

National Park Service

Lake Mead NRA Monitoring of Ground Disturbance; Illegal Tracks and Traces 2003-NPS-314-P-2004-07

Project Description

This proposal will help determine thresholds and triggers for management actions concerning illegal off-road vehicle travel. The park will survey by ground and air to discover and document new or previously unknown ORV disturbances. These will be recorded by GPS for input into the park's GIS and other database systems. In addition, small traffic counters will be placed in twenty selected locations and monitored monthly to determine correlation if any between destination site carrying-capacity and illegal off-road vehicle use.



Nevada Conservation Corp member reinstalling traffic counter after data collection.

Project Status

Data collection for this project is completed. All twenty roads with traffic counters have been monitored monthly since they were installed, except for a few months when several counters were washed out during spring flooding. These were replaced and continued to function and were monitored as per schedule. Illegal track discovery and documentation continued throughout the park.



GPS documentation of illegal off-road vehicle damage in desert pavement.

Partners

Nevada Conservation Corp., Great Basin Institute

Project Contact

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Funding Awarded

\$50,600

Funding Spent

\$50,600

Completion Date or Status

Data collection was completed December 31, 2005.

Products Produced from Project

The Lake Mead National Recreation Area disturbance GIS database will be updated with new disturbance data and correlating traffic data.

Introduction:

Lake Mead National Recreation Area encompasses almost 1.5 million acres of Mojave Desert surrounding the lower Colorado River system, including Lake Mead and Lake Mojave. The lakes cover a relatively small portion of the surface area, leaving almost 1.3 million terrestrial acres for recreational purposes, including hiking, camping, and desert exploration, accessible via over 500 miles of approved backcountry dirt roads. Surveys have shown a documented increase in illegal off-road vehicle trails over the last several years. While the numbers of vehicles with illegal operations is small in proportion to the total number of vehicles, even a relatively small number can cause significant damage.

Consequences of unmanaged or illegal soil disturbances are immediate, extensive, serious, and long-term. Mojave Desert soils are stabilized not so much by vascular plants as cryptobiotic crusts and a mosaic of rock mulch called desert pavement. Exposed soils are subsequently lost to wind and water erosion, removing all nutrients, microbiota, and seed in the process. Disturbances create opportunities for exotic and invasive plants to establish in previously clean areas. The development of illegal tracks off the existing approved routes or other existing disturbed areas in need of restoration are a visual invitation for others to do the same. Natural recovery after disturbance may take several decades to thousands of years without active restoration or other intervention.

This project address MSHCP Conservation/Management Action NPS(20) – Monitor traffic volume on roads and trails near sensitive resources as appropriate.

What measurable goals did you set for this project and what indicators did you use to measure your performance? To what extent has your project achieved these goals and levels of performance?

Deliverable #1: Quarterly reports will be submitted to the Clark County MSHCP Database.

Status: Completed; quarterly reports were submitted on 4/8/2004, 7/9/2004, 10/6/2004, 1/5/2005, 3/30/2005, 6/30/2005, 9/30/2005, and 12/30/2005.

Deliverable #2: Final Project Report will be submitted to the Clark County MSHCP Database.

Status: Completed; this report completes this deliverable.

Deliverable #3: Written and oral reports to the Clark County and/or the Implementation and Monitoring Committee upon request.

Status: Completed; no reports were requested.

Deliverable #4: Updated inventory of illegal roads and traces, in GIS format with attribute data will be made available to the HCP.

Status: Completed; all GIS and Access data was submitted to the MSHCP database April 27, 2006.

Deliverable #5: Analysis of change of acreage and rate of change in creation of illegal tracks and traces, with report to MSHCP.

Status: Completed; this report completes this deliverable.

Deliverable #6: Incidental inventory of significant ground disturbance from other sources such as burros, cattle and abandoned mines, in GIS format with attribute data available to MSHCP.

Status: Completed; All GIS and Access data was submitted to the MSHCP database April 27, 2006.

Deliverable #7: Coordinate with Science Advisor to review the monitoring strategy and revise strategy based on findings of the review and prior to implementation.

Status: Completed; met with Science Advisors Dennis Murphy and Ron Marlow on November 17, 2003.

Cumulative Progress Report – Significant Accomplishments

November, 2003: The question “How can status and trends of off-road vehicle (ORV) disturbance in response to specific management actions be accurately determined?” was discussed with Dennis Murphy and Ron Marlow from the University of Nevada Reno on November 17, 2003. This meeting was held to fulfill Deliverable #7: Coordinate with the Science Advisor to review the monitoring strategy and revise the strategy based on the findings of the review and prior to implementation.

Lake Mead NRA land area is very large (over one million acres), but with limited staff to survey and discover disturbance. Although several years have been spent searching for and documenting disturbance, it is difficult to find it all. When discovered, dates of disturbance are generally unknown. Remote sensing, although able to cover large areas quickly, does not have the precision to find ORV tracks before they become well established by subsequent use. Without proper information the effects of management actions (restoration, barriers, entrance stations, patrols, etc.) cannot be accurately determined. A systematic and accurate method of survey to develop a true picture of disturbance patterns over the years was needed.

Anecdotal evidence suggests that illegal ORV use is strongly associated with carrying capacity of lakeside recreation facilities (mostly beaches and remote campsites) and visitor use. Almost all illegal ORV trespasses also utilize the unpaved approved road system as a staging point. A method of survey that employed intensive ground survey and visitor use statistics over specific but limited areas was suggested. Lake Mead staff chose twenty areas for monthly

survey. These were not chosen randomly, but would cover known problem areas where disturbance was occurring and expected to increase, locations where problems were expected in the near future, and places where little ORV disturbance was anticipated.

These large survey plots were thoroughly searched in the beginning and all disturbance recorded. Small magnetic-type traffic counters were installed on specific areas of the staging roads in order to directly correlate traffic count with amount of subsequent ORV disturbance. This helped determine a use threshold which could initiate specific management actions in a given trouble area.

We anticipated that it would take a year to select plots, install traffic devices and develop survey protocol, and another to test and refine. At the end of the biennium, we should have an accurate and defensible ORV disturbance monitoring program that could be accomplished with limited staff. This was expected to be achieved with a single 2-year intern and vehicle using existing park GIS equipment and office space, supervised by the Lake Mead Arid-Land Restoration Program Lead.

March, 2004: A Nevada Conservation Corp (Great Basin Institute) intern was hired in March to begin work on April 19, 2004. His first several months were spent learning about the park, GIS and Arcview. He also assisted the Restoration Program Lead in development of project monitoring methods and protocols. He built upon the considerable disturbance database already documented and in use by park personnel. First quarterly report was submitted to MSHCP.

June, 2004: Second quarterly report was submitted to MSHCP.

September, 2004: Third quarterly report was submitted to MSHCP. Final locations for twenty traffic counters were determined. Maps and descriptions of these locations were created and are attached in Appendix One. All disturbances were documented before traffic counter installation. The locations are:

1. Callville Wash South Road (AR98) borders the Pinto Valley Wilderness Area on the south. Not a well-known spot but is experiencing increasing overnight use. It has limited illegal off-road incursions into the wilderness area.
2. Boxcar Cove Road (AR91) is an extremely popular day-use area, with moderate overnight use. This is a popular party location with heavy existing illegal off-road damage.
3. Upper Government Wash Road (AR87) is another extremely popular day-use, party, and overnight camping location. It also has heavy existing illegal off-road travel.

4. Muddy River Road (AR111) receives heavy use by the public visiting the Lost City ruins. Many of these visitors leave the approved road to drive directly into the ruins with ATVs and other 4-wheel drive vehicles. Recreational bulldozer activity also occurs occasionally.
5. Old Blue Point Bay Road (Closed) was closed and re-routed to the lake for safety and other reasons two years ago but still receives considerable trespass. Part of the old road was converted into a hike and horse trail which terminates at a spring popular with birders.
6. Burro Wash Road (AR60) borders the Black Canyon Wilderness on the south, and the Eldorado Wilderness on the north. Local off-road enthusiasts have established extensive illegal incursions into the Eldorado Wilderness by creating a large "racetrack" area near the river.
7. Placer Cove Road (AR47) is an extremely popular party and overnight spot. Graffiti, illegal off-road traffic, and other illegal activities are common.
8. Fire Mountain Road (AR44) has experienced a tremendous increase in visitors and off road traffic over the last few years. It is a popular camping, fishing, and PWC launching location. It also has significant cultural resources which are being heavily impacted by increased visitor use and subsequent illegal off-road traffic.
9. Six Mile Cove Road (AR31) is a popular overnight use and fishing area. Illegal off-road traffic both north and south of this area is common.
10. North Pipe Springs Road (Off AR20) is a popular route for hunters to access the Spirit Mountain Wilderness Area. Many visitors leave the approved route and are creating illegal routes closer to the base of Spirit Mountain, a designated Traditional Cultural Property.
11. Sand Mine Road (AR110) receives moderate use, mostly due to road conditions. However, traffic is increasing because of visitation to emerging ruins.
12. St. Thomas Road (AR109) used to receive moderate use, but is now experiencing heavy use because of visitation to emerging ruins.
13. Fire Cove Road (AR106) receives moderate use, mostly due to road conditions.
14. Boathouse Cove Road (AR97) is bordered on the north by the Jimbilnan Wilderness area, and on the south by the Pinto Valley Wilderness area. Receives low use.

15. Canyon Point Road (AR58) is a popular party and target shooting area with increasing use and a lot of trash. It is cherry-stemmed into the Black Canyon Wilderness.

16. Yucca Camp Road (AR51) is a popular hunting road and receives low to moderate use. It is cherry-stemmed into the Eldorado Wilderness, but is being illegally extended by off-road travel.

17. Montana Wash Road (AR45) terminates into Morning Star Cove. It receives low to moderate use. This cove sits between two very popular spots and is getting increasing use.

18. Opal Mountain Rd (AR33) terminates into 33 Cove. It is bordered by the Ireteba Peaks Wilderness on the north and receives low use.

19. Sandy Wash Road (AR25) terminates into Clam Cove. It receives low use.

20. Empire Wash Road (AR22) is bordered on the north by the Nellis Wash Wilderness area, and on the south by the Spirit Mountain Wilderness area. It receives low use, but is the primary access route for several remote Lake Mojave coves.

October, 2004: Obtained and tested traffic counters. Developed SOP for programming, installation, and data collection. Developed spreadsheets and monitoring forms. Documented disturbance and installed counters on AR22, 25, 31, and 33.

November, 2004: Documented disturbance and installed traffic counters on AR20 (Pipe Springs Rd), 44, 45, 47, 60, 58, 51, 87, 91, 97, and 98. Removed trash from AR45. Removed graffiti on AR47 and 45. Installed barrier on AR44. Checked all installed sites for traffic count and disturbance. Battery failure on AR25.

December, 2004: Documented disturbance and installed counters on AR106, 108, 109, 110, and 111. Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Battery failure on AR45, 51, 58, 60, 87, and 91. Counter failure on AR44 and 47. Made minor corrections to documentation sheets. Fourth quarterly report was submitted to MSHCP.

January, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Battery failure on AR47, 60, and 106. Removed trash on AR47. Documented and repaired disturbances on AR51 and 60. Counter on AR91 flooded out and re-installed. AR109 and 111 closed due to flooding. Installed barrier on AR60.

February, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Installed barrier on AR20 (Pipe Springs Rd). Removed graffiti from AR20 area. Counter malfunction on AR87. Installed barrier and rehabbed disturbances on AR97. Battery failure on AR97 and 98. Signs shot out on AR58. Recorded new disturbance on AR106. AR111 closed due to flooding.

March, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Counter malfunction on AR87, believed to be from overhead power lines. Counter on AR87 was removed but disturbances were still recorded. Removed graffiti from AR47. Rehabbed disturbances on AR109. AR111 closed due to flooding. Fifth quarterly report was submitted to MSHCP.

April, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Battery failure on AR45. Removed trash from AR45 and 47. Replaced malfunctioning traffic counter on AR22. Replaced missing counter on AR44. Could not locate counter on AR47. Signs shot up on AR58. Replaced barrier on AR106. AR111 closed due to flooding.

May, 2005: Gave PowerPoint presentation to Law Enforcement Rangers on the monitoring program and traffic study. Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Installed sign on AR20. Picked up a lot of trash off AR45. Installed barrier on AR59. AR111 closed due to flooding. Trained on new Arcmap software.

June, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Modified SOP for traffic counter functions. Repaired barriers and rehabbed disturbances on AR111, now open. Picked up a lot of trash at AR45 and 47. Repaired barriers at AR44, 45, and 47. Removed graffiti from AR47. Counters missing from AR58 and 91. Sixth quarterly report was submitted to MSHCP.

July, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Counter missing on AR47. Repaired barrier on AR60. Removed trash at AR25 and 31. Developing sign inventory database.

August, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Battery failure on AR44 and 58. Extended barrier at AR20 (Pipe Springs Rd). Repaired barrier at AR60 twice. Repaired barrier and removed trash from AR44. Replaced traffic counters on AR22, 25, and 31 that were washed or graded away.

September, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Field tested new GPS units.

Repaired barriers on AR60, 106, and 111. Seventh quarterly report was submitted to MSHCP.

October, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Installed barrier for AR58. Removed graffiti on AR47.

November, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Traffic counter failure on AR31 and 58. Installed new signs on AR108 and 111. Repaired barrier on AR111.

December, 2005: Checked all installed sites for traffic count and disturbance. Checked and replaced batteries as needed. Counter missing on AR44 and 91. Repaired barrier on AR60. Repaired disturbance on AR51 and 58. Removed graffiti and trash from AR44, 45, and 47. Eighth quarterly report was submitted to MSHCP.

All maps and locations of trespasses and other disturbances are attached in Appendix Two. The actual GIS and Access databases were submitted to the Clark County MSHCP database on April 27, 2006. SOPs and other supplemental information are attached in Appendix Three.

Due to the sporadic and unreliable nature of traffic data collected, we are unable to run accurate statistical analysis. Further discussion of this occurs below under the "Challenges" section of this report. However, two areas of the park seem to be "hot spots" for repeated off-road violations at this time. These are the Muddy River Access Road (AR111) and The Burro Wash Road (AR60). They seem to have repeated disturbances way out of proportion to their traffic counter numbers. We suspect that this is due to the high number of motorcycles, dirt bikes, and ATVs currently used on these roads. They are very rough and difficult roads for law enforcement to patrol on a frequent basis, but smaller vehicles have no problem navigating them. The difficulty of obtaining an accurate count of these smaller vehicles is also discussed under "Challenges" below.

The chart below is a summary of traffic counts in relation to disturbances for each of the twenty roads in this study.

AR Name & #	Number of Visitors(Oct-April) *Total is Average visitor per month (2004-2005)	Number of Visitors(May-Sept) *Total is Average visitor per month (2004-2005)	Total of New Disturbances	Total Redisturbances
Muddy River Access/111	61	15	8	12
Sand Mine/110	17	12	0	0
Old St. Thomas/109	172	116	0	0

Old Blue Point/108	0	0.02	0	1
Fire Cove/106	21	52	3	8
Callville Wash/98	13	36	0	0
Boathouse Cove/97	38	37	0	0
Box Car/91	48	297	3	1
Government Wash/87	NA	NA	1	0
Burro Wash/60	27	62	2	over 100
Canyon Point/58	51	59	3	8
Yucca Camp/51	7	4	5	4
Placer Cove/47	62	1384	19	15
Montana Wash/45	18	48	2	4
Fire Mtn Cove/44	18	35	6	2
Opal Mtn. Road/33	0.5	2	3	5
Six Mile Cove/31	73	475	5	7
Sandy Wash/25	7	13	1	0
Empire Wash/22	12	6	1	0
N. Pipe Springs/ AR 20	25	24	2	9

Did the project encounter internal or external challenges? How were they addressed? Was there something Clark County could have done to assist you? What lessons did you learn from undertaking this project?

We encountered several challenges during implementation of this project. One of the most frustrating was that this particular model of traffic counter seemed prone to computer failure and battery failure. We initially thought it would be a good choice because it could be buried and completely hidden from view, helping to prevent the counters from being stolen or vandalized. However, we now think that the electronic components were not insulated well enough from heat, vibration, and dust to make them reliable for our use. The batteries were also very small although were supposed to last three to four months, but required changing every six to eight weeks. There was no way to tell battery charge level, so if we missed it by even a day, we lost all data for that period. The Government Wash Road power lines severely interfered with this model's data collection process and this data was discarded.

We also lost several counters to flash flooding, vehicle damage, and vandalism. A few of the flooded counters were recovered with metal detectors downstream from their installed locations, but data was lost. Several were run over by visitor vehicles or road maintenance operations and destroyed. Several counters were never recovered and it is unknown whether they were removed by visitors or deeply buried by flood events. After the first road grader incident we asked the

operator to call us the day before so we could remove the counter for that day, and this prevented further counter loss from that cause.

Another problem with this particular counter design was that unless the vehicle actually ran over that particular installation location, the vehicle was not counted. None of the roads where these were installed have control markings or striping, and depending on traffic load, drivers are free to wander from one side to the other. This happens primarily because some stretches of the road are worse than others and most drivers choose the easiest driving portion. They may drive on the "wrong" side for considerable distances simply because it is easier and traffic load allows them to do so. This is particularly true with ATVs and motorcycles, and may result in substantial undercount in some locations.

We intend to mitigate these hardware challenges by using a different type of counter that uses a buried cable with a remote box for data collection. Batteries are larger and more reliable, and data collection components can be placed far out of danger from flash flooding, road grading, and vandalism.

A logistical challenge was that it was sometimes difficult to check the areas at the same time every month. This did not matter for traffic counter data which is date-specific, but did mean we had a larger window for off-road vehicle disturbance. It was harder to pin-point when damage actually occurred. Future studies of traffic patterns will require more consistent collection events and therefore require more personnel to accomplish.

Due to inconsistent data collection we cannot run statistical analysis on the data collected. However, we will use this experience to devise another study similar in nature but more rigorous and amenable to accurate analysis. This study is currently being devised with the help of the Public Lands Institute at University of Nevada, Las Vegas, and will be implemented as soon as funding is available.

What impact do you think the project has had to date?

Even though counter statistics may be lower than actual traffic due to counter placement and malfunctions, the statistics themselves are more than anticipated in several locations. This may impact internal operations in regards to law enforcement patrols, maintenance operations, etc. Methods must be improved and refined before publication or use by other agencies can occur.

Is there additional research or efforts that would complement or add to your project that could be conducted?

We will be conducting the new traffic study in conjunction with another study which monitors road and informational sign conditions in conjunction with off-road vehicle damage. This is also being devised with the help of the Public Lands Institute.

Literature Cited

There is no literature cited for this report.