Water Supply Reservoirs

A Traditional Water Management Practice

Presented by:
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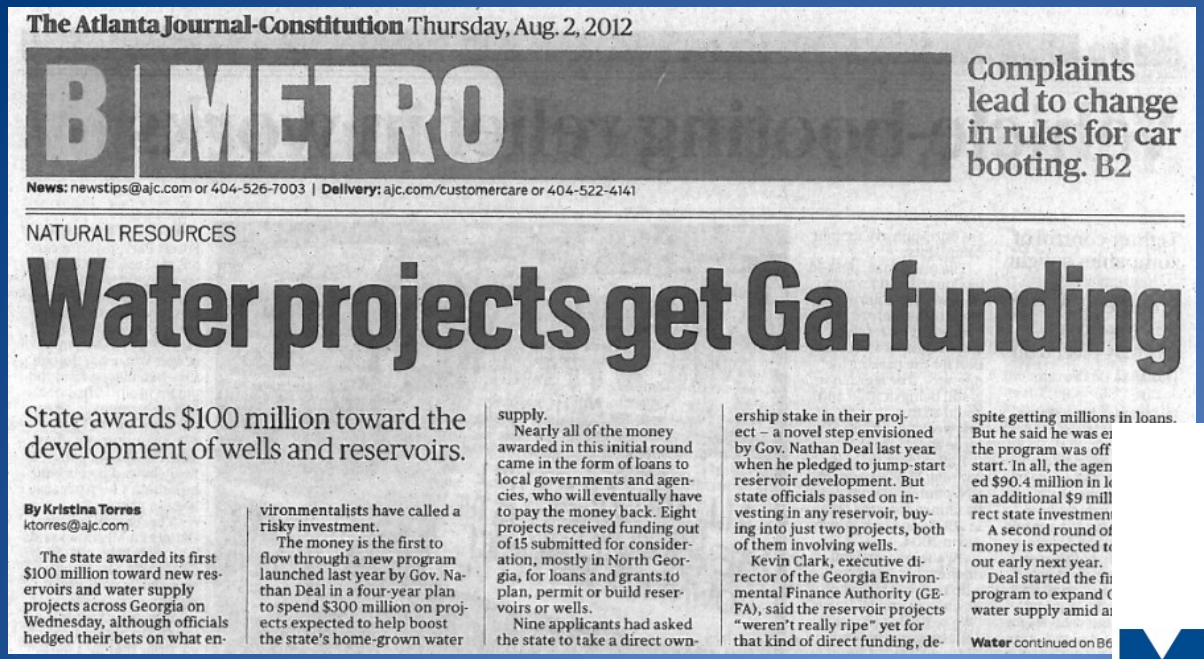

The Atlanta Journal-Constitution Thursday, Aug. 2, 2012

B METRO

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NATURAL RESOURCES

Water projects get Ga. funding

State awards $100 million toward the development of wells and reservoirs.

By Kristina Torres
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The state awarded its first $100 million toward new reservoirs and water supply projects across Georgia on Wednesday, although officials hedged their bets on what environmentalists have called a risky investment.

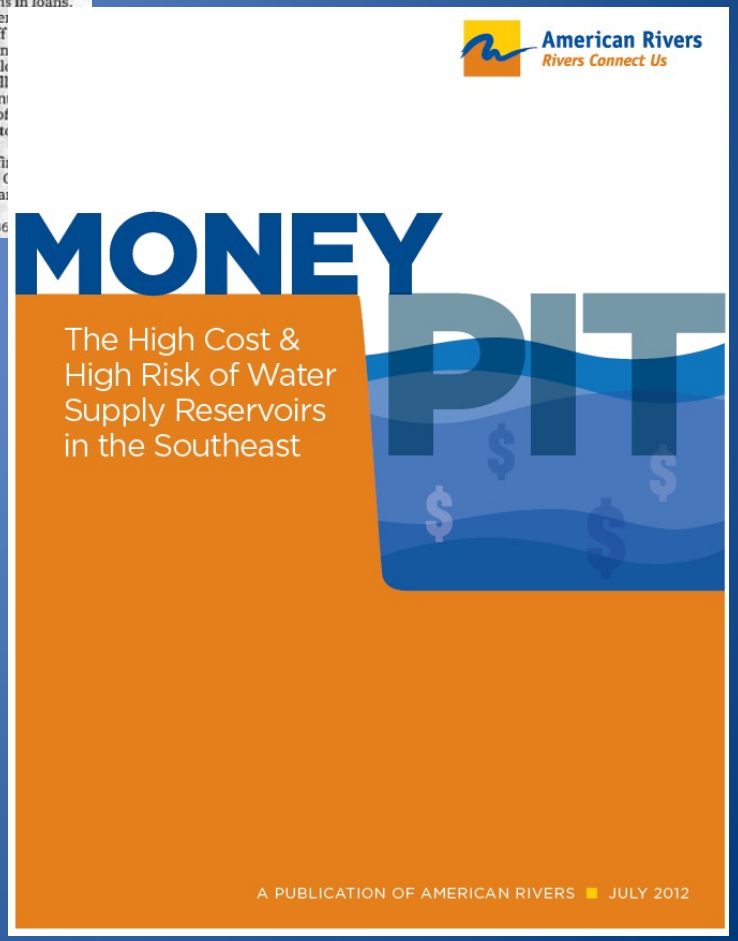
The money is the first to flow through a new program launched last year by Gov. Nathan Deal in a four-year plan to spend $300 million on projects expected to help boost the state's home-grown water supply.

Nearly all of the money awarded in this initial round came in the form of loans to local governments and agencies, who will eventually have to pay the money back. Eight projects received funding out of 15 submitted for consideration, mostly in North Georgia, for loans and grants to plan, permit or build reservoirs or wells.

Nine applicants had asked the state to take a direct ownership stake in their project – a novel step envisioned by Gov. Nathan Deal last year when he pledged to jump-start reservoir development. But state officials passed on investing in any reservoir, buying into just two projects, both of them involving wells.

Kevin Clark, executive director of the Georgia Environmental Finance Authority (GEFA), said the reservoir projects "weren't really ripe" yet for that kind of direct funding, despite getting millions in loans. But he said he was e
the program was off
start. In all, the agen
ed $90.4 million in l
an additional $9 mill
rect state investmen
A second round of
money is expected t
out early next year.
Deal started the fi
program to expand
water supply amid a

Water continued on B6

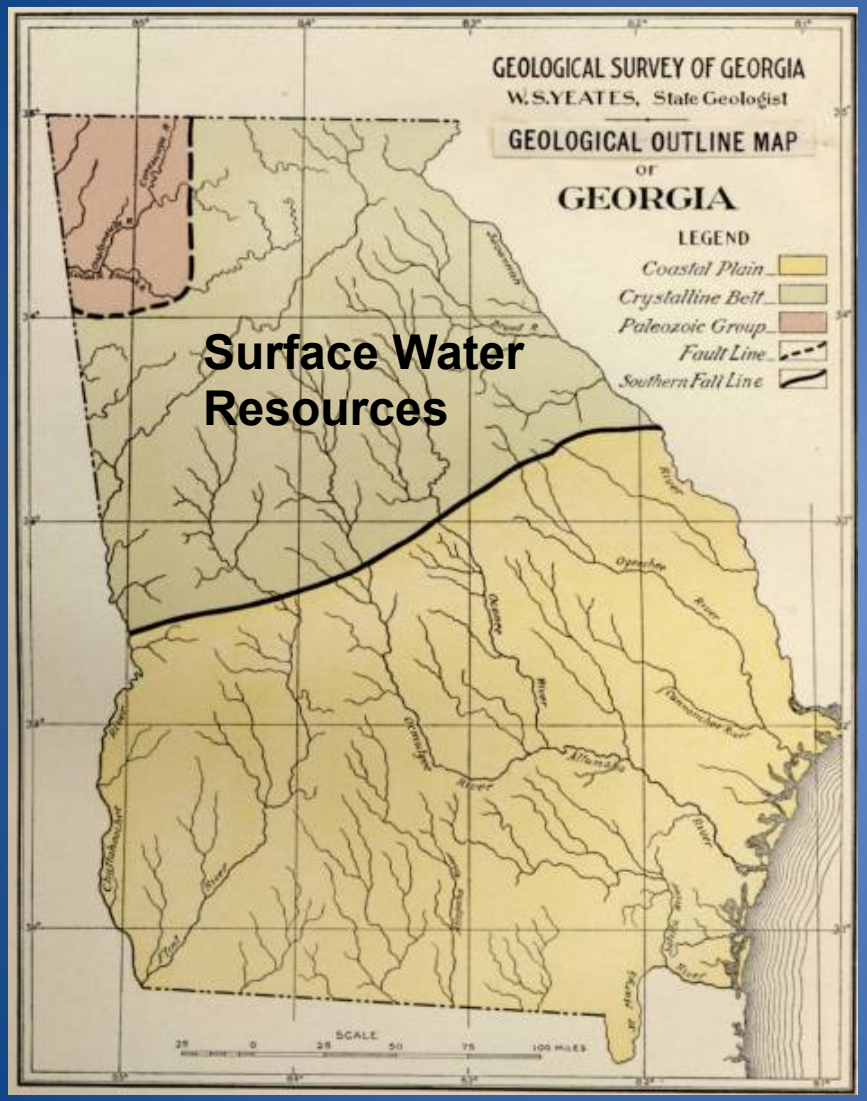


Reservoirs can be expensive and controversial

- Many people support the construction of reservoirs
- Many people are vehemently opposed

Why build reservoirs?

Reservoirs are often a necessary component of a surface water supply system



In many geologic regions, significant groundwater resources are not available and surface water streams are the only feasible source for medium and larger size public water systems.

What is the function of a reservoir in a water supply system?

Reservoirs have one principal function:

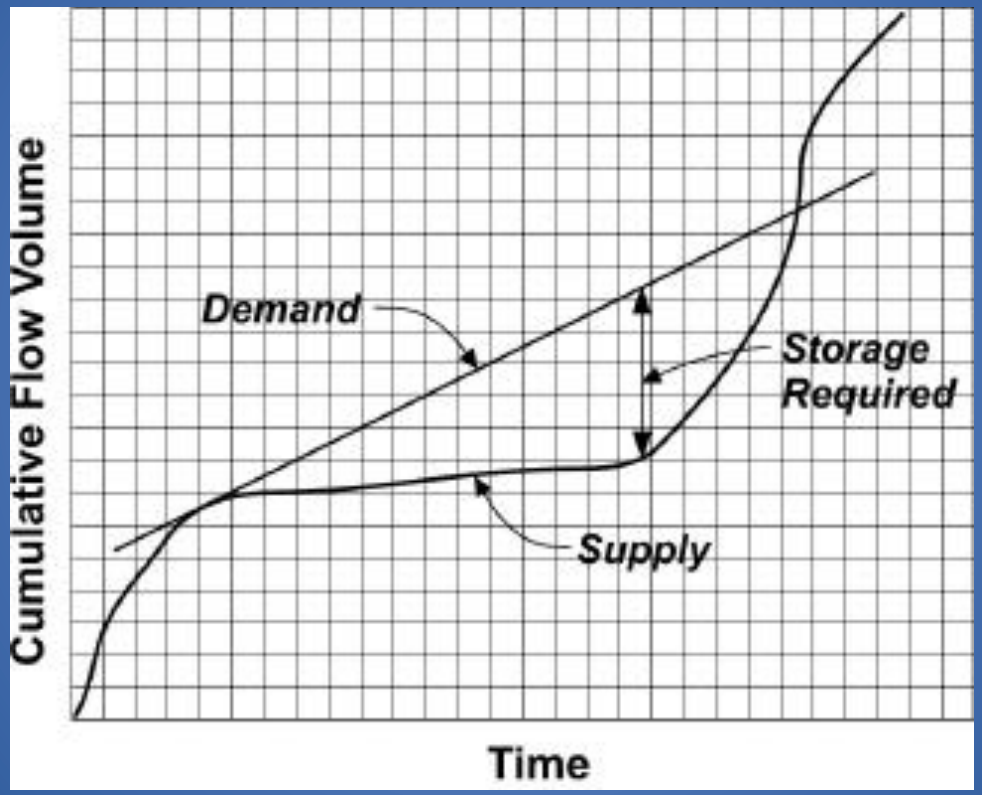
Storage

The Need for Storage

In a dynamic system where inputs and outputs are not constantly equal, storage must be utilized.

- Analog electronic circuits require capacitors, the sole purpose of which is storage of electric charge.
- Computers cannot function without data storage.
- Warehouses store inventory to allow for variations between supply and demand of a product.
- Detention ponds utilize storage to reduce peak flows from storm events.
- Elevated tanks store water so that water distribution system pressures will remain relatively constant in spite of short term variances in supply and demand.
- In a water supply system dependent on surface water, storage from raw water reservoirs is used to supply water to the system during periods of low stream flow.

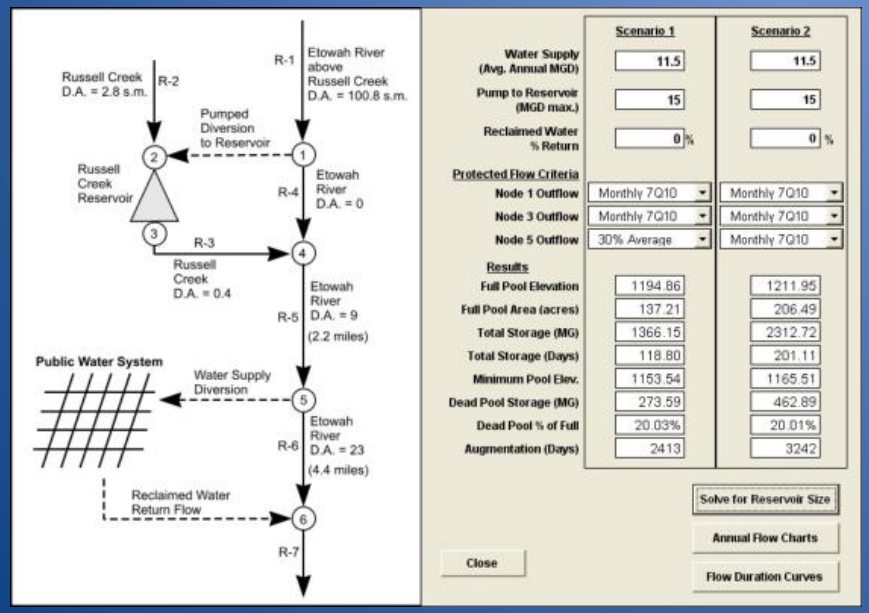
Determining Storage Volume Requirements



Graphical Determination of Required Storage Volume
Rippl, 1883

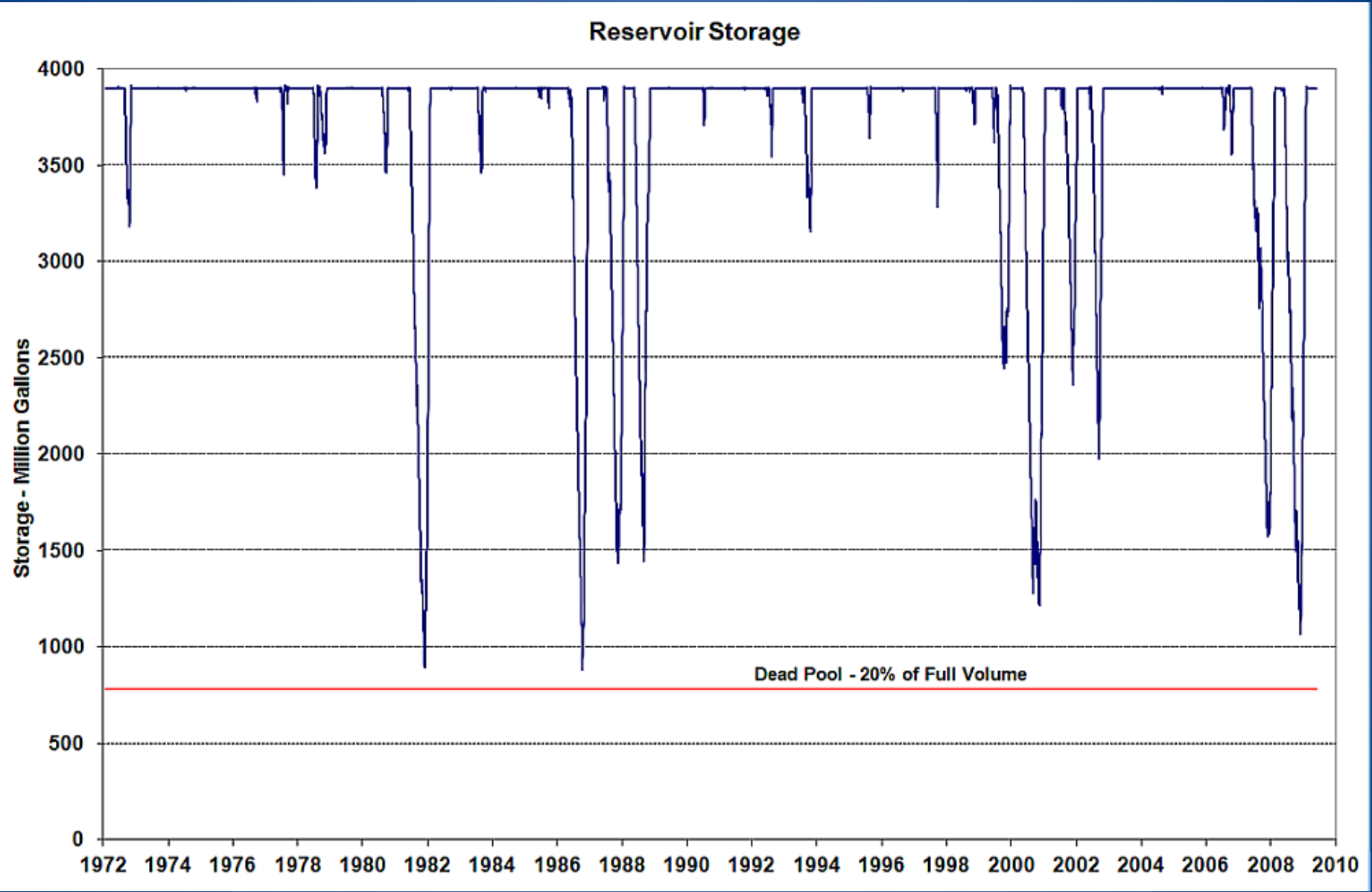
Determining Storage Volume Requirements

- Modern techniques for reservoir sizing use detailed computer simulations of the system operation including proposed reservoir configurations and can include other variables in the analysis.
- Trial and error simulations are run until the point of system failure is determined.
- These analysis techniques use historic stream flow records and simulate the system operation during droughts of record.



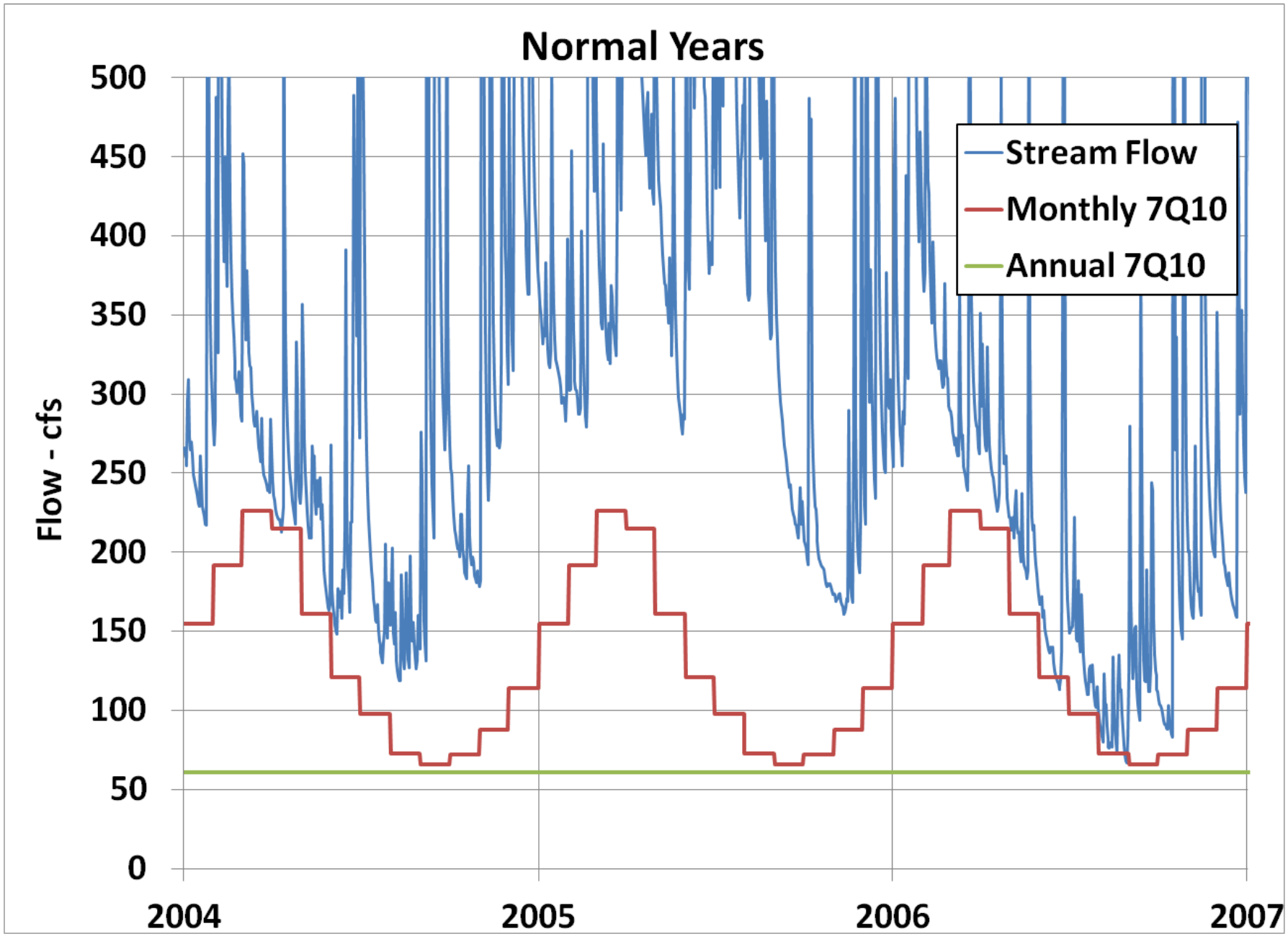
- The reservoir alternative must assure that minimum instream flow criteria are met in the operation of the reservoir. This is the most critical component of the safe yield analysis.

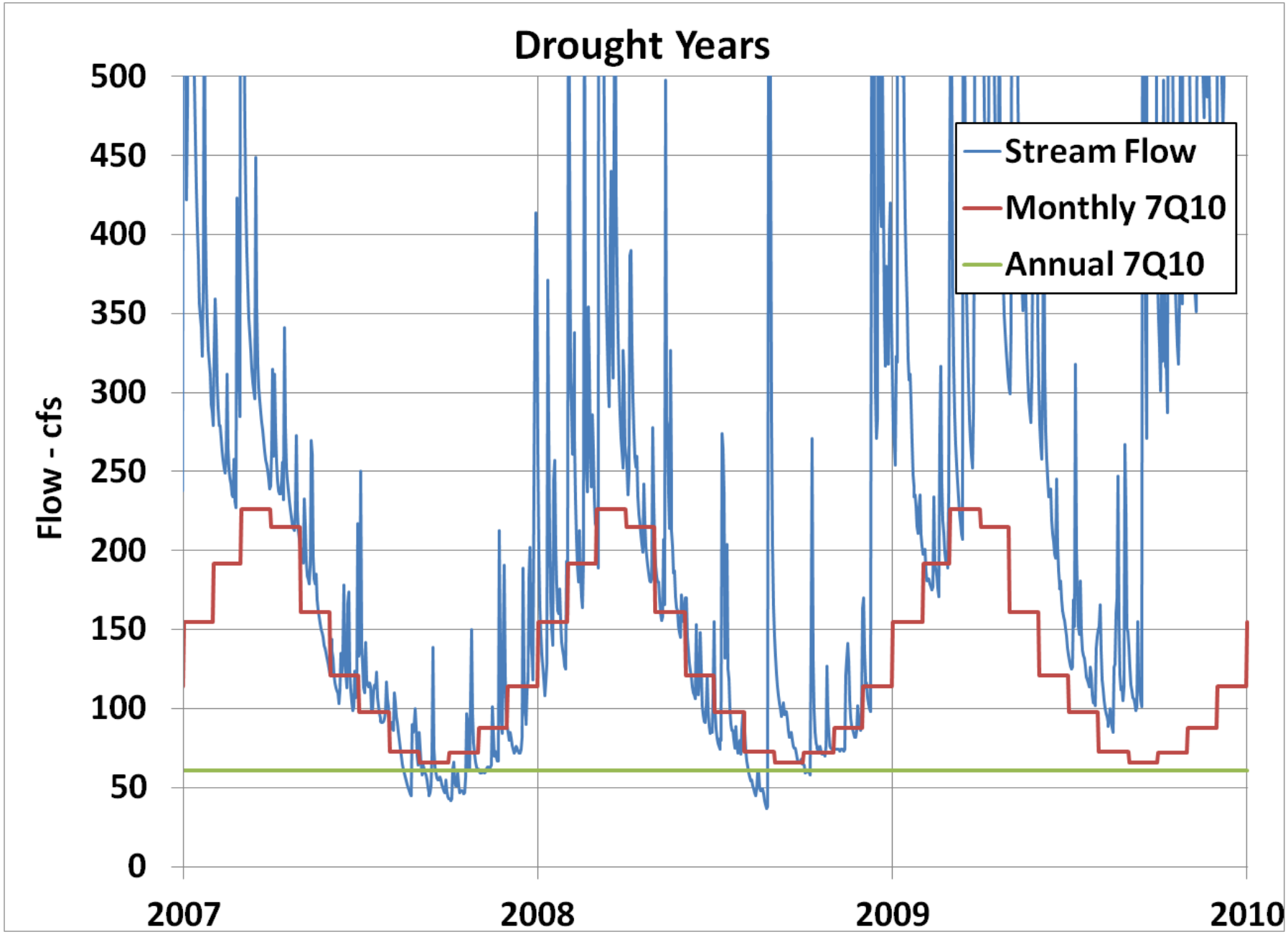
Mathematical Simulation Results



Protected Minimum Instream Flow

- In Georgia, prior to 1977 water withdrawal permits issued by the state had no protected stream flow requirement.
- In 1977, new regulations were issued that required the protection of the Annual 7Q10 flow. A stream's annual 7Q10 is a statistical figure that reflects the lowest seven-day running average of a stream's flow with a recurrence frequency of once in ten years.
- In 2001, a new policy was issued requiring more stringent protected flow levels. Typically, Monthly 7Q10 flows became the new requirement. Monthly 7Q10 is a statistical figure that reflects the lowest seven-day running average of a stream's flow for each calendar month with a recurrence frequency of once in ten years.
- Minimum Instream Flow requirements have been adopted for the purpose of protecting aquatic wildlife resources.
- The greater the Minimum Instream Flow requirement, the greater will be the required reservoir volume.


Normal Years
Flow - cfs
500
450
400
350
300
250
200
150
100
50
0
2004
2005
2006
2007
Stream Flow
Monthly 7Q10
Annual 7Q10

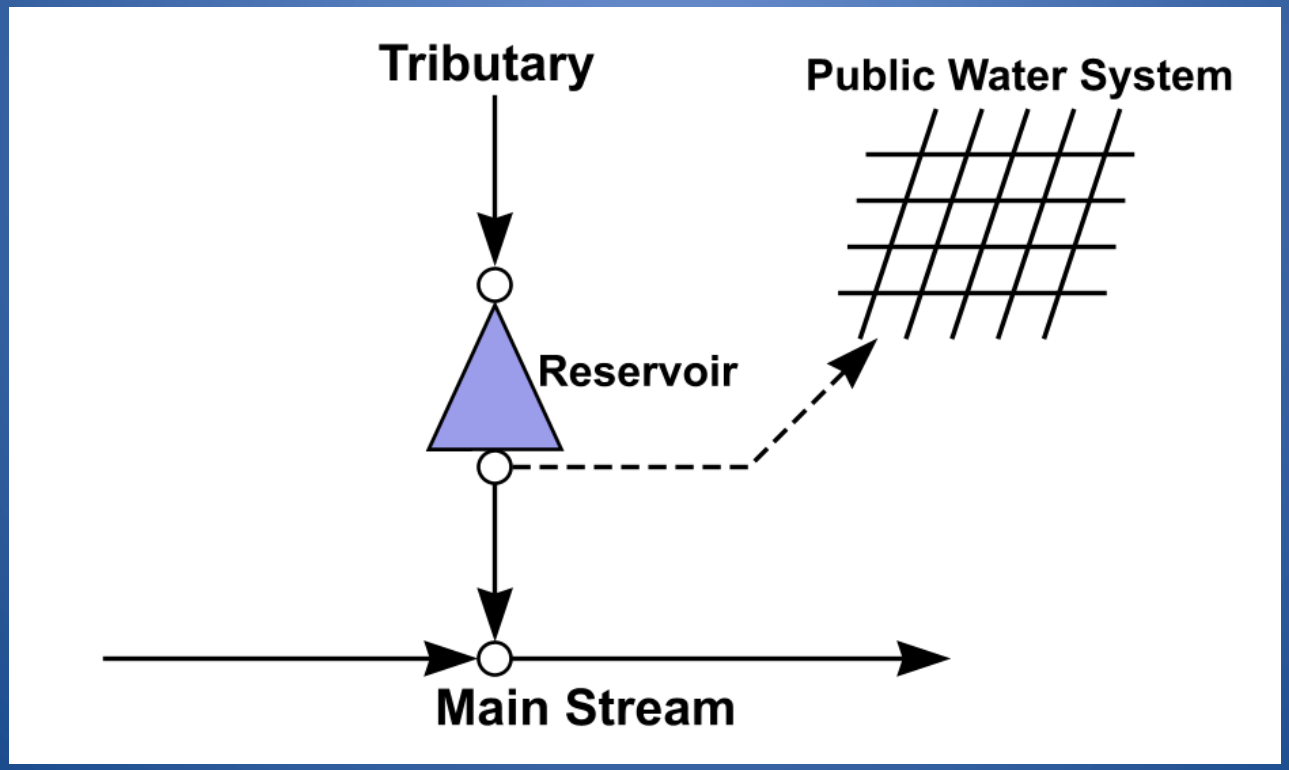

Drought Years
Flow - cfs
500
450
400
350
300
250
200
150
100
50
0
2007
2008
2009
2010
Stream Flow
Monthly 7Q10
Annual 7Q10

Reservoir Configurations

- Water supply reservoirs are seldom built on large streams due to environmental impacts.
- The current trend is to build reservoirs on tributaries and, in most cases, pump water from the main stream to the reservoir for filling.
- In some cases, the water supply withdrawal is taken from the main stream and water is released from the reservoir during low flow periods for streamflow augmentation.

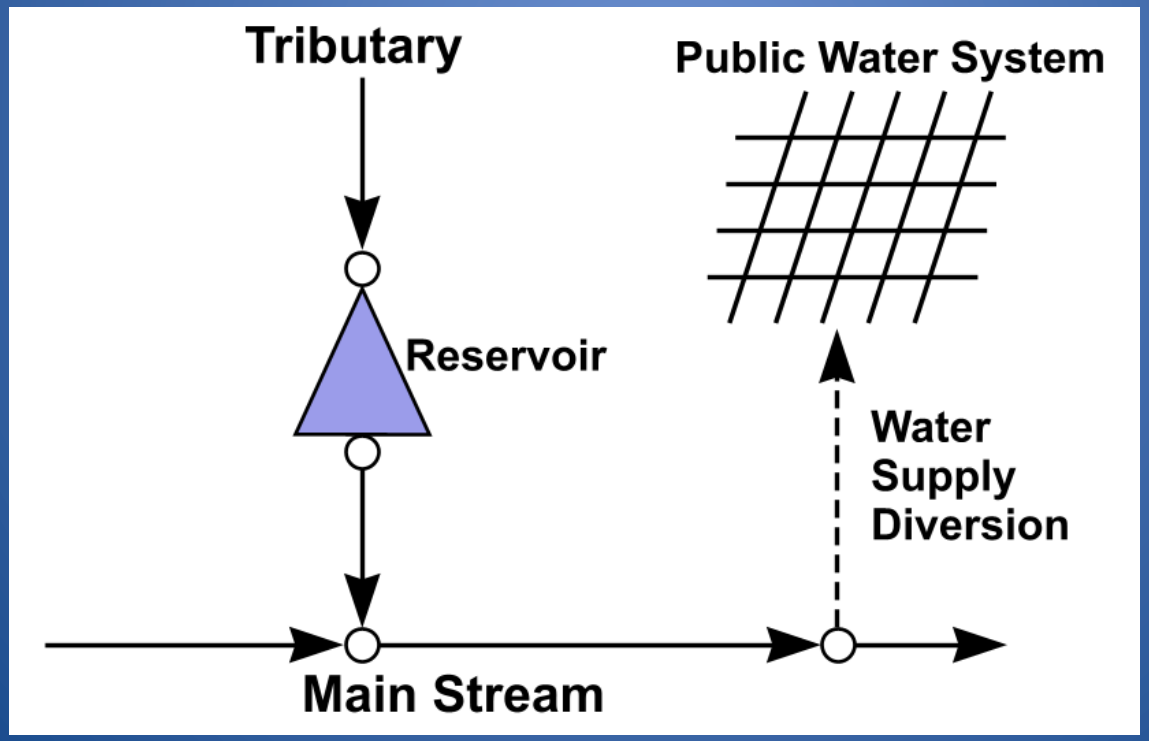
Option 1

- No Pumping from Main Stream
- Water Supply taken from reservoir
- Only feasible for smaller systems



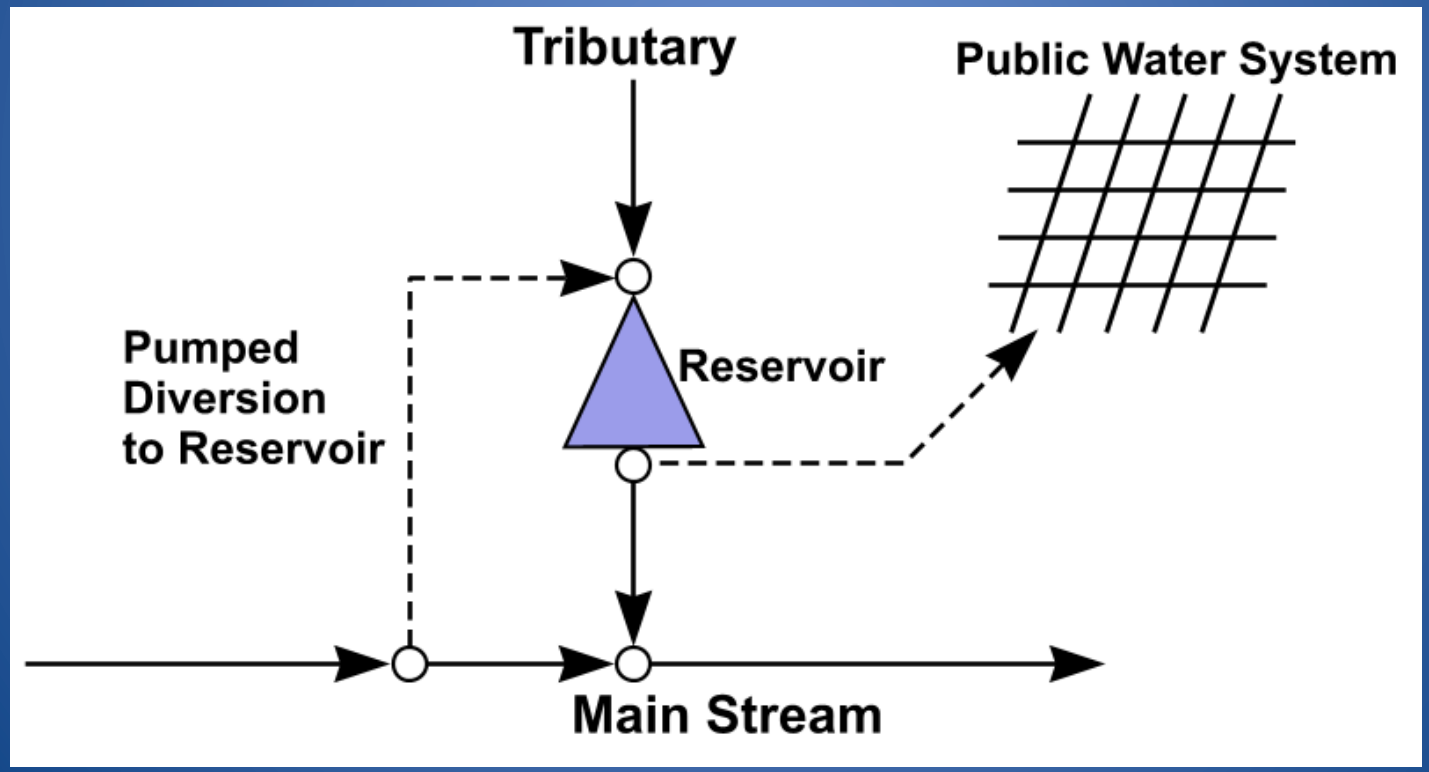
Option 2

- No pumping from main stream
- Water supply taken from main stream
- Reservoir provides flow augmentation during low flow periods



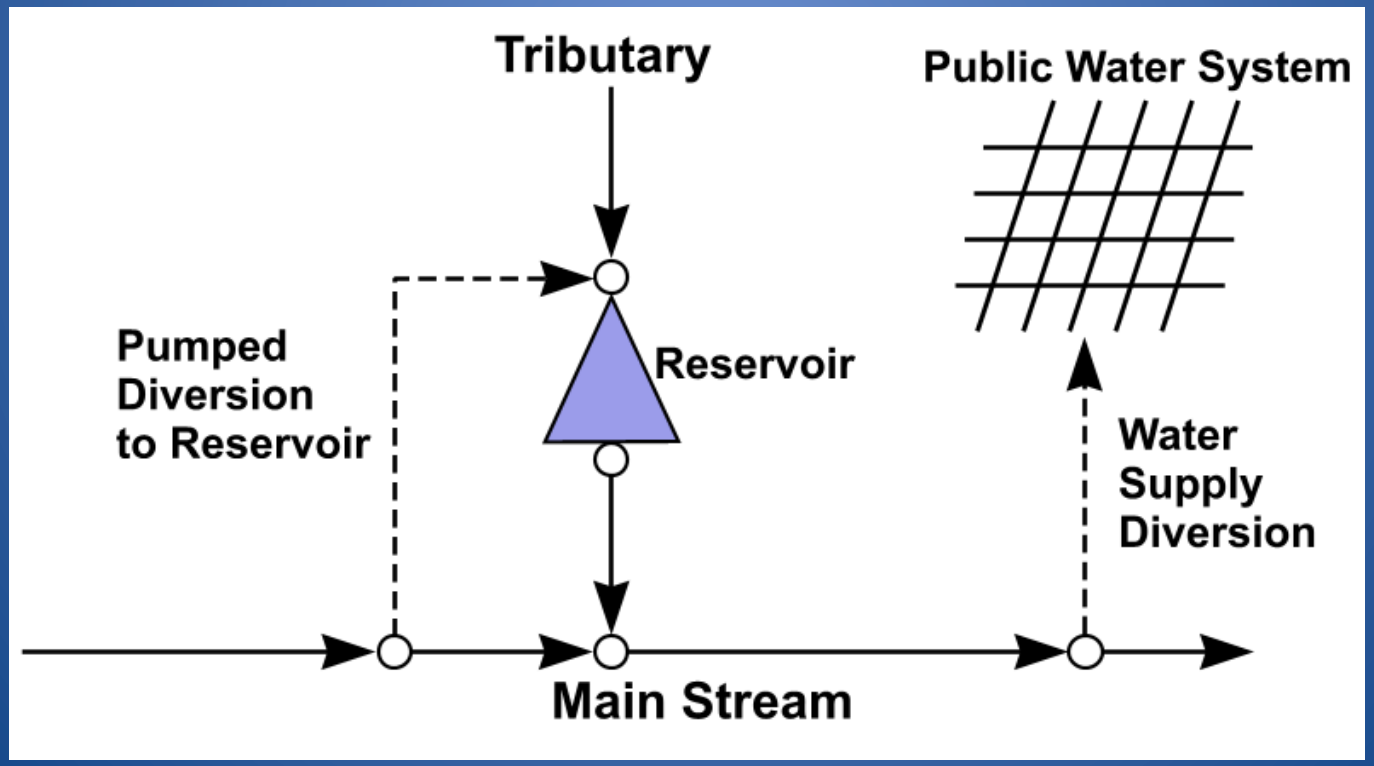
Option 3

- Reservoir fills with pumping from main stream
- Water supply taken from reservoir



Option 4

- Reservoir fills with pumping from main stream
- Water supply taken from main stream
- Reservoir provides flow augmentation during low flow periods



Planning and Permitting a Reservoir (a lengthy and arduous process)

- Needs Assessment – prepare a projection of future water supply needs. Must consider water conservation efforts.
- Alternatives Analysis – determine the least environmentally damaging most practicable alternative.
- Cultural Resources
- Analysis of Environmental Impacts (EIS may be required)
  - Wetlands
  - Stream Loss
  - Threatened/Endangered Species Habitat
- Compensatory Mitigation Plan
  - Purchase credits from a mitigation bank
  - Develop a mitigation site
  - Can be very expensive

Alternatives to Reservoir Construction

Water Conservation

- It seems that most reservoir opponents are convinced that all future water supply needs can be met through water conservation.
- Water Conservation (Demand management) is a tool that must be used as much as is practical to reduce the need for expanded water supplies but it is risky to assume that all water needs for future population growth can be met through reductions in usage by the existing population.
- Water conservation must be included in the Needs Assessment that is performed as part of the reservoir planning process

Alternatives to Reservoir Construction

Upland Storage Lagoons

- It may be possible to construct upland storage lagoons to provide required water storage.
- If a lagoon could be located that would not directly impact a stream it would be more acceptable from an environmental perspective.
- This alternative should be investigated in an alternatives analysis.
- Unfortunately, the terrain in the piedmont is not very conducive to locating an upland lagoon having adequate volume without impacting a stream. Such a structure would require very large amounts of earth moving and likely require much rock excavation.
- Control of seepage would be expensive.

Alternatives to Reservoir Construction

Wastewater Reuse

- Reuse of wastewater for potable water supplies is probably the most promising solution for increasing supply in the future.
- Wastewater treatment technology is becoming more advanced and more reliable. However, it is not likely that direct potable reuse, which means pumping treated wastewater directly to the water treatment facility, will be accepted in the near future.
- The best option is indirect potable reuse with the reclaimed water being applied to the upper end of a water supply reservoir.
- If an existing reservoir is available, its water supply yield could be increased by utilizing reclaimed wastewater.
- A proposed discharge to Lake Lanier is being opposed by environmental groups.