

Drought in Dixieland: Managing Water Shortage in the ACF Basin

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Overview

The Apalachicola-Chattahoochee-Flint River Basin, situated in the states of Alabama, Florida and Georgia, has experienced serious water shortages in recent years. These shortages have aggravated water allocation conflicts in the basin, and contributed to continuing litigation among the states.

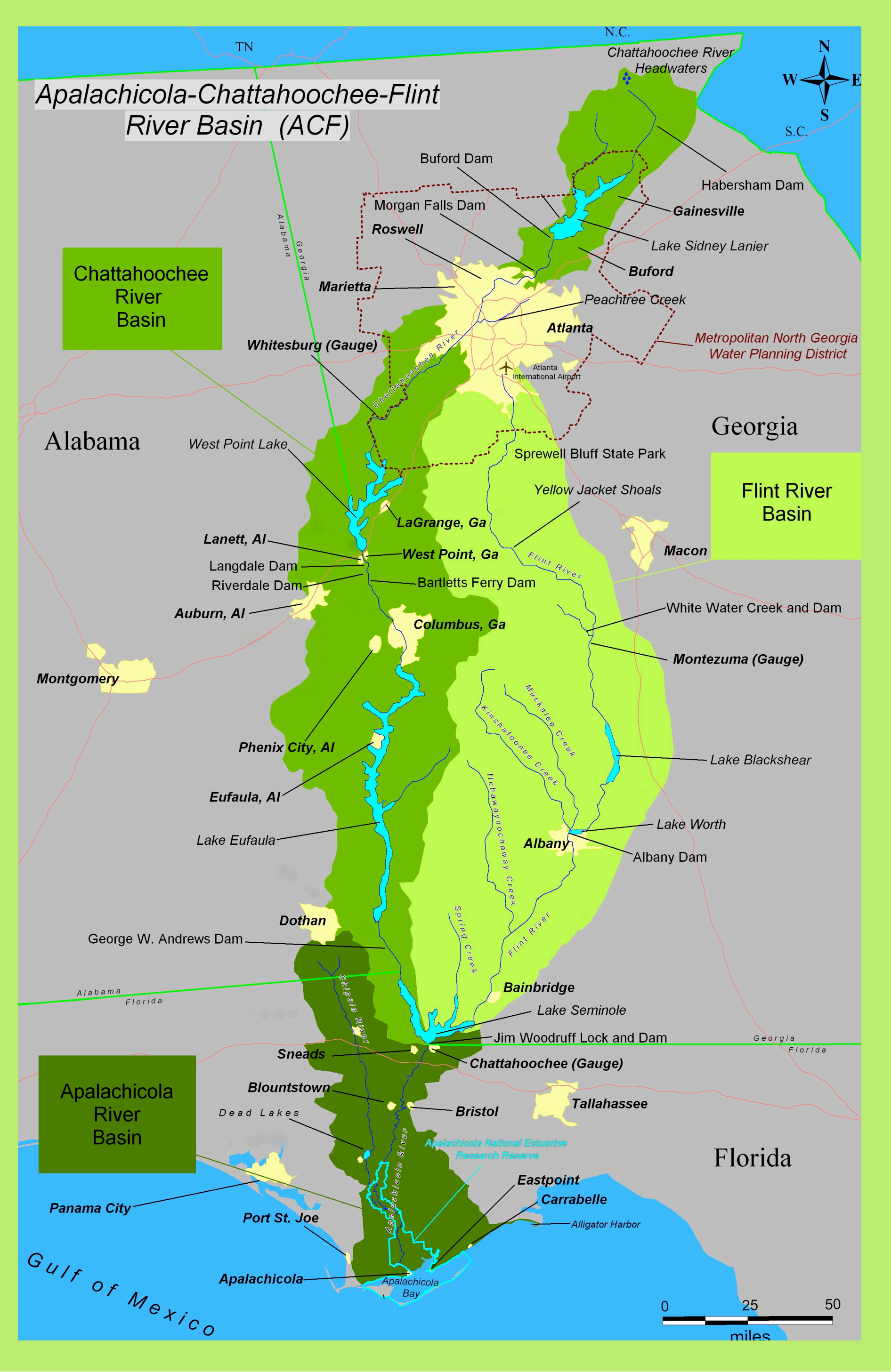
Here, we focus on two water management options that may ameliorate this conflict by making the distribution of water among more flexible: (1) rainwater harvesting in urban settings with emphasis on its viability in the Atlanta Metropolitan Area and (2) management of agricultural water use during drought years. Both of these management options raise numerous research questions about the range of adaptation strategies for urban and agricultural water users in the basin.

Management of Agricultural Water Use

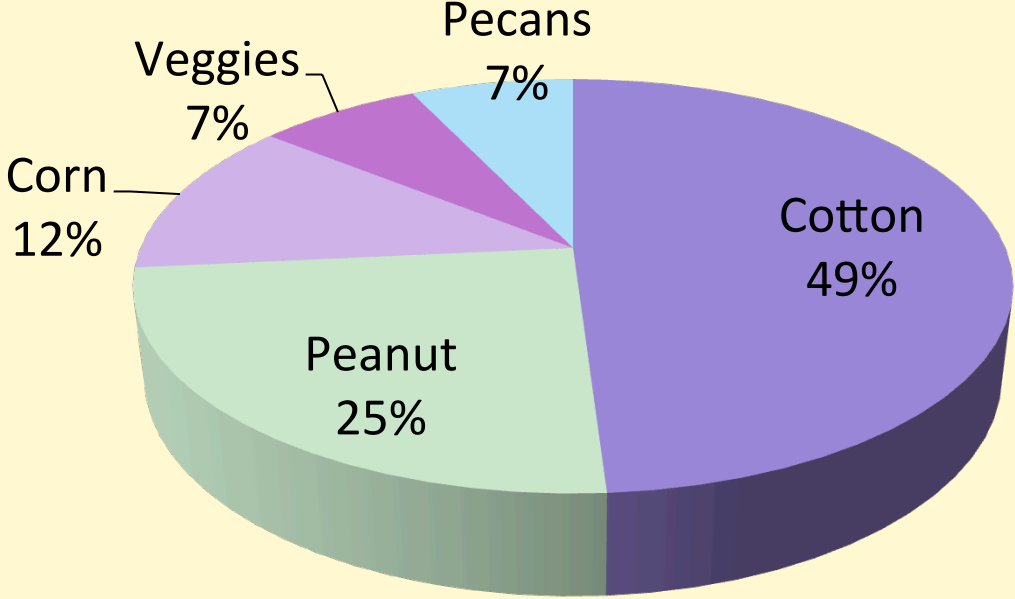
Agriculture is one of the sectors most strongly influenced by droughts. At the same time, the agricultural sector is one of the largest consumers of water in the United States, often exacerbating water stress during drought periods.

Methods

Crop and water use data for this analysis was collected from USDA and Georgia Department of Agriculture for 2008-09. Scenario analysis was performed using non-linear optimization to solve for variable subsidy and water withdrawal schemes.



Crop Distribution in the Flint



Policy Implications

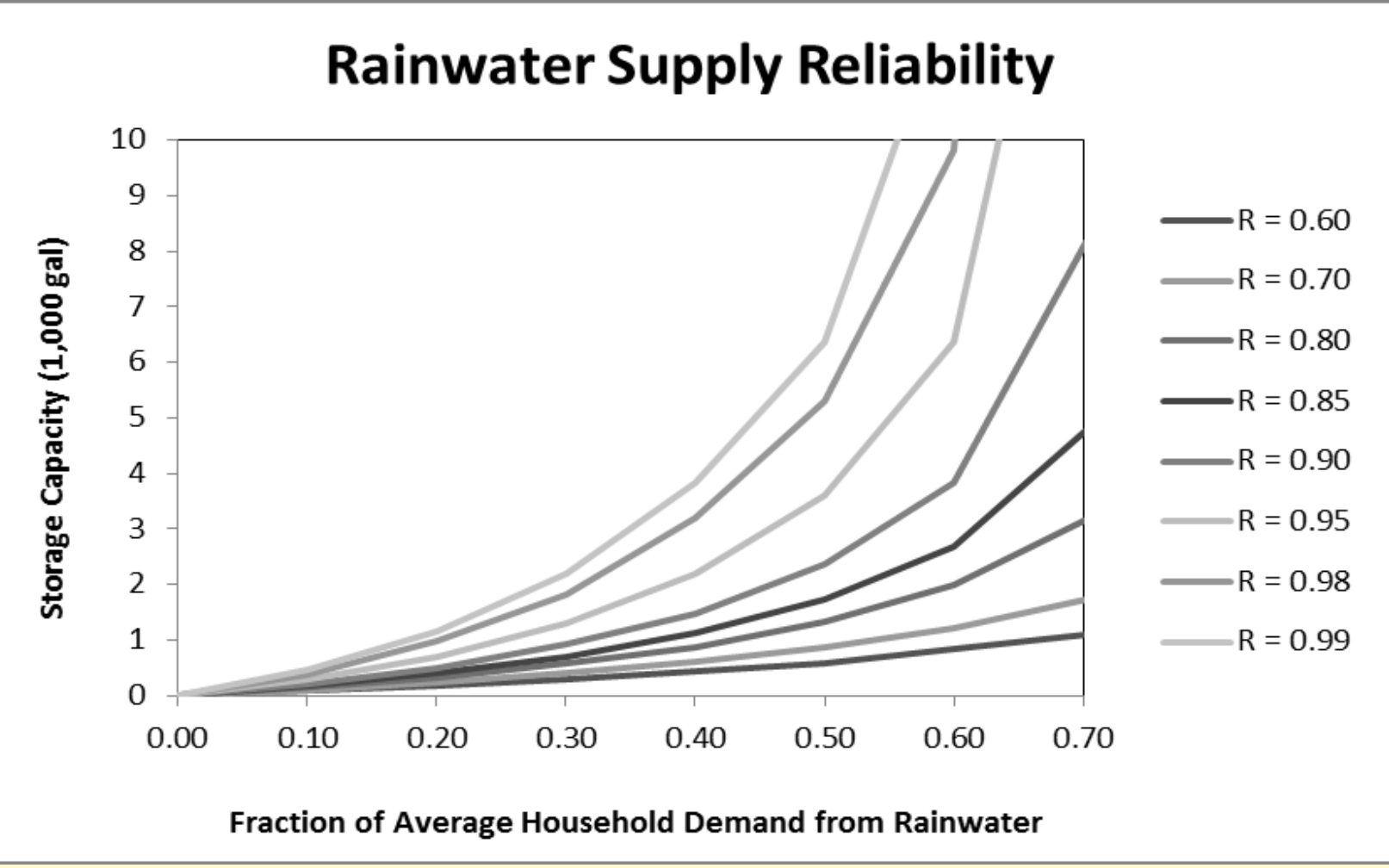
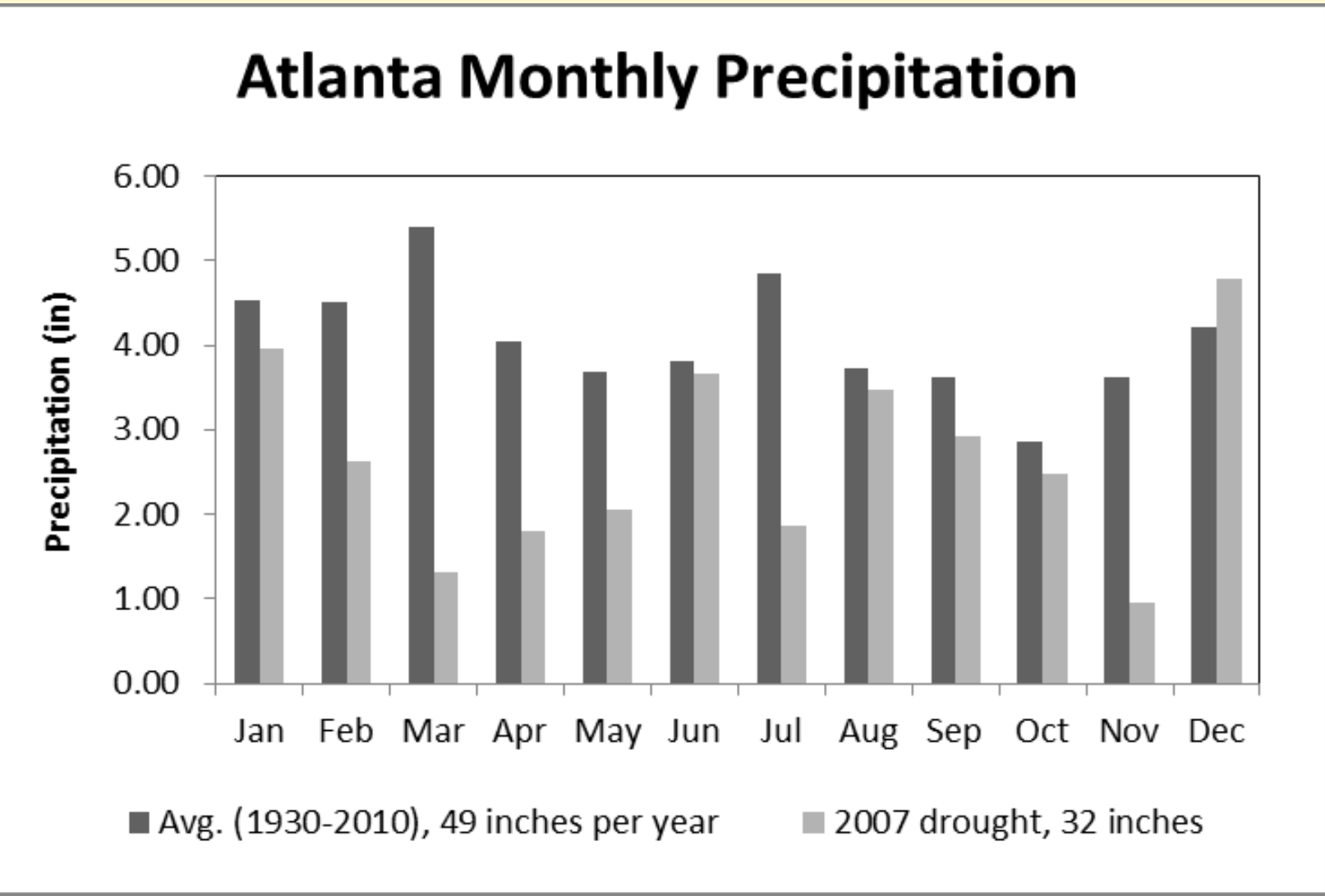
- Agricultural policies critically influence water use
- By adjusting agricultural subsidies, significant water savings can be created
- Water savings could be “banked” to increase drought resilience, or “traded” to resolve the ACF conflict
- Technology can improve water use efficiency at reasonable costs
- Climate change will necessitate innovative agriculture policies

Rainwater Harvesting in Urban Settings

The Chattahoochee River and Lake Lanier supply about 70% of the water to the Atlanta Metro area. Meanwhile, Atlanta’s right to withdraw its current quantity of water for public use has been contested in court during the ACF dispute. We examine the possibility of rainwater harvesting (RWH) as a solution to decrease the demand for water on Lake Lanier, thereby reducing the strain on an already taxed system.

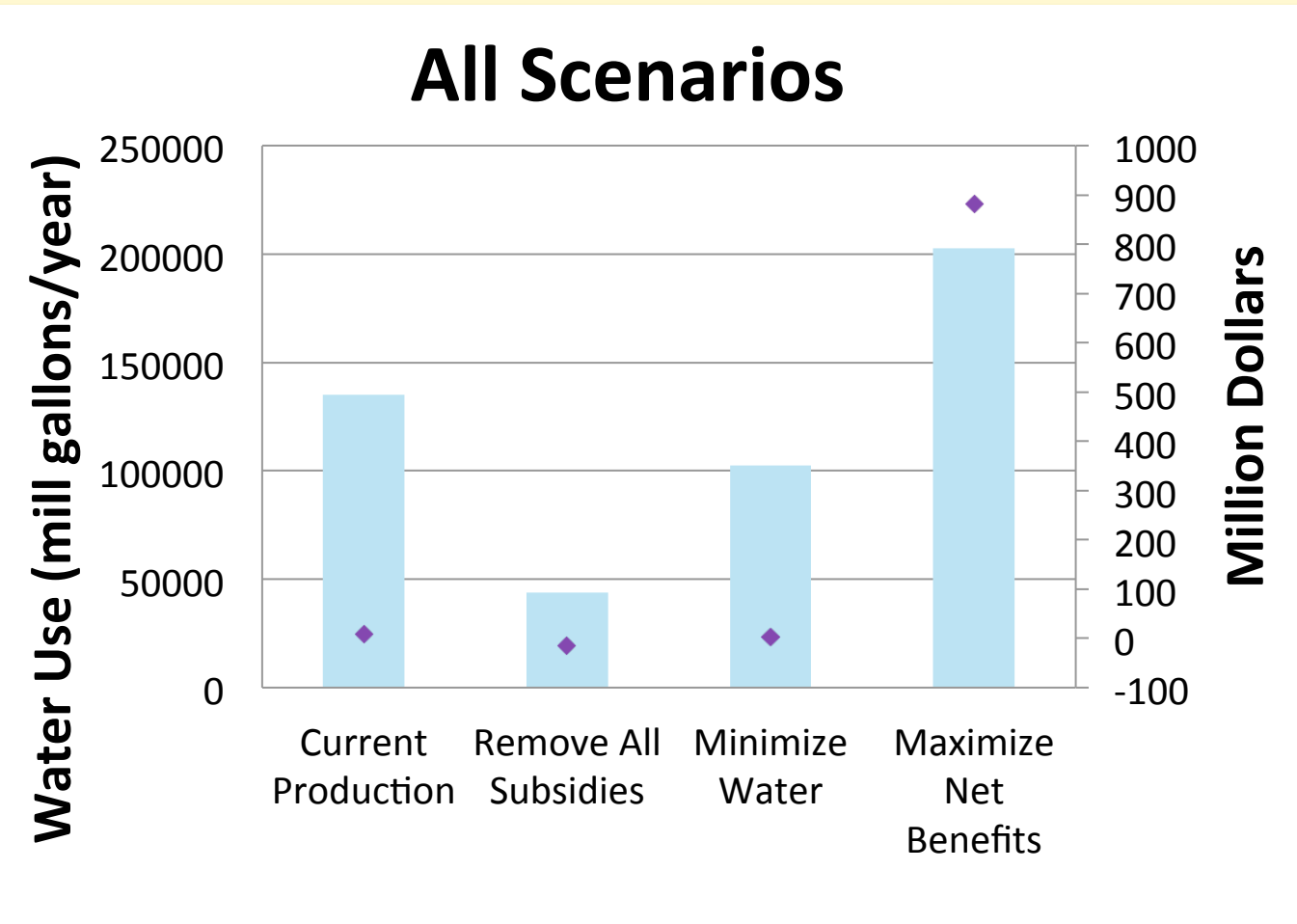
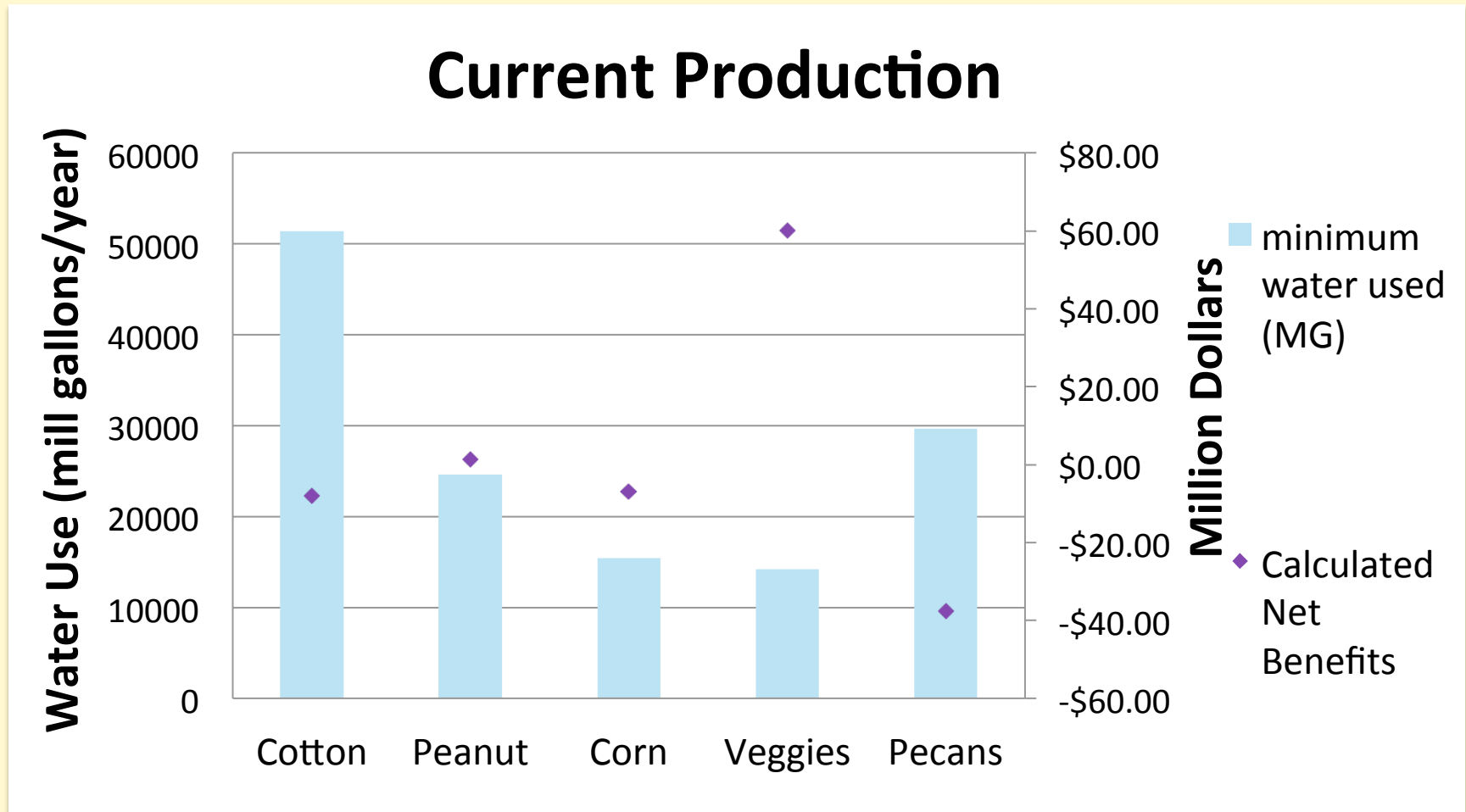
Many states have developed legislation about RWH. Given that Atlanta lies in a water-rich area, but currently suffers from drought, we intend to assess the following:

- The possible impact on runoff and groundwater flow for likely adoption rates.
- The ecological impact between the point of catchment and the run-off destination.
- If RWH is beneficial, how to focus adoption efforts: residential vs. commercial, potable vs. non-potable



- Through a mass balance simulation, we computed the storage tank size needed to supply a given percentage of household demand with a given reliability (days demand is met/days in precipitation time series) using daily precipitation data from 1930-2009.
- The amount of water that can be captured on a roof equal to the average square-footage of an Atlanta home (2,072 ft², assuming a one-story building) over the period of record is only 70 percent of the average household demand (6,000 gal/month).
- The convex reliability curves on the graph show that the storage needed to meet a given fraction of the household demand increases with the demand. For household use, smaller tanks may be more cost-effective considering the diminishing water supply returns with larger tanks. This suggests that collecting rainwater for specific activities may be preferable to using it as a primary supply source.

Scenario	Description
Current Production	Subsidies constant, calculate water withdrawals
Remove all subsidies	Net benefits are revenues minus costs
Transfer subsidies	Given a constant subsidy amount, what are the optimal distributions for the objectives?



ST	Description of Legislation and Year ¹
AR	Board of Health and Rainwater System Act, 2009
AZ	Rainwater Syst. Act, failed; School Energy Act, 2012
CO	Water Collected From Rooftops Act, 2009
IL	Green Infrastructure for Clean Water Act, 2010
NC	Water Resource Policy, failed
OH	Potable and non-potable rainwater harvesting
OR	Potable and non-potable harvesting allowed, 2009
TX	Rainwater tech in new gov. buildings, 2011
UT	Allows for rainwater capture up to 2500 gallons
VA	Rainwater system tax credit, 2001
WA	Lower storm-water rates w/ RWH; RWH facilities law failed

¹ Green: RWH laws passed; Yellow: mixed passage/failure; Red: RWH laws failed