Western Water Assessment

Colorado
University of Colorado at Boulder

NOAA

Assessing the Effectiveness of Lawn Watering Restrictions During the Drought of 2002

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Cooperative Institute for Research in Environmental Sciences

CIRES

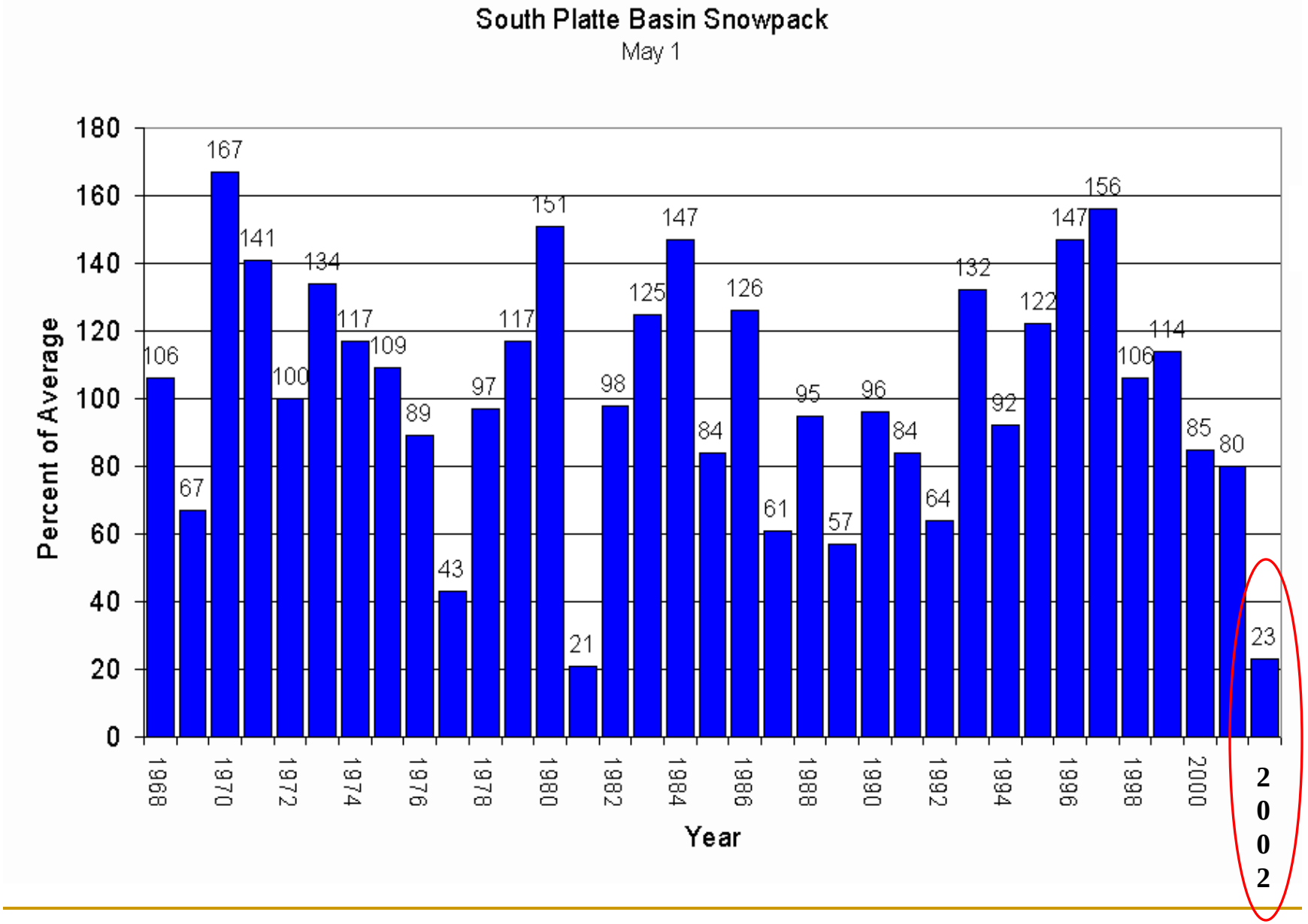
Western Water Assessment
http://sciencepolicy.colorado/wwa

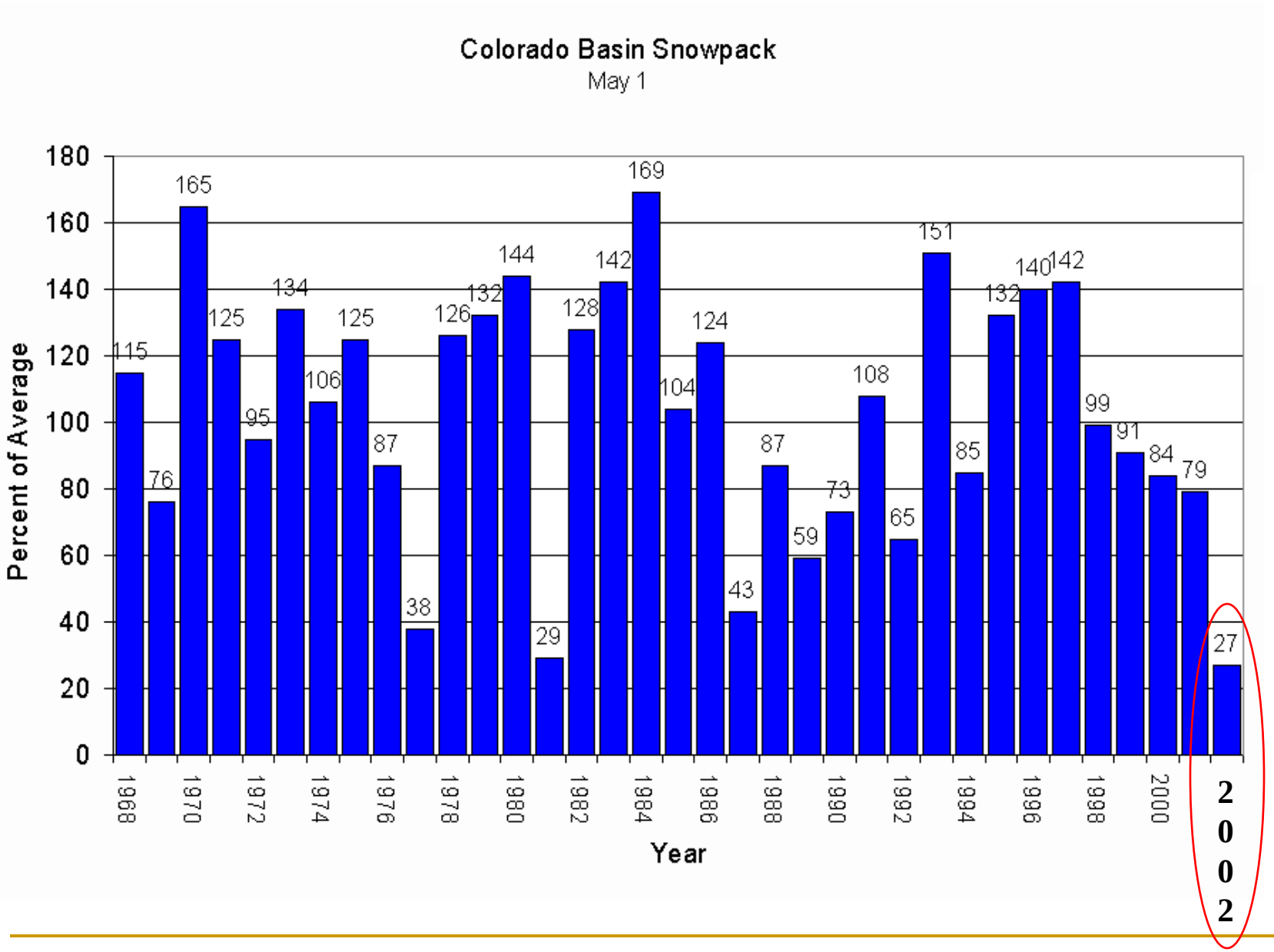
Problem: An Emerging Water Supply Crisis

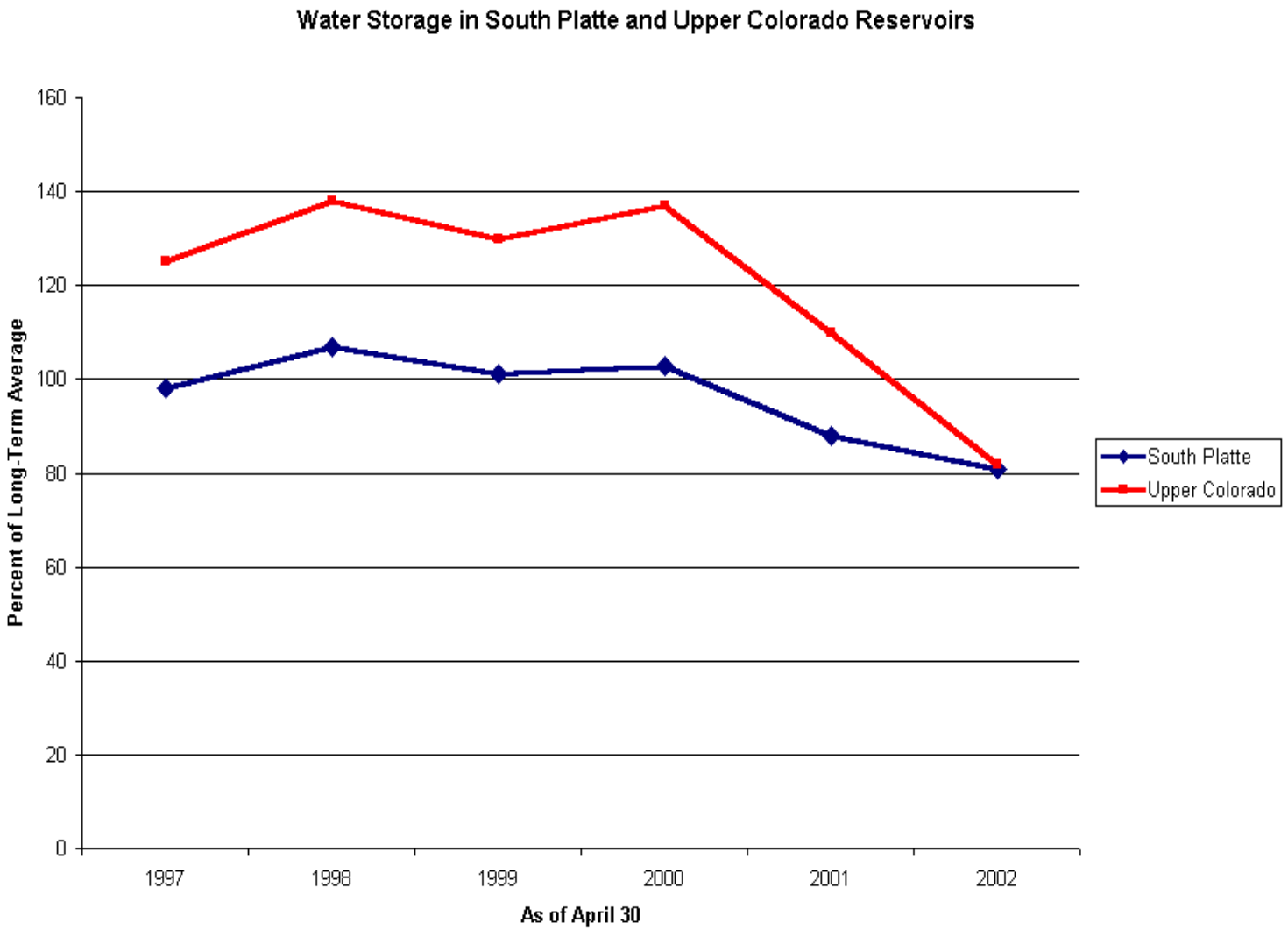
By May it was apparent that the low snowpack would be inadequate to replenish already low municipal reservoirs

Cities Studied

- Aurora
- Boulder
- Denver
- Fort Collins
- Lafayette
- Louisville
- Thornton
- Westminster


South Platte Basin Snowpack
May 1
Percent of Average
Year
0
20
40
60
80
100
120
140
160
180
106
67
167
141
100
134
117
109
89
43
97
117
151
21
98
125
147
84
126
61
95
57
96
84
64
132
92
122
147
156
106
114
85
80
23
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002


Colorado Basin Snowpack
May 1
Percent of Average
Year
180
160
140
120
100
80
60
40
20
0
115
76
165
125
95
134
106
125
87
38
126
132
144
29
128
142
169
104
124
43
87
59
73
108
65
151
85
132
140
142
99
91
84
79
27
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002


Water Storage in South Platte and Upper Colorado Reservoirs
Percent of Long-Term Average
160
140
120
100
80
60
40
20
0
1997
1998
1999
2000
2001
2002
As of April 30
South Platte
Upper Colorado

Lawn Watering Restrictions			
City	Start of Voluntary Restrictions	Start of Mandatory Restrictions	Lawn Watering Schedule
Aurora	None	May 15	Every 3 days
Boulder	May 8	May 21	Twice a week
Denver	May 8	July 1	Every 3 days
Fort Collins	June 26	July 22	Twice a week
Lafayette	None	May 22	Once a week
Louisville	None	May 15	Twice a week
Thornton	May 8	None	Every 3 days
Westminster	May 22	August 1	Every 3 days

General Research Questions

- Do watering restrictions actually reduce water use?
- Do mandatory restrictions work better than voluntary restrictions?
- What levels of water savings are associated with what levels of restrictions?

Different Ways to Calculate Savings

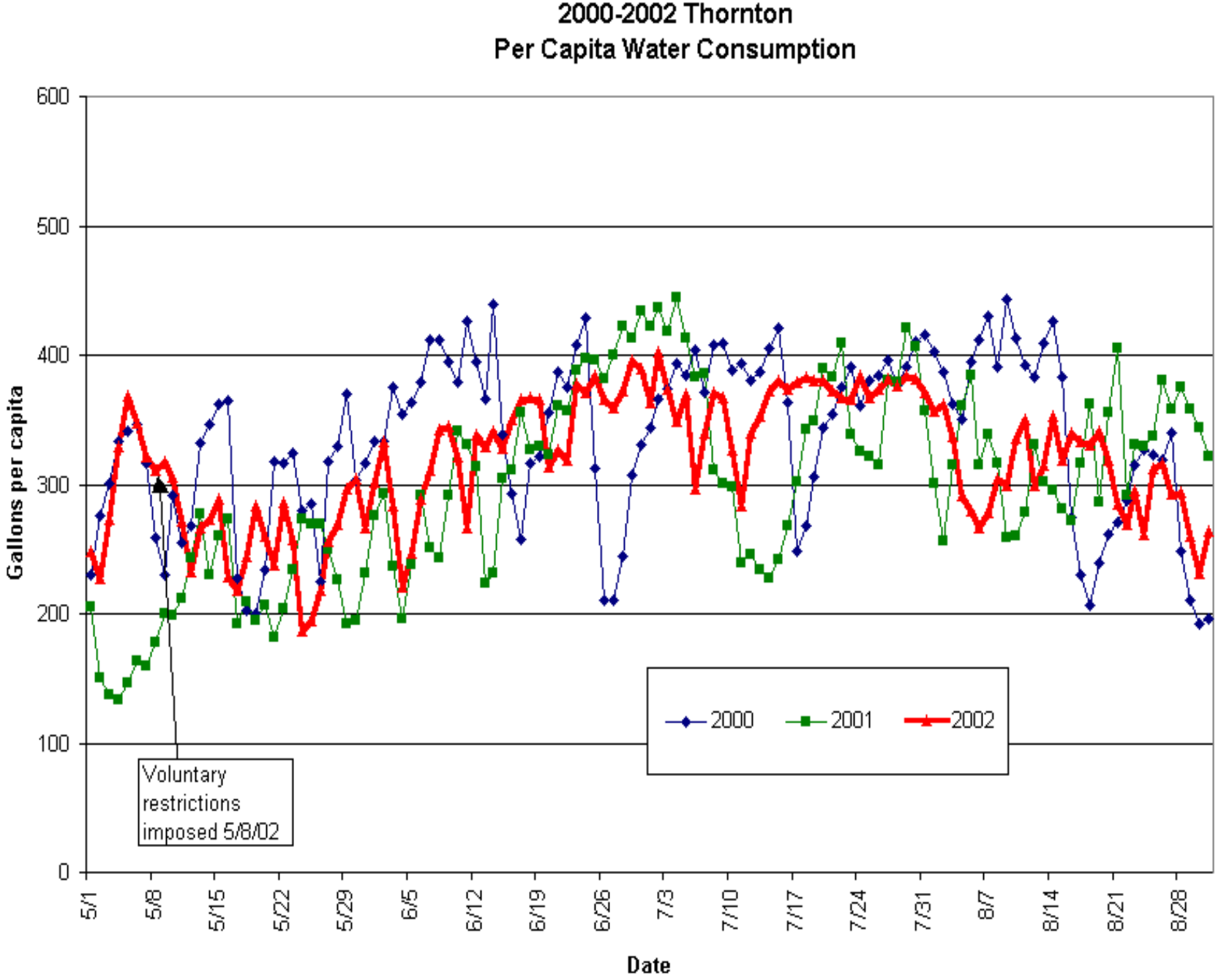
- All methods involving comparing water use in 2 comparable time periods (one with and one without watering restrictions), but:
  - What time periods?
  - Do you account for population growth?
  - Do you account for climate conditions?

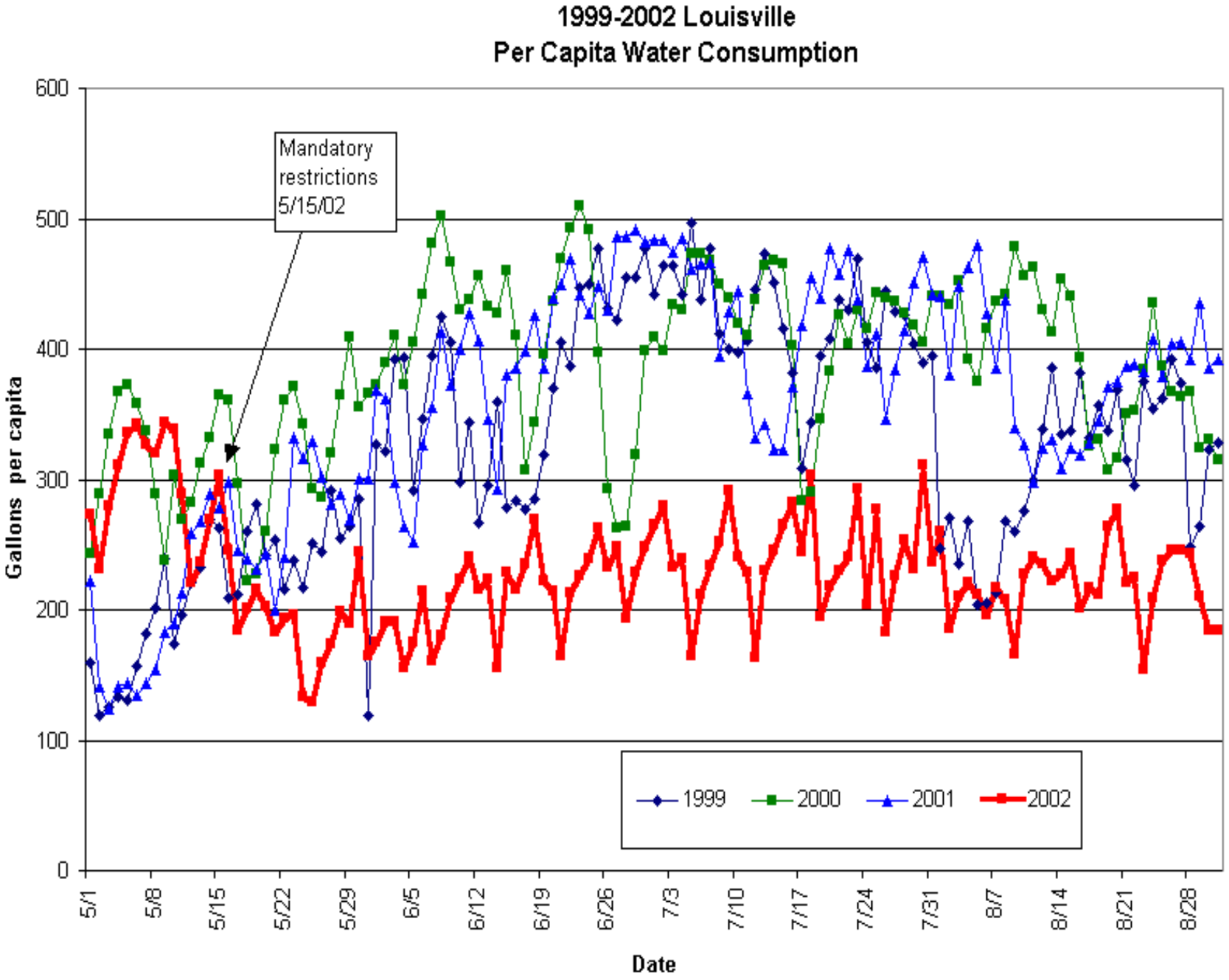
Our Methodology

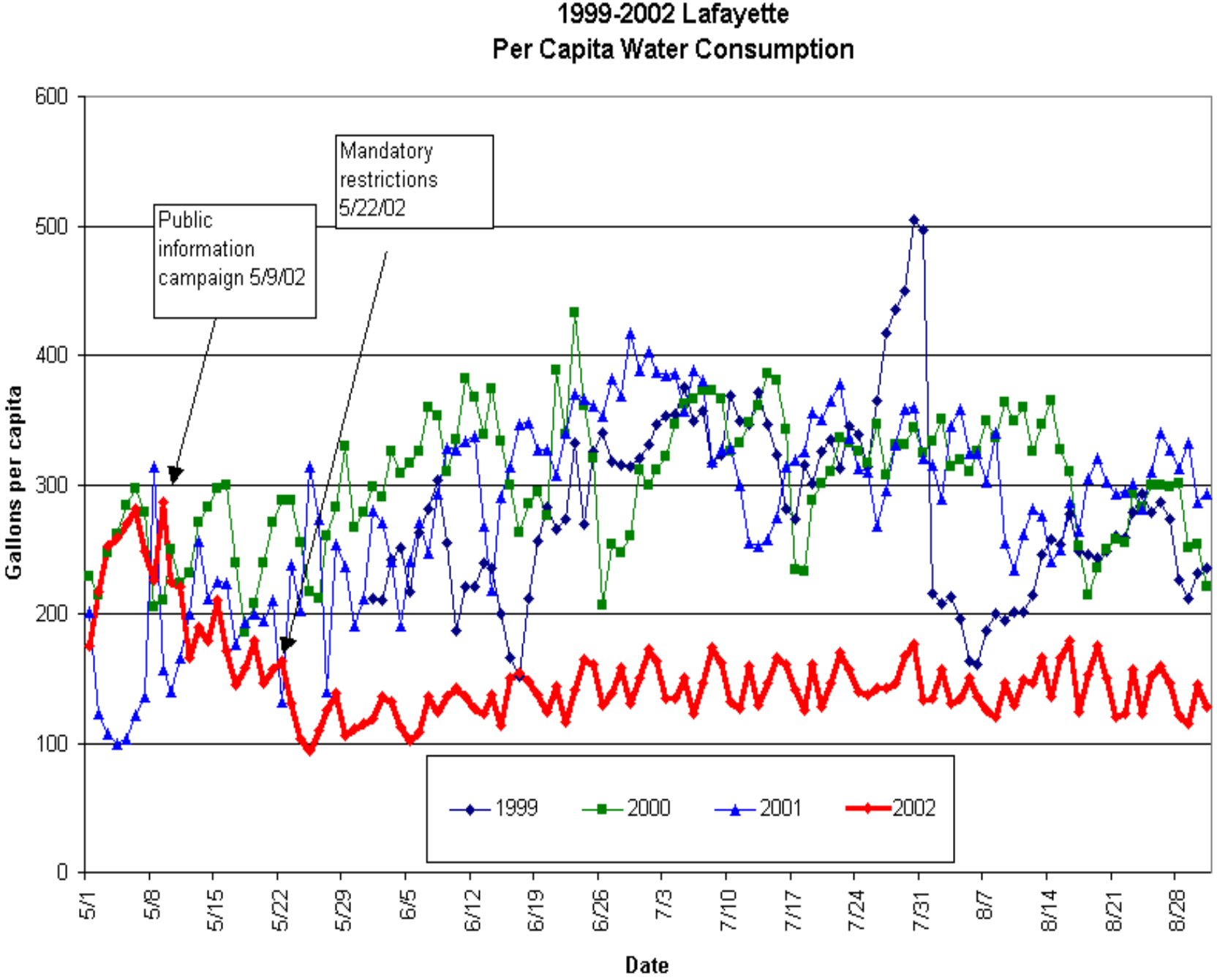
- Collected (from the cities) total daily water deliveries for the summers of 2000, 2001 and 2002
- Calculated savings during the water restrictions periods using 3 standardized methods

Three Calculations of "Savings"

1. Net = water use in 2002 versus average use in 2000/2001 (over the same dates)
2. Net Per Capita = Same method as above except with values calculated on a per capita basis (to account for population growth)
3. Expected Use Per Capita = Comparison of per capita use in 2002 versus a predicted use without restrictions given climate conditions (regression technique)


2000-2002 Thornton
Per Capita Water Consumption
Gallons per capita
600
500
400
300
200
100
0
5/1
5/8
5/15
5/22
5/29
6/5
6/12
6/19
6/26
7/3
7/10
7/17
7/24
7/31
8/7
8/14
8/21
8/28
Date
2000
2001
2002
Voluntary restrictions imposed 5/8/02


1999-2002 Louisville
Per Capita Water Consumption
Mandatory restrictions 5/15/02
Gallons per capita
600
500
400
300
200
100
0
5/1
5/8
5/15
5/22
5/29
6/5
6/12
6/19
6/26
7/3
7/10
7/17
7/24
7/31
8/7
8/14
8/21
8/28
Date
1999
2000
2001
2002


1999-2002 Lafayette
Per Capita Water Consumption
Gallons per capita
600
500
400
300
200
100
0
Public information campaign 5/9/02
Mandatory restrictions 5/22/02
1999
2000
2001
2002
5/1
5/8
5/15
5/22
5/29
6/5
6/12
6/19
6/26
7/3
7/10
7/17
7/24
7/31
8/7
8/14
8/21
8/28
Date

	Voluntary Restrictions			Mandatory Restrictions		
	Net	Per Capita	Expected	Net	Per Capita	Expected
Every 3 days	0%	4%	9%	14%	17%	22%
Twice a Week	0%	2%	8%	30%	31%	33%
Once a week	--	--	--	53%	55%	58%

Some Conclusions

- Mandatory restrictions work
- Voluntary restrictions are of limited value
- More restrictive programs generate the greatest savings
- Every city was able to reduce per capita water use (demand management works)

Thank You.

You can find the study at:

Kenney, Klein and Clark. 2004. *Use and Effectiveness of Municipal Water Restrictions During Drought in Colorado*. Journal of the American Water Resources Association, 40(1):77-87.

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