Nitrogen input from residential lawncare practices

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Issues

- What we know, we know
  - Excessive nutrient input to Chesapeake Bay
  - Nitrate major contributor to water quality impairment
  - Multiple sources in urban areas
    - Point source and Nonpoint source
- Expansion of urban land use
  - Increase in lawn area
    - Projected low density development to reach 62% by 2020 (58% in 1997)

Results of the CWP Survey of Chesapeake Bay Resident Behaviors

Frequent Fertilizers

Poor Pooch Scoopers

Chronic Car Washers

Septic Slackers

Bad Mechanics

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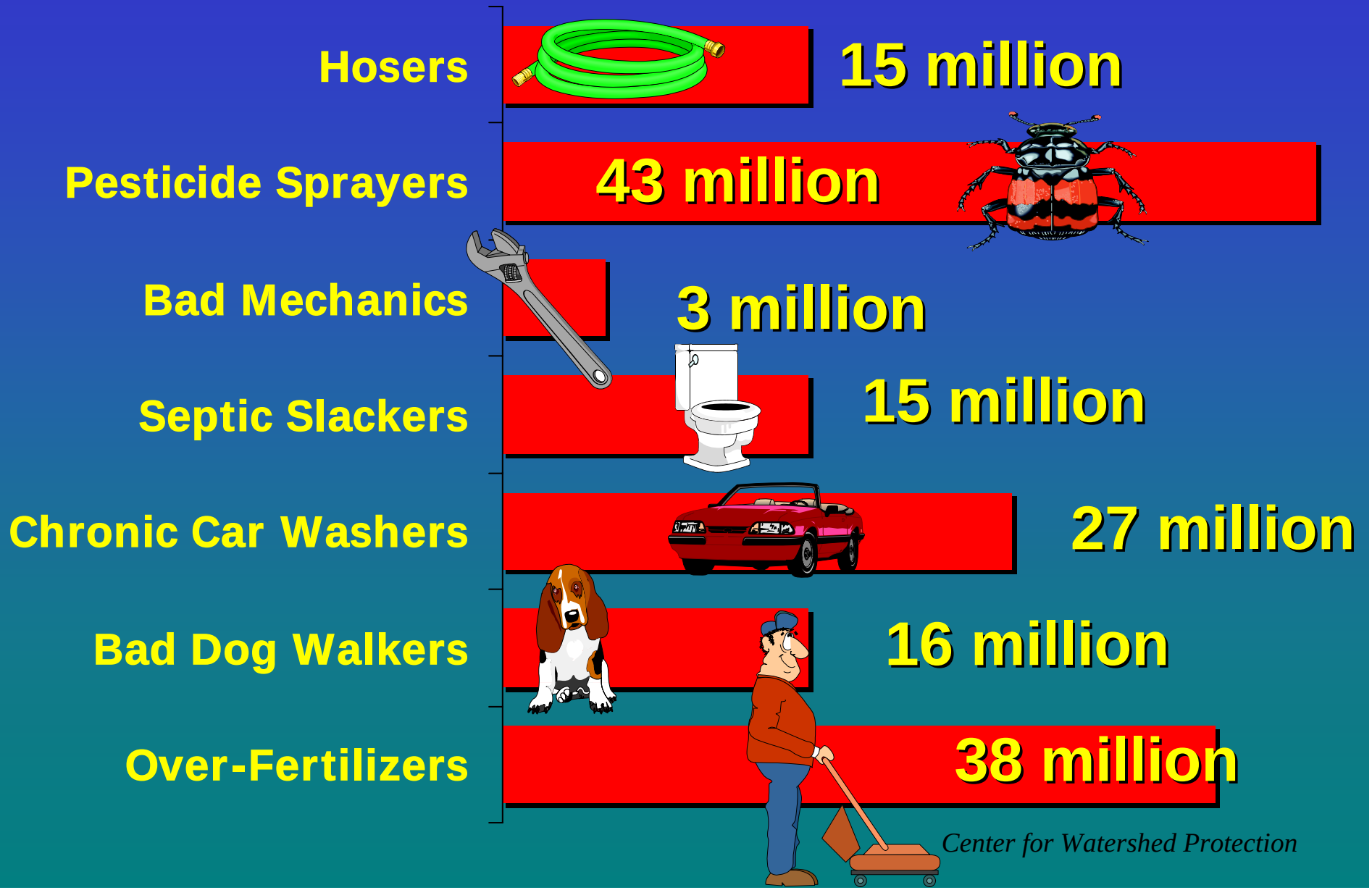
Conservative Estimates of U.S. Polluters



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Issues

- What we know we don’t know (as well as we would like)
  - Fate of nitrogen applied not well understood
    - Contribution to runoff based on all sources ?
    - Local variability
  - Effectiveness of ‘carrot” approach for NPS
    - Outreach/education to homeowners

Purpose

- Results from household lawn care survey

  Law, N. L., L. E. Band and J. M. Grove. 2004. Journal of Environmental Planning and Management (2004), 47(5):737-755

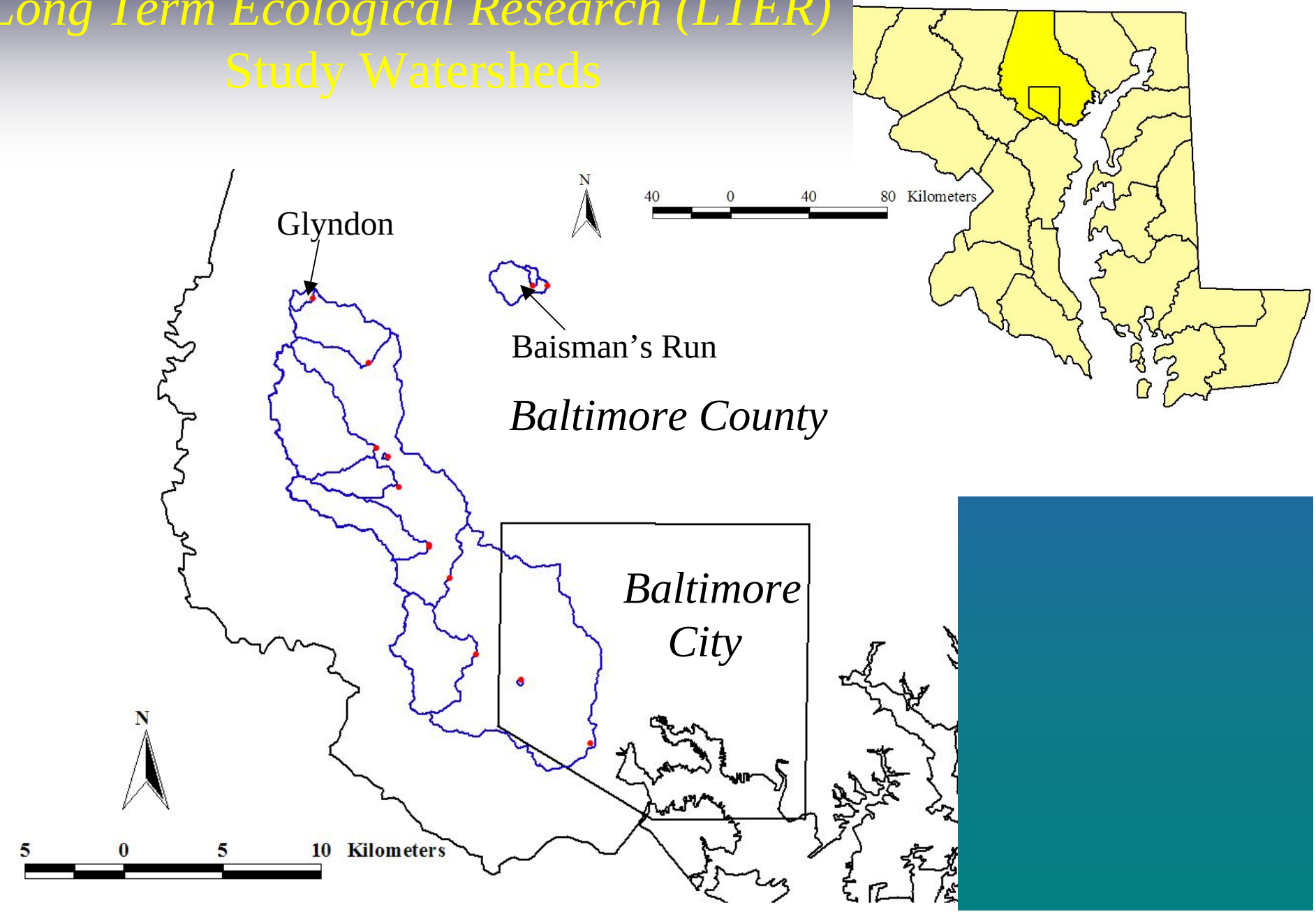
Survey Goal

- Estimate nutrient input to urban watersheds from residential lawn care practices

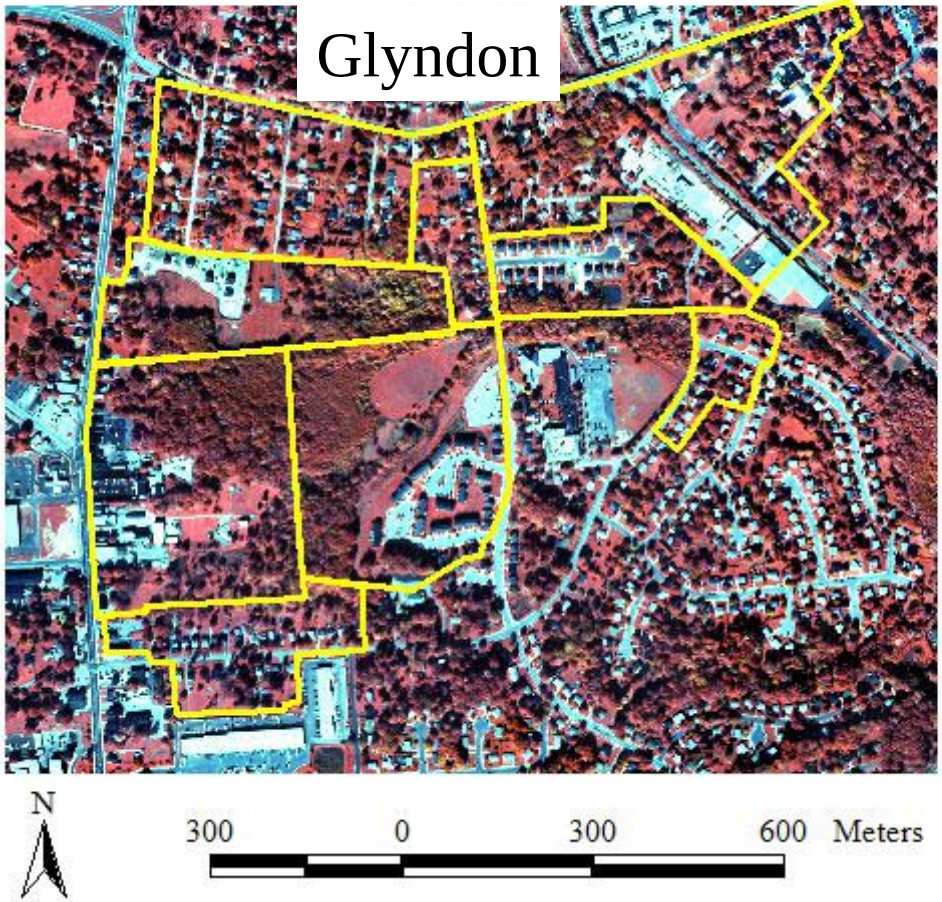
Baltimore Ecosystem Study

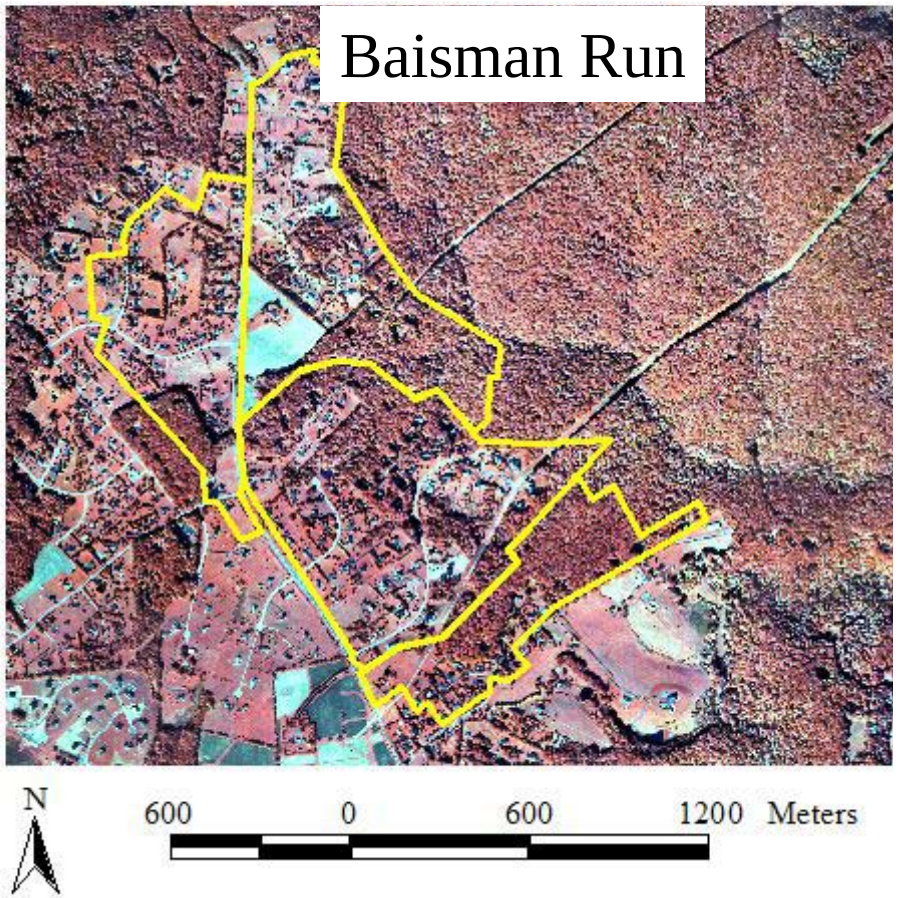
Long Term Ecological Research (LTER)

Study Watersheds



Study watersheds and subdivisions





Watershed area (mi.^{2})	0.31	1.4
Residential	47%	34%
Forest	4%	66%
Percent lawn area	32%	25.5% (75%)
Housing density (house/ha)	3.9	0.3 (1.0)

Survey methods

- Study sites
  - 2 gauged catchments partitioned into subdivisions
  - 6 subdivisions in Glyndon
  - 4 subdivisions in Baisman Run
    - Glyndon, n = 60, 70 % response rate
    - Baisman, n = 40, 83 % response rate
  - “Start house” randomly selected
- 23 questions, lawn characteristics, soil sample
- Units are in kg N/ha/yr
  Multiple by 0.02 ~lb N/1000 ft^2

Survey Results

Survey Results

% Fertilizer	62
% Self-apply	58
% Lawn care	42
Avg. application Rate (lbs N/1000ft^2)	2.2 (0.2 -7.6)
% Soil Tested	16

Survey Results

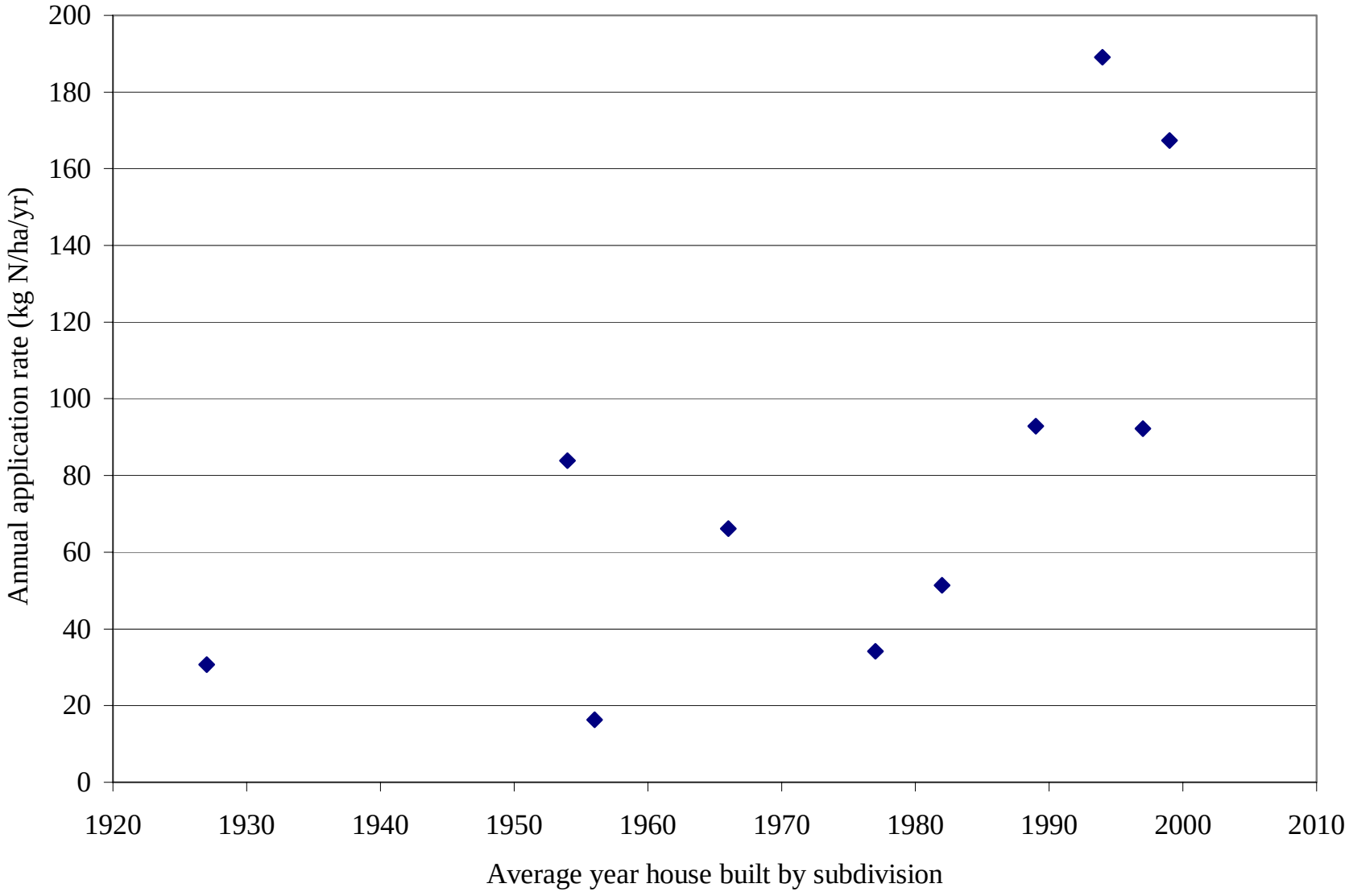
- Frequency of application
  - Homeowners 1-2 times/year (Spring and Fall)
  - Lawn care service up to 6 times/year
- Application rate within guidelines

(99-195 kg/N/ha of lawn or 2-4 lbs N/1000 ft^2)

- Approximately 53% of total N budget in Glyndon from fertilizer

Some plots

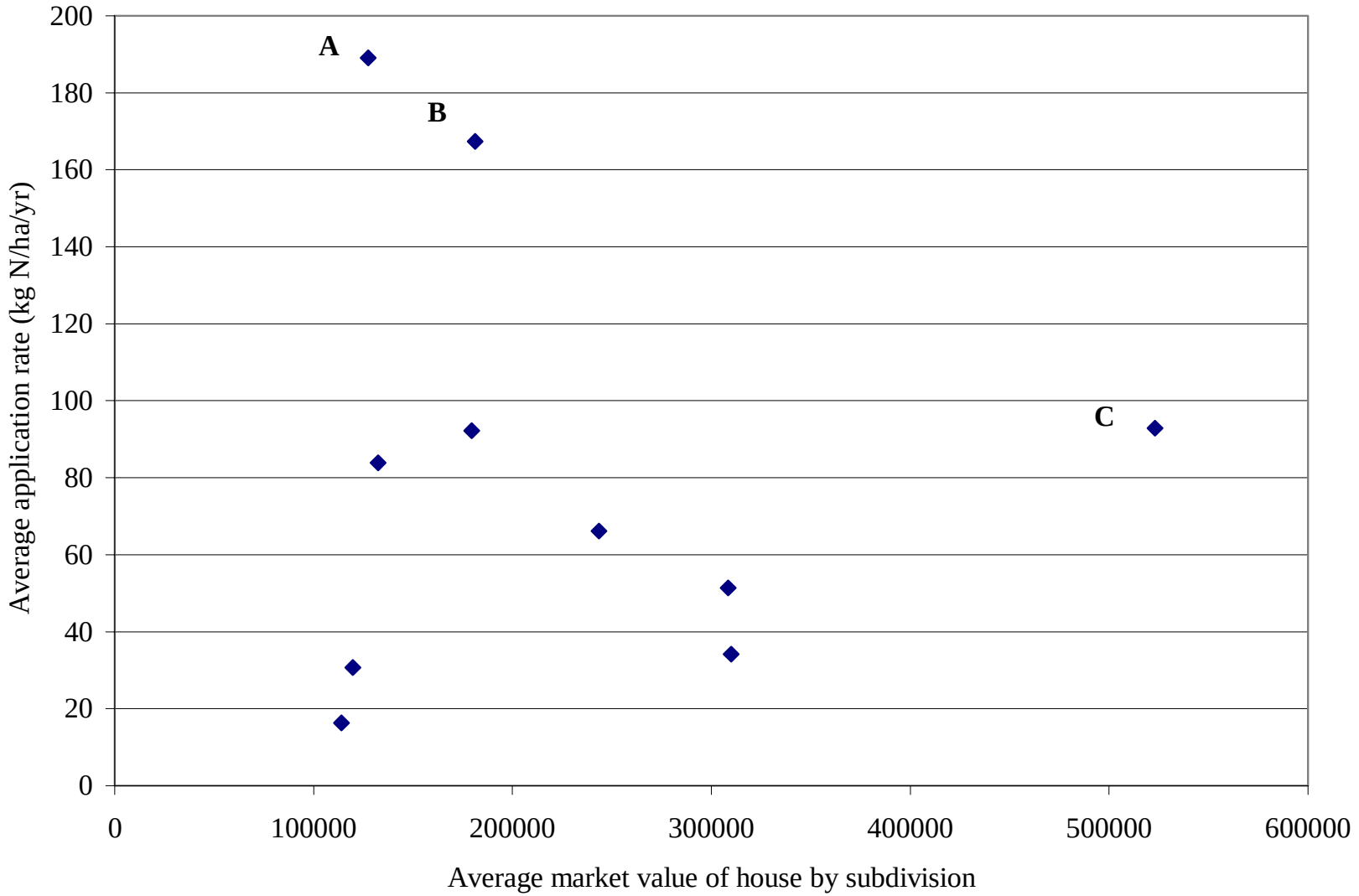
The mean application rate of fertilizer per unit lawn area as a function of median age of house within each subdivision.



- Greater application rate for newer homes
  - Higher socio-economic status of newer homes; newer homes have a higher market value
  - More fertilizer applied to establish lawns due to poor soil quality from recent construction

The mean application rate of fertilizer as a function of average market value

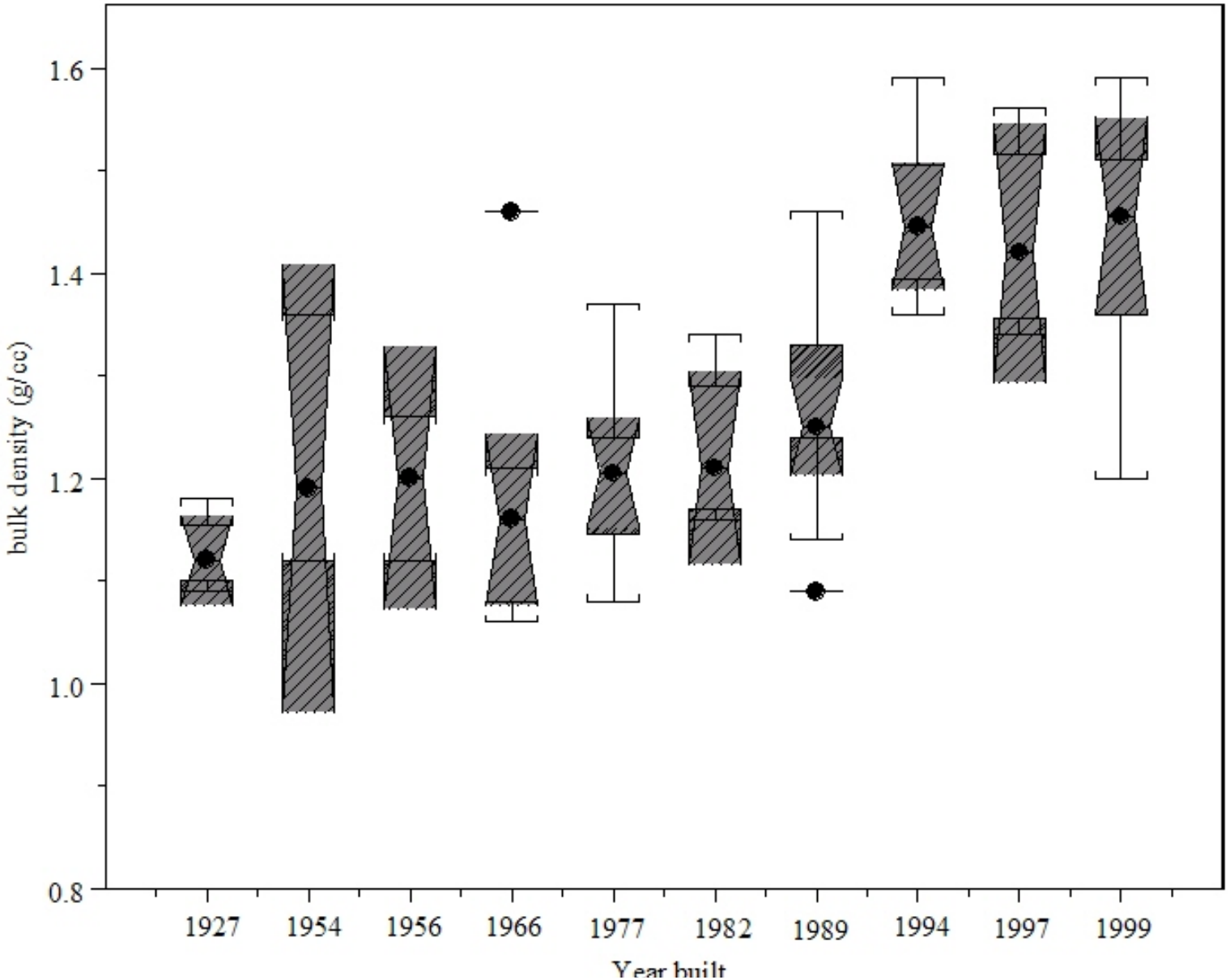
The mean application rate of fertilizer as a function of average market value



Soil Quality

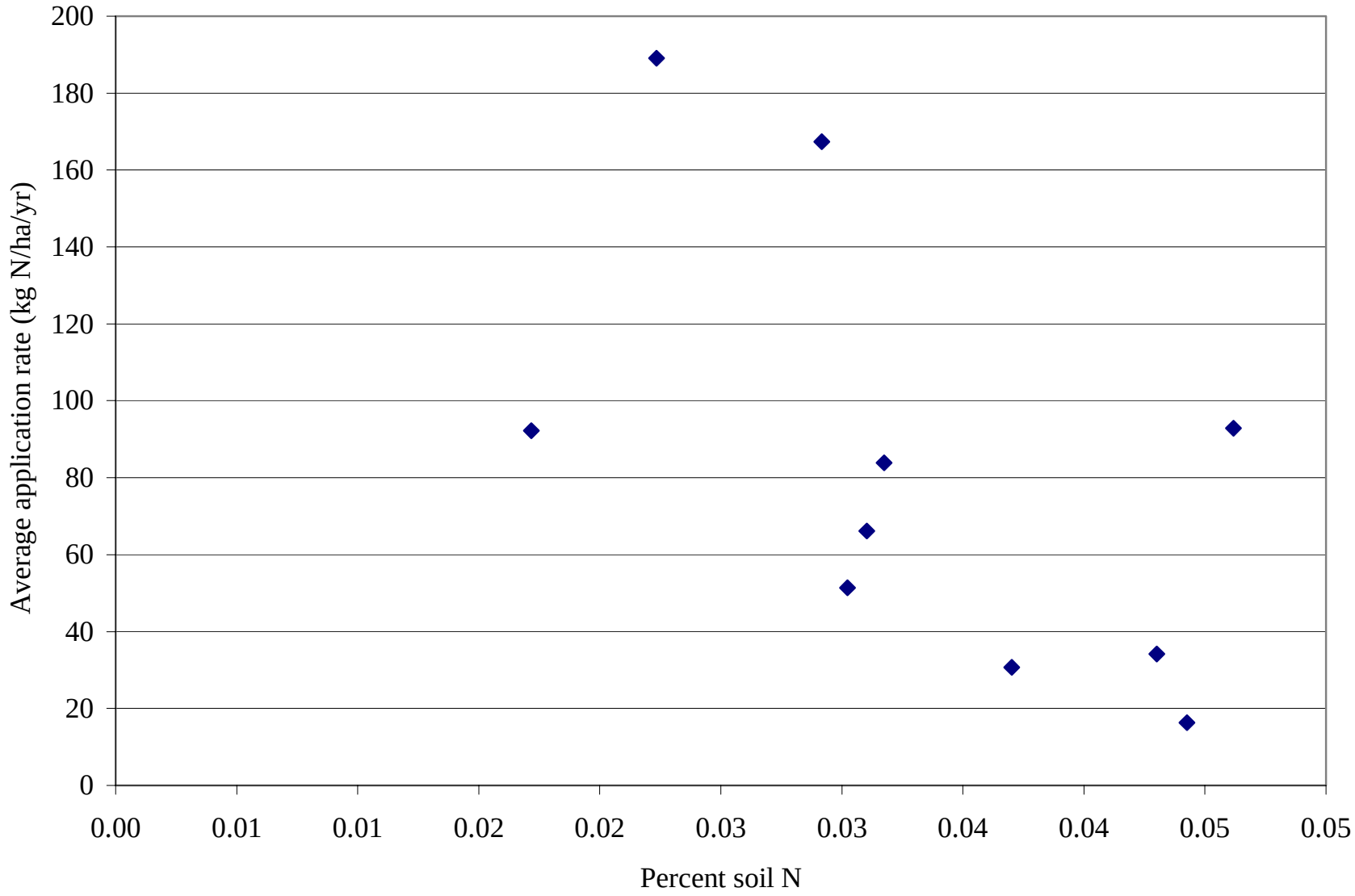
Average soil bulk density (g/cm3) by median age of house

Average soil bulk density (g/cm3) by median age of house



Fertilizer application rate as a function of soil N content

Fertilizer application rate as a function of soil N content

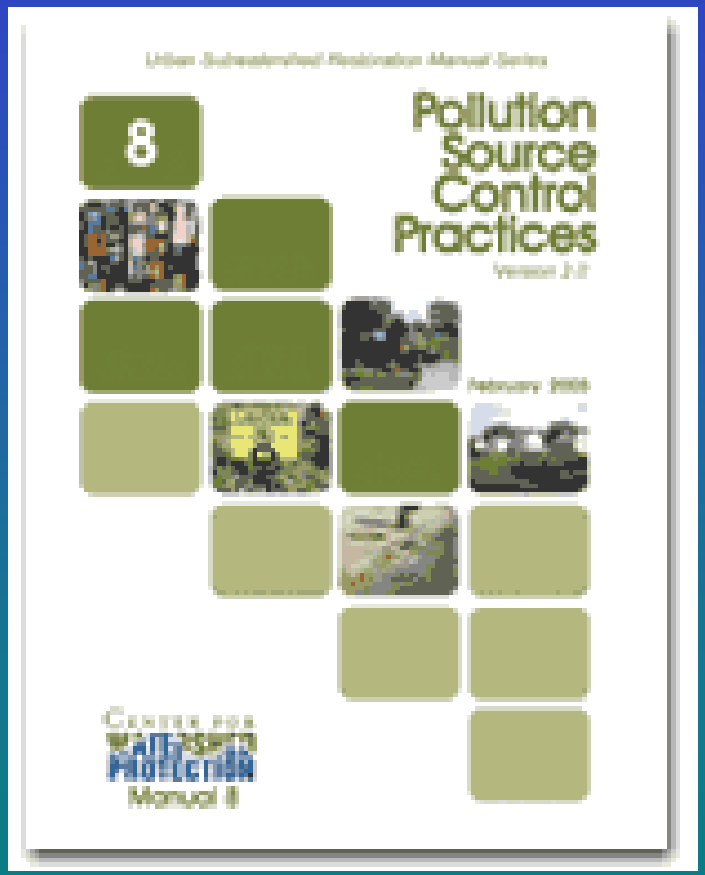


Conclusions

- Variable management practices within same residential land use type influenced by socio-economic and soil characteristics
- Application rates within guidelines
- Lawn fertilizer major source of N input
  - Need to determine affect on N output
- Hot-spots for nutrient run-off

Urban Subwatershed Restoration Manual Series

- ***1*** An Integrated Framework to Restore Small Urban Watersheds
- ***2*** Methods to Develop Restoration Plans for Small Urban Watersheds
- ***4*** Urban Stream Repair Practices
- ***8*** Pollution Source Control Practices
- ***10*** Unified Stream Assessment: A User's Manual
- ***11*** Unified Subwatershed and Site Reconnaissance: A User's Manual



For more information visit

http://www.cwp.org

http://www.stormwatercenter.net/

Acknowledgements

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  - L.E. Band, J.M. Grove
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- Rich Pouyat and Ian Yesilonis
- Beth Koda, David Tenenbaum, Stephen Kenworthy, Rose Williams
- The residents of Glyndon and Baisman's Run

Summary characteristics of study watersheds.

	Glyndon	Baisman Run
Watershed area (km2)	0.8	3.7
Residential	47%	34%
Forest	4%	66%
Open urban space	16%	0
Commercial, instit.	32%	0
Percent lawn area	32%	25.5% (75%)
Housing density (house/ha)	3.9	0.3 (1.0)
Average square footage of house	1534	3082
Average lot size (ha)	0.13	0.93

[1] Values in parentheses refer to the residential portion of the Baisman's Run watershed and not the whole watershed.

Study	*lbs N/ 1000 ft²*	*Comments*
CWP	1 5.5	Prior to 1940 1970s
NCSU Water Quality Group	0.59 - 3.1	Household survey of 4 NC communities
Petrovic 1990	0.5 – 4.6	Application rates based on literature review
Garn 2002	3 - 3.5	Walworth County, WI assumed 4 applications/yr
King et al.	1 – 11	Golf course in Austin, TX
MD Coop Ext. Serv.	2 - 4	Recommended application rate