footnote d): - Dispersion - Detention credits for reducing impervious surface (pervious pavement, partial infiltration, - Onsite retention (rain gardens, rain harvesting etc.)	Detention credits will result in reduced stormwater facility sizes, lowering construction costs.	High – mandatory LID requirements would be very effective, if made clear in the code. Current KC manual is difficult to interpret. Making infiltration mandatory only in areas where soils are favorable makes practical sense.	Fall 2006 / PWE Council/ Utilities Committee (Kerry) as part of 2005 Stormwater Manual adoption
STREET STANDARDS								
13. Reduced impervious surfaces through deviations to standards: - Reduced street widths - Swale instead of curb/gutter - Pervious pavement and sidewalks - Bioretention in swales	None	Administrative deviations from code allowed upon approval of LID proposals	Lower construction costs due to reduced pavement widths and smaller stormwater facility sizes	Revised policies city-wide for Street Standards, for approved street widths. Other mandatory requirements may be imposed or negotiated in certain situations, such as under SEPA review, master site plans, developer agreements, etc.	Alternative LID street designs approved, subject to administrative approval.	Stormwater detention credits due to reduced impervious surfaces and partial infiltration.	High – Reduced street widths, resulting in less impervious surface. Low to Moderate – Alternate LID design can compromise street functions and normally require additional maintenance.	????? / PWE Kerry and Todd: Schedule to be determined
OTHER								
14. Permitting	None	None, except for education (see below)	None	Require LID assessment for all city & private projects, assessment to be done by dedicated City staff	LID education during permitting to: - educate developers - expedite permit review - improve City standards/code	Incentives: - Improved service for developers will increase interest in LID. - Reduced permit fees - Faster turn-around	Low – Requires aggressive City program with dedicated staff to integrate LID review in all permits. Could improve to moderate effectiveness over time.	



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www.ci.issaquah.wa.us/Files/POTENTIAL%20LID%20REQUIREMENTS%20AND%20INCENTIVES%203-30-06.pdf

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LID ^a Technique	LID in Existing Code			Enhanced LID Policy			Implementation	
	Mandatory	Voluntary	Incentive for Voluntary	Mandatory	Voluntary	Incentive for Voluntary	Effectiveness ^b	Schedule / Priority / Lead
15. Public Recognition	None	Self recognition (e.g., Port Blakely)	Developments are favorably promoted as "green" or "sustainable"	None	RCO program to provide recognition to projects/developers who implement LID	Developments are favorably promoted as "green" or "sustainable"	Unknown. Typically dictated by developer marketing interests only.	
16. Education	None	Staff provides assistance on LID techniques as needed.	Not much – few (if any) developers see any benefit of adding LID to their projects, regardless of how much information is provided by staff.	Amount of Staff support for mandatory LID requirements is dependent on complexity of code requirements.	LID Review Team formed to: - educate developers on LID - expedite permit review	City to develop LID materials: - LID street/storm standards - LID permitting guidebook - LID Review Team	Low – experience had demonstrated that voluntary LID approach requires considerable staff time with little if any result.	

^a LID is defined as techniques that reduce stormwater flow rate, stormwater volume, and water quality impacts from a development site.

^b Effectiveness is defined as ability of LID measure to 1) make a measurable impact in stormwater runoff characteristics, and 2) can be implemented within current City regulatory or staffing structure. (High / Medium / Low)

c Mandatory Stormwater LID requirements:

d Voluntary (incentive-based) Stormwater LID requirements:



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www.ci.issaquah.wa.us/Files/POTENTIAL%20LID%20REQUIREMENTS%20AND%20INCENTIVES%203-30-06.pdf