



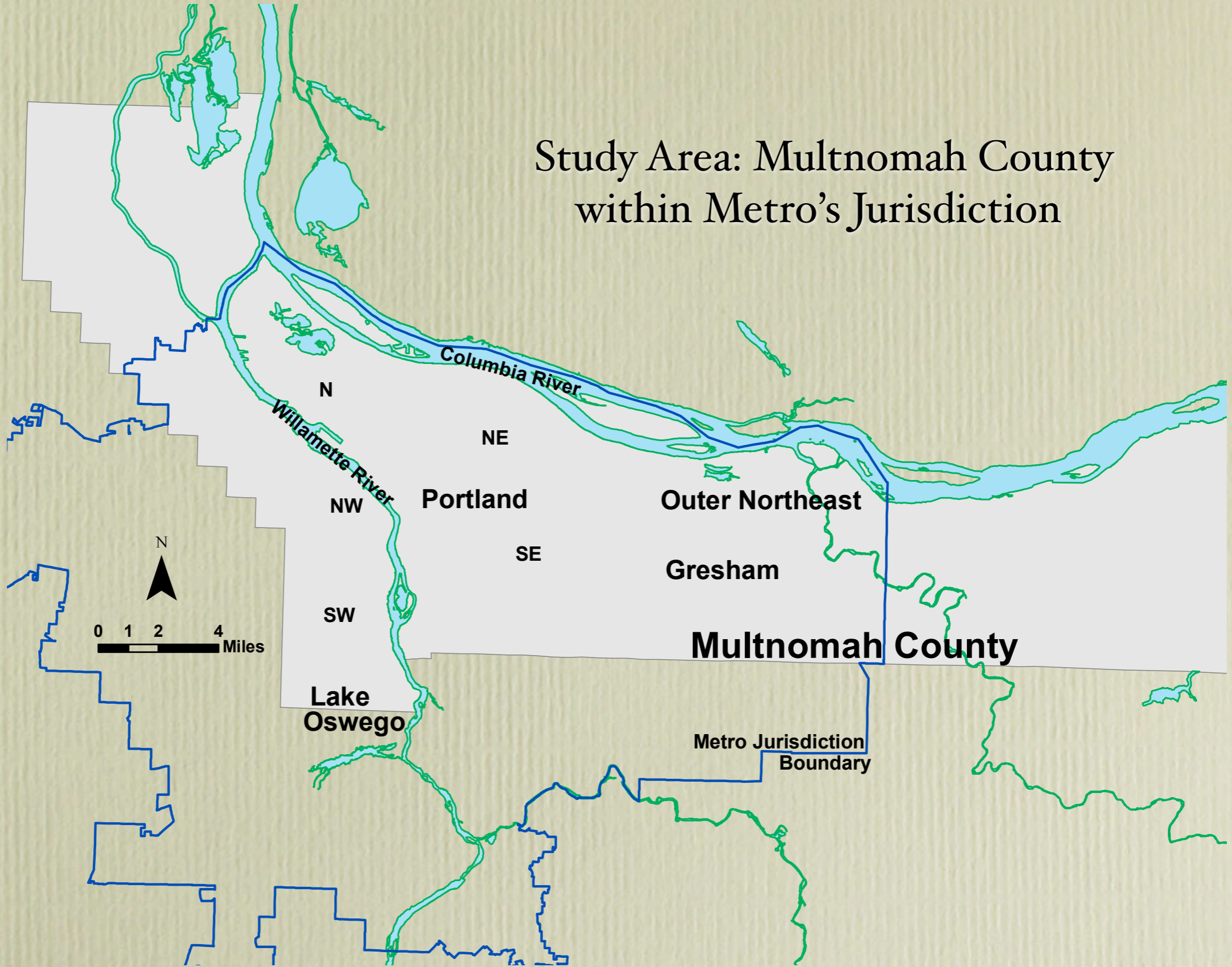
Valuing Vegetation in an Urban Watershed

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Pomona College

Noelwah R. Netusil
Reed College

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Study Area: Multnomah County within Metro's Jurisdiction



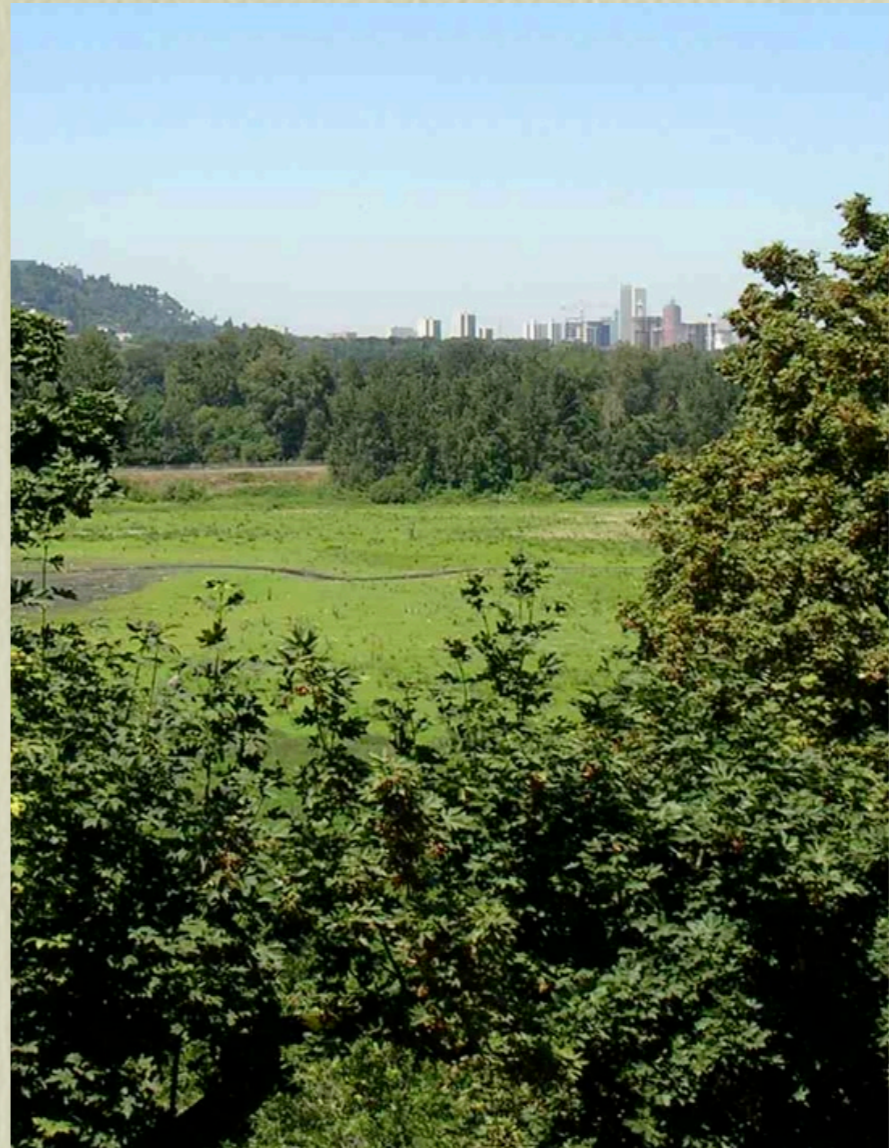
Study Area



*Oaks Bottom Wildlife Refuge
Portland, Oregon*

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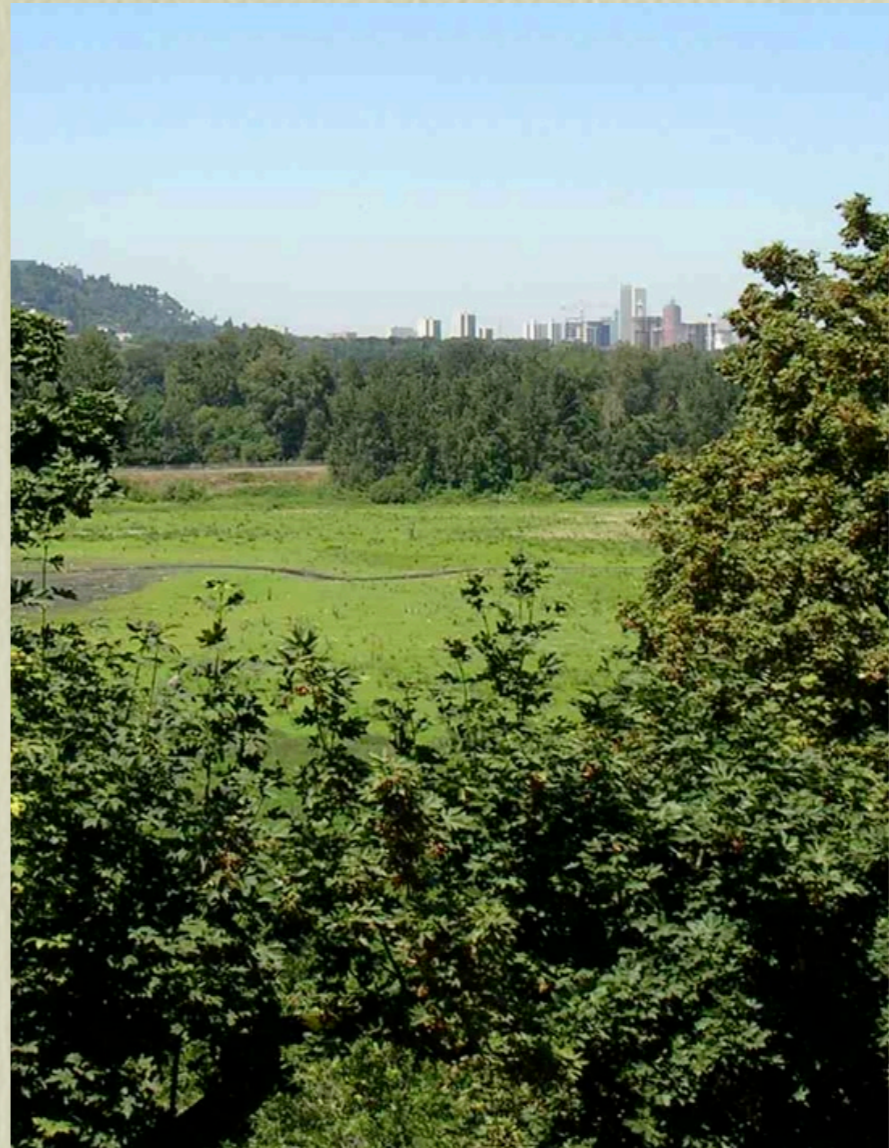
- Regional Government (Metro)



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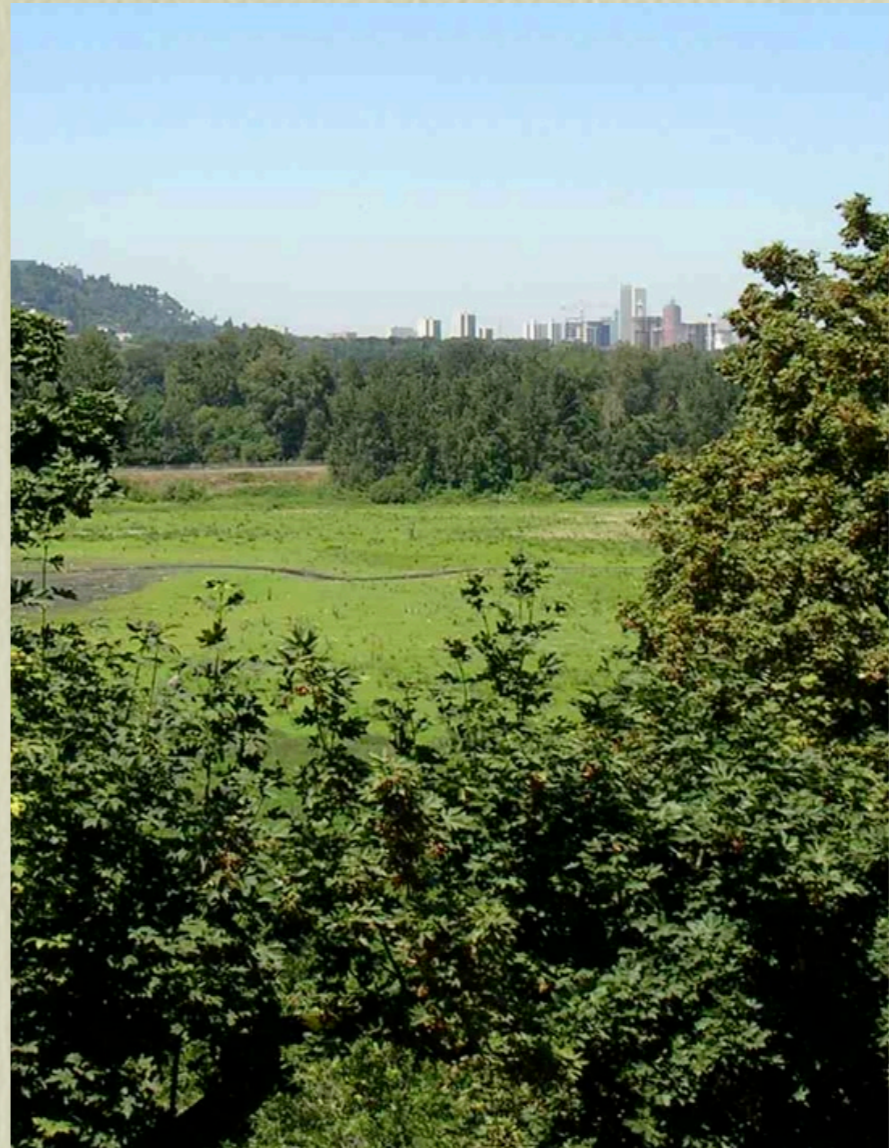
- Regional Government (Metro)
- Urban growth boundary



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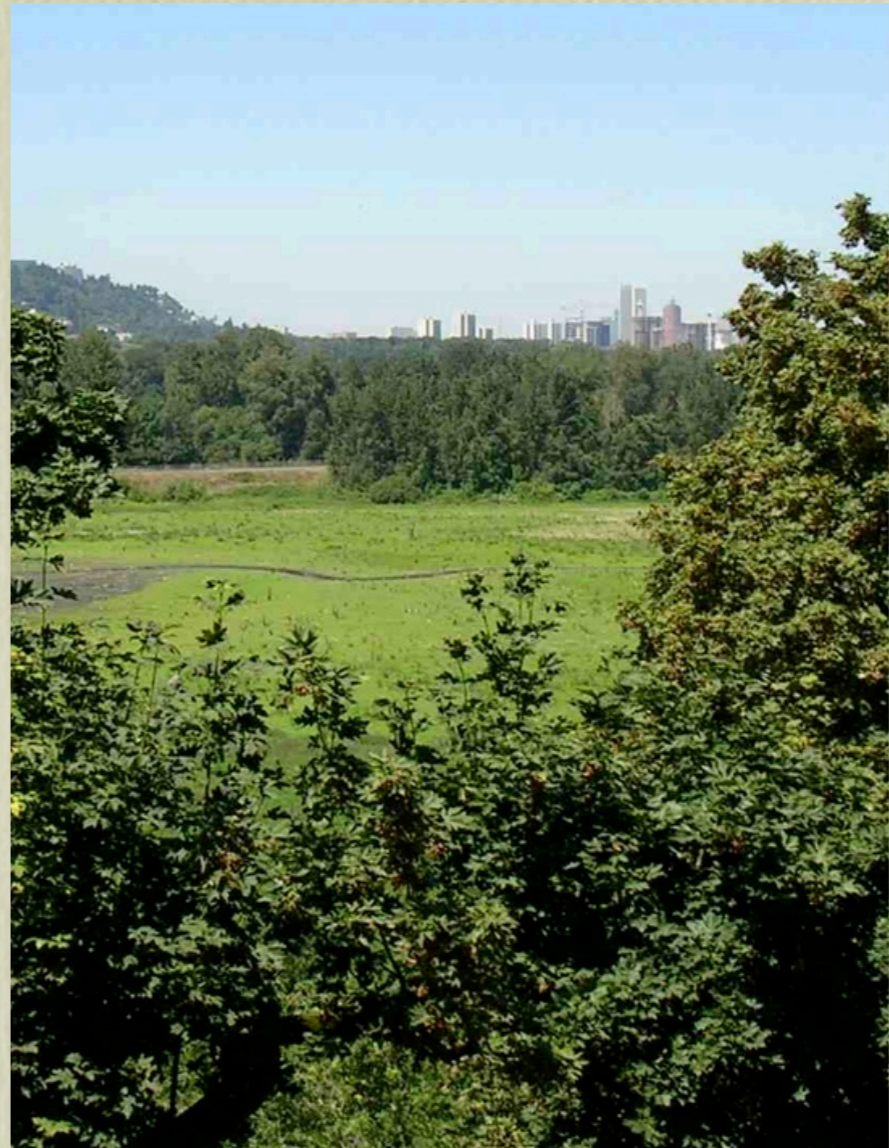
- Regional Government (Metro)
- Urban growth boundary
- Combined sewer system



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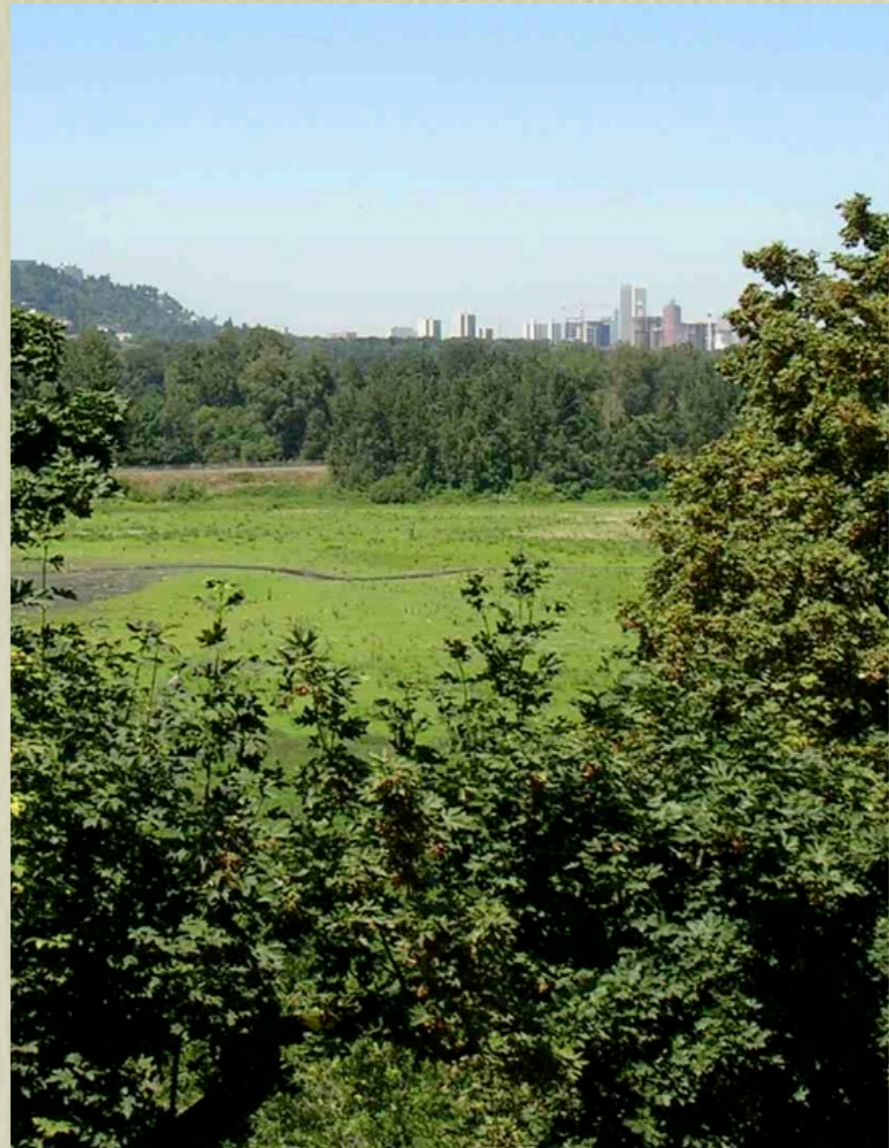
- Regional Government (Metro)
- Urban growth boundary
- Combined sewer system
- Eight months of rain



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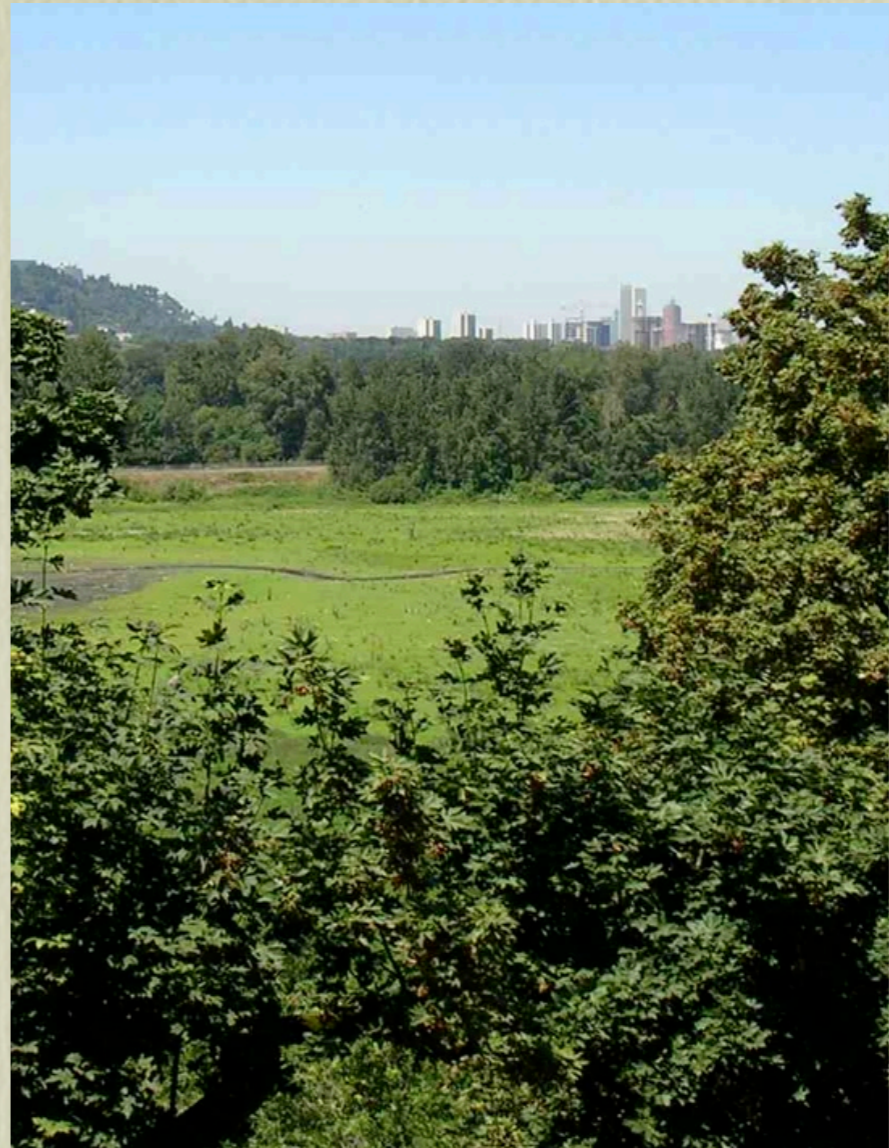
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- Water quality



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- Regional Government (Metro)
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- Combined Sewer Overflow Projects



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Study Area

- Regional Government (Metro)
- Urban growth boundary
- Combined sewer system
- Eight months of rain
- Water quality
- Combined Sewer Overflow Projects
- New focus on residential properties



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Research Questions

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- Do different land cover types on a property have a different effect on its sale price?
- Does land cover on surrounding properties have an effect on a property's sale price?

Previous Research

- Trees and Tree Canopy
 - Anderson and Cordell (1988)
 - Donovan and Butry (2009)
 - Netusil et al. (forthcoming)
- Vegetation
 - Des Rosiers et al. (2002)
 - Kestens et al. (2004)
 - Mansfield et al. (2005)

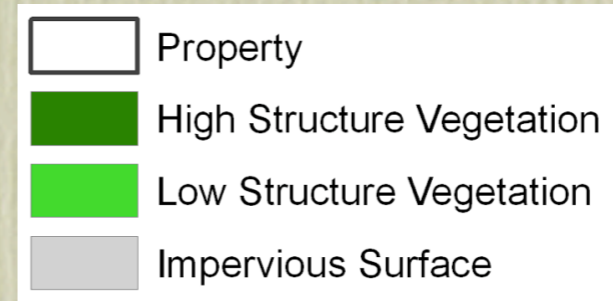
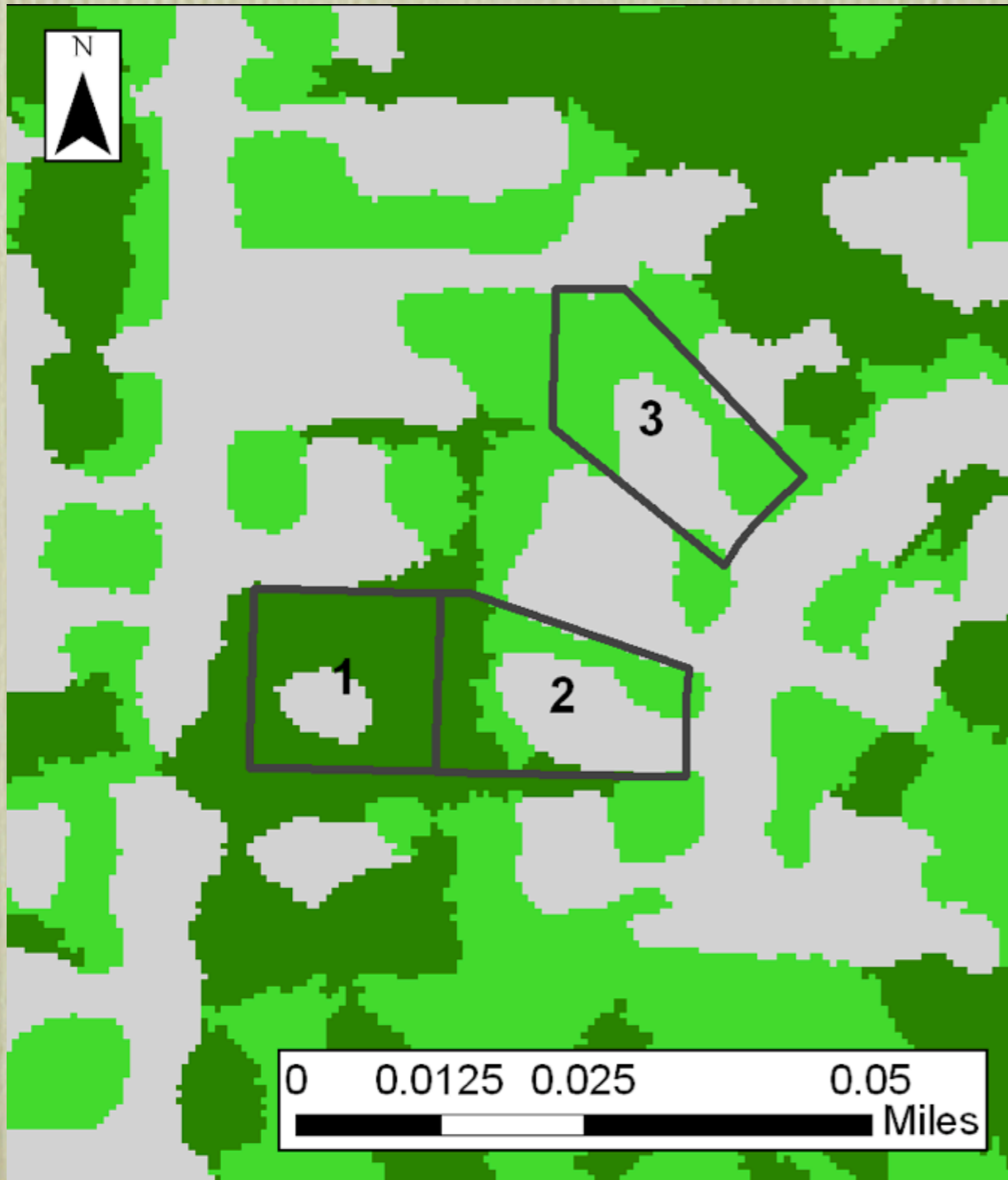
Property Data

| Variable | Mean | Standard Deviation | Minimum | Maximum |
|-----------------------------------|-----------|--------------------|----------|-------------|
| Real Sale Price (2007 dollars) | \$310,121 | \$190,816 | \$53,135 | \$4,349,733 |
| Lot Square Footage | 7,718 | 19,378 | 808 | 1,751,131 |
| Building Square Footage | 1,933 | 869 | 360 | 35,680 |
| Age | 53.4 | 31.77 | 0 | 137 |

Land Cover Data: On-Property

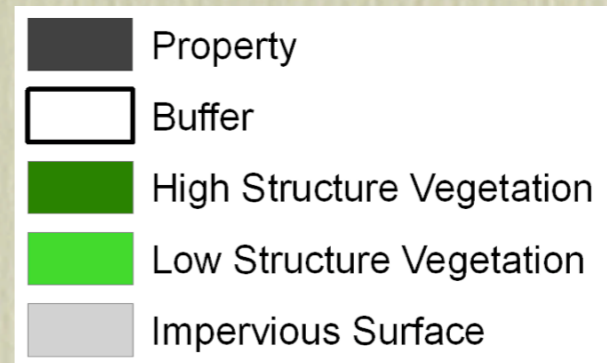
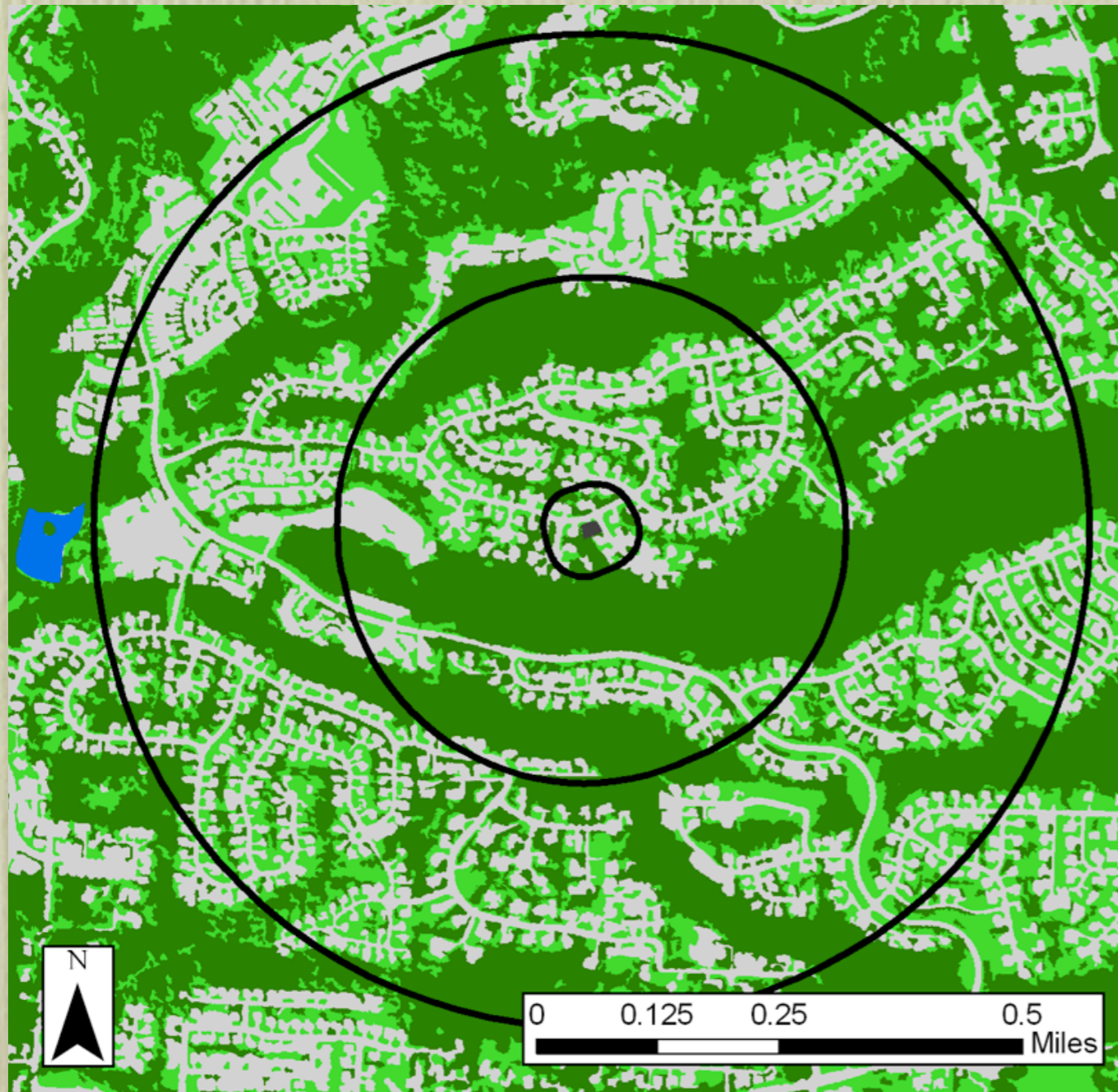
| | Mean | Standard Deviation | Minimum | Maximum |
|---------------------------|--------|--------------------|---------|---------|
| High Structure Vegetation | 26.08% | 22.13% | 0 | 100% |
| Low Structure Vegetation | 29.67% | 19.18% | 0 | 100% |
| Impervious Area | 44.24% | 19.60% | 0 | 100% |
| Open Water | 0.01% | 0.57% | 0 | 72.61% |

On-Property Land Cover



| | High Structure | Low Structure | Impervious |
|------------|----------------|---------------|------------|
| Property 1 | 84.77% | 0% | 15.23% |
| Property 2 | 26.07% | 29.66% | 44.26% |
| Property 3 | 0% | 61.01% | 38.99% |

Buffers



| | High Structure | Low Structure | Impervious |
|-----------------------|----------------|---------------|------------|
| 200 foot | 36.83% | 17.45% | 45.72% |
| 200 foot- 1/4 mile | 57.33% | 16.64% | 26.04% |
| 1/4 mile- 1/2 mile | 46.08% | 23.46% | 30.46% |

Land Cover: Within 200 Feet

| | Mean | Standard Deviation | Minimum | Maximum |
|---------------------------|--------|--------------------|---------|---------|
| High Structure Vegetation | 25.59% | 14.58% | 0 | 99.91% |
| Low Structure Vegetation | 28.23% | 10.33% | 0 | 90.19% |
| Impervious Area | 46.09% | 13.22% | 0 | 96.64% |
| Open Water | 0.09% | 1.53% | 0 | 67.71% |

Model

- 42,722 single-family residential transactions
- January 1, 2005-December 31, 2007
- Semi-log specification
- A priori expectations about water and vegetation variables
- Impervious surface is the excluded category

Results: On Property

| Variable Name | Estimated Coefficients (robust standard errors) |
|--------------------------------------|--|
| High Structure Vegetation | 0.0896*** (0.0169) |
| High Structure Vegetation Squared | -0.143*** (0.0224) |
| Low Structure Vegetation | 0.0422* (0.0224) |
| Low Structure Vegetation Squared | -0.105*** (0.0332) |
| Open Water | -0.333 (0.316) |

Impervious Surface is the excluded category

***p < 0.01, **p < 0.05, *p < 0.1

Calculations

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- 26.08%: Average for properties in our study
- Estimated increase in sale price of \$122
- Present discounted cost: \$230+
- Private benefits < private costs

Results: Within 200 Feet

| Variable Name | Estimated Coefficients (robust standard errors) |
|--------------------------------------|--|
| High Structure Vegetation | 0.138*** (0.0332) |
| High Structure Vegetation Squared | 0.0224 (0.0509) |
| Low Structure Vegetation | 0.350*** (0.0576) |
| Low Structure Vegetation Squared | -0.342*** (0.0872) |
| Open Water | 0.932*** (0.148) |

Impervious Surface is the excluded category

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Results: 200 Feet to 1/4 Mile

| Variable Name | Estimated Coefficients (robust standard errors) |
|--------------------------------------|--|
| High Structure Vegetation | 0.374*** (0.0536) |
| High Structure Vegetation Squared | -0.0329 (0.0792) |
| Low Structure Vegetation | 0.392*** (0.104) |
| Low Structure Vegetation Squared | -0.315*** (0.0885) |
| Open Water | 0.315*** (0.0885) |

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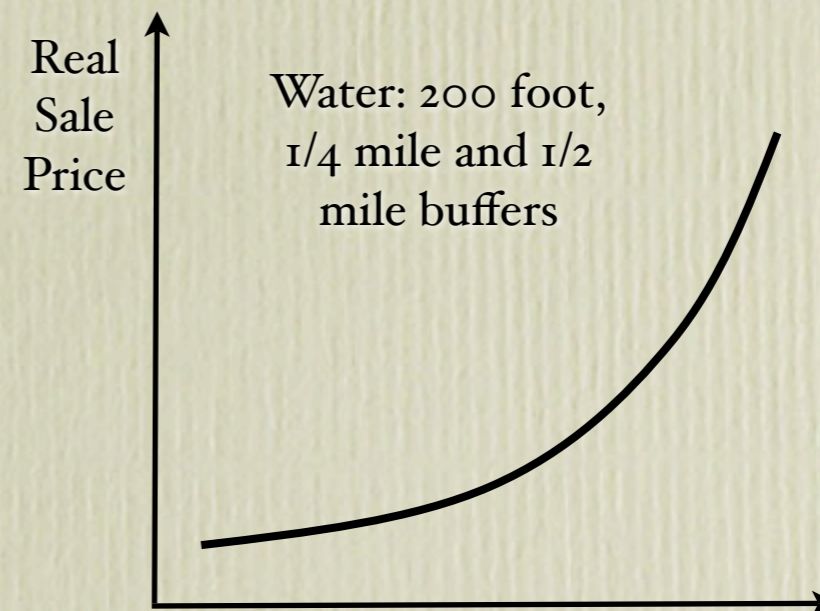
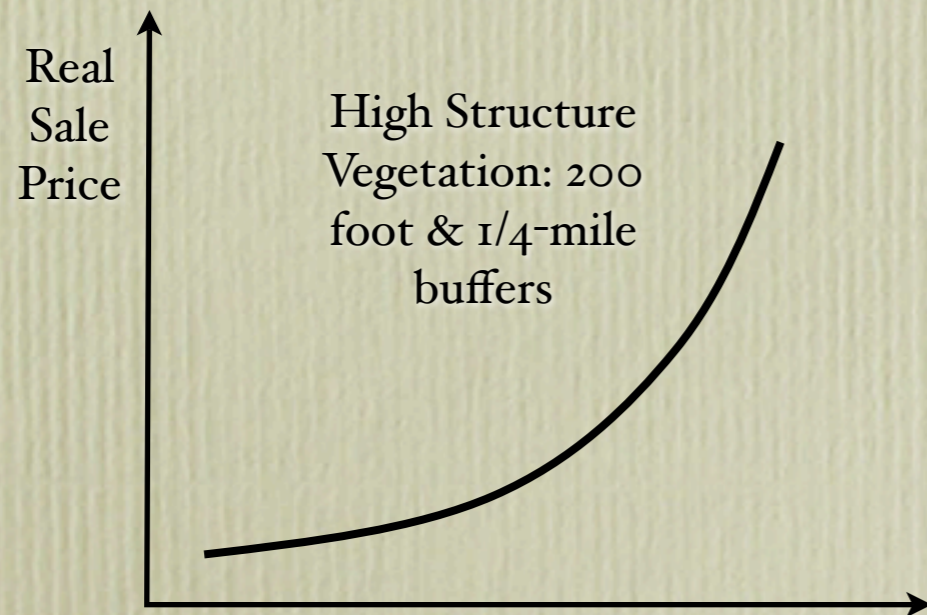
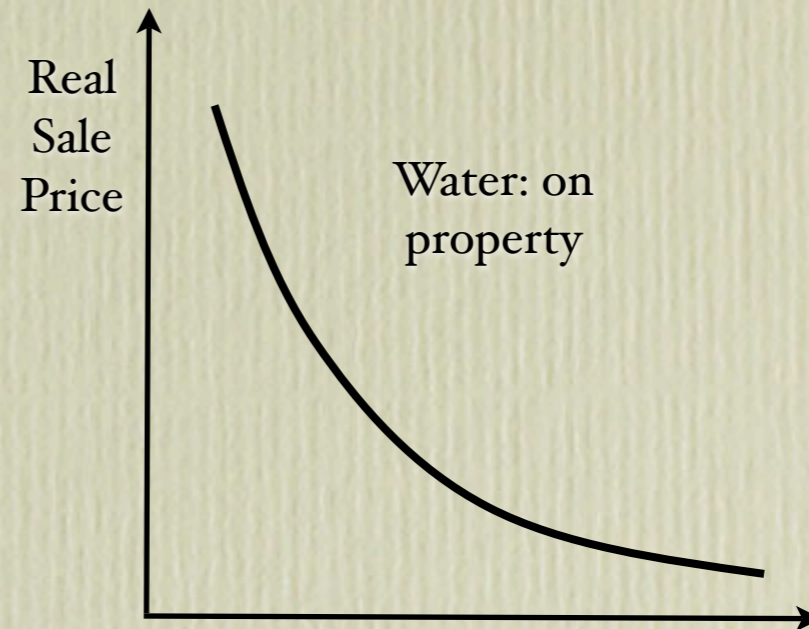
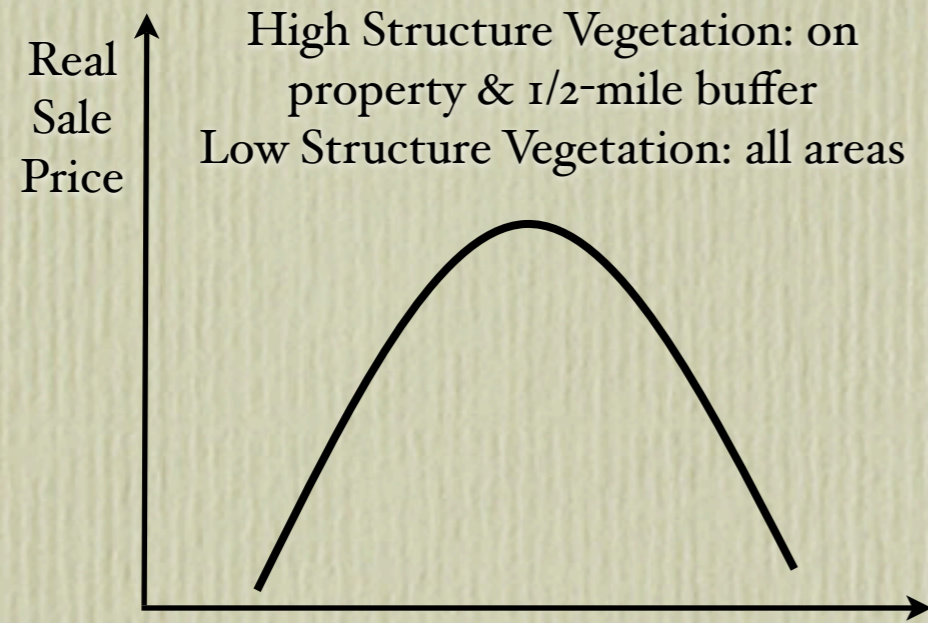
Results: 1/4 Mile to 1/2 Mile

| Variable Name | Estimated Coefficients (robust standard errors) |
|--------------------------------------|--|
| High Structure Vegetation | 0.556*** (0.0584) |
| High Structure Vegetation Squared | -0.298*** (0.0846) |
| Low Structure Vegetation | 0.812*** (0.112) |
| Low Structure Vegetation Squared | -0.683*** (0.173) |
| Open Water | 0.479*** (0.046) |

Impervious Surface is the excluded category

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Results



Overall Benefits

- Increase in high structure vegetation in surrounding buffers also has a positive effect on sale price
- Per-acre benefit is largest for increasing on-property high structure vegetation
- Other benefits may not be included in our estimates: water flow, water quality, carbon sequestration, air quality, aesthetics, wildlife habitat, etc.

Policies

- 35%-40%: Target tree canopy for residential areas set in Portland's *Urban Forest Action Plan*
- Incentive programs: Clean River Rewards, Ecoroof grant program, etc.
- Tax incentives: proposed riparian and upland tax credits
- Education: Portland Stormwater Marketplace

Questions?

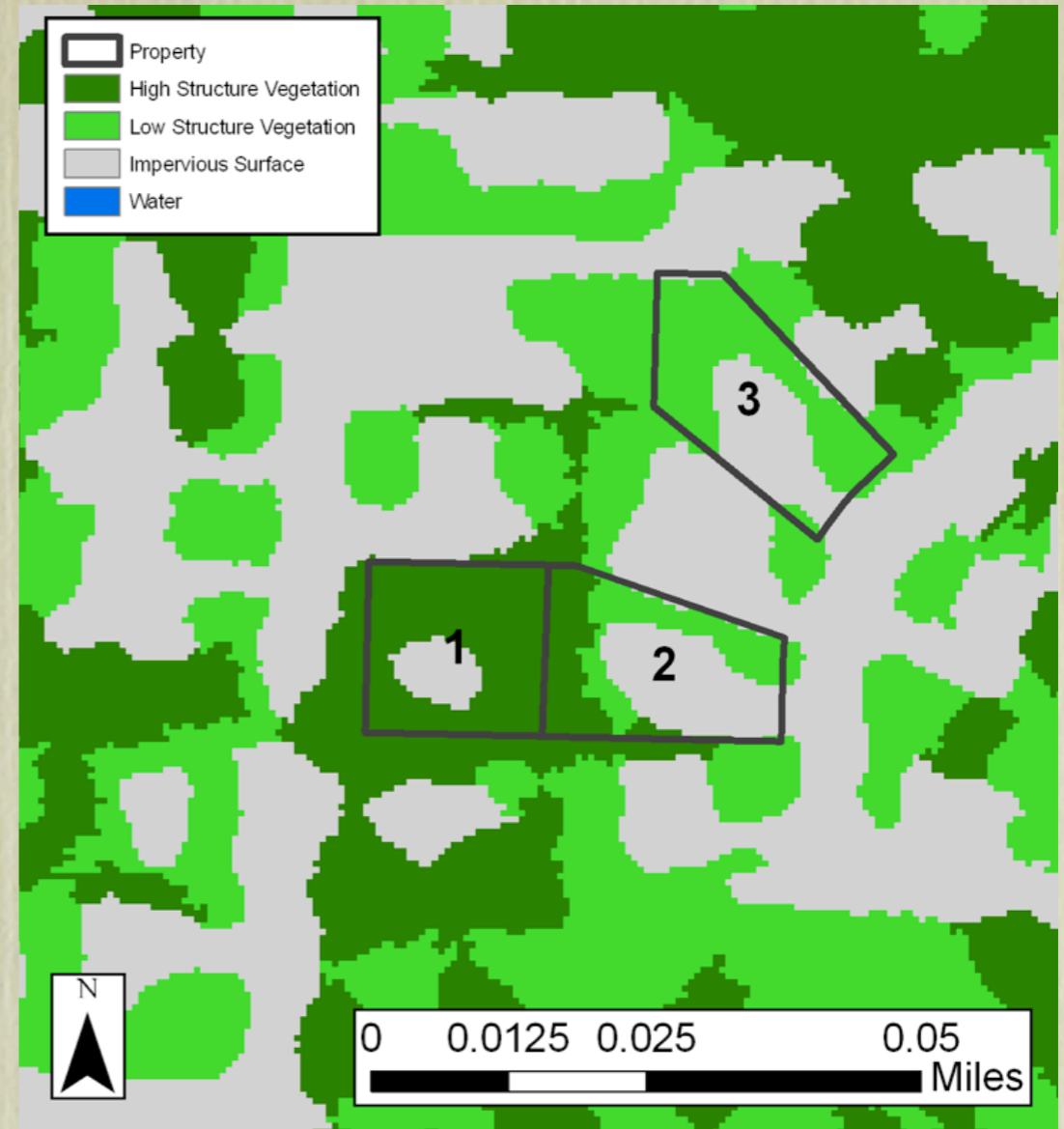
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Claire Puchy
Matt Summers
Schultz Environmental Studies
Award, Pomona College



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