

**The Science Behind  
Managing  
Natural Resources  
in the Owens Valley**

**FACT SHEET 1:  
MONITORING VEGETATION  
CHANGE IN THE OWENS VALLEY**

City of Los Angeles  
Department of Water and Power  
March 2005

Understanding the complexity of vegetation change in the Owens Valley is important to the Los Angeles Department of Water and Power, the Inyo County Water Department, and many residents of the valley. It is a much more challenging task than it might first appear, and both agencies are dedicated to meeting the challenge.

The Department of Water and Power retained a highly respected team of biologists, scientists, hydrogeologists, and engineers with the global environmental consulting firm, MWH, to conduct a spectrum of research in the Owens Valley. The purpose of this effort is to bring the cutting-edge of science to answer important questions about managing natural resources including water and vegetation. MWH and the Department of Water and Power have conducted monitoring, studied the most current scientifically-accepted methods of monitoring vegetation change, and investigated vegetation trends in other parts of the Western United States seeking answers and better approaches.

This is the first in a series of fact sheets being prepared to share MWH's research findings with the residents of the Owens Valley. This fact sheet is a simplified summary of a more detailed white paper prepared by Terry McLendon, PhD, lead ecological researcher for MWH on the topic of monitoring vegetation change in the Owens Valley (McLendon, 2005). A series of public seminars will be held in 2005 so that members of the community can meet Dr. McLendon and learn more about MWH's research into the science of managing natural resources in the Owens Valley.



## MONITORING VEGETATION CHANGE

Vegetation is dynamic – it changes over time. From a land management standpoint, it is important to be able to evaluate these changes. And to do that, we have to be able to determine what the changes are. How to determine those changes, by using proper monitoring techniques, is the focus of this fact sheet.

### Facts about sampling vegetation for monitoring

A sample may provide a very good or very poor estimate of the overall population, depending upon how well the sampling procedure is designed and implemented.

- In sampling, scientists look at the **mean** (the average) and **variability** (an indication of how different from each other the sampled individuals are, such as the range in height of the stick-people shown below).
- Because it is usually not possible to measure every single individual in the population, sample results are analyzed using statistics to provide a better understanding of the likelihood that conclusions, based upon the samples, are reasonable.



- Both the Inyo County Water Department and Los Angeles Department of Water and Power sample vegetation in the Owens Valley. These agencies follow procedures outlined in the Green Book which has guided vegetation monitoring for many years.

Mean Value is the average value - in this case average height of the sampled population.

## MEASURING CHANGE OVER TIME

One of the most fundamental things we measure is “change over time.” Vegetation throughout the Owens Valley is a mosaic reflecting complex interactions of environmental factors across the landscape: water sources, temperatures, prevailing winds, and land uses among others. Scientists can monitor plants within designated parcels for different attributes: height, weight, productivity, cover, density and diversity. They can look at overall vegetation, individual plant species, or plant parts (such as leaves, stems, trunks, etc.) for signs of change over time.

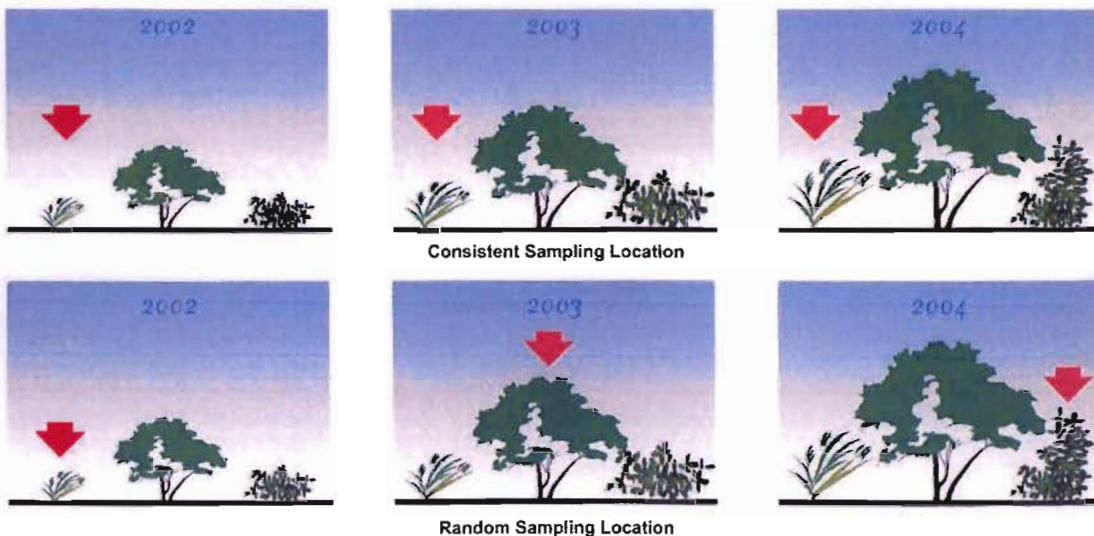
### Facts about monitoring consistency

To monitor for changes over time, scientists first establish where to take the samples within each of the designated parcels. When monitoring change over time, the first sampling sites within the parcels should be selected using a random process. Subsequently, for the most scientifically sound data collection, monitoring teams would return the same locations to measure changes in these plants year after year.

#### Importance of Returning to Monitor the Same Locations

When monitoring teams consistently monitor the same transect locations year after year, they can measure the change in vegetation over time. But, you can see in the illustrations at right, if monitoring teams measure different transect locations year after year, it is hard to make comparisons with any scientific accuracy.

↓ Sampling Location



## LINE-POINT TRANSECT METHOD OF MONITORING

The Green Book was developed jointly by the Inyo County Water Department and the Los Angeles Department of Water and Power as the technical guide for monitoring vegetation in the Owens Valley. The Green Book prescribes the line-point transect method of monitoring used by both agencies. It is a widely used method and accepted in the scientific community. The monitoring team stretches a 50-meter long tape between two points. The observer walks down the tape, and at each of 100 recording points along the tape, stops and records if live leaf cover is present and if so, identifies the species. The plant cover is then calculated for the site and for each species at that site.

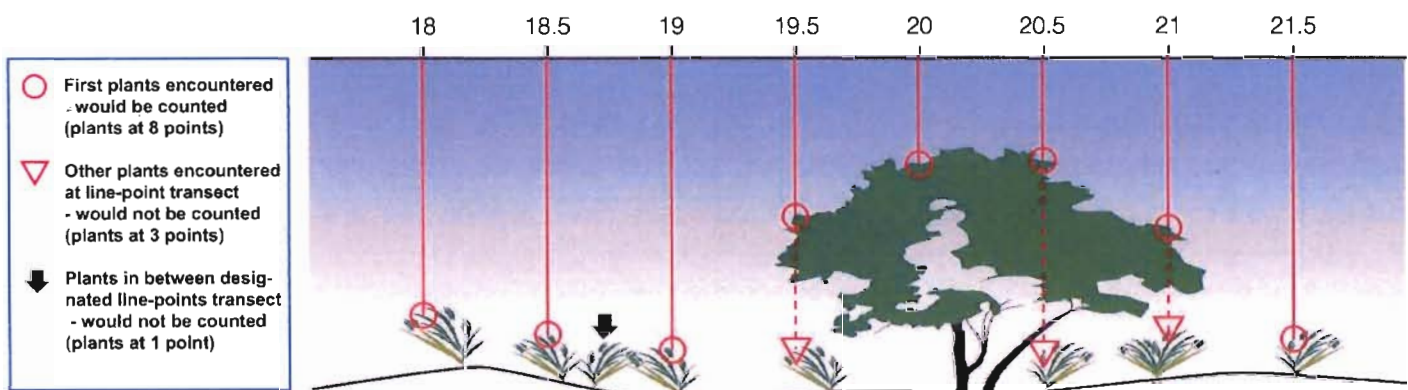
### Facts about the line-point transect method of monitoring

This type of monitoring has been done for approximately 20 years and has established a long record of measuring vegetation in the Owens Valley. There are several ways to improve upon the science behind the current practices that would give a much more accurate measurement of vegetation changes:

For example, only the first plant species encountered is currently being recorded, not all plants. A more accurate method would be to record every plant species encountered at the sampling point.

The accuracy of the line-point transect method under practical conditions is within about 2-3 percentage points. These limits in accuracy affect what conclusions should be drawn from the collected data.

### Monitoring “first plant” vs. “all plants” Encountered Along Line-Point Transect



## VEGETATION CHANGE IN THE OWENS VALLEY

Over 1700 parcels in the Owens Valley with native vegetation were mapped by the Los Angeles Department of Water and Power in the mid-1980s. These parcels occur throughout the Owens Valley. The focus of the current monitoring program, which was initiated in 1991, has been on parcels that are suspected of being impacted by groundwater pumping for comparison to parcels located outside of well field influence.

The Inyo County Water Department has collected vegetation data on 137 parcels since 1991. Of these, data have been collected each year since 1991 on 18, or less than 1% of the parcels with native vegetation. These 18 parcels represent areas that have been subjected to groundwater pumping (wellfield) and areas that have not been subjected to groundwater pumping (control). Total perennial cover on these parcels has fluctuated annually. Cover values have increased in some years on all 18 parcels and have decreased in some years on all 18 parcels. This is true of both wellfields and control parcels. Overall, sampled total perennial cover increased on the control parcels (not subjected to groundwater pumping) from an average of 16% in 1991 to 25% in 2003. The same increase was manifested on the wellfield parcels (16% in 1991 and 24% in 2003). The annual fluctuations in sampled total perennial cover on these 18 parcels are consistent with annual fluctuations in vegetation throughout the Great Basin region of the western United States.



## ADDITIONAL RESEARCH UNDERWAY

MWH has conducted extensive biological research in the Owens Valley for the Los Angeles Department of Water and Power for nearly four years. Several of the studies will be the topics of future fact sheets and upcoming public seminars. We will share the results of studies that have explored:

- Ecological succession
- The relationships of depth-to-water and vegetation
- How other ecological factors affect vegetation change
- Root architecture and water uptake

We want to understand why and how changes occur. We believe that residents of the Owens Valley do too. The Los Angeles Department of Water and Power has embarked upon a program to share research about resource management and measuring changes in vegetation in the Valley. If you would like to receive these fact sheets by mail, contact the Los Angeles Department of Water and Power, 300 Mandich Street, Bishop, California 93514; 760/872-1104; or on-line at [www.laaqueduct.com](http://www.laaqueduct.com).



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