

POLICY BRIEF: MOJAVE WATER CONSERVATION

Community Natural Resource Management

Spring 2008

Dawn Okerlund

PROBLEM CONTEXT

Altering the desert landscape throughout the Mojave Valley, such as planting grass and water-thirsty landscaping is one significantly noticeable issue of natural resource management within the Las Vegas community. Artificial landscaping in the Mojave Desert has strained desperately needed water resources as a result. Such that the local water supply of Lake Mead has been quickly depleted and the valley has been placed under a drought warning.

NATURAL RESOURCES**The Colorado River and Lake Mead**

Currently local water resources originate from the Colorado River and Lake Mead. The Colorado River drains a part of the arid regions on the western slope of the Rocky Mountains. The river's source is the La Poudre Pass Lake, located high in the Rocky Mountain National Park, just west of the Continental Divide. Below the Rocky Mountain National Park, the rivers course passes through numerous valleys and is then dammed to create a number of lakes and reservoirs. The river flows from its headwaters in the Rocky Mountain National Park through Colorado to Utah and into Arizona. Eventually reaching Hoover Dam, built during

the Great Depression to form Lake Mead. Lake Mead is known today as a popular recreation site as well as the supplier of the majority of the water for the city of Las Vegas and the Los Angeles Department of Water and Power. From Hoover Dam, the river flows south to form part of the boundary between Arizona and Nevada, and that between Arizona and California. Along the California-Arizona reach of the river, four additional dams are operated to divert water for agricultural irrigation and recreational purposes within the Imperial Valley.

Lake Mead is the largest man-made lake and reservoir in the United States. Located on the Colorado River about 30 miles southeast of Las Vegas it is divided between the states of Nevada and Arizona. Formed by water impounded by Hoover Dam, the lake extends 110 miles behind the dam and holds approximately 28.5 million acre feet of water. Water held in Lake Mead is released to communities within Nevada and in southern California via aqueducts.

It is believed that in 1983 a high-water mark or "bathtub ring", which appears white and shows the shoreline of Lake Mead, was not visible in photos. The bathtub ring is white due to the deposition of minerals on previously submerged surfaces. Estimates taken in early 2007 indicate the lake had been depleted to 50 percent of its capacity,

threatening to make the Las Vegas valley's primary raw water intake inoperable. Though a small rise which also occurred during 2007 temporarily eased the current crisis, projections point out that if the lake doesn't receive sufficient inflow during the spring of 2008 problems may arise later in the summer. Arrangements are currently underway to pipe water from elsewhere in Nevada by 2011. However, since the primary raw water intake at Lake Mead could become inoperable as soon as 2010 based on current drought conditions and user projections, this could spell potential disaster for Las Vegas.



Drought and Factors Influencing Water Conditions

Lake Mead draws a majority of its water from snow melt in the Western Colorado Rockies. Since 2000 the water level has been dropping at a fairly steady rate due to less than average snowfall and increasing demand. Further research early this year by the University of California in San Diego led analysts to conclude that if future climate continues to change as projected and water use is not curtailed, Lake Mead could dry up by 2021. Since early 2000, Lake Mead's water level has dropped nearly 100 feet,

intensifying the current drought alert, which Southern Nevada is experiencing. As a result, the Water Authority and other agencies have adopted a drought plan in an effort to survive the drought.

A few primary factors which have brought about this natural resource management issue, causing a dwindling water supply and creating unintended and unforeseen drought conditions, includes the significant population growth over a relatively short period of time. Another factor is the lack of regular precipitation and is currently estimated at approximately 4.5 inches annually. Other primary factors having an influence on the drought include an increasing transient population whose habits and lifestyles are unsuitable to desert living. These factors also include over demand and conflicting demands on the use of the local water supply as a resource by consumers.

Several secondary factors contributing to the issue of drought within the Mojave Valley include the need for improved cooperation between states and other agencies reliant on the Colorado River as a water resource. Particularly so that laws of the river can be improved and continue to provide future resources to the Mojave Desert. Other secondary factors include the lack of local water agencies offering incentive programs and a lack of public

education and awareness in regards to the need to reclaim water within the valley.

BEHAVIORAL OBJECTIVES AND CHARACTERISTICS

The idea of promoting new behavior could be the most fitting intended behavioral consequences ideal to this resource issue. There are a few characteristics which could potentially improve the natural resource condition in order to achieve these desired consequences. One such behavior includes focusing on a group based behavior such as encouraging government agencies and other local authorities to collaborate with one another more efficiently and effectively. Another behavior would include the implementation of incentive programs such as the Southern Nevada Water Authority offering rebates for a water smart landscape intended for an arid desert environment. Lastly a favorable behavior necessary to improve the current and future drought conditions includes providing educational awareness, particularly for demanding water consumers such as residential clientele, through marketing materials and advertisements.



In addition, a characteristic that would be considered

as both a complex and a routine non-dramatic focus might include a strategy such as establishing tiers for the cost of water usage through calculating a reasonable amount of consumption per household. Those exceeding that threshold would incur higher costs as they reach the next tier. Therefore the more one incurs, proportionately the cost would increase and has proven so with other utilities throughout the country over a number of decades.

POTENTIALLY EFFECTIVE IMPLEMENTATION STRATEGIES

There are numerous avenues for implementing public policy. Choosing just one approach towards executing a strategy suitable for this natural resource issue and expecting it to be effective would be wrong. With that in mind if only one were chosen, it would likely offer less potential for successful implementation of any policy that has been created. It could be recommended that multiple implementation strategies be in place and enacted upon simultaneously in order to have a worthwhile affect upon the local desert landscape.

There are several implementation strategies that could be considered to be useful when considering the current drought situation as the natural resource management issue within the Mojave Desert. A few of these implementation

strategies include the involvement of: markets, publicity and public awareness, taxation, and trade restrictions.

Markets

Considering the vehicles of markets as well as publicity and public awareness as implementation strategies would be a good foundation towards applying the needed change. Markets as the primary base implementation strategy could have the most significant affect on the current drought conditions within the Las Vegas community.

It is believed that direct incentives enable behavior or they require it as a qualification for rewards. It is also believed that market-based implementation mechanisms employ charges, rights, information, and rewards to influence the supply and demand for environmental goods and behaviors. Therefore, several market-oriented approached mechanisms would ideally be appropriate for potential implementation strategy, particularly those relating to product charges and/or credits, deposit-refund systems, and consumer information provisions.

Publicity and Public Awareness

The concept of publicity and public awareness such as the use of billboards, commercials and other advertisements

is also a potential choice for an implementation strategy in regards to the current drought throughout the Mojave Valley. One might think this would only be viewed as a pre-approach, significantly prior to a state of importance or urgency occurring. However, the level at which publicity and public awareness is placed moves higher on the implementation strategy choices once a crisis begins to evolve, such as drought. Many activists believe that knowledge leads to attitude change, which in turn, leads to behavior change. Although this theory generally rings true, it seems likely that it could take a significant amount of time for such a change to create an impact on a natural resource. Particularly when attempting to influence a large community or even a region as a whole over an exceptionally short period of time. A proactive implementation strategy such as this would likely have a higher success rate had it been pre-planned and implemented prior to any state of urgency arising.

SOCIAL CONTEXT

Considering the social context of the issues for water conservation within the Las Vegas Valley due to conflicting uses and high demands, salience as well as resource decision systems should be measured as key concerns. As a

result of population surges throughout the valley during the last decade increasing rates of water exhaustion have collided with a soaring demand for the local water supply and have begun to, almost simultaneously, create and increase salience for the necessity of this natural resource. The water supply being used in ways that are uncommon to a desert ecosystem, such as planting grass and water-thirsty landscaping, surprisingly appears to be a void of political conflict in the media's eye. Yet salience has developed into a state of urgency and near crisis, primarily brought on at a local scale within the Las Vegas Valley media, because of the unexpected water drought conditions. If a perceived intensity of the situation provides implementation opportunity, then the community seems to be limiting itself to the available number of mitigation strategies which it could execute due to the urgency of the situation.

POLICY CHANGE

Embedded Behaviors

Unlike most communities, the unincorporated areas of Clark County are more densely populated and the local County Commission tends to set precedence in the valley. Additionally, the valley does not as a community rely on

agriculture, ranching, mining, or industrial operations to support its economy which could also account for being a hindrance on the local water supply. Instead, the Mojave Valley heavily relies on tourism as the main economic source. Although, most of the larger mega casinos are self-sufficient to some extent and tourists tend to stay within those structures, a significant impact on the water supply stems from tourism. Relying on this type of economy, the community as a whole is growing in an effort to support that demand. As a result, local natural resources, primarily local water sources are continuing to feel the impacts. These impacts have indeed changed the local infrastructure and land in noticeable ways due to population growth over a short period of time. The significant impacts however are on the local water supply. This natural resource issue is unfortunately not immediately apparent, unless one goes out of their way to see the water level change. This transformation is commonly referred to as the "bathtub ring", where even an untrained eye can recognize the impacts of supply and demand.



Another challenge is that the Las Vegas Valley is also dealing with much of the policymaking taking place upstream

at the state and federal levels in regards to water rights and allotments to provide for our growing community. The community's dependency on local, state, and federal government policy and regulation is by far the most significant barrier to any potential transformation. Particularly, since the Las Vegas Valley is situated at the receiving end of the Colorado River and shares these water rights with numerous other states as well as Mexico.

Fortunately, the desire to change is not only an opportunity, but beginning to gradually take shape on a local level, through efforts made by the Southern Nevada Water Authority. With that, it would be ideal if policy makers and stakeholders continued to collaborate with one another in an effort to change behavior and their course of action during this time of challenge and take a hold of this as an opportunity. The question is whether or not reliance should be on government and if government should be challenged to enact more strenuously upon enforcing policies as an implementation strategy by way of policy pronouncement, legislative decree and regulation, or devolution of ownership and management.

Stakeholder Identification

Stakeholders within the Las Vegas community include individuals, groups, corporations, and entities which have an interest in the common water issues. These stakeholders could be classified into two groups: satellite stakeholders and nuclear stakeholders. Satellite stakeholders such as residents, individuals and corporations do not directly control resource policy but can apply outside pressure which leads nuclear stakeholders to create change.

Residents as satellite stakeholders may be concerned with existing and future water management practices locally or upstream as well as supply costs which they anticipate incurring. Individuals located downstream reliant upon the water source for agricultural irrigation and recreation purposes, in addition to those located outside the area planning to visit or relocate, would also be considered satellite stakeholders. Corporation and real estate investors may have a financial stake in policies that demand the supply of water from nearby water sources as well.

Nuclear stakeholders on the other hand are directly linked to water resource use and planning for future water allotments. Nuclear Stakeholders include those who have control over water resources needed to implement change

such as the Southern Nevada Water Authority and the Las Vegas Valley Water District. Nuclear stakeholders also include those who can mobilize local water resources to block it such as other states involved in the laws of the river.

Once the appropriate stakeholders have been identified an analysis could be formed as to whether or not they possess the necessary trait-taking characteristics which can be used to help create and execute change in the use and protection of the local water supply.

ALTERNATIVE ASSESSMENT

Depleting reservoirs and groundwater aquifers put water supplies, human health, and the environment at serious risk. Lower water levels lead to additional risks to include higher concentrations of natural contaminants such as radon and arsenic or human pollutants such as agricultural and chemical wastes. Using water more efficiently within the Las Vegas Valley to mitigate for drought helps maintain supplies at safe levels, protecting human health and the environment.

Appropriate strategies can be established through alternative assessments to keep water supplies available and safe. These might include assessments to reduce

depletion via alternatives such as the process of desalination of brackish ground water or sea water, in addition to the possible reclaiming of waste water. Additional alternatives may include strategies for reducing overuse by implementing or improving home water conservation and landscape water conservation efforts.

ALTERNATIVES TO REDUCE DEPLETION

Desalination of brackish ground water or sea water provides numerous benefits. For instance, according to the Southern Nevada Water Authority reverse osmosis technology already exists, desalination is not reliant on climate and can reduce the dependency on future importation of water. Adversely, disadvantages can also be an outcome of desalination such as high construction and operation costs, as well as high energy consumption.

Reclaiming waste water provides advantages which could potentially increase the amount of tangible water available to the Mojave Desert. It provides an important resource option for long-term planning and makes existing water supplies go further. Reclaiming treated waste water is also useful for



landscape irrigation, particularly for local golf courses, freeway medians, and cemeteries. Disadvantages of reclaiming waste water bring added costs, particularly since treatments may be required to meet specific health standards, as well as the cost of new piping to needed points of use. Safety considerations require that rigorous health-based standards for treatment are consistently met and that use restrictions are complied with, for example restrictions generally prohibit irrigation of a golf course during hours of use.

ALTERNATIVES TO REDUCE OVERUSE

Home water conservation as an alternative to reducing overuse of the local water supply brings added benefits to include the use of water-efficient appliances. The installation of faucet aerators and high efficiency shower heads, toilets, washing machines, and dishwashers reduce greenhouse gas emissions and can help address climate change. Added benefits include home water conservation alternatives which reduce the need for costly water supply infrastructure investments and new wastewater treatment facilities. Simple affordable adjustments such as replacing toilet flappers every few years can help reduce leaks. Using water more efficiently helps maintain supplies at

safe levels, protecting human health and the environment as a result. In addition, reducing the energy required to supply and treat public water supplies provides other advantages. In general, disadvantages of home water conservation seem minimal and can easily be incorporated into yearly home maintenance efforts such as listening for leaks and contracting a plumber for services. Another disadvantage might include the initial costs, although home water conservation returns long-lasting benefits.

Landscape water conservation benefits promote long-term sustainability of the local ecosystem. Through the use of water-smart landscaping, such as trading thirsty grass for water-smart plants, water consumers could earn an incentive credit for each square foot of turf removed plus long-term savings on water bills. Avoiding water waste and runoff by placing sprinklers and drippers on timers to a set cycle on assigned watering days and spacing cycles apart, would thereby reduce water lost to evaporation. Hand watering dry spots with a hose, rather than running the entire irrigation system, can reduce waste and additional unnecessary expenses. Checking sprinklers and dripper systems after each mowing for broken or misaligned parts which may be spraying everything but the landscaping would also help to conserve and reduce additional incurred costs.

Furthermore, using sprinklers on grass and efficient drip irrigation to water trees and shrubs separately provides water-smart efficiency. Using timers and adjusting irrigation clocks seasonally to comply with mandatory watering restrictions would also avoid unnecessary overwatering and water-waste fees.

Disadvantages of landscape water conservation include the need to have some kind of organization, structure, or retailer available after construction to supply users with spare parts and repair materials if needed. Although this is a disadvantage it is minor and is part of the general day-to-day property maintenance responsibilities residents must account for. Another is the need for required automated sprinklers and drippers with efficient watering timers requiring regular monitoring and repairs must be anticipated and could also be seen as a drawback. Additionally another disadvantage is that landscape water conservation can limit the landscape design to a narrow selection of suitable plants.

ALTERNATIVES TO INCREASING COST OF USE

Benefits of the alternatives to increasing cost of use would more closely reflect actual service related costs and consumption by the consumer. Where service charges could be

based on water meter sizes and water usage by the consumer is often a discretionary choice. Disadvantages are the periodic rate increases which would be applied through the use of tiers. These would incrementally escalate at each tier to burden heavier water users and minimize impacts to those consumers with low to moderate water use.

ALTERNATIVES TO PROVIDING EDUCATION

Educating consumers provides numerous benefits both to the water supply, local desert ecosystem, as well as current and future generations. In addition, public awareness provides positive communication and collaboration with the public, other agencies as well as states which share the natural resource and abide by the laws of the river. Drawbacks to providing educational awareness regarding water-smart landscaping in an effort to mitigate drought throughout includes obtaining ample funding, such as those needed for operating cost such as employing staff and purchasing materials.

CAPITAL RESOURCES

Social and Economic Capital

The human capital pressing undesired change upon the natural water resources of Lake Mead stems from the current

and rapidly increasing population within the surrounding valley as well as from those tourists drawn to the areas mega casinos and hotel resorts over the last decade.

The primary source of water for the entire Las Vegas Valley, such as those used for daily activities, originate from Lake Mead. Although Lake Mead is receiving its allotted Colorado River water from the Upper Basin states, as it has historically, it is the minimum allotted amount. Consequently, this is another reason why water levels have been dropping at a significantly greater rate in recent years. This consequence is also due to the amount of water flowing out of Lake Mead exceeding the amount of water flowing into Lake Mead.



In addition, to being home to thousands of desert plants and animals, adapted to survive in extreme temperatures with scarce rain (Table 1), the lake provides a hub of cultural activities for residents and visitors such as boating, fishing, swimming, and sunbathing. The surrounding watershed area is also a popular destination

for biking, hiking, golfing, horseback riding, wildlife photography, as well as Hoover Dam sightseeing. These activities provide the necessary social connection and a recreational outlet for the local community and visitors attracted to the scenic Mojave Desert landscape.

According to the Clark County Comprehensive Planning Department the valley had a total population of just over 1.1 million in 1996 and was estimated to have reached a little over 1.9 million by the year 2006, growing nearly 59% over a ten year time span. This increase averages to a growth rate of just below 5.9% each year. Estimates derived from the 2000 Census, indicated the state of Nevada's population was just at two million people in its entirety. With an expanding population and a real estate boom due to low interest loans, single family development has dramatically increased. Causing additional burdens and straining local water resources from the continued importation and planting of water-thirsty landscaping, golf course establishments and operations, and development activities.

Residents living in the Las Vegas Valley are primary employed by local mega casinos, hotels, tourist resorts, and entertainment venues. The valleys casino and hotel gaming industry provides lavish accommodations with theme

parks and unique settings. Many of which carry thousands of rooms and are believed to hold a 90% average daily occupancy rate. In 2000, the Las Vegas Convention and Visitors Authority reported approximately 124,270 available hotel/motel rooms. By 2003 this number had risen to nearly 130,500 and by 2006 had reached just over 132,600 rooms.



The Las Vegas gambling and entertainment scene drew 29.6 million people in 1996 and had increased to 35 million by 2001. In 2005 more than 3.8 million of those visitors were convention delegates. By the year 2006 demographers estimated that nearly 39 million people had visited that year and had brought in over 39 billion dollars to the local economy.

Even though tourism within the valley as an industry is an important aspect to residents economically and offers a strong employment foundation, its success has taken a drastic toll on the future and potential sustainability of the areas natural resources. At the expense of providing a prosperous 24 hour lifestyle, the toll has noticeably been on the local water supply as the valley's primary water resource.

REFLECTION

A goal of the Mojave Water Conservation policy brief is the identification and assessment for the demand and supply placed upon Lake Mead as the primary natural water resource. This resource provides for residents and tourists within the Las Vegas Valley as a daily foundation.

Pointing out Lake Mead's current declining water levels due to rapid population growth, increasing tourism, and scarce rainfall is vital to understanding the noticeable water depletion. Largely since these changes as well as the activities which accompany them, such as planting water-thirsty landscaping, have significantly impacted the regions current drought conditions.

Another purpose for this policy brief focuses on the identification of alternatives as potential implementation opportunities. Considering Las Vegas on a global scale and the need to maintain the current economy, policy makers and stakeholders together could easily apply several alternatives simultaneously to protect the dwindling water supply. Alternatives such as implementing a tiered cost system for water services could provide a necessary means of aiming towards sustainability. In addition, a tiered cost system could afford the necessary future financial

means to execute or at least research other potential alternatives such as desalination.

These alternatives could be opportunities of obtaining the sustainability of the resource in order to support the necessary daily needs of residents. Alternatives within this study, such as those intended to reduce overuse, could be drawn upon in an effort to create new policies and improve upon existing policies. Whereby stakeholders, such as the Southern Nevada Water Authority and other local governmental agencies, would be obligated to collaborate with one another as well as with citizens in an effort to restore and protect the water resource.

Additionally, key tools for fostering and implementing these alternatives requires the partnership and buy-in of stakeholders, to include citizens, in order to replenish the natural resource, such as those intended to reduce overuse of the water supply. Such collaboration could aid stakeholders in implementing needed change to restore and sustain the water as a usable resource. By creating new policies and improving upon existing policies, decision makers and officials are establishing an environment of cooperation in which stakeholders and citizens can together protect Lake Mead as a vital natural resource.

FIGURES AND TABLES

TABLE 1

CLARK COUNTY	1991	1996	2001	2003	2006
Population Overview					
Population*	829,839	1,119,708	1,498,274		1,912,654
Single Family Residential Homes**				56.1%	58.5%
Tourism Overview					
Number of Visitors***	N/A	29,636,000	35,017,000		38,915,000
Economic Impact***	N/A	\$22,533,257,000	\$31,907,492,000.00		\$39,419,206,000.00
Hotel/Motel Room Inventory***				130,482	132,605
Hotel/Motel Room Occupancy***				85.0%	89.7%
Climate Overview					
Average Annual Precipitation (inches)****	4.0	2.8	3.9	6.9	1.7

Source: Statistics primarily obtained from the 2004 and 2007 Las Vegas Perspective publications. Annual surveys conducted by the Center for Business and Economic Research (CBER). Data collected during the months of October and November 2003, November and December 2006, and January 2007.

* Clark County Comprehensive Planning.

** Las Vegas Perspective.

*** Las Vegas Convention & Visitors Authority.

**** National Weather Service

REFERENCES

- Anderson, Terry and Donald Leal. (1991). *Free Market Environmentalism*, San Francisco: Pacific Research Institute.
- Clark County (2008). Comprehensive Planning Department. *Demographics*. Retrieved April 19, 2008, from http://www.accessclarkcounty.com/depts/comprehensive_planning/
- Honadle, George. (1999). *How Context Matters: Linking Environmental Policy to People and Place*. Kumarian Press.
- Illia, Tony. (2007). *Rural Groundwater Pipeline Project Presses Ahead*. Las Vegas Business Press. Retrieved October 7, 2007.
- Monroe, Robert. (2008). *Lake Mead Could Be Dry by 2021*. Retrieved February 12, 2008, from University California San Diego, News Center <http://ucsdnews.ucsd.edu/newsrel/science/02-08LakeMead.asp>
- National Oceanic and Atmospheric Administration (2007). National Marine Sanctuaries. Maritime Heritage. *Lake Mead B-29*. Retrieved December 1, 2007, from <http://sanctuaries.noaa.gov/maritime/expeditions/b29.html>
- National Park Service. (n.d.). Retrieved February 15, 2008, from <http://www.nps.gov/lame/>
- Southern Nevada Water Authority. (n.d.). Retrieved February 1, 2008, from <http://www.snwa.com>
- Las Vegas Valley Water District. (2008). *10 Ways to Save, Being Water Smart Can Help You Save Water... And Money*. [Brochure].
- U.S. Census Bureau. (n.d.) American FactFinder. Retrieved April 19, 2008, from <http://www.census.gov/>
- 2004 Las Vegas Perspective. (2005). The Workforce of Growth. 6-18, 52-70.
- 2007 Las Vegas Perspective. (2008). World Class City.. Global Appeal. 6-19, 63-83.

Las Vegas Convention & Visitors Authority. (n.d.).
Retrieved April 18, 2008, from
<http://www.visitlasvegas.com/vegas/>

National Weather Service. (n.d.). Retrieved April 18, 2008,
from <http://www.nws.noaa.gov/>