

Florida Travel Behavior Inventory

presented to
Florida Model Task Force

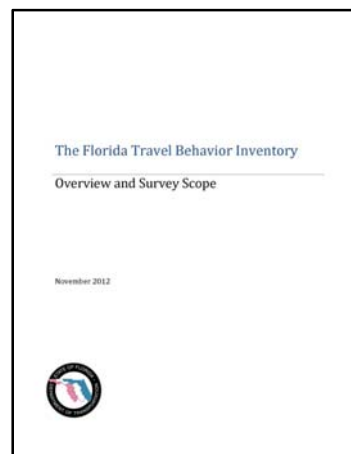
presented by
Steve Ruegg

December 7, 2012



Presentation Outline

- Statement of Purpose
- Survey Benefits
- Model Applications
- Data Collection
- Data Processing
- Sample Size
- Survey Sample Frames
- Conceptual Schedule
- Conclusions
- MTF Endorsement



Statement of Purpose



A consistent, reliable and comprehensive inventory of travel behavior in Florida is essential to the development, maintenance, and application of local, regional and statewide forecasting models



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Purpose and Need: Survey Benefits



- Total costs for the ideal sample size and all survey types statewide could range from \$5 to \$10 million
- But when compared to the Five-Year Work Program budget of over \$36 billion, this total is less than 1/3 of 1% of the work program.
- If we can avoid building even one unnecessary major capital improvement, a survey probably pays for itself.

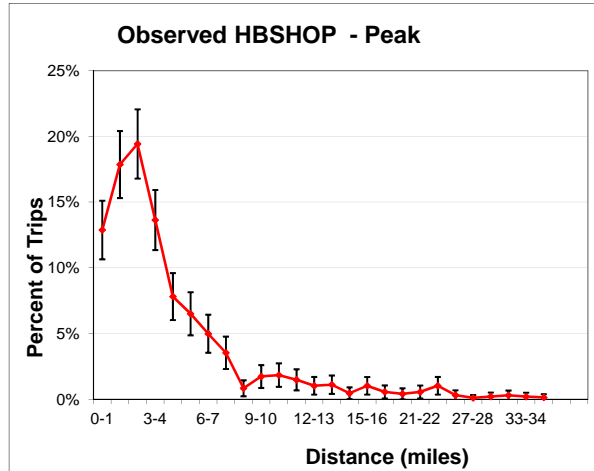
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Model Applications



- Estimation
- Calibration
- Validation
- Uncertainty
- Sensitivity
- Historical Trends



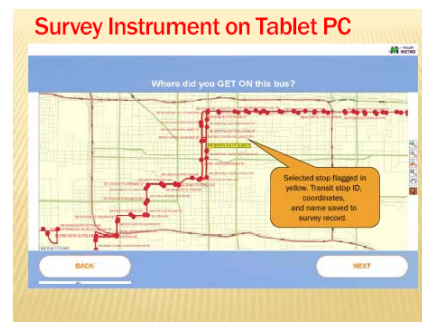
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Data Collection





- State of Practice Techniques
- State of Practice Technology
- Lower Respondent Burden
- Increased Response Rate
- More efficient Surveys



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Data Processing



- Consolidated Master Set of Variables
- Consistent Data Definitions
- Common Data Framework
- Accessible
- Secure Disclosure Rules
- Historical Archive

Table 1: Sample Household Survey Data Requirements

Household Data	Person Data	Vehicle Data	Place/Trip Data
Household ID	Household ID	Household ID	Household ID
Home Address	Person ID	Vehicle ID	Person ID
Primary Language	Gender	Vehicle Year	Place ID
Dwelling Type	Age	Vehicle Make	Location
Number of Units in Bldg	Licensed Driver	Vehicle Model	Time of Departure
Own/Rent Status	Disability Status	Vehicle Used on Travel Day	Mode of Travel
Telephone Ownership	Work Status	Reason if not Used	Travel Cost Details
Income	Usual Work Location		Transit Trip Details
Travel Day(s)	Primary Job Details		Parking Details
Day of Week of Travel	Secondary Job Details		Party Size
	Educational Attainment		Party Members
	Student Status		Other Mode Details
	Type of School		Primary Activity
	School Location		Other Activities
	Relation to Head		Location Lat/Long
	Reason for No Travel		



Sample Size





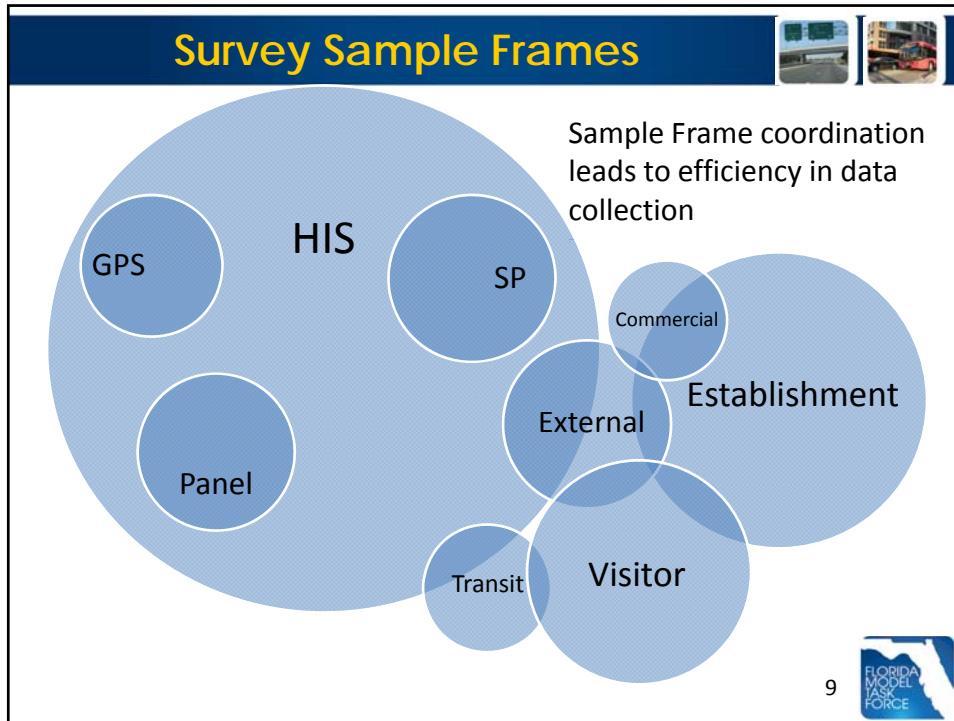
Sample Size Principles:

- Based on acceptable model accuracy
- Statistical basis for sample sizes
- Known model performance outcomes

Preliminary Sample Size Estimates:

- HIS: 0.4% – 1.0%
- Ext: 10%-20%
- GPS: 5%-10% of HIS
- SP/WTP: 480 w/10 options
- Transit: 10%-20%
- Panel: 1,500-2,000 HHLDS
- Visitors: 400/Market Seg
- Commercial: 400/Mkt Seg
- Establishment: 3,000 Est





Conceptual Schedule

Survey	Year									
	1	2	3	4	5	6	7	8	9	10
HIS	=====> Ongoing, Incremental =====>									
Panel										
GPS										
SP/WTP										
Transit										
External										
Visitor										
Commercial										
Establishment										

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Conclusions



- Program Phasing and Prioritization
- Uniform Design
- Needs-based Survey Sizing
- Unified Support

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MTF Endorsement



The Model Task Force endorses the development, funding and implementation of a Florida Statewide Travel Behavior Inventory program to facilitate economic growth and development, improvement of the transportation system and improved travel forecasts and analysis throughout the state of Florida.



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Discussion



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Home Interview Survey



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Purpose and Need



- Travel behavior data from all persons in a sample of households throughout the model region – including household, person, vehicle and trip data.
- Provides basic state, regional, or district level travel profiles for statistical analysis, trend analysis, statewide modeling, and/or rural modeling.
- Detailed travel activity information that supports activity-based, trip-based and hybrid model development.

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Purpose and Need



- The data should reflect the full diversity of behavioral determinants of travel activity:
 - Accurate travel and activity information for all persons
 - Travel reflective of weekday travel
 - Minimum numbers of households per county and/or modeling region
 - Adequate representation of diversity across explanatory variables

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Sample Frame & Data Collection



- Address-based sample frames provide the best coverage of the general population
- Data collection may involve multiple methods:
 - Recruitment is often performed over the phone
 - Paper trip diaries may be used to help participants keep track of their travel
 - Retrieval of person and trip data is best performed using a computer-aided procedure – phone or internet-based
 - Personal GPS devices can be used to verify trip data
 - In-person interviews may be used for hard-to-reach populations (sparingly due to cost)

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Data Collected



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	Reason for No Travel		

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Sample Size Considerations



- For model calibration & validation: provide reliable estimates of aggregate travel measures for key model, segmented by mode, purpose, time of day, and origin-to-destination patterns
- For model estimation: provide adequate sample sizes for observed choices, to support the statistical testing and estimation of existing and new choice models, such as destination choice or activity pattern models.
- Typical sample sizes range from 0.4% for large states (California) to 1-2% for small states (Utah). A sampling rate of 0.5-0.75% is recommended for Florida ~ 36,000 to 54,000 households.

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Survey Schedule / Timeframe



- Due to large number of households to recruit, the survey will take place over many months
- Periods when schools are out of session, as well as holidays, are typically avoided
- Winter months may also be atypical in parts of the state, due to presence of seasonal residents

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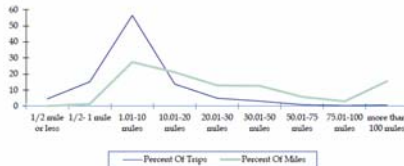
Long-Distance/External Travel Surveys



- Focus of External & Long-Distance Travel Surveys
 - External: trips of differing lengths with one or both trip ends outside urban/regional model
 - Could include some long-distance commute trips as well
 - Long-Distance: trips of 50+ miles that are not of a routine nature; key component of statewide models
 - Alternate thresholds of 50, 75, and 100 miles = long-distance

NCHRP 05-84 Long-Distance and Rural Travel Transferable Parameters
for Statewide Travel Forecasting Models Final Report

Figure 2.1 Vehicle Trips and VMT by Trip Length



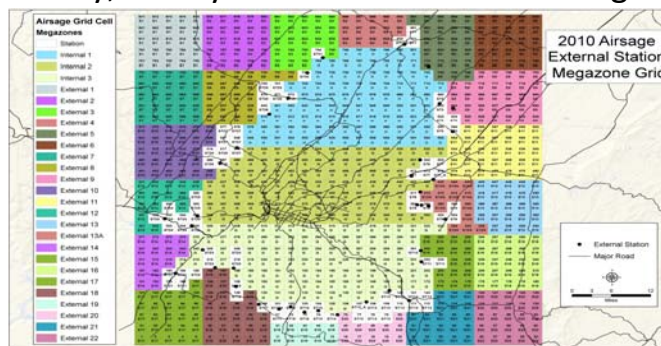
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Long-Distance/External Travel Surveys




- What data collection techniques are best?
 - External: traditional roadside intercept surveys; passive data collection techniques (cellular, Bluetooth)
 - Long-Distance: national or statewide household travel diary; survey not limited to HHs making L-D trips



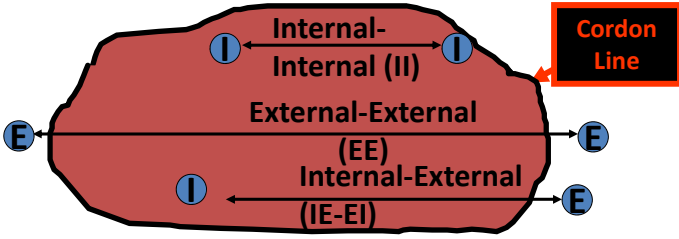
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Long-Distance/External Travel Surveys




- What key variables do we need to collect?
 - External: Internal-external splits at each external zone; origin-destination zones for through trips; trip purpose and auto occupancy rates by purpose
 - Long-Distance: household characteristics; purpose and frequency of long-distance trips; trip purpose and auto occupancy rates by purpose

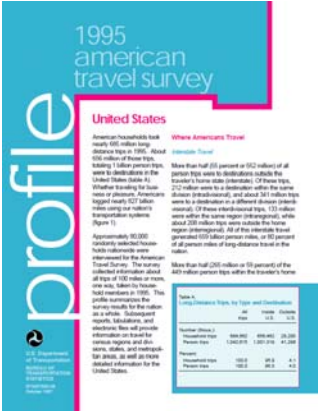



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Long-Distance/External Travel Surveys



- Accuracy and sample size
 - External: generally 10-25 percent of all trips passing through each external zone during survey period
 - Low volume external zones can be assumed 100% IE
 - Long-Distance: ideal sample similar to that of the 1995 American Travel Survey
 - 116,176 individuals/262,764,948 U.S. population = 0.04%

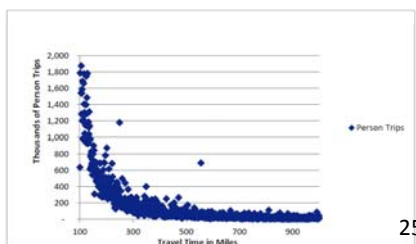


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Long-Distance/External Travel Surveys



- What is the timeframe for the survey?
 - External: One time intercept survey would suffice; however, passive data collection should reflect 30+ days of data
 - Long-Distance: One time household survey would suffice; however, rolling/panel surveys would better identify trends relative to seasonal patterns, gas prices, and airfares



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GPS Based Surveys



- Can be used in multiple survey types as well as a survey type in and of itself.
- Should be used as part of O/D, Household Travel and On-Board surveys.
- Can be used in all surveys to help eliminate geocoding errors.
- GPS based variables include: Lat/long., time/date, speed and direction of travel.

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GPS Based Surveys



- Some household travel surveys use multiple techniques to obtain data with only a subset using GPS.
 - The 2011 California Household Travel Survey (CHTS) SGAG Augment for example had 4,700 households but used only 1,750 with GPS. This survey used GPS units that were wearable. This survey was able to get Lat/Long, Time/Date speed and direction of travel.
- Due to costs of GPS devices it is recommended that the survey take place over the span of a year with monthly quotas.
 - Cincinnati Household Travel Survey also used GPS units in concert with other surveys like child diaries, individual survey forms etc.

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GPS Based Surveys



- GPS has also being widely used in multiple day surveys to reduce respondent burden.
- GPS can also be used with Prompted Recall method
 - The Cincinnati Survey mentioned above, the Jerusalem survey, and the New York Regional Travel Survey used this.
 - There are several studies either completed or ongoing around the US that can be used as models.

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Toll Willingness to Pay SP Surveys



- Purpose & Need
 - Analysis of road pricing requires estimates of willingness to pay (WTP) because:
 - WTP is an important analytical tool in evaluating traffic and revenue potential and in enhancing the credibility of the study for presentation to the financial community
 - WTP varies by facility, region, and traveler characteristics
 - SP surveys provide statistically efficient and reliable estimates of WTP
 - Florida has a long history of SP surveys for its toll facilities, especially in the South Florida region
- Model Application
 - WTP used in the assignment step using an equivalent time penalty (CTOLL in FSUTMS)
 - Development of toll choice models to directly represent traveler/trip characteristics and update WTP in all existing models
 - Forecast demand for new/future conditions (e.g. how does increasing tolls affect demand?)

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Toll Willingness to Pay SP Surveys



- What is a Stated Preference Survey (a refresher)
 - Respondents are shown a series of trade-off questions
 - Trade-offs are designed to force difficult choices
 - Resulting data allows for choice model estimation to predict behavior under different (future) conditions

SUNCOAST TRAVEL SURVEY

Below are different travel options for your trip. These options include information on travel time and toll cost. If the options below are the only options available for your trip, which would you prefer?

Highlighted information will vary from screen to screen.

Make Your Trip Using Your Current Route	Make Your Trip Using the New Suncoast Parkway Extension
Travel time: 1 hr. 20 mins.	Travel time: 1 hr. 4 mins.
Toll cost: \$0.00	Toll cost: \$2.15
I prefer this option: <input type="radio"/>	I prefer this option: <input type="radio"/>

(Question 1 of 4)

[Next Question](#)

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Toll Willingness to Pay SP Surveys



- Data Collection – 2 Potential Approaches
 - Simultaneously with HH Travel Diary Survey
 - SP questions are customized as able around a trip reported in the diary (previous questions in the survey)
 - Pro: Higher sample size and con: Higher respondent burden
 - After conducting the HH Travel Diary Survey
 - SP questions are fully customized around a trip reported in the diary
 - Pro: Lower respondent burden because it is conducted about 1-2 months after the HH Travel Diary and con: Potentially lower response if not timed well

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Toll Willingness to Pay SP Surveys



- Data Variables & Sample Sizes
 - HH Travel Diary collects full trip data including use of toll facility, toll amount, payment type
 - SP experiments would be customized by region and/or facility, but also uniform to allow aggregation for state-level
 - 400 completed surveys per market segment is sufficient to estimate WTP with small error margins
 - Sample frame could represent FL population or could target urban regions with toll roads and those with long-distance trips in the HH travel diary survey

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Toll Willingness to Pay SP Surveys



- Schedule/Timeline
 - Most corridor-specific SP surveys require 12-16 weeks
 - With additional effort to customize based on trips reported in the HH travel diary survey and the potential to conduct joint RP/SP modeling 20-24 weeks is more realistic

	Option 1: 2-3-4 Express Lanes with additional information	Option 2: 2-3-4 Express Lanes	Option 3: 2-3-4 Express Lanes	Option 4: 2-3-4 Express Lanes, Bypass or other toll-free route
Departure time:	Between 6:00 AM and 9:00 AM	Between 6:00 AM and 9:00 AM	Between 6:00 AM and 9:00 AM	Between 6:00 AM and 9:00 AM
Travel time:	25 min.	24 min.	25 min.	25 min.
Toll:	Toll free		\$1.00	\$0.00
Number of additional passengers:	1 person			
Subject line:	I prefer this option	I prefer this option	I prefer this option	I prefer this option

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Need for Transit Surveys



- Development of Mode Choice and Transit Network Models
- FTA New (Small, Very Small) Starts
 - Recent Survey required
 - Forecasts of riders and User Benefits
 - Before Conditions
 - After Conditions

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Types of Surveys



- Surveys of routes, vehicles, systems
 - On/off counts
 - Passenger movements
 - Run time and dwell times
 - Parking, passenger drop-off
 - Fares
- Surveys of passengers
 - Marketing focused
 - Traditional on-board for modeling/planning
 - Special purpose surveys

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Use in Models



- Network and path-building parameters
 - Weight and penalties
 - Other parameters
- Ridership targets
 - Riders & transfers by route, mode, purpose, TOD
 - Activities by stop
 - Mode of access/egress, parking usage
 - Transit travel patterns
- Model estimation
 - Model structure (nesting, etc.)
 - Logit coefficients

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Types of On-board Survey Data



- Person
- Household
- Trip
- Expansion factors (weight)

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Panel Survey



- Panel surveys measure variations in travel behavior over time by taking repeated measurements on the same sample at different points in time.
- It provides the opportunity to capture the lags and leads in travel behavior, reveal the contributing patterns to the decision process, and observe compensatory processes.

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Panel Survey



- Data collection approach
 - The initial recruitment of households for the Panel Survey is similar to recruitment for a Household Travel Diary Survey, and could take place at the same time the next one is conducted.
 - For successive waves, additional recruitment is needed to account for household attrition and demographic changes in the population.
- Data Variables
 - Generally the same instruments (for core questions to be asked) as the Household Travel Diary Survey.
 - Qualitative questions may be added to obtain attitudinal information on particular subjects of interests.

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Panel Survey



- Sampling
 - Sample size for the panel survey depends on the rarity, rate, and variability of the behavior change, panel replacement rate, and the sampling design, etc.
 - The Panel Survey can start with the sample frame for the Household Travel Diary Survey. Continuous monitoring of changes in the population demographics should be conducted.
 - Additional consideration and efforts are needed to address issues like higher non-responses, attrition, panel tracing, panel fatigue, panel conditioning, and in-migrating and other new households, etc.

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Visitor Survey



- Visitors make significant contributions to the overall traffic in Florida.
- It is critical to be able to reflect the demand generated by non-resident and seasonal resident travelers, whose travel patterns and mode usage is different from those of full-time residents.
- Visitor surveys provide unique and useful information about non-resident and seasonal resident travel that may not be adequately captured through household travel surveys.

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Visitor Survey



- Data collection approach
 - **Seasonal (or snowbird) residents** could be captured as part of the Household Travel Diary Survey; Additional efforts could also be considered, such as targeted sampling to seasonal residents.
 - **Visitors (non-residents)** can be approached through intercept surveys at airports and major attraction sites.
- Data variables
 - For **seasonal residents**, all data collected would be a part of (and therefore identical to) the Household Travel Diary Survey.
 - For **non-residents (visitors)**, the key variables include demographics, general visit information, and detailed trip information (purpose, mode, departure time, and origin/destination) about the last trip coming to this location and the next trip leaving this location.

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Visitor Survey



- Sampling
 - Around 400 for 95% confidence level, around 270 for 90% confidence level for each segment.
 - The segments could include travel purpose (business/leisure), length of stay (day, overnight, multi-day), and geography (area type, location, etc.)
 - Sample frames vary with data collection approaches and techniques, which may present significant challenges when expanding the data to represent the visitor population.

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Commercial Surveys

presented to
MTF Committee Name

presented by
Krishnan Viswanathan

Dec 5, 2012



Purpose and Need



- Vital to understand from an economic development point of view
 - What goods are being transported and where
- Limited information on all actors in supply chain
 - CFS, Transearch provide flow information
 - Lack of true understanding of supply chain decision making
- Huge contributors to facility wear and tear
 - Sheer weight of vehicles

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Model Application



- Current Florida Statewide Freight Model follows traditional four step approach
 - Based on 2003 Transearch data
- Next generation freight model is more supply chain oriented
 - Need detailed information on all actors of the freight story
- Either option requires detailed information on what commodities are moving and where
 - Helps understand current demand and future needs

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Data Collection



- Context is critical
 - Commercial vehicle (local traffic focus) or freight (long distance)
 - Ideal survey mix of both
- Develop matrix of methods Vs. needs
 - Establishment, commodity flow, count surveys, vehicle trip diaries (with or without GPS)
- Freight data more difficult to collect
 - Confidentiality, employer policies, hours worked

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Data Variables



- Location information
 - True O/D, interim stops, business address, survey location
- Time and Route information
 - Routes and frequency along with time of day/week information
- Truck classification type and size categories
- Commodity/goods information
 - Goods characteristics
 - Empty, LTL, Full

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Sampling Requirements



- Sample Size
 - Establish confidence interval
 - Establish market segments
 - Minimum of 260 per market segment to get statistically significant results
- Sampling Frame
 - Vehicle registration list
 - Commercial establishment list
- Frequency
 - Ideally on a continuous basis (once a year)
 - Consider ACS type approach
 - Weighting concerns

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Establishment Surveys



- Collect Person and Truck Trips associated with the operation of the business establishments
 - In essence, the “*Non-Home Based*” trips
 - Magnitude of Attractions
 - For Trip-Based Models -- To establish Trip Attraction Rates
 - For Tour-Based Models -- For specifying the destination choices of stops within a tour in terms of:
 - Accessibility
 - Agglomeration
 - Substitution
 - Complementary

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Establishment Surveys



- Also, collect trip making data to specify “Special Generators”
 - Universities
 - Military Bases
 - Hospitals
 - Theme Parks
 - Vacation Resorts

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Establishment Surveys



Data To be Collected:

- Site Generated Trips – The travel/trip diary data
 - Mode of commuting: mode/route/fare/toll, access and egress modes, frequency of usage
 - Employee attending out-of-office functions (e.g., attending meetings and field surveys): Mode, distance, & duration (departure and return arrival time)
 - Employee perform service calls: Stops and locations
 - Dispatch of truck deliveries
 - Lunch and errands: Mode, distance, & duration (departure and return arrival time, if return to office after the errands)
- Establishment Circumstantial Data
 - Employees class and numbers (org chart), full time/part time and vacancy
 - Business Hours (Day Time Only, two-shift, around the clock)
 - Area of working space
 - Identify the availability and participation of Flexible Work Schedule
 - Parking Availability and Subsidiary
 - Commuting/Transit Subsidiary
 - Company car ownership
- Establishment Visitors
 - Customers/Clients and other Business Visitors (number of individuals and number of groups), frequencies,
 - Delivery and Pick-up
 - Building Maintenance/Repair and Cleaning Services

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Establishment Surveys



- Survey Design
 - Initial Turnkey survey
 - 3,000 establishments
 - Longitudinal survey
 - To monitor the changes of establishments in their
 - Turnovers
 - Structure
 - Policies associated with trip making

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