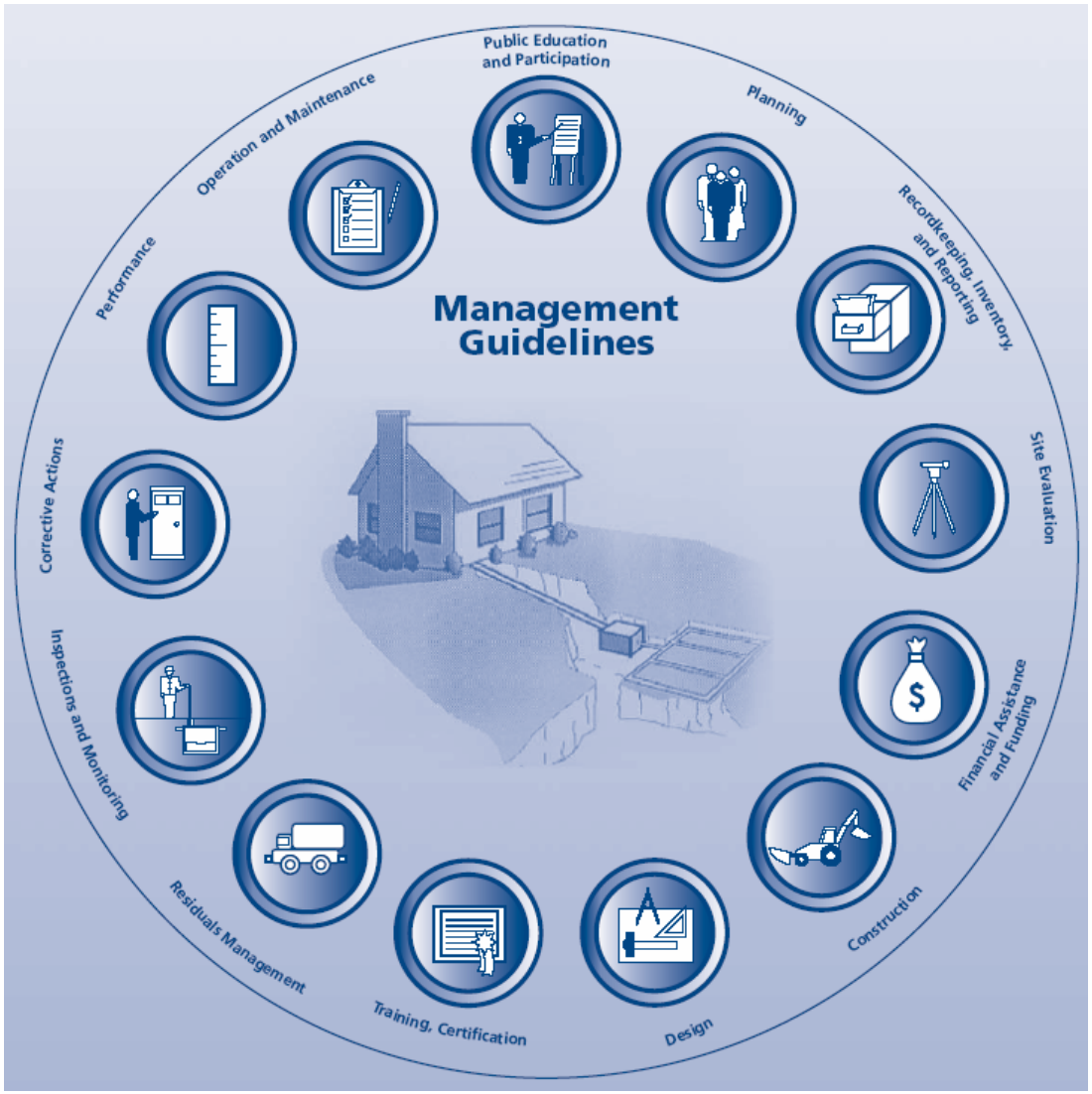
A range of cost-effective strategies …… DRAFT

Some concepts for discussion

E. Roeder

Strategy Elements



Draft 05/08/07, has not undergone agency review

Who implements?

- Management levels
  - Homeowner awareness:
    Property owner within the framework of state and local construction standards
  - Maintenance contract:
    Property owner within the framework of state and local construction permits
  - Operating permit:
    Property owner within the framework of state and local construction, operation and maintenance standards
  - Responsible Management Entity (RME) for operation and maintenance:
    property owner constructs, RME ensures operation and maintenance
  - Responsible Management Entity (RME) ownership (utility):
    RME oversees construction, operation and maintenance
- Department of Health is permitting agency implementing state and local onsite regulations

Strategy Elements

- Recordkeeping, Inventory
- Performance Requirements
- Planning
- Financial Assistance and Funding
- Assuring Performance
  - Training and Certification
  - Site Evaluation
  - Design
  - Construction
  - Operation and Maintenance
  - Inspection and Monitoring, Reporting
- Corrective Action
- Public Education and Participation
- Residuals Management

Strategy Element Recordkeeping, Inventory

- Status
  - Wekiva Study Area coverage of improved properties without sewer (October 2004)
  - OSTDS Permitting Records
    central database and county datasets (~1997-2006)
- Could be implemented by County Health Departments, Property Tax appraisers, responsible management entities

1: Create and maintain current inventory of OWTS

Example of Inventory Question: Age of Systems

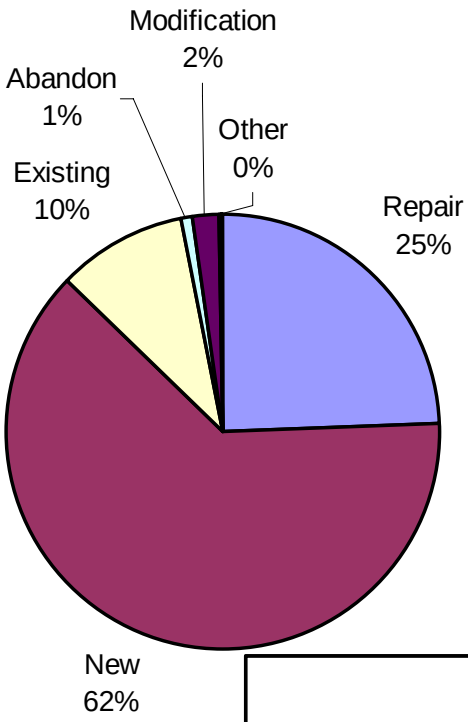
COUNTY	1970(census)	1982	1990	1997-98
Lake	26%	50%	65%	83%
Orange	43%	57%	87%	95%
Seminole	37%	59%	83%	93%
TOTAL	36%	55%	79%	91%

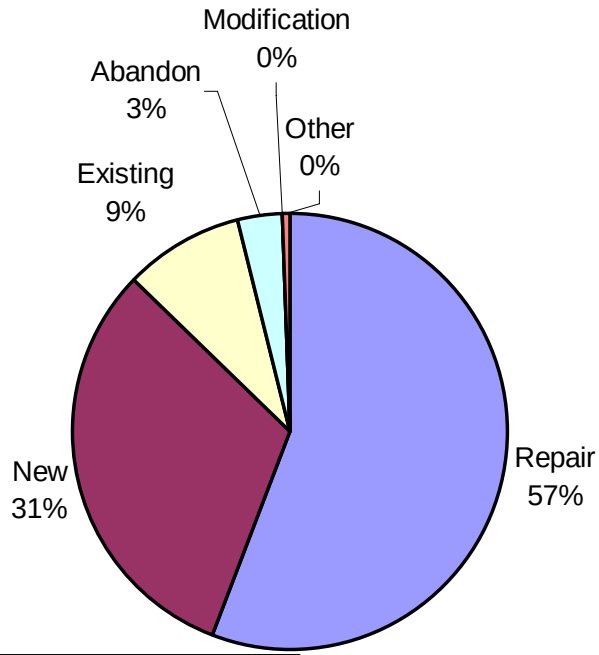
Percent of the total number of OWTS at end of fiscal year 2004/2005 that had been originally installed by 1970, 1982 (water table separation requirement), 1990, and 1997/1998 (prior to permitting database**).**

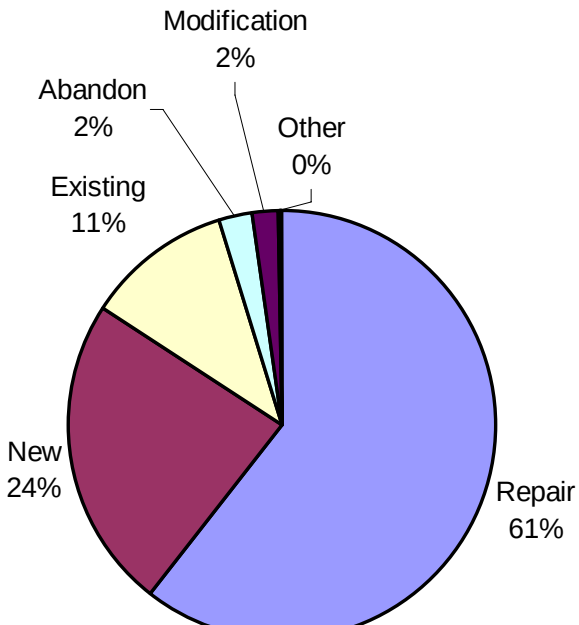
Recordkeeping, Inventory

- 2:
  Integrate geospatial information, such as location of OWTS and parcel information, with information about construction

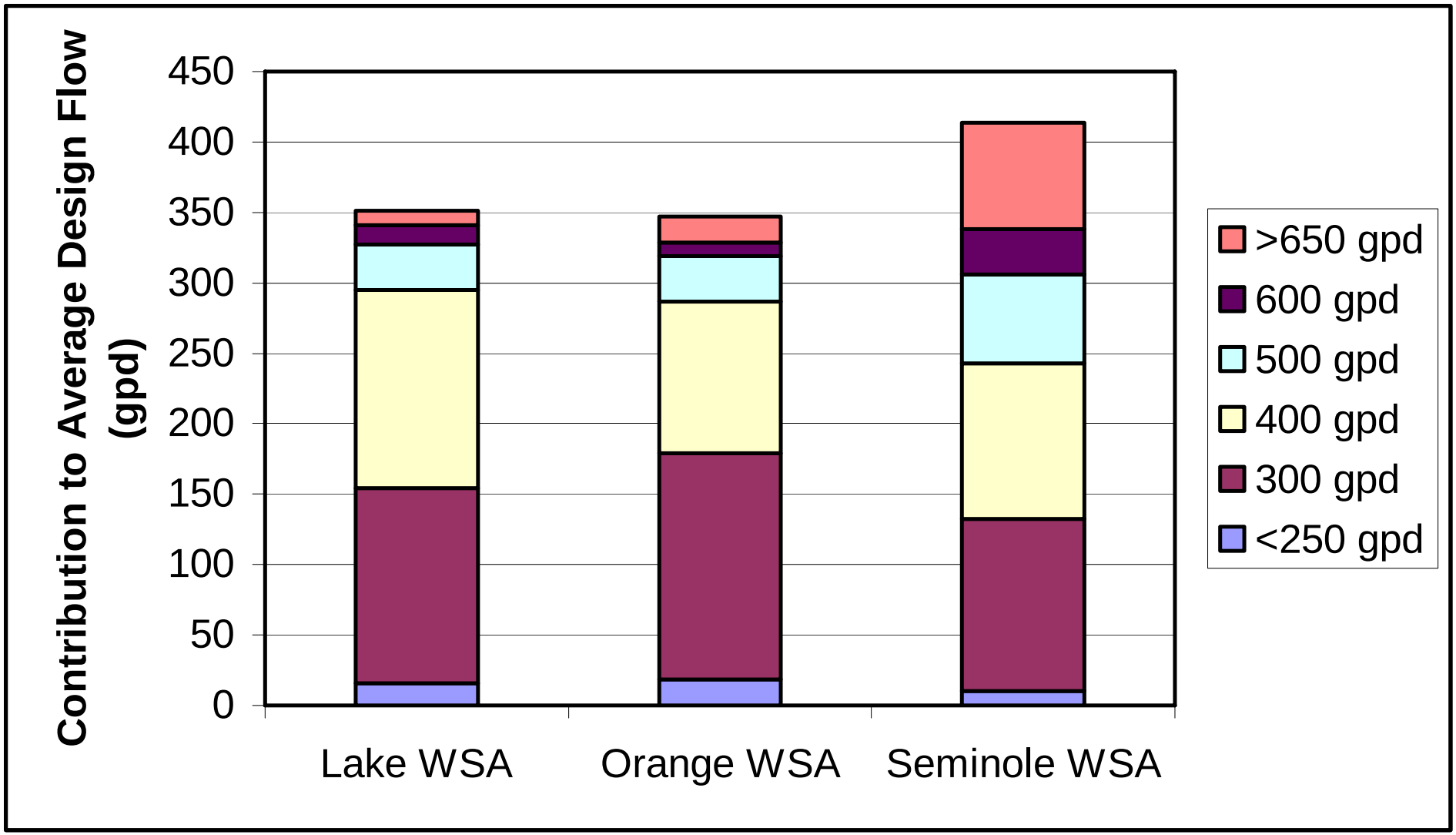
- Illustrate with sample of permitting records located in the Wekiva Study Area
  - Residential OSTDS dominate (95-98%)
  - Type of permits
  - Size of typical system







Average (2001-2005) distribution of OSTDS permits geocoded to the Wekiva Study Area in the three counties



Contribution of different system sizes to the overall average permit design flow in the Wekiva Study Area.

Average design flow for permits

average design flow (gpd)	County repairs	WSA repair	County new	WSA new
Lake	321	316	361	363
Orange	327	313	471	420
Seminole	361	370	455	533

Typical System

Percent of issued permits that are "typical systems"	300 gpd repairs county	300 gpd repairs WSA	400 gpd new county	400 gpd new WSA
Lake	58%	55%	34%	37%
Orange	53%	61%	34%	36%
Seminole	50%	50%	31%	21%

Record Keeping/Inventory

- 3: Inventory systems that have no current permitting records
- 4: Manage inventory by tracking additions and subtractions
- 5: Check inventory periodically to answer questions such as:
  - How many systems are failing at a given time?
  - What is the separation of the drainfield bottom from the estimated wet season high water table and the observed water table?
  - How full of sludge are septic tanks?

Strategy Element Performance Requirements

- Could be implemented through permitting requirements by the Department of Health, and/or through Responsible Management Entities

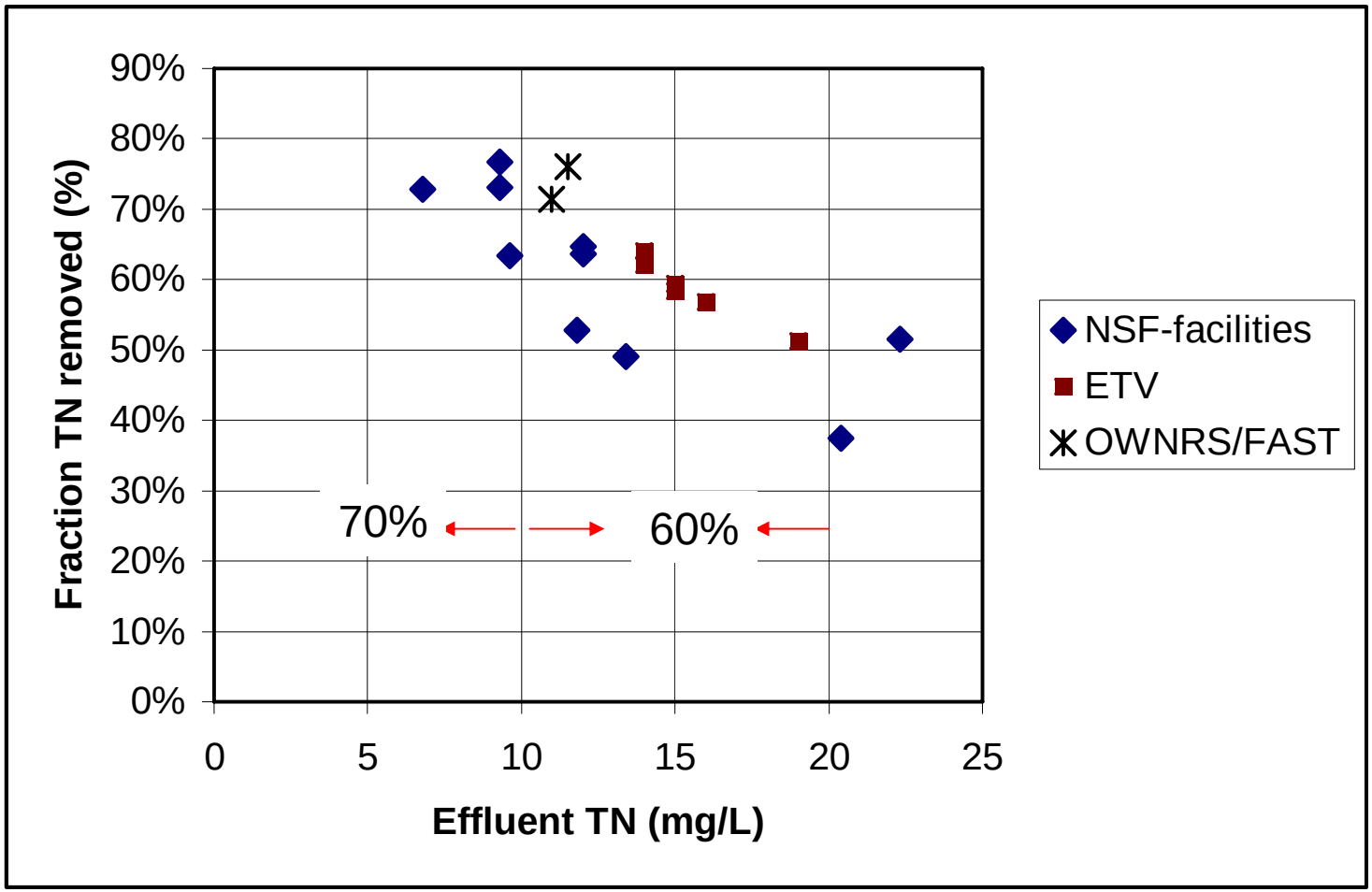
1. Re-evaluate loading per system

TN concentration	Flow	household size	household flow	load/house	load/person	data sources
mg/L	gal/capita day	person/house	gal/day	lb TN/year	lb TN/year person	
39	68.6	2.46	169	19.7	8.0	Ayres Associates 1993, EPA 2000, Florida 2000 census
		2.6		20.0	7.7	Otis, 2007
63	44				8.4	EPA, 1980
50.5	68.6				10.5	EPA, 2000
68	60				12.4	McCray et al, 2005
57	80	5	400	69.4	13.9	Anderson, 1998
74	63	5	315	70.9	14.2	Seminole Site
43	112.5	4	450	58.9	14.7	Lake Site
69	35	1	35	7.3	7.3	Orange Site
		2.6		28.7	11.0	(mid-range per capita load observed in Wekiva)

2. **Evaluate technology for nitrogen removal**

- Source separation
- Treatment of mixed wastewater
  - ATU ~30% TN removal
  - Recirculating treatment systems without carbon addition ~40-75% TN removal
  - Treatment with carbon addition or alternative electron acceptor, possibly higher removal

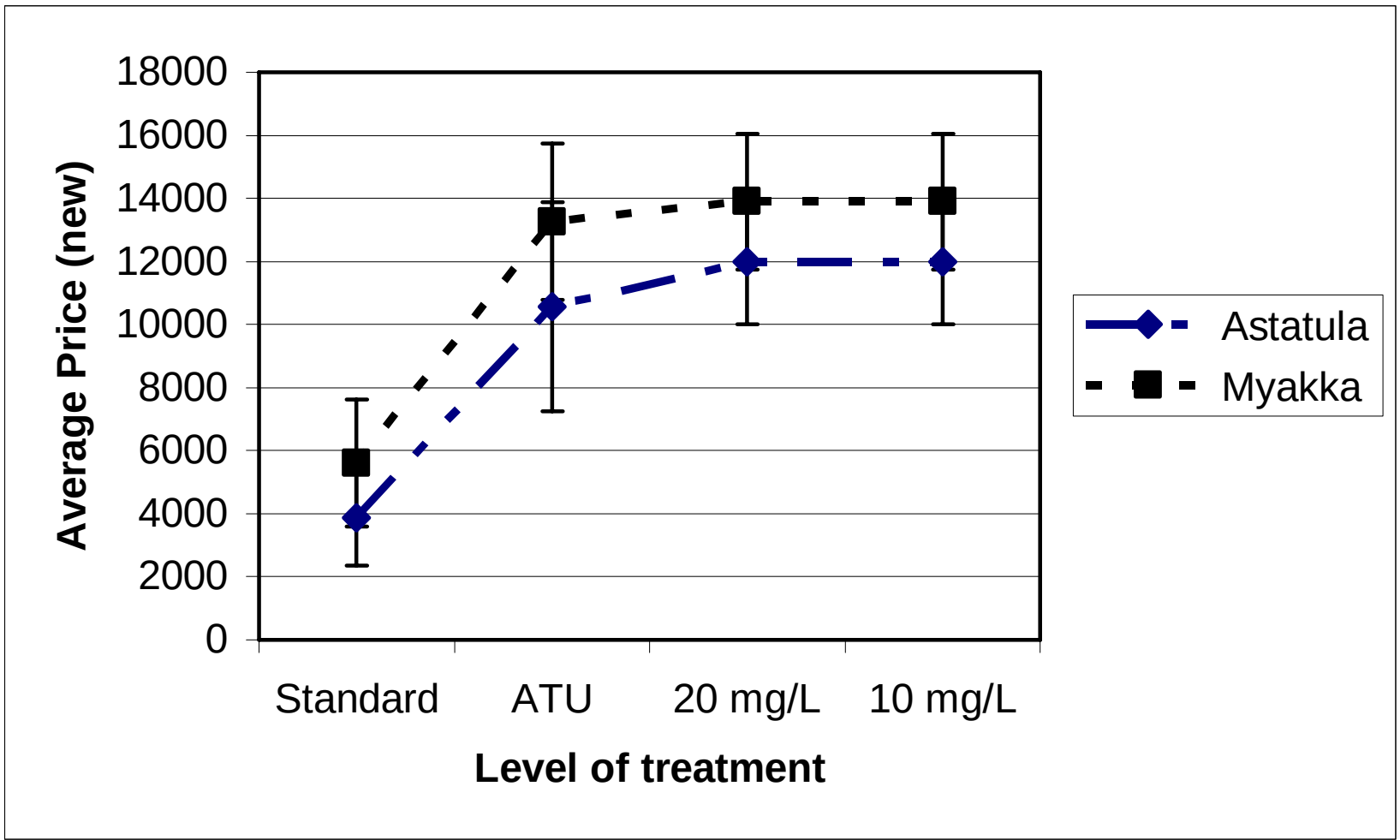
3. Establish performance standards that explicitly incorporate concentration and load reduction



4. Evaluate cost-effectiveness of a range of nitrogen removal performance requirements

- Surveyed installers and distributors on costs of treatment
- Focused on systems that are commonly installed and have test center results <10mg/L
- Compared Astatula and Myakka installations
- Asked for total installation cost, including first two years of maintenance contract, etc

4. Evaluate cost effectiveness of a range of nitrogen removal performance requirements



Example: Survey of cost for new system

Installation costs and effects for new systems

Load to drainfield (lb TN/system year)		Treatment System			
	Soil(%removal)	Conventional	ATU	20 mg/L	10 mg/L
		pretreatment effectiveness	30	60	70
		Average Cost ($)			
	Astatula	3886	10566	12000	12000
	Myakka	5602	13263	13900	13900
		Incremental Cost Difference ($)			
	Astatula		6680	1434	0
	Myakka		7661	637	0
		Load to groundwater (lb TN/system year)			
20	Astatula (5%)	19.0	13.3	7.6	5.7
20	Myakka (50%/95%)	10.0	0.7	0.4	0.3
29	Astatula (5%)	27.6	19.3	11.0	8.3
29	Myakka (50%/95%)	14.5	1.0	0.6	0.4

Cost-effectiveness for new systems (based on initial installation cost)

Load to drainfield (lb TN/system year)		Treatment System			
Soil(%removal)	Conventional	ATU	20 mg/L	10 mg/L	
	pretreatment effectiveness	30	60	70	
	Overall Cost-Effectiveness ($/lb TN/year removed compared to conventional)				
20	Astatula (5%)	1172	712	610	
20	Myakka (50%/95%)	824	864	855	
29	Astatula (5%)	808	491	421	
29	Myakka (50%/95%)	568	596	590	

Cost-effectiveness for drainfield repair out of the ground water

Load to drainfield (lb TN/system year)	Treatment System Option for a Drainfield Repair in Myakka Soil				
	currently	New mound	new ATU	new 20 mg/L	new 10 mg/L
	Average Cost ($)				
		5497	13633	13633	13633
	Incremental Cost Difference ($)				
		5497	8137	0	0
	Load to groundwater (lb TN/system year)				
20	20	10	0.7	0.4	0.3
29	29	14.5	1.0	0.6	0.4
	Incremental Cost-Effectiveness ($/additional lb TN/year removed)				
20		550	875	0	0
29		379	603	0	0
	Overall Cost-Effectiveness ($/ lb TN/year removed)				
20		550	706	696	692
29		379	487	480	477

Cost-effectiveness for pretreatment in existing system w/ gravity drainfield

Load to drainfield (lb TN/system year)	Treatment System Option for a Retrofit in Astatula Soil keeping drainfield				
	currently	50% retrofit	new ATU	new 20 mg/L	new 10 mg/L
	Average Cost ($)				
		4500	7917	7917	7917
	Incremental Cost Difference ($)				
		4500	7917	0	0
	Load to groundwater (lb TN/system year)				
20	19.0	9.5	13.3	7.6	5.7
29	27.6	13.8	19.3	11.0	8.3
	Incremental Cost-Effectiveness ($/additional lb TN/year removed)				
20		474	1389	0	0
29		326	952	0	0
	Overall Cost-Effectiveness ($/ lb TN/year removed)				
20		474	1389	694	595
29		326	952	477	409

- 5. **Consider density reduction as a means to achieve lower nitrogen loading**
- **6. Establish performance standards that encourage improvements in the effectiveness of treatment systems**
- **7. Review if construction standards, in particular for filled and mound systems, achieve the goal of 2 feet separation from the estimated wet season water table and nitrification**
- **8. Pretreatment performance standards apply before discharge to the disposal system**

Planning

- Different entities will be in charge of planning and implementing under all onsite management levels except utility

1: Build on existing assessments of the vulnerability of receiving waters

- Wekiva Aquifer Vulnerability Assessment of Floridan Aquifer (not intended for lot-scale decisions)
- Transform vulnerability map into a format that could be more useful for onsite permitting decisions

- (Florida Aquifer Vulnerability Assessments of Surficial and Floridan Aquifers
- Surface Water Vulnerability?)

- Pollutant Load Reduction Goals

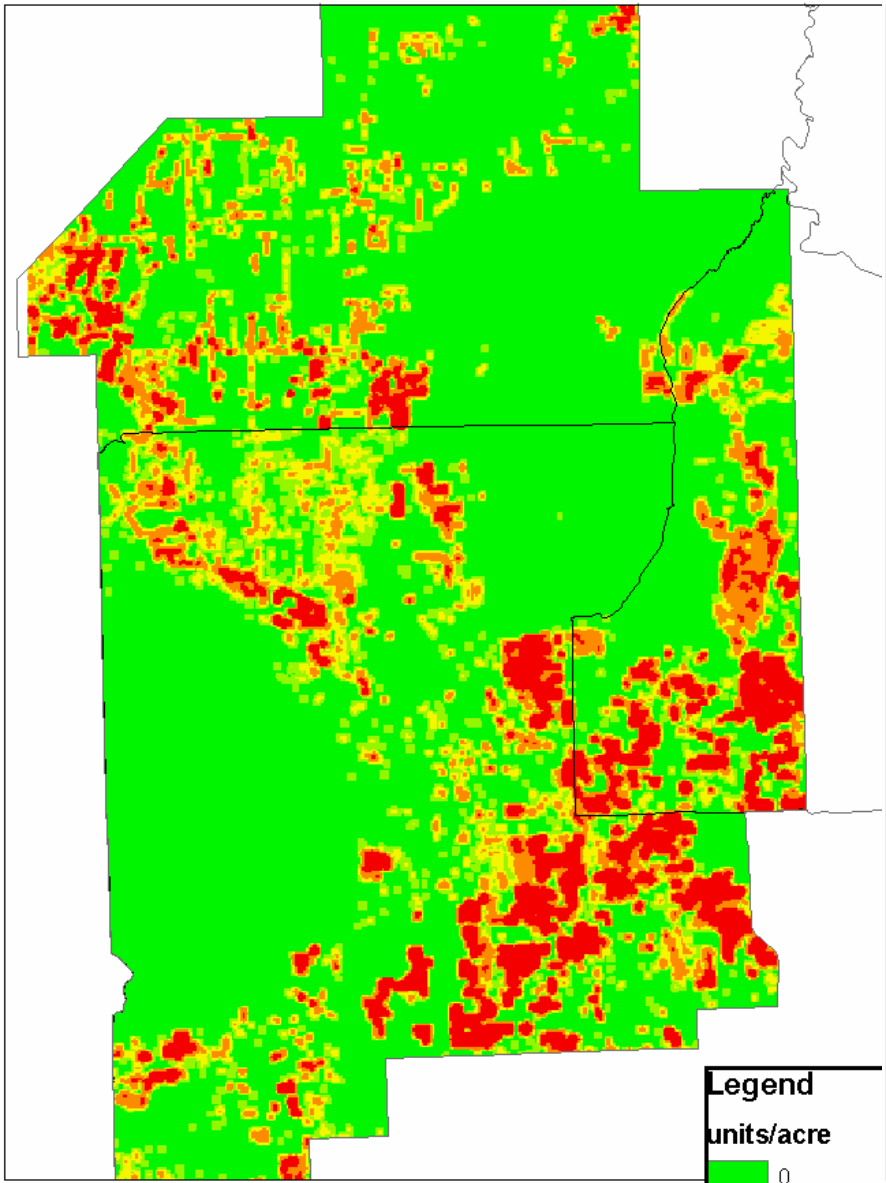
1: Build on existing assessments of the vulnerability of receiving waters

Pollutant Load Reduction Goal	Nitrate	Total Phosphorus	Total Coliform Bacteria
Wekiwa Spring	82%	- - -	- - -
Upper Wekiva River (to Little Wekiva River)	69%	50%	49%
Lower Wekiva River (to Blackwater Creek)	36%	50%	30%
Rock Spring	85%	- - -	- - -
Rock Springs Run	52%	29%	50%

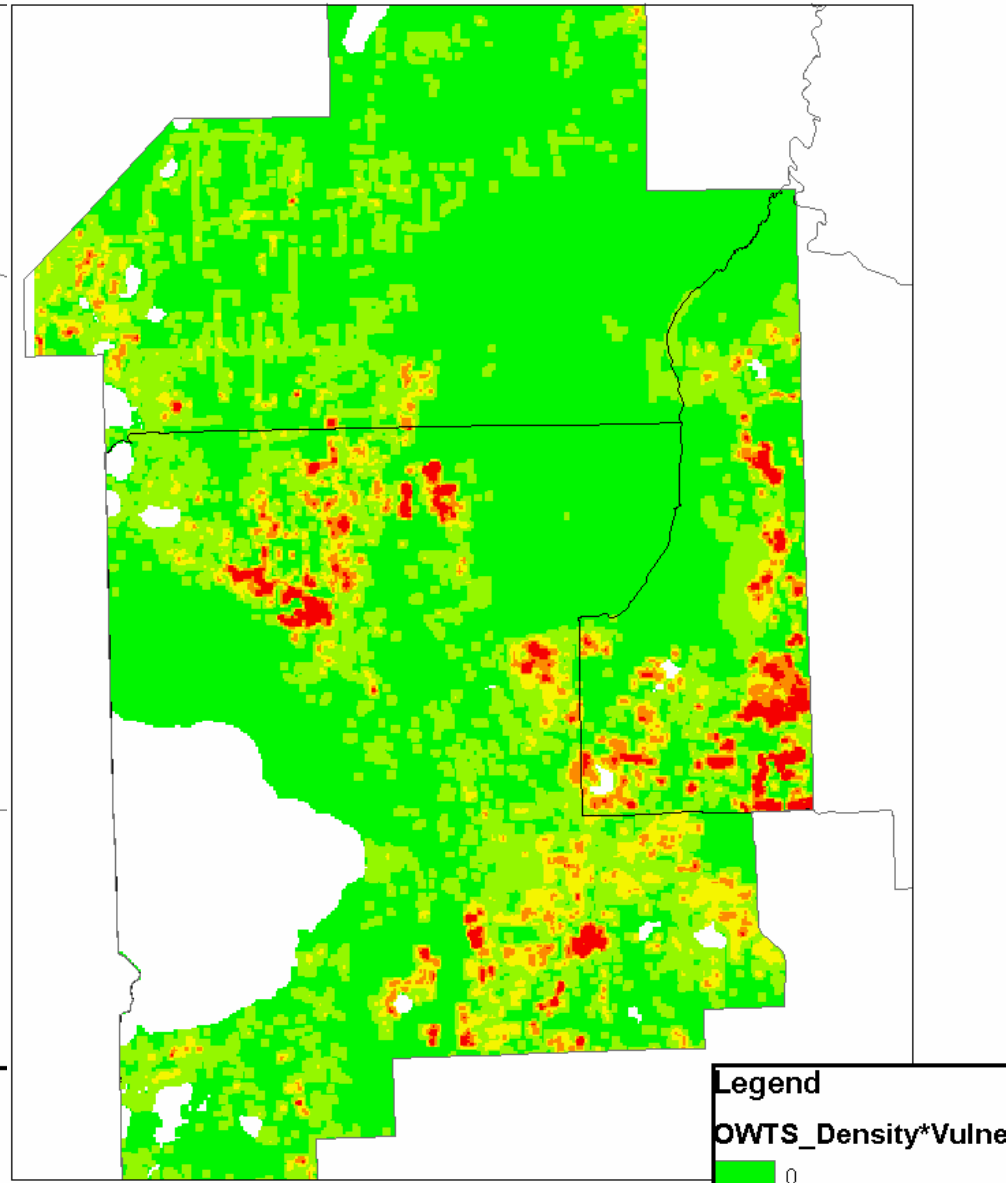
2006 Pollution Load Reduction Goal published by SJRWMD

2. Integrate land use, wastewater management, and aquifer vulnerability

- Vulnerability-based approach: prioritize increased treatment in more vulnerable areas (e.g. centralized wastewater facilities, 2004 DOH recommendations)
- Risk-based approach: Prioritize increased treatment in areas with high density and high vulnerability



OWTS density in the Wekiva Study Area

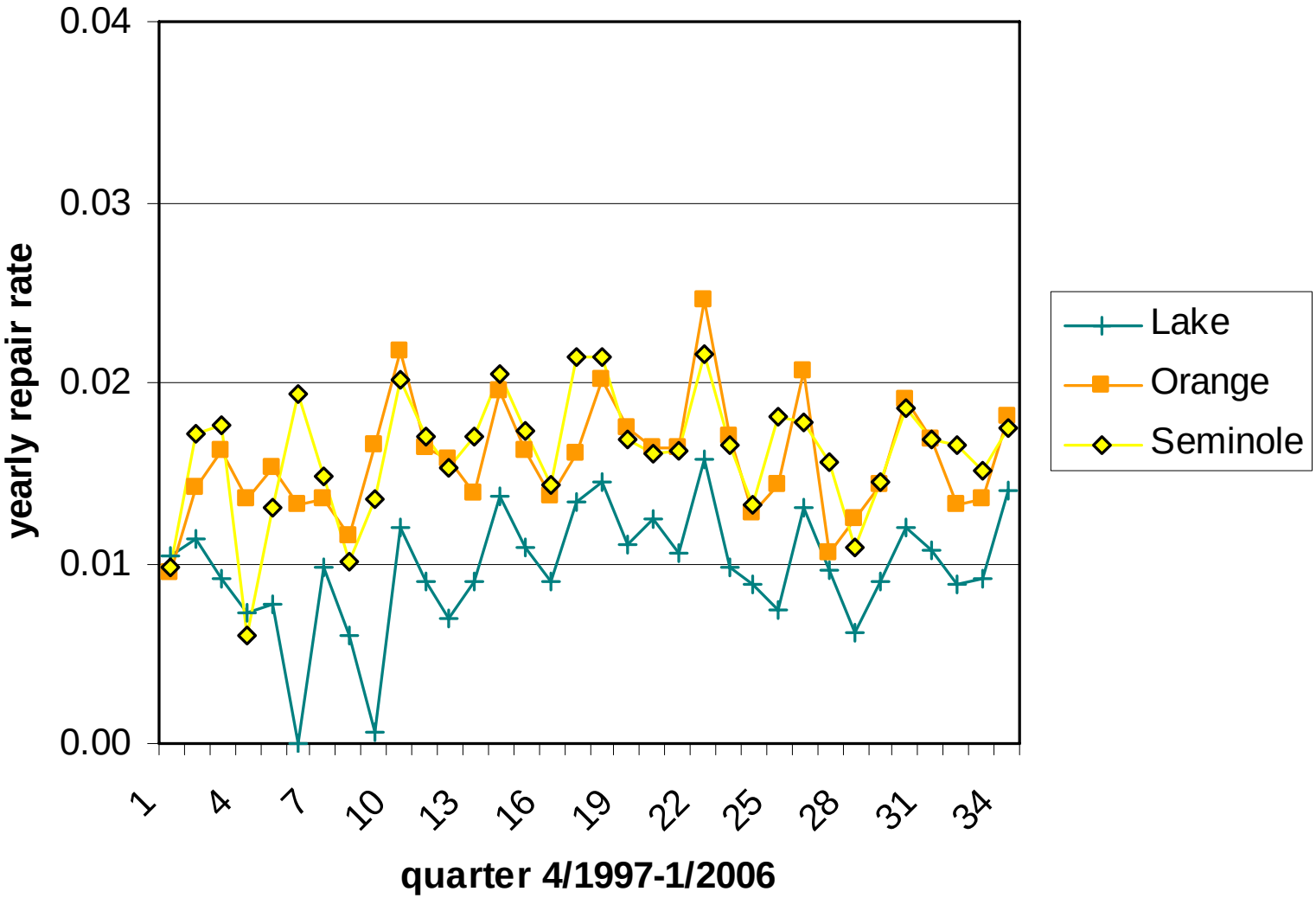


Product of
OWTS density and Floridan Aquifer Vulnerability
as measure of Risk

3. Assess extent to which changes in DOH-regulations effect OWTS loading without changing management approach

- Performance discussed in a different section
- Assess numbers of permits that would be impacted without any other changes

Yearly Repair Rates



Reach of DOH-regulations

- Over 20 years, about 30% of current systems in Orange and Seminole County need repairs (1.5%/year * 20 years)
- Over 20 years, about 20% of current systems in Lake County need repairs (1%/year * 20 years)

- Rates may change in response to inspections and costs
- Other strategies may increase rate of upgrades or abandonments

4. For DOH-regulated systems, establish performance standards

- Could use reduction standards based on:
  - pollution load reduction goals,
  - best available technology,
  - same as central sewer

- Bounding estimate:
  no load increase from OWTS, due to new systems

No net increase goal: required load/system reduction

County	County new	County repair	County load reduction	WSA new	WSA repair	WSA load reduction
Lake	1670	598	74%	278	111	72%
Orange	848	1211	41%	268	537	33%
Seminole	281	447	39%	88	253	26%
TOTAL	2798	2256	55%	636	901	41%

Annually issued new and repair permits and percent reduction required from both to achieve no net load increase.

5. For new developments, evaluate a range of wastewater management alternatives, such onsite, clustering, and central facilities for nitrogen reducing treatments
6. Designate priority areas for upgrades to existing OWTS infrastructure. Designate responsible entity for upgrades ranging from the property owner to a utility

Financial Assistance and Funding

- Costs
  - Planning
  - Design
  - Permitting
  - Construction
  - Operation
  - Maintenance
  - Monitoring
  - Record Keeping
  - Corrective Action
- Largely the responsibility of system owner

Responsibility, Equity, Affordability

- A property owner who installs a cost-effective system pays for the savings of a lot-owner who does not have to install a cost-ineffective system -> need for a a cost-sharing mechanism
- The occurrence of the need for a repair, which could lead to an upgrade is random -> need for an insurance mechanism
- Increased maintenance or living with unsanitary conditions could be results of requiring upgrades, neither of which contribute to nitrogen reduction. -> need for an incentive mechanism

Financial arrangements

- Shift responsibility to a utility
  - Possibility to finance cost-effective solutions across scales (e.g. central sewer)
  - Still needs funding
- Cost-sharing mechanism
  - Trading (cost-ineffective lots pay for cost-effective lots)
  - Discharge fees per pound of nitrogen discharged (at marginal costs of N-removal),
  - onsite system fee, by type of pretreatment or flat rate
- Insurance mechanism
  - Regular small payments to fund the number of repairs occurring in the covered area
- Incentives
  - Subsidy/Grant program (fee, or taxpayers of local, regional, state, or federal entity)
  - Lower fees for higher treatment

Ensuring Performance

- Training and Certification
  - Engineers
  - Permit Reviewers
  - Installers
  - Maintenance entities
  - Inspectors

- Design
  - Need balance between prescriptive (easy to permit, presumed to comply) and performance-based (flexible, compliance determined by monitoring) elements
  - trade-off between assurance up-front and later

  - Construction
  - Site Evaluation

- Operation and Maintenance, Inspection and Monitoring, Reporting
  - Require system inspection/maintenance for all systems
  - Treatment effectiveness in the field is more variable than under testing conditions; need measures of average compliance and follow-up with high sources

- Corrective Action/ Accountability

Other Strategy Elements

- Public Education and Participation
- Residuals Management