# Southwest Florida Water Management District

# Small Area Population Projection Methodology Workshop For Water Supply Planning

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#### Population Model Overview

- Build-Out Density Model
- Growth Drivers Model
- Population Projection Model
- Seasonal Projection Methods
- Tourist Projection Methods
- Net Commuter Projection Methods
- Request for Feedback





# **Population Modeling Experience**

- Experience with developing GIS-based, small-area population projection models
  - Rich Doty 17 years
  - Jason Teisinger 10 years
  - 2 other analysts 2 years each
- Peer reviewed
- Withstood extensive public scrutiny & legal challenges



*Figure 6. Example of Build-out Density Model shaded by dwelling units per acre* 





# **Model Objectives and Constraints**

### Population Model Objectives

- Projects population at census block level
- Projections constrained at county level to BEBR projections
- Projects seasonal peak, functional, tourist, and net commuter projections based on SWFWMD methods
- Summarize results to different boundaries (utility, basin board, TAZ, etc.) to facilitate planning and comparisons
- Get input from local and regional government planners, water utilities, and other stakeholders



Update projections on an annual basis





# **Population Model Overview**

- GIS-based model
- Small-area projections
  - 2000 Census Block level disaggregated to parcels
  - 5-year increments to 2030
- Growth trends based on census and parcel data
- Growth drivers and constraints based on GIS maps
- Control county-level growth to BEBR projections
- Inputs and results adjusted based on stakeholder input











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# **Build-Out Density Model**

- Countywide Model
- Identifies growth inhibitors, such as incompatible land cover/land use (e.g., wetlands)
- Determines density of future growth based on historical densities











# **Build-Out Density Model**

- Caps growth based on historical densities by FLU Category
  - Current & projected
  - Combination of:
    - Parcel data
    - Future land use (from comprehensive plans)
    - DRI / large development data
    - 2000 Census data
    - Local input from planners, utilities, etc.



Sarasota County Buiild-Out Density Model





# Build-Out Density Model Inputs: Property Parcel Data



- Parcel Data Provides:
  - Spatially precise land use
    - FDOR Code
  - Timing of historical development
    - Year Built
  - Current Density
    - Units
    - Acres





# Build-Out Density Model Inputs: Future Land Use



- Future Land Use Data Provides:
  - Future vision
    - FLU Codes / Descriptions
  - Future unit density ranges





# Build-Out Density Model Inputs: Development Data



- DRI / Large Development Data Provides:
  - Projected units
    - Single Family
    - Multi-Family
  - Projected timing of development
    - Begin Year
    - End Year
    - Growth by Year





# Build-Out Density Model Inputs: Census Data



- 2000 Census Data Provides:
  - Population by Census
    Block
  - Average household size by Census Block
  - Average occupancy by ZCTA





## Build-Out Density Model: Combination of Inputs







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# **Growth Drivers Model Overview**

- Identifies new growth areas, in absence of other input data
- Spatial Drivers in Model:
  - Proximity to Roads & Interchanges
  - Proximity to Existing Commercial Zones & Other Developed Areas
  - Proximity to Surface Water Bodies
- Values Derived Using Statistical Relationship Between Historical Residential Development and Above Layers



SWFWMD Growth Drivers Model





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# **Growth Rate Calculations**

Historical growth trend calculations based on:

#### Population estimates

- Block-level census data (1990 & 2000)
- Property parcel data (2005) converted to population and summarized by census block

#### Growth rate calculations

- Similar to BEBR's methodology (accepted industry standard)
- 4 projection methods resulting in 6 projection calculations
- Minimum and Maximum projections discarded
- Average calculated from remaining 4





# **Rate Calculation Approaches**

#### 2 Linear (5 & 15 year)

 Assumes future population change for each census block will be the same as over the historic period

## • 1 Exponential (15 year)

 Assumes population will continue to change at the same annual growth rate as over the historic period

#### 2 Share of Growth (5 & 15 year)

Assumes that each census block's percentage of the county's total growth will be the same as over the historic period

#### • 1 **Shift Share** (5 & 15 year)

 Assumes that each census block's percentage of the county's total annual growth will change by the same annual amount as over the historic period





# **Growth Calculations**

- Average 4 rate calculation methods (parcel level)
- Check against build-out (parcel level)
  - If growth for a parcel is greater than its build-out, control growth to equal build-out
- Summarize countywide growth (county level)
- Check growth summary against target (BEBR)
  - If county growth exceeded target growth, reduce growth for each parcel proportionally
  - If county growth fell below target growth (as typically happened), growth would be distributed to areas with no prior development based on the mean growth driver values





# **Aggregation of Results**

- Can aggregate census blockbased results to other boundaries, including:
  - Water utility service area boundaries
  - Traffic Analysis Zones (TAZs)
  - Municipal boundaries
  - Census Tracts
  - Basin Board boundaries
  - Watersheds



Census Block-Level Projections







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- Based on SWFWMD methodology
- Based on following Zip Code (ZCTA) level data:
  - 2000 Census
  - Hospital Admissions for population cohort typical of seasonal residents divided by the probability of admission (difference between Q1 and Q3 comparisons to estimate seasonal population)





#### Peak population calculated first:

(2000 Population in Households)

- + (2000 Housing Units Vacant for Seasonal x 1.95 Persons Per Household)
- + (2000 Group Quarters Population)

#### Ratio of peak to census population: (2000 Peak Population) / (2000 Census Population)

- This ratio is populated in the parcel level data to calculate peak population at the parcel level
- The 2000 ratio is held constant over time (but may change with the 2010 Census)





- Functional population calculations:
  - Seasonal Resident Ratio (SEASRR) is based on SWFWMD hospital admissions data (difference between Q1 & Q3) at ZCTA level
  - Calculate 2000 Seasonal Households: [((SEASRR – 1) x 2000 Pop in HH) / 1.95 (Districtwide Seasonal Persons Per Household)]
  - Calculate 2000 Ratio of Seasonal to Total Households: (Seasonal HH) / [(Census HH) + (Seasonal HH)]
  - Calculate 2000 Projected Seasonal Resident Peak Population: (Peak HH) x (Ratio of Seasonal to Total HH) x (Seasonal Persons Per HH)
  - Calculate 2000 Projected Permanent Resident Population: (Peak HH) x (1 - Ratio of Seasonal to Total HH) x (Permanent Persons Per HH)
  - Determine appropriate value for proportion of year spent in service area:

(0.442 for beach destination counties, & 0.567 for non-beach destination counties) – per Dr. Klages



- Functional population calculations (continued from previous slide):
  - Seasonal resident adjustment:
    - (((Proportion in Service Area) x 132) + ((1 Proportion in Service Area) x (132 – 69.3)))/132
    - (where 132 is a 5-year average per capita use and 69.3 is estimated indoor per capita use)
  - Functionalized seasonal population:
    (2000 Seasonal Residents) x (Seasonal Resident Adjustment)
  - Total functional population:
    (2000 Permanent Residents in HH) + (2000 Functionalized Seasonal Residents) + (2000 Group Quarters Residents)
- Ratio of functional to census population calculation: [2000 Functional Population] / [2000 Census Population]
  - This ratio is populated in the parcel level data to calculate functional population at the parcel level
  - The 2000 ratio is held constant over time (but may change with the 2010 Census)





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# **Tourist Population Methods**

- SWFWMD Methodology
- Simple linear trend of DBPR room estimates
- Based on 10 years of county level data (1996 – 2005)
- Trend used to extrapolate rooms at existing tourist lodging locations throughout District
  - Lodging locations geocoded to road centerlines
- County level average unit occupancy and party size ratios applied
  - (Rooms) x (Occupancy Rate) x (Party Size)



Ratios provided by SWFWMD (Klages, 2006)



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# **Net Commuter Population Methods**

- SWFWMD Methodology
- Based on the ratio of 2000 net commuters to total population at the Census tract level
- Net commuters are functionalized by the following ratios:
  - 8 / 24 (hours per day)
  - 5 / 7 (days per week)
- Ratio applied to future total population projections to derive future net commuter
   projections





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# We Need Your Feedback!

- Please continue to provide information that may influence growth, such as:
  - New growth areas
  - Changes in future densities
  - New or lost industries / major job centers
  - New roads
- Model inputs typically assume future densities by FLU Category will be <u>similar</u> to historical densities (1995-2005).



New Development Master Plans

- They will direct how much growth SWFWMD will plan for over the next 20 years. However, the projections will be updated annually.
- Model results and inputs useful for local planning efforts and decision support analysis.





## **Project Contacts**

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