The Impact of Water Level and Climate Variation on Recreation Demand at Fort Cobb Reservoir

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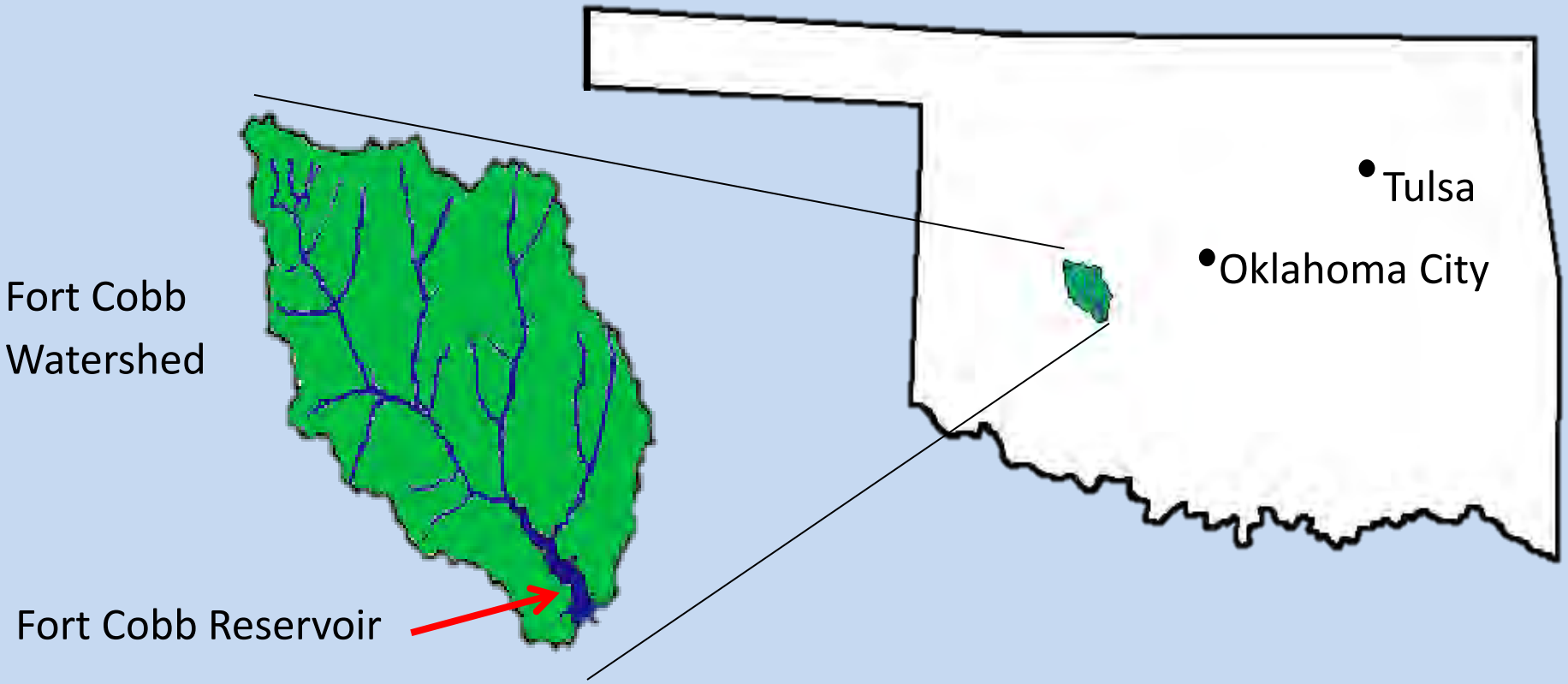
Fort Cobb Reservoir




Boat Ramp
Tent Hill
Black Jack Cove
Deer Run Cove
Eagles Nest Cove
Boat Ramp
Rd
N2530 Rd
White's Catfish Cove
Cove Road
Caddo Hill
Sunset Cove Marina
Boat Ramp
Fort Cobb State Golf Course
Dam
Cobb Creek
N2550 Rd
Fort Cobb Lake State Park

The Problem

- Recreators at the lake care about and value:
  - Campsites w/ hookups
  - Bathrooms/picnic shelters
  - Water quality/levels
  - Scenery
- Changing conditions at the lake affect its value

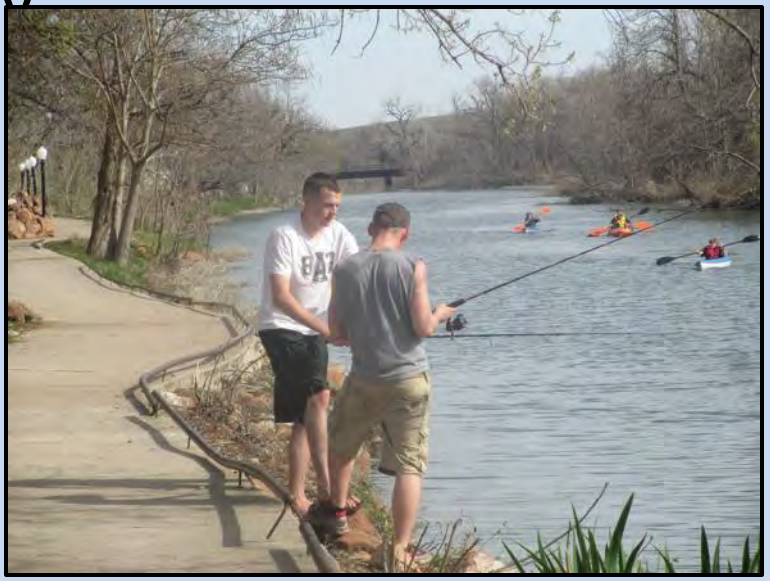
Research Objectives

- Value recreational trips to Fort Cobb Reservoir

- Relate the demand for trips to conditions at the reservoir, including:
  - Water levels
  - Air temperature
  - Precipitation

Economic Theory and Valuation

- A person's behavior/choice reveals their preferences/values
- Willingness to pay can be > 0 even if they spend zero money
- Impaired water conditions affect behavior, reduce value



Procedures

- Estimate the demand for trips using data on visitors' trip frequency and travel costs (from on-site visitor survey)

- Relate changes in demand to changes in lake conditions using data on monthly visitation (from Tourism and Recreation Dept records)

On-Site Visitor Survey

- Conducted over two weekends in June, July
- 2-page questionnaire
- About 200 responses

Visitor Sample Summary Stats

Variable	Mean	Std. Dev.	Min	Max
Visits to Fort Cobb Res.	16.57	42.71	1	480
Travel cost	91.21	108.43	0	935.97
Group size	3.30	1.80	1	10
Age	44.23	12.74	20	74
Boating	0.72	0.45	0	1
Fishing	0.72	0.45	0	1
Overnight	0.93	0.26	0	1

Visitors' Trips Demand Model

- Want to explain this decision:

Visitors' Trips Demand Model

- With λ_i = **visitor *i*'s total trips** over 2-year period, the trip demand model is:

$$\lambda_i = \exp\left(\begin{array}{l} b_1 + b_2 travel\ cost_i + b_3 substitute\ cost_i + \\ b_4 group\ size_i + b_5 age_i + b_6 boating_i + \\ b_7 fishing_i + b_8 overnight_i \end{array}\right)$$

Visitors' Trips Demand Model

Variable	Coefficient	Std. Error
Constant	-0.102	0.755
Travel cost	-0.007	0.003
Substitute cost	0.002	0.003
Group size	0.054	0.061
Age	0.013	0.010
Boating	0.932	0.315
Fishing	-0.102	0.755
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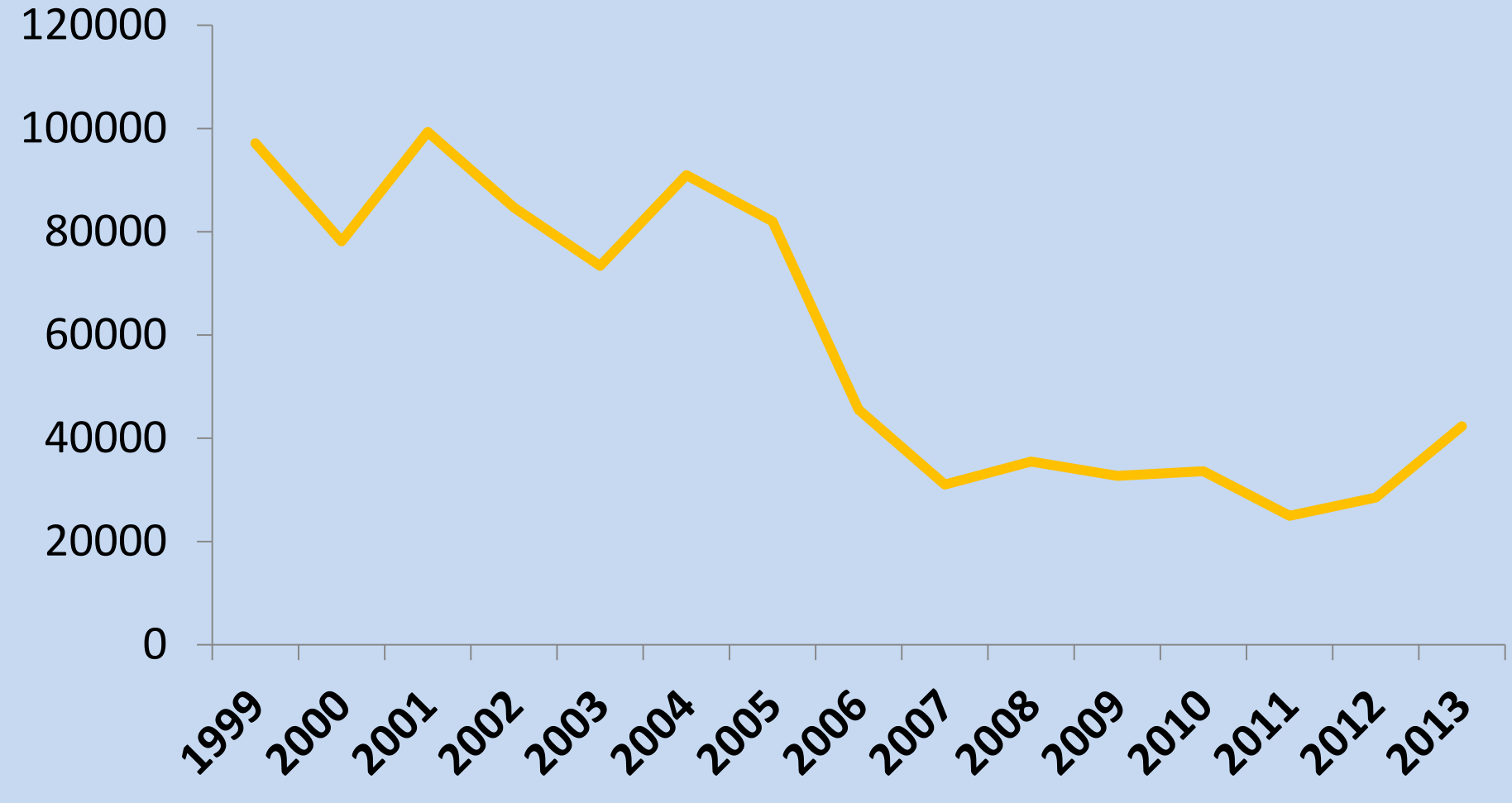
Visitors' Trips Demand Model

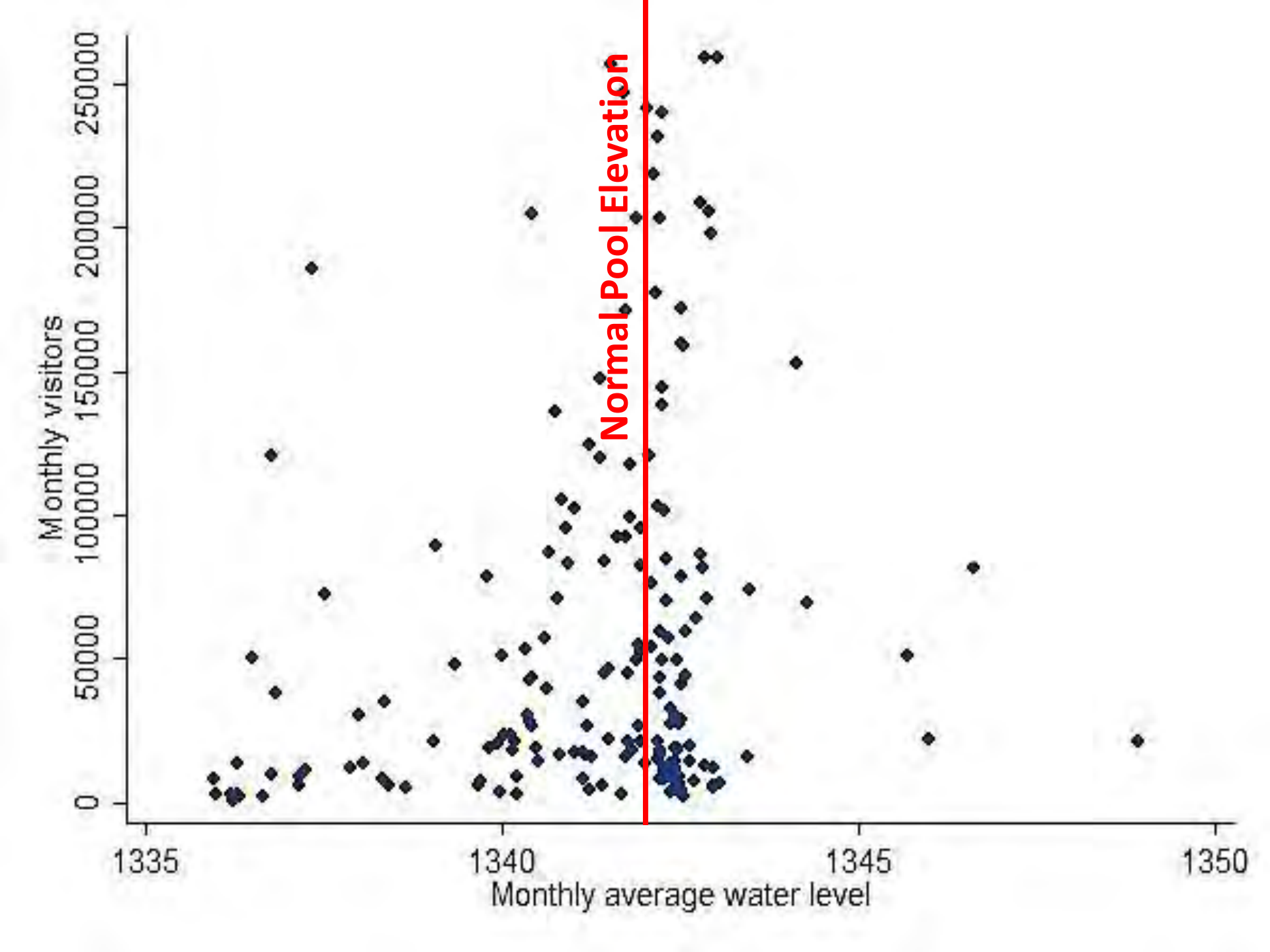
- Willingness to pay estimates:

Trip welfare measure	Sample Average	95% Confidence Interval
WTP/visiting group	**$150**	**$67 - $647**
WTP/visitor	**$61**	**$27 - $257**
WTP/visitor/day	**$18**	**$8 - $72**

Average Monthly Visitors to the Reservoir

- Want to explain this:




Normal Pool Elevation
Monthly visitors
0
50000
100000
150000
200000
250000
1335
1340
1345
1350
Monthly average water level

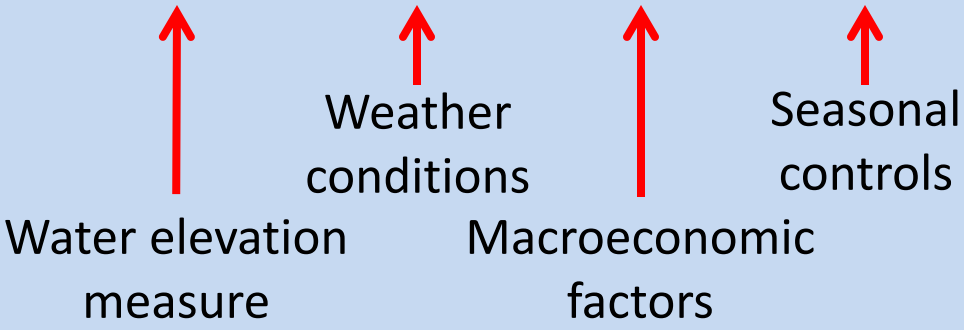
Monthly Data Summary Stats

Variable	Mean	Std. Dev.	Min	Max
Visits	58,254	65,072	879	259392
Water Level	1341.15	2.10	1335.94	1348.90
Temperature	55.14	14.88	26.44	83.39
Rainfall	0.07	0.07	0.00	0.39
Wind speed	9.85	1.52	6.71	14.36
Unemployment	4.84	1.12	2.80	7.20
Gas price	2.35	0.91	0.92	4.03

Monthly Visitation Model

- With v_t = **total visitors in month *t***, the monthly visitation model is:

$$ln(v_t) = a + bw_t + gc_t + hx_t + dd_t + e_t$$



Monthly Visitation Model

Variable	Coefficient	Std. Error
Dif. from normal	-0.054†	0.032
Temperature	0.142*	0.033
Temperature squared	-0.001*	0.000
Rainfall	0.006	0.498
Wind speed	-0.008	0.037
OK Unemployment rate	0.012	0.048
Gas price	-0.117	0.120
Constant	6.355*	0.912
Year trend	-0.084*	0.030

Seasonal controls (month dummies) not shown

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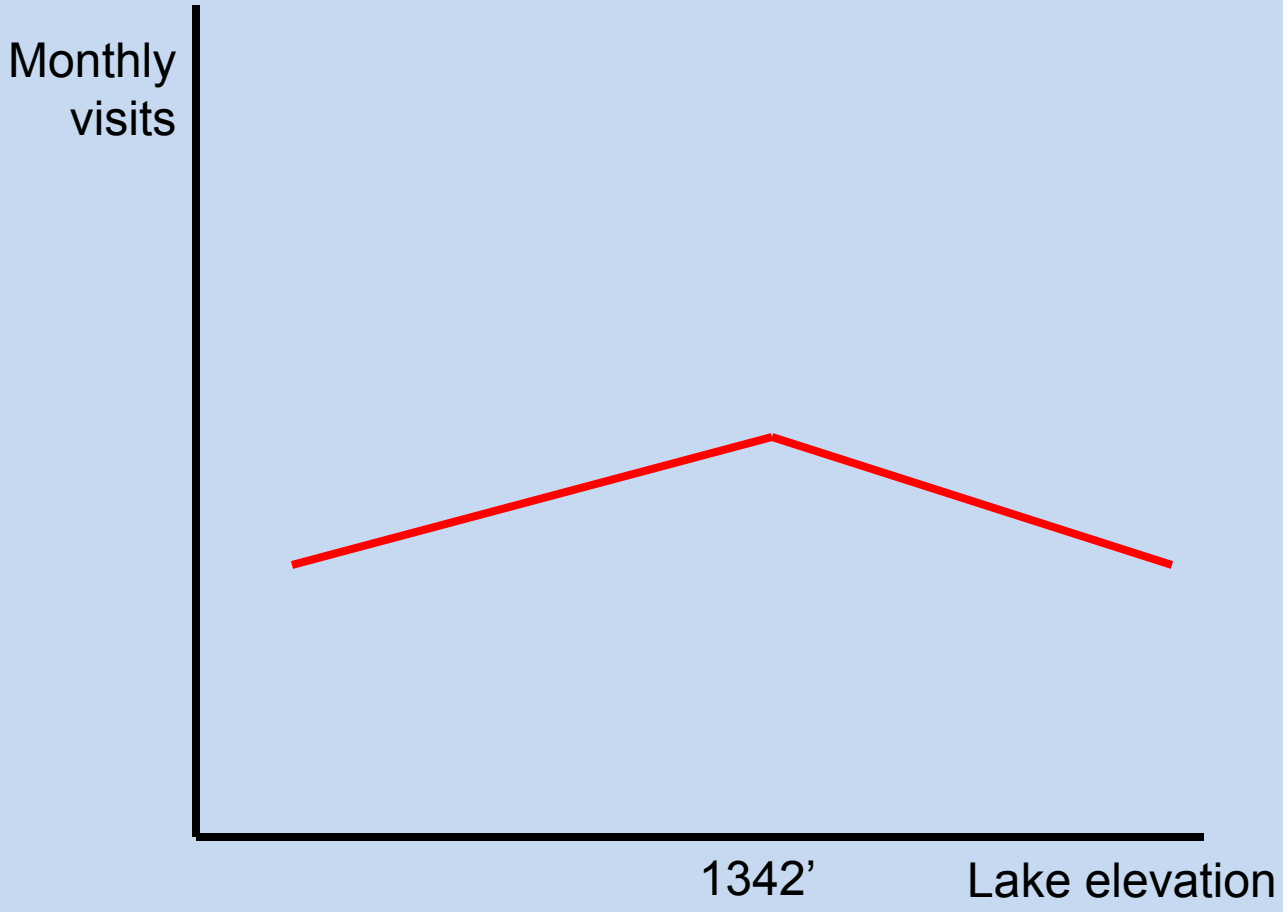

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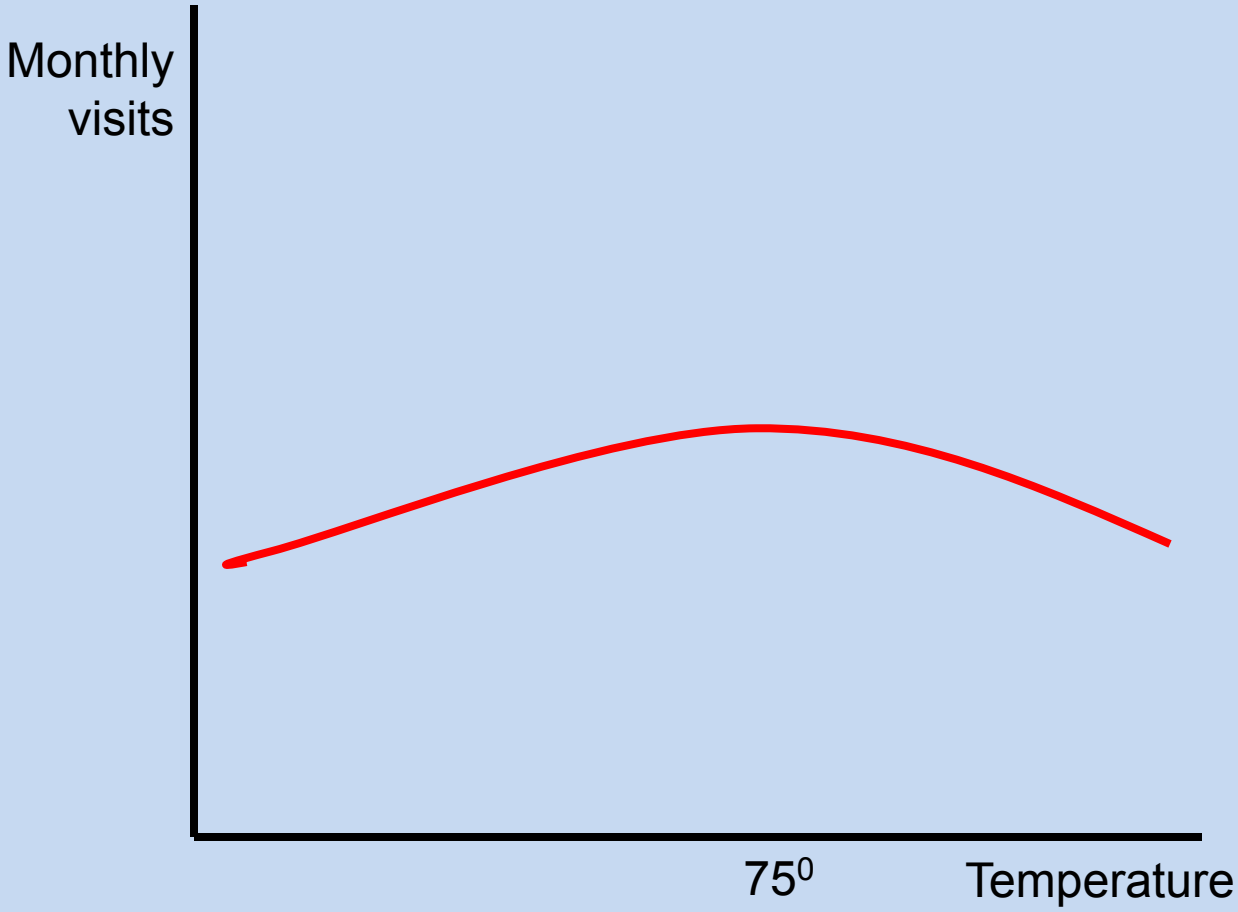

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Monthly Visitation Model

- Some predictions from the model:

Scenario	Change in Monthly Visits
1 ft lake level change from normal elevation	**-3095**
1 deg. increase from sample avg. temperature	**1693**
1 deg. increase from 80 deg.	**-1266**

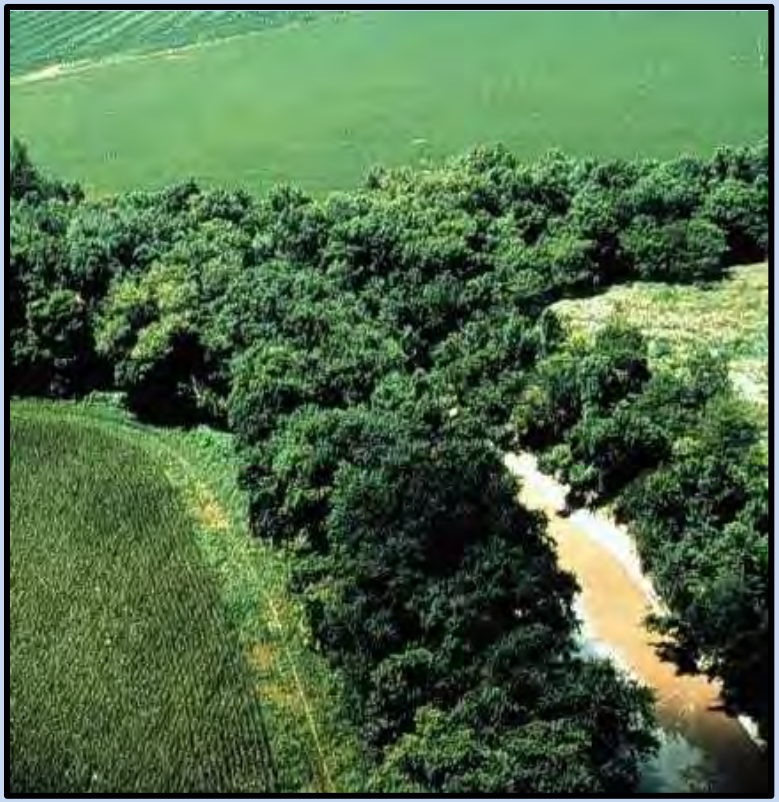
Conclusion

- *On average, the value of a visit is about $60*
- *Visitation increase with temperature, except when it is already hot*
- *Other weather factors do not affect visitation*
- *Visitation decreases when water elevation moves away from normal pool height*

Next Steps

- Link trip intensity and visitation to water quality measures

- Measure economic benefits improved water quality to non-users



Acknowledgements

- USDA National Integrated Water Quality Program
- Oklahoma Agricultural Experiment Station
- Lowell Caneday
- Azaz Zaman