

Section 8.0 Interpretation and Use of Results

*This section identifies how the desired analyses that were identified within the **Stormwater Strategic Plan** can be conducted, reported out on, and used to improve the stormwater program. This section also includes examples of various effectiveness assessments that have been conducted by municipal stormwater programs throughout the state. These examples will assist other stormwater program managers in determining what metrics they may want to utilize for their program and/or how they may conduct their analyses and use the results.*

8.1 Background

Once the strategy for the program effectiveness assessment has been developed, the stormwater program manager should identify the data that is necessary to conduct the assessments and ensure that the approach and infrastructure for the data collection is in place. This step is critical in order to be able to conduct the desired analyses and report out on the goals and metrics identified within the assessment strategy.

Actual Outcome - a measured condition or implementation result.

Using the data collected, the stormwater program manager will be able to determine the **Actual Outcome** of the assessment.

The **Actual Outcome** can then be compared to a **Targeted Outcome** to form the basis of the **Assessment Result**.

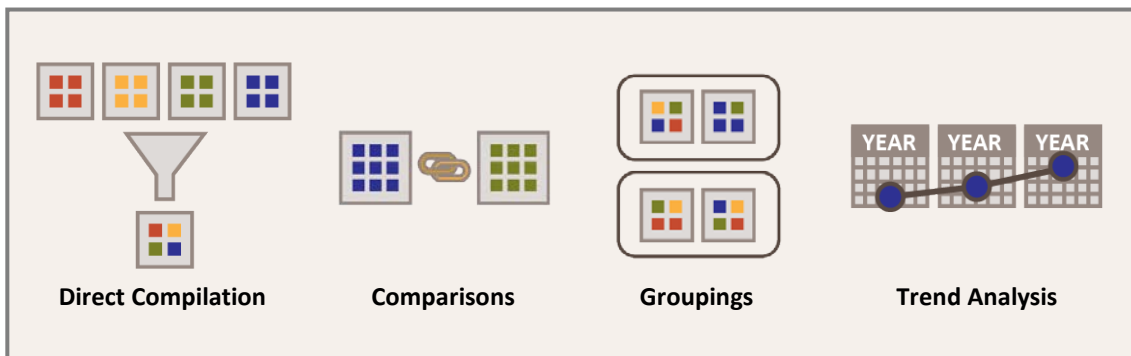
The **Assessment Result** describes the relationship of Actual and Targeted Outcomes and, in doing so, ties the planning and assessment processes together.



The analyses can assist stormwater program managers in assessing progress in meeting intermediary goals, long-term goals, and identifying programmatic changes that may be necessary in order to obtain a stormwater program goal.

In addition, the results may be presented to interested parties including regulators, the general public, and/or public officials so that they may understand the benefits of the stormwater program. Graphic presentations of the results should be developed and included in annual reports, ROWDs, and/or press releases or other types of communications to the public to identify how the stormwater program has been effective.

The analyses may assist the stormwater program manager in documenting permit compliance, determining trends, and/or estimating pollutant load reductions. The most common types of analyses utilized as a part of a PEA including the following:



8.2 Program Modifications

Once an effectiveness assessment has been conducted, stormwater program activities should be modified, as needed, based on the results of the assessment. Modifications may include:

- Improving upon areas that did not accomplish goals;
- Expanding upon efforts that proved to be effective;
- Discontinuing efforts that may no longer be productive; or
- Shifting priorities to make more effective use of resources.

Once effective strategies are fully implemented, fewer resources may be needed to continue the effective activities, which will allow resources to be shifted to address new

issues. In addition, since new pollutant issues may arise that require attention, shifting priorities may result in a need to shift resources.

Since the development and implementation of a stormwater program is often a phased effort and higher Outcome Levels often require relatively large amounts of data over a period of years, many programs will initially assess the effectiveness of the lower Outcome Levels. However, assessments should be conducted at the highest Outcome Level supported by the data, and program managers should strive to address the higher Outcome Levels as soon and as often as possible.



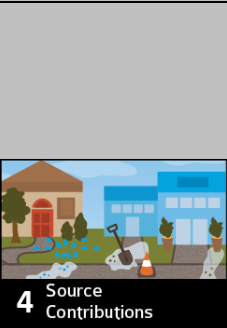
8.3 Example Program Effectiveness Assessment Analyses




This section includes examples of effectiveness assessments that have been conducted by municipal stormwater programs throughout the state. They are organized first by Outcome Level and then by Program Element and summarized in **Table 8.1**. Each example includes the source of the information in case additional information is desired.

For each example, the following is provided:

- A description of the program activity;
- A description of the effectiveness assessment method utilized. The methods are categorized as direct compilation, comparisons, groupings and/or trend analysis;
- The **Actual Outcomes** of the assessment are described in each example and, if available, compared to Targeted Outcomes;
- An Assessment Result is provided either by comparing it to the **Targeted Outcome** or by presenting conclusions that may be drawn from an analysis of the results; and
- Finally, how a program manager could use the information.

Table 8.1 Effectiveness Assessment Examples

Outcome Level	Program Element					
	Construction	New Development / Redevelopment	Residential	Industrial/ Commercial	Municipal	Overall Program
Source and Impact Component						
 <p>6 Receiving Water Conditions</p>					<ul style="list-style-type: none"> - SCVURPP: Trash Removal/ Reduction 	<ul style="list-style-type: none"> - Orange County Stormwater Program: Nutrient Load Reduction
 <p>5 Urban Runoff and MS4 Contributions</p>					<ul style="list-style-type: none"> - City of Stockton: SSO Response and Reduction 	
 <p>4 Source Contributions</p>	<ul style="list-style-type: none"> - County of San Diego: BMP Implementation 	<ul style="list-style-type: none"> - City of Sacramento: Stormwater Quality Improvement Program 	<ul style="list-style-type: none"> - Orange County Stormwater Program: HHW Program - City of Stockton: HHW Program - City of Stockton and County of San Joaquin: Stream Clean Up Events 	<ul style="list-style-type: none"> - City of San Diego: Restaurant BMPs 	<ul style="list-style-type: none"> - Caltrans: Traction Sand & Deicing Salt - San Joaquin County: Landscape and Pest Management 	
Target Audience Component						

Outcome Level	Program Element					
	Construction	New Development / Redevelopment	Residential	Industrial/ Commercial	Municipal	Overall Program
 <p>3 Target Audience Actions</p>			<ul style="list-style-type: none"> - Orange County Stormwater Program: Public Awareness Survey - Palo Alto Regional Water Quality Control Plant: Car Wash Coupons - San Francisco Water Pollution Prevention Program: Thermometer Exchange - City of Fresno: Used Oil Collection 	<ul style="list-style-type: none"> - Palo Alto Regional Water Quality Control Plant: Vehicle Service Facilities 	<ul style="list-style-type: none"> - Orange County Stormwater Programs: Municipal Facility Inspections - City of Stockton: Field Crew Inspections 	
 <p>2 Barriers and Bridges to Action</p>			<ul style="list-style-type: none"> - Orange County Stormwater Program: Public Awareness Survey - Orange County Stormwater Program: Incident Reporting 		<ul style="list-style-type: none"> - County of San Joaquin: Capital Improvement Projects - Orange County Stormwater Program: Inspector Training 	
Stormwater Management Program Component						
 <p>1 Stormwater Program Activities</p>	<ul style="list-style-type: none"> - Fresno-Clovis SWQMP: Inspection Tracking 		<ul style="list-style-type: none"> - Orange County Stormwater Program: Impression Tracking 	<ul style="list-style-type: none"> - County of Sacramento: Inspection Tracking 	<ul style="list-style-type: none"> - Caltrans: Training Program - Caltrans: Vegetated Slope Inspections 	

8.4 Source and Impact Component

Source and Impact Component



Level 6 assessments can be used to draw conclusions about overall program effectiveness, but results usually require extended periods of monitoring and analysis. Moreover, it's important to keep in mind that receiving water conditions usually reflect more than stormwater discharges. Other influences that can have a significant impact include sanitary sewer overflows, rising groundwater, agricultural, and other non-point discharges such as aerial deposition.

Level 6 Outcomes can provide managers with the data and information necessary to determine the overall success of their programs, or to better direct them to the most important constituents and sources. Receiving water conditions can be evaluated in a variety of ways, including comparison of monitoring results to benchmarks, compliance with water-quality standards, protection of biological integrity, and beneficial use attainment. Each of these approaches presents its own issues and challenges for monitoring design, representative data collection, and interpretation of results.

OP Overall Program

Ultimately stormwater program managers may need to assess the effectiveness of the overall stormwater program in order to determine if there has been a measurable change in receiving water quality or other environmental conditions. Such assessments can be difficult and expensive therefore, it is critical that stormwater managers understand the purpose of the assessment, the type of data needed to support the assessment, and the appropriate assessment methods.

Project

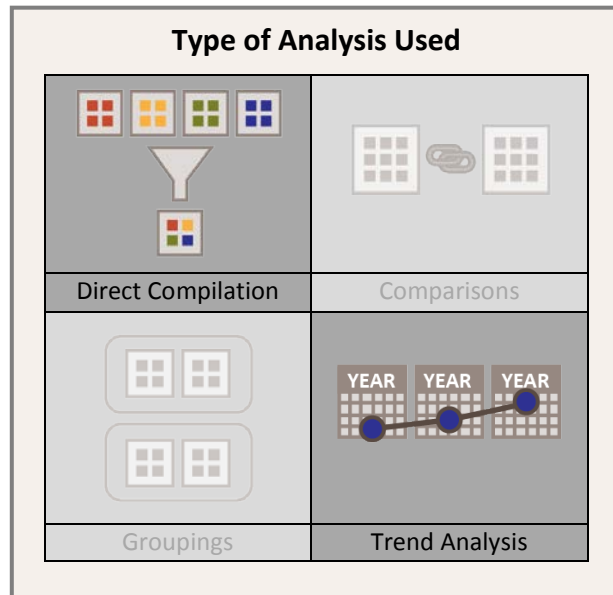
**Orange County Stormwater Program:
Nutrient Load Reduction**

Over the years, high nutrient loads from the Newport Bay watershed have resulted in excessive algal growth in the Bay. In fact, large macroalgal blooms were seen from the 1980's through the middle 1990s. The blooms can adversely impact the beneficial uses by depressing oxygen levels, and fouling beaches, swimming and boating areas. Based on the concerns related to the nutrient loads, several actions occurred

simultaneously in the watershed that directly addressed the nutrient loadings.

First, in 1996 the State of California placed Newport Bay and the San Diego Creek watershed on the Clean Water Act Section 303(d) list of water quality limited segments and listed them as a high priority for nutrient Total Maximum Daily Load (TMDL) development. This listing was in response to qualitative and quantitative measurements indicating exceedances of the nutrient-related Water Quality Objectives (WQOs) for Newport Bay. A nutrient TMDL was adopted in 1998. As a part of the TMDL implementation plan, the County of Orange initiated a Regional Monitoring Plan (RMP). Each year (now quarterly) a report is submitted on behalf of the watershed Permittees. The RMP quantifies the endpoints of the TMDL including the seasonal nutrient loadings from the watershed, the nutrient concentrations in San Diego Creek, and the extent, magnitude and duration of algal blooms in Newport Bay.

Second, in July 1990 the Santa Ana Regional Water Quality Control Board (RWQCB) issued Waste Discharge Requirements to three nurseries requiring substantial reductions in nutrient loads. In response, the nurseries implemented BMPs to reduce runoff such as drip irrigation systems and recycling systems which have substantially reduced the nitrogen loads.

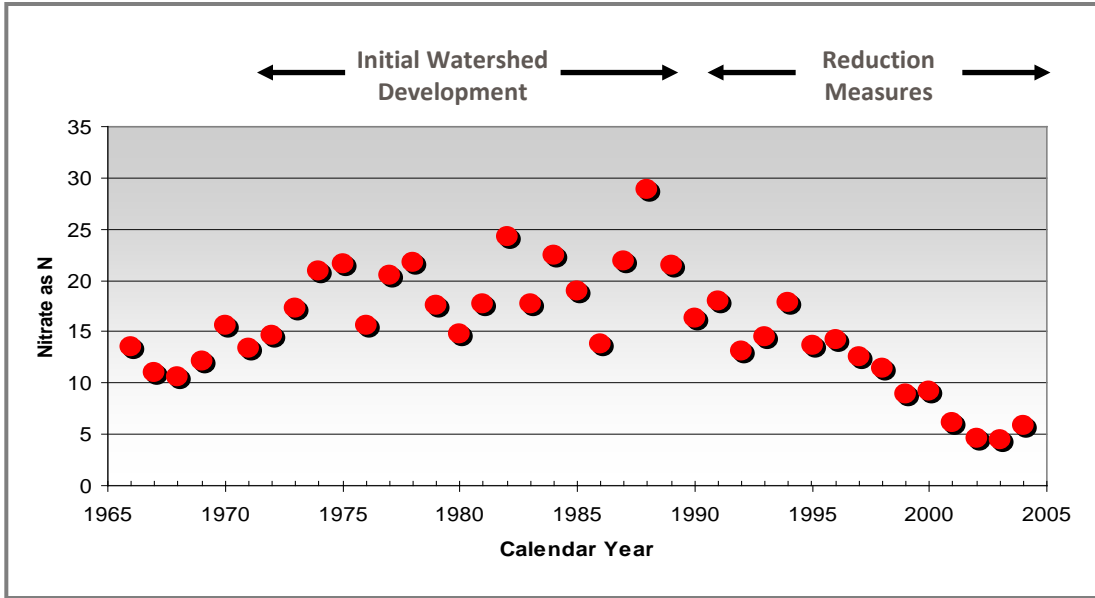


Third, the Irvine Ranch Water District (IRWD) began diverting water from San Diego Creek into the San Joaquin Marsh. The San Joaquin Marsh project was completed by IRWD to restore and enhance the water quality cleansing of the marsh. Water is diverted from San Diego Creek during dry weather, routed through the marsh, and then returned to the Creek. Water quality monitoring has demonstrated that the Marsh has significantly reduced the nitrogen levels and sediment content of the water that is discharged to San Diego Creek.

Fourth, based on the known elevated concentrations of nitrogen in the groundwater and concerns regarding the discharge of groundwater within the watershed, the RWQCB adopted Order No.R8-2004-0021. As a result of this permit, a Nitrogen and Selenium Management Program (NSMP) and Working Group of stakeholders was established to address these concerns through a five-year work effort. The NSMP work plan includes monitoring, the development of a conceptual model, identification of sources and loads and data gaps, testing of treatment controls, evaluation/development of a trading/offset program, and an evaluation of the nutrient TMDL targets and allocations.

Fifth, the Transportation Corridor Agencies (TCA) constructed the Eastern Transportation Corridor in the Peters Canyon Channel watershed (a tributary of San Diego Creek and upper Newport Bay). The Corridor is depressed below grade in the vicinity of Interstate 5 and Jamboree Road. An extensive subdrain system was constructed to lower the groundwater table below the roadway surface. Groundwater in this area is high in nitrates, and historically the aquifer free surface has been above the flow line of Peters Canyon Channel, resulting in groundwater discharge to the Channel and upper Newport Bay. The Toll Road subdrain system currently discharges to the sanitary sewer, reducing the load of nitrogen from groundwater that would otherwise discharge through Peters Canyon Channel.

As a result of these diverse and multi-faceted efforts within the watershed to address the nitrogen loads, water quality has improved within Newport Bay and the watershed over the past 30 years as evidenced by the long-term nitrate concentrations, the total nitrogen loads from San Diego Creek and the reduction in algal biomass within Newport Bay.



Historical Nitrate Concentrations in San Diego Creek (1965-2005)



Algal Biomass July 1996



Algal Biomass July 2005

Assessment Result



Actual Outcome: Average Summertime Total Nitrogen Load reduced from ~4000 lb/day in 1985 to 1100 lb/day in 1995 to 400 lb/day in 2000.



Targeted Outcome: 1100 lb/day by December 31, 2002 and 900 lb/day by December 31, 2007



Assessment Result: Targeted outcome achieved approximately 7 years early.

Next Steps

In addition to using this information to demonstrate compliance with regulatory requirements, this information can be used to plan approaches to achieving similar results for other constituents or for nutrients in other locations. It can also be used to plan direction and focus of future program efforts (level of effort needed to maintain TN levels, resources that can be directed to other issues).

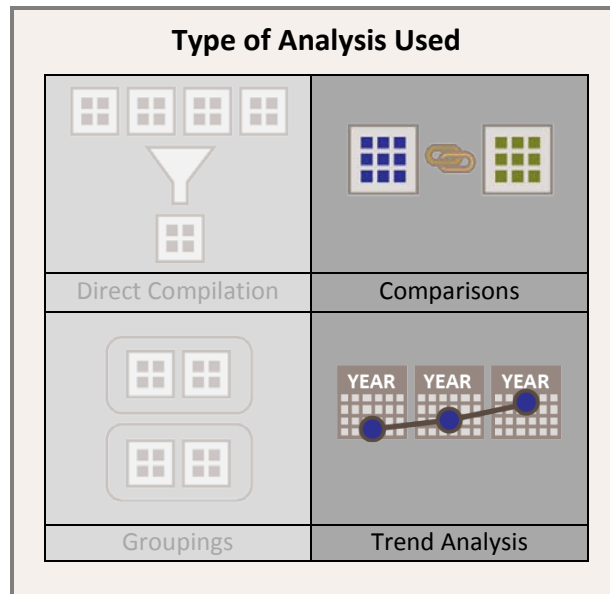
Source: Newport Bay Watershed Action Plan, August 2006 and the Regional Monitoring Program Report for the Newport Bay/San Diego Creek Watershed Nutrient TMDL November 2005. For more information visit the Orange County website www.ocwatersheds.com and go to "Stormwater Program"

M**Municipal Program Element**

Improvements in the environment may be observable and directly attributed to a program’s control measures. One example is in the case of trash/ debris removal.

Project**Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP): Trash Removal/Reduction**

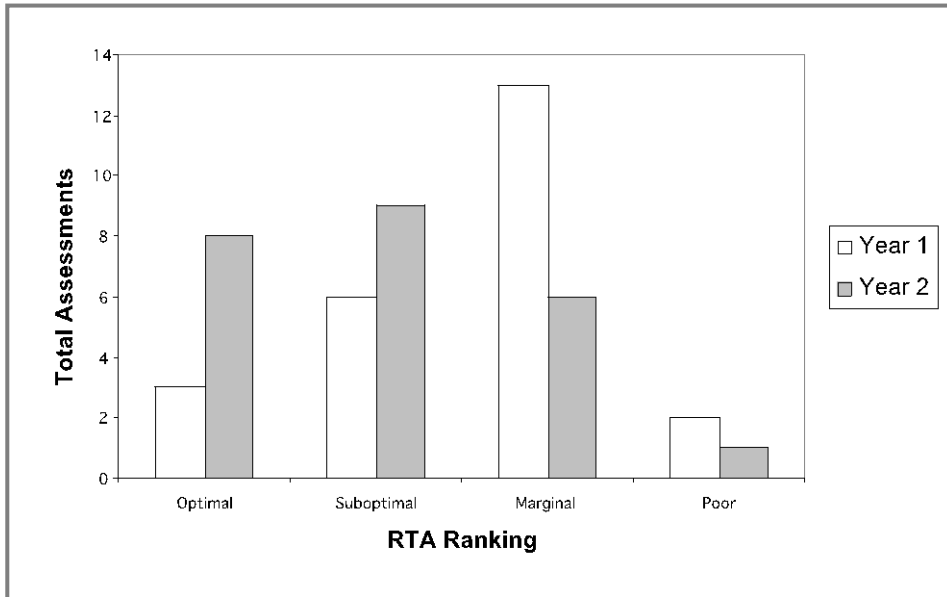
In 2004, the SCVURPP co-permittees documented the location of 64 potential trash problem areas located in creeks or in close proximity to a creek (i.e., banks). The co-permittees then conducted trash evaluations from 2004 to 2006 at potential trash problem areas using rapid creek trash assessments¹. The goals of the assessments were to establish baseline conditions with regard to trash accumulation and types, and track changes overtime.



This type of assessment can also provide information on sources of trash found in creeks that can guide future implementation of control measures.

As a preliminary step to assessing changes in receiving water quality, trash assessment scores at 24 creek sites assessed during multiple years were evaluated. Assessment scores indicated improvement in 67% (i.e., 16 of 24) of sites assessed. Trash removal during assessments conducted in Year 1 and management actions put into place between assessments may have resulted in the improved conditions during Year 2. It is difficult to evaluate trends in site condition however, without more data since seasonal and inter-annual variability of trash levels for these sites is unknown.

¹ Rapid Trash Assessment (RTA) Protocol developed by the San Francisco Bay Regional Water Quality Control Board (Water Board) was used in FY 2004-05 to qualitatively assess trash conditions in wadeable creeks. In FY 2005-06, the RTA was refined to better evaluate conditions of trash-impacted sites in urban creeks, as opposed to the Water Board’s RTA which addressed both rural and urban creeks. The refined protocol is named the “Urban RTA”.



Comparison of Trash Assessment Scores Conducted by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) at 24 Sites in Two Consecutive Years.

Assessment Result



Actual Outcome: Condition of 67% of sites identified as trash problem areas improved with respect to trash accumulation in one year moving from marginal to suboptimal or optimal.



Targeted Outcome: no information

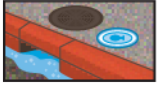


Assessment Result: Results demonstrated that measurable change/improvements can occur in one year.

Next Steps

If information is available regarding strategies and BMPs employed at each site, then this information can be used to identify successful approaches by comparing BMPs/strategies to results. This information can then be used to focus future efforts on implementing the more successful strategies/BMPs.

Source: For more information go to http://www.scvurppp-w2k.com/pdfs/0506/Trash_memo_AR_FY0506.pdf



5

Urban Runoff & MS4 Contributions

Level 5 Outcomes can be an important expression of successful program implementation because they provide a direct linkage between the sources regulated by Stormwater Management Programs and the receiving waters they're intended to protect. In addition, they apply exclusively to MS4s. By providing a direct linkage between sources and receiving waters, Level 5 Outcomes allow managers to determine how well their programs may be functioning. Measurement of Level 5 outcomes is fairly straightforward, but their analysis is complicated by a variety of factors such as the comingling of discharges, and the characteristics and timing of storm events.

M

Municipal Program Element

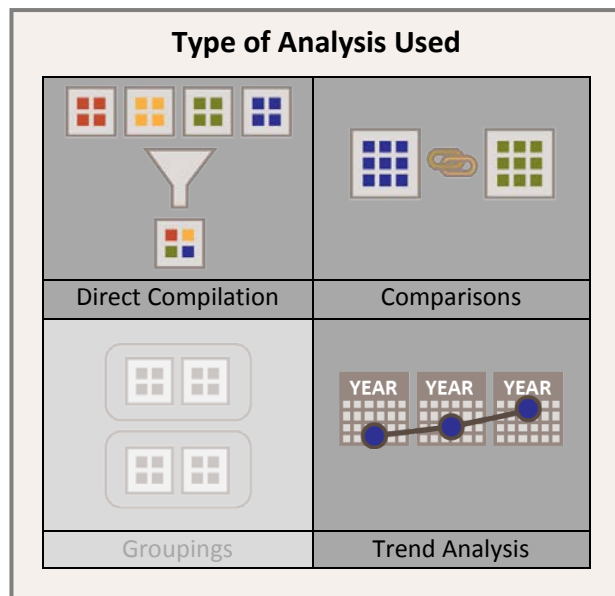
Indicators of effectiveness for municipal operations would include confirmation that guidance has been developed, numbers and types of BMPs that are being implemented, and/or training sessions that have been conducted.

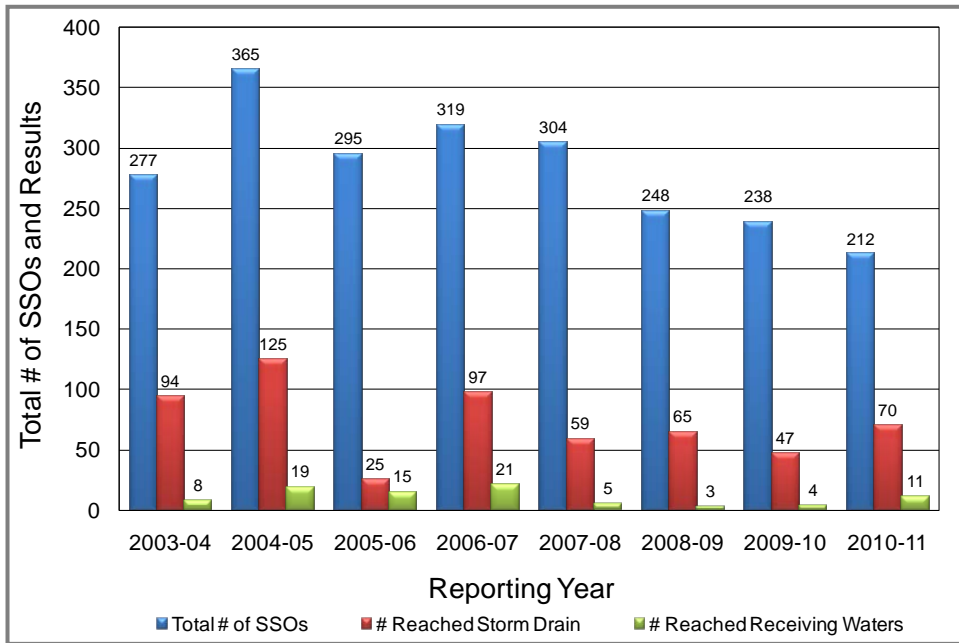
Project

City of Stockton: SSO Response and Reduction

The City developed and implements a Sanitary Sewer Overflow Emergency Response Program (SSOERP). When possible, the City prevents the SSOs from entering the storm drain system or receiving waters. The City also reviews and revises the SSOERP as needed.

- Since 2003, 2,258 SSOs have occurred and were responded to by the City.
- Of the 2,258 spills, 582 reached the storm drain system and 86 of them reached a receiving water.
- In general, a downward trend has been observed in the total annual number of SSOs.





Total Number of Sanitary Sewer Overflows and the Results

Assessment Result



Actual Outcome: The number of SSOs has decreased from 365 in 2004-05 to 212 in 2010-11. In addition, the number reaching the storm drain has decreased from 125 in 2004-05 to 70 in 2010-11.



Targeted Outcome: no information



Assessment Result: The program has been effective in reducing the total number of SSOs and the number reaching the storm drain. This in turn should result in reduced levels of pollutants in the MS4.

Next Steps

To further evaluate improvements in discharge quality, measurement of pollutants including BOD, TSS and nitrogen compounds could be measured in the storm drain system during wet weather in locations where SSOs have occurred.

Source: June 2012 City of Stockton and County of San Joaquin NPDES Municipal Stormwater Program Report of Waste Discharge and Proposed Stormwater Management Plan. Section 5 Municipal Operations. For more information visit the City of Stockton website

<http://www.stocktongov.com/government/departments/municipalUtilities/utilStorm.html>



4

Source Contributions

Source reductions are changes in the amounts of pollutants or reductions in flow associated with specific sources before and after BMPs are employed. Because source loadings determine the characteristics of the runoff discharged through MS4s, managers stand to benefit from a better understanding of how they can be reduced. Level 4 Outcomes provide program managers with feedback regarding reductions in the amounts of pollutants associated with specific sources before and after a BMP is employed.

Stormwater pollutant load reductions from proper disposal of materials can be estimated by the amount of materials collected. This includes:

- The amount of household hazardous waste turned in at collection centers or the amount of used motor oil turned in at collection facilities, (this data is collected by the California Integrated Waste Management Board);
- The volume of trash collected in public accessible trash receptacles or during coastal or stream clean up; or
- The amount of spilled material cleaned up after accidents, separate sewer overflows, or the termination of an illicit connection or non-stormwater discharge.

These quantities can be estimated and reported as stormwater pollutant loads avoided.

ND/R

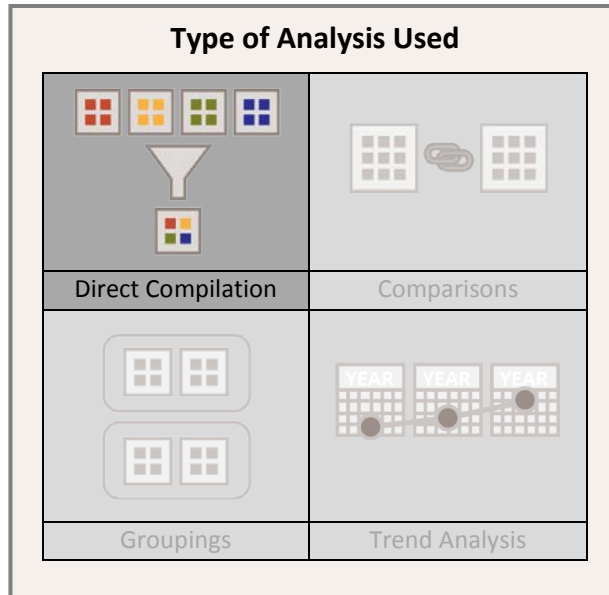
New Development/Redevelopment Program Element

Assessment at this Level for the New Development/Redevelopment program will include comparisons between project runoff volumes or pollutant loads avoided through site level BMP implementation. More comprehensive BMP installations (at a subwatershed or watershed level) can be documented at higher Outcome Levels.

Project

City of Sacramento: Stormwater Quality Improvement Program

Directly measuring the reduction of loads due to stormwater treatment requires a significant level of effort and resources due to the extensive inflow and effluent characterization required. In Sacramento’s North Natomas Development, all urban runoff is treated by wet extended detention basins. Specific studies are underway to determine the effectiveness of the basins. In the meantime, load reductions were estimated by ascertaining average pollutant



reduction percentages for similar type basins from the WERF/ASCE International Stormwater Best Management Practices (BMP) Database and applying that to the North Natomas urban discharge. Using the example of dissolved lead, the stormwater program estimated load reduction as follows:

Ave. dissolved lead reduction % for 3 similar basins from the database	60%
Sacramento area urban discharge dissolved lead annual loading (from Sacramento Urban Discharge Characterization 2005)	0.0004kg/ac
Natomas watershed area	6100 ac
Total estimated dissolved lead annual load reduction	.0004 x 6100 x .6 = 1.46 kg

Assessment Result



Actual Outcome: For this basin, a load reduction for lead is estimated to be 1.46 kg/year.



Targeted Outcome: no information



Assessment Result: This BMP is projected to be effective in reducing lead loadings.

Next Steps

This estimated load can be used as a baseline or reference point that can be compared to actual load reductions when that information is available. Additionally, the estimated load reduction could be compared to estimated load reductions for other BMPs to help identify the most effective BMP for this basin or similarly situated basins.

Source: For more information go to www.sacstormwater.org

C

Construction Program Element

Assessment at this Level for the Construction program will include comparisons between project runoff volumes or pollutant loads avoided through site level BMP implementation. More comprehensive BMP installations (at a subwatershed or watershed level) can be documented at higher Outcome Levels.

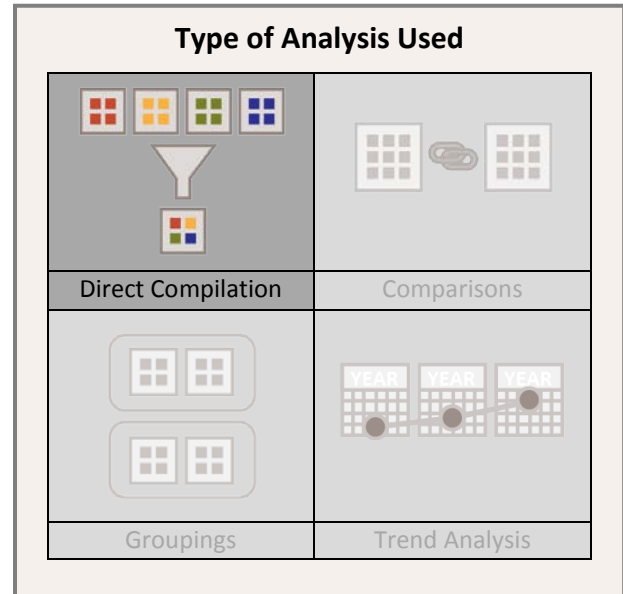
Project

County of San Diego: BMP Implementation

In FY 2002-03 and 2003-04, the County of San Diego estimated potential load reductions resulting from BMP implementation at permitted construction sites using an indirect method that incorporates assumptions regarding the relative amounts of sediment likely to be discharged from unprotected versus protected sites. Because of the extremely large number of permitted sites open throughout the year (more than 8,000 in a typical year), the County determined that collecting detailed site-specific data would not be feasible.

Instead, staff employed a less direct approach of projecting potential reductions from estimated levels of site protection. This analysis relied heavily on the use of literature values and based on some broad assumptions about site conditions. Using GIS, each site's total acreage was estimated by matching Assessor's Parcel Numbers to parcel maps.

- The acreage of each parcel with an active building permit was multiplied by the estimated percentage of disturbed acreage and multiplied by the fraction of the year that the project was active.
- To derive the loading estimation, this total was multiplied by 8.3 tons per acre per year. This loading factor is a regionally-adjusted literature value that estimates how much sediment would be discharged annually from a one-acre unprotected site. Since 100% protection was assumed after BMP protection, the difference was calculated using the entire 8.3 tons.
- Using this equation, the total potential reduction in sediment loading as a result of BMP implementation was estimated at 3,409 tons in FY 2002-03 and 12,642 tons in FY 2003-04.



Assessment Result



Actual Outcome: For this basin, a load reduction for sediment was estimated to be 3,400 tons/year for 2002-03 and 12,600 for tons/year for 2003-04.



Targeted Outcome: no information



Assessment Result: Increased use of BMPs is projected to result in greater reduction of sediment loadings.

Next Steps

The parameter that was actually measured in this example is the rate of BMP implementation in the service area. Looking at this by itself would provide an assessment result at Outcome Level 3. By converting this to projected sediment reduction, it provides information on whether implementation of BMPs can be expected to result in measurable reductions of sediment loadings. Whether or not measurable reductions are projected would inform decisions as to whether it is worthwhile to implement these BMPs or focus reduction efforts elsewhere. Or these estimated projections can be used as a baseline against which to compare actual measured reductions.

Source: County of San Diego. Jurisdictional Urban Runoff Management Plan (JURMP) Fiscal Year 2002-03 Annual Report and Fiscal Year 2003-04 Annual Report; Fifield, Jerald S. Designing for Effective Sediment and Erosion Control on Construction Sites. ForresterPress: Santa Barbara, California. 2001. For more information contact Watersheds@sdcounty.ca.gov.

PE

Public Education Program Element

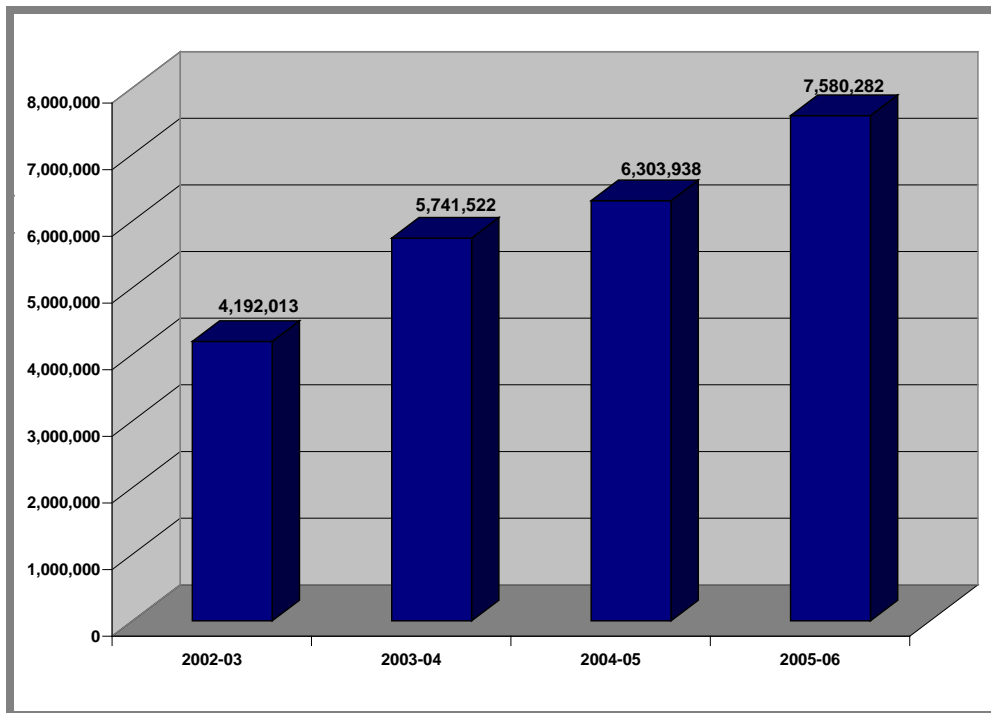
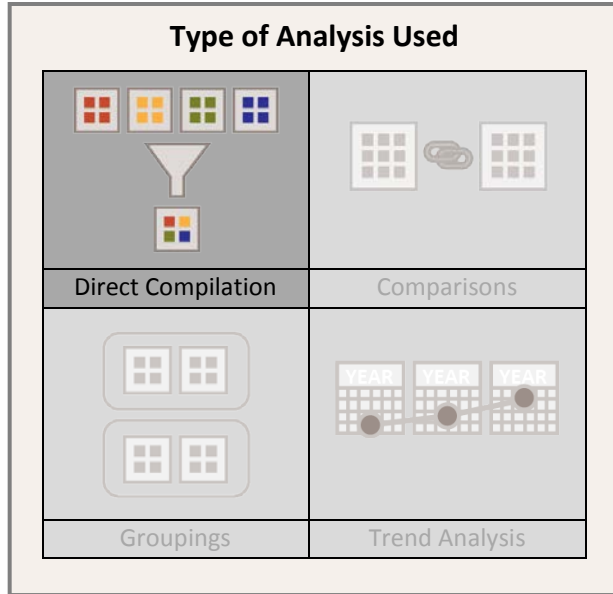
Indicators of Level 4 Outcomes in the residential program may include the amount of material that is diverted to a household hazardous waste (HHW) center and materials removed in creek cleanups (although this material has already left the source it is good to track how much material is removed from the waterways).

Project

Orange County Stormwater Program: Household Hazardous Waste Program

As a part of the stormwater program the County of Orange has a household hazardous waste collection program that is administered by the Integrated Waste Management Department (IWMD). The program includes four sites which are located in the cities of Anaheim, Huntington Beach, San Juan Capistrano, and Irvine.

In 2005-2006 over 7,580,000 pounds of household hazardous waste was collected. This represents a 20% increase from 2004-2005 in which over 6,300,000 pounds were collected and an 80% increase from 2002-2003 in which 4,200,000 pounds were collected.



Household Hazardous Waste Collected in Pounds

Assessment Result



Actual Outcome: The quantity of household hazardous waste collected increase by 80% between 2002 and 2006.



Targeted Outcome: no information



Assessment Result: This could be an indicator that more people are properly disposing of hazardous materials or it could be an indicator that people are using larger quantities of hazardous materials.

Next Steps

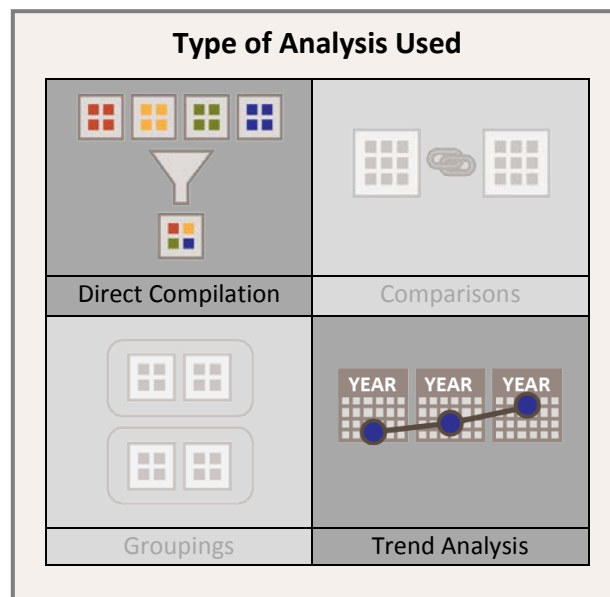
If the quantity collected is coupled with the population served by each location, per capita comparisons could be made to see if there is any difference in amount collected at each of the 4 sites. Evaluation of publicity, ease of access to the facility or other factors could be compared to quantities collected to determine future approaches to implementing the HHW program to optimize collection. One or two questions regarding how residents heard about the program or what types of wastes they are bringing could also provide additional information on the effectiveness of the program with respect to communication with the target audience and effectiveness of the program with respect to diverting pollutants from waterways.

Source: 2005-2006 Unified Annual Report, Section 5 Municipal Activities. For more information visit the Orange County website www.ocwatersheds.com and go to "Stormwater Program"

Project

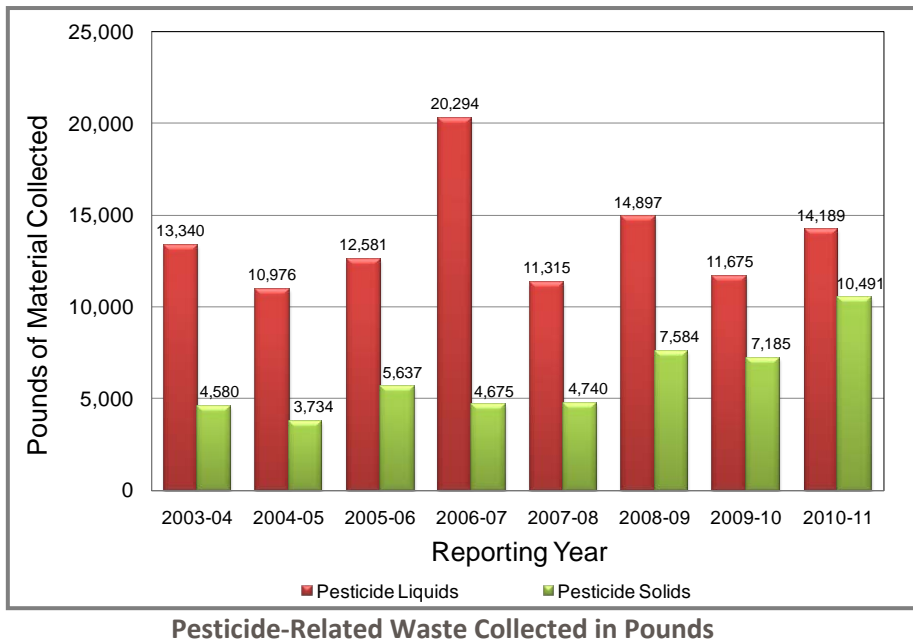
City of Stockton: Household Hazardous Waste Program

The Permittees raised awareness about HHW collection services and are increased the amount of HHW that is being disposed of properly, thus reducing the potential load of pollutants that could enter the storm drain system. The Permittees are also coordinating the HHW program with their Pesticide Water Quality Based



Plan to ensure that these materials are safely and properly disposed of. The key messages are provided through printed materials as well as the website.

- Since 2003, almost 110,000 pounds of pesticide liquids and over 48,000 pounds of pesticide solids have been collected at the HHW centers.
- Since 2003, there has been a general increase in the amount of pesticide solids collected at the HHW, while the amount of pesticide liquids has been more variable.



Assessment Result



Actual Outcome: Quantity of pesticides collected annually has generally increased from ~17,920 pounds in 2003-2004 to ~24,680 pounds in 2010-2011, an increase of 38%.



Targeted Outcome: no information



Assessment Result: The quantity of pesticides turned in by residents has been generally increasing, which may be due to a number of factors.

Next Steps

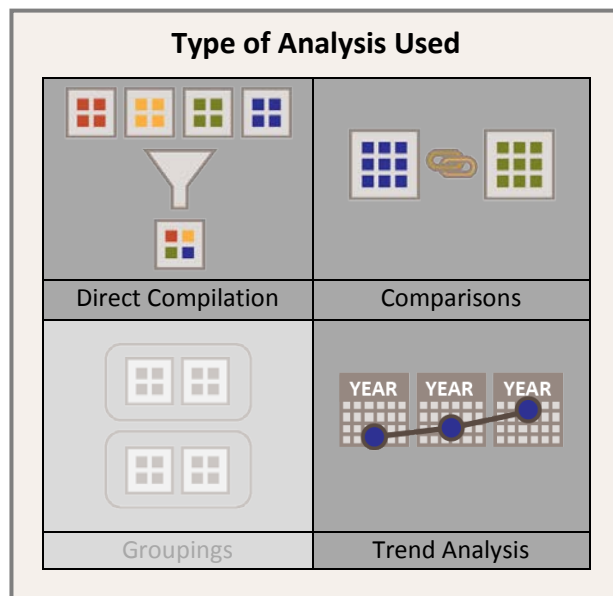
Which outreach strategies have been most effective could be explored by evaluating what new materials or strategies have been employed since 2003. In particular, the quantity of liquid pesticides collected in 2006-2007 was substantially higher than any other year. Determining if a different strategy was used that year or if there were external factors (e.g., amount of pesticides sold) that may have contributed to this result could be very informative. In addition, there was a significant increase in the quantity of solid pesticide collected in 2008-2009 and 2010-2011, compared to previous years. Programmatic changes or external factors that contributed to these increases could also be used to guide future outreach efforts.

Source: June 2012 City of Stockton and County of San Joaquin NPDES Municipal Stormwater Program Report of Waste Discharge and Proposed Stormwater Management Plan. Section 4 Public Education and Outreach. For more information visit the County of San Joaquin website <http://www.sjcleanwater.org/> or the City of Stockton website <http://www.stocktongov.com/government/departments/municipalUtilities/utilStorm.html>

Project

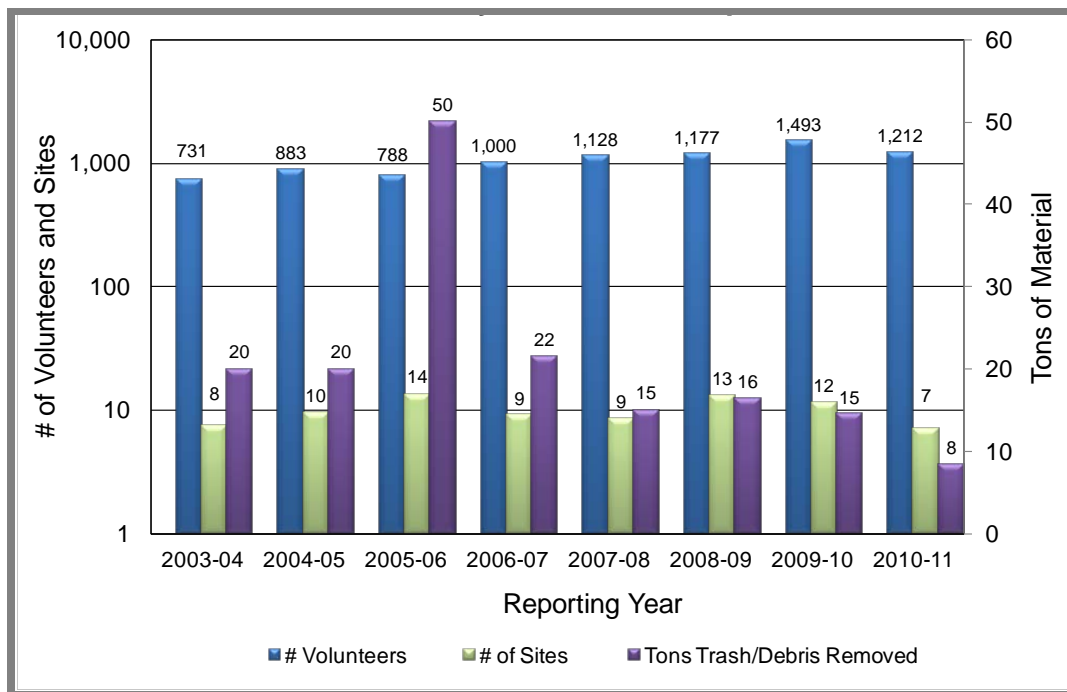
City of Stockton and County of San Joaquin: Stream Clean Up Events

Participation rates and quantities of trash collected indicate that the public is aware of the education campaign and community events sponsored by the Stormwater program. Measurable quantities of materials have been removed from the local creeks and streams, thus reducing the amount of



materials that may adversely impact the local waterways.

- Since 2003, approximately 8,400 volunteers have participated in local stream clean up events.
- As a result, approximately 166 tons of trash and debris have been removed.
- Since 2003-2004, an overall increasing trend in the number of volunteers has been apparent.
- The number of volunteers has been consistently high since 2006-2007.
- As a result of each cleanup event, a consistent amount of trash and debris has been removed annually from local streams and tributaries.
- Note: there may be a reporting anomaly with the data for 2005-2006.



Results of the Community Stream Cleanup Events

Assessment Result



Actual Outcome: The program has observed a steady to increasing participation rate by volunteers and a steady quantity of trash and debris removed.



Targeted Outcome: no information



Assessment Result: The Stormwater Program has been able to maintain a good level of trash and debris removal using volunteers over a 7-year period indicating an effective outreach effort over a sustained period.

Next Steps

Reviewing the outreach strategies used for this program could help identify effective approaches that could be used for other aspects of the Stormwater Program that also rely on outreach and education. It appears that the amount of trash and debris removed in recent years may have decreased slightly. It would be worthwhile to determine if this is because sites are starting out cleaner than in previous years which would speak to the overall effectiveness of this program or if external factors have contributed to this decrease (weather for example). It would be worthwhile to determine the reason for the huge spike in trash and debris removed in 2005-06 (more than twice as much removed than in any other year) and if it is related to a specific effort by the Stormwater Program.

Source: June 2012 City of Stockton and County of San Joaquin NPDES Municipal Stormwater Program Report of Waste Discharge and Proposed Stormwater Management Plan. Section 4 Public Education and Outreach. For more information visit the County of San Joaquin website <http://www.sjcleanwater.org/> or the City of Stockton website <http://www.stocktonqov.com/government/departments/municipalUtilities/utilStorm.html>

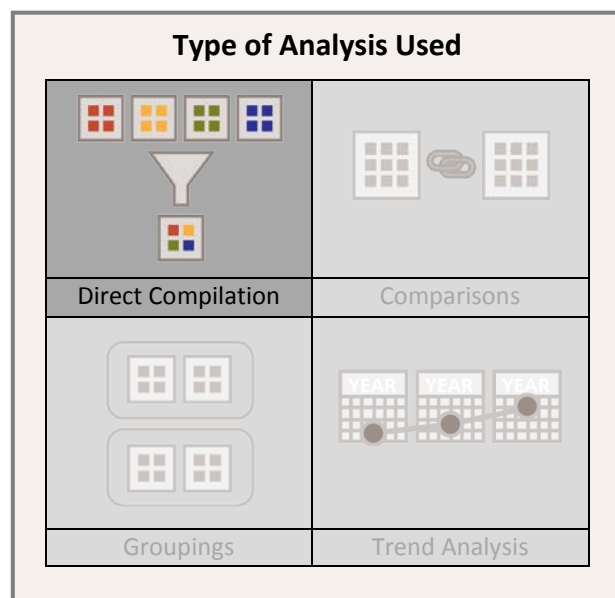
Project

City of San Diego: Restaurant BMPs

San Diego estimated the potential loadings generated from washing floor mats by making the following assumptions:

# of mats per restaurant	2
Square footage of mat surface	4 sq. ft.
Average thickness of grease on mats	0.02 inch
Volume of grease on mats.	0.0067 cu. Ft
Density of grease.	57 lbs/cu. Ft
Grease washed from two mats daily	0.76 lbs
Assume washing 365 days/year	277 lbs/year

By calculating the number of sources (10,342 in area) multiplied by the effectiveness of the BMP (indoor washing assumed to be 100% effective) and estimating the rate of implementation achievable (estimated at 30-50%), they determined that the potential load reduction by implementing BMPs at restaurants could achieve a reduction of 860,000 to 1,430,000 lbs grease annually.



Assessment Result



Actual Outcome: Implementation of BMPs at restaurants could achieve a reduction of 860,000 to 1,430,000 lbs grease annually.



Targeted Outcome: no information



Assessment Result: This indicates that there is value in pursuing BMP implementation because of the significant potential load reduction that could result.

Next Steps

The potential reduction determined in this example could be used as a Targeted Outcome against which to measure actual results and BMP implementation rates. Alternatively, if a target load reduction for grease were established in another way, comparison of the potential load reduction to the target load reduction would confirm whether this is a worthwhile strategy to pursue.

Source: Weston Solutions, LWA, and Mikhail Ogawa Baseline Long Term Effectiveness Assessment, August 2005. For more information go to www.projectcleanwater.org/html/wq_assessment.html

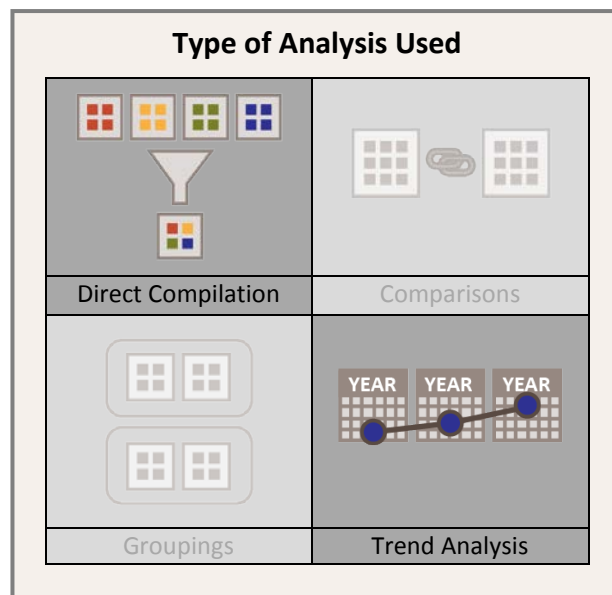
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Municipal Program Element

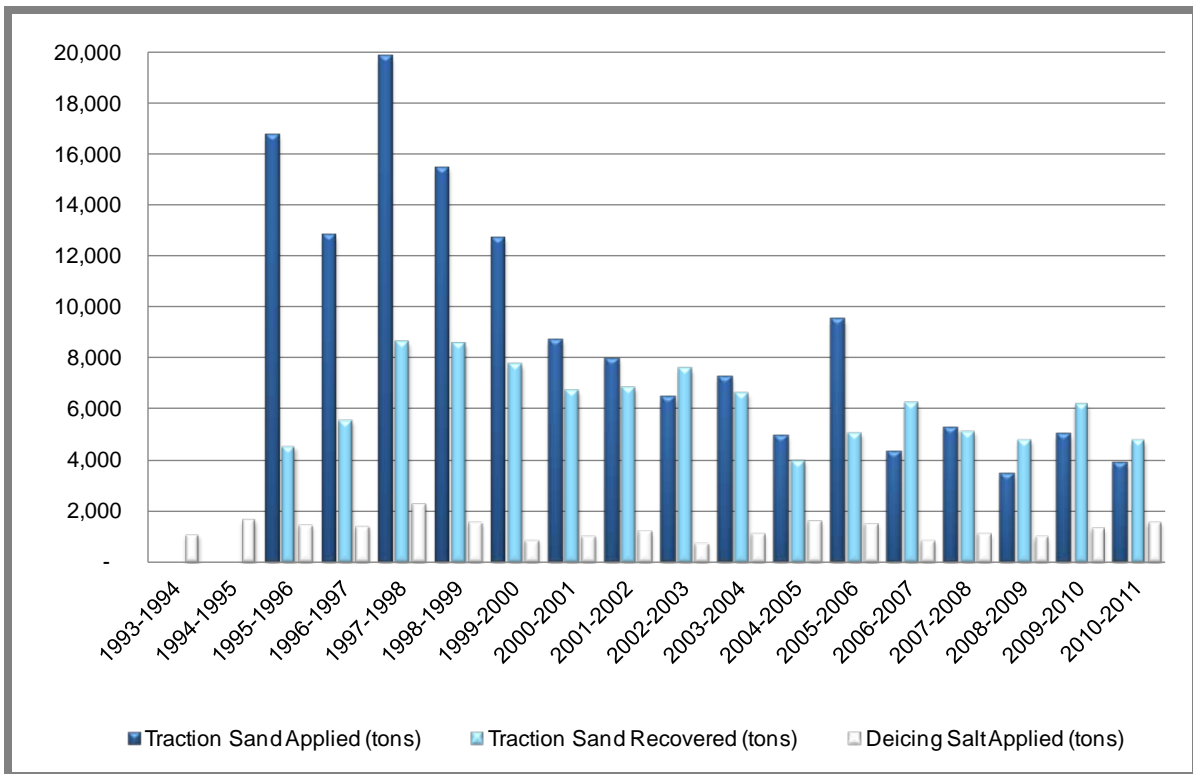
Project

California Department of Transportation (Caltrans): Traction Sand and Deicing Salt

Caltrans has established BMPs for the application of traction sand and deicing salt. The use of these BMPs has resulted in a decrease in the amount of traction sand and deicing salt applied and reduced the amount of material that could potentially end up in the storm drain inlets and/or local waterways.



- In the Lake Tahoe hydrologic unit, 3,865 tons of traction sand was applied during the 2010-2011 snow season. However, 4,761 tons of traction sand was recovered. This represents a recapture rate of 123%. Several reasons noted within the Deicer Report explain the high recovery rate.
- Since 1995-1996, Caltrans has had an average traction sand recovery rate of 83%, with the recovery efficiency exhibiting an overall increasing trend due to improved BMPs.
- During the 2010-2011 snow season, 1,555 granular tons of salts were used. Since 1993-1994, the amount of granular salt applied has generally been exhibited on a downward trend.



Traction Sand Application and Removal and Deicing Salt Application in the Lake Tahoe Hydrologic Unit (District 3), by Fiscal Year

Assessment Result



Actual Outcome: In 2011, the traction sand recovery rate was 123%. Since 1995, there has been a decrease in traction sand applied and an increase in the recovery rate.



Targeted Outcome: no information



Assessment Result: Since 1995-1996, Caltrans has had an average traction sand recovery rate of 83%, with the recovery efficiency exhibiting an overall increasing trend due to improved BMPs.

Next Steps

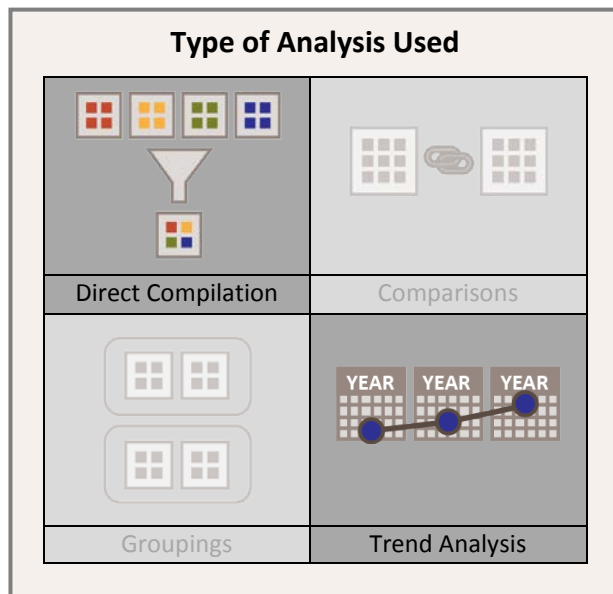
A reasonable targeted outcome for this example would be to achieve a 100% recovery rate. This appears to have been consistently achieved since the 2006-2007 snow season. This information can be used to identify effective BMP strategies. In addition, the effort needed to maintain this recovery rate could be determined and resources could possibly be shifted to activities where reductions are still needed.

Source: April 2013 California Department of Transportation Statewide Stormwater Management Program Annual Report Fiscal Year 2011-2012. Chapter G Program Effectiveness Assessment. For more information visit the Caltrans website http://www.dot.ca.gov/hq/env/stormwater/annual_report/curent_ar.pdf

Project

San Joaquin County: Landscape and Pest Management

The San Joaquin County municipal stormwater program implements a comprehensive municipal operations program to ensure that the operations and maintenance activities are performed in a way that minimizes the pollutants generated. As a part of the program they track a number of parameters to assist them in identifying if the program is being implemented in accordance with the

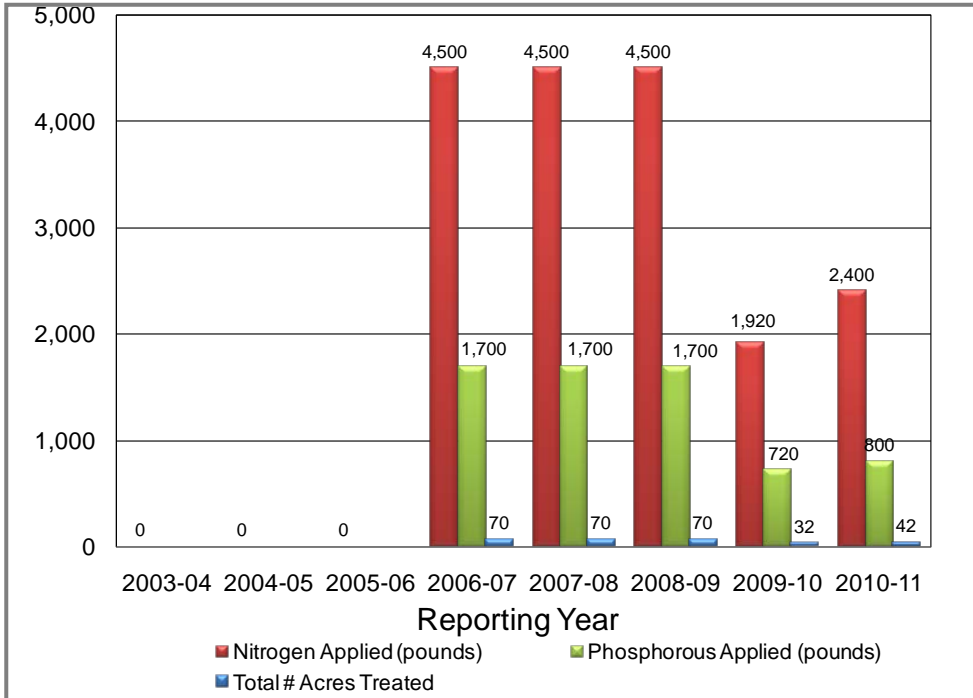


SWMP and related performance standards. One set of parameters that they track include the following:

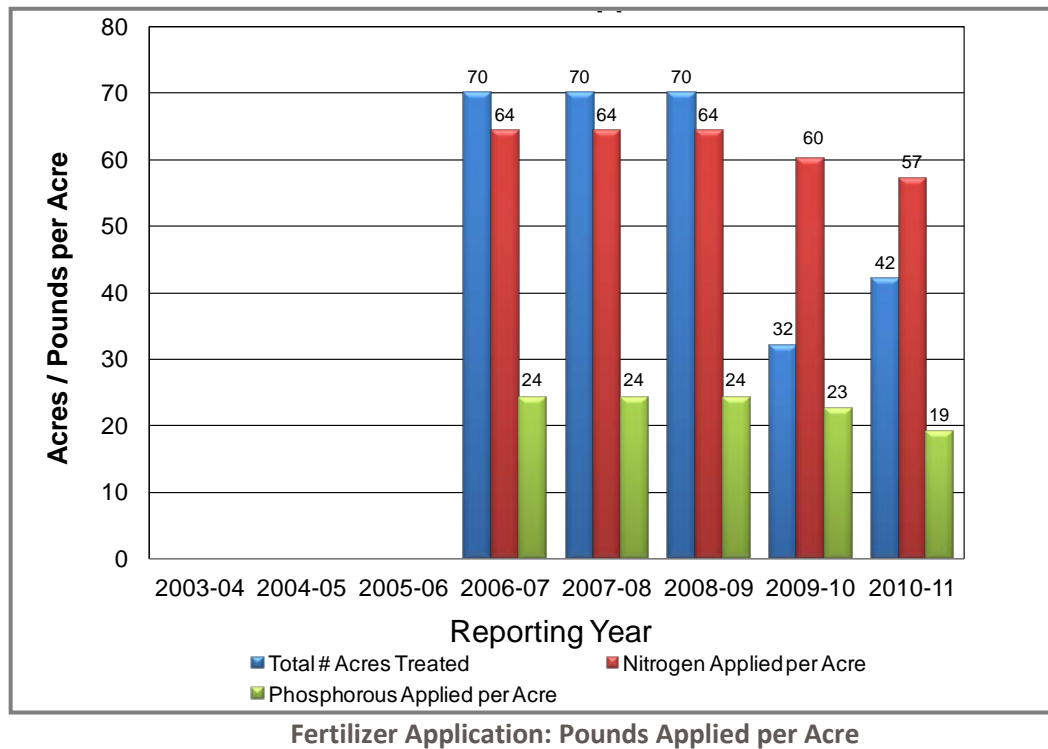
Landscape and Pest Management

- Total number of acres treated with fertilizers;
 - Total pounds of nitrogen applied;
 - Total pounds of phosphorous applied;

The County's Parks and Recreation Department has been generally reducing the amount of fertilizers used within its jurisdiction. The County has reduced the total amount of nitrogen and phosphorous applied per acre by approximately 11% and 21%, respectively.

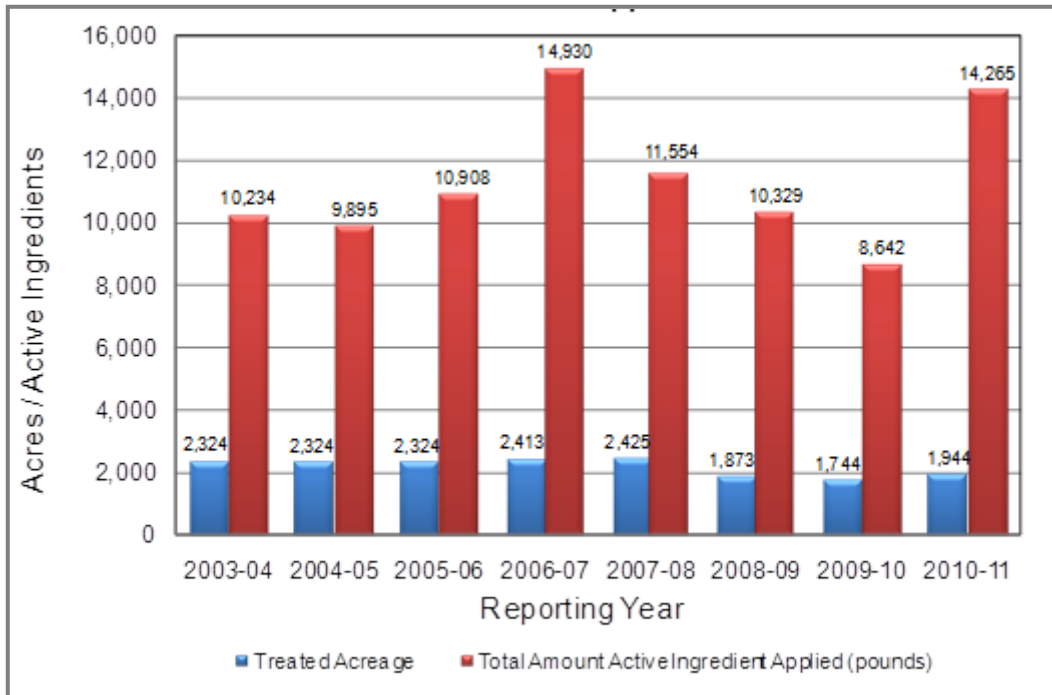


Fertilizer Application: Total Amount of Nitrogen and Phosphorus Applied



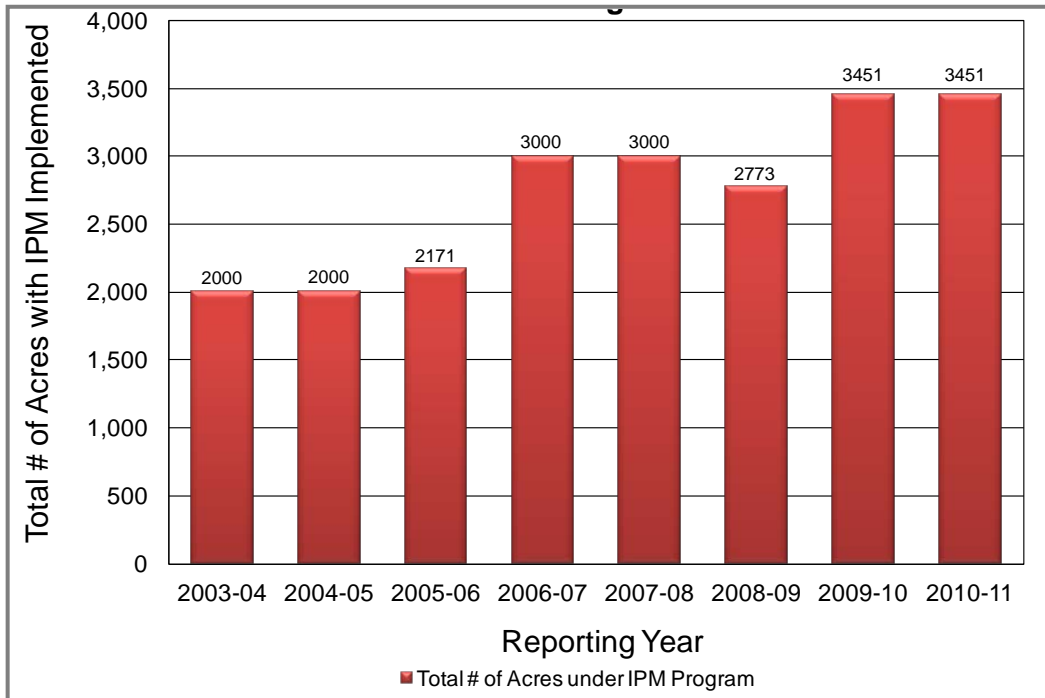
- Total number of acres treated with pesticides; and
 - Types of products used
 - Name of active ingredient and pounds of active ingredient applied
- Total number of acres under the IPM practices and types of practices used.

To better account for the volume and type of pesticide used, County staff maintains an internal inventory on pesticide use and tracked Department of Parks and Recreation reported pesticide use. After the 2006-2007 fiscal year, the County began to significantly reduce its application of pesticides, with the exception of 2010-2011. In 2010-2011, there was an increase in pesticide use due to one-time levee maintenance activities that required immediate attention to correct findings by state and federal levee inspectors. The County has reduced its pesticide use by 42%, from a high of 14,930 pounds in 2006-2007 to a low of 8,642 pounds in 2009-2010.



Pesticide Application

The County implements an IPM program that requires the use of less toxic or non-toxic approaches to pest management. Some of the IPM alternatives that are being employed include hand weeding, mulching, pruning, plant selection, and landscape design. Since 2003, there has been a 72.5% increase in the acreage covered by the IPM program.



IPM Program Application

Assessment Result



Actual Outcome: The County has reduced the total amount of nitrogen and phosphorous applied per acre by approximately 11% and 21%, respectively. In addition, since 2003, there has been a 72.5% increase in the acreage covered by the IPM program. Overall, the County has reduced its pesticide use by 42%, from a high of 14,930 pounds in 2006-2007 to a low of 8,642 pounds in 2009-2010.



Targeted Outcome: no information



Assessment Result: The County has implemented its program to meet the goal of the SWMP to reduce pesticide usage and to increase the use of IPM.

Next Steps

In addition to demonstrating effective implementation of its pesticide reduction program, this information can be used to evaluate effectiveness at Outcome Level 4, Load Avoidance.

Source: June 2012 City of Stockton and County of San Joaquin NPDES Municipal Stormwater Program Report of Waste Discharge and Proposed Stormwater Management Plan. Section 5 Municipal Operations. For more information visit the County of San Joaquin website <http://www.sjcleanwater.org/>

8.5 Target Audience Component

Target Audience Component



One of the primary purposes of a Stormwater Management Program is to change behaviors in target audiences so that the activities that they are engaged in are protective of water quality. Level 3 Outcomes build on knowledge and awareness (Level 2) by providing program managers with feedback on what types of behaviors are occurring in Target Audiences, and whether their programs are actually inducing changes in them.

Level 3 Outcomes provide program managers with feedback on how effective the program has been in motivating target audiences to change their behavior and implement appropriate BMPs.

PE Public Education Program Element

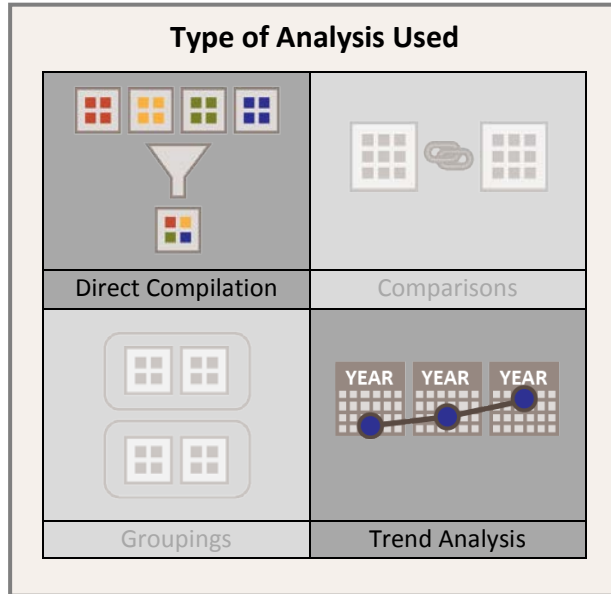
Indicators of effectiveness with respect to target audience actions include reported changes such as picking up after pets, disposing of household hazardous wastes correctly, and using a broom instead of a hose to clean up an area. Although these changes are reported, and thus, they are qualitative, they are still a good indicator of the willingness to change.

Project

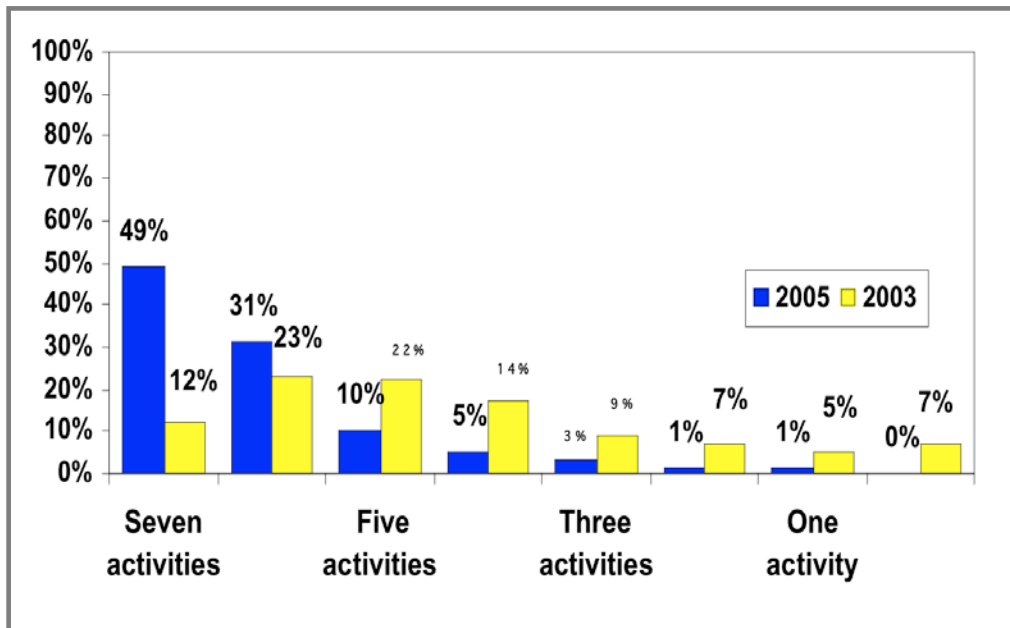
Orange County Stormwater Program: Public Awareness Survey

The Santa Ana Region municipal stormwater permit requires the Permittees to measurably change the behavior of target communities and thereby reduce pollutant releases to the municipal storm drain system and the environment. On behalf of the 34 co-permittees, the Principal Permittee (County of Orange) developed an approach for the program's public awareness surveys to ensure that the program is effective and able to measure changes in knowledge and behavior.

In May 2003 a public awareness survey was conducted with 1,500 respondents and repeated in November 2005. The purpose of the second survey was to assess the extent to which public awareness had changed and if the residents made any behavior changes as a result of the campaign. A couple of the key findings indicating that the residents were changing their behaviors include the following:



- Roughly two thirds of the respondents indicated that they would change their personal behaviors to make a difference in cleaning up pollution (65%). This represented a 2% increase from the 2003 survey.
- When comparing the 2003 and 2005 surveys, roughly half of the residents reported taking part in the seven activities identified as behaviors that are protective of water quality (activities such as disposing of chemicals correctly, picking up after a pet, etc) in the 2005 survey. This represents a 37% increase from the 2003 survey. This is attributable to the materials that were developed since the materials addressed all seven activities in the survey.



Survey Results: Reported Activity Participation

Assessment Result



Actual Outcome: In 2005, approximately half of the survey participants reported taking part in all seven activities included in the survey. Approximately 80% of respondents reported taking part in at least six of the identified activities.



Targeted Outcome: no information



Assessment Result: Respondents reporting taking part in six or more of the identified activities increased by 45%.

Next Steps

This result was attributed to outreach materials that included specific information about activities that would reduce pollutant releases to the municipal storm drain system. This can be used to identify effective strategies for communicating information to residential audiences. In addition, with this large of a change in reported behavior, the Stormwater Program could explore ways to measure results at higher outcome levels (i.e., changes in water quality or measurable load reductions).

Source: 2005-2006 Unified Annual Report, Section 6 Public Education. For more information visit the Orange County website www.ocwatersheds.com and go to "Stormwater Program"

Project

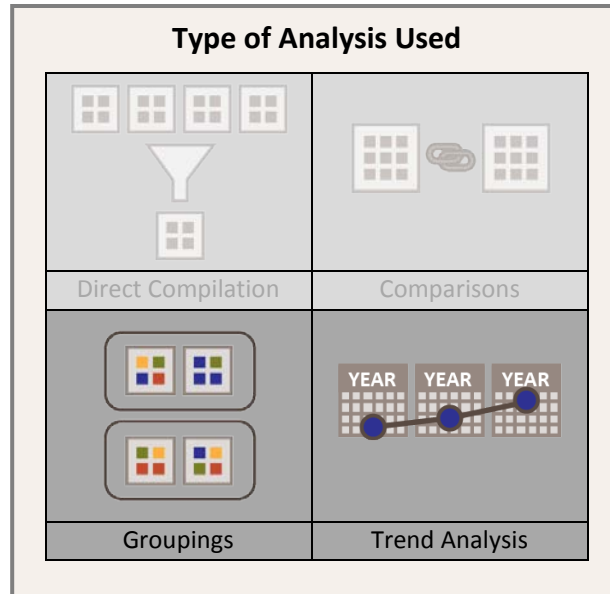
Palo Alto Regional Water Quality Control Plan: Car Wash Coupons

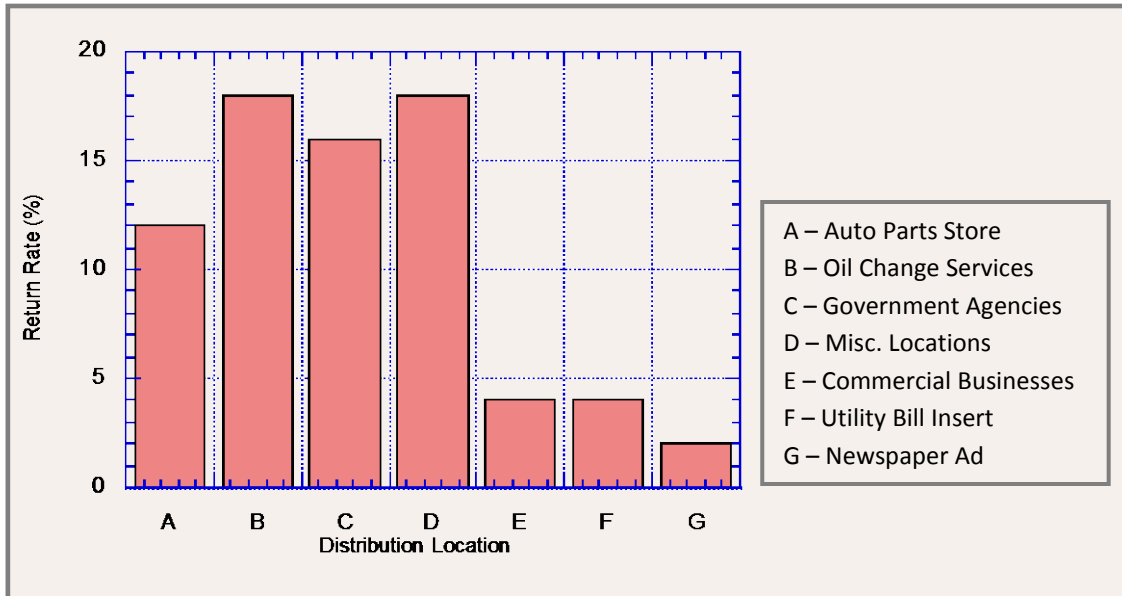
One element of the PARWQCP pollution prevention program is the Clean Bay Business Program targeting vehicle service facilities. One of the ways that the RWQCP publicizes the Clean Bay Business Program is to offer discount coupons to be redeemed at carwashes that qualify as Clean Bay Businesses. The effectiveness of the car wash

coupons is evaluated with respect to the percentage of coupons returned and which method of distribution resulted in the most coupons being returned. This was done by using different colored coupons for different methods of distribution, keeping track of how many coupons were distributed using each method and how many coupons of each color are returned.

Between 1994 and 1998, the distribution locations that achieved the highest return rate were oil change services, auto parts stores, and government employee paychecks. Other distribution methods that were used include utility bill inserts; counters at community centers, libraries, and city hall; and local corporation employee paychecks. Even though these methods do not have the highest return rates, they were still employed because they reach residents and help increase their awareness of storm water pollution. Distribution methods such as placing coupons at cars parked at shopping malls and hand delivery to residential homes were tried in previous years but were discontinued because they were very labor intensive and did not generate high coupon return rates. The figure below illustrates the return rates from the various distribution locations in 1998.

The PARWQCP also tracked the rate of coupons redeemed over time. Between 1994 and 1998, the percentage of coupons returned increased from 4% to 13%.





Car Wash Coupon Return Rates

Assessment Result



Actual Outcome: In 1998, carwash coupon return rates ranged from 12-18% for coupons distributed at auto parts stores, oil change services and government agencies. Return rates were less than 5% for coupons distributed at other commercial businesses, in utility bills and in the newspaper.



Targeted Outcome: no information



Assessment Result: Auto parts stores, oil change services and government agencies are better locations than other businesses, utility bills and newspaper ads for distributing information on actions that can reduce water pollution (at least with respect to cars).

Next Steps

Coupon return rates are a direct measure of a Target Audience Action as opposed to reported behavior from surveys. In addition to measuring behavior change as a result of public outreach, this information can also be used to optimize resources by helping program managers focus on the most effective locations for public outreach.

Source: Water Environment Research Foundation, 2000. Tools to Measure Source Control Program Effectiveness. WERF Project 98-WSM-2. For more information go to www.werf.org or www.cityofpaloalto.org/public-works/cb-auto.html

Project

San Francisco Water Pollution Prevention Program: Thermometer Exchange

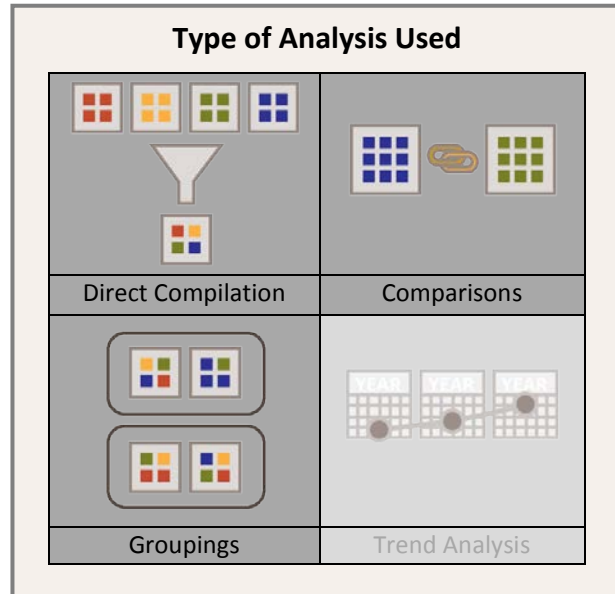
In partnership with the Solid Waste Management Program, the Department of the Environment and the San Francisco Fire Department, the SFWPPP initiated an extensive public education and outreach campaign designed to encourage residents to turn in mercury thermometers for recycling and thereby keep mercury out of the Bay and Ocean.

Every Saturday in May 2000, anyone who turned in a mercury thermometer at one of nine fire stations in San Francisco received a new digital thermometer. The SFWPPP measured the effectiveness of its Mercury Thermometer Education effort based on participation and thermometers collected. During the one-month campaign, 3300 people turned in 4700 thermometers. Almost 40% of the thermometers were collected at one station located in Chinatown.

In addition to tracking participation and thermometers collected, a short intercept survey was conducted at the collection sites. Participants were asked for their zip code and where they had heard about the turn-in events:

- 42% of those surveyed had heard about the program through the newspaper;
- 26% heard about it on the radio;
- 18% heard about it through word of mouth;
- 5% heard about it through television advertisements;
- 3% heard about it through utility bill inserts; and
- 2% heard about it via street posters, fire stations, and Val Packs.

There were some differences geographically with respect to how people had heard about the program:



- A higher than average percentage of respondents at the Chinatown station had heard about the program on the radio (42%).
- In the Marina District, the vast majority had heard about the program in the newspaper (74%) with far less than average mentioning word of mouth (4%) or radio (10%).

When reviewing the responses by week, some changes were seen over time with respect to where people had heard about the program:

- In the first two weeks of the campaign, 64% and 54% respectively reported hearing about the program in the newspaper.
- In the last two weeks of the campaign, this dropped to 24% and 29% respectively.
- Those who said they heard about the campaign on the radio comprised 6% of the responses in the first week. This increased to 25%, 40% and 30% in the second, third, and fourth weeks.
- Word of mouth responses accounted for 14% and 9% of the responses in the first two weeks but increased to 27% and 24% of the responses in the last two weeks.

This assessment method was a simple add-on to an existing element of the outreach campaign. It was able to provide the SFWPPP with information on effective outreach methods (i.e., newspaper articles, radio) and provide some insight into what type of approaches work best in different San Francisco neighborhoods.

Assessment Result



Actual Outcome: During the one-month campaign, 3300 people turned in 4700 thermometers. Almost 40% of the thermometers were collected at one station located in Chinatown. Intercept surveys collected information on where participants had heard about the event.



Targeted Outcome: no information



Assessment Result: Two-thirds of participants had heard about the event in the newspaper or the radio. There was a relationship between geographic locations and the most effective form of outreach.

Next Steps

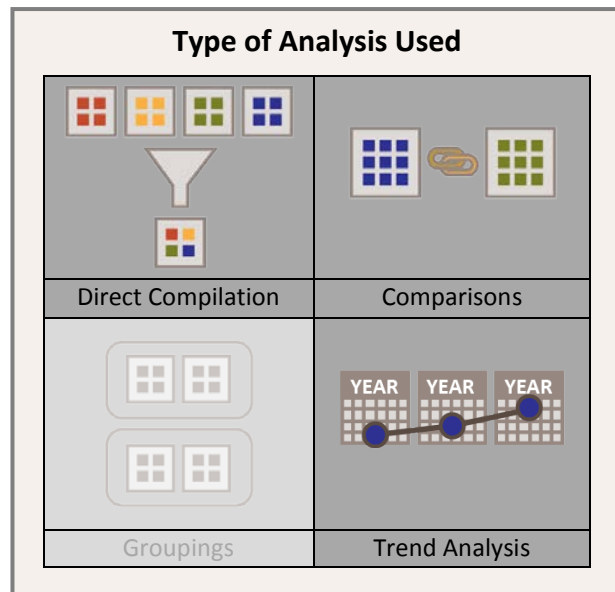
This assessment provided the SFWPPP with information on effective outreach methods (i.e., newspaper articles, radio) and provide some insight into what type of approaches work best in different San Francisco neighborhoods.

Source: Water Environment Research Foundation, 2001. Controlling Pollution at Its Source: Wastewater and Stormwater Demonstration Projects. WERF Project 98-WSM-2. For more information go to www.werf.org and click on Publications.

Project

City of Fresno: Used Oil Collection

One of the significant sources of stormwater pollution is automotive fluids, which is also the largest category of illicit discharge complaints investigated by the Fresno Metropolitan Flood Control District (FMFCD) and its Co-Permittees. By working with CalRecycle, and the Cities of Fresno and Clovis, FMFCD evaluated four years' worth of used motor oil collection data from the two Cities and compared the collection data to illicit discharge response data.



As shown in Figure 1, used oil collected in the City of Fresno increased 19% from Fiscal Year 2009-2010 to Fiscal Year 2012-2013.

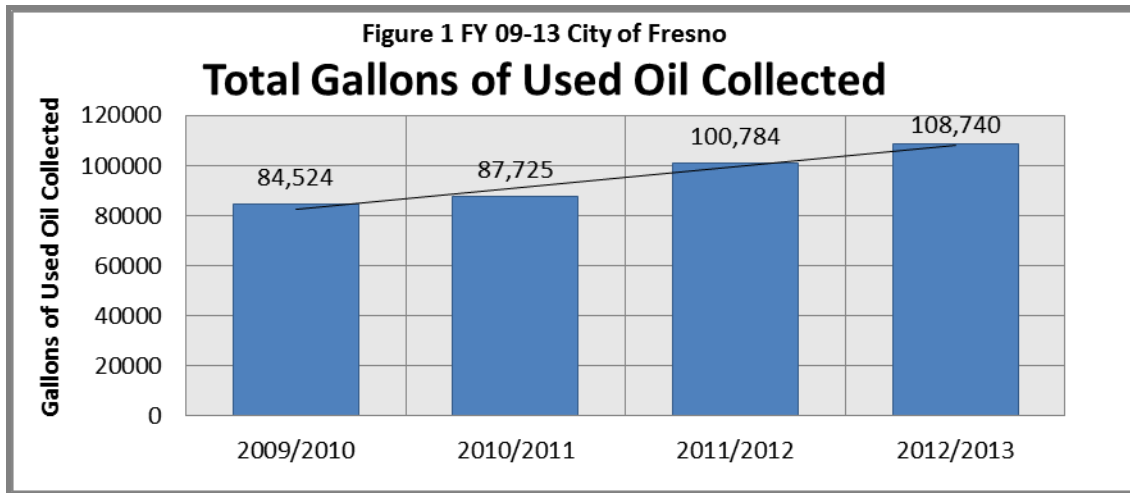
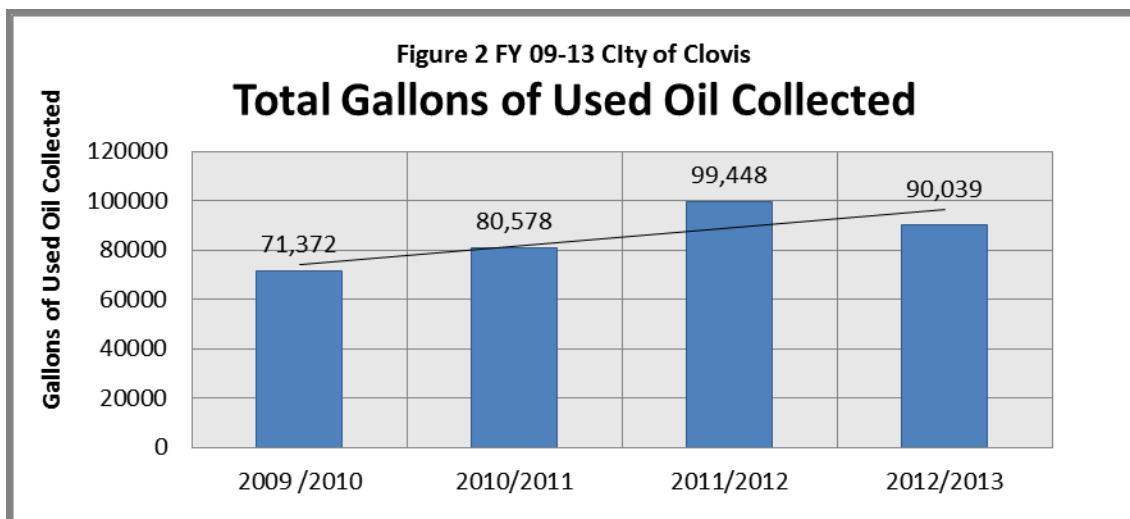
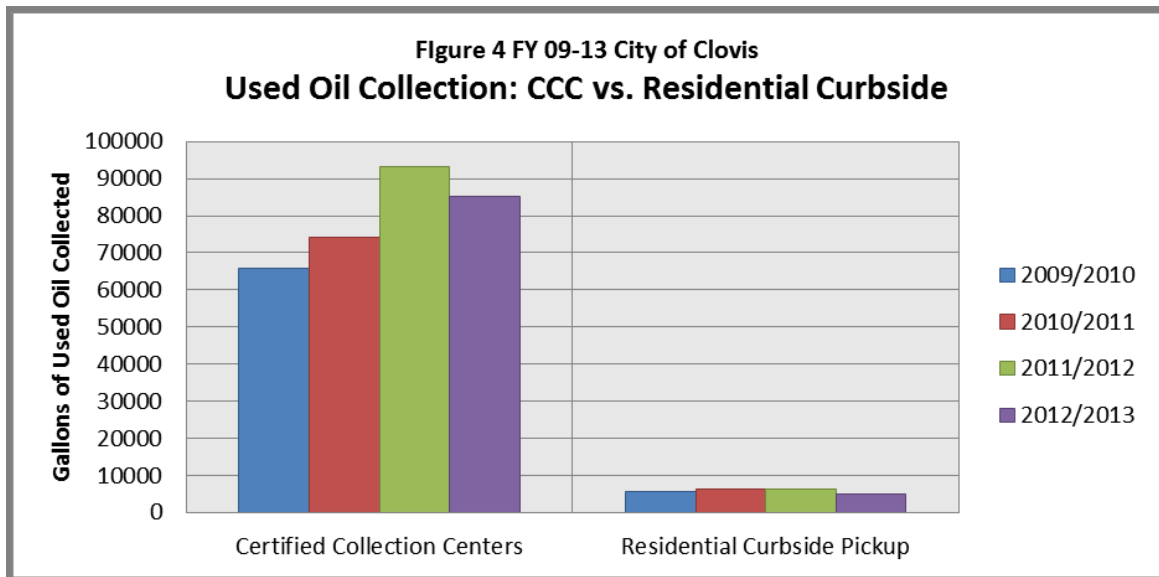
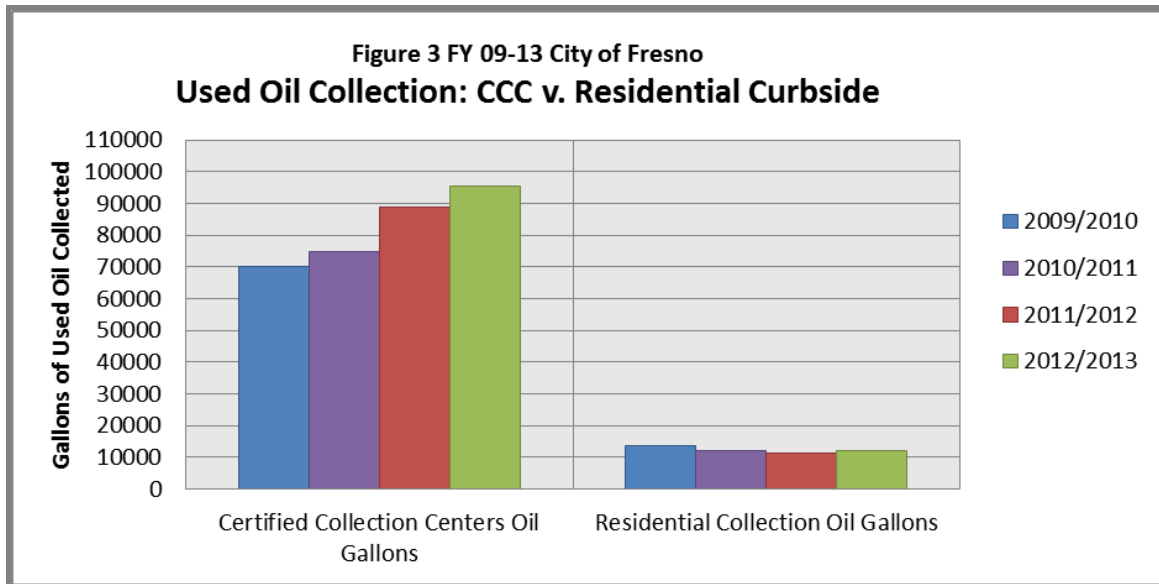


Figure 2 shows an increase of 39% from Fiscal Year 2009-2010 to Fiscal Year 2011-2012 for the City of Clovis. Overall, in the last four fiscal years, there was a total of 381,773 gallons of used oil collected from the City of Fresno and a total of 341,437 gallons from the City of Clovis.



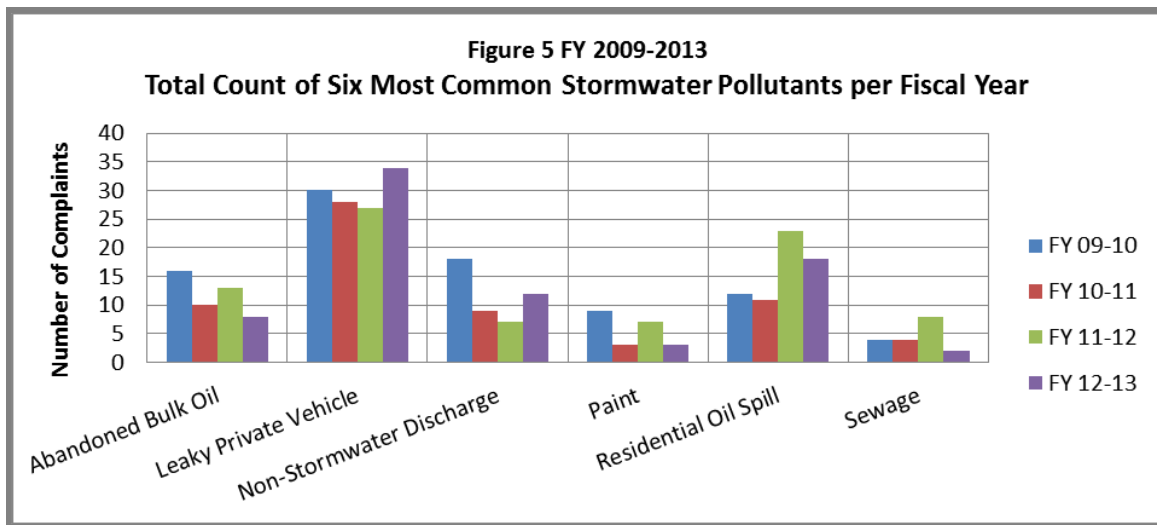
In Figure 3 and Figure 4, the amounts of used oil collected from Certified Collection Centers (CCCs) and the City of Fresno and City of Clovis Residential Curbside Collection Programs are compared over the last four fiscal years. CCCs are clearly the primary mechanism for used oil collection. However, the Residential Curbside Collection Programs

provide residents who might not have the time to take the used motor oil to a CCC a convenient alternative method for properly disposing of used motor oil.



As shown in Figure 5, between the 2009 and 2013 fiscal years, leaky private vehicles were the type of stormwater incident most investigated by the cities. The number of leaky private vehicle incidents decreased slightly between 2009-2010 and 2011-2012 but increased in the 2012-2013 fiscal year. Residential oil spills also had an overall increasing trend, although the number of these types of incidents decreased between 2011-2012 and 2012-2013.

Two stormwater pollutant sources, abandoned bulk oil and paint, exhibited a decreasing trend. The data for abandoned bulk oil correlate with an increase in the collection of used motor oil by the two cities. The decrease in paint complaints could be a result of many years of public outreach, the availability at HHW collection events, and the relatively new paint manufacturer product responsibility programs, such as Paint Care. This type of information could be used to verify increases in awareness and behavior changes, as well as to adapt or guide future used motor oil outreach efforts.



Assessment Result



Actual Outcome: A total of 381,773 gallons of used motor oil collected in the City of Fresno and a total of 341,437 gallons in the City of Clovis, correlating to a downward trend in illicit discharge complaint investigations.



Targeted Outcome: An increase in the collection of used motor oil and a decrease in the number of illicit discharge complaints associated with abandoned used motor oil.



Assessment Result: The availability of convenient used motor oil disposal options for City residents could be responsible for the decreasing trend in illicit discharge complaints involving abandoned used motor oil.

Next Steps

Co-Permittees will continue their baseline used motor oil outreach campaigns, as determined by their individual used motor oil budgets. The stormwater programs will continue to promote the proper disposal of used motor oil, respond to and track illicit discharges, and evaluate trends.

Source: 2004-05, Fresno/Clovis Storm Water Quality Management Program Annual Progress Report - Section 1- Public Education and Involvement. For more information contact FMFCD at info@fresnofloodcontrol.org

Compliance rates observed during inspections and the need for and results of follow-up inspections are the most often used tools to assess target audience actions for Industrial/Commercial programs.

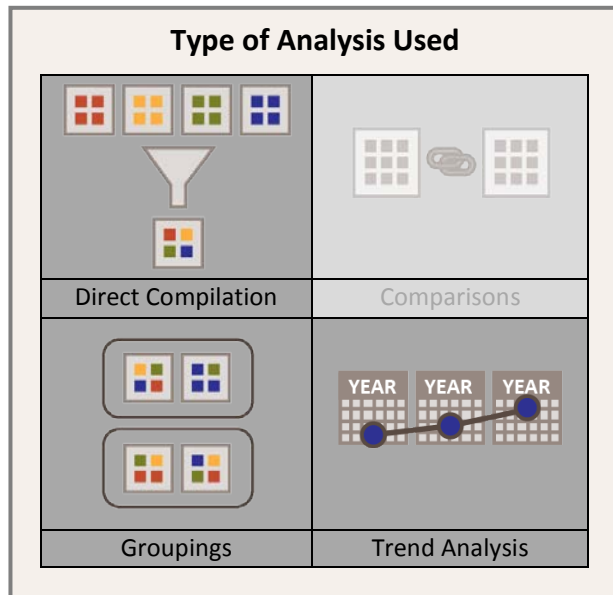
Project

Palo Alto Regional Water Quality Control Plan: Vehicle Service Facilities

One element of Palo Alto's pollution prevention program is the Clean Bay Business Program targeting vehicle service facilities. For a vehicle service facility to qualify as a Clean Bay Business it must comply with the City's ordinance and implement a variety of BMPs. Compliance with each of the 15 ordinance requirements (each requirement is a BMP) has been tracked between 1992

and 1997. A business qualifies as a Clean Bay Business if it is in complete compliance on its first annual inspection (i.e., no follow-up inspection required) and it has no discharge limit violations.

- In the first year 156 businesses (48%) were in complete compliance and 131 businesses (40%) qualified as Clean Bay Businesses.
- By 1997, all 303 vehicle service shops were in complete compliance and 21 of 23 fleet maintenance facilities were in complete compliance. In addition, 277 businesses (92%) qualified as Clean Bay Businesses.



Assessment Result



Actual Outcome: Within 5 years of implementing the Clean Bay Business Program for vehicle service facilities, almost 100% of the facilities were in compliance. The number of businesses qualifying as Clean Bay Businesses more than doubled in the 5 year period.



Targeted Outcome: no information



Assessment Result: The ordinance requirement and inspection program have been effective strategies for getting vehicle service facilities to implement BMPs.

Next Steps

This information can be used to inform other efforts to work with small businesses. In addition, with the apparent success of the program, the City could explore ways to measure results at higher outcome levels. The City can also determine if this program can be implemented at a maintenance level to allow shifting of resources to other water pollution issues.

Source: Water Environment Research Foundation, 2000. Tools to Measure Source Control Program Effectiveness. WERF Project 98-WSM-2. For more information go to <http://www.werf.org> or www.cityofpaloalto.org/public-works/cb-auto.html

M**Municipal Program Element**

Many control measures of a municipal program can be assessed through inspections. Compliance rates observed during inspections/audits and the need for and results of follow-up inspections are the most often used tools.

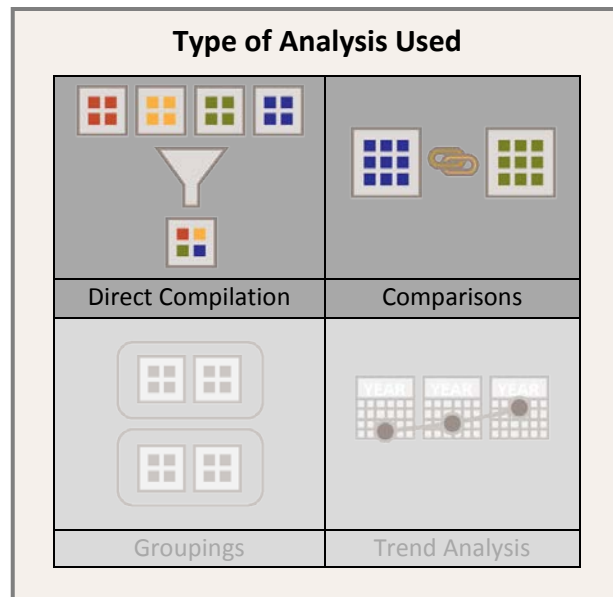
Project

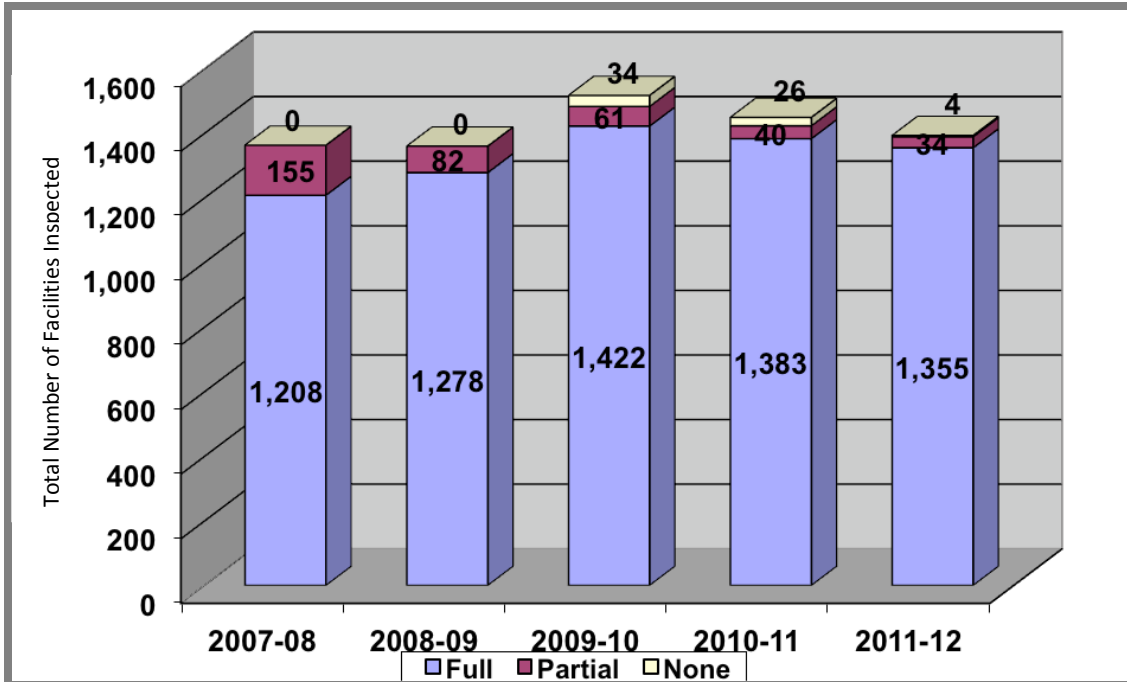
**Orange County Stormwater Program:
Municipal Facilities Inspections**

The Santa Ana Region municipal stormwater permit requires the Permittees to ensure that, through a systematic process of evaluation, BMPs are incorporated into municipal facilities and infrastructure maintenance programs. The Model Municipal Activities Program was developed and implemented in 2002-

03. It established a framework for conducting a systematic program of evaluation and BMP implementation targeting fixed facilities/areas, field programs/activities and drainage facilities. The key findings of this program have been:

- The facilities and areas have been inventoried:
 - 1,762 facilities/areas have been reported as inventoried and are subject to the Program
- The facilities are inspected to ensure that the BMPs are being implemented:
 - In 2011-2012, 1,393 municipal facilities were reported as having been inspected for stormwater issues (compared to 1,449 in 2010-11; 1,517 in 2009-10; 1,360 in 2008-09; 1,363 in 2007-08)
- At the end of the 2011-12 reporting period, 1,355 municipal facilities were determined to have full BMP implementation(compared to 1,383 in 2010-11; 1,422 in 2009-10; 1,278 in 2008-09; 1,208 in 2007-08)





Levels of BMP Implementation

Over time the compliance has improved among the facilities indicating that the staff is aware of the BMPs that should be implemented and are implementing them. Tracking this information allows the County staff to evaluate the facilities and activities to determine where the resources should be focused during the next fiscal year.

Assessment Result



Actual Outcome: The number of facilities with no or partial implementation of BMPs has decreased from 155 in 2007-08 to 38 in 2011-12, a decrease of 75%.



Targeted Outcome: no information



Assessment Result: Overall BMP implementation rates among inspected facilities are very high with 89% of facilities having full implementation of BMPs in 2007-08 and 98% having full implementation in 2011-12. Efforts to reduce partial and no implementation of BMPs have also been effective.

Next Steps

This information is used to evaluate the facilities and activities to determine where resources should be focused. If there are BMPs that are commonly not implemented this could be one area to focus on. Strategies used to get full implementation of BMPs by municipal facilities could inform efforts to get commercial/non-municipal facilities to implement BMPs. The rate of BMP implementation over time could be used to set a targeted outcome (i.e., somewhere between 89 % and 97%).

Source: Unified Annual Report, Section 6 Municipal Operations. For more information visit the Orange County website www.ocwatersheds.com and go to "Stormwater Program"

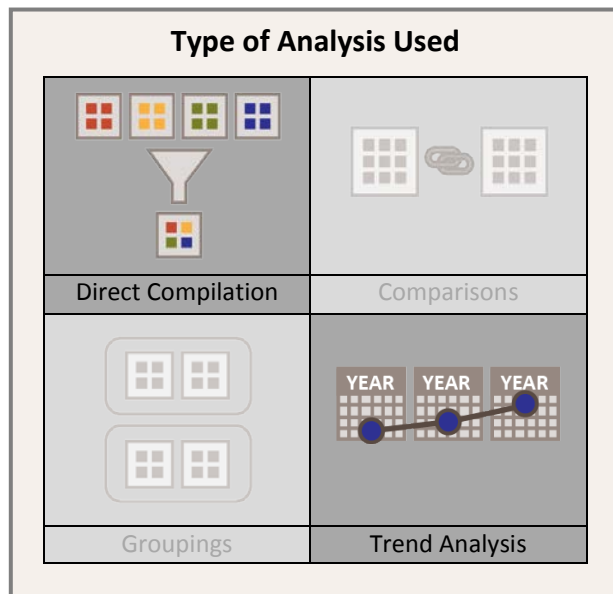
Project

City of Stockton: Field Crew Inspections

Illicit discharges are detected via several mechanisms including field crews who act as the "eyes and ears" of the stormwater program and identify illicit discharges while they are conducting their daily activities.

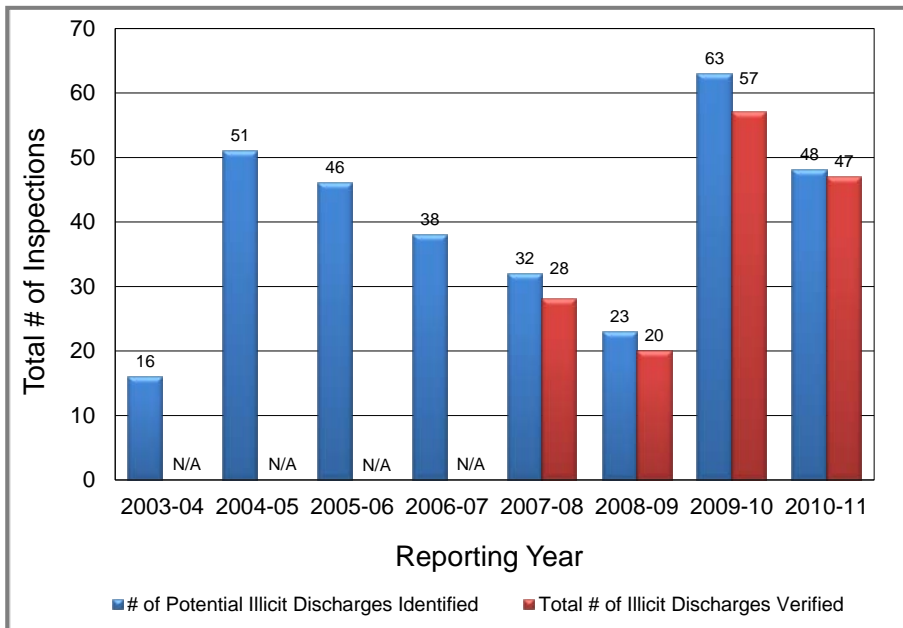
Outcomes for the City of Stockton ID/IC program include:

- Since 2003, 317 potential IDs have been identified.
- Since 2003-2004, the field crews have become more aware of what



constitutes an ID and have progressed from reporting incidents that may not have been problematic to reporting IDs that are verified in the field and addressed.

- The success rate of the field inspectors has increased in recent years (from 88% in 2007-2008 to 98% in 2010-2011).



Field Crew Inspections: Illicit Discharges Identified and Verified

Assessment Result



Actual Outcome: The number of illicit discharges identified more than doubled between 2008-09 and 2009-10. The % verified increased from 88% in 2008-09 to 98% in 2010-11.



Targeted Outcome: no information but 95-98% would be a reasonable target for percent of illicit discharges that are verified.

Result

Assessment Result: Training of inspectors has resulted in an increase in proportion of illicit discharges that are verified indicating that the training has been very effective. It is possible that the training is also the reason for the substantial increase in illicit discharges identified.

Next Steps

This information can be used to evaluate training. In addition, the 2009-10 values could be used as a baseline to measure effectiveness in reducing the total number of illicit discharges. Attention can be turned from training inspectors on identification to implementing strategies for education and enforcement that will result in the target audience reducing the number of illicit discharges.

Source: June 2012 City of Stockton and County of San Joaquin NPDES Municipal Stormwater Program Report of Waste Discharge and Proposed Stormwater Management Plan. Section 3 Illicit Discharges. For more information visit the City of Stockton website <http://www.stocktongov.com/government/departments/municipalUtilities/utilStorm.html>



2

Barriers & Bridges to Action

Level 2 outcomes measure the knowledge and awareness that a target audience has regarding a particular subject. These outcomes are critical since they ultimately form the basis for achieving desired behavioral changes and provide a means of gauging progress toward, or barriers to, their achievement. Level 2 Outcomes provide program managers with feedback on how effective various control measures have been in raising awareness and changing attitudes of the target audiences.

PE

Public Education Program Element

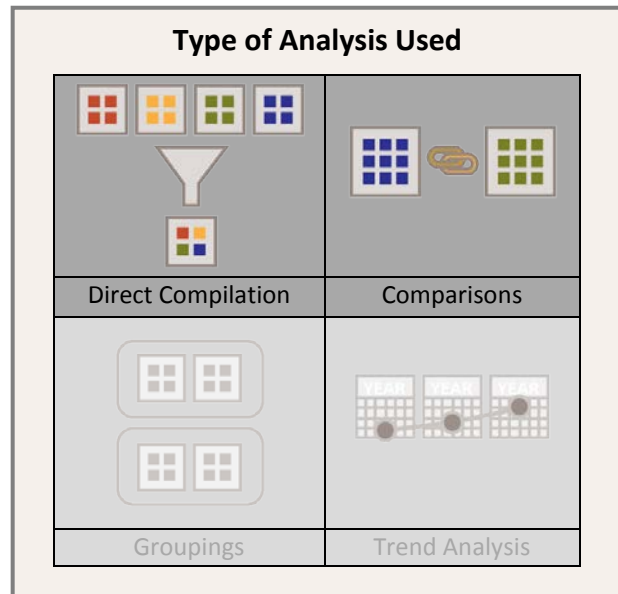
Surveys are commonly used to assess awareness of the residential target audiences regarding stormwater issues. Repeating the same survey questions over time can show changes in public awareness that may be attributed to a stormwater program's efforts.

Recall of specific outreach materials can also be an indicator that the program efforts have resulted in increased awareness.

Project

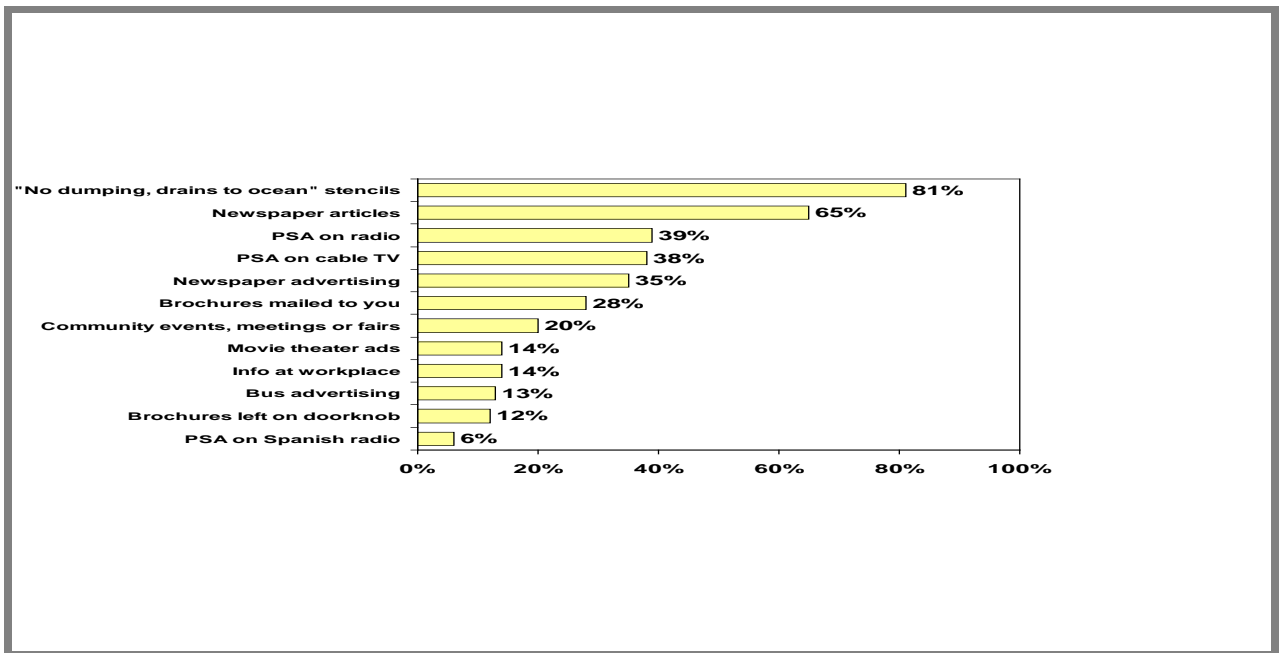
Orange County Stormwater Program: Public Awareness Survey

The Santa Ana Region municipal stormwater permit requires Permittees to measurably increase the knowledge of target communities. On behalf of the 34 co-permittees, the County of Orange developed an approach and methodology for the program's public awareness surveys to measure changes in knowledge and behavior. In May 2003, 1,500 respondents were surveyed. This survey was repeated in November 2005. The second survey assessed



whether public awareness had changed and if the residents made any behavior changes as a result of the campaign. Some of the key findings include:

- Knowledge about urban runoff and storm drains increased. 90% of the residents know that water flowing in the street enters a storm drain and goes directly to a waterway.
- Respondents were asked if items such as oil, styrofoam cups, pet waste, water from hoses, etc. contributed to polluting urban runoff. The survey results showed a strong upward trend regarding knowledge of pollutant sources and indicated that the educational materials and messages that have been developed to address specific pollutants are reaching the residents.
- The survey asked questions related to the effectiveness of the media outreach program in order to identify those aspects of the program that are recalled the most. The most effective mechanism reported and recalled were the storm drain stencils (81%) followed by newspaper articles (65%) and public service announcements on the radio (39%).



Public Awareness Survey Results

Assessment Result



Actual Outcome: 90% of residents know that water that water flowing in the street enters a storm drain and goes directly to a waterway. Outreach mechanisms that were most frequently recalled included storm drain stencils, newspaper articles and PSAs on the radio.



Targeted Outcome: no information



Assessment Result: These results indicate that public outreach efforts are effective and identified the most effective mechanisms for outreach.

Next Steps

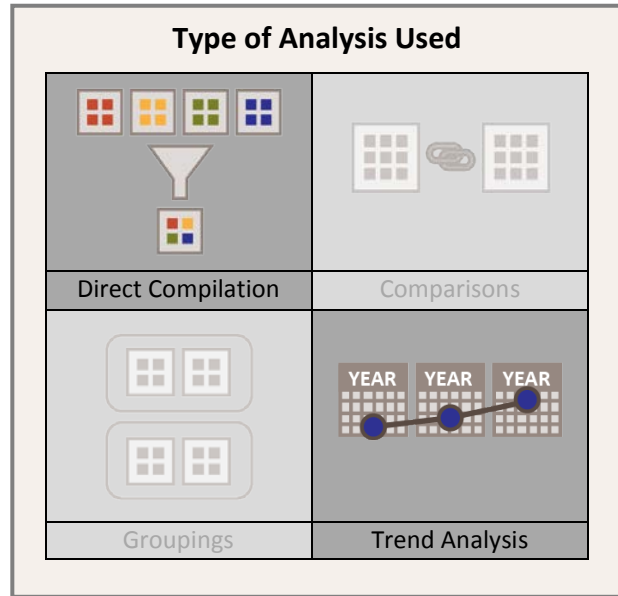
This information can be used to focus future resources on the most effective outreach methods and to determine if messages should focus on general outreach or more pollutant specific messages.

Source: 2005-2006 Unified Annual Report, Section 6 Public Education. For more information visit the Orange County website www.ocwatersheds.com and go to "Stormwater Program"

Project

Orange County Stormwater Program: Incident Reporting

The Orange County municipal stormwater program has developed a telephone and web-based reporting system for the general public to report illicit discharges and illegal connections. The phone number and web page are also advertised in the public education materials, the Orange County “White Pages” telephone directories, and the 34 individual Permittee websites.



The program tracks awareness and, in part, target audience actions by identifying the number of complaints that are received. Although the number of complaints is a function of the number of actual incidents and the advertisement of the number and website, it can serve as an indicator for general public awareness regarding what constitutes an illicit discharge or an illegal connection and why it is important to report them. A summary of the program from 2003-2006 is provided below:

- 2005-2006 – 4,386 complaints/incidents reported
- 2004-2005 – 3,408 complaints/incidents reported
- 2003-2004 – 3,387 complaints/incidents reported

To provide additional insight for the overall effectiveness of the program this information can also be compared to the number of enforcement actions, specific education campaigns that have been conducted as well as the training of the inspectors.

Assessment Result



Actual Outcome: The number of complaint/ incidents reported more than doubled between 2002-2003 and 2005-2006.



Targeted Outcome: no information



Assessment Result: These results indicate that public outreach efforts are effective in educating the public regarding what constitutes an illicit discharge and why it is important to report them.

Next Steps

To provide additional information on program effectiveness, this information can be compared to the number of enforcement actions, specific education campaigns that have been conducted as well as the training of the inspectors. This could help to identify the most effective outreach methods and how well the public understands what constitutes an illicit discharge.

Source: 2005-2006 Unified Annual Report, Section 10 Illicit Discharges/Illegal Connections. For more information visit the Orange County website www.ocwatersheds.com and go to "Stormwater Program" http://www.ocwatersheds.com/WQHotline/wqh_reporting.asp

M

Municipal Program Element

Assessment may be demonstrated by tracking actions taken by municipal staff. In addition, pre and post surveys at training sessions or workshops can also assess the understanding of target audience regarding the program requirements.

Project

County of San Joaquin: Capital Improvement Projects

The San Joaquin County municipal stormwater program implements a comprehensive municipal operations program to ensure that the operations and maintenance activities are performed in a way that minimizes the pollutants generated.

As a part of the program they track a number of parameters to assist them in identifying if the program is increasing the awareness of municipal staff involved in the program.

One of the ways that they identify awareness is by tracking the implementation of the construction requirements for the municipal capital improvement projects.

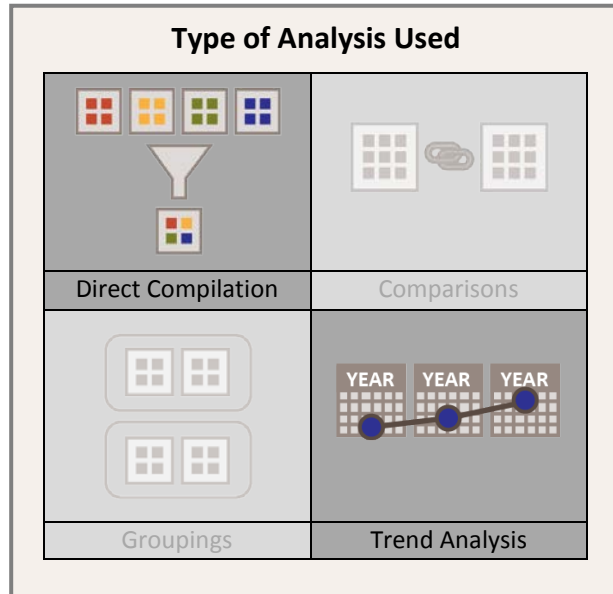
The County requires that all capital improvement projects must be reviewed by stormwater staff to ensure that the construction BMPs and new development standards are incorporated during the design stage. As such, the County tracks the following:

- Total number of CIP plans reviewed
- Total number of CIP plans requiring revisions
- Total number of active public construction sites
- Total number of active public construction sites > one acre
- Total number of active public construction sites that submitted a Notice of Intent (NOI)

Some of the key findings include:

- Since 2003 all of the construction projects > one acre submitted a copy of the NOI.
- During 2004-2005 42% of the CIP plans reviewed required revisions. However, during 2005-2006 only 25% of the CIP plans reviewed required revisions.

These two measurements indicate that County staff involved in the design and construction of the County CIP projects increased their understanding of the program requirements and are implementing the necessary BMPs.



Assessment Result



Actual Outcome: CIP plans requiring revisions decreased 17% between 2004-2005 and 2005-2006.



Targeted Outcome: no information



Assessment Result: These results indicate that staff increased their understanding of program requirements.

Next Steps

A review of the types of revisions that are still needed could help to focus future training efforts.

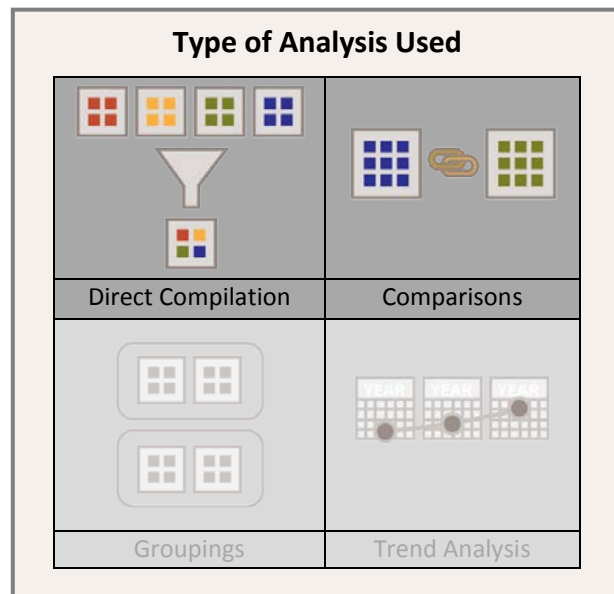
Source: 2005-2006 Annual Report, Section 4 Municipal Operations. For more information visit the County of San Joaquin website <http://www.sjcleanwater.org>

Project

Orange County Stormwater Program: Inspector Training

The Orange County municipal stormwater program provides a number of training modules to the 34 co-permittees. One of the training modules is for the authorized inspectors who assist with the implementation of the ID/IC program. As a part of the training, pre- and post- surveys were provided to gauge the awareness of the inspectors before and after the training module. The key results from one of the training sessions indicated that the pre-training score was 66% correct, while the average post-training score was 81%. Overall, this demonstrates how the awareness of the attendees was increased during the training session.

One example of how the assessment data may be interpreted is:



- For questions where the % difference does not change significantly between the pre- and post- survey – This may indicate that, during the next training session, the speakers may need to spend additional time on these topics in order to increase the understanding.
- For questions where the % difference does change significantly – This may indicate that these questions were appropriately covered during the training session and at the right difficulty level.
- For questions where the pre-survey results are very high – This may indicate that the question is not at the right difficulty level and may need to be modified.

Based on the results of the surveys, the training modules and corresponding handouts and surveys can be updated so that they are more effective.

Assessment Result



Actual Outcome: Inspectors knowledge increased by an average of 15% as a result of training.



Targeted Outcome: no information



Assessment Result: The training module was effective in educating inspectors about ID/IC program implementation.

Next Steps

This information can be used to modify training modules to make sure topics are being covered effectively. Pre- and post-survey results can be used to identify topics that are not covered sufficiently (no significant change in survey results), topics that are covered well (significant change in survey results), topics that don't need to be covered or questions that need to be modified (pre-survey score very high).

Source: For more information visit the Orange County website www.ocwatersheds.com and go to "Stormwater Program"

8.6 STORMWATER MANAGEMENT PROGRAM COMPONENT

Stormwater Management Program Component



1

Stormwater Program Activities

Level 1 assessment measures are often explicitly defined by permit requirements (minimum inspection frequencies for construction sites or commercial facilities, annual updates to source inventories, etc.). However, where they are not explicitly included within the stormwater permit, managers must set their own assessment measures by interpreting the types and degrees of program activity that are necessary to achieve a satisfactory level of performance and, to what degree, they want to track each of these items. Level 1 Outcomes provide program managers with feedback on how well the development and implementation of the SWMP is progressing and whether targeted goals are being met.

C

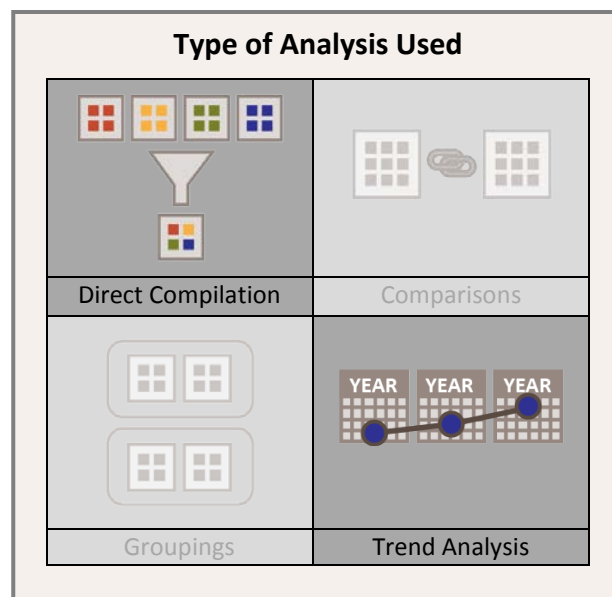
Construction Program Element

Indicators of effectiveness for construction would include confirmation that construction inspections are being conducted and that BMP implementation, corrective actions, and training have been documented.

Project

Fresno-Clovis Stormwater Quality Management Program (SWQMP):
Inspection Tracking

The Fresno Metropolitan Flood



Control District (District) developed and maintains a database to document the construction inspections. As a part of the program, they track:

- Number of inspections;
- Number of permit violations; and
- Number of corrective actions.

The District uses the data to modify training programs and public outreach campaigns according to the types and frequency of the inspection problems observed.

The District also maintains a construction training base database that not only tracks the training sessions conducted, but also has participant contact information that is used for regulation updates and training announcements.

- Over 228 people, including developers, site superintendents and city agencies attended the District’s construction training courses in fiscal year 2005-06 (this was a 63 % increase from FY 2004-05).

Assessment Result



Actual Outcome: The number of people receiving training increased 63% between 2004-2005 and 2005-2006.



Targeted Outcome: no information



Assessment Result: These results indicate that training is being conducted for more people.

Next Steps

The number of people trained could be compared to the number of people that should receive training to determine if training programs need to be expanded or continued at the current rate.

Source: 2005-06, Fresno/Clovis Storm Water Quality Management Program, Annual Progress Report - Section 5- Construction and Development. For more information contact FMFCD at info@fresnofloodcontrol.org

PE**Public Education Program Element**

Indicators of effectiveness for public education and outreach include tracking the number of impressions, tracking the number of brochures distributed, hits to the program website, and/or the number of volunteers marking storm drains.

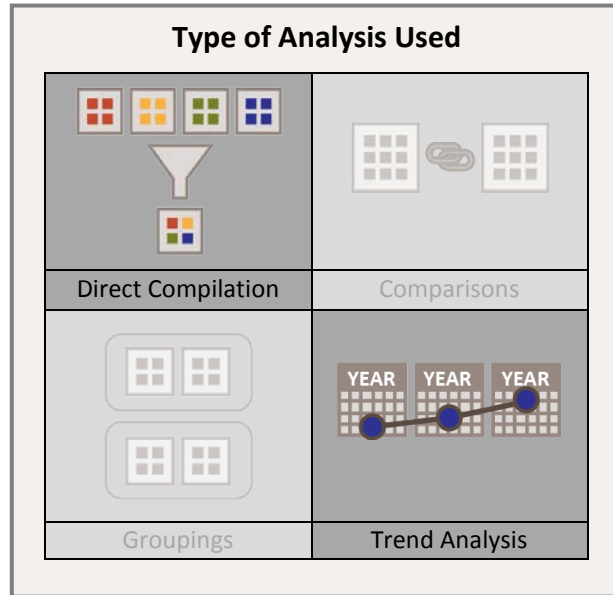
Project

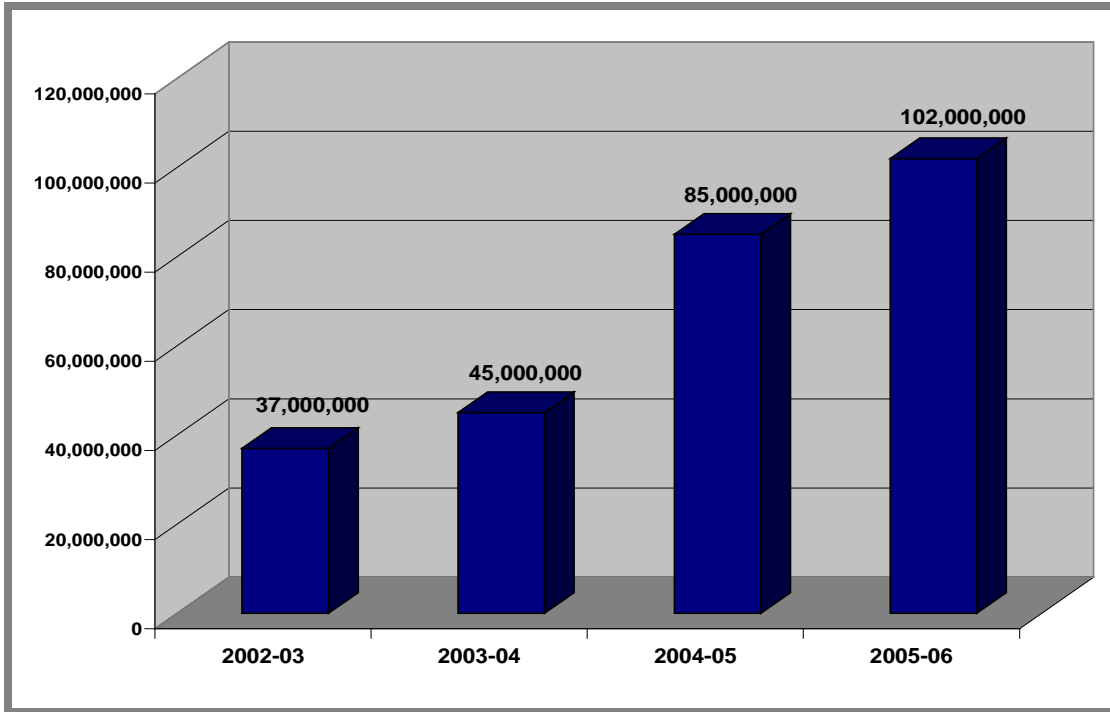
**Orange County Stormwater Program:
Impression Tracking**

The Santa Ana Region municipal stormwater permit requires the Permittees to target 100% of the residents, including businesses, commercial, and industrial establishments. Through the use of the local print, radio, and television, the Permittees must ensure that the public and business education program makes a minimum of 10 million impressions per year in the Santa Ana Regional Board area.

The Principal Permittee (the County of Orange) took the lead in developing and implementing a regional public education program on behalf of the 34 co-permittees. The regional program includes a media outreach campaign to reach a majority of the selected target groups. The media plan includes print, internet, bus, theater, cable, and radio advertising. The County also developed and implemented a non-media outreach plan which includes outreach materials for the co-permittees, business outreach, utility outreach, and media relations.

The countywide public education program created approximately 102 million impressions during 2005-2006, which was a 20% increase over the number of impressions created during the 2004-2005 time period. The public education program was developed, implemented and far exceeded the permit requirement of the 10 million impressions.





Number of Impressions

Assessment Result



Actual Outcome: The public education program created 37 million impression in 2002-03. This has increased to 102 million impressions over time.



Targeted Outcome: 10,000 million impressions



Assessment Result: The number of impressions regularly exceeds the targeted outcome and increased by a factor of approximately 2.5 over 4 years.

Next Steps

This information is used to indicate that the public education program is being implemented as required. This would indicate that there should be the information available to evaluate program effectiveness at higher outcome levels.

Source: 2005-2006 Unified Annual Report, Section 6 Public Education. For more information visit the Orange County website www.ocwatersheds.com and go to "Stormwater Program".

Indicators of effectiveness for industrial/commercial would include tracking the number of BMPs incorporated, or the number of sites inspected.

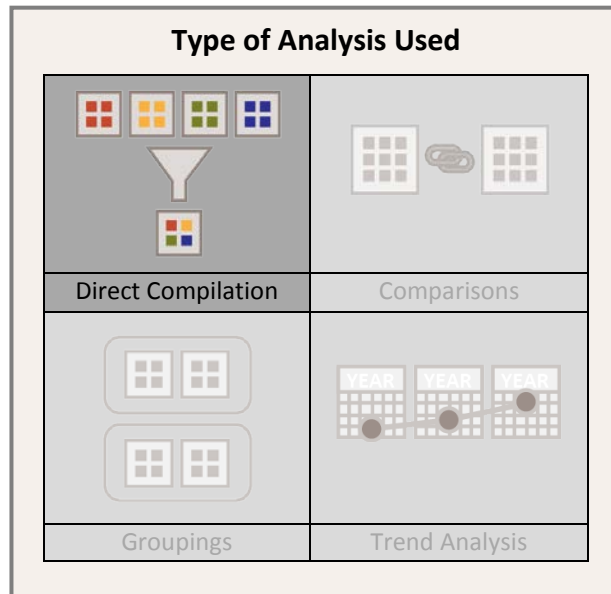
Project

County of Sacramento: Inspection Tracking

The Environmental Management Department (EMD) implements the County's industrial inspection program and has developed a database to track the implementation. Some of the results include:

- Conducted 385 inspections in Fiscal Year 2004-05
- Conducted 777 inspections in Fiscal Year 2005-06
 - Issued approximately 361 Notices of Violation
 - Handed outreach material to almost all business owners/operators during the inspections

EMD held two training classes where approximately 80 Sacramento County business operators/owners attended during the Fiscal Year 2005-06. In addition, the Business Environmental Resources Center (BERC) assisted 24 City of Sacramento businesses with stormwater related issues.



Assessment Result



Actual Outcome: The number of inspections conducted doubled between 2004-2005 and 2005-2006.



Targeted Outcome: no information



Assessment Result: EMD is conducting inspections and training to implement its program and reaching an increasing number of industrial facilities.

Next Steps

This information indicates EMD is utilizing a variety of strategies (inspections, training, resource center) to implement its industrial program. Comparison to the total number of industrial facilities in the service area would provide an indication of the portion of the target audience that is reached.

Source: <http://www.emd.saccounty.net/EnvHealth/Stormwater/Stormwater.html>

M

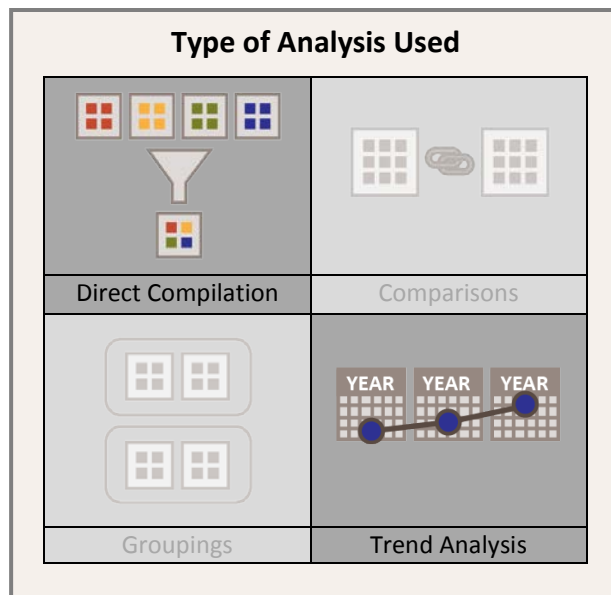
Municipal Program Element

Indicators of effectiveness for municipal operations would include confirmation that guidance has been developed, numbers and types of BMPs that are being implemented, and/or training sessions that have been conducted.

Project

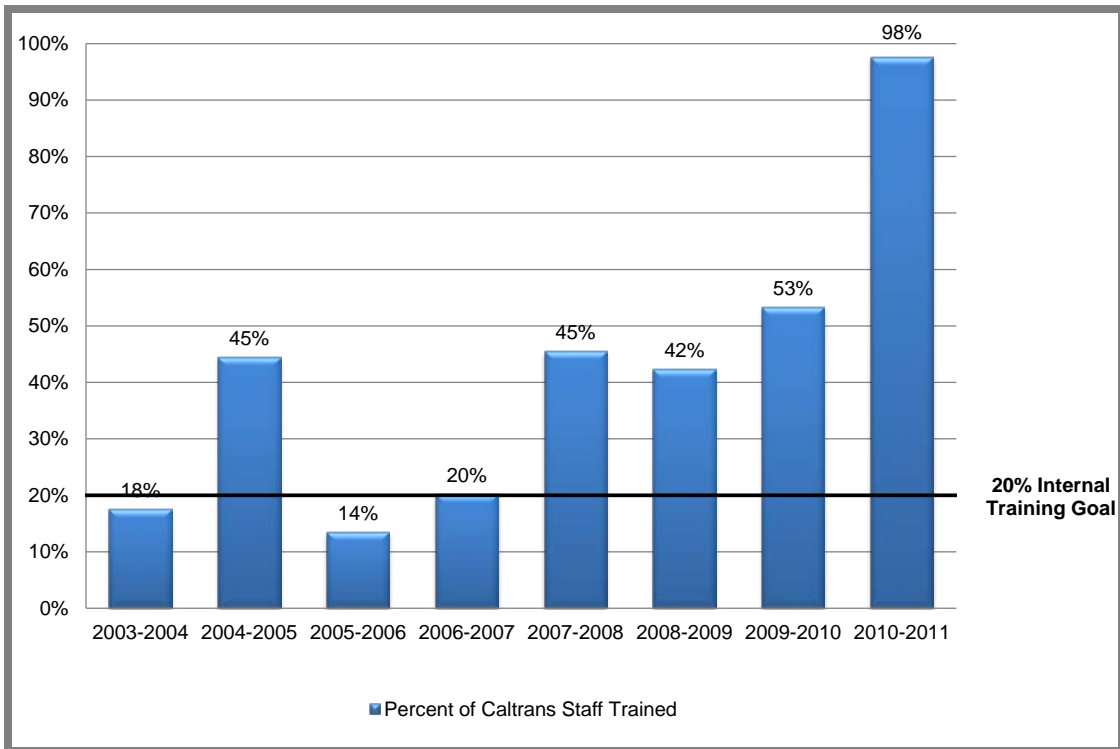
California Department of Transportation (Caltrans): Training Program

The training program goal is to train 20% of the Caltrans staff involved in stormwater during each fiscal year, with the entire staff trained over a five-year term. Both goals have been met.



Within the Division of Construction the following conclusions were noted:

- Eleven (11) training courses were provided to 2,930 employees (98% of staff).
- The focus of the courses included field applications, inspection procedures, dewatering operations, water quality sampling, water quality sampling and analysis, and elements of the SWPPP.
- Since 2003-2004, on average, 41% of the employees have been trained each year (some multiple times).



Construction Employee Training: Percent of Staff Trained by Fiscal Year

Assessment Result



Actual Outcome: Since 2007, 45% to 98% of staff have been trained annually. In 2010-11, eleven training courses were offered resulting in training 98% of staff.



Targeted Outcome: Train 20% of staff each fiscal year to result in training all staff every 5 years.



Assessment Result: Caltrans has exceeded its training goal every year since 2007.

Next Steps

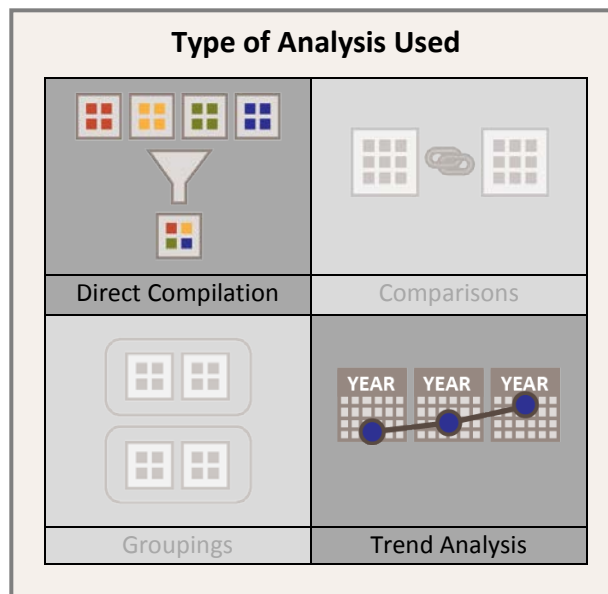
This information can be used to demonstrate that CalTrans is meeting its training goals. This would indicate that evaluation at higher outcome levels (particularly Levels 1 and 2) should be possible.

Source: April 2013 California Department of Transportation Statewide Stormwater Management Program Annual Report Fiscal Year 2011-2012. Chapter G Program Effectiveness Assessment. For more information visit the Caltrans website http://www.dot.ca.gov/hq/env/stormwater/annual_report/curent_ar.pdf

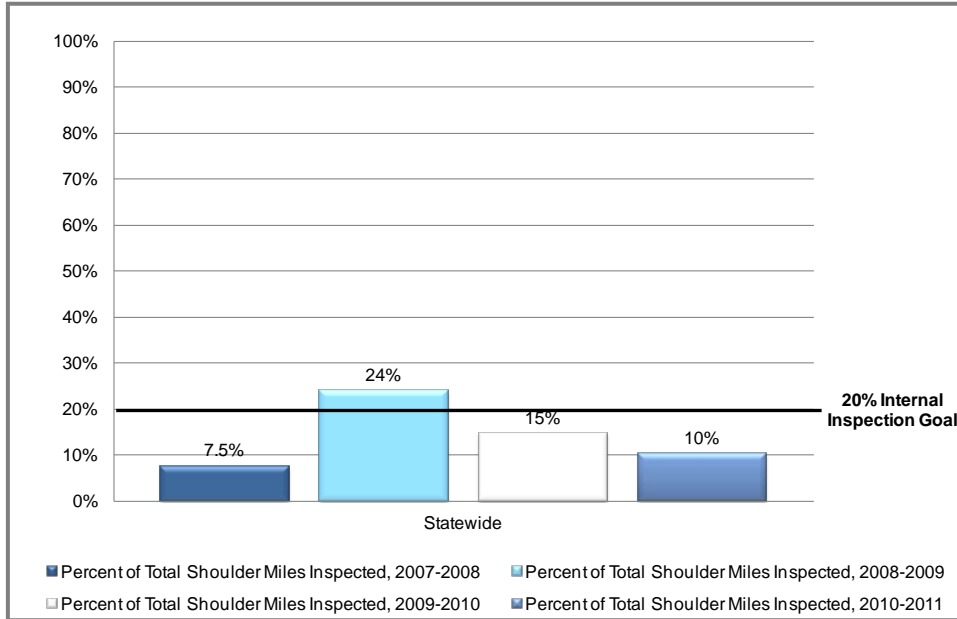
Project

California Department of Transportation (Caltrans): Vegetated Slope Inspections

Caltrans' Division of Maintenance has an ongoing program to inspect roadside vegetated slopes for erosion. The division has a self-imposed goal to inspect approximately 20% of the slopes in each District annually depending on weather conditions and work load priorities. The objective is to meet the SWMP requirement within the five-year period, even though there may be fluctuations in the actual percentage of inspections completed.



Statewide, the program goal was met some years and not others. During the assessment of this program, the goal may be revisited to see if it should be modified.



Slope Inspection: Percent of Shoulder Miles Inspected, Statewide

Assessment Result



Actual Outcome: Percent of shoulder miles inspected has ranged from 7.5% to 24%.



Targeted Outcome: Inspect 20% of slopes each fiscal year to result inspecting all slopes every 5 years.



Assessment Result: Caltrans has met this goal once since 2007-2008.

Next Steps

This information can be used to determine if the goal is realistic and if there are factors (e.g., weather, resources) prevent this goal from being achieved. Whether adequate information is obtained from the current inspection rate could also be evaluated.

Source: April 2013 California Department of Transportation Statewide Stormwater Management Program Annual Report Fiscal Year 2011-2012. Chapter G Program Effectiveness Assessment. For more information visit the Caltrans website

http://www.dot.ca.gov/hq/env/stormwater/annual_report/curent_ar.pdf