



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Regional Approaches for Meeting Future Water Demands in North Carolina

Gregory W. Characklis

Professor

Department of Environmental Sciences and Engineering
Gillings School of Global Public Health

&

Director

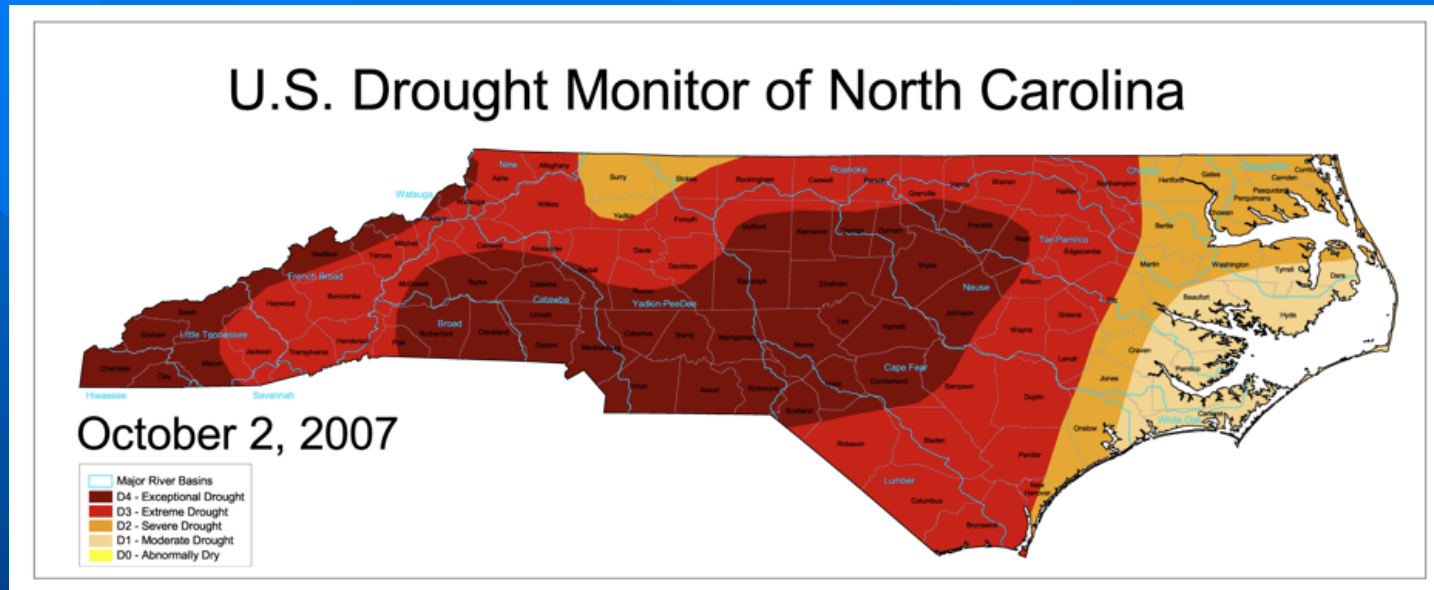
Center for Watershed Science & Management
UNC Institute for the Environment

NC Legislative Working Group

Raleigh, NC

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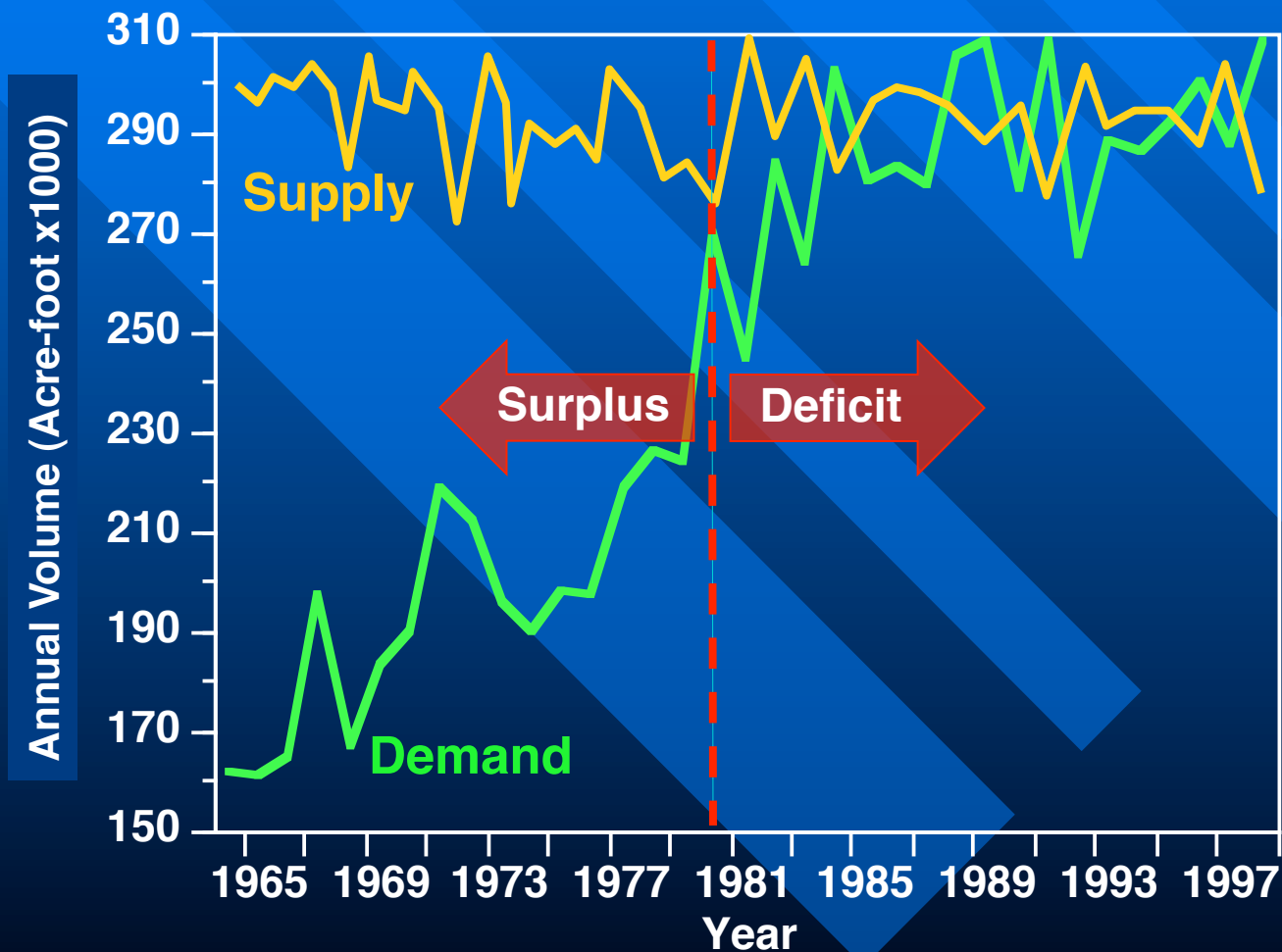
Water Scarcity is a Threat to North Carolina



- Droughts in 2002 and 2007-8 were the most severe on record
- Development, commercial and agricultural activities were affected
- Environmental flows were reduced
- New supplies (e.g., reservoirs) are more expensive and difficult to permit, while water demands continue to grow, leading to increased scarcity
- We can reduce the impacts of scarcity through improved management

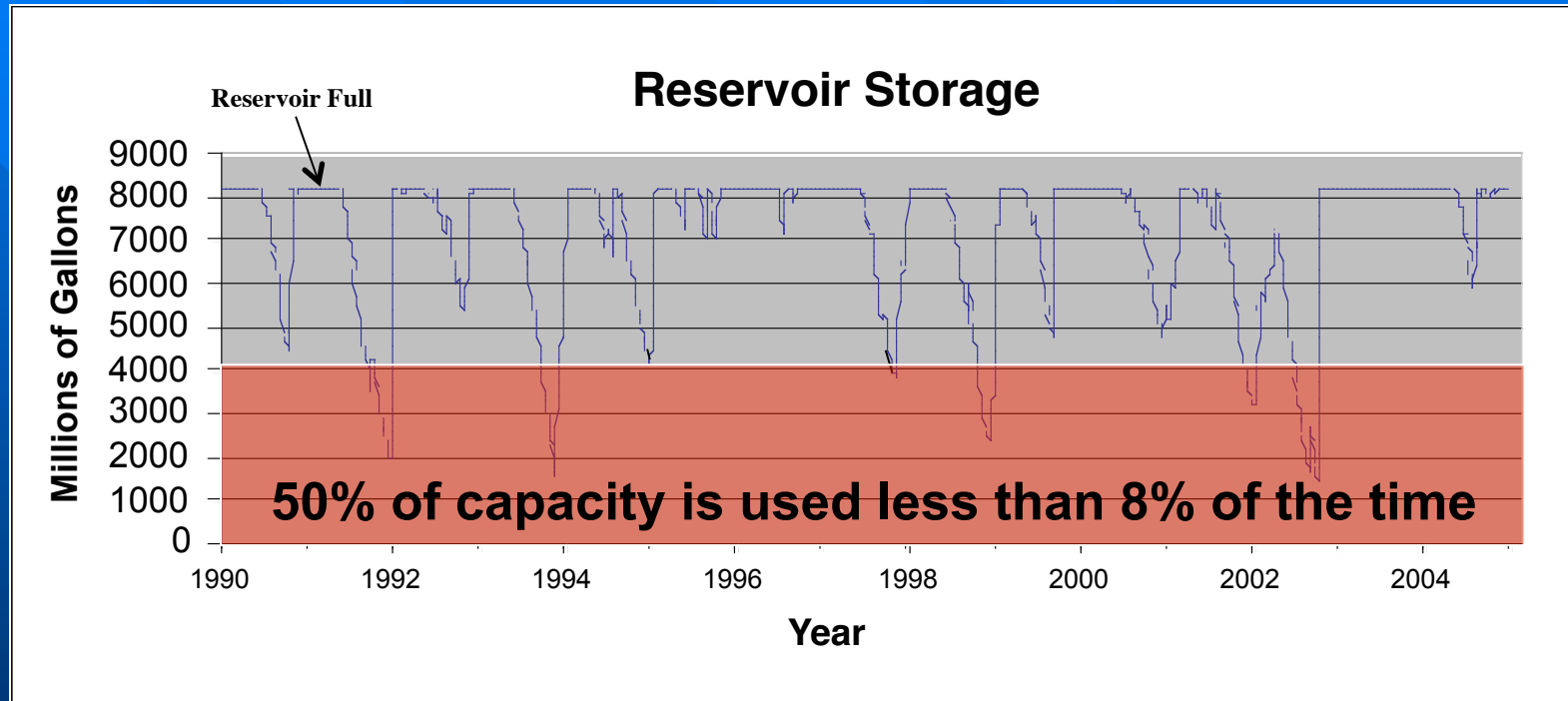
Reservoirs are Designed to Meet Demands Far in the Future

(so there is usually surplus supply in the years soon after they are built, even during drought)



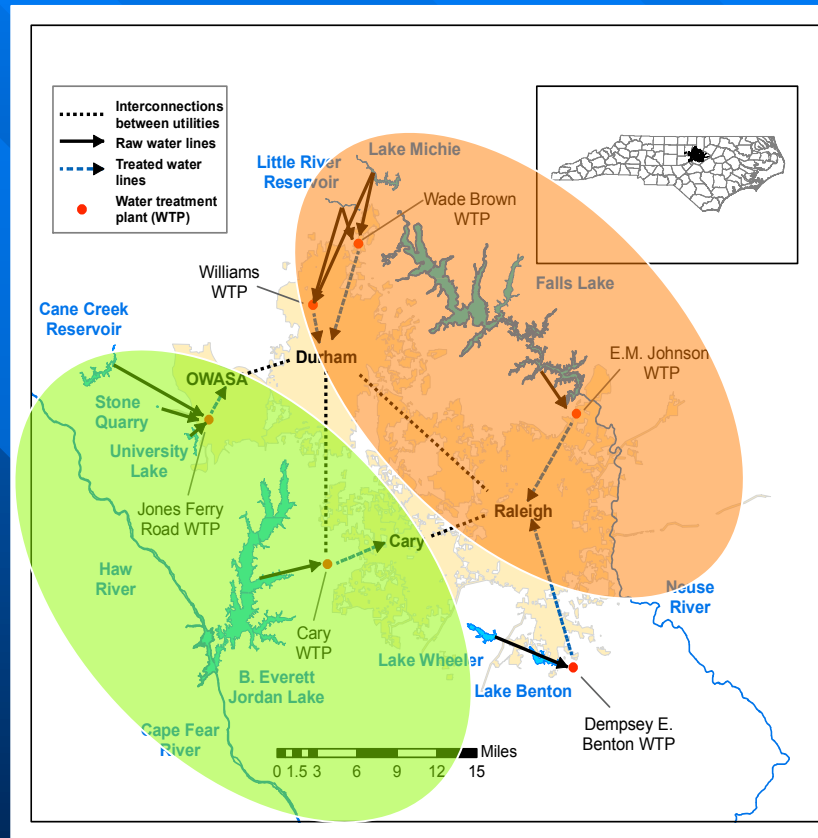
1 Acre-foot = 326,000 gallons = annual usage by 3-4 homes

Water Supplies are Sized for Drought, not Normal Conditions



- Even a “mature” reservoir often has capacity that is rarely used
- Drought does not affect all supplies equally, so cities in the same region often have supply that can be shared
- Regional cooperation can save a lot of money, the trick is to understand the hydrology and infrastructure well enough to coordinate planning

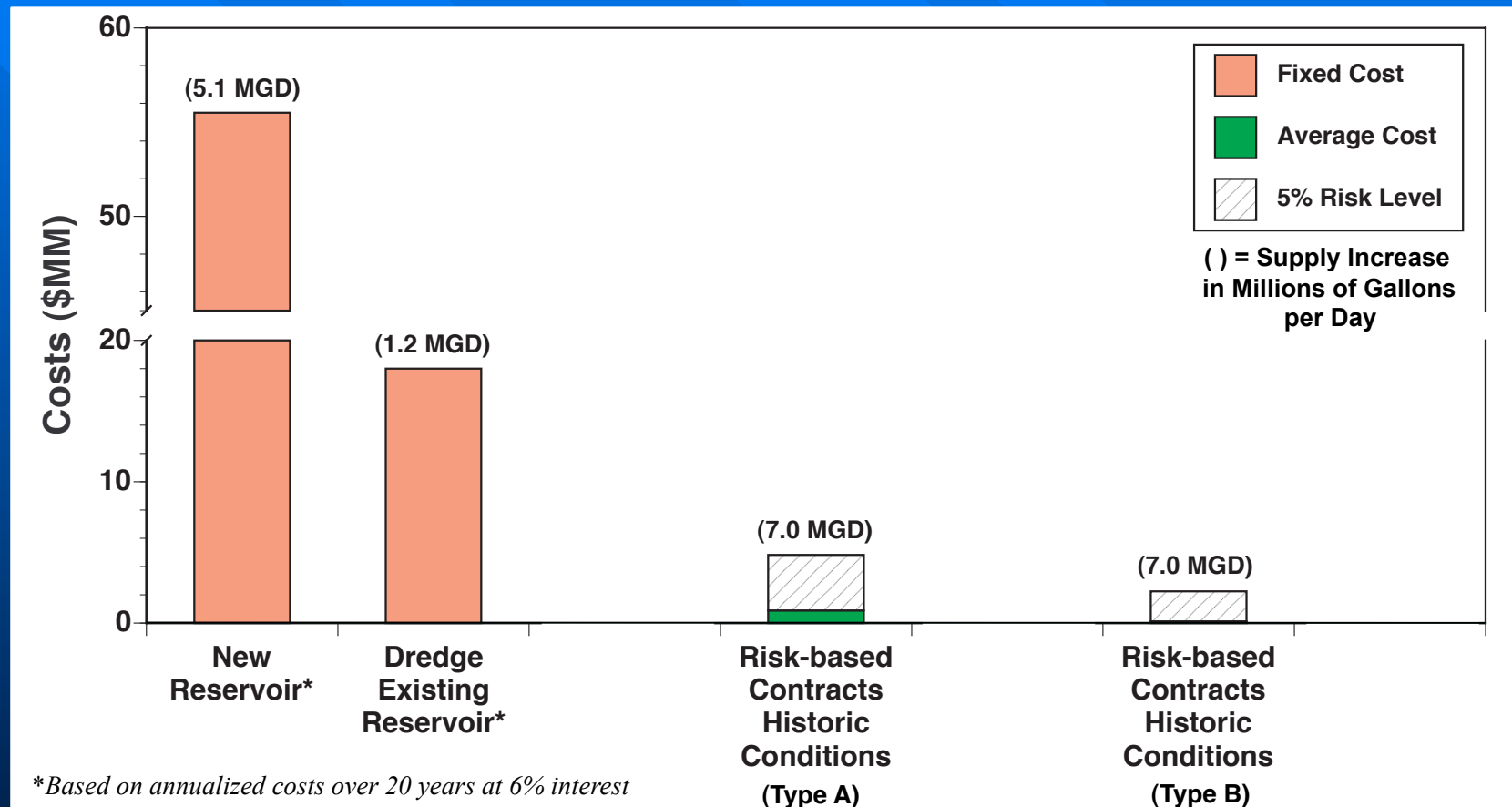
Research Triangle Water Supply



- Four major water utilities with 9 different reservoirs in 2 different watersheds
- During drought, not all of the reservoirs are depleted to the same degree
- There are “interconnections” allowing for transfers of water among utilities

Comparison of Supply Alternatives

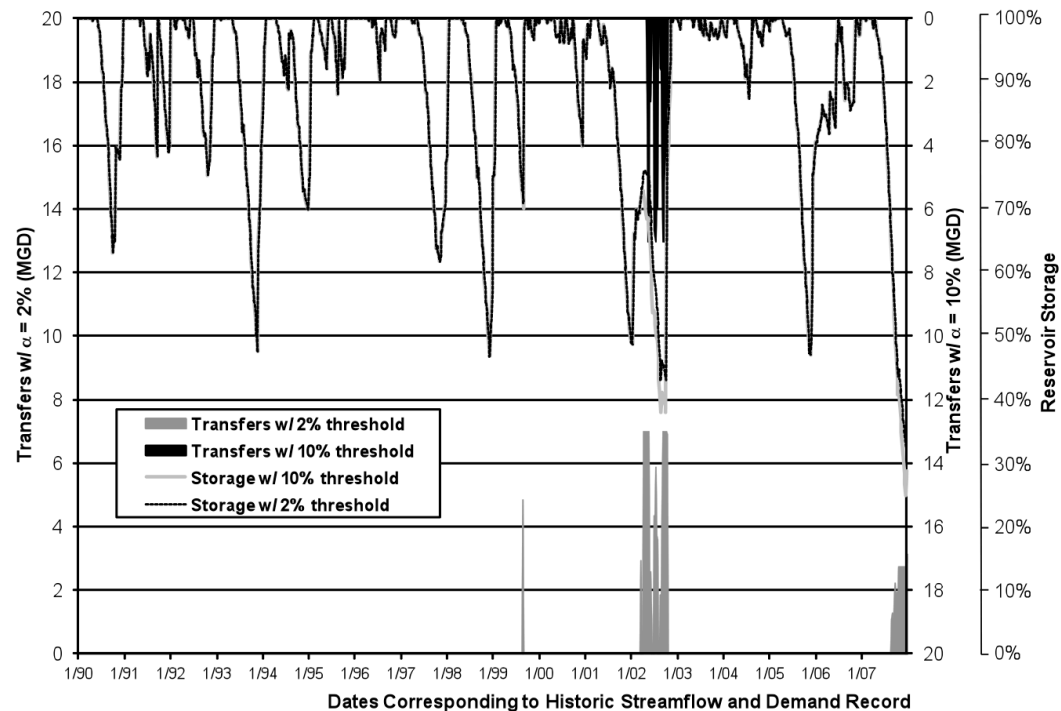
(OWASA: Costs over the period 2010-2025)



Kirsch, Characklis and Zeff (2013) "Evaluating the Impact of Alternative Hydro-climate Scenarios on Transfer Agreements," *Journal of Water Resources Planning and Mgmt.*

- **Transfers cost much less than building new supply infrastructure, but**
 - **To work, we must have interconnections in the right place and of the right size**
 - **Rules regarding transfers between utilities need to be clear**
 - **Tradeoffs involved with interbasin transfers need to be understood**

Transfers Only During the Worst Droughts



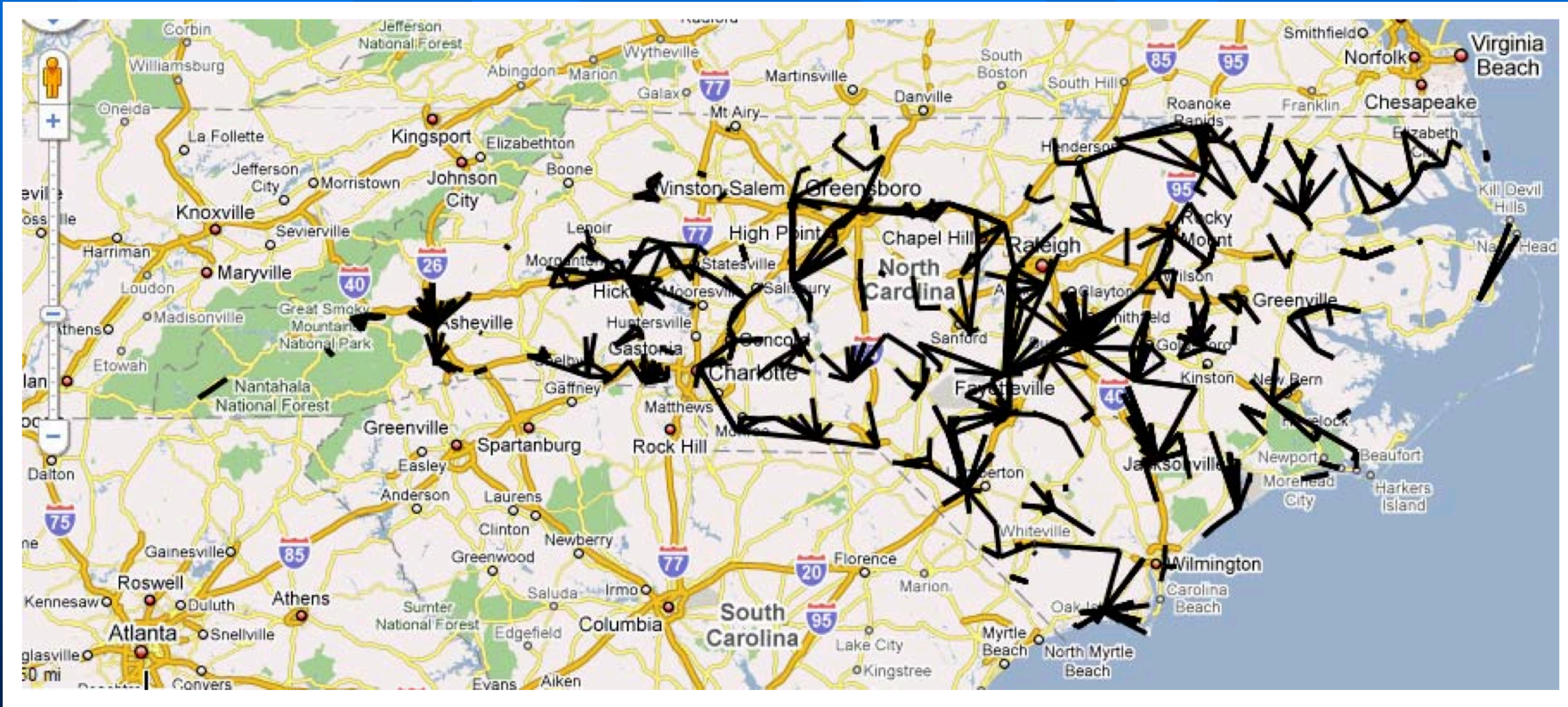
Source: Kirsch, Characklis and Zeff (2013) "Evaluating the Impact of Alternative Hydro-climate Scenarios on Transfer Agreements," *Journal of Water Resources Planning and Mgmt.*

- Risk-based contracts can be structured so that transfers occur only during drought
- Over the dry period described above, transfers in Triangle occur only 1 year in 6

* MGD = million gallons per day or 3.8 million liters per day

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We Know Where Interconnections are Now (but, not where they are most needed)

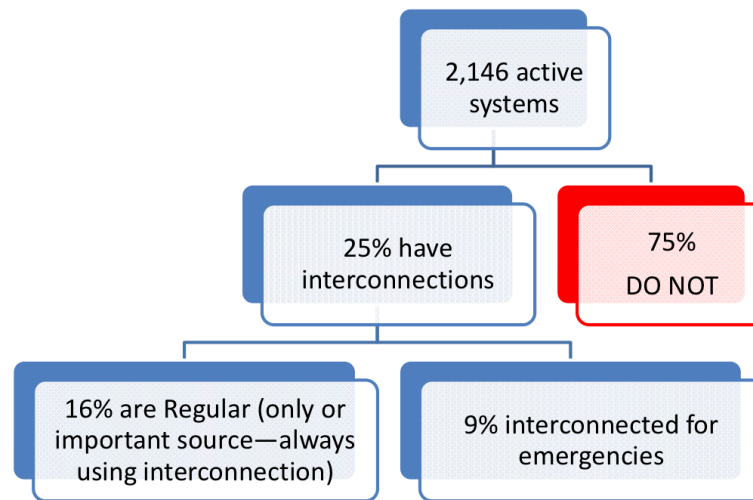


- Value of an interconnect is primarily related to several factors
 - Surplus supply capacity (storage-to-demand ratio)
 - Surplus treatment capacity
 - Distance between interconnected communities

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(but, not where they are most needed)

Interconnections among NC Community Water Systems



Source: EFC research using Sept. 2008 DENR SDWIS database

- **Value of an interconnect is primarily related to several factors**
 - **Surplus supply capacity (storage-to-demand ratio)**
 - **Surplus treatment capacity**
 - **Distance between interconnected communities**

Contact Information

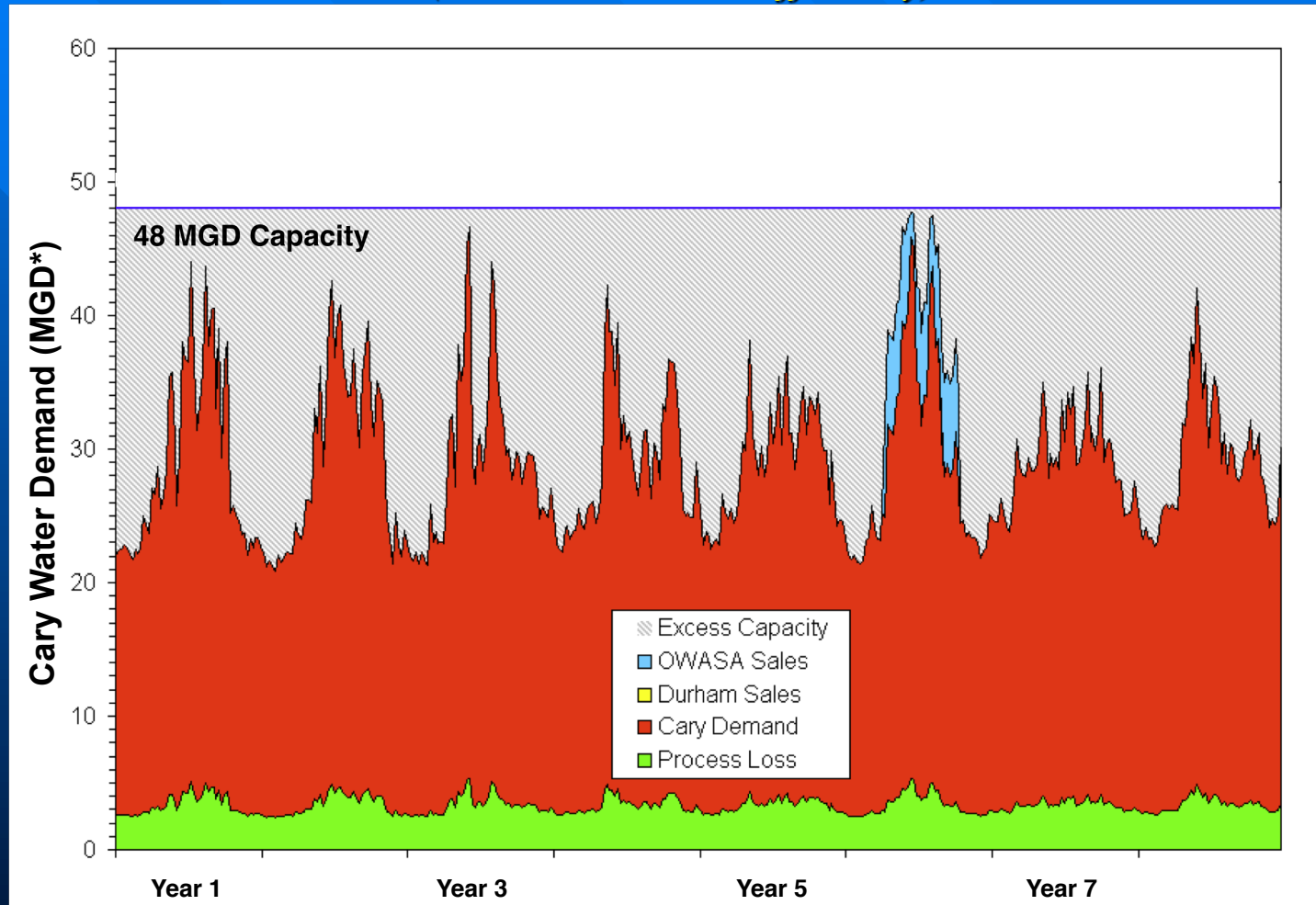
Greg Characklis

Email: charack@email.unc.edu

Phone: 919-843-5545

Lots of Available Treatment Capacity

(it can be used more efficiently)

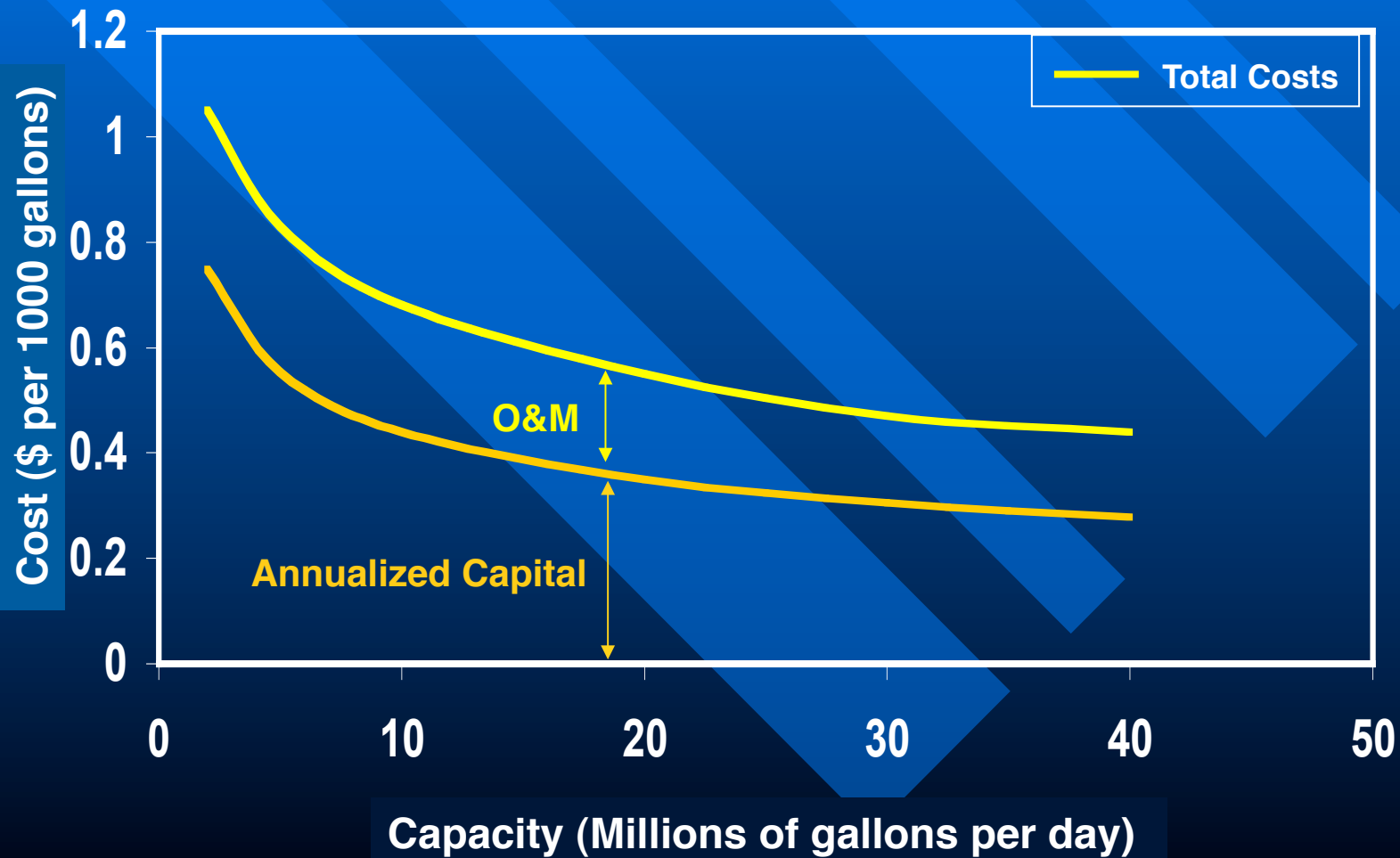


- Treatment plants are built to meet demands far in the future as well
- Capacity is fully utilized very infrequently
- Efficiency can improve if transfers can be timed to occur outside of “peak” periods

* MGD = million gallons per day or 3.8 million liters per day

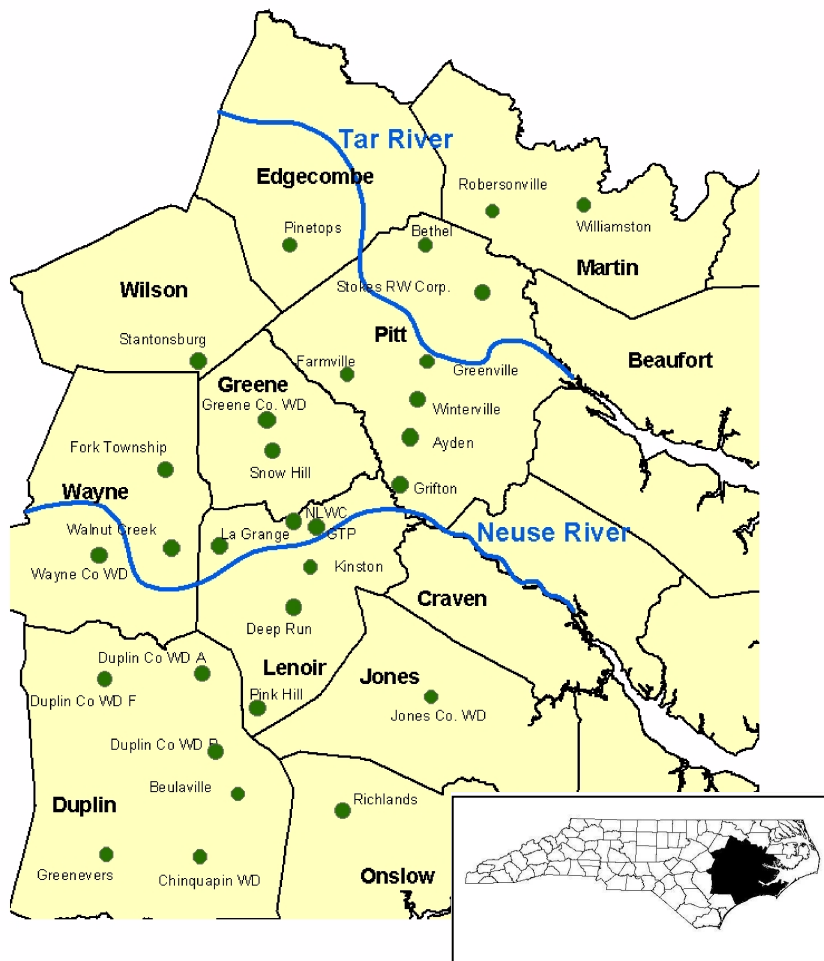
Surface Water Treatment:

Economies of Scale



North Carolina's Central Coastal Plain

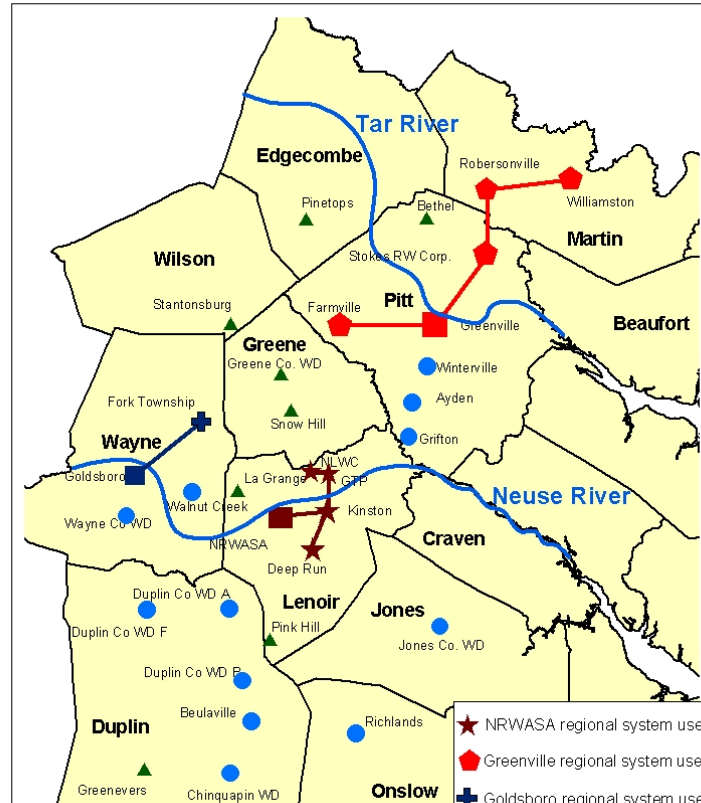
- Increased pumping rates from the Cretaceous aquifers have resulted in problems



- State has begun to regulate the aquifers
 - Pumping permits have been issued and are “tradable” amongst communities
 - Reduce withdrawals by up to 75% by 2017
- New supplies must be developed
 - Surface water available (Neuse/Tar)
 - Not much surface water treatment capacity
- Cost estimate for solving this problem for each community individually is roughly \$250 million over 30 years
- A less expensive strategy could be to
 - Build large regional treatment plants
 - Allow ground water permits to be traded

Regional Cooperation Can Greatly Reduce Costs

Three Regional System Scenario



Capital Cost: \$61.3 million
O&M Cost: \$7.0 million/yr
Total Cost*: \$163.8 million

* Present Value, assuming 30 year life and 6% discount rate

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