Ensuring an Adequate Water Supply for the Future:

Learning From the Drought

Orange Water and Sewer Authority

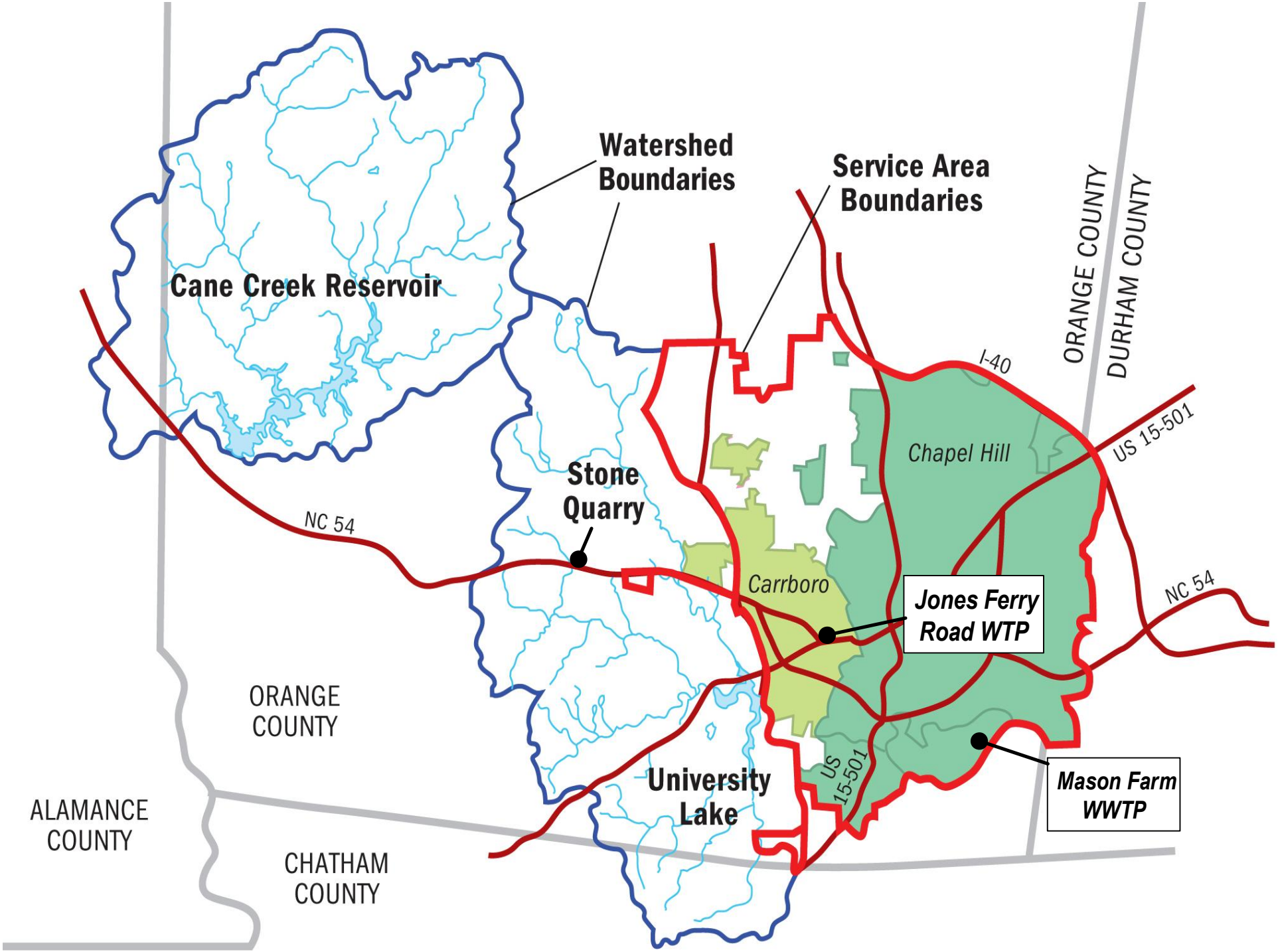
March 9, 2008

Objectives

Provide Information on:

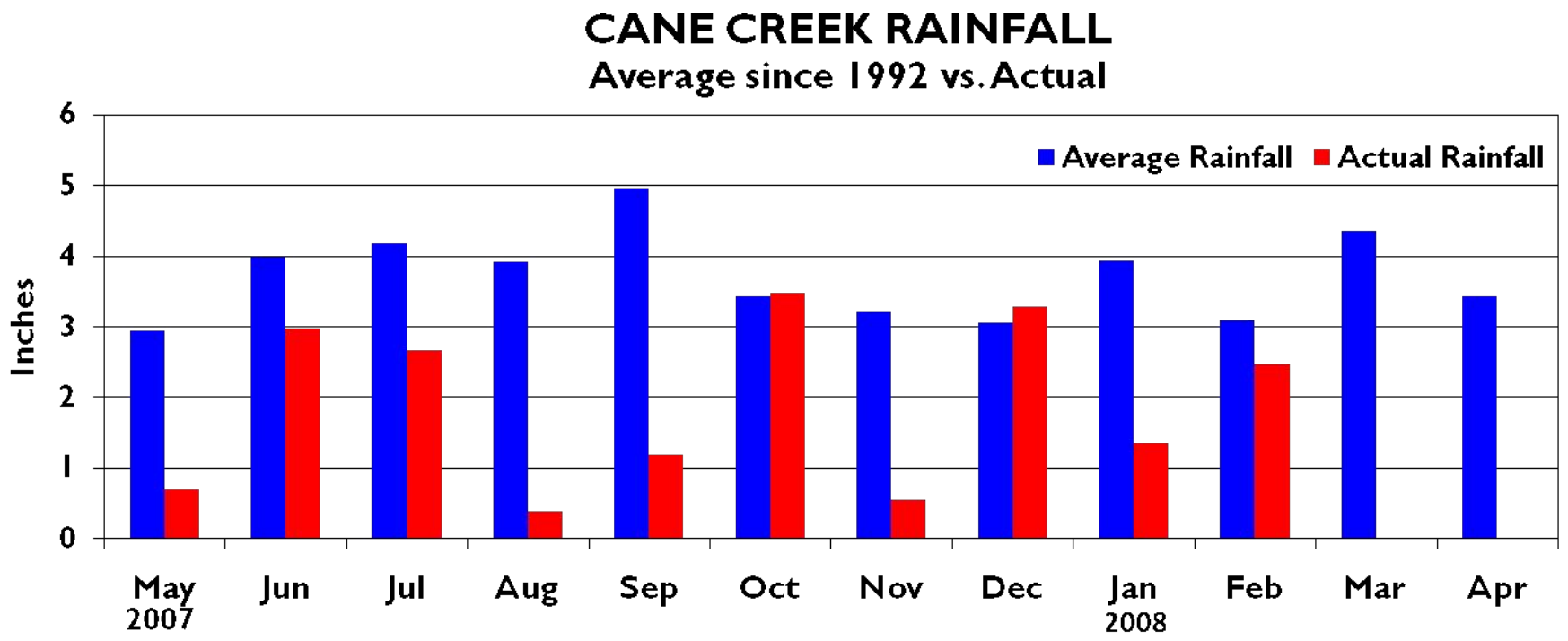
- Current status of supplies and demand
- Long-term supply and demand outlook
- Emerging strategies – changing approaches
- A brief word about water quality

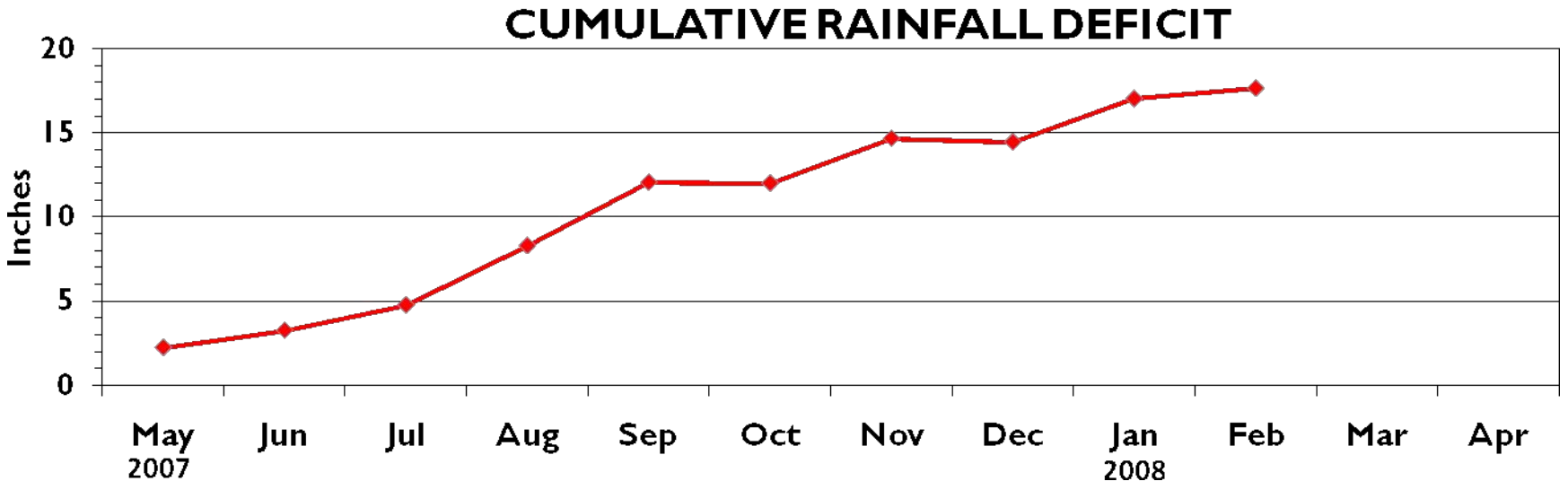
Receive Your Questions, Comments and Suggestions!


Watershed Boundaries
Service Area Boundaries
Cane Creek Reservoir
Stone Quarry
University Lake
Jones Ferry Road WTP
Mason Farm WWTP
Chapel Hill
Carrboro
I-40
US 15-501
NC 54
ORANGE COUNTY
DURHAM COUNTY
ALAMANCE COUNTY
CHATHAM COUNTY

Drought Headlines

- Water storage at ~53% full – ***unprecedented for our lakes to be so low at this time of year***
- Conditions have improved; however, our local "water supply" drought has not ended
- Below normal rainfall expected throughout the spring
- Stage Three Water Shortage declared March 1, 2008
- Stage Three Water Rate Surcharges in effect March 17
- Conservation needed to ensure adequate supply through rest of the year


CANE CREEK RAINFALL
Average since 1992 vs. Actual
Average Rainfall
Actual Rainfall
Inches
0
1
2
3
4
5
6
May
2007
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
2008
Feb
Mar
Apr

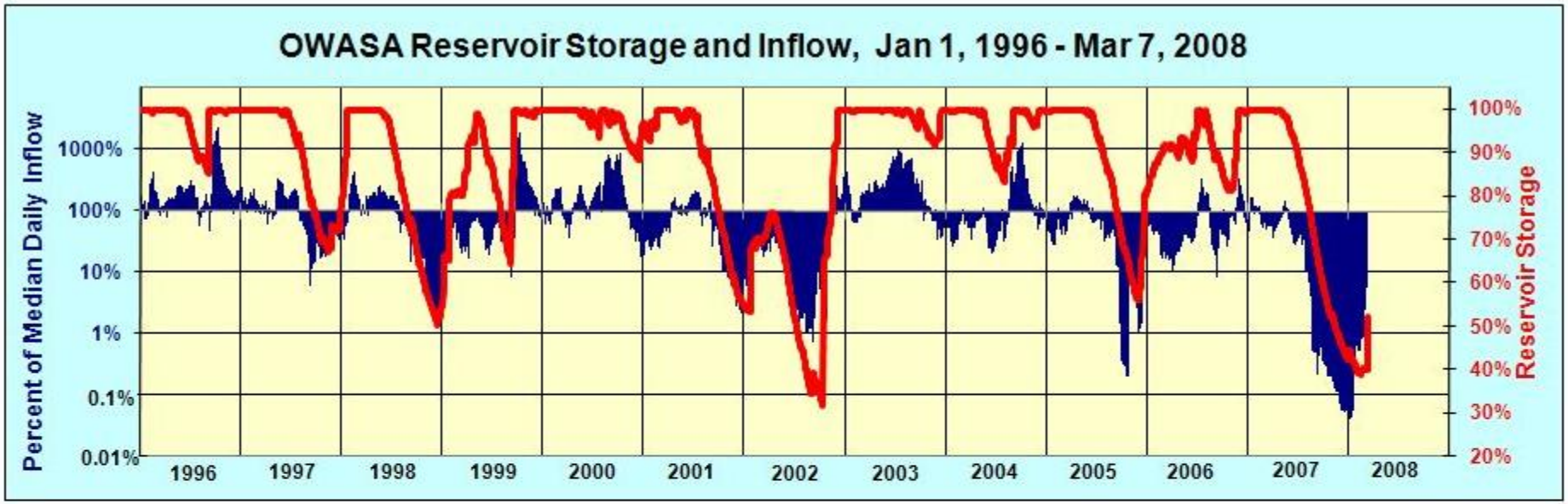

CUMULATIVE RAINFALL DEFICIT
Inches
0
5
10
15
20
May
2007
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
2008
Feb
Mar
Apr

Cane Creek Reservoir (12’5” below full)

University Lake (~5’ below on 3/3; now full)

Quarry Reservoir (was 7' down; now full)

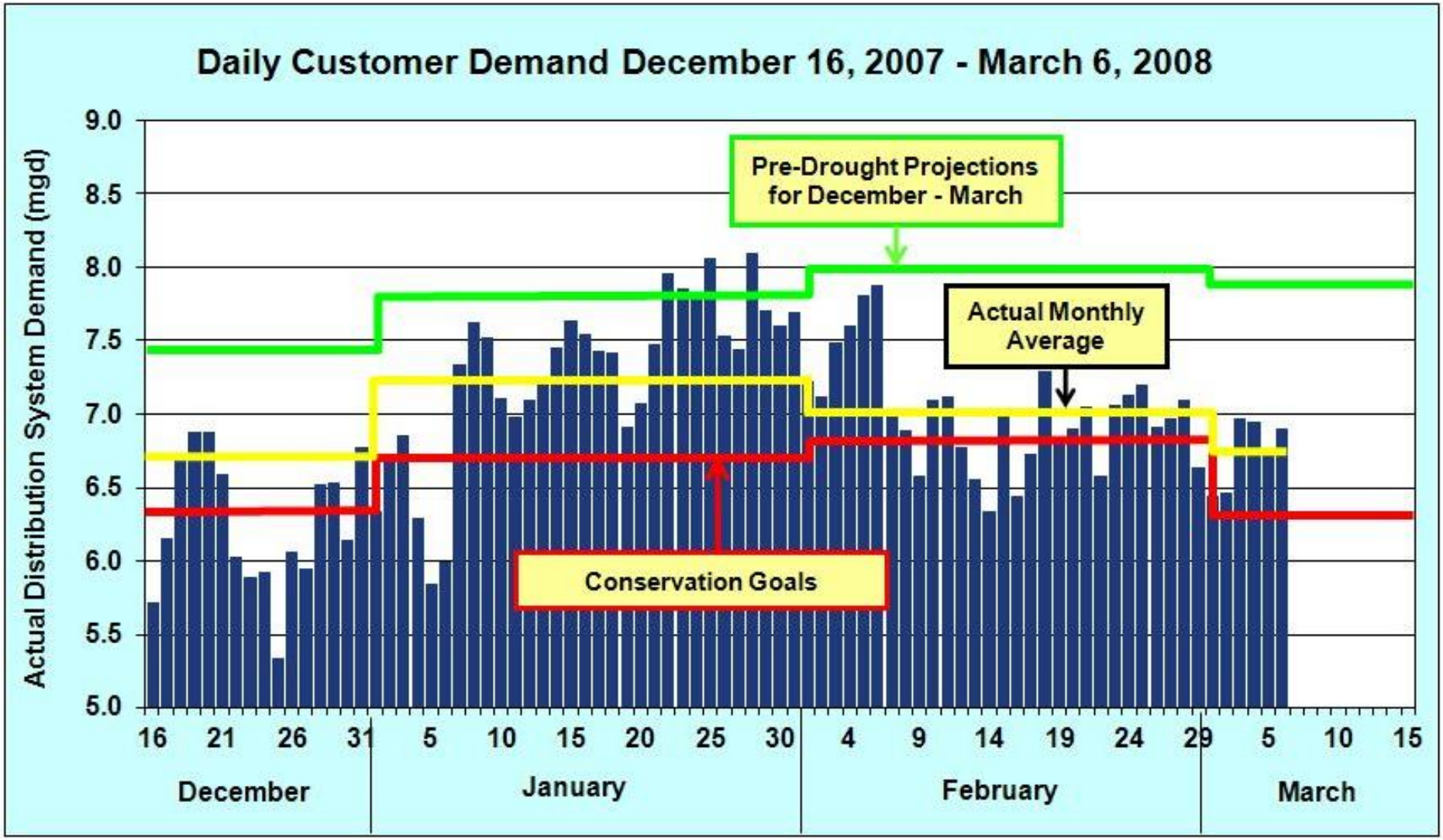
OWASA Reservoir Storage



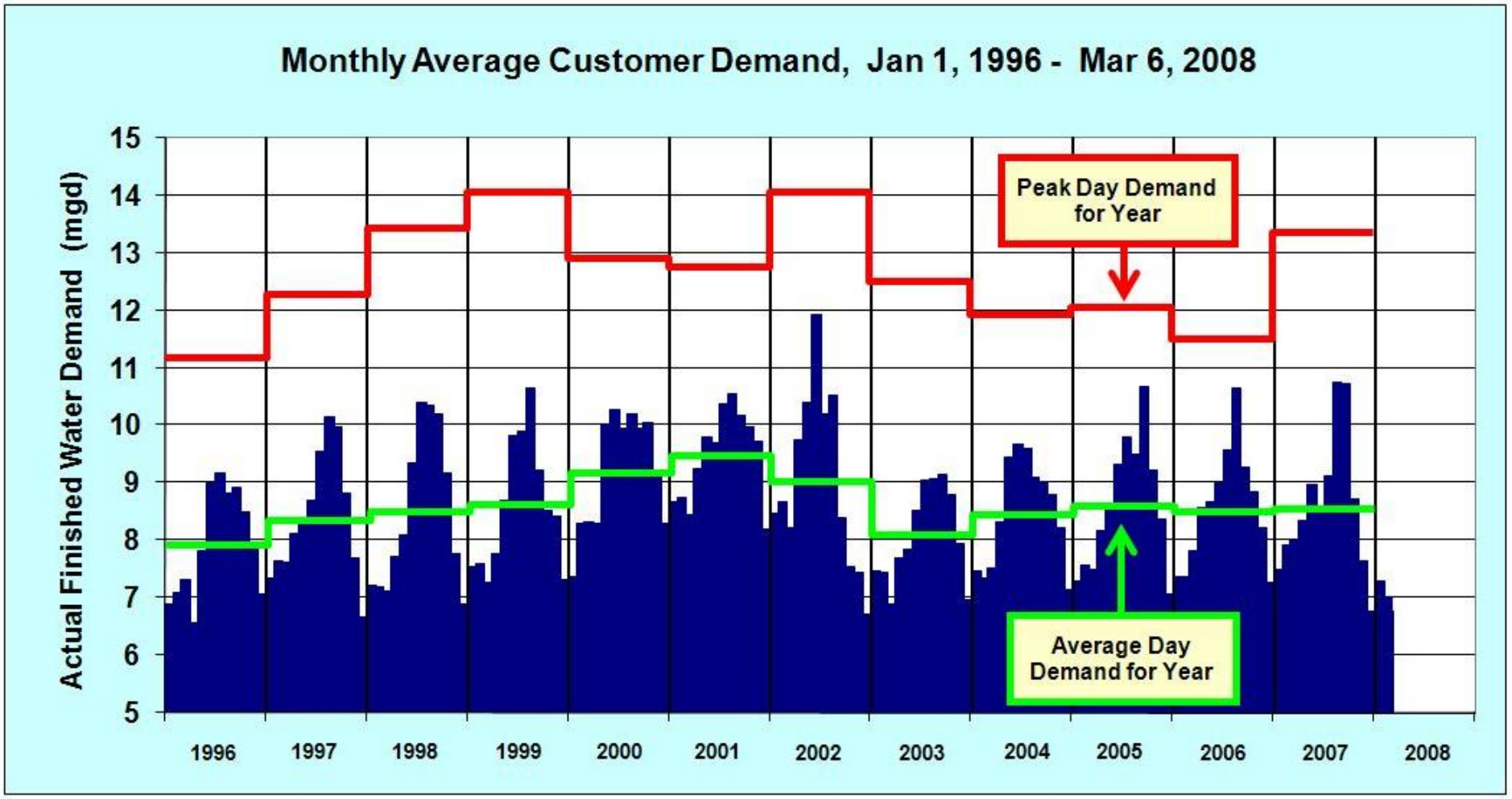
Total Reservoir Inflow (30-day median)
as percent of 18-year daily median

Percent of Total Reservoir Storage

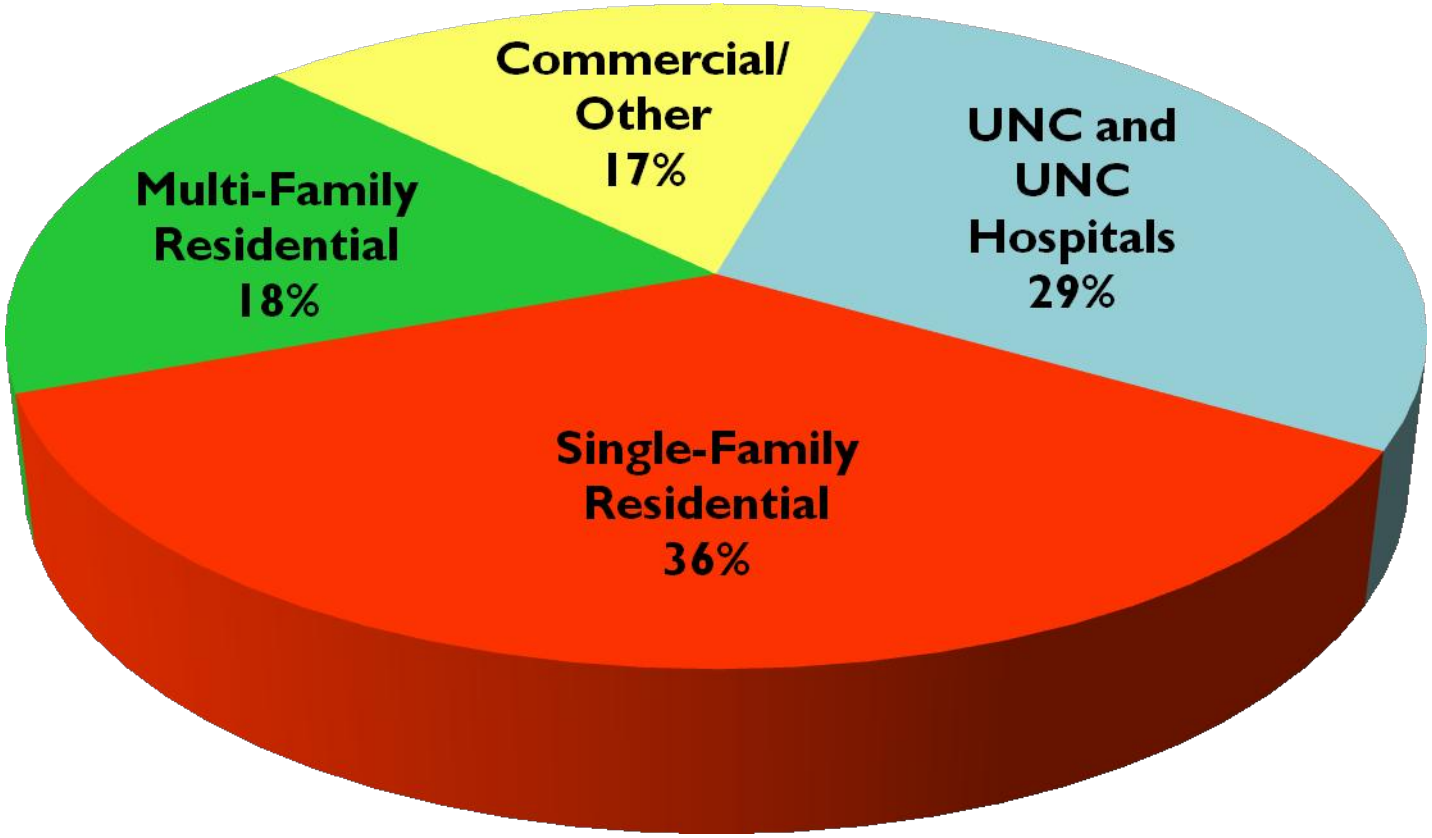
Daily Water Demands



OWASA Water Demands

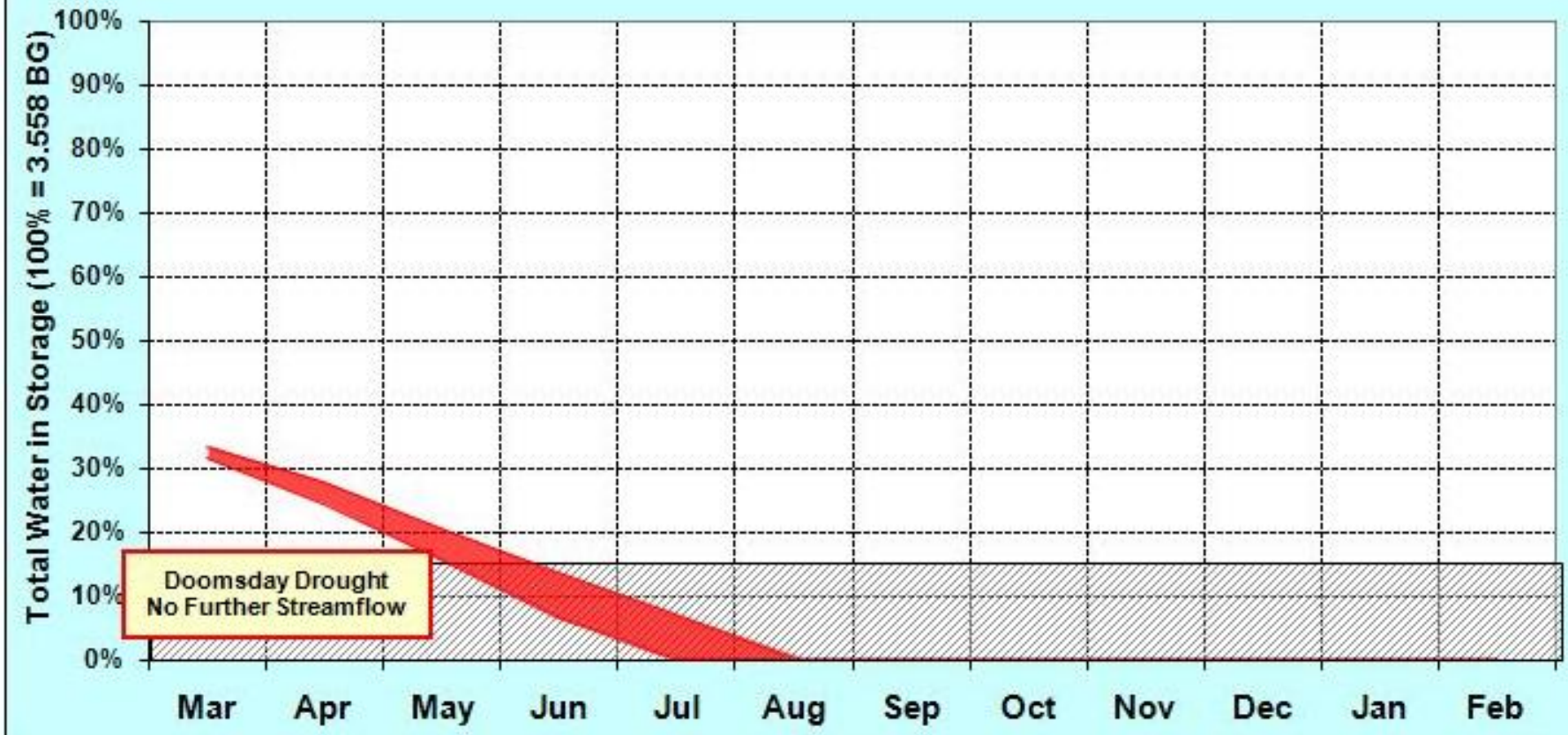


Use By Major Customer Classes



2008 Minimum Reservoir Storage Projections At Average Demands of 7 and 9 mgd Under Worst Historic Drought Conditions

Beginning with Reservoirs 40% Full on March 1, 2008



7 mgd Demand = Upper edge of each color band 9 mgd Demand = Lower edge of each color band

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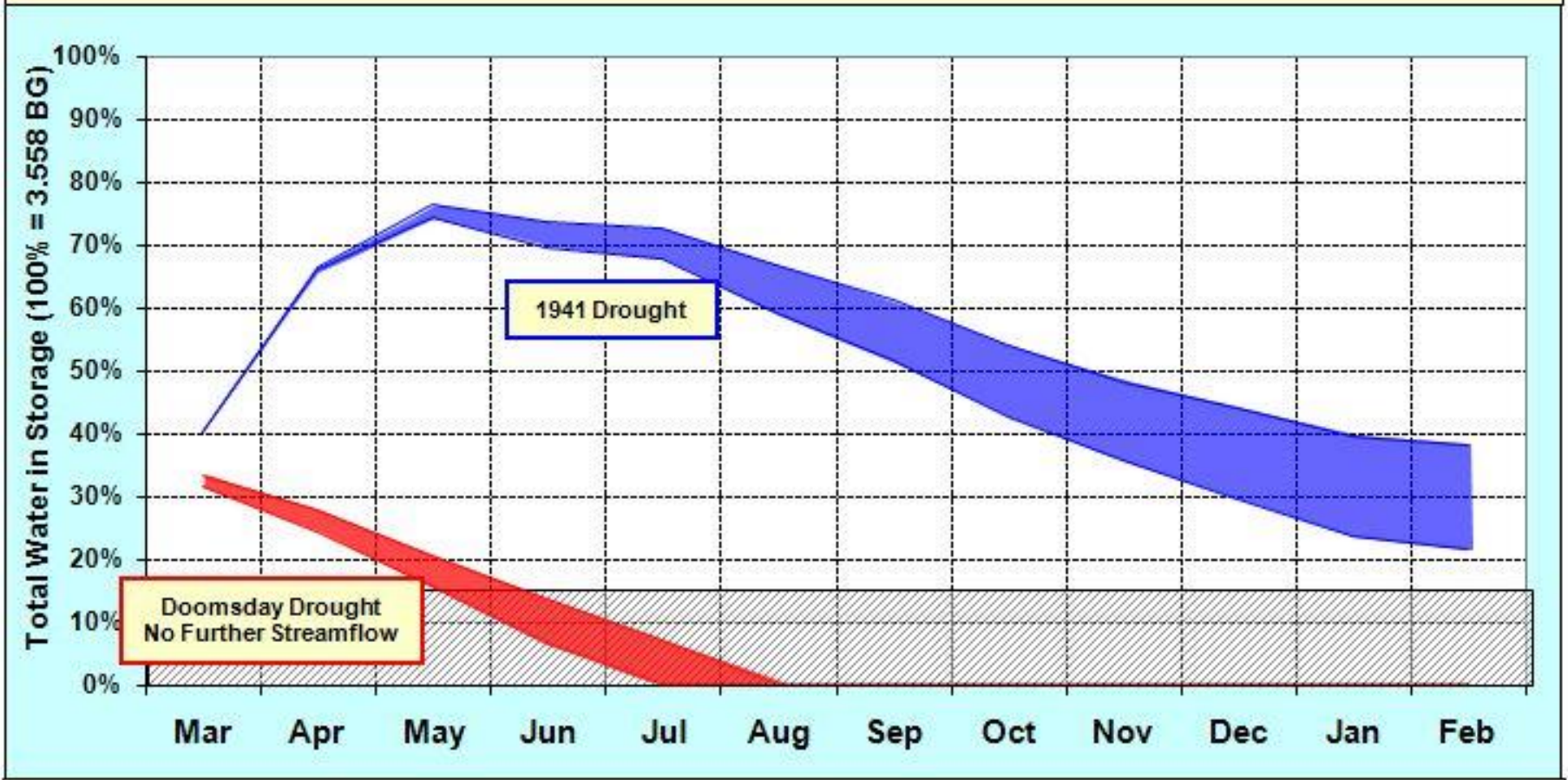

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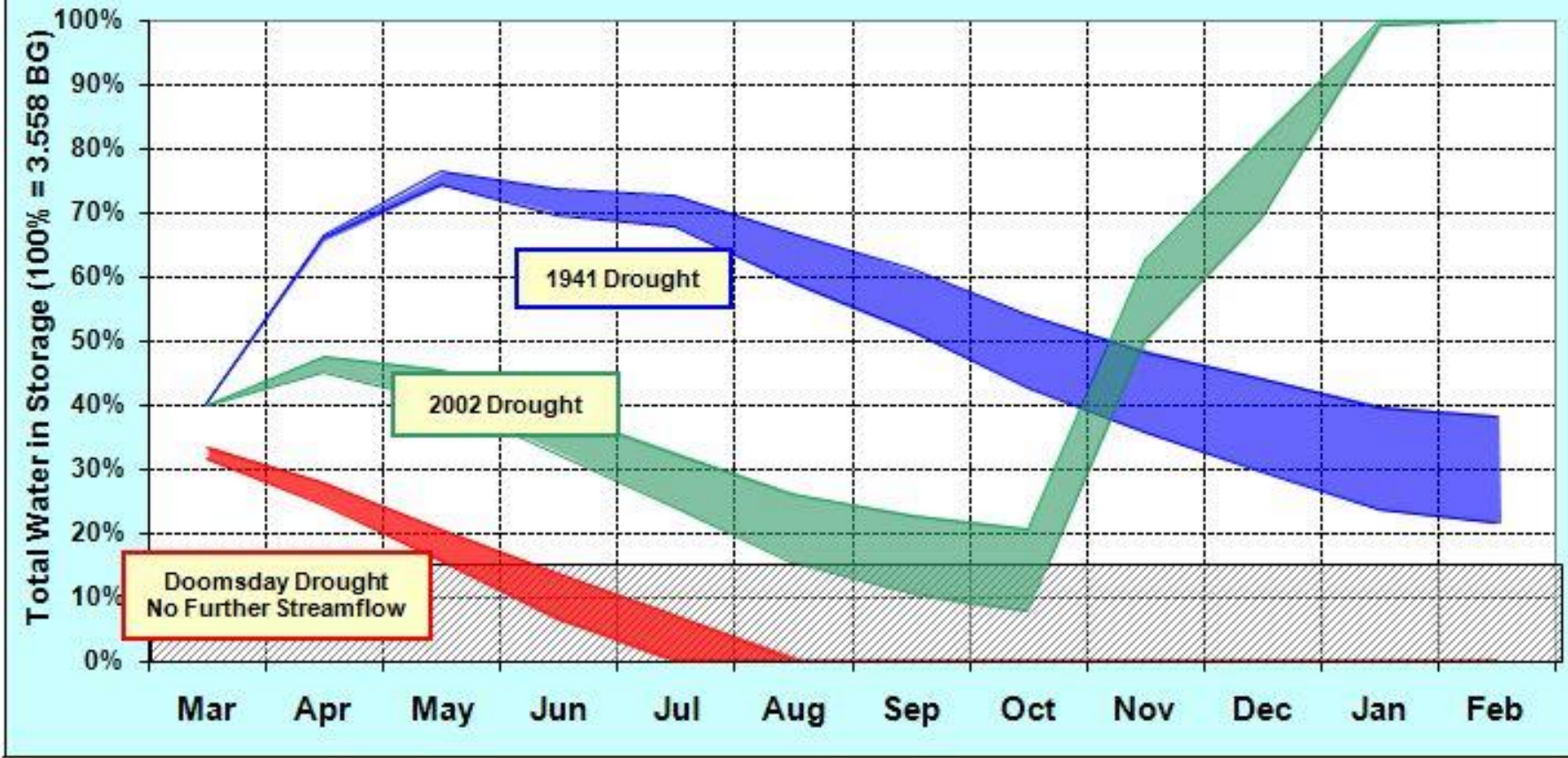

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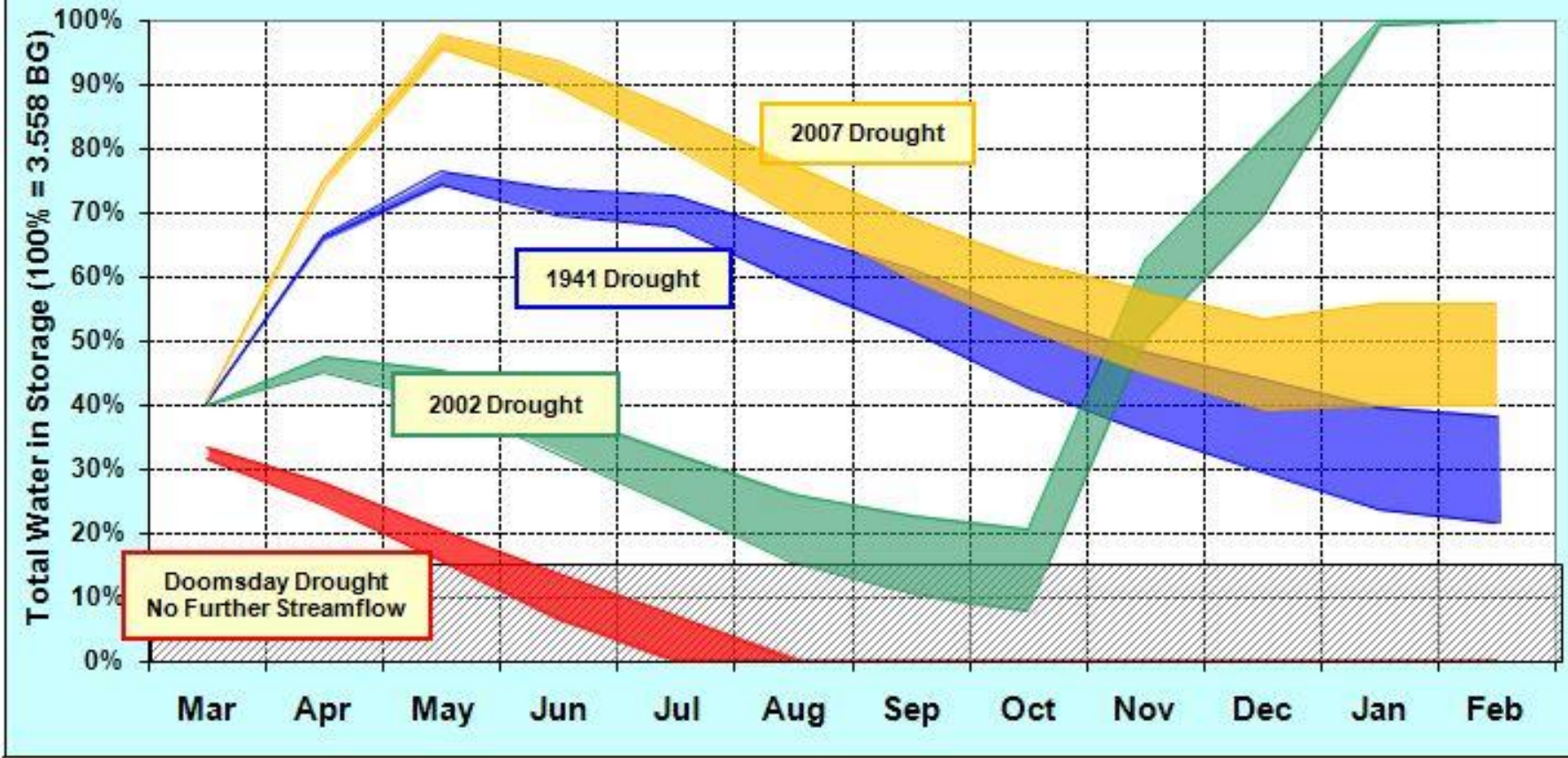

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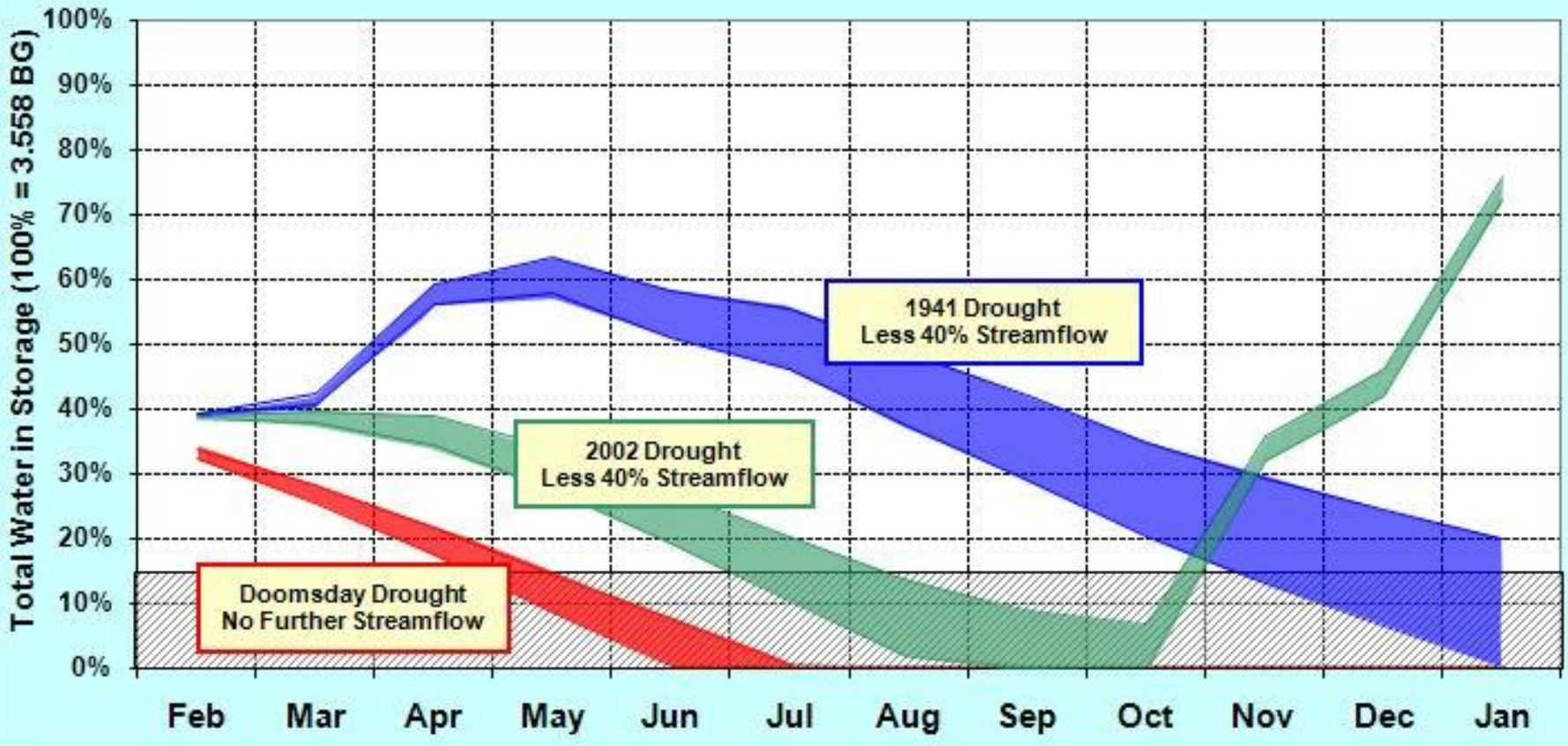
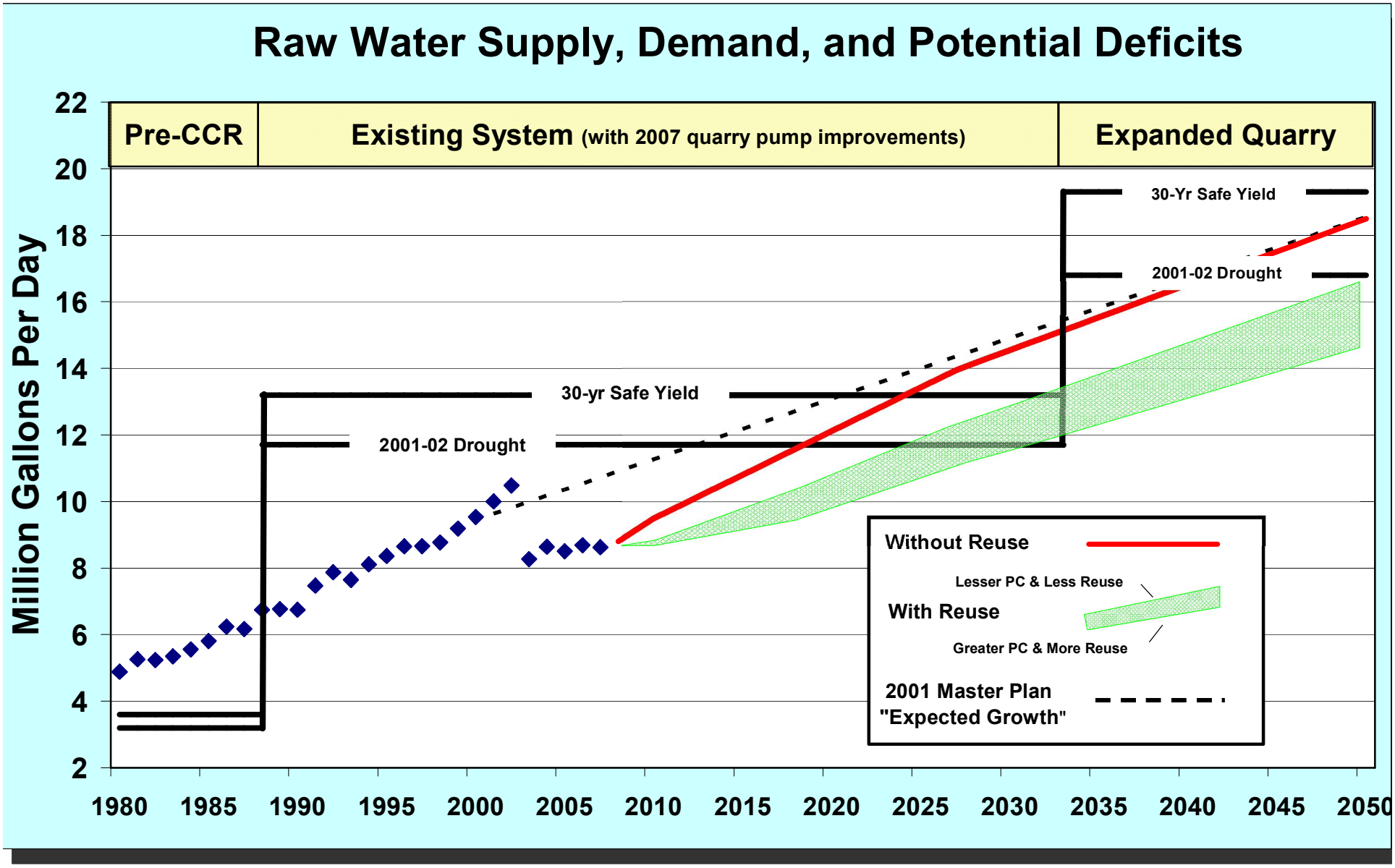
2008 Minimum Reservoir Storage Projections At Average Demands of 7 and 9 mgd Under Worst Historic Drought Conditions

Actual Streamflow Records Reduced by 40%



Assumes that total storage begins at 39% on February 1, 2008

7 mgd Demand = Upper edge of each color band 9 mgd Demand = Lower edge of each color band


Raw Water Supply, Demand, and Potential Deficits
Pre-CCR
Existing System (with 2007 quarry pump improvements)
Expanded Quarry
Million Gallons Per Day
22
20
18
16
14
12
10
8
6
4
2
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
30-Yr Safe Yield
2001-02 Drought
30-yr Safe Yield
2001-02 Drought
Without Reuse
Lesser PC & Less Reuse
With Reuse
Greater PC & More Reuse
2001 Master Plan
"Expected Growth"

Increasing Uncertainty…

- Two droughts of record in last 6 years?
- Local effects of global climate change?
  - More frequent and severe droughts
  - More intense precipitation events
  - Effects on facilities, quantity and quality
- Security risks
- Operational risks (greater dependence on RCW)
- Other…

Shifting Emphasis…

- Greater **conservation and demand management will be essential** to everything we do!
  - Cost-effective compared to new reservoirs
  - Reduces energy and water & sewer costs
  - Complements GHG and climate change efforts
- Use of **reclaimed water**
- Full cost **pricing**
- More **options to ensure reliability and reduce risk** to droughts, & other emergencies

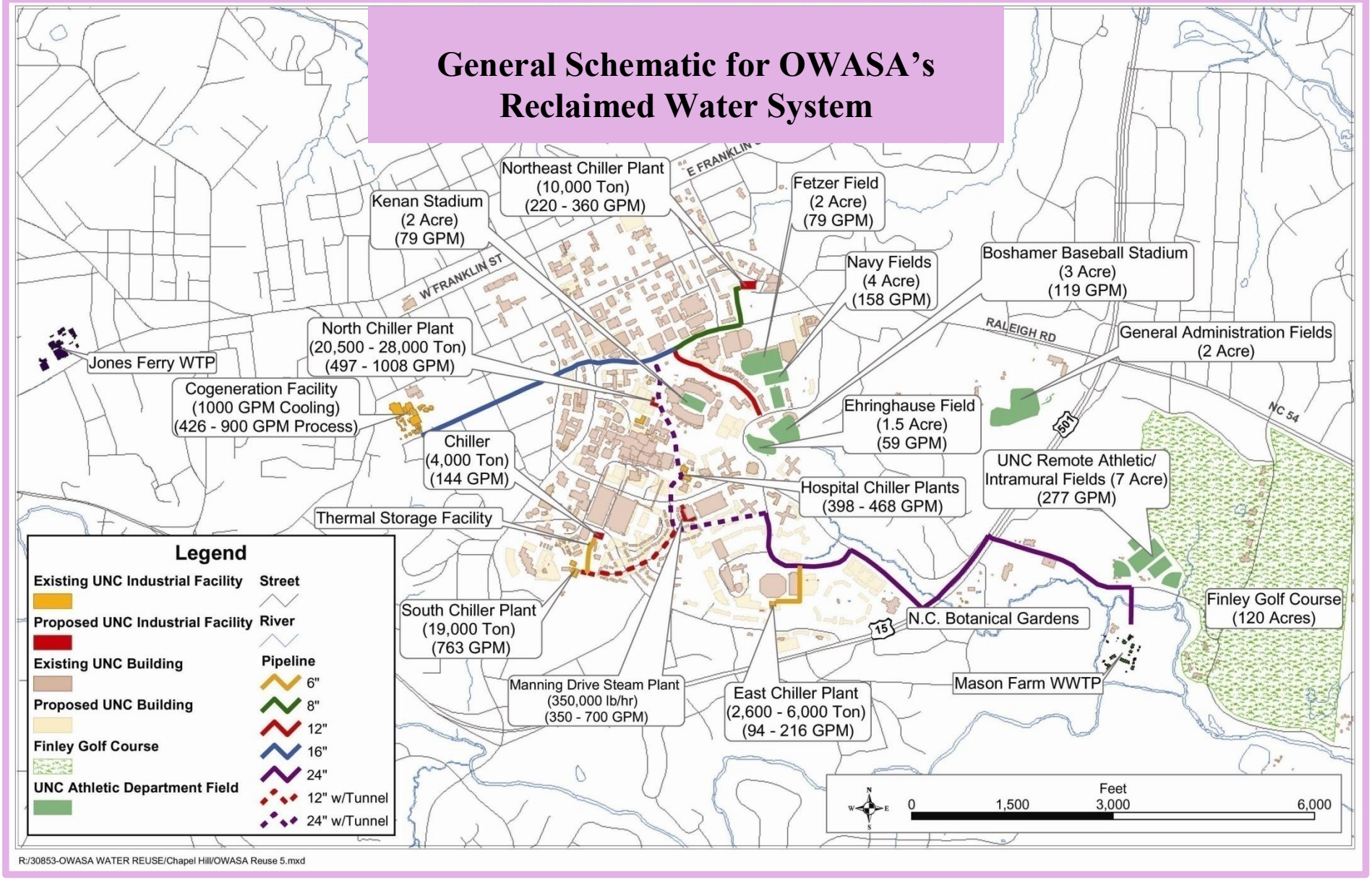
Conservation

- **Water use efficiency requirements** as a condition of receiving OWASA service
  - New development as efficient as possible
- Conservation **pricing**
- Expanded **education and outreach**
  - Targeted water use audits
  - More workshops
  - Financial incentives (loans, rebates, credits, etc.)
- Strong **partnerships** will be essential

Reclaimed Water (RCW)

- Highly treated water normally discharged into Morgan Creek; suitable for non-drinking water uses
- New RCW system serving main campus
  - Now under construction; start-up March '09
  - Initally save 0.6 mgd; perhaps 2 mgd in 20 years
  - UNC paying all the costs
  - Expandable to serve other customers
- Bulk fill RCW at Mason Farm WWTP
  - Now distributing RCW at no charge
  - Haulers must first receive training

General Schematic for OWASA's Reclaimed Water System



R:/30853-OWASA WATER REUSE/Chapel Hill/OWASA Reuse 5.mxd

Reclaimed Water

- Carolina North
  - Working closely with UNC
  - Would probably build new RCW facility
  - Dual distribution system from very outset
  - Expandable to serve nearby areas

Water Supply Alternatives

- Buy drinking water from others
- Wells
- Jordan Lake
- Haw River

Short-Term Next Steps

- Continue to closely monitor supply and demand
- Continue worst case scenario planning – be prepared to act; running out of water is not an option
- Continue local and regional emergency response planning
- Joint staff work with Carrboro, Chapel Hill and Orange County to develop additional conservation measures nearing completion

Next Steps

- Consider what risk tolerance will be acceptable to our customers and determine what actions will be required to get us to 2030s when the expanded Quarry Reservoir comes on line
- Update long-term demand projections and Water Supply Plan
  - Conservation remains a key component; now and in the future
  - Potential expanding role for reclaimed water
  - Participate in discussions to determine potential costs and benefits of regional access to Jordan Lake (even if needed only as an emergency backup supply)

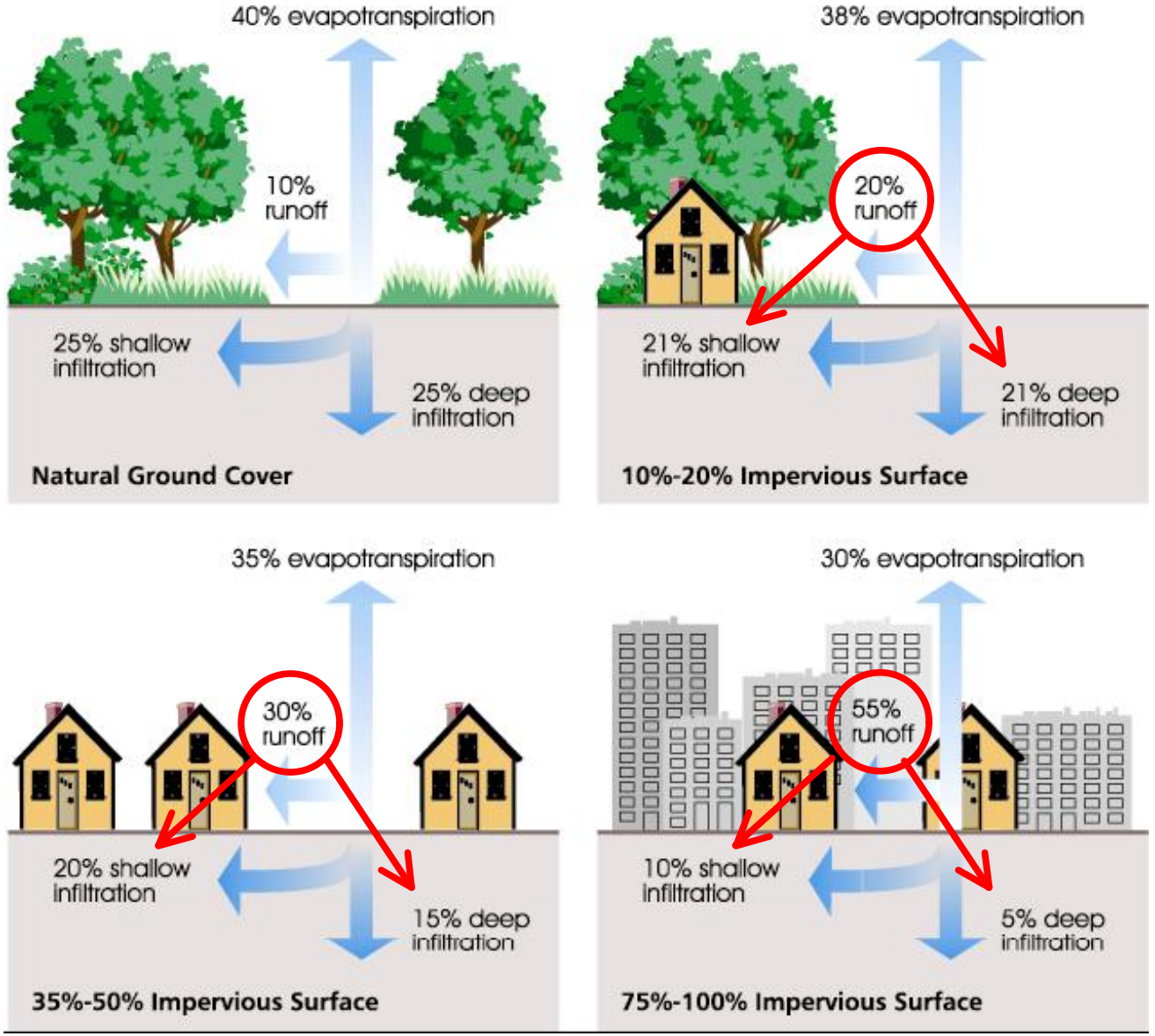
Implement Plan

- Implement water supply and demand management plan
  - Conservation and demand management strategies
  - Expanded use of reclaimed water
  - Supply-side strategies

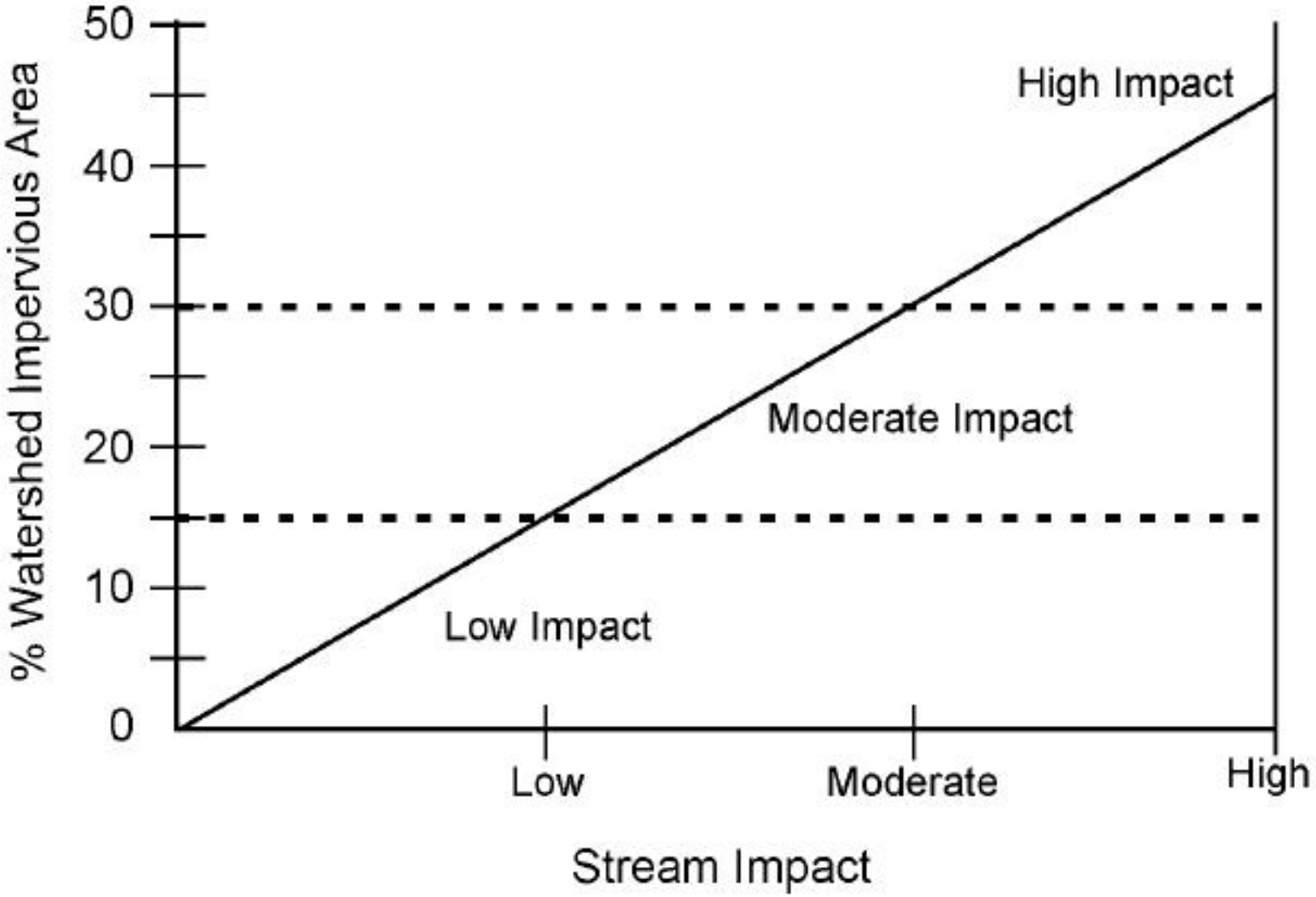
A Few Words About Water Quality

- Essential for protection of public health
  - Conventional parameters of concern
  - Emerging contaminants of concern
- Important from taste and odor perspective
- Quality affects design and cost of treatment
- Effects of climate change on water quality?
  - Watershed vegetation and hydrology
  - Quality of precipitation

Impacting the Hydrologic Cycle



Imperviousness and Stream Health



Quality is Good, Not Pristine

- Nutrient enrichment
- Total Organic Carbon
- Algal Growth
- Dissolved Oxygen depletion in bottom
- Taste and Odor Challenges

Management Studies

- Watershed and Water Quality Modeling
- Evaluation of Alternative Scenarios
- Water Quality Goals
- Management Options
- Participation by landowners, local govts, etc.

Protection Strategies

- Large-Lot (5-ac/2-ac) re-zoning
- Limited non-residential development
- No public water and sewer extensions
- Acquire 1,265 acres of additional land
  - Fee simple acquisition and conservation easements
  - State and County funding support
- Cost-share assistance for Ag BMPs
- Restricted in-lake recreational activities

There's much more to tell!

And we have a lot to do...

- We seek and appreciate ***your feedback***!
- We appreciate ***your efficient use*** and protection of our water resources!
- ***Your leadership and support*** will be essential to the success of our efforts!

919-968-4421

www.owasa.org

OWASA

Buy drinking water from others

- We have existing emergency interconnections with the City of Durham (recently expanded), Town of Hillsborough, and Chatham County.

New Water Transfer Pump Station with Durham

However, there may be limited potential to purchase water from others during current drought.

Wells (groundwater)

- Available supply is highly uncertain
- Groundwater supply is also impacted by the drought
- Use of groundwater could affect others and also affect streamflow
- Not recommended

Jordan Lake

- OWASA currently has a Level II storage allocation equivalent to ~5.0 MGD; but no existing infrastructure or contractual arrangements with others to access this supply
- So far, the Jordan Lake water supply pool has performed very well during the current drought
- Important for OWASA and our region to work together to efficiently access this resource in the future, even if only needed by OWASA during shortage conditions

Haw River

- Potential Worst Case Drought Response Scenario – pump Haw River water to the Cane Creek Reservoir
- Supply appears to be available – extensive regulatory approvals required
- Feasible, but very expensive
- Appears to be most viable Worst Case Drought Response option

Financial Implications

- Potential revenue shortfall this Fiscal Year (FY) year projected at $1.0 – $2.5 million
- Work to reduce O&M spending by $1.3 million this FY
- Depending on the duration and severity of the drought – higher than anticipated rate increases may be required (and potentially additional reductions in O&M and/or Capital Project expenditures)

Stage Three Restrictions

- No irrigation except with hand-held hose or watering can; limited to 3 days per week with ½ inch limit; no watering of turf (grass)
- No outdoor use except for public health and safety
- No car washes; no filling or topping off swimming pools
- No flushing or pressure testing of new lines unless the water is captured and recycled
- 20% or more demand reduction goal; less than 35 gallons per person per day recommended

Stage Three Surcharges

(for single-family residential customers)

		Effective Date	
		November 1, 2007	March 17, 2008
Monthly Usage	Without Surcharges	Stage 2 Surcharges	Stage 3 Surcharges
2,000 gallons	$15.04	$15.04	$15.04
5,000 gallons	$29.14	$29.14	$32.67
10,000 gallons	$56.79	$70.62	$87.97
20,000 gallons	$159.34	$340.97	$460.87

Stage Three Surcharges

(for non-residential customers)

			Effective March 17, 2008
Monthly Usage	April (Non-peak) No Surcharges	May (Peak) No Surcharges	April or May (Non-peak or Peak) With Stage 3 Surcharges
5,000 gallons	$37.66	$51.51	$58.81
10,000 gallons	$53.06	$80.76	$95.36
100,000 gallons	$330.26	$607.26	$753.26

Figure 1. Single Family Residential Housing Starts in Carrboro and Chapel Hill, CY 1996-2006

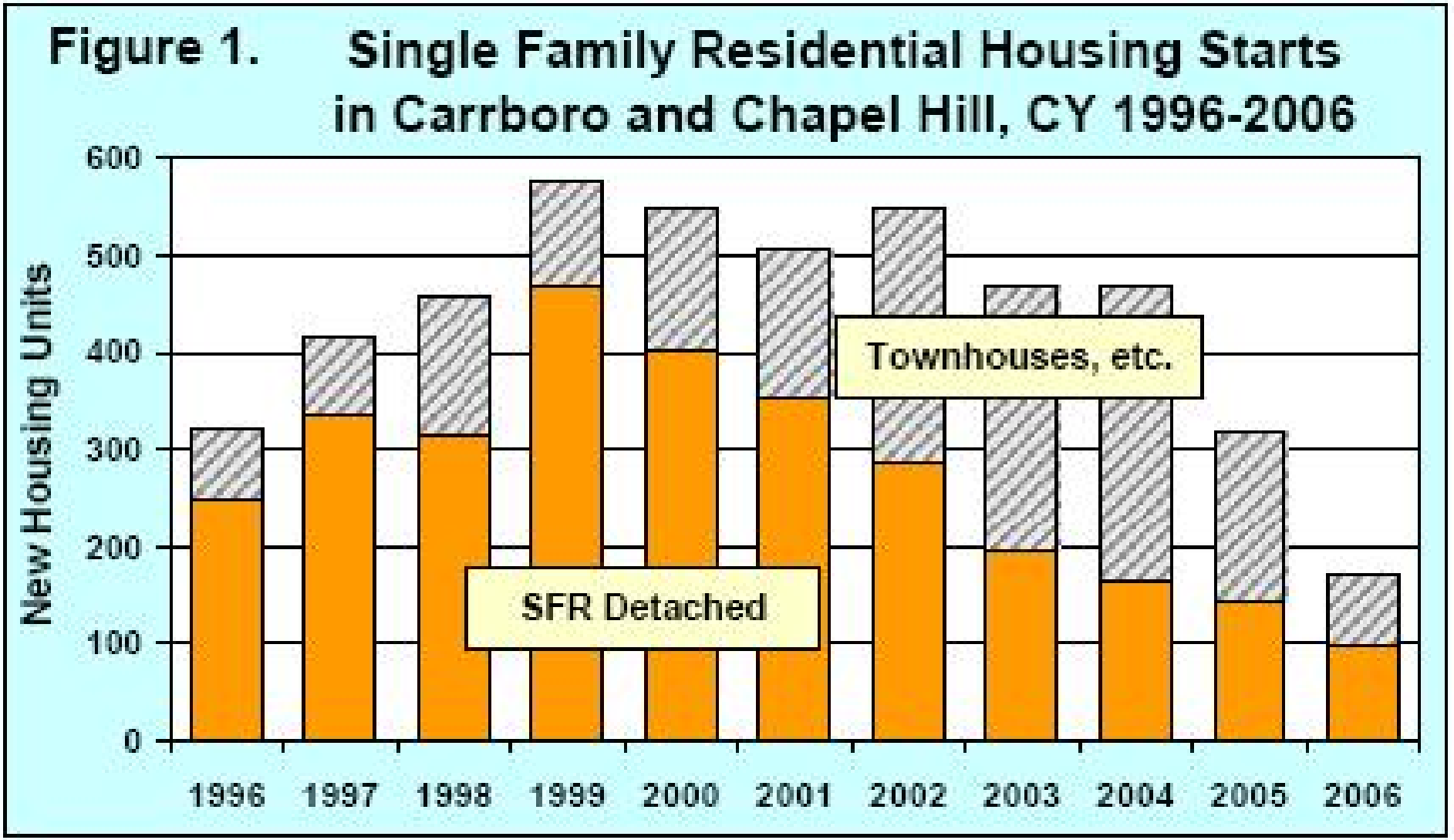


Figure 7.

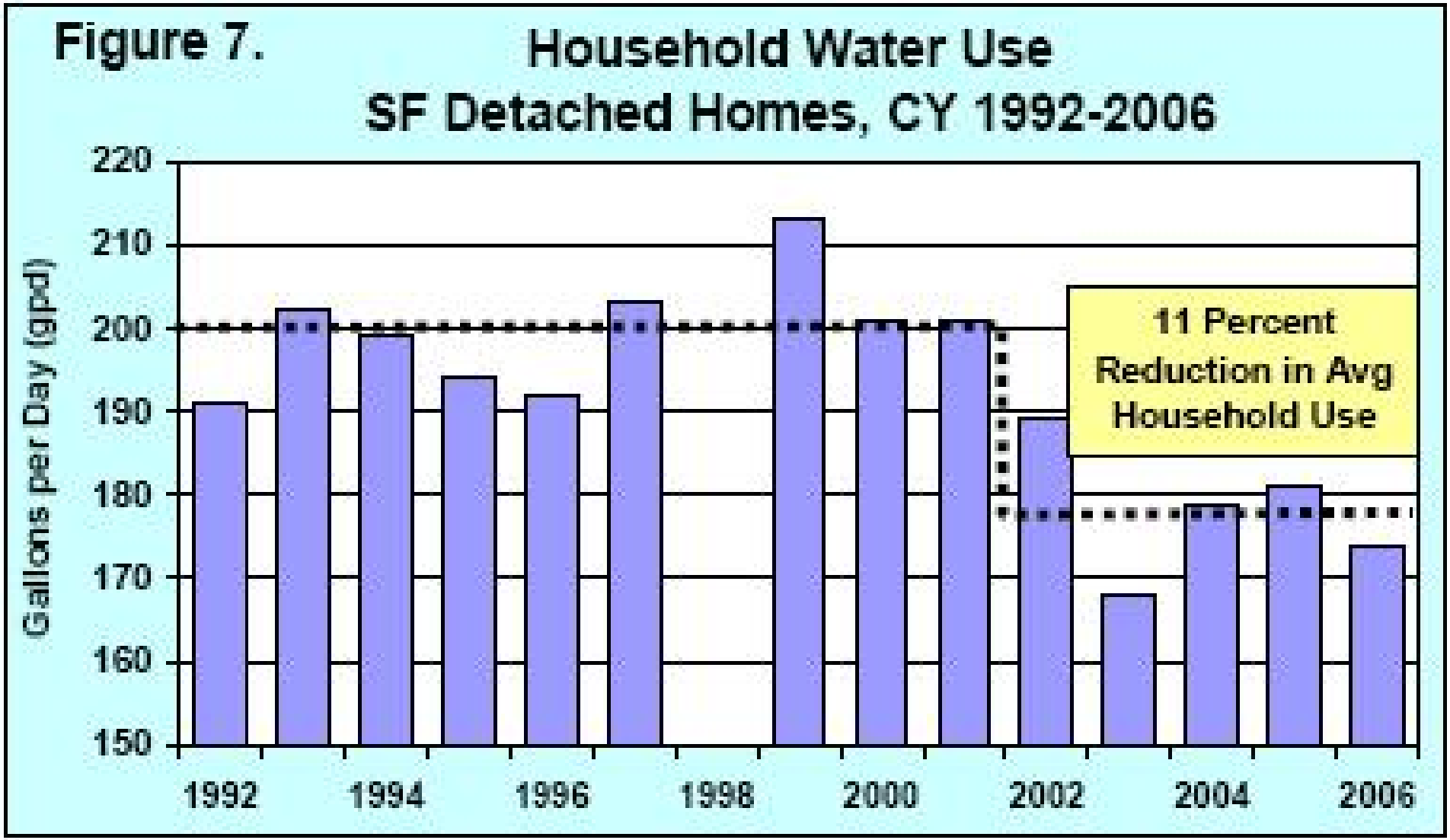
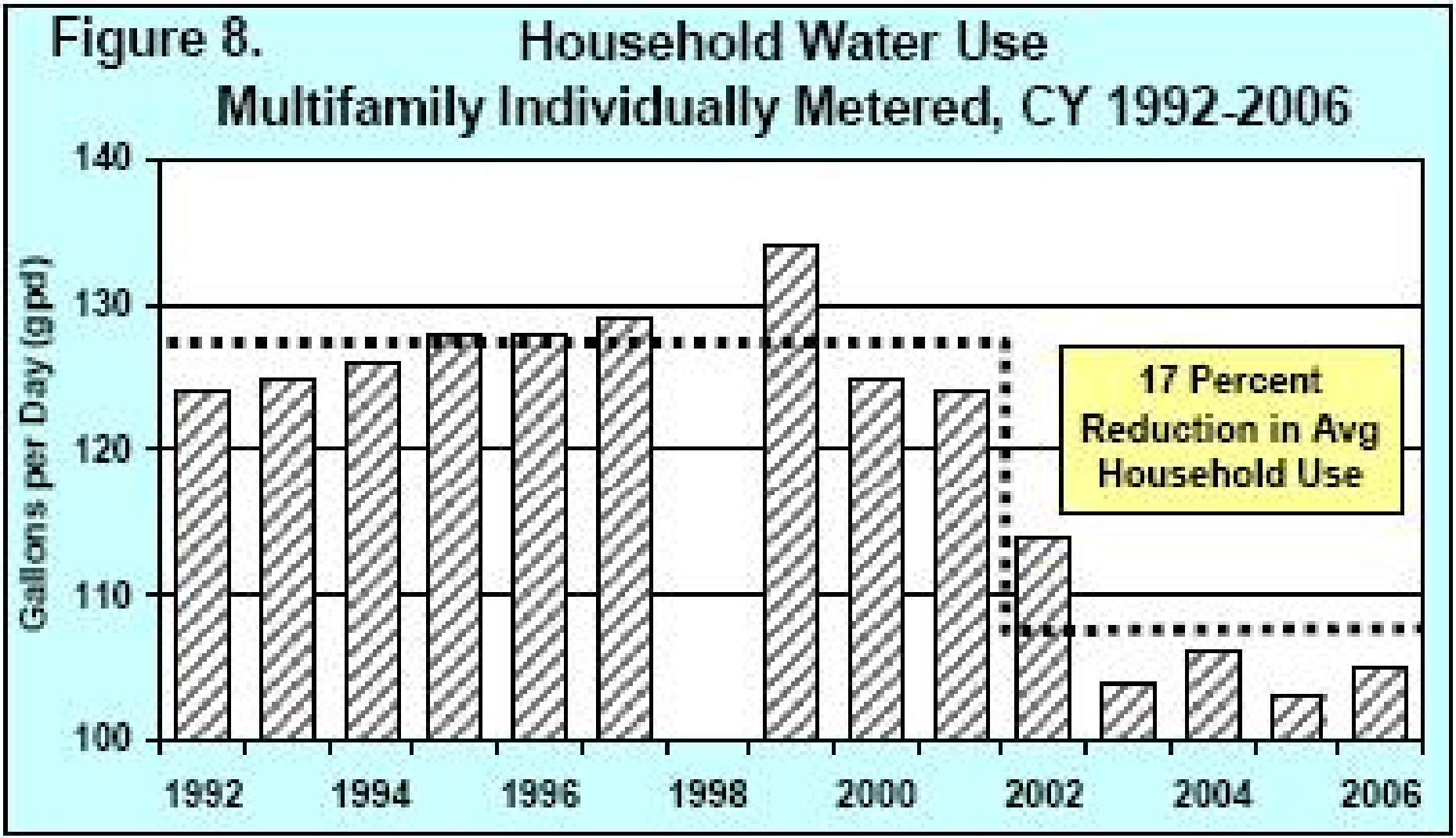
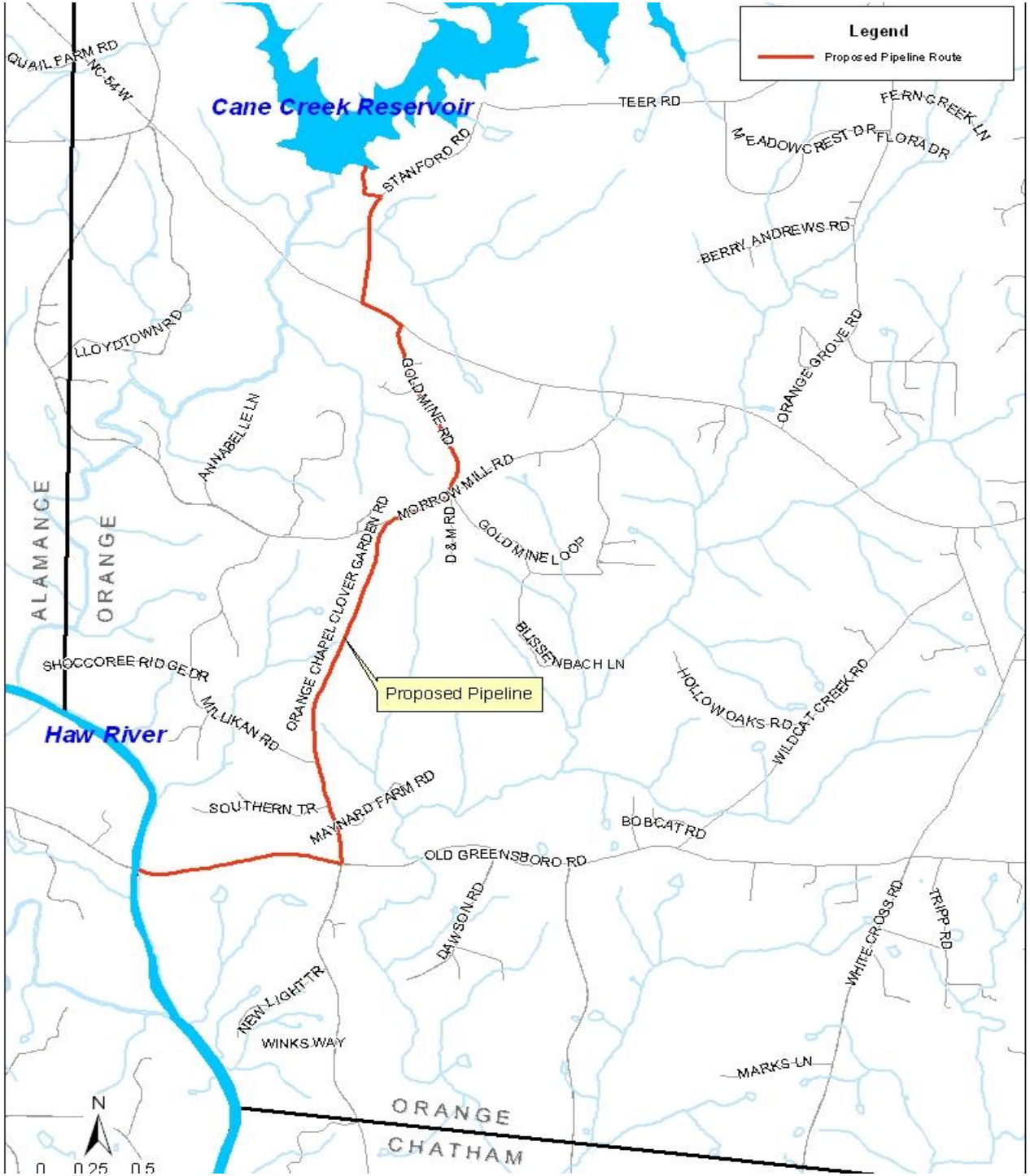

Household Water Use
SF Detached Homes, CY 1992-2006
Gallons per Day (gpd)
220
210
200
190
180
170
160
150
1992
1994
1996
1998
2000
2002
2004
2006
11 Percent
Reduction in Avg
Household Use

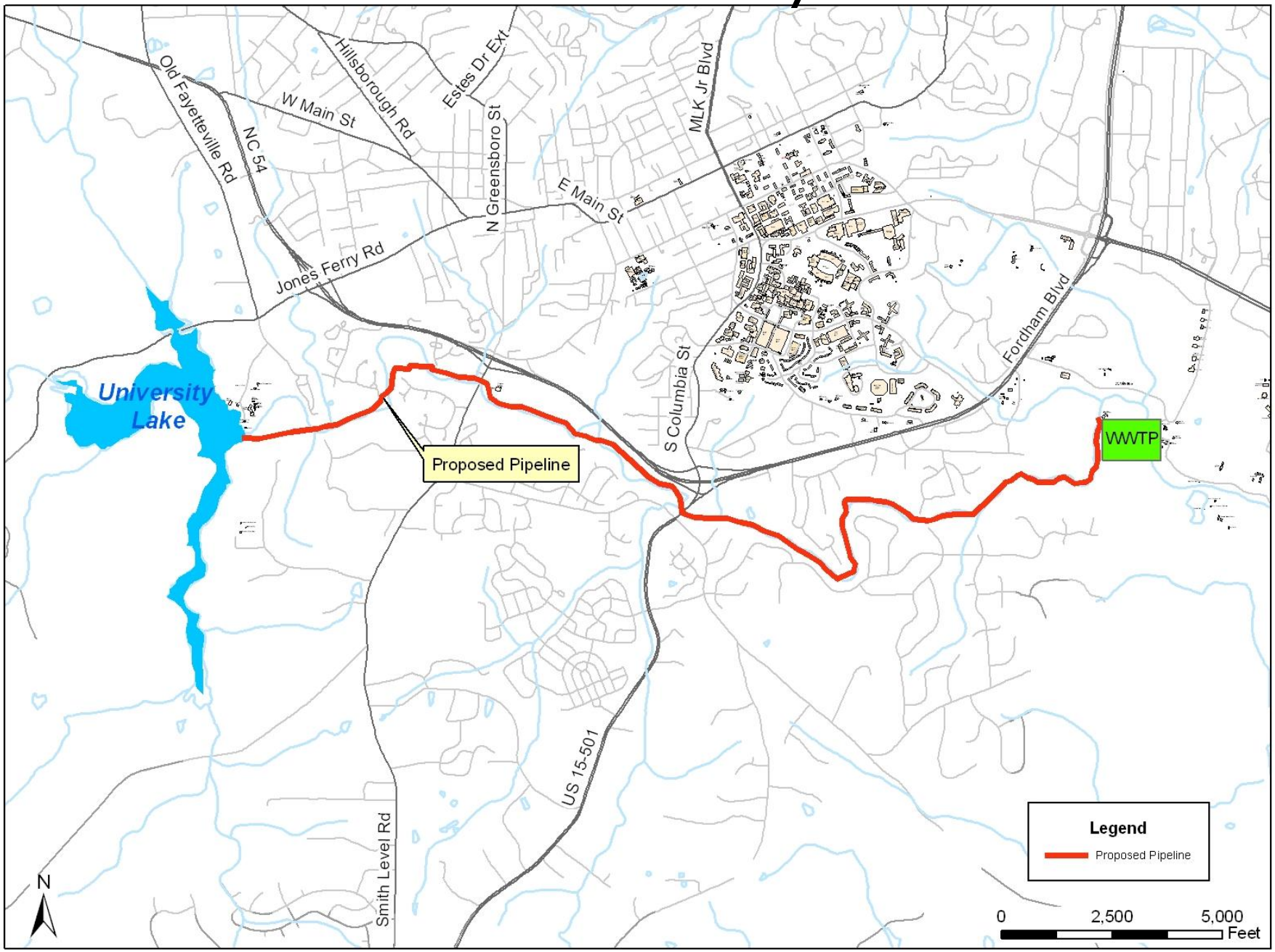
Figure 8. Household Water Use

Multifamily Individually Metered, CY 1992-2006

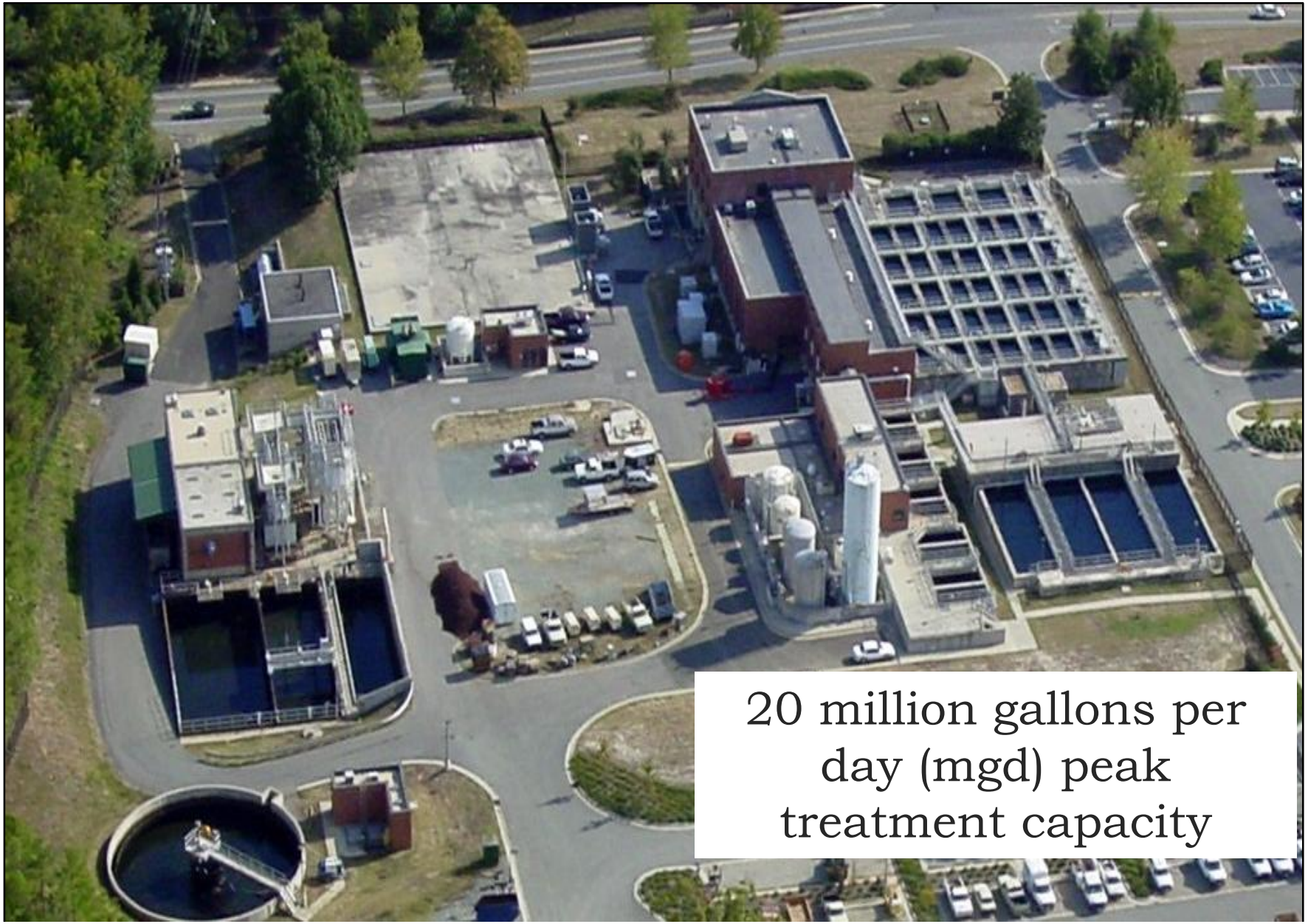



Legend
Proposed Pipeline Route
Cane Creek Reservoir
Haw River
Proposed Pipeline
QUAIL FARM RD
NC 54 W
TEER RD
FERN CREEK LN
MEADOWCREST DR
FLORA DR
STANFORD RD
BERRY ANDREWS RD
LLOYDTOWN RD
GOLDMINE RD
ORANGE GROVE RD
ANNABELLE LN
MORROW MILL RD
D & M RD
GOLDMINE LOOP
ALAMANCE
ORANGE
ORANGE CHAPEL CLOVER GARDEN RD
BLISSENBACH LN
SHOCCOREE RIDGE DR
MILLIKAN RD
HOLLOW OAKS RD
WILDCAT CREEK RD
SOUTHERN TR
MAYNARD FARM RD
BOBCAT RD
OLD GREENSBORO RD
DAWSON RD
WHITE CROSS RD
TRIPP RD
NEW LIGHT TR
WINKS WAY
MARKS LN
N
ORANGE
CHATHAM
0
0.25
0.5

RCW to University Lake



Jones Ferry Road Water Treatment Plant



Reservoir Drawdown Frequency and Guidelines for Conservation Triggers, Average Demand = 9.15 mgd

Number of times (or percent of years) during 77 years of daily streamflow records in which reservoir storage would have declined to 20% or less during the following 18 months.

Water Remaining (Percent Full) in University Lake, Cane Creek, and Quarry Reservoirs	Jan 8.0 mgd	Feb 8.2 mgd	Mar 8.0 mgd	Apr 8.3 mgd	May 9.2 mgd	Jun 9.8 mgd	Jul 10.5 mgd	Aug 10.6 mgd	Sep 10.3 mgd	Oct 9.8 mgd	Nov 9.0 mgd	Dec 8.1 mgd
100%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
95%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
90%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	1 1%	0 0%	0 0%	0 0%	0 0%
85%	0 0%	0 0%	0 0%	0 0%	2 3%	0 0%	0 0%	1 1%	0 0%	0 0%	0 0%	0 0%
80%	0 0%	0 0%	0 0%	0 0%	2 3%	3 4%	2 3%	1 1%	1 1%	0 0%	0 0%	0 0%
75%	0 0%	0 0%	0 0%	0 0%	2 3%	3 4%	2 3%	1 1%	1 1%	0 0%	0 0%	0 0%
70%	0 0%	0 0%	0 0%	0 0%	2 3%	3 4%	3 4%	3 4%	1 1%	1 1%	0 0%	0 0%
65%	0 0%	0 0%	0 0%	2 3%	4 5%	4 5%	4 5%	3 4%	1 1%	1 1%	0 0%	0 0%
60%	0 0%	0 0%	1 1%	4 5%	6 8%	10 13%	6 8%	5 6%	3 4%	1 1%	1 1%	0 0%
55%	0 0%	1 1%	2 3%	4 5%	13 17%	12 16%	12 16%	7 9%	3 4%	2 3%	1 1%	0 0%
50%	0 0%	1 1%	2 3%	6 8%	15 19%	18 23%	16 21%	9 12%	6 8%	3 4%	1 1%	1 1%
45%	1 1%	1 1%	3 4%	7 9%	17 22%	21 27%	22 29%	17 22%	8 10%	3 4%	2 3%	1 1%
40%	1 1%	1 1%	3 4%	8 10%	24 31%	29 38%	26 34%	25 32%	18 23%	5 6%	3 4%	1 1%
35%	1 1%	3 4%	5 6%	12 16%	25 32%	34 44%	34 44%	31 40%	27 35%	15 19%	3 4%	2 3%
30%	1 1%	4 5%	6 8%	14 18%	27 35%	38 49%	39 51%	39 51%	40 52%	25 32%	7 9%	3 4%
25%	3 4%	4 5%	6 8%	17 22%	33 43%	45 58%	48 62%	46 60%	50 65%	40 52%	19 25%	5 6%

Conservation Stages and Risk Levels =

NORM	ADV	#1	#2	#3	EMRG
0-1%	1-3%	3-8%	8-21%	21-47%	48+%

2007 Reservoir Levels

2008 Reservoir Levels

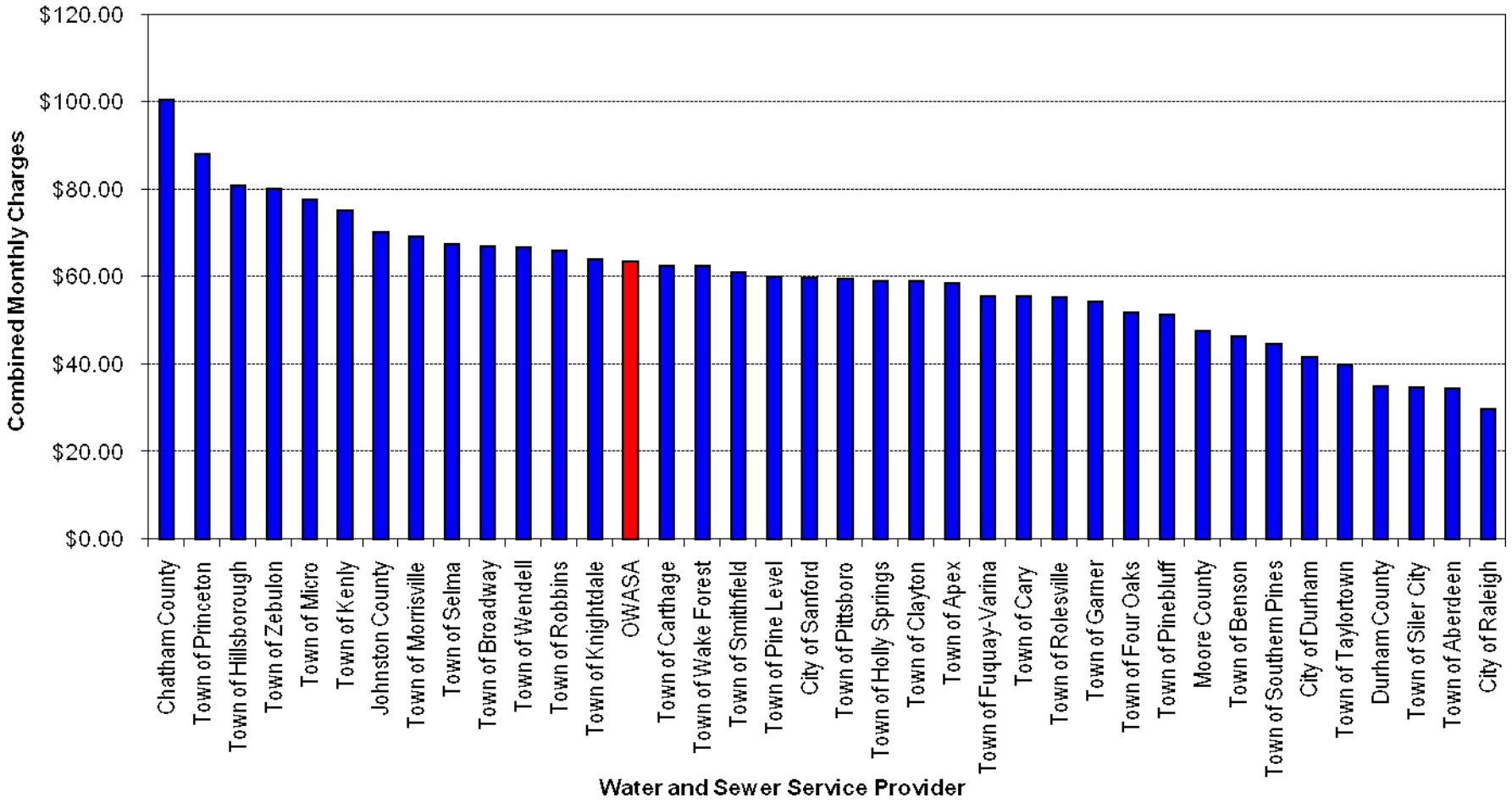
Each cell of the table contains an integer and a percentage, which represent the probability that reservoir levels will decline to 20 percent or less of full capacity during the following 18 months. These were calculated from spreadsheet model runs of 77+ years of daily streamflow data, updated through January 2003, and driven by monthly water demand and reservoir storage at the beginning of each month. Calculations were based on an average annual raw water demand of 9.15 mgd, adjusted by observed monthly ratios, which are reflected in monthly demands shown at the top of the table.

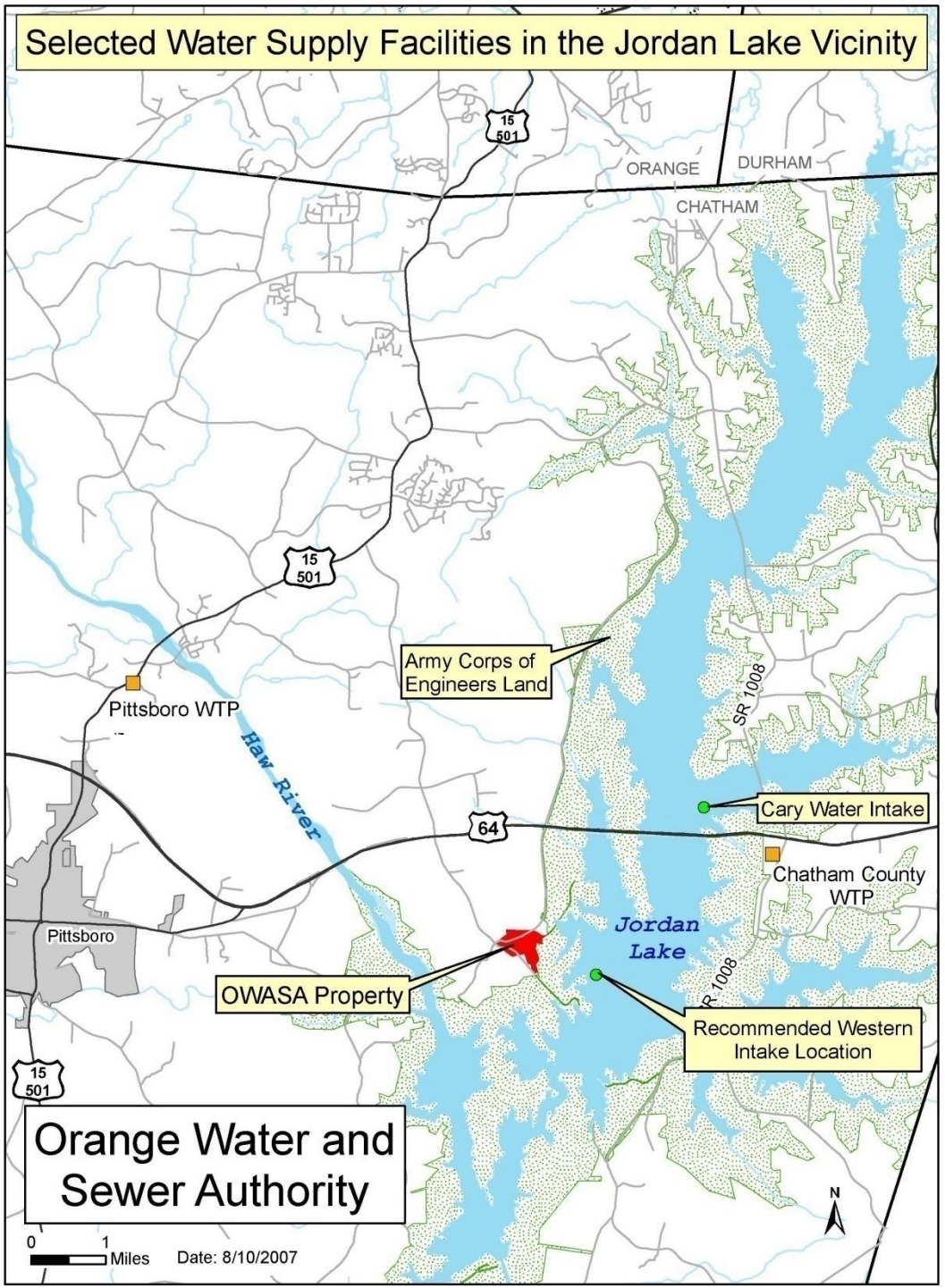
Each column of the table corresponds to a month, and each row corresponds to reservoir storage, as percent full, at the beginning of that month. Colors indicate the corresponding conservation and risk levels proposed for each condition. Cells highlighted in **orange** or **blue** represent actual reservoir storage conditions at the beginning of that month during 2007 (orange) or the **current year (blue)**.

Rev 1/2/2008

How our rates compare

Figure 3. Monthly Combined Water and Sewer Charges for Typical In-District Residential Customers as of January 2007 (assuming 6,000 gallons per month usage)




Selected Water Supply Facilities in the Jordan Lake Vicinity
15
501
ORANGE
DURHAM
CHATHAM
15
501
Army Corps of
Engineers Land
Pittsboro WTP
Haw River
SR 1008
Cary Water Intake
64
Chatham County
WTP
Pittsboro
Jordan
Lake
OWASA Property
SR 1008
Recommended Western
Intake Location
15
501
Orange Water and
Sewer Authority
0
1
Miles
Date: 8/10/2007
N

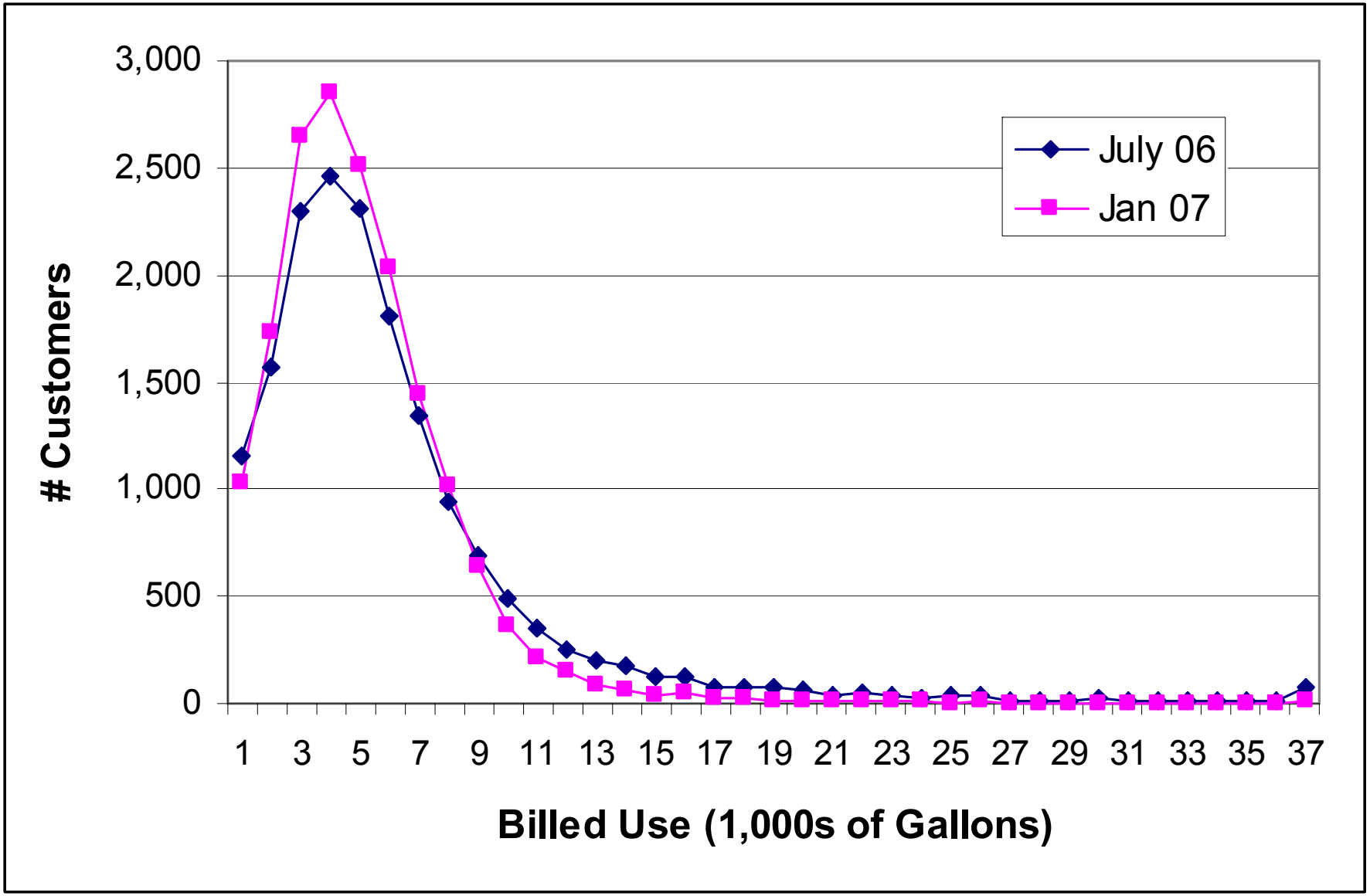
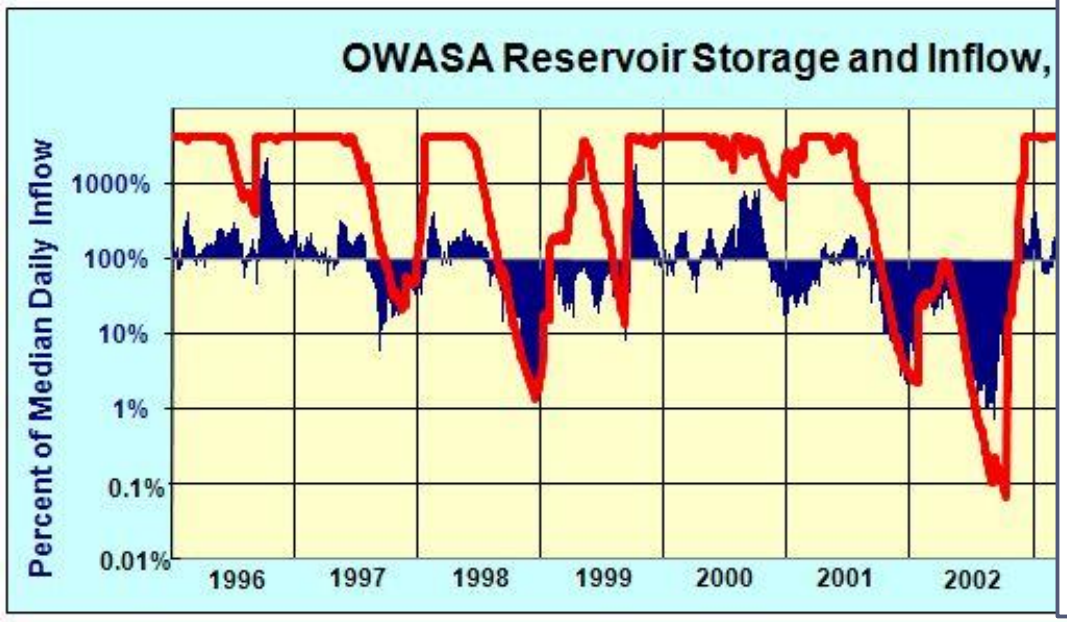

3,000
2,500
2,000
1,500
1,000
500
0
Customers
July 06
Jan 07
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
37
Billed Use (1,000s of Gallons)

Table 2.

Dec 2007-Jan 2008 Water Consumption as Percent of Dec 2006-Jan 2007 Consumption

Class	Description	Dec-Jan 07/08 as Percent of Dec-Jan 06/07	Percent of Total Use
Class 00	Townhomes	90%	0.5%
Class 01	Single Family Residential	85%	31.6%
Class 02	Ind. Metered Multi-Family	90%	5.2%
Class 03	Master Metered Multi-Family	95%	21.8%
Class 04	Private Non-UNC Dorms/Group Homes	107%	1.4%
Class 05	Nursing Homes	80%	0.7%
Class 06	Hotel/Motel/Guest Quarters	91%	1.3%
Class 07	Non-UNC Medical/Health Care	94%	1.3%
Class 08	Non-UNC Schools and Churches	86%	1.4%
Class 09	Office/Retail/Commercial/Banks	95%	5.3%
Class 10	Service Stations/Auto Repair	88%	0.2%
Class 11	Car Washes	32%	0.1%
Class 12	Laundromats	111%	0.4%
Class 20	Non-UNC Irrigation	58%	0.3%
Class 21	Non-UNC Recreational Facilities	76%	0.5%
Class 22	Municipalities/Government Operations	75%	0.3%
Class 25	Restaurants/Food Preparation	81%	1.6%
Class 26	UNC Classroom/Faculty Offices	91%	3.3%
Class 27	UNC Laboratory/Research Facilities	93%	3.4%
Class 28	UNC Office/Administration	90%	0.2%
Class 29	UNC Student Housing	103%	3.8%
Class 30	UNC Hospitals/Patient Care	92%	4.1%
Class 31	UNC Heating and Cooling	91%	9.2%
Class 32	UNC- Other	114%	2.2%
Total		**90.9%**	**100.0%**

OWASA Reservoir Storage



Total Reservoir Inflow (30-day median)
as percent of 18-year daily median

Percent of Total Reservoir Storage

Since the drought of 2001-02

- ✓ Implemented conservation rates in 2002. ***Increasing block rate structure for individually metered residential customers took effect on October 1, 2007.***
- ✓ New Water Conservation Ordinances approved by Carrboro, Chapel Hill & Orange County in 2003 mandating year round conservation measures.
- ✓ Process water recycling approved for Jones Ferry Road Water Treatment Plant in February 2005 (reduces reservoir withdrawal 6-8%).
- ✓ Construction underway for the reclaimed water system serving the University (operational by 2009).
- ✓ Adopted Goal and Objectives for long-term water conservation in 2005 ("...highest and best use of local water resources").

Very positive results

- Since 2001, per-household residential water consumption has decreased about 12%; and summer peak demand has been lowered by about 20%.
- Conservation will play an increasingly important role in our future…

OWASA's Build Your Own Rain Barrel Work Shop