

# Assessment of Non-Residential Water Use Efficiencies through Sales and Employment Business Databases

Miguel Morales and James Heaney

Dept. of Environmental Engineering Sciences

University of Florida

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# Conserve Florida Water Clearinghouse

- Developed model to serve as water conservation planning tool (EZ Guide Online)
  - Estimates water use within a water budget
  - Evaluates and optimizes conservation best management practices
  - Assists in utility and regional water supply planning

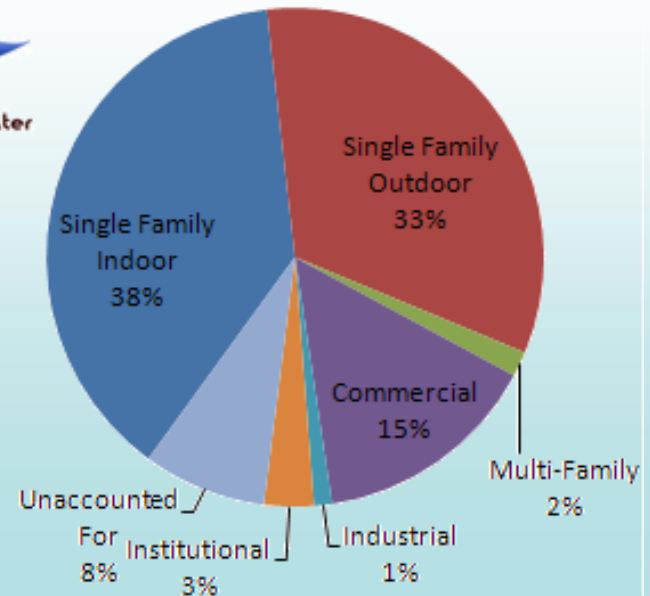
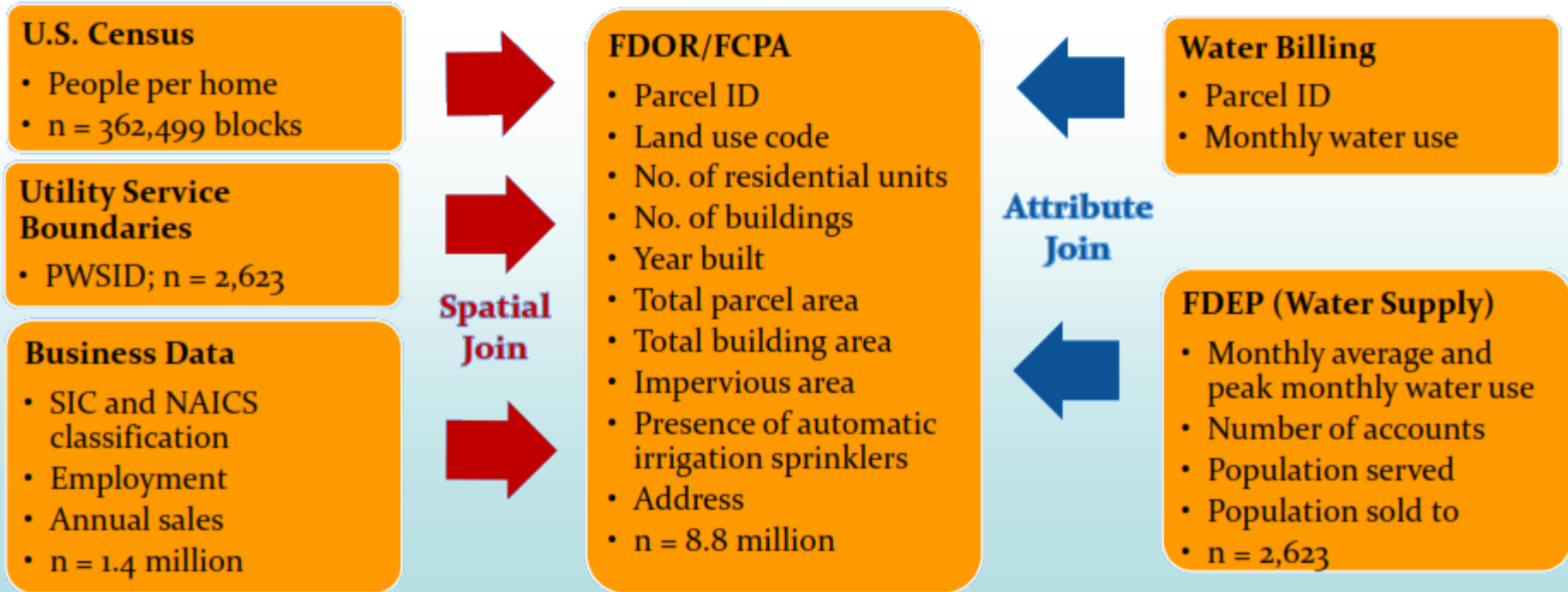


Figure 3.2.1 Calibrated Water Budget by Sector

# A Parcel-Driven Approach

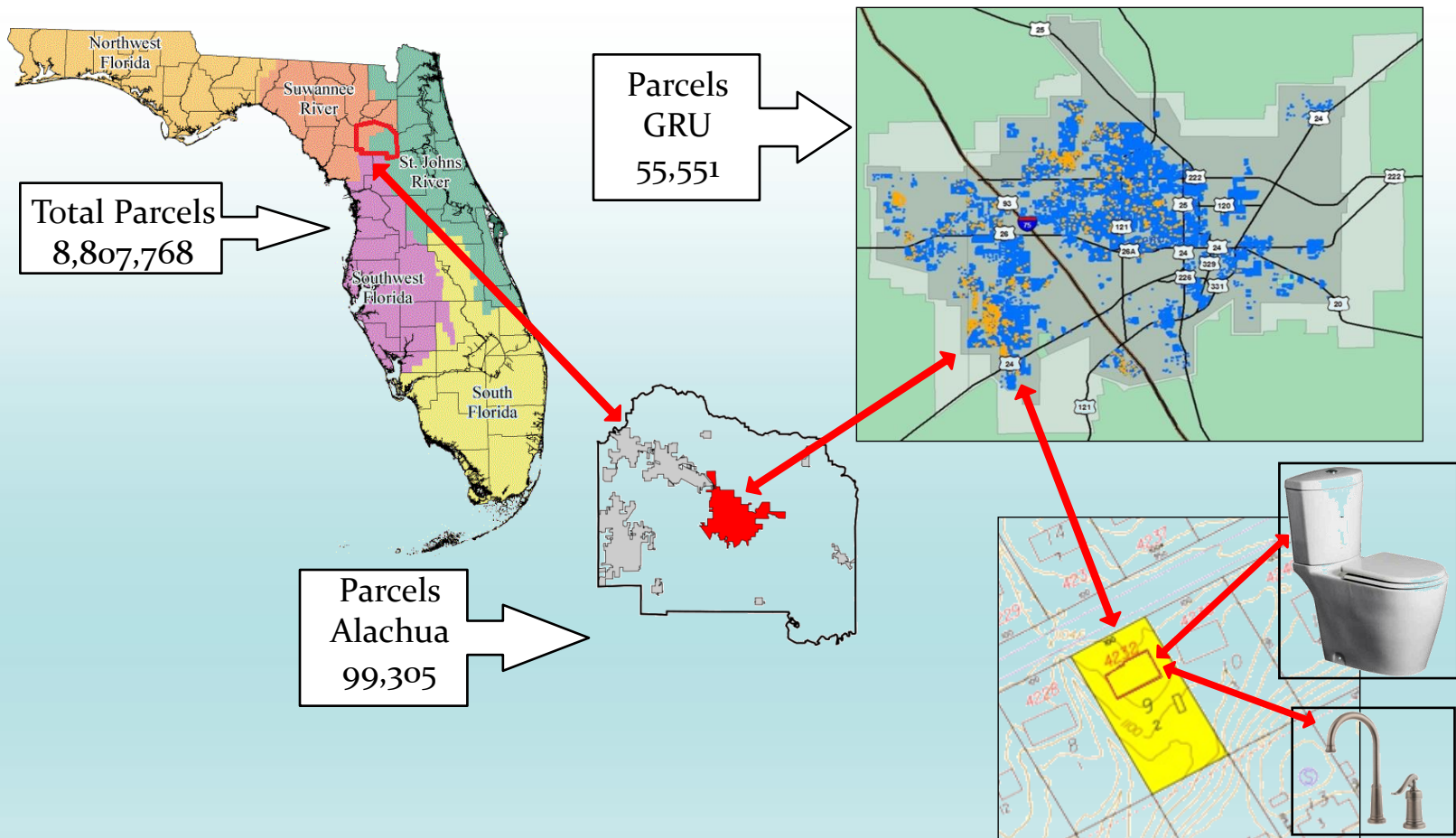


- Developed relationships between water use and parcel attributes to develop EZ Guide water conservation model
- For non-residential (NR) relationships based on heated building area (gal/heated ft<sup>2</sup>/d)

# EZ Guide Improvement on Non-Residential (NR) Water Use Demand Estimation

- Physical and economic property data available for every parcel in the state of Florida through:
  - Florida Department of Revenue (FDOR) and
  - Florida County Property Appraisers (FCPA)
- This parcel-level data provides:
  - A measure of size (heated building area) that is a good predictor of NR water use
  - A standardized classification scheme across the state that assigns each NR parcel into one of 55 land use classifications
  - Attributes that are **consistent** and **available** at a fine spatial resolution

# Macro to Nano-Scale Evaluation of Urban Water Use



# Continued Research Needs

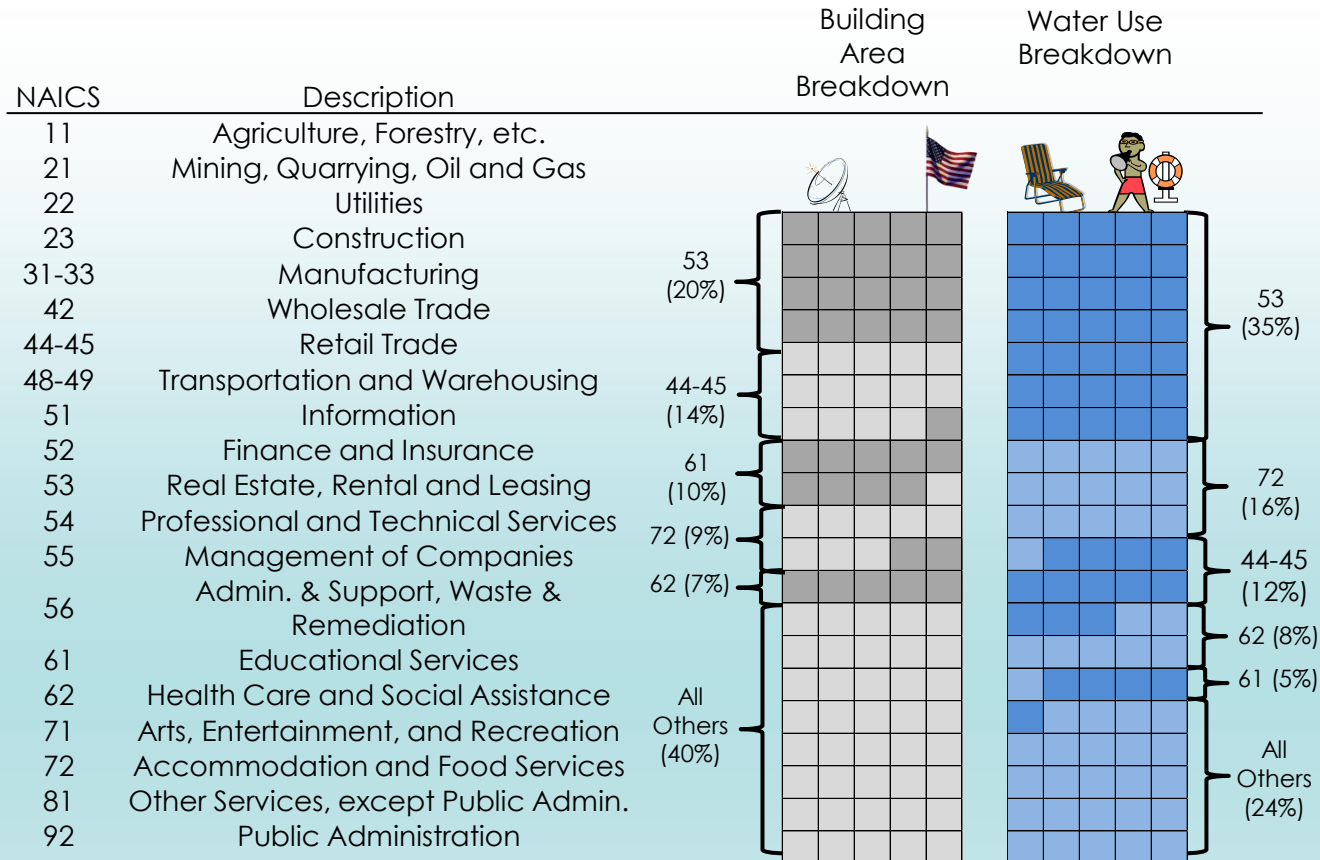
- Standardized methodology to classify NR customers
  - Schemes to classify NR customers differ greatly and often lack adequate disaggregation
    - Makes evaluations water use across sectors difficult
    - Hinders comparisons between utilities
  - EZ Guide approach limited to Florida
- NR water use patterns vary widely
  - Large heterogeneity within the sectors
    - Driven by differences in water use processes and technologies,
    - Varying employee and visitor occupancy patterns, and
    - Seasonal effects driven by fluctuations in consumer demand and climatic factors.

# Nationwide Standardized Classification

- North American Industry Classification System (NAICS)
  - A standardized business classification scheme for all of North America
  - Uses a hierarchical structure allowing for two to six digit classification codes
  - Available at the business level from proprietary business databases
- Business databases additionally provide employment and annual sales
  - Allowing for other drivers to explain NR water use
  - Example business data provider:
    - Database of over 25 million businesses



# Florida Statewide Analysis

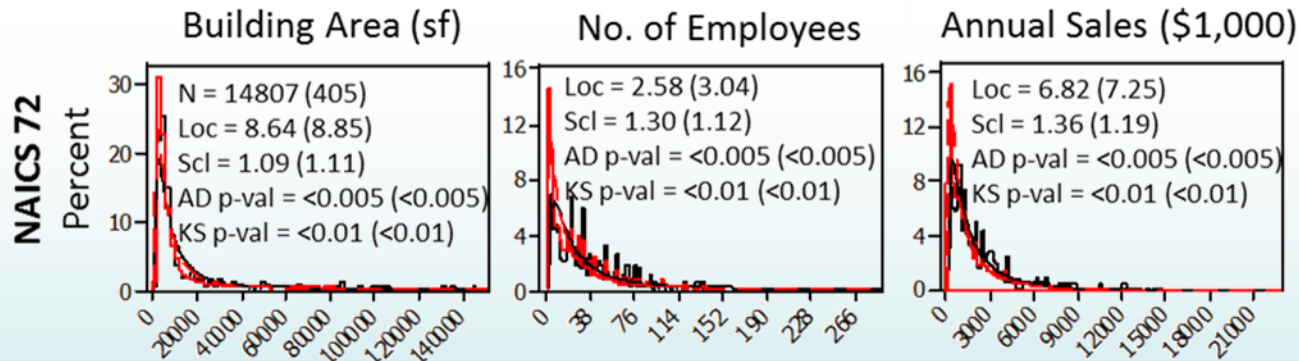




# Statistics for Top 5 Sectors

| NAICS | Description                       | N                          | Avg. Building Area (sf)   | Avg. Number of Employees | Avg. Annual Sales (\$1,000) | Avg. Water Use (gpd) | Weighted Avg. Water Use Coef. (gal/sf/d) | Est. Total Water Use (MGD) | % of Total Water Use |
|-------|-----------------------------------|----------------------------|---------------------------|--------------------------|-----------------------------|----------------------|--|----------------------------|----------------------|
| 44-45 | Retail Trade                      | 33,044<br>(560)            | 8,310<br>(10,754)         | 10.3 (16.1)              | 2,801<br>(4,134)            | 1,103                | 0.103                                    | 28.16                      | 11.7%                |
| 53    | Real Estate, Rental and Leasing   | 13,807<br>(166)            | 28,950<br>(20,679)        | 6.50 (10.0)              | 1,272<br>(1,891)            | 4,303                | 0.208                                    | 83.17                      | 34.6%                |
| 61    | Educational Services              | 4,658<br>(107)             | 43,248<br>(67,858)        | 51.8 (62.2)              | 299<br>(337)                | 4,262                | 0.063                                    | 12.65                      | 5.3%                 |
| 62    | Health Care and Social Assistance | 12,681<br>(368)            | 11,106<br>(11,410)        | 21.9 (27.6)              | 2,905<br>(3,710)            | 1,485                | 0.130                                    | 18.33                      | 7.6%                 |
| 72    | Accommodation and Food Services   | 14,807<br>(405)            | 11,928<br>(14,610)        | 25.5 (33.6)              | 1,965<br>(2,495)            | 3,257                | 0.223                                    | 39.37                      | 16.4%                |
|       | All Others                        | 124,436<br>(1,102)         | 6,151<br>(10,528)         | 8.8 (18.5)               | 2,097<br>(4,039)            | 852                  | 0.087                                    | 58.90                      | 24.5%                |
|       | <b>Total or Weighted Avg.</b>     | <b>203,433<br/>(2,708)</b> | <b>9,628<br/>(14,192)</b> | <b>11.9 (22.7)</b>       | <b>2,155<br/>(3,505)</b>    | <b>1,696</b>         | <b>0.123</b>                             | <b>240.58</b>              | <b>100.0%</b>        |

# Detailed Analysis for NAICS 72 (Accommodation and Food Services)



| NAICS     | Description                            | N             | Avg. Building Area (sf) | Avg. Number of Employees | Avg. Annual Sales (\$1,000) | NE vs. BA (100k sf) |           |                | AS (\$1,000) vs. NE |             |                |
|-----------|--|---------------|-------------------------|--------------------------|-----------------------------|---------------------|-----------|----------------|---------------------|-------------|----------------|
|           |  |               |                         |                          |                             | b                   | m         | R <sup>2</sup> | b                   | m           | R <sup>2</sup> |
| <b>72</b> | <b>Accommodation and Food Services</b> | <b>14,807</b> | <b>11,928</b>           | <b>25.5</b>              | <b>1,965</b>                | <b>21.4</b>         | <b>36</b> | <b>0.073</b>   | <b>191</b>          | <b>69.5</b> | <b>0.59</b>    |
| 721       | Accommodation                          | 3,358         | 25,337                  | 17.1                     | 1,742                       | 5.98                | 44        | 0.36           | 286                 | 85.5        | 0.78           |
| 722       | Food Services and Drinking Places      | 11,555        | 8,700                   | 28.5                     | 2,098                       | 23.9                | 54.3      | 0.087          | 148                 | 68.5        | 0.54           |

| NAICS     | N          | Avg. Building Area (sf) | Avg. Number of Employees | Avg. Annual Sales (\$1,000) | Avg. Water Use (gpd) | Q (gpd) vs. BA (100k sf) |              |                | Q (gpd) vs. NE |           |                | Stepwise Regression: Q vs. BA, NE, AS |              |            |              |                      |           |
|-----------|------------|-------------------------|--------------------------|-----------------------------|----------------------|--------------------------|--------------|----------------|----------------|-----------|----------------|---------------------------------------|--------------|------------|--------------|----------------------|-----------|
|           |            |                         |                          |                             |                      | b                        | m            | R <sup>2</sup> | b              | m         | R <sup>2</sup> | b                                     | BA           | NE         | AS           | R <sup>2</sup> (adj) | First In  |
| <b>72</b> | <b>405</b> | <b>14,610</b>           | <b>33.6</b>              | <b>2,495</b>                | <b>3,257</b>         | <b>2,230</b>             | <b>7,030</b> | <b>0.092</b>   | <b>2,040</b>   | <b>36</b> | <b>0.039</b>   | <b>1,560</b>                          | <b>5,600</b> | <b>N/A</b> | <b>0.357</b> | <b>0.12</b>          | <b>BA</b> |
| 721       | 74         | 26,054                  | 20.8                     | 1,742                       | 6,447                | 3,900                    | 9,780        | 0.085          | 4,580          | 90        | 0.09           | 1,540                                 | 11,800       | -245       | 3.2          | 0.54                 | AS        |
| 722       | 330        | 11,251                  | 36.7                     | 2,098                       | 2,539                | 1,840                    | 6,210        | 0.081          | 1,140          | 38        | 0.073          | 799                                   | 6,800        | 62.0       | -0.5         | 0.16                 | BA        |

# Conclusion

- The availability of the FDOR database and customer water billing data in Florida provides a major improvement in our ability to estimate NR water use (EZ Guide)
- The nationwide availability of business data in conjunction with water billing data and local property appraiser databases allows for a similar parcel-level approach to be readily applied across the country, providing:
  - Standardized and fine-resolution NAICS classifications
  - Drivers of water use such as building area, employment, and sales to better model and estimate demands

# Acknowledgements

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## Published Work

- Morales, M., Heaney, J., Friedman, K., and J. Martin. (2013). "Parcel-level Model of Water and Energy End Use: Impacts of Indoor Water Conservation on the Public Supply Sectors." *Journal American Water Works Association*. Vol. 105, No. 9.
- Morales, M., Martin, J., Heaney, J., and K. Friedman. (2013). "Parcel-level Modeling of Seven End Use Water Demands in 64 Public Supply Land Use Sectors." *Journal American Water Works Association*. Vol. 105, No. 8.
- Morales, M., Heaney, J., Friedman, K., and J. Martin. (2011). "Estimating Commercial, Industrial, and Institutional Water Use Based on Heated Building Area." *Journal American Water Works Association*, Vol. 103, No. 6.