Appendix G

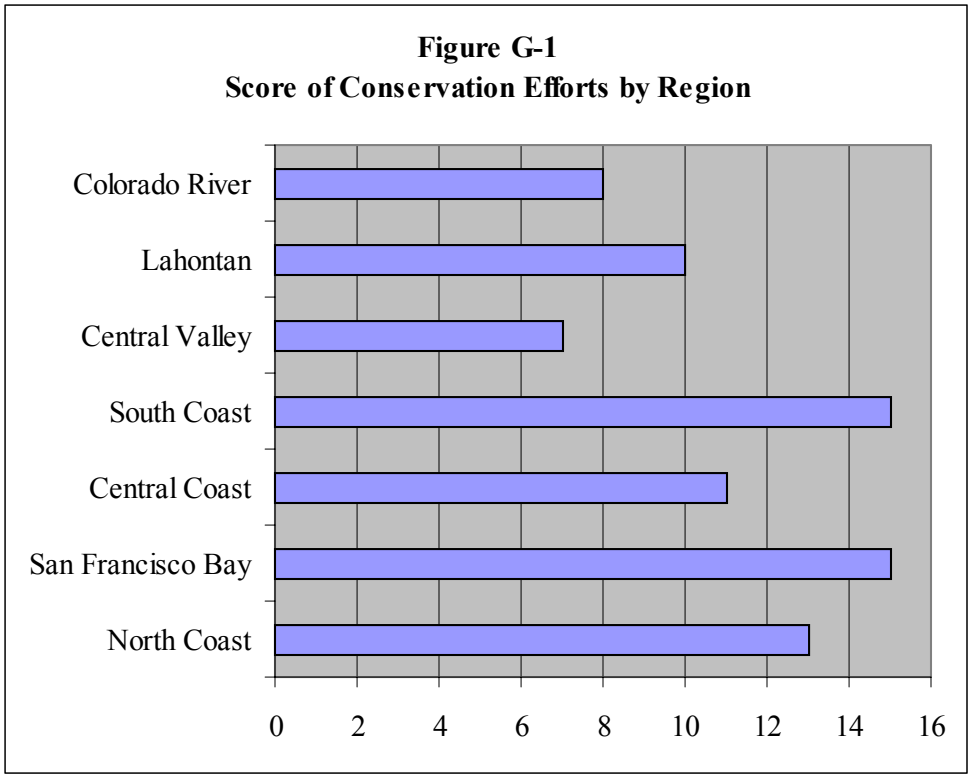
CII Conservation Potential by Region: Discussion

Initially, we intended to calculate conservation potential achieved between 1995 and 2000 by region. Unfortunately, the quantitative data were inadequate for analyzing detailed regional conservation potential at this level. We include here, however, our initial analysis (see Table G-1) as an indicator of differences in conservation among regions. For a detailed discussion of conservation efforts by region, including a summary of the method used to produce Figure G-1, see Section 4 of the full study.

Table G-1
Regional Conservation Scores

	UWMP Score Weighted	UWMP % of Population Filing	Reclaimed Water Use	BMP Score Weighted	BMP % of Population Filing	$ Spent on BMPs	Overall score
North Coast	low	high	medium	high	low	high	**13**
S.F. Bay	high	high	low	high	high	medium	**15**
Central Coast	medium	low	medium	medium	low	high	**11**
South Coast	medium	high	high	medium	high	medium	**15**
Central Valley	low	low	low	medium	low	low	**7**
Lahontan	medium	high	low	medium	low	low	**10**
Colorado	low	low	high	low	low	low	**8**

Figure G-1
Score of Conservation Efforts by Region



Working with available data, we used six categories to rate regions on efficiency and we examined population growth and future shortages to measure the pressure on regions to conserve. In each category, a range was created based on the lowest and highest scores recorded by the regions and this range was used to classify each region as having implemented high (top 33 percent of range), medium (middle 33 percent of range), or low (bottom 33 percent of range) levels of conservation. Descriptions of these categories, explanations of why they can be used to determine the level of conservation in a region, and the methods used to calculate the conservation scores are presented below. A summary of our findings is shown in Figure G-1.

Best Management Practices

Percentage of Population Filed

Over 220 water suppliers in the state are members of the California Urban Water Conservation Council (CUWCC 2002). As members, these suppliers have signed an MOU committing themselves to the implementation of sixteen urban conservation measures (Best Management Practices (BMPs)). Each MOU signatory is required to submit a worksheet updating its progress toward fulfilling the BMPs biannually. We refer to the agencies that submitted these worksheets in either 1999 or 2000 as "active MOU signatories." In this category, we rated a region's conservation progress by the percentage of its population that was represented by active MOU signatories.

Use as a Conservation Indicator

BMP reports were filed for all regions in 1999 and 2000 with the exception of the North Coast, which did not file any BMP reports in 2000. Since the goal of the MOU is to conserve water, we have assumed that under most circumstances, the state's more conservation-oriented water providers have filed the BMP reports. Reasons for not filing the reports may include insufficient funds or staff shortages, which would imply that the water provider has neither the money nor staff to implement conservation programs. Another reason for not reporting on the BMPs may be that the water provider has made little progress toward conservation goals. Based on our assumptions, a high percentage of a region's population served by active MOU signatories should indicate a greater amount of conserved water in that region.[1]

Methodology

The population represented by active MOU signatories was summed by region and then divided by the region's total population to get the percentage of each region's population represented by an active MOU signatory. The difference between the highest percentage (69 percent in the South Coast region) and the lowest percentage (16 percent in the Central Valley) was divided by three to derive a range of BMP report filing (see Tables G-2 and 3 below).[2]

---

[1] We used population instead of customer counts because customer counts are not available for all MOU signatories.

[2] Note that the Lahontan region was removed from this range because it was 12 percentage points lower than the next lowest region (the Central Valley) and would have artificially inflated the scores.

Table G-2
Range of Population Represented
by Active MOU Signatories

Level of Efficiency	BMP Reports Filed (Percent)
High	above 51.4
Medium	33.7 to 51.4
Low	below 33.7

Table G-3
Population Represented by
Active MOU Signatories

Region	Population Represented (percent)	Score
North Coast	23%	low
S.F. Bay	58%	high
Central Coast	28%	low
South Coast	65%	high
Central Valley	15%	low
Lahontan	3%	low
Colorado	16%	low

Best Management Practices, Reported Conservation Measures

Description

As mentioned above, each MOU signatory is required to submit a worksheet updating its progress toward fulfilling the BMP reports biannually. In this category, we rated a region's conservation progress based on a number of fields in these worksheets.

Use as a Conservation Indicator

We assumed that the level of conservation reported by each water supplier in its BMP reports corresponds to the water supplier's overall level of conservation.

Methodology

BMP 9 requires water agencies to identify the top ten percent of their CII water users and, within ten years of signing the MOU, complete audits of these users (option A) or document that the top ten percent has reduced its water use by ten percent (option B). Since all agencies, whether they choose option A or option B, must identify their top ten percent of users, every organization that reported identifying these users received one point.

Beyond this first step under BMP 9, if a water agency completed at least one survey in the commercial, institutional, or industrial sector in 1999 or 2000 (option A), then it received another point. The highest total number of surveys completed by any agency over the past two years was 240, although the average number was much lower at

79 for the commercial sector.[3] No distinction in points was made between those districts completing many surveys and those completing a few due to sample size and potential inconsistency of the samples.[4]

The water providers are also supposed to offer incentives for water conservation under option A. The incentives include rebates, loans, grants, and others. If a water supplier answered yes, that it was offering at least one of these incentives, it received a point and, under this criterion, 70 water agencies received points. If a district proved that it offered incentives by including information on how much it spent on them or how many incentives it awarded, then it received another point. Only 12 water districts received points for this level of reporting.

Fifty-five water agencies chose to exercise option B, and they were given one point for choosing this option. These agencies received another point if they maintained records about how savings were realized (38 agencies received points from this criterion). And, if these agencies quantified how much water had been saved, then they received another point (50 agencies received a point for this category).[5]

In addition to the BMP 9 categories, the BMP scoring also included the historical CII ULFT installations by CII sector and whether or not a water district had a conservation coordinator. If an agency installed any ULFTs from 1991 to 1998, then it received a point. The range of ULFTs installed per district over this period varied from 4 to 3,736 and the average number of ULFTs installed in the 41 districts was 489. Once again, a small sample size and uncertainty about whether ULFTs were installed in the residential or CII sectors prevented us from distinguishing between districts that installed several ULFTs and those that installed a few ULFTs.

Agencies that had a conservation coordinator received another conservation point. It was assumed that having a conservation coordinator was a sign that an agency was committed to conservation. Agencies without a conservation coordinator will have more difficulty achieving substantial and reliable savings, hence we assumed conservation is low in that particular district.

After points were assigned to agencies for reporting on BMP 9, the CII ULFT program, and the presence of a conservation coordinator, all of these points were summed and averaged by region.[6]

To determine the level of efficiency for each region, the scores of each water provider were considered. The difference of the lowest score (1) and top score (9) was divided by three to get an interval of 2.67. This interval was used to calculate the range shown below in Table G-4.

---

[3] This is the average number of surveys completed by those agencies that completed at least one survey. Agencies that completed no surveys were not included in this average.

[4] In 1999 and 2000, only 16 districts reported completing any surveys. And those 16 districts may have defined surveys differently. In some regions, for example, the wholesale districts may have conducted surveys and some of the districts report these surveys as their own while others do not (this may have occurred with MWD's audits in the early 1990s (Sweeten 2002)).

[5] Some water districts participated in both options A and B because they were confused about the either/or option (Smith 2002).

[6] We used a weighted average to better represent the population.

Table G-4
Range of BMP Scores

Level of Efficiency	BMP Score Range
High	6.33 plus
Medium	3.66 - 6.32
Low	below 3.66

Table G-5
Weighted BMP Scores by Region

Region	Best Estimate	Level of Efficiency
North Coast	8.98	high
S.F. Bay	6.92	high
Central Coast	3.84	medium
South Coast	4.18	medium
Central Valley	3.97	medium
Lahontan	5.00	medium
Colorado	3.36	low

Dollars (per capita) Spent on Best Management Practices

Description

The CUWCC reported the amount of money each water agency spent on BMPs in 1999 and 2000 (CUWCC 2002). These numbers were summed by region and then divided by the region's population to get a per-capita BMP expenditure.

Use as a Conservation Indicator

We assumed that the more money a region spent (per capita) on conservation, the more conservation programs it had in place.

Methodology

CUWCC reported the money spent on BMPs by each MOU signatory in 1999 and 2000. For each region, the amount of money spent on BMPs in 1999 and 2000 was summed and averaged to calculate a 1999/2000 average.[7] These averages were then divided by the region's population to determine the amount spent on BMPs per capita.

Scoring a region as high, medium, or low involved examining the difference between the highest and lowest spending per capita in the regions. We chose to look at spending at the regional level instead of at the district level because spending in the individual water districts varied greatly, ranging from $.02 to over $11 per capita.[8] Using this level of classification forced nearly every region into the lowest category. At the regional level of analysis, however, the highest average spent per capita on BMPs fell to $9.05 in the North Coast region and the lowest average spent per capita was $1.73 in the

[7] Two years were used to ensure the greatest number of data points and to be sure that no district was omitted because of a fluke – for instance BMPs were not in their budget one year.
[8] Spending on BMPs per capita exceeded $11.02 in a few water districts, but these districts were omitted from the overall analysis because these spending levels seemed exceptionally high.

Central Valley region. The North Coast's average is based on one district, the city of Santa Rosa, which represents 23 percent of the population. And, its per capita spending is significantly higher than the Central Coastal Region, the second highest spender, which spent $5.46 per person. Because the North Coast's score appears artificially high, the Central Coast Region's Score was used as the top score in the scoring process.

To score the different regions, the lowest regional score (from the Central Valley) was subtracted from the Central Coast's score and the result was divided by three to get three intervals of 1.24. The final range and scores are listed in Tables G-6 and G-7 below.

Table G-6
Range of Dollars Spent on BMPs (per capita)

Level of Efficiency	Dollars Spent (per capita) With North Coast Average	Dollars Spent (per capita) Without North Coast Average
High	above 6.60	above 4.22
Medium	4.16 - 6.59	2.98 - 4.22
Low	below 4.16	below 2.98

Table G-7
Score of Dollars Spent on BMPs

Region	Best Estimate	Level of Efficiency (without North Coast)
North Coast	9.05	high
S.F. Bay	3.40	medium
Central Coast	5.46	high
South Coast	3.26	medium
Central Valley	1.73	low
Lahontan	2.79	low
Colorado	2.45	low

Urban Water Management Plans, Percentage Filed

Description

The DWR requires water providers supplying water to 3,000 or more urban customers to prepare an Urban Water Management Plan (UWMP) and in 1995, the DWR received 299 of these plans (74 percent of expected). The plans require water providers to address a number of issues including future demand, supply, and demand management measures.

Use as a Conservation Indicator

Since the UWMP process requires the water providers to review their drought plans and discuss work on conservation, the water providers preparing plans every five

years were probably more active in the conservation area than those who do not submit plans. We assumed, therefore, that the water providers filing plans were more focused on conservation.

Methodology

For each region, DWR reports both the number of UWMPs expected and the number filed. The number of plans filed was divided by the number of plans expected to get the percentage filed. The difference between the highest and second lowest percentages was then divided by three to get an interval of 6.9, which was used to calculate the range shown in Table G-8 below.[9]

Table G-8
Range of Urban Water Management Plan Filing Percentages

Level of Efficiency	UWMP Filed (percent)
High	above 74.7
Medium	67.8 - 74.3
Low	below 67.8

Table G-9
Urban Water Management Plan Filing

Region	Number of UWMPs Expected by DWR	Number of UWMPs Received by DWR	Percent of Expected Received by DWR	Score
North Coast	13	10	76.9%	high
S.F. Bay	60	46	76.7%	high
Central Coast	28	17	60.7%	low
South Coast	187	152	81.3%	high
Central Valley	86	58	67.4%	low
Lahontan	17	13	76.5%	high
Colorado	13	3	23.1%	low

Urban Water Management Plans, Reported Conservation Measures

Description

The DWR requires that the water providers' discussion of conservation measures in the UWMPs include reporting on the specific conservation measures that comprise the CUWCC's Best Management Practices (BMPs). These discussions often contained greater detail than the BMP reporting and allowed the providers that were not MOU signatories to discuss what they were doing in the area of conservation.

[9] Because the Colorado River region had an exceptionally low filing rate (23.1 percent), we used the second lowest filing rate (60.7 percent) in this calculation.

Use as a Conservation Indicator

We used this reporting data as a measure of conservation because it serves three purposes: it provides a check on the BMP scoring; it captures information on some of the non-BMP conservation efforts; and it allows for the evaluation of water providers that are not MOU signatories.

Methodology

Scoring the UWMP's conservation measures involved assigning one point to each report that was reviewed and then assigning additional points for the conservation activities reported in the plans. In an effort to capture conservation information from the greatest number of districts, any reported conservation efforts reflecting CII conservation levels were recorded. There were several measures, such as the implementation of a ULFT program, that many districts had adopted and there were other measures that only two or three districts had implemented, such as the distribution of CII retrofit kits. All of these measures (22 total) were compiled into a list and for each measure a district implemented, it received a point. Two measures, retrofitting existing connections with meters or requiring that new construction have meters, received only one half point each. The highest score was for a water district in the South Coast region that received 15 points and the lowest score was one, which many water districts received.[10]

Once scores were tallied, subtotals were calculated and averaged for each region and these averages were compared to the total range of conservation scores (1 –15).[11] The lowest score was subtracted from the highest score to get a range of 14, which was then divided by three to get an interval of 4.65. The interval was applied to the overall range to get the score ranges listed in Table G-10.

Table G-10
Range of Urban Water Management Plans Reviewed

Level of Efficiency	UWMP Score Range
High	above 10.34
Medium	5.68 – 10.33
Low	below 5.67

Table G-11
Urban Water Management Plan Scores by Region

Region	Best Estimate	Level of Efficiency
North Coast	3.13	low
S.F. Bay	12.19	high
Central Coast	9.39	medium
South Coast	9.59	medium
Central Valley	5.62	low
Lahontan	6.66	medium
Colorado	5.00	low

[10] A score of one means that a water supplier's UWMP was reviewed, but that the supplier did not report any CII conservation measures. Some of these suppliers did report conservation measures, but received only one point because all of their measures were aimed at the residential sector.
[11] These averages were weighted to better represent the population.

Reclaimed Water

Description

The California State Water Resources Control Board reports how much partially treated wastewater the regions are using for the irrigation of golf courses, schools, parks, and cooling towers.

Use as a Conservation Indicator

Because reusing water decreases demand for treated potable water, the percentage of a region's water supply that comes from reuse was chosen as a conservation category.

Methodology

The relevant uses of reclaimed water, as reported by the State Water Resources Control Board (CSWRCB 2002), were totaled by region and then divided by the region's total water use to determine what percentage of water use reclaimed water represented in each region.

Once the percentage of reclaimed water use was calculated by region, the percentages were ranked as high, medium, or low levels of efficiency based on the range between the lowest and second highest percentages.[12] The ranges of efficiency are shown in Table G-12 below.

Table G-12
Range of Reclaimed Water

Level of Efficiency	BMP Reports Filed (percent)
High	above 4.35
Medium	2.43 to 4.34
Low	below 2.43

Table G-13
Reclaimed Water Scores

Region	Percentage of CII Use From Reclaimed Water	Score
North Coast	3.56%	medium
S.F. Bay	2.17%	low
Central Coast	3.27%	medium
South Coast	6.28%	high
Central Valley	0.50%	low
Lahontan	0.75%	low
Colorado	10.09%	high

[12] Because the Colorado River region used an exceptionally high percentage of reclaimed water (10.1 percent), we used the second highest percentage (6.28 percent in the South Coast region) in this calculation.

Efficiency Pressures: Population Growth

Population growth, by region, was taken from the DWR's Bulletin 160-98 and represents anticipated population growth between 1995 and 2020 (DWR 1998). While we did not use population growth as a conservation indicator, we do assume that regions with fast population growth will experience greater pressure to implement conservation measures.

To determine whether a region's population growth fell in the top, middle, or bottom 30 percent, the lowest growth percentage (22 percent in the San Francisco Bay region) was subtracted from the second highest growth percentage (106 percent in the Colorado region) and this difference was divided by three to get the interval 28.[13] Applying this interval to the range of percentages indicates that anything above 72 was considered high conservation pressure, between 50 and 72 was considered medium conservation pressure, and below 50 percent was considered low conservation pressure.

Table G-14
Population Growth Range

Pressure for Efficiency	Population Growth (Percent)
High	above 72
Medium	50-72
Low	below 50

Table G-15
Population Growth by Region

Region	Population Growth 1995 to 2020	Score
North Coast	38%	low
S.F. Bay	22%	low
Central Coast	44%	low
South Coast	41%	low
Central Valley	78%	high
Lahontan	169%	high
Colorado	106%	high

Efficiency Pressures: Potential Shortage of Supply

DWR rated the likelihood a region would face shortages in 2020 under current management practices (DWR 1998). We included this shortage information in our discussion of efficiency pressures because, as in the population case, if a water supplier knows it will face shortage in the future, it should be more motivated to implement conservation technologies to avoid such a situation.

[13] Because population growth in the Lahontan region was exceptionally high (169 percent), we used the second highest percentage in this calculation.

Although DWR estimates potential shortage for an average year and for a drought year, the drought year estimate is used herein because it represents the greatest potential shortage, for which the water districts are supposed to plan. DWR reported estimates of water use and water shortage in 2020 and the shortage number was divided by the use number to get a percentage that could be compared between regions. The ratings for potential shortage were calculated by taking the difference between the highest and lowest percentages and dividing by three to get an interval of 7.23. This interval was used to get the score range shown in Table G-16.

Table G-16
Potential Shortage Range

Pressure for Efficiency	Potential for Shortage (percent)
High	above 16.27
Medium	9.04 to 16.26
Low	below 9.03

Table G-17
Rating of Potential Shortage of Supply in Drought Years

Region	2020 Shortage, Drought Conditions	2020 Use, Drought Conditions	Shortage as Percent of Total Use	Score
North Coast	194,000	10,740,000	2%	low
S.F. Bay	287,000	5,830,000	5%	low
Central Coast	270,000	1,652,000	16%	medium
South Coast	1,317,000	6,181,000	21%	high
Central Valley	3,551,000	35,334,000	10%	medium
Lahontan	436,000	1,858,000	23%	high
Colorado	158,000	4,366,000	4%	low

Regional Scores

We calculated a numerical score for each region by assigning points to each high, medium, or low score that the region received. A high score received three points, a medium score received two points, and a low score received one point.

Table G-18
Regional Conservation Scores

	UWMP Score Weighted	UWMP % of Population Filing	Reclaimed Water Use	BMP Score Weighted	BMP % of Population Filing	$ Spent on BMPs	Overall score
North Coast	low	high	medium	high	low	high	**13**
S.F. Bay	high	high	low	high	high	medium	**15**
Central Coast	medium	low	medium	medium	low	high	**11**
South Coast	medium	high	high	medium	high	medium	**15**

Central Valley	low	low	low	medium	low	low	**7**
Lahontan	medium	high	low	medium	low	low	**10**
Colorado	low	low	high	low	low	low	**8**

The North Coast

Despite low pressure for population growth and potential shortages, the North Coast scored overall as a region making considerable efforts in improving efficiency. The only two categories that the region receives low scores for are the UWMPs and the percentage of BMP reports filed. Note that the UWMP score was based on a very small sample (three percent) and is probably unreliable.

San Francisco Bay

There was some variability in the San Francisco region's scores but overall, the region appears to have relatively strong efficiency efforts in place even though the pressures to conserve are low. Water providers in the Bay Area are good about filing UWMPs and BMP reports and their efficiency scores are high in the BMP category, but they use very little reclaimed water and spend only a medium amount on BMPs.

Central Coast

The Central Coast appears to have implemented a medium number of efficiency measures to address its low population growth and medium shortage potential. The region has low UWMP and BMP report filing rates, but it reports medium efficiency in these categories, spends the second highest amount per capita on BMPs, and uses a medium amount of reclaimed water.

South Coast

The South Coast appears to have strong conservation measures in place. The region received all medium and high scores for conservation to address population growth and high shortage potential. The percentage of water providers filing BMP reports and UWMPs was high and the South Coast uses the second highest percentage of reclaimed water (after the Colorado River region).

Central Valley

Of all regions, the Central Valley appears the least focused on conservation. Indeed, the region received the lowest conservation scores despite high population growth and potential for shortage.

Lahontan

Compared to other areas of the state, the Lahontan region seems to be planning poorly for potential shortages in supply as it faces both high population growth and high shortage potential. While the region received medium UWMP and BMP scores, all other scores were low.

Colorado

Despite high population growth (109 percent), the Colorado region has a low potential for shortage and low conservation scores. A remarkably high level of reclaimed water use – ten percent of the region's total use – is the exception to consistently low conservation scores. Note that the sample sizes for the UWMP and BMP conservation measures are small, 10 and 15 percent, respectively, reducing the reliability of these scores.

Constraints

Sample Size

Small samples were particularly problematic in the UWMP scoring category. In each region, between nine and 33 percent of the UWMPs received by the DWR were reviewed and these plans represented between three and 39 percent of the regions' population. Sample size probably affected the scores of the North Coast the most because only three percent of its population was represented in the single UWMP reviewed for this region. The percent of the population represented in the UWMPs reviewed was approximately ten percent in the Central Coast and Colorado regions, around 21 percent in the San Francisco Bay, Central Valley, and Lahontan regions, and 39 percent in the South Coast region, making the conservation scores in the latter regions the most reliable.

Table G-19
Number of Urban Water Management Plans Reviewed, by Region

Region	Sample Size of UWMP Reviewed	Sample as Percent of UWMPs Received by DWR	Percent of Population Represented in Sample
North Coast	10	20.0%	2.9%
S.F. Bay	46	8.7%	20.9%
Central Coast	17	11.8%	10.0%
South Coast	152	21.7%	39.0%
Central Valley	58	17.2%	20.6%
Lahontan	13	30.8%	20.5%
Colorado	3	33.3%	10.0%

Wholesale vs. Retail

In the BMP sections, some numbers may be low because wholesale agencies were not included in the analysis. We omitted wholesale water providers because the MOU does not require that they comply with every BMP and they should, therefore, be judged on criteria different from the criteria used to score retail agencies, which are expected to comply with all BMPs.[14]

[14] Some agencies have exemptions from certain BMPs, although the general rule is that retail agencies are expected to comply with all of the BMPs.

Omitting wholesalers may have lowered the BMP scores in some regions because retail agencies sometimes rely on their wholesalers to implement conservation programs. These conservation efforts may have been omitted from a region's score when we excluded the wholesalers from the scoring. An example of this is in the South Coast region where the MWD conducted over 800 water use audits in the CII sector in the early 1990's and some of the water providers reported these surveys as their own in the BMP reporting while others left it to MWD to report the surveys. The agencies that did not include the audits in the BMP reporting probably have artificially low scores.

CII Conservation vs. Residential Conservation

In both the BMP and UWMP sections, it was difficult to distinguish between the conservation efforts that were occurring in the CII sector and the residential sector. In the BMP reporting, for example, the ULFT category did not distinguish between ULFTs installed in the CII sector and those installed in the residential sector. So, regions with high residential conservation, but low CII conservation, may have received higher overall conservation scores.