



Monitoring of Illegal Ground Disturbances in Response to Management Actions
2008-2010
For
Clark County, Nevada and the Multiple Species Habitat Conservation Plan

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Agency Organization: National Park Service- Lake Mead National Recreation Area

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Executive Summary

The goal of this project was to help mitigate impacts from illegal off road vehicle (ORV) activities by providing data collection support and effectiveness monitoring for the Lake Mead National Recreation Area (LMNRA) restoration program and provide vital and timely information to Lake Mead National Recreation Area law enforcement and management staff. The major objectives of the Monitoring of Illegal Ground Disturbance in Response to Management Action were to: (1) collect traffic counter data from 18 approved roads on the Nevada side of LMNRA; (2) assess and collect data from illegal ground disturbances on the 18 approved roads; and (3) inform restoration manager, law enforcement and management of illegal ground disturbances. The 18 traffic counters were evenly spread throughout the Nevada side of the Lake Mead National Recreation Area.

During the summer months, roads that provided lake access had higher vehicle use, while during the winter months, roads that provided access to outdoor recreating activities not associated with water activities, such as hiking trails, had higher vehicle use. Similarly, in the summer months, more disturbances occurred near the lake, particularly graffiti, while in the winter months, more upland disturbances occurred, such as off-roading and barrier breaches.

During the two years of this project, National Park Service personnel have accomplished the following:

- Monitored 18 roads every month for two years (with the exception of AR 106, closed for the Northshore Road Reconstruction Project FROM October 2008 to March 2010)
- Informed National Park Service Law Enforcement about any illegal disturbance
- Restored 5.2 miles and 9.0 acres of illegal roads, tracks, and traces

Introduction

Description of the Project

“Off-road vehicles pose a growing threat to our natural heritage of public lands. At risk is the capacity of these lands to provide us with their many important benefits. We want them to provide habitat to wildlife and endangered species; catchments for clean and healthy drinking water; a variety of recreational opportunities and solitude. Each of these benefits is threatened by the growing use of off-road vehicles on public land.”(Pica, Smith, Kripke, 1998) Lake Mead National Recreation Area has limited staff to intensively manage a large land area of over one million acres. Resource management staff has spent several years prior to this project searching for and documenting off-road vehicle disturbances, but timeframes of occurrences were largely unknown. Without this information, whether management actions (restoration, barriers, entrance stations, patrols, etc.) are positively, neutrally, or negatively affecting the rate of new disturbances cannot be accurately determined. A systematic and accurate way of surveying was needed to develop a true picture of disturbance patterns over the years. Remote sensing, although able to cover large areas quickly, does not have the precision to find off-road vehicle tracks before they become well established by subsequent use. Furthermore, remote-sensing is not updated quickly or often enough to determine timeframes accurately.

Impacts associated with illegal off-road travel are identified in the MSHCP as significant threats, causing habitat fragmentation and degradation, direct mortality of covered species, and expansion of weeds. “ORVs frequently trample, crush, uproot, and otherwise directly damage plants and their root systems. In addition to destroying vegetation directly, the weight of ORV’s compact soil, which hinders the ability of roots to penetrate and exacerbates the damage to vegetation. The compaction causes soil to become denser and less porous, less permeable to water and air. These impacts disrupt critical hydrological flows and nutrient cycling, making it more difficult for vegetation to establish and grow.” (Pica, Smith, Kripke, 1998) This project will help mitigate these impacts by providing data collection support and effectiveness monitoring for the park’s restoration program and providing vital and timely information to park law enforcement and management staff. The approved roads that were selected for this study are as follows:

- Muddy River Road (AR 111)
- Sand Mine Road (AR 110)
- Fire Cove Road (AR 106)

- Callville Wash South Road (AR 098)
- Callville Wash North Road (AR 094)
- Boathouse Cove Road (AR 097)
- Burro Wash Road (AR 060)
- Yucca Camp Road (AR 051)
- Boy Scout Canyon Road (AR 059)
- Placer Cove Road (AR 047)
- Montana Wash Road (AR 045)
- Fire Mountain Road (AR 044)
- Six Mile Cove Road (AR 031)
- Mid-Basin Road (AR 028)
- Nellis Cove Road (AR 024)
- West River Mountains Road (AR 154)
- River Mountains South Powerline Road (AR 155)
- Pipe Springs Road (AR 020A)

Background and Need for the Project

This project was a continuation of previously funded MSHCP project 2003-NPS-314-P. This project provided logistical and data collection support for Lake Mead's restoration program and provided information for law enforcement and staff management decisions. The restoration manager acted as a liaison with the Bureau of Land Management and helped develop a common data dictionary and methodology for assessment. The restoration manager also prepared reports for park law enforcement and management staff for input into the Interagency Recreation and Off Highway Vehicle (OHV) Conservation Initiatives and Annual Project Review to the Adaptive Management Science Team. These reports included a quantitative description of activities and proposed upcoming activities.

Anecdotal evidence suggests that illegal off road vehicle use is strongly associated with carrying capacity of lakeside recreation facilities (mostly beaches and remote campsites) and amount of visitor use. Almost all illegal ORV trespasses occur off of the park's backcountry approved road system. Lake Mead staff implemented a method of

survey that employs intensive ground survey and visitor use statistics over specific but limited areas. In the previous study, twenty areas were selected for intensive survey on a monthly basis. These areas were specifically chosen because they fell into one of three categories: 1. Problem areas where disturbances were expected to increase, 2. Potential future problem areas or 3. Non-problem areas that were expected to have little future ORV disturbance. The majority of these sites continued to be surveyed as part of this project. These large survey areas were thoroughly searched and all disturbances recorded as part of the previous project. Traffic counters were installed on specific areas of the approved roads to directly correlate vehicle use with amount of subsequent ORV disturbances. This allows a use threshold or carrying capacity to be determined whereby specific management actions can be initiated in a given problem area. Information concerning ongoing restoration and law enforcement activities was integrated to determine what effects if any they had on subsequent rate of disturbances.

Goals and Objectives of the Project

The goals of this project were as follows:

- Goal #1: Discover incidents of ORV disturbances on a timely basis before they become established illegal routes.
- Goal #2: Provide timely and accurate information to law enforcement and the restoration program that will result in more effective management in the selected areas.
- Goal #3: Provide timely and accurate visitor information to help determine long-term management strategies for the park.

Management Actions and Threats Addressed

- Conservation/Management NPS(20) - Monitor traffic volume on road and trails near sensitive resources as appropriate.
- Ecosystem Threat 401 - habitat degradation and modification and indirect effects on species due to dispersed recreational activities (trampling of plants and soil by hunters, hikers, campers, mountain bikers, and equestrians); trail construction and maintenance
- Ecosystem Threat 402 - habitat degradation and modification resulting from concentrated recreation (camping, ski area expansion, facilities development)
- Ecosystem Threat 403 - habitat modification and degradation and wildlife mortality from competitive OHV races

- Ecosystem Threat 503 -habitat fragmentation and destruction by roads and trails

Methods and Materials

Traffic Counters

There were two types of traffic counters used during this project: nu-metric vehicle magnetic imaging traffic counter model NC 30x (nu-metric counter) and TRAFx generation II vehicle counters (TRAFx counter). Table 1 contains information on the type of traffic counter used on each road. The nu-metric counters were used in the previous project: 2003-NPS-314-P, and were found to be inefficient and easily lost. Problems with the nu-metric counters are more thoroughly discussed later. In response to these problems, TRAFx counters were tested on a few roads while the nu-metric counters were being used. After testing the TRAFx counters for a few months on select roads, the nu-metric counters were replaced with TRAFx counters for the remainder of the 2005-NPS-526 project as specified in Table 2.

TABLE 1. Traffic Counter types with pictures



Type of Traffic Counter	Picture of Traffic Counter
<p>nu-metric Model NC 30x</p>	
<p>TRAFx Generation II Vehicle Counters</p>	

Table 2. Dates the different Traffic Counters were used on Approved Roads

Approved Road	Vehicle Magnetic Imaging Traffic Counter Model NC 30x (Dates)	TRAFx Generation II Vehicle Counters (Dates)
AR 20A	05/2008-12/01/2008	12/01/2008-3/11/2010
AR 44	05/2008-12/03/2008	12/03/2008-03/03/2010
AR 45	05/2008-12/03/2008	12/03/2008-03/03/2010
AR 47	05/2008-12/03/2008	12/03/2008-03/03/2010
AR 24	05/2008-11/10/2008	11/10/2008-03/02/2010
AR 28	05/2008-11/10/2008	11/10/2008-03/02/2010
AR 31	N/A	05/06/2008-03/02/2010
AR 51	05/2008-11/13/2008	11/13/2008-03/04/2010
AR 59	N/A	11/13/2008-03/04/2010
AR 60	05/2008-11/13/2008	11/13/2008-03/04/2010
AR 94	05/2008-07/17/2008	07/17/2008-03/08/2010
AR 97	05/2008-11/20/2008	11/20/2008-03/08/2010
AR 98	05/2008-11/20/2008	11/20/2008-03/08/2010
AR 154	05/2008-11/24/2008	11/24/2008-03/10/2010
AR 155	05/2008-11/24/2008	11/24/2008-03/10/2010
AR 106	05/2008-10/2008	N/A
AR 110	05/2008-11/25/2008	11/25/2008-03/17/2010
AR 111	05/2008-11/25/2008	11/25/2008-03/17/2010

The two types of traffic counters each used a different data collection method. The nu-metric counter's data were manually collected from the traffic counter using the traffic counter data collection form following the nu-metric standard operating procedure (appendix 2 and 7). The TRAFx counters' data were electronically collected with a docking station following TRAFx standard operating procedure (Appendix 3).

Problems have arisen with both traffic counter systems. However, the problems with the TRAFx counters were largely due to human error and easily corrected with technical assistance while the nu-metric counters problems were inherent to the units and were not easily corrected. Some of the reasons the nu-metric counters were replaced with TRAFx counters are listed below:

1. The nu-metric system had a very short battery life (1 month) and the data would be lost if the battery died. The TRAFx counters' battery life was over 13 months, and data was not lost if the battery died.
2. The nu-metric batteries (approximately \$5.00/battery) were more expensive than the TRAFx batteries (approximately \$1.00/battery).
3. The nu-metric counters were placed approximately 2 inches under the soil surface, making them susceptible to loss from road grading or wash outs after rains. Due to this design, the nu-metric counters had a limited detection area i.e. they only recorded vehicles that drove over them. The TRAFx counters were not as susceptible to loss because due to their design they could be hidden off on the side of the road in areas of high vegetations and could be elevated out of areas that could potentially wash out. Due to this design, the TRAFx counters had an expanded detection area i.e. they could be set to record any vehicle traffic within a 16.5 foot radius of the counter.

For either counter type, vehicle counts could be affected by visitors driving off-road due to washouts, rough road or other deliberate off-road travel. For instance, if a vehicle avoided a wash-out next to the traffic counter, the vehicle may not go over the nu-metric counter or may go outside the 16.5 foot radius of the TRAFx counter resulting in an incorrect lower traffic count for that road.

One problem with the TRAFx counter was that if the dock station was removed incorrectly from the counter, the counter would turn off. The fact that it had turned off would not be discovered until the next monthly check. This problem was resolved by learning that the counter's status light should blink rapidly after removing the dock station. The rapid blinking indicated that the traffic counter was turned on and was ready to start collecting data. In the long run even though the TRAFx Counters were initially more expensive than the nu-metric counters; they were still more cost effective

than the nu-metric counters due to their less expensive batteries, and the personnel time saved from not having to locate lost traffic counters or retrieve traffic counters with lost data.

Monitoring and Data Collection

Every backcountry approved road on the Nevada side of Lake Mead National Recreation Area was assessed in selecting the location of the 18 traffic counters for this study. The selection process took into account roads that were heavily traveled, lightly traveled, heavily disturbed, lightly disturbed, near cities (Boulder City, Henderson, Overton, etc.), and far from cities. All roads selected for this project were categorized as 4x4 recommended.

For monthly road monitoring and traffic counter checks, the disturbance monitoring standard operating procedure was followed (Appendix 1). Backcountry road monitoring trucks were equipped with project and safety supplies as listed in Appendix 8 on the traffic counter supply check list. In brief, the data documentation procedure was the following:

- (1) Use a Global Positioning System (GPS) unit with existing disturbance information to identify whether disturbance is new or a re-disturbance; if it is a new disturbance spatially document the disturbance using the GPS (Appendix 9).
- (2) On the disturbance assessment form, record detailed information regarding the disturbance. (
- 3) On the monitoring assessment form, record general information about the disturbance and if restoration was completed on that date.
- (4) On the restoration treatment form, record detailed information about the restoration performed and record before and after photos of restoration.
- (5) Further record information regarding the disturbance on the traffic counter road new disturbance form (Appendix 5) or a traffic counter road re-disturbance form (Appendix 6).
- (6) In the office, enter the information from the forms into the traffic counter database, and the restoration data spreadsheet.
- (7) Download data or manually enter data from traffic counter into electronic form. For the TRAFx counters, the data was downloaded off of the docking station using TRAFx communicator V1 program, and converted into a text file. All monthly data for each road was compiled into a single text file. For the nu-metric counters, data from the traffic counter data collection form was entered into the traffic counter database. For analysis

purposes, all of the nu-metric counter data was later converted into a text file and merged with the TRAFx counter data text file for each road. The nu-metric counters recorded vehicle passes in a daily format while the TRAFx counters recorded vehicle passes in an hourly format. Thus, for roads that have both TRAFx and nu-metric data, the daily data from the nu-metric counters was entered under 1am and all the other hours were left blank.

(8) For new disturbances, download GPS files and create a location map following creating map layout in ArcMap standard operating procedure using ArcMap 9.2 (Appendix 4).

(9) Prepare an e-mail report for the rangers with information gathered during road monitoring and traffic counter checks.

Results and Evidence of the Results

The 2005-NPS-526 project gathered data from April 1, 2008 to April 1, 2010. The sets of milestones and deliverables for the Clark County MSHCP project were the following:

Objectives Completed

Milestones –

M1 Contract Award and Mobilization – **02/19/2007**

M2 Begin Monitoring Activities- **04/01/2008**

M3 Complete Monitoring Activities- **03/31/2010**

Deliverables – **Due/Submitted**

D1 Work Plan and Detailed Timeline – **03/20/2008**

D2 Project Kickoff Meeting – **03/20/2008**

D3 Data Management Plan – **03/20/2008**

D4 Quarterly Progress Report- **04/01/2008**

D5 Quarterly Progress Report- **07/01/2008**

D6 Quarterly Progress Report- **10/01/2008**

D7 Quarterly Progress Report- **01/01/2009**

D8 Quarterly Progress Report- **04/01/2009**

D9 Submit Annual Project Data – **05/01/2010**

D10 Submit Biennium Project Summary Report-**06/30/2009**

D11 Quarterly Progress Report- **07/01/2010**

D12 Quarterly Progress Report- **10/01/2010**

D13 Annual Project Review Presentation- **08/11/2009**

D14 Quarterly Progress Report- **04/01/2010**

In order to facilitate early detection of disturbance, and prevent them from worsening, all 18 roads were monitored monthly. All disturbances were located and documented as described above in the ‘monitoring and data collection section’. An email was sent to all

the law enforcement rangers in the specific region that the roads were monitored detailing everything that was documented along the road(s). The traffic counter data was also sent to the rangers. The rangers could use this data to increase patrols in certain areas. The dates for traffic counter data collection and ranger e-mails are listed below:

Traffic Counter Daily Activities

04/21/2008 Checked Traffic Counters 106-111; Emailed Rangers
04/28/2008 Checked Traffic Counters 44; Emailed Rangers
04/29/2008 Checked Traffic Counters 45-47; Emailed Rangers
05/07/2008 Checked Traffic Counters 24-31; Emailed Rangers
05/16/2008 Checked Traffic Counters 94-97; Emailed Rangers
05/19/2008 Checked Traffic Counters 154-155; Emailed Rangers
05/27/2008 Checked Traffic Counters 20A; Emailed Rangers
05/29/2008 Checked Traffic Counters 44-47; Emailed Rangers
06/18/2008 Checked Traffic Counters 154-155; Emailed Rangers
06/23/2008 Checked Traffic Counters 106-111; Emailed Rangers
07/01/2008 Checked Traffic Counters 20A; Emailed Rangers
07/02/2008 Checked Traffic Counters 44-47; Emailed Rangers
07/07/2008 Checked Traffic Counters 24-31; Emailed Rangers
07/17/2008 Checked Traffic Counters 94-98; Emailed Rangers
07/24/2008 Checked Traffic Counters 106-111; Emailed Rangers
07/30/2008 Checked Traffic Counters 20A; Emailed Rangers
08/04/2008 Checked Traffic Counters 44-47; Emailed Rangers
08/12/2008 Checked Traffic Counters 24-31; Emailed Rangers
08/14/2008 Checked Traffic Counters 51-60; Emailed Rangers
08/20/2008 Checked Traffic Counters 94-98 and 154-155; Emailed Rangers
08/25/2008 Checked Traffic Counters 106-111; Emailed Rangers
08/26/2008 Checked Traffic Counters 20A; Emailed Rangers
08/27/2008 Checked Traffic Counters 44-47; Emailed Rangers
09/11/2008 Checked Traffic Counters 24-31; Emailed Rangers
09/15/2008 Checked Traffic Counters 51-60; Emailed Rangers
09/17/2008 Checked Traffic Counters 94 and 98; Emailed Rangers
09/22/2008 Checked Traffic Counters 154-155; Emailed Rangers
09/25/2008 Checked Traffic Counters 106-111; Emailed Rangers
10/01/2008 Checked Traffic Counters 44-47; Emailed Rangers
10/09/2008 Checked Traffic Counters 24-31; Emailed Rangers
10/20/2008 Checked Traffic Counters 94-97; Emailed Rangers
10/22/2008 Checked Traffic Counters 59-60; Emailed Rangers
10/23/2008 Checked Traffic Counters 154-155 and 51; Emailed Rangers
10/27/2008 Checked Traffic Counters 106-111; Emailed Rangers
10/29/2008 Checked Traffic Counters 20A; Emailed Rangers
11/05/2008 Checked Traffic Counters 44-47; Emailed Rangers

11/10/2008 Checked Traffic Counters 24-31; Emailed Rangers
11/13/2008 Checked Traffic Counters 51-60; Emailed Rangers
11/19/2008 Checked Traffic Counters 60; Emailed Rangers
11/20/2008 Checked Traffic Counters 94-98; Emailed Rangers
11/24/2008 Checked Traffic Counters 154-155; Emailed Rangers
11/25/2008 Checked Traffic Counters 110-111; Emailed Rangers
12/01/2008 Checked Traffic Counters 20A; Emailed Rangers
12/03/2008 Checked Traffic Counters 44-47; Emailed Rangers
12/09/2008 Checked Traffic Counters 24-31; Emailed Rangers
12/15/2008 Checked Traffic Counters 51-60; Emailed Rangers
12/16/2008 Checked Traffic Counters 94-98; Emailed Rangers
12/17/2008 Checked Traffic Counters 154-155; Emailed Rangers
12/29/2008 Checked Traffic Counters 110-111; Emailed Rangers
12/31/2008 Checked Traffic Counters 20A; Emailed Rangers
01/06/2009 Checked Traffic Counters 44-47; Emailed Rangers
01/08/2009 Checked Traffic Counters 24-31; Emailed Rangers
01/09/2009 Meeting w/ Supervisory Law Enforcement Rangers
01/15/2009 Checked Traffic Counters 51-60; Emailed Rangers
01/22/2009 Checked Traffic Counters 94-98; Emailed Rangers
01/23/2009 Checked Traffic Counters 154-155; Emailed Rangers
01/26/2009 Checked Traffic Counters 110-111; Emailed Rangers
02/04/2009 Checked Traffic Counters 20A; Emailed Rangers
02/05/2009 Checked Traffic Counters 44-47; Emailed Rangers
02/10/2009 Checked Traffic Counters 24-31; Emailed Rangers
02/17/2009 Checked Traffic Counters 51-60; Emailed Rangers
02/19/2009 Checked Traffic Counters 94-98; Emailed Rangers
02/23/2009 Checked Traffic Counters 154-155; Emailed Rangers
02/26/2009 Checked Traffic Counters 110-111; Emailed Rangers
03/03/2009 Checked Traffic Counters 44-47; Emailed Rangers
03/09/2009 Checked Traffic Counters 24-31; Emailed Rangers
03/16/2009 Checked Traffic Counters 51-60; Emailed Rangers
03/19/2009 Checked Traffic Counters 98; Emailed Rangers
03/23/2009 Checked Traffic Counters 154-155; Emailed Rangers
03/25/2009 Checked Traffic Counters 94-97; Emailed Rangers
03/26/2009 Checked Traffic Counters 110-111; Emailed Rangers
03/31/2009 Checked Traffic Counters 20A; Emailed Rangers
04/01/2009 Checked Traffic Counters 44-47; Emailed Rangers
04/15/2009 Checked Traffic Counters 51-60; Emailed Rangers
04/20/2009 Checked Traffic Counters 24-31; Emailed Rangers
04/27/2009 Checked Traffic Counters 110-111; Emailed Rangers
04/29/2009 Checked Traffic Counters 20A; Emailed Rangers
05/05/2009 Checked Traffic Counters 44-47; Emailed Rangers
05/13/2009 Checked Traffic Counters 24-31; Emailed Rangers
05/15/2009 Checked Traffic Counters 51-60; Emailed Rangers
05/20/2009 Checked Traffic Counters 94-98; Emailed Rangers

05/22/2009 Checked Traffic Counters 154-155; Emailed Rangers
05/27/2009 Checked Traffic Counters 110-111; Emailed Rangers
06/03/2009 Checked Traffic Counters 44-47; Emailed Rangers
06/04/2009 Checked Traffic Counters 20A; Emailed Rangers
06/11/2009 Checked Traffic Counters 24-31; Emailed Rangers
06/18/2009 Checked Traffic Counters 94-98; Emailed Rangers
06/22/2009 Checked Traffic Counters 154-155; Emailed Rangers
06/25/2009 Checked Traffic Counters 110-111; Emailed Rangers
06/26/2009 Checked Traffic Counters 60; Emailed Rangers
06/30/2009 Checked Traffic Counters 20A; Emailed Rangers
07/08/2009 Checked Traffic Counters 44-47; Emailed Rangers
07/09/2009 Checked Traffic Counters 24-31; Emailed Rangers
07/15/2009 Checked Traffic Counters 51-60; Emailed Rangers
07/20/2009 Checked Traffic Counters 94-98; Emailed Rangers
07/23/2009 Checked Traffic Counters 154-155; Emailed Rangers
07/27/2009 Checked Traffic Counters 110-111; Emailed Rangers
08/04/2009 Checked Traffic Counters 44-47; Emailed Rangers
08/07/2009 Checked Traffic Counters 20A; Emailed Rangers
08/08/2009 Work on MSHCP PowerPoint Presentation
08/10/2009 Work on MSHCP PowerPoint Presentation
08/11/2009 MSHCP PowerPoint Presentation to County
08/19/2009 Checked Traffic Counters 51-59; Emailed Rangers
08/20/2009 Checked Traffic Counters 94-98; Emailed Rangers
08/26/2009 Checked Traffic Counters 110-111; Emailed Rangers
08/31/2009 Checked Traffic Counters 20A; Emailed Rangers
09/03/2009 Checked Traffic Counters 44-47; Emailed Rangers
09/10/2009 Checked Traffic Counters 24-31; Emailed Rangers
09/18/2009 Checked Traffic Counters 51-60; Emailed Rangers
09/22/2009 Checked Traffic Counters 94-98; Emailed Rangers
09/24/2009 Checked Traffic Counters 154-155; Emailed Rangers
10/01/2009 Checked Traffic Counters 20A; Emailed Rangers
10/02/2009 Checked Traffic Counters 24-31; Emailed Rangers
10/10/2009 Checked Traffic Counters 94-98; Emailed Rangers
10/14/2009 Checked Traffic Counters 154-155; Emailed Rangers
10/22/2009 Checked Traffic Counters 51-60; Emailed Rangers
10/28/2009 Checked Traffic Counters 20A; Emailed Rangers
10/29/2009 Checked Traffic Counters 110-111; Emailed Rangers
11/04/2009 Checked Traffic Counters 44-47; Emailed Rangers
11/13/2009 Checked Traffic Counters 51-60; Emailed Rangers
11/16/2009 Checked Traffic Counters 24-31; Emailed Rangers
11/17/2009 Checked Traffic Counters 94-98; Emailed Rangers
11/20/2009 Checked Traffic Counters 154-155; Emailed Rangers
11/24/2009 Checked Traffic Counters 110-111; Emailed Rangers
11/30/2009 Checked Traffic Counters 20A; Emailed Rangers
12/02/2009 Checked Traffic Counters 44-47; Emailed Rangers

12/08/2009 Checked Traffic Counters 24-31; Emailed Rangers
12/10/2009 Checked Traffic Counters 94-98; Emailed Rangers
12/14/2009 Checked Traffic Counters 51-60; Emailed Rangers
12/15/2009 Checked Traffic Counters 154-155; Emailed Rangers
12/16/2009 Checked Traffic Counters 110-111; Emailed Rangers
01/06/2010 Checked Traffic Counters 44-47; Emailed Rangers
01/07/2010 Checked Traffic Counters 24-31; Emailed Rangers
01/12/2010 Checked Traffic Counters 94-98; Emailed Rangers
01/20/2010 Checked Traffic Counters 154-155; Emailed Rangers
01/23/2010 Checked Traffic Counters 51-60; Emailed Rangers
01/25/2010 Checked Traffic Counters 110-111; Emailed Rangers
02/05/2010 Checked Traffic Counters 24-31; Emailed Rangers
02/08/2010 Checked Traffic Counters 51-60; Emailed Rangers
02/10/2010 Checked Traffic Counters 44-47; Emailed Rangers
02/24/2010 Checked Traffic Counters 110-111; Emailed Rangers
02/25/2010 Checked Traffic Counters 20A; Emailed Rangers
03/02/2010 Checked Traffic Counters 24-31; Emailed Rangers
03/03/2010 Checked Traffic Counters 44-47; Emailed Rangers
03/04/2010 Checked Traffic Counters 51-60; Emailed Rangers
03/08/2010 Checked Traffic Counters 94-97; Emailed Rangers
03/10/2010 Checked Traffic Counters 154-155; Emailed Rangers
03/11/2010 Checked Traffic Counters 20A; Emailed Rangers
03/17/2010 Checked Traffic Counters 110-111; Emailed Rangers

Evaluation and Discussion of Results

AR 111

Muddy River Road (AR 111) is located immediately southeast of Overton, NV. This road historically provided lake access, but no longer does due to the receding lake level. Although the road no longer provides lake access, it does provide access to the Overton Wildlife Management Area, which is located immediately adjacent to the road. The Honey Bee Parking area is located along the road, which was used by visitors who recreated in the wildlife management area. Most vehicle use along the road was by Overton residents using All Terrain Vehicles (ATVs). Overall, AR111 had low traffic counts; recorded counts ranged from 6-59 per month. The road received more vehicle traffic and disturbances during the colder months of the year (especially in the spring and winter). The main type of disturbance recorded on this road was trucks or SUVs following washes. However, most of the area along the road was fenced in because of cattle problems limiting the distance vehicles could travel off-road in washes. During 2/2009 and 3/2009 partial month of data was collected because the traffic counter was accidentally turned off during the previous months collection period.

Comparing Vehicle Passes and Disturbance Data with Temperature (Mean) on AR 111

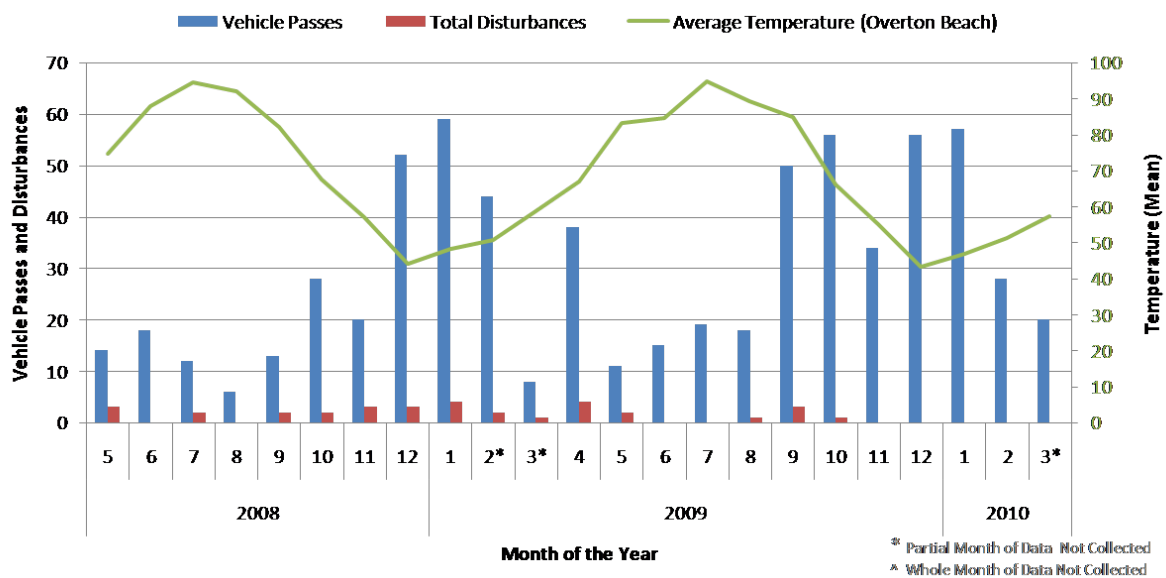
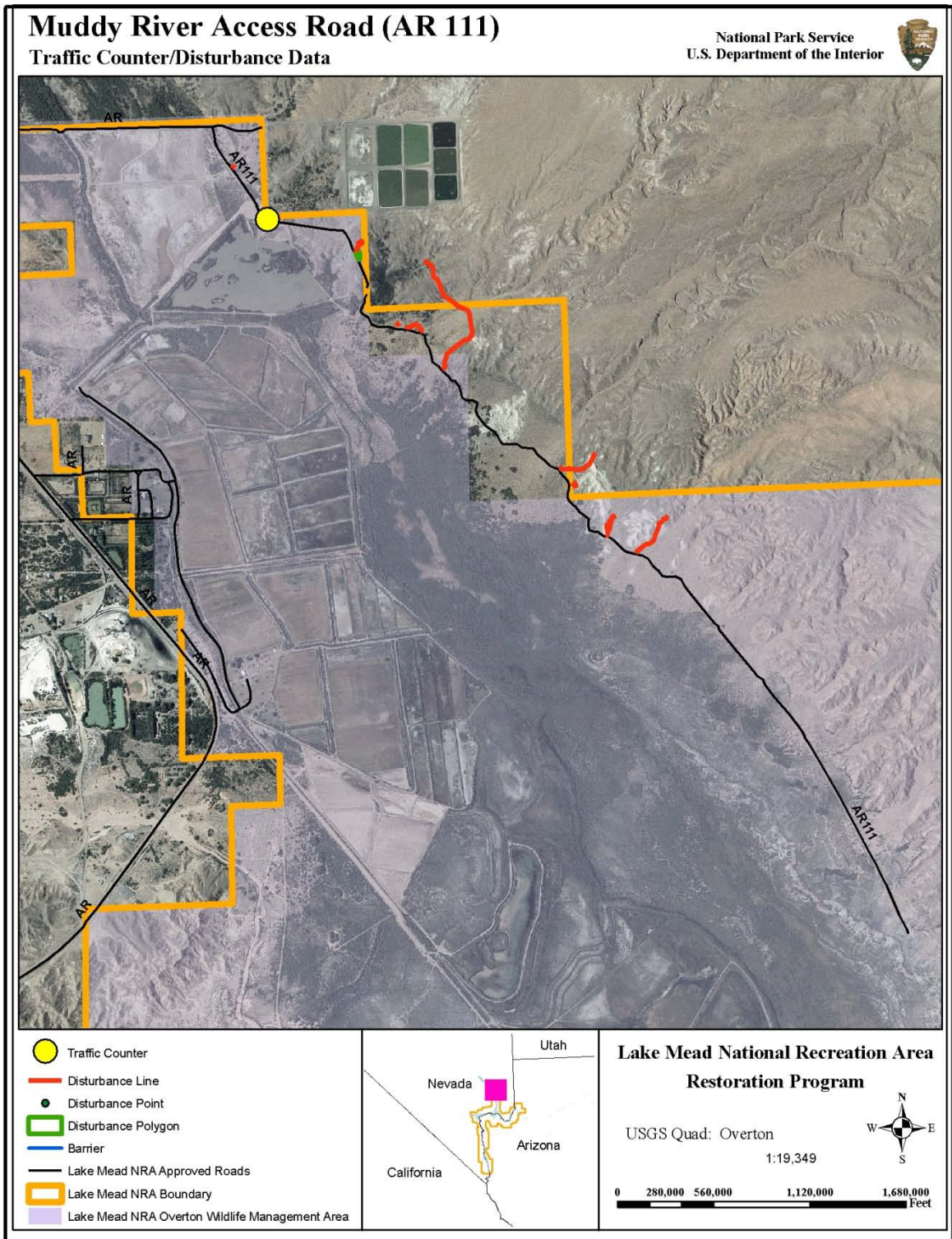


FIGURE 1. Location of traffic counters and disturbances on AR 111



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05/27/2010

AR 110

Sandy Mine Road (AR 110) is located south of Overton, NV. This road historically provided lake access, but no longer does due to the receding lake level. This road is directly adjacent from Poverty Flats on Bureau of Land Management (BLM) land. Fall through spring, Poverty Flats is a popular spot for recreation vehicles (RVs) to camp for free. AR 110 received more vehicle traffic during the winter and spring months. Overall, AR110 had low traffic counts; recorded counts ranged from 0-29 per month. On this road there was a disparity in the traffic counts between the nu-metric counter and the TRAFx counter. Two to three times more traffic was recorded with the TRAFx counter than with the nu-metric counter. The disturbances on this road mainly occurred during the winter months when the traffic counts were greatest. The main types of disturbances seen on this road were hill climbs by SUVs and dirt bikes.

Comparing Vehicle Passes and Disturbance Data with Temperature (Mean) on AR 110

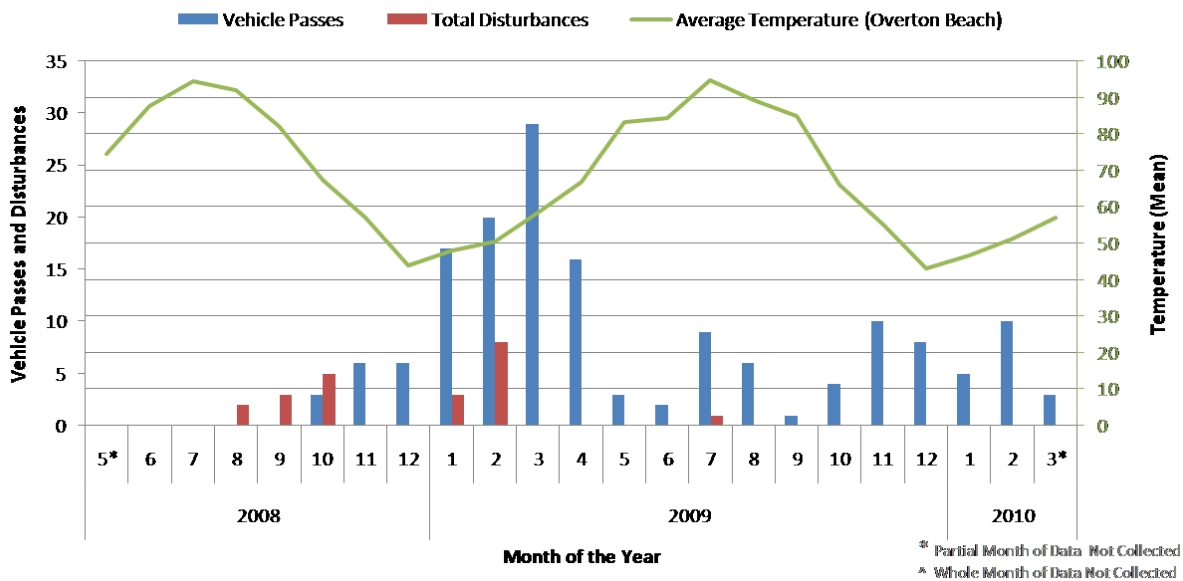
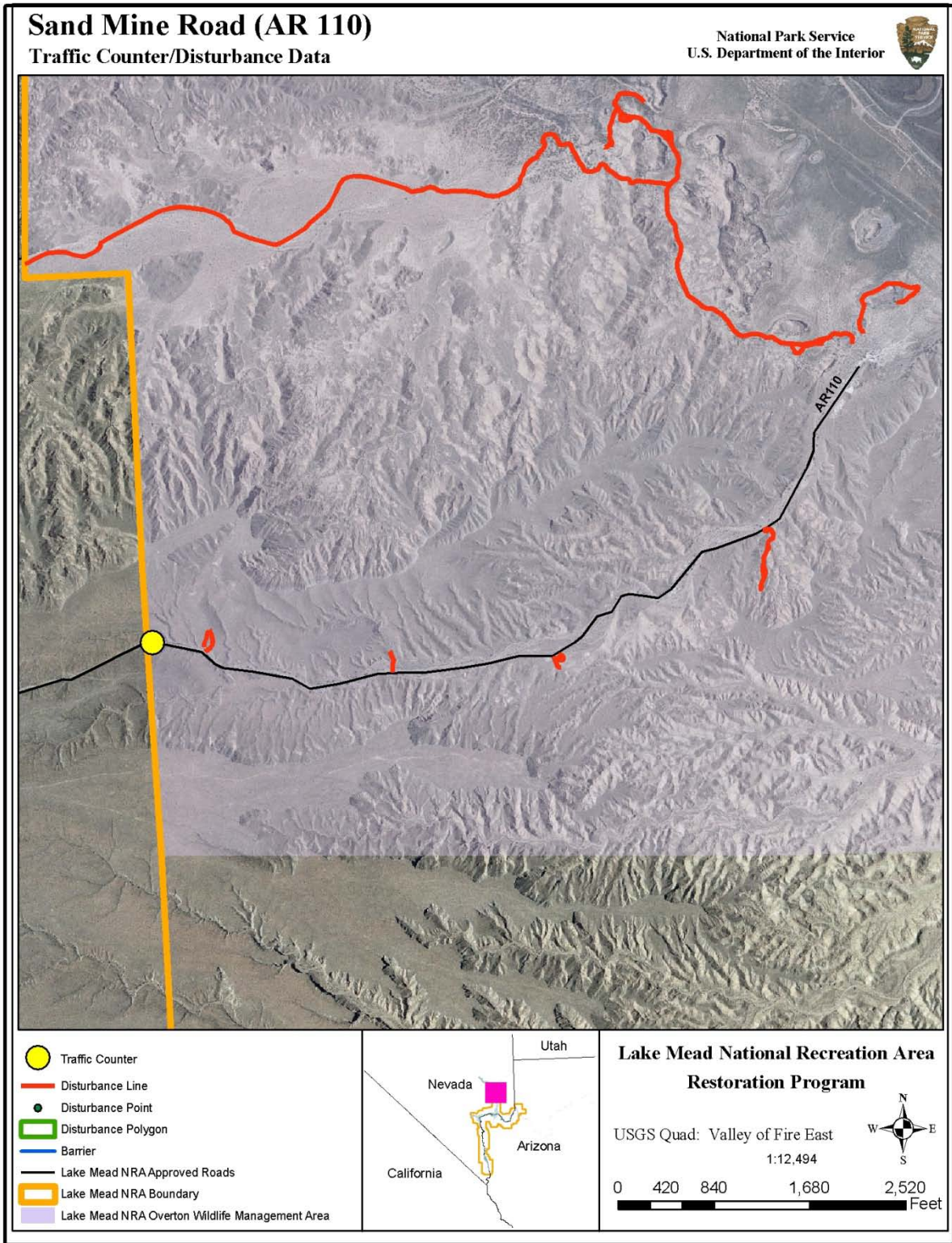


FIGURE 2. Location of traffic counters and disturbances on AR 110



AR106

Fire Cove Road (AR 106) is located off Northshore Drive south of the Valley of Fire Access road. The traffic counter and disturbance data was collected on this road for 5 ½ months (May 2008-October 2008). The road was then closed due to the Northshore Reconstruction Project for the remainder of the project. Because AR106 data was limited, no analysis was conducted.

Comapring Vehicle Passes and Disturbance Data with Mean Temperature on AR 106

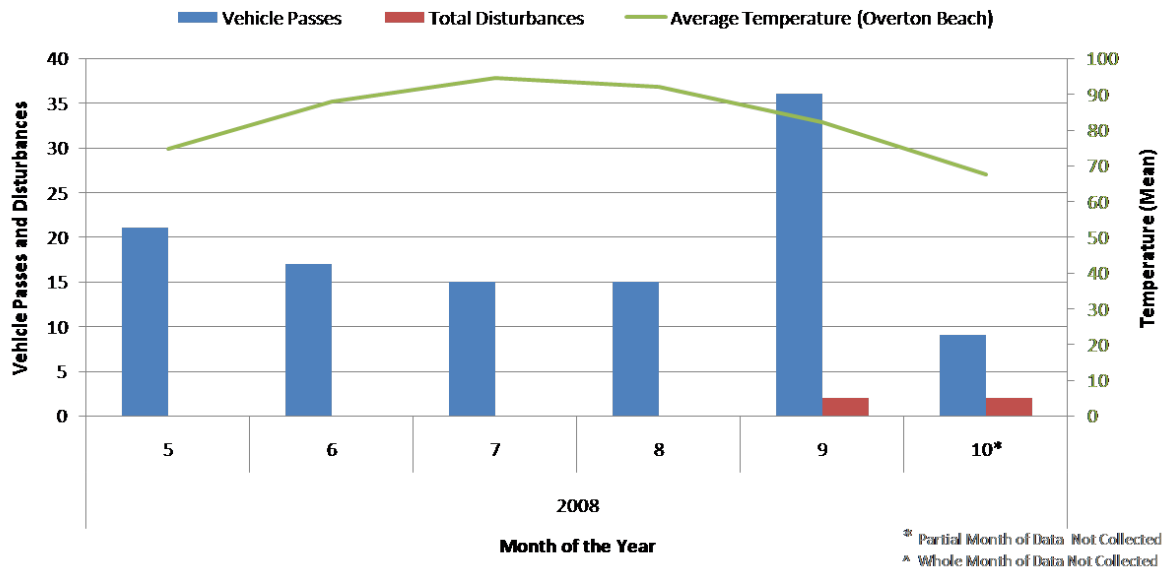
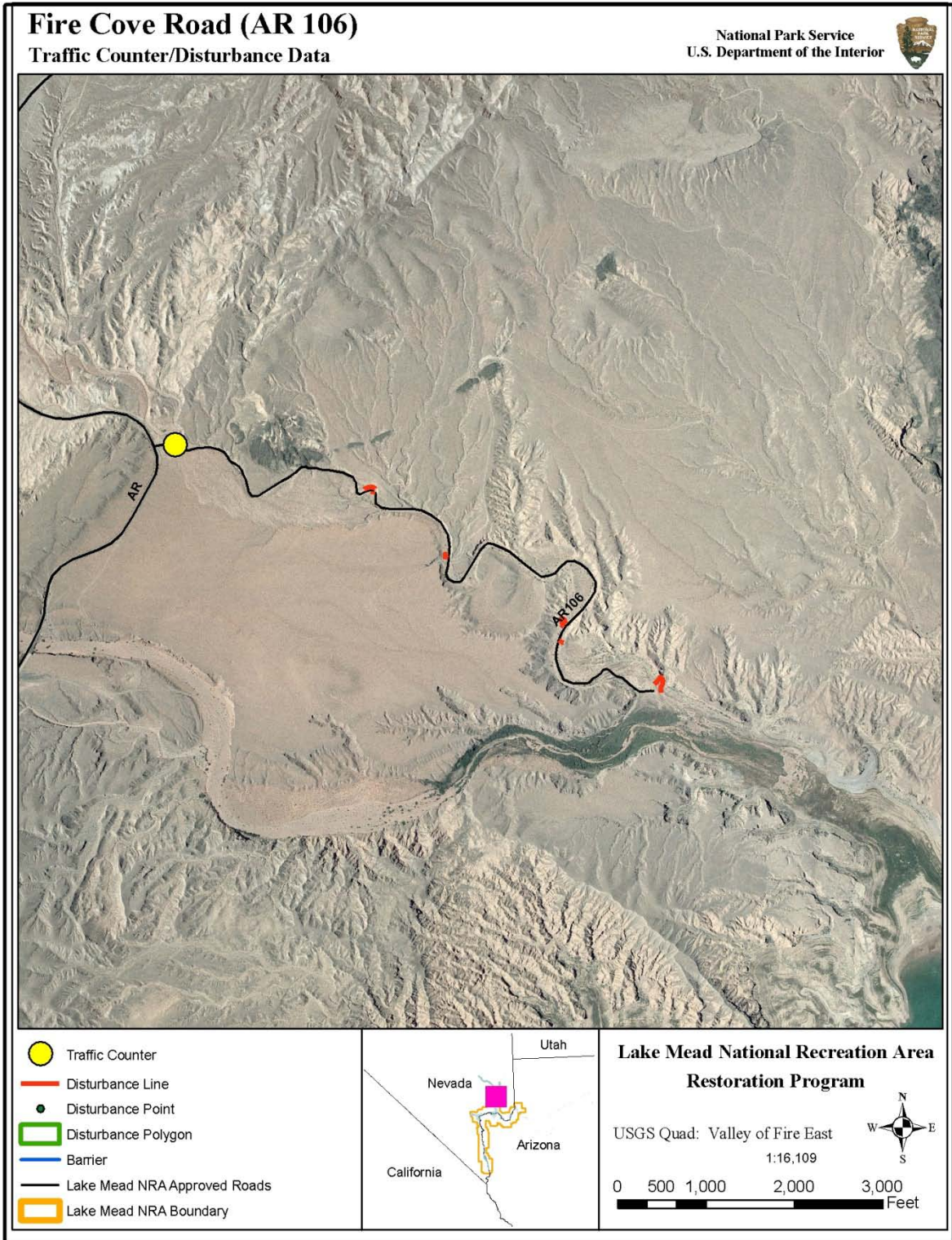


FIGURE 3. Location of traffic counters and disturbances on AR 106



AR 098

Callville Wash South Road (AR 098) is located off of Northshore Drive northeast of the Callville Bay Marina access road. The approved road is bordered on the east by the Pinto Valley Wilderness Area. The road follows a wash to a cove that is immediately adjacent to Callville Bay Marina. AR 098 received more vehicle traffic from late winter to early summer. Overall, this road had low traffic counts; recorded counts ranged from 4-63 per month. The reason that this road did receive high traffic counts during the summer season was because the beach area at the end of the road was very muddy and full of salt cedar. Because this road is located in a wash and the majority of the road has 5-40 foot walls, disturbances were minimal. During the months of 08/2008 and 09/2008 the nu-metric counter malfunctioned and did not collect data for unknown reasons.

Comparing Vehicle Passes and Disturbance Data with Temperature (Mean) on AR 098

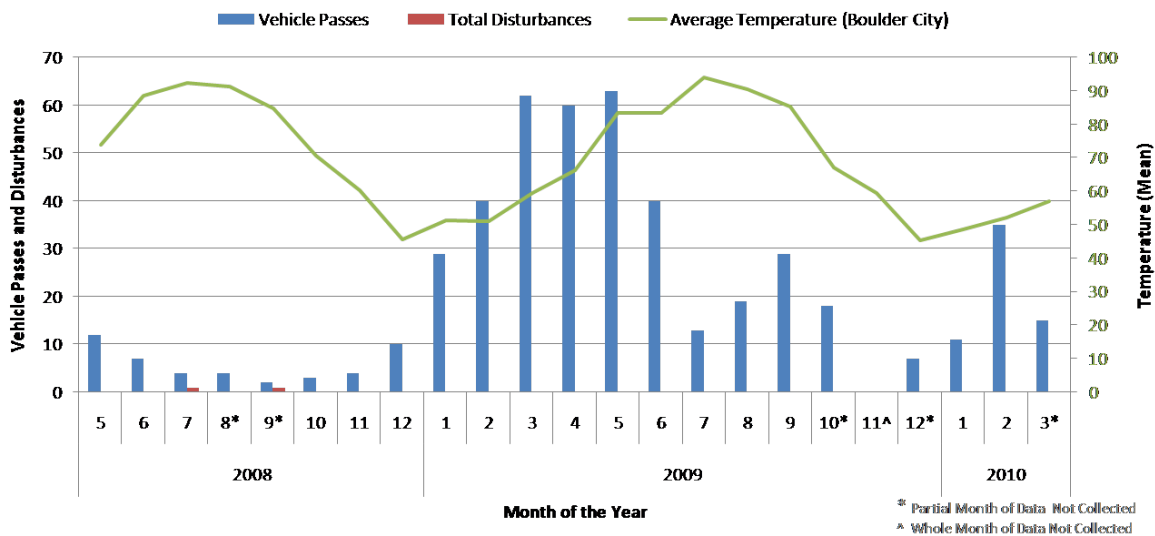
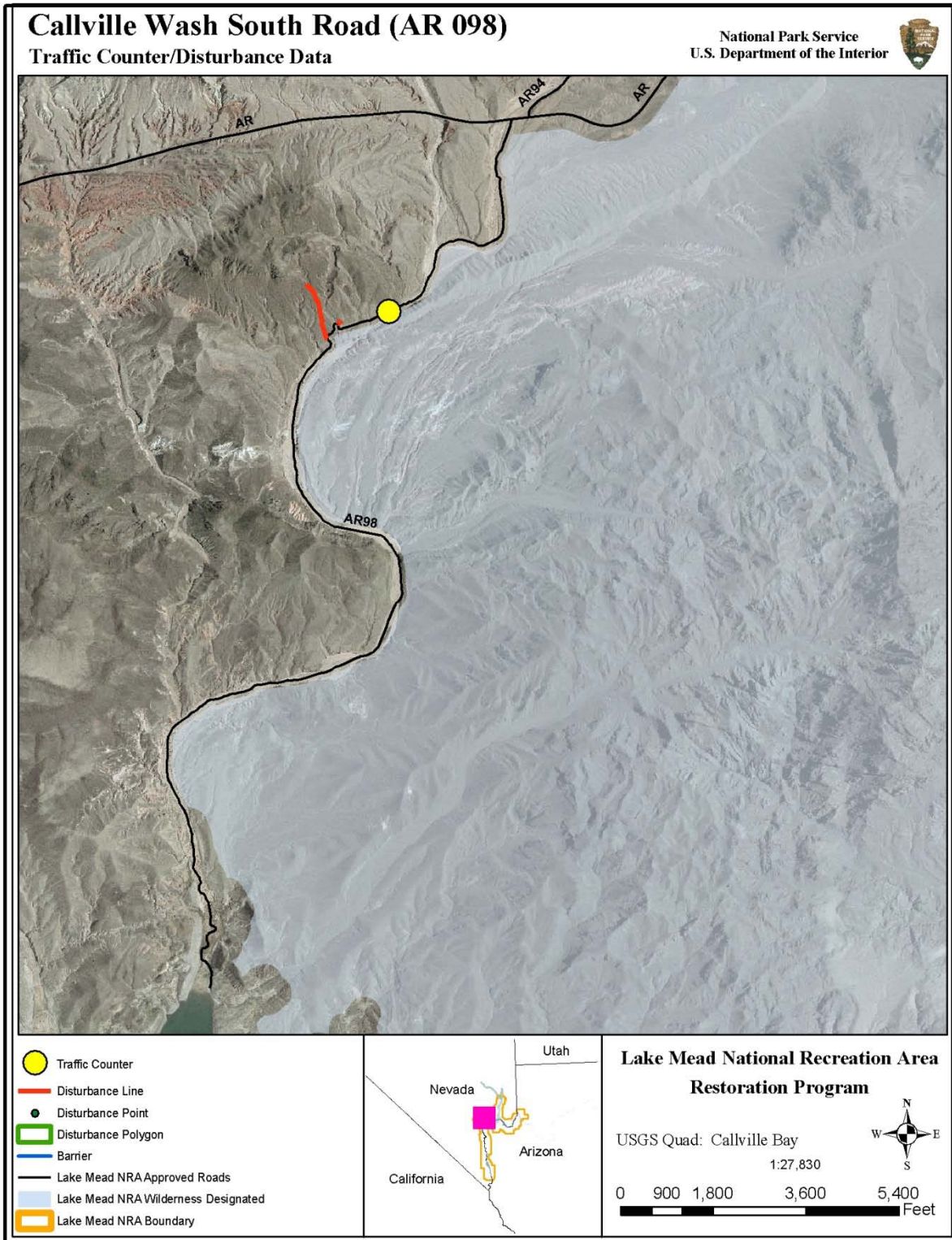


FIGURE 4. Location of traffic counters and disturbances on AR 098



AR 094

Callville Wash North road (AR 094) is located off of Northshore Drive northeast of the Callville Bay Marina access road. This road is in the same wash as AR98, but heads north from Northshore Drive. AR 094 begins on park service land and heads north ending on BLM land. The approved road is bordered on the northwest by Muddy Mountain Wilderness Area. This road provides hiking access to the popular Bowl of Fire area and Anniversary Mine. AR 094 received more vehicle traffic from late winter to early summer. Overall, this road had moderate traffic counts; recorded counts ranged from 3-104 per month. Because the road is in a wash with 5-40 foot walls on both sides, disturbances were minimal.

Comparing Vehicle Passes on AR 094 and Disturbance Data with Temperature (Mean)

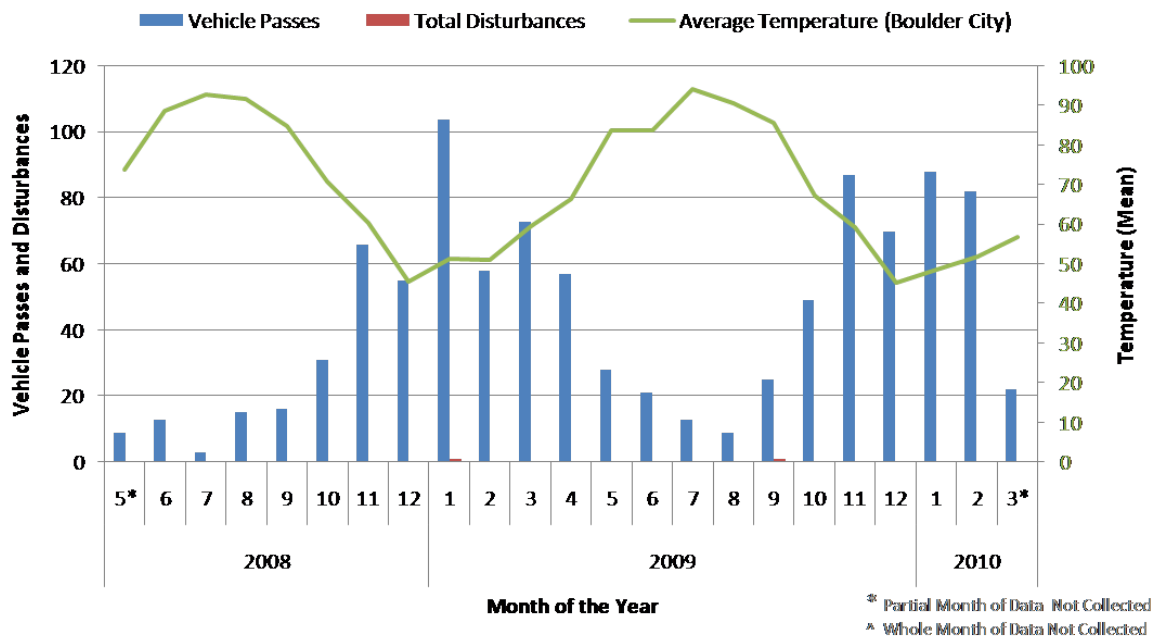
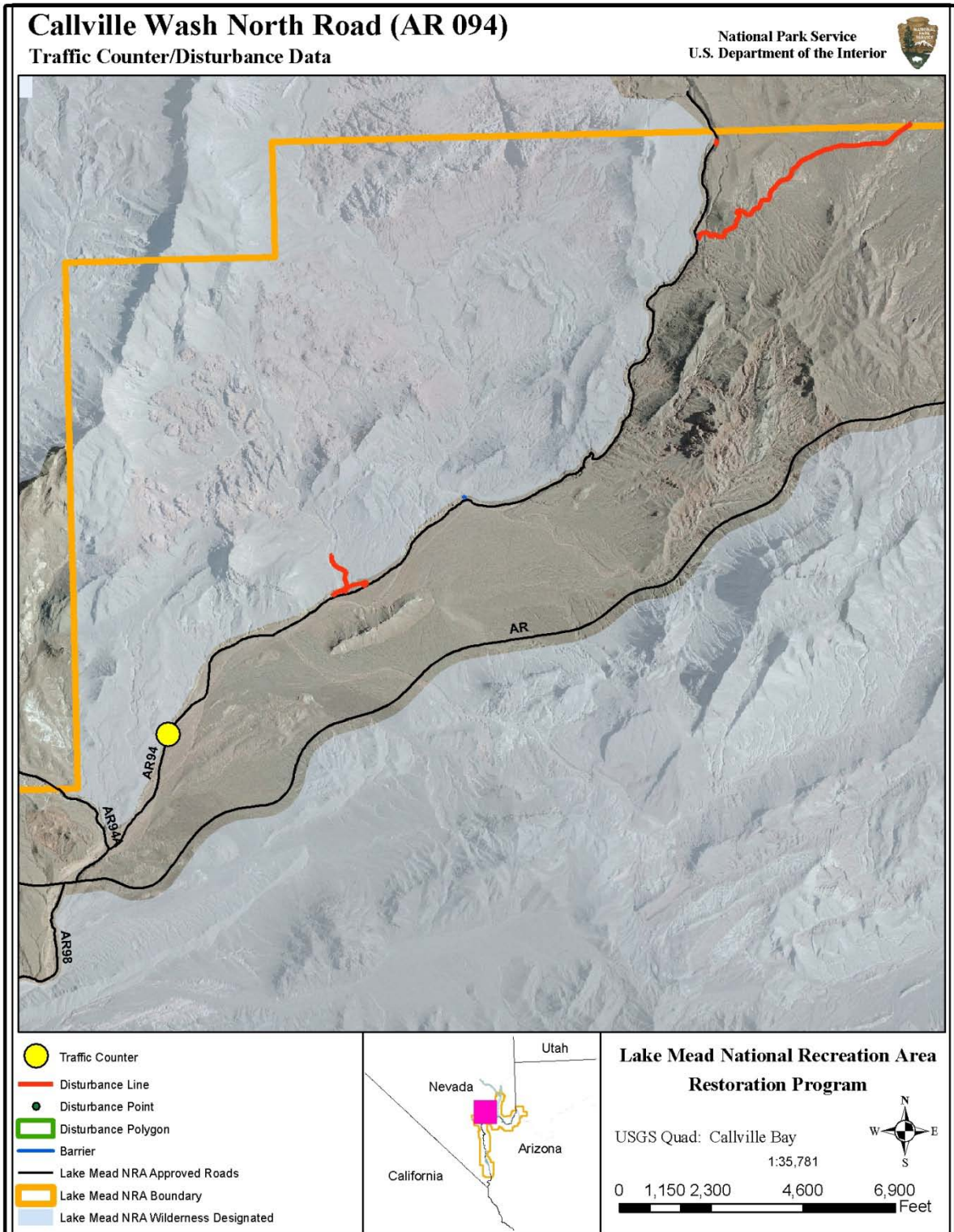


FIGURE 5. Location of traffic counters and disturbances on AR 094



AR 097

Boathouse Cove road (AR 097) is located on Northshore Drive near Redstone. The approved road is bordered on the east by the Jimbilnan Wilderness area and on the west by the Pinto Valley Wilderness Area. AR 097 provides access to Lake Mead's Virgin basin, but due to the receding water level, access to the water has become more difficult. However the beach was still used for camping during this project. This road received more vehicle traffic and disturbances in the winter and spring. Overall, this road had moderate traffic counts; recorded counts ranged from 6-118 per month. On this road there was a disparity in the traffic counts between the nu-metric counter and the TRAFx counter. The nu-metric counter had an average of 6 passes per month, which increased to an average of 62 per month when TRAFx counter was used. Many of the disturbances on this road were from SUVs/trucks hill climbing near the end of the road. Between 04/21/2009 and 05/20/2009 traffic counter data was not collected because the traffic counter was accidentally turned off at the end of the previous collection period.

Comparing Vehicle Passes on AR 097 and Disturbance Data with Temperature (Mean)

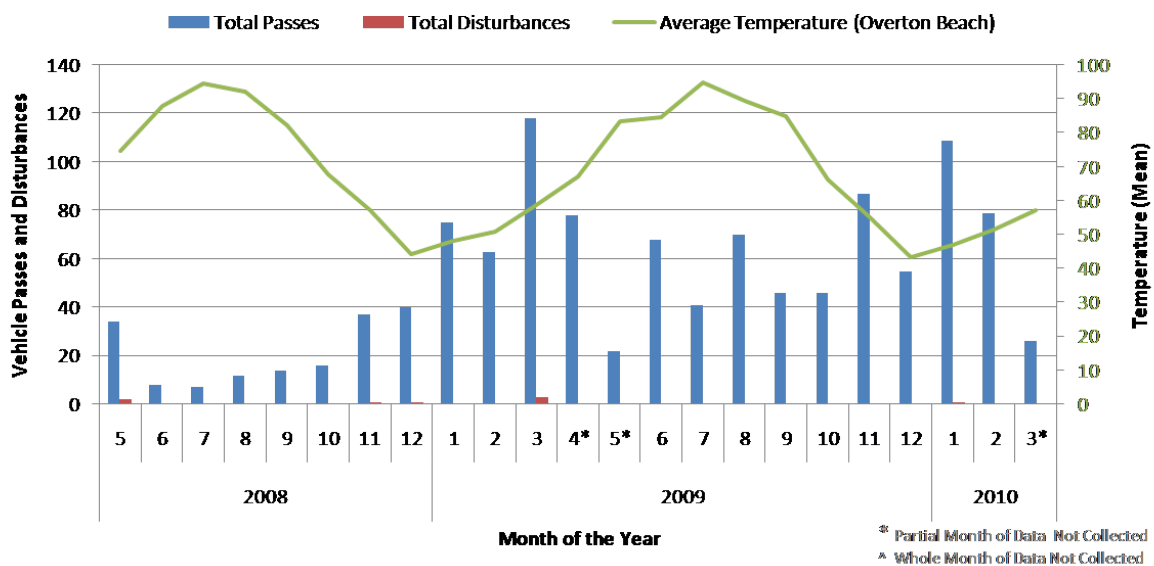
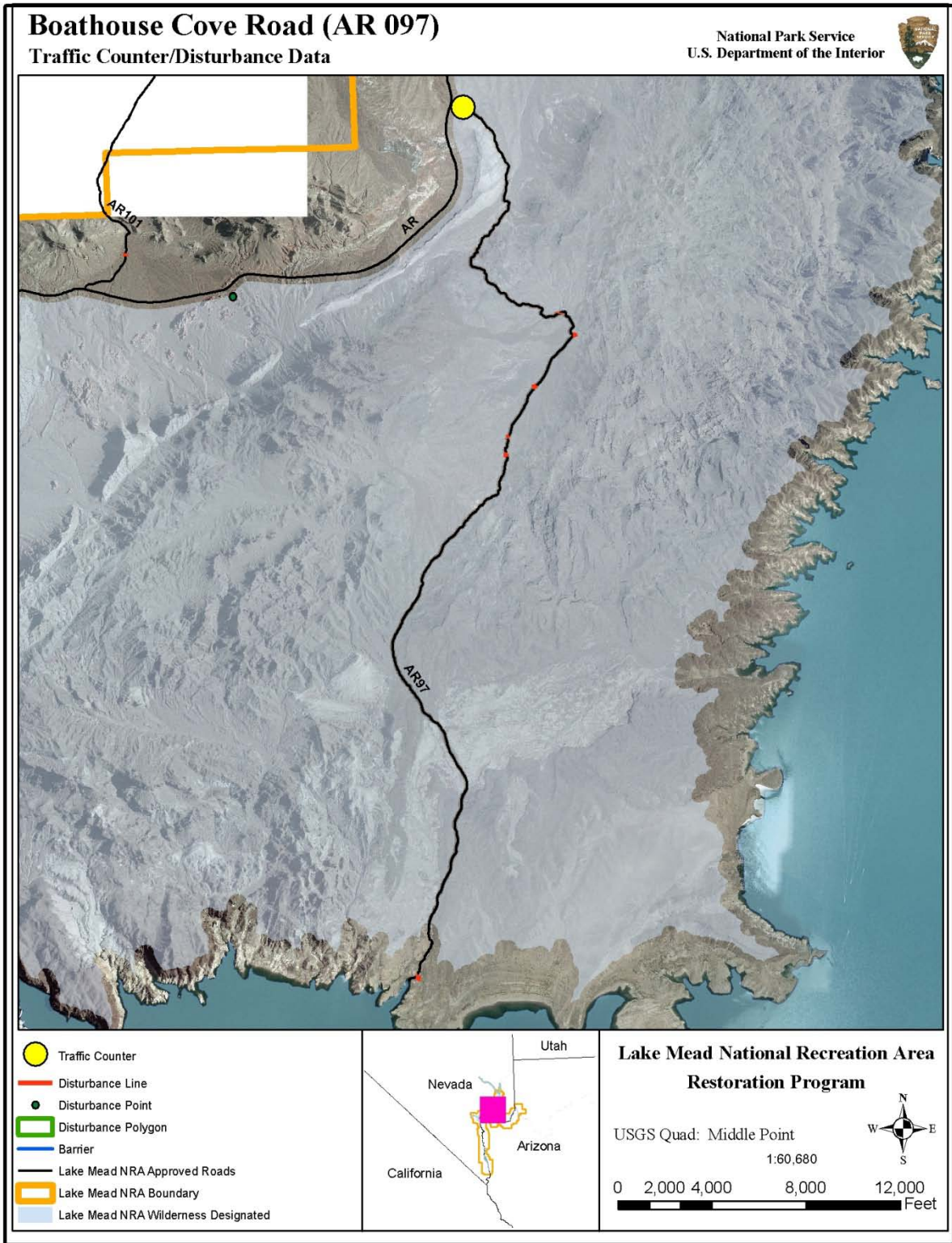


FIGURE 6. Location of traffic counters and disturbances on AR 097



AR 060

Burro Wash Road (AR 060) is a power line road that starts in the Boulder City area and ends at Lake Mohave. The approved road is bordered on the north by Black Canyon Wilderness area and on the south by the Eldorado Wilderness area. At the beginning of this project the entire road was not surveyed because of the roughness of the terrain. Once National Park Service employees were certified and approved to drive Utility Terrain Vehicles (UTVs) and ATVs the entire road was monitored. Overall, this road had moderate traffic counts; recorded counts ranged from 17-81 per month. Most of the disturbances on this road were recorded during the winter months. The majority of the disturbances were at the beginning of the road around camping areas. This road is heavily used by ATVs, SUVs and dirt bikes because of the ruggedness of the road. At the end of the road there was an illegal race track, which was closed and restored by the LMNRA restoration crew. When the TRAFx counter was first installed (11/2008), the traffic counts were inordinately high due to interference from the high tension power line overhead. When the TRAFx counter was relocated from the beginning of the road to approximately 2 miles down the road, traffic counts were no longer elevated.

Comparing Vehicle Passes on AR 060 and Disturbance Data with Temperature (Mean)

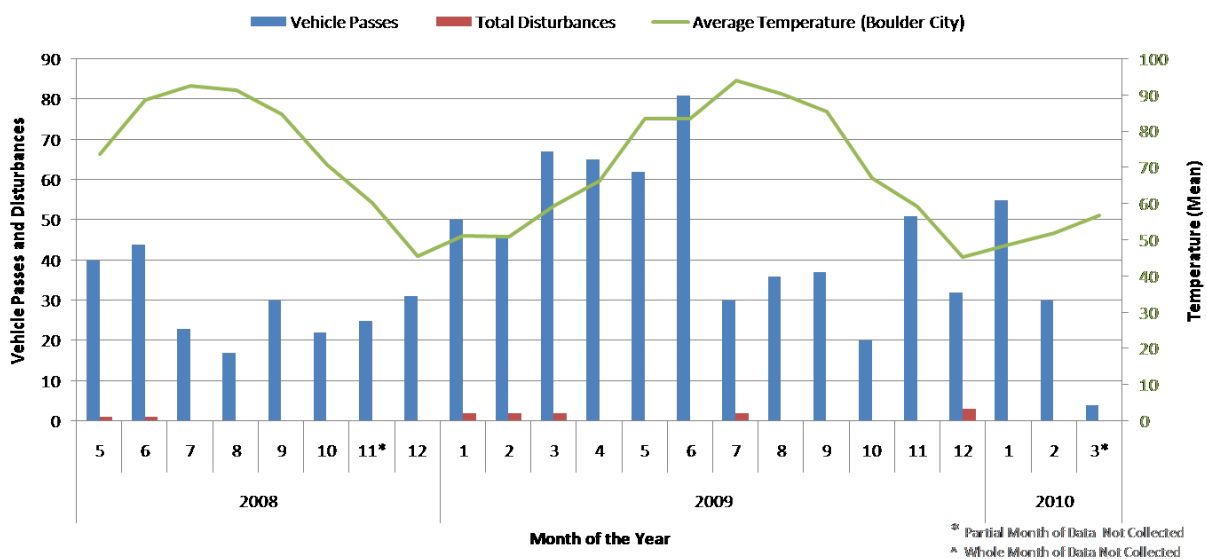
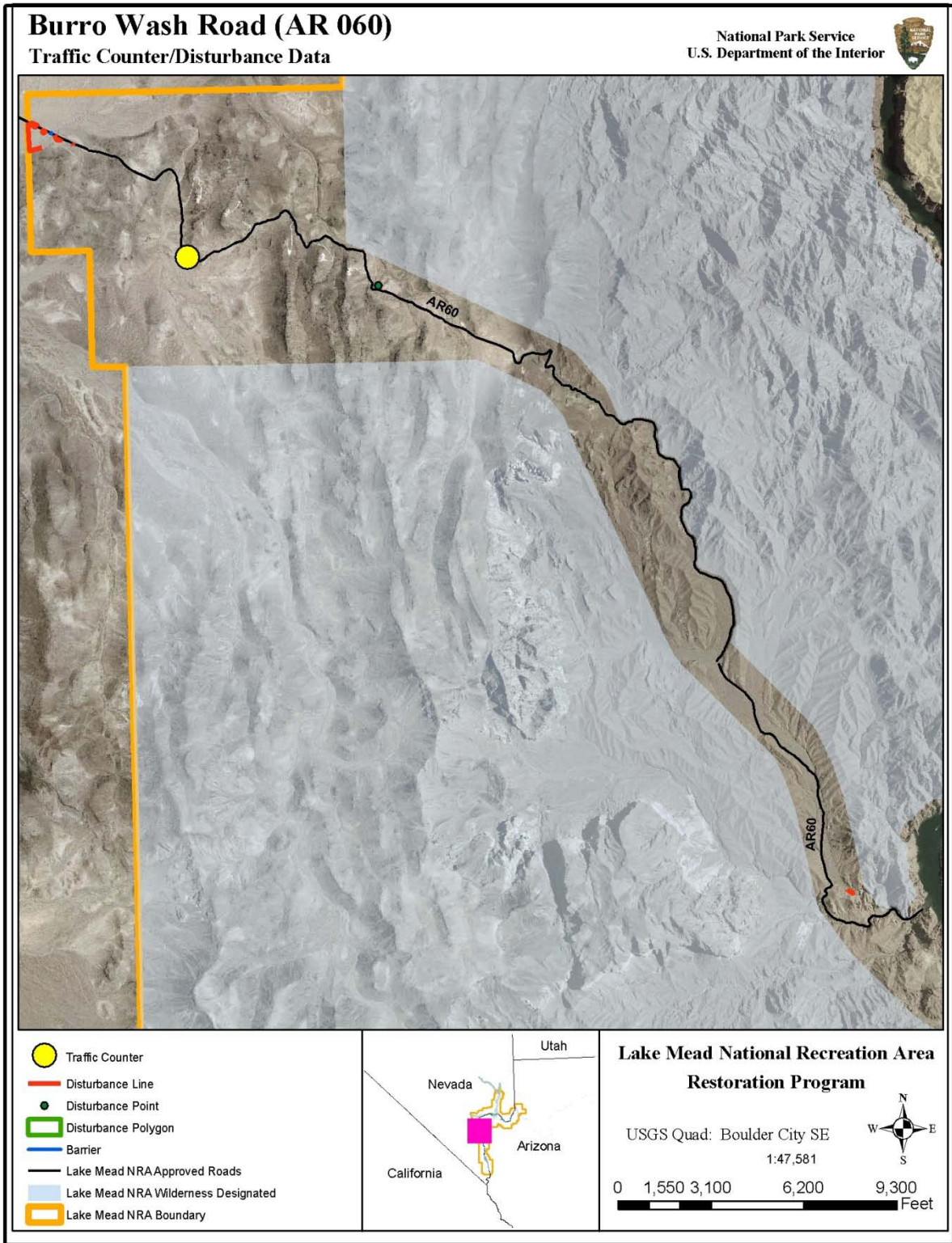


FIGURE 7. Location of traffic counters and disturbances on AR 060



AR 051

Yucca Camp road (AR 051) is located in the Boulder City area and is a cherry stemmed road in the Black Canyon Wilderness area. Overall this road received very low traffic counts; recorded counts ranged from 0-10 per month. The higher traffic counts in the winter were associated with hunting use. Although this road had low traffic counts, it had a high number of disturbances mainly at the end of the road. A barrier was installed at the end of the road to prevent visitors from driving beyond the end of the road. Although disturbances at the end of the road decreased since the barrier was installed and extended, there was still the potential for visitors to drive around the barrier due to the flatness of the terrain.

Comparing Vehicle Passes and Disturbance Data on AR 51 with Temperature (Mean)

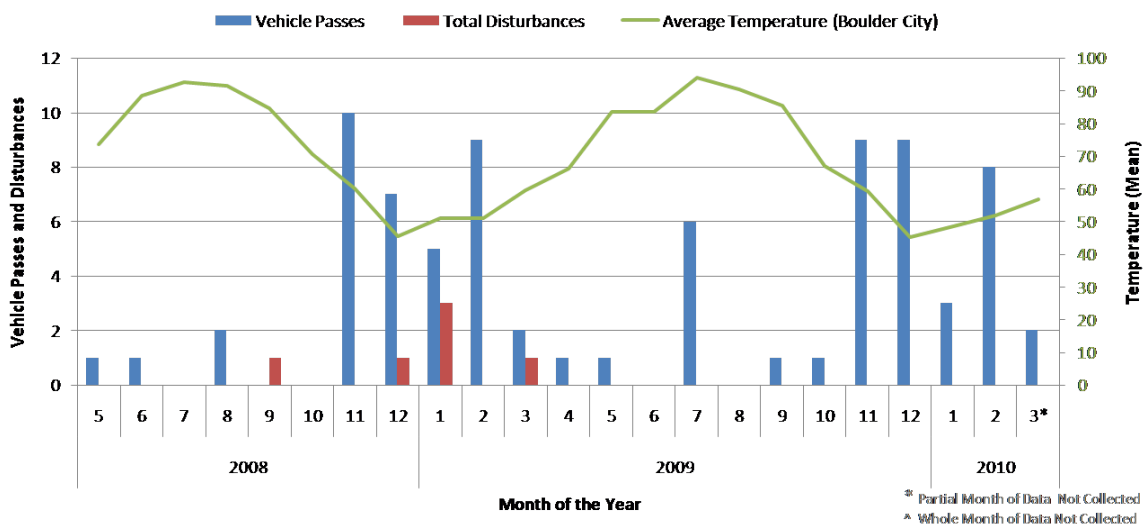
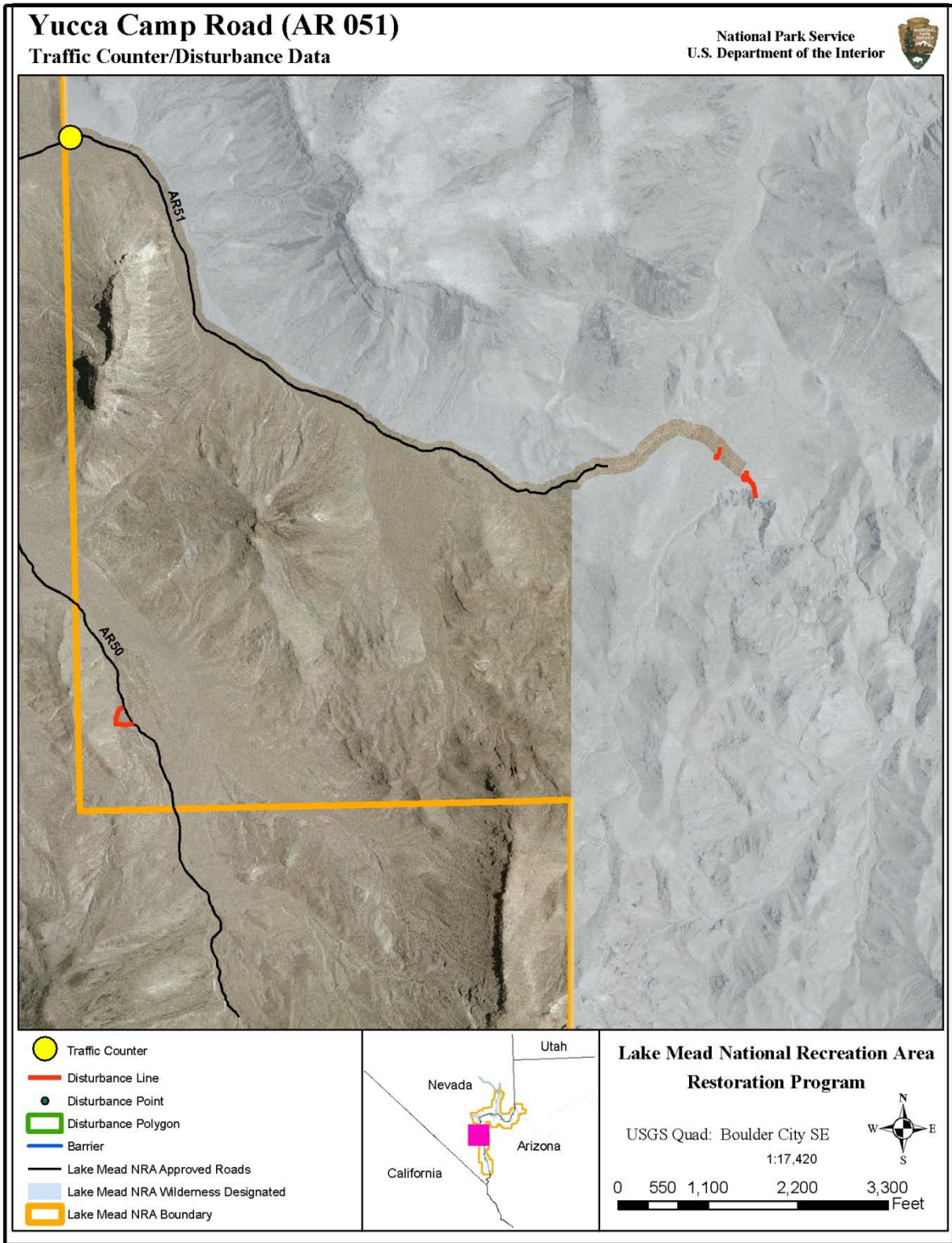


FIGURE 8. Location of traffic counters and disturbances on AR 051



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AR 059

Boy Scout Canyon road (AR 059) is located in the Boulder City area and is a cherry stemmed road in the Black Canyon Wilderness area. The road mainly sees traffic from surrounding Boulder City area. A popular off-road vehicle course is located near the beginning of the approved road on Boulder City land. The road provides access to the popular Boy Scout Hot Springs hiking trail. Overall, this road received moderate traffic counts; recorded counts ranged from 4-45 per month. This road received disturbances throughout the year. Most disturbances were concentrated near the end of the road where the hiking trail begins, and the beginning of road where vehicle users would cut the LMNRA boundary fence to drive off-road in the park. From 12/2008-2/2009 the TRAFx counter was losing data; this problem was remedied by using a different TRAFx counter.

Comparing Vehicle Passes on AR 059 and Disturbance Data with Temperature (Mean)

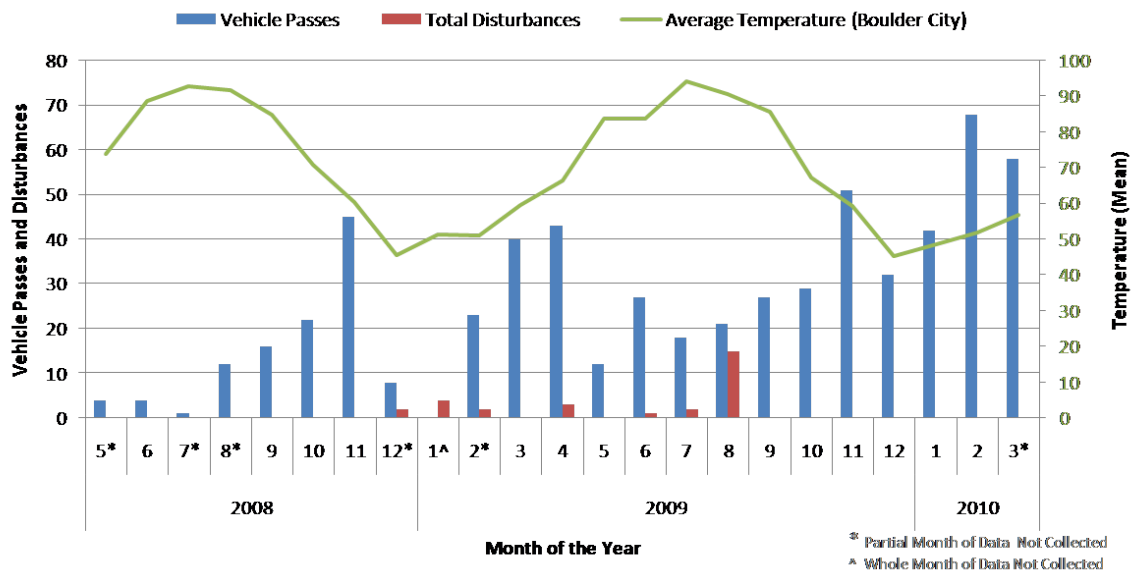
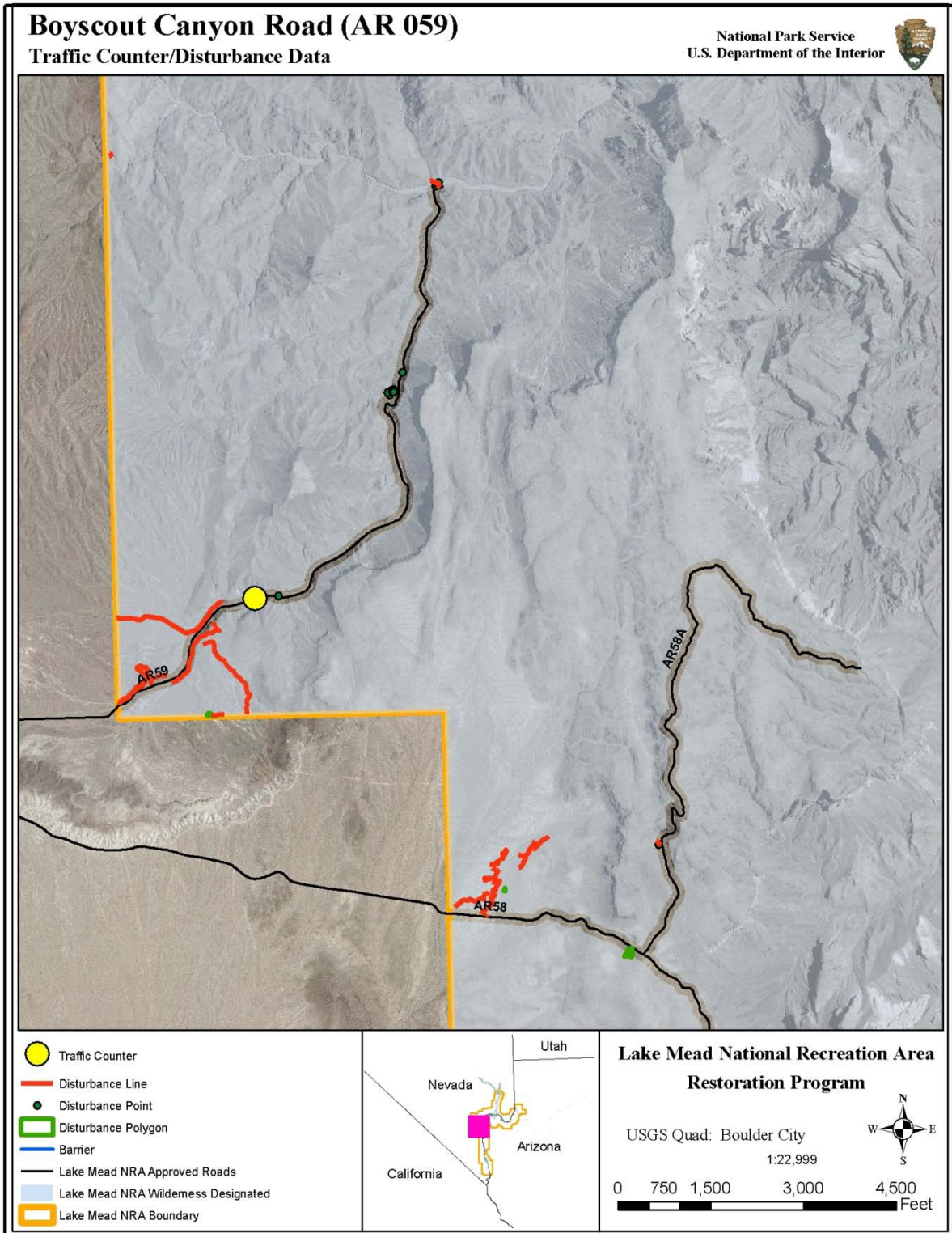


FIGURE 9. Location of traffic counters and disturbances on AR 059



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AR 047

Placer Cove Road (AR 047) is located in the Nelson area not far from Eldorado Wash. This extremely popular road provides lake access, cliff jumping, camping, and other recreational opportunities. AR047 received the most vehicle traffic during the summer. This road received extremely high traffic counts; recorded counts ranged from 138-4178 per month. During the summer this road was used by “beach partiers” while the rest of the year the road was used by fisherman and paddle sport enthusiasts. Of the 18 road studied here, this one received the greatest amount of disturbance, particularly graffiti. The road also receives off-road vehicle disturbance and barrier breaches from vehicle accidents, vandalism, and other illegal activities related to alcohol use. Because this area is a major problem area for the park, in January 2010, the superintendent of Lake Mead NRA prohibited camping and drinking of alcoholic beverages within a one mile radius of Placer Cove. This may affect future traffic counter data.

Comparing Vehicle Passes on AR 047 and Disturbance Data with Mean Temperature

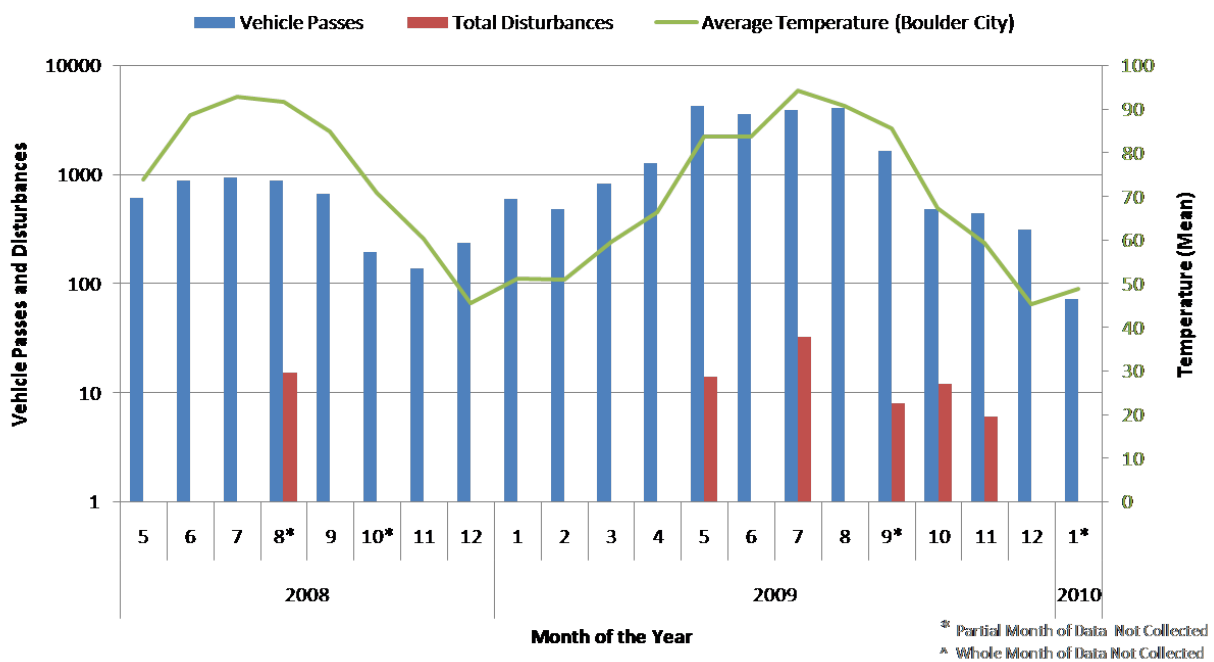
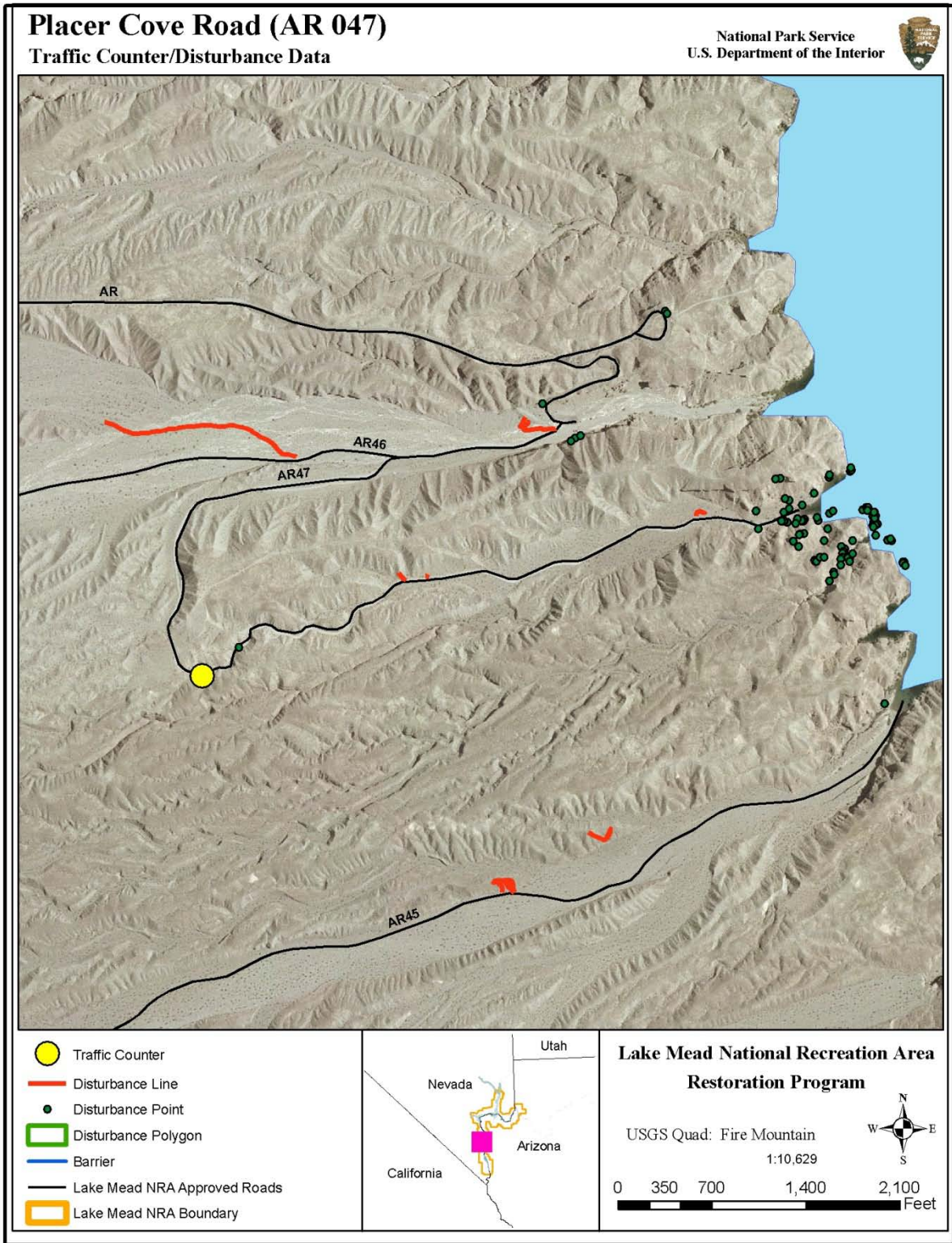


FIGURE 10. Location of traffic counters and disturbances on AR 047



AR 045

Montana Wash Road (AR 045) is located in the Nelson area south of AR047. This popular road provides lake access, cliff jumping, camping, and other recreational opportunities. AR045 received the most vehicle traffic during the summer due to lake access. This road received high traffic counts; recorded counts ranged from 4-457 per month. The prohibitions that were enacted at Placer cove affect the end of this road because it falls within that one mile radius of Placer cove. Even though this road is near Placer cove, disturbances were low and were mainly graffiti tags near the cove. During the month 7/2008 the nu-metric counter did not collect data for unknown reasons.

Comparing Vehicle Passes on AR 45 and Disturbance Data with Temperature (Mean)

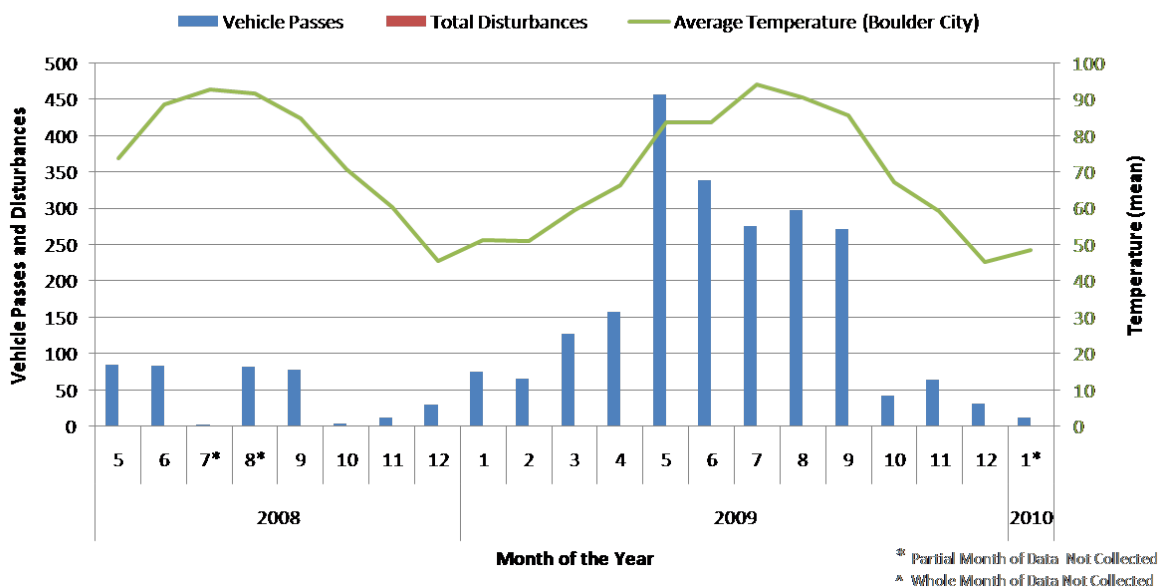
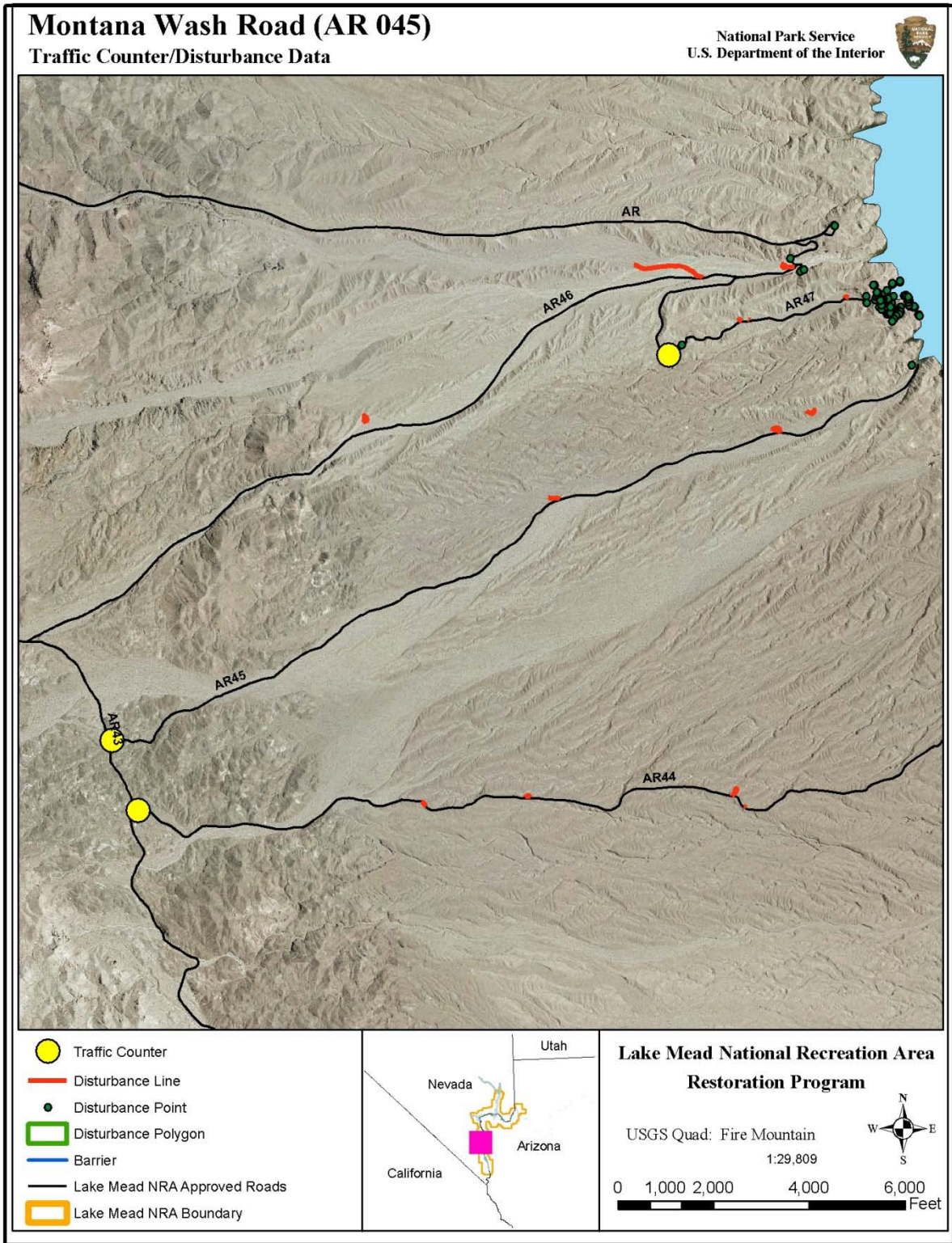


FIGURE 11. Location of traffic counters and disturbances on AR 045



AR 044

Fire Mountain road (AR 044) is located in the Nelson area south of AR045. This road provides lake access and is popular with campers, fisherman and personal watercraft users. AR044 received the most vehicle traffic during the summer due to lake access. This road received moderate traffic counts; recorded counts ranged from 8-122 per month. This road received a high frequency of ORV disturbances at the end of the road until a barrier was built in 2005. Since the barrier was installed at the end of the road, most of the disturbances along this road were due to vehicles avoiding rough sections of the road. The road also has a history of stolen cars being dumped into Lake Mohave.

Comparing Vehicle Passes on AR 44 and Disturbance Data with Temperature (Mean)

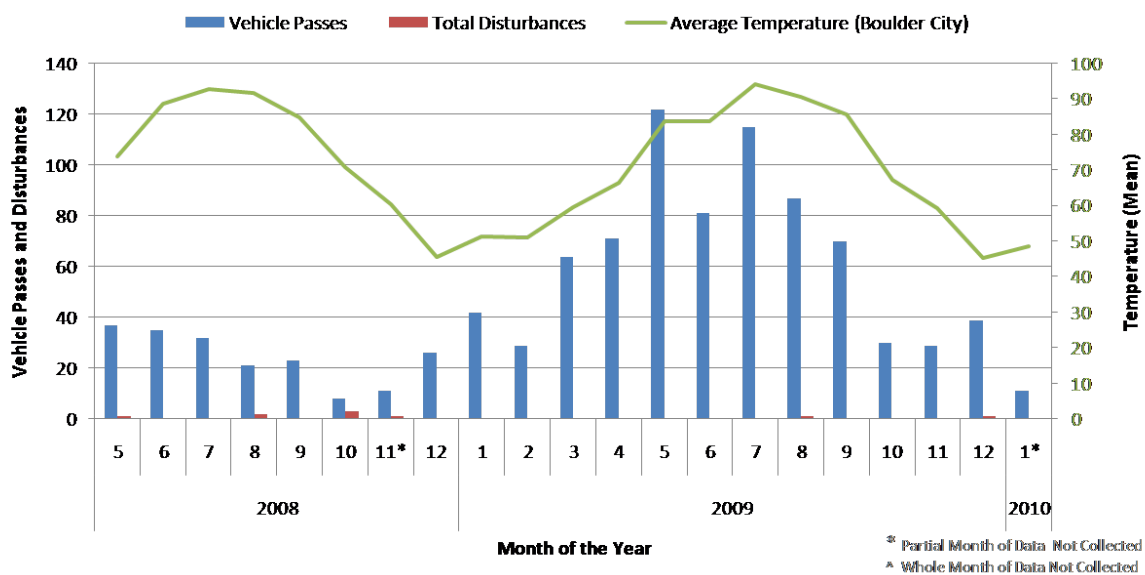
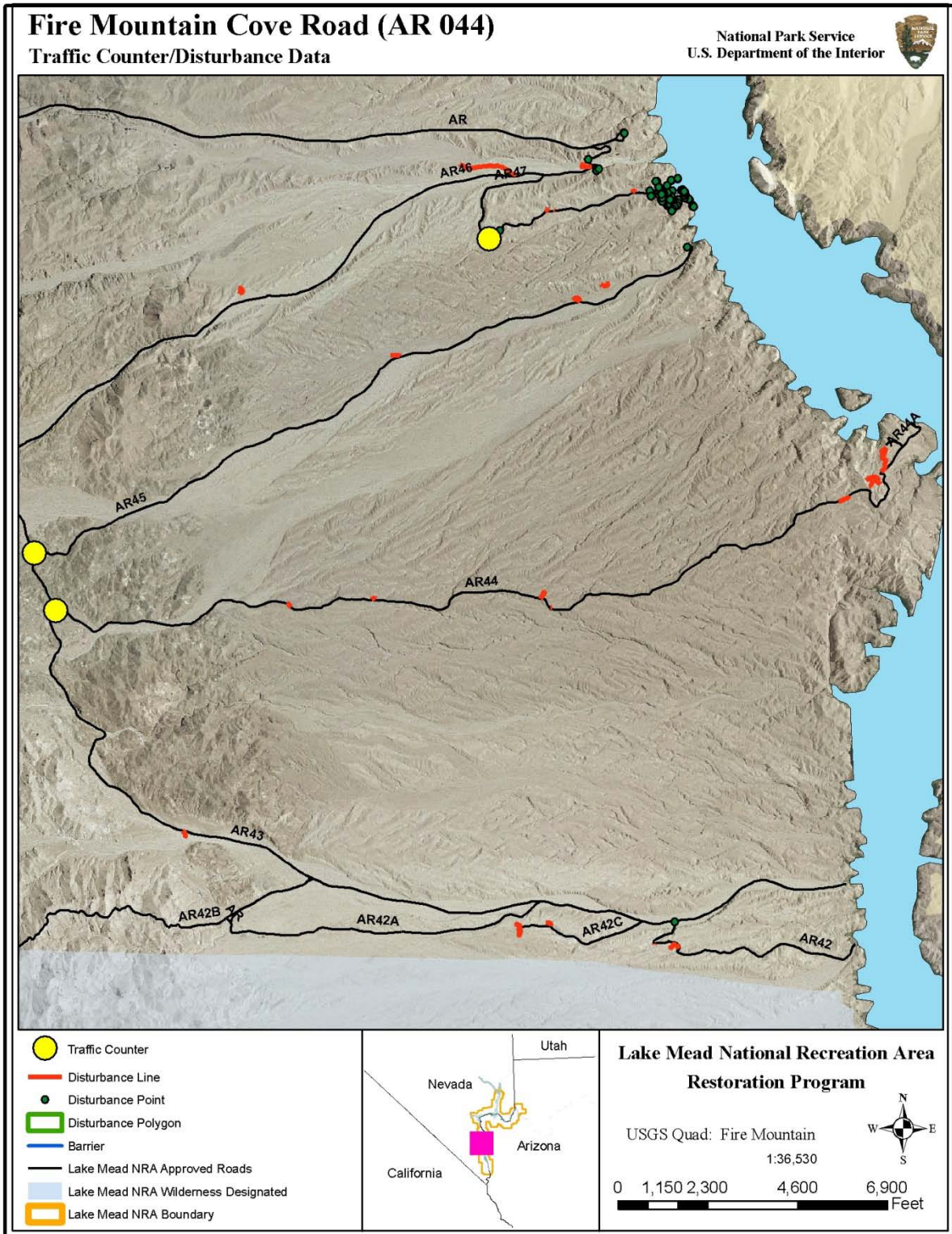


FIGURE 12. Location of traffic counters and disturbances on AR 044



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AR 031

Six Mile Cove road (AR 031) is located south of Cottonwood Cove marina. Two permanent bathrooms and two large dumpsters are located at the end of the road. This road provides lake access and popular camping, fishing, boating, kite boarding, and wind surfing opportunities. AR031 received the most vehicle traffic during late spring to early fall due to lake access. This road received very high traffic counts; recorded counts ranged from 44-1838 per month. The majority of the disturbances occurred during the summer months near the end of the road where ATVs and SUVs would travel off-road in washes.

Comparing Vehicle Passes on AR 031 and Disturbance Data with Temperature (Mean)

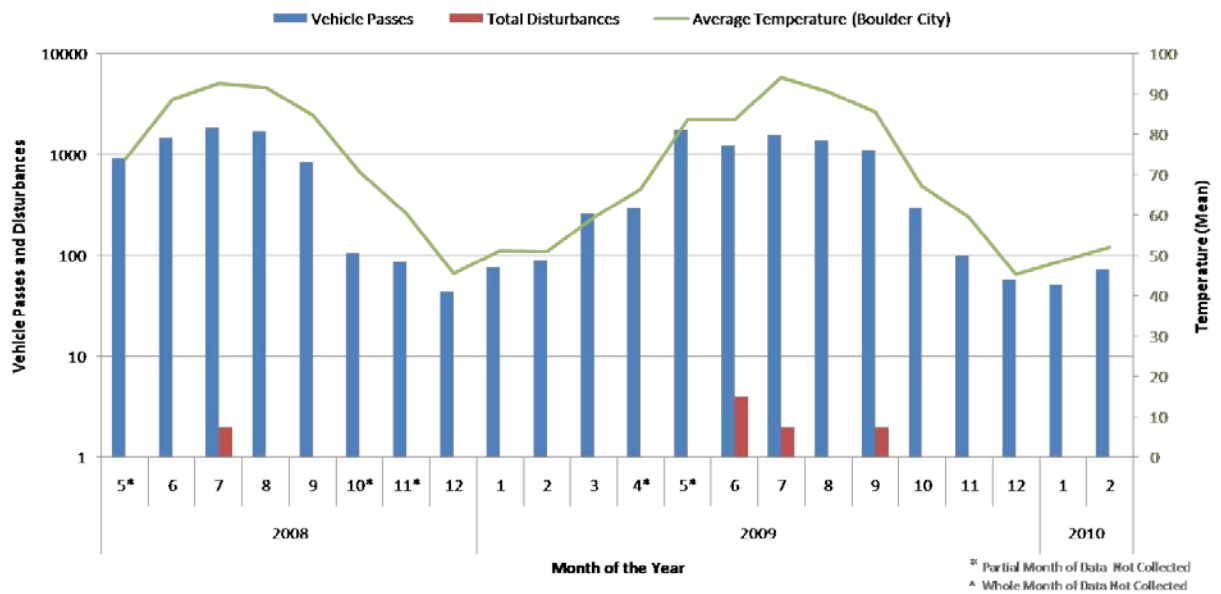
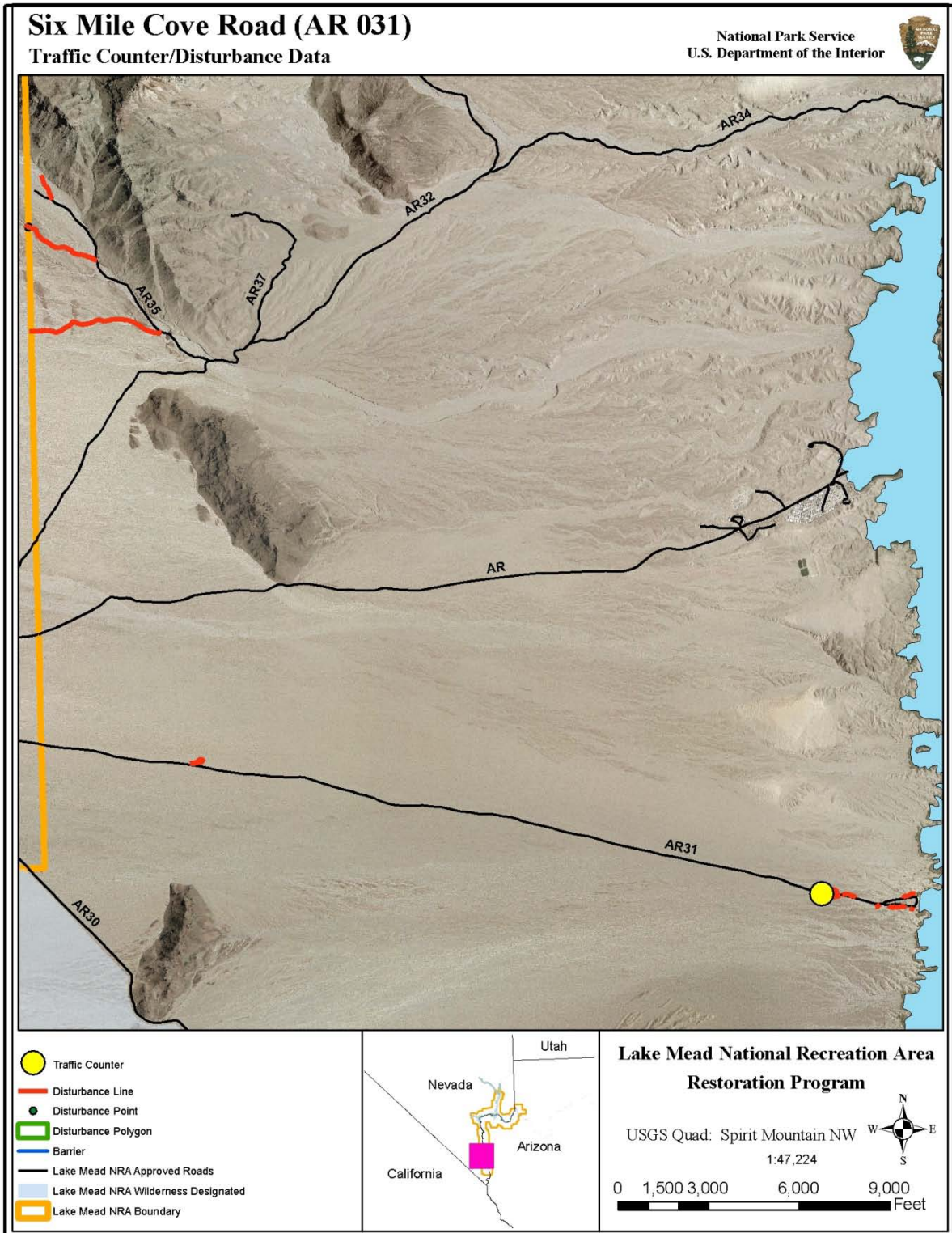


FIGURE 13. Location of traffic counters and disturbances on AR 031



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AR 028

Mid-Basin road (AR 028) is located in the Cottonwood Cove area south of AR031. This road provides lake access and popular camping and swimming opportunities. This road received high traffic counts; recorded counts ranged from 14-234 per month. The numeric counter had low traffic counts the first summer averaging 46 passes, but the second summer the TRAFx counter had high traffic counts averaging 151 passes. Disturbances were low on this road.

Comparing Vehicle Passes on AR 028 and Disturbance Data with Temperature (Mean)

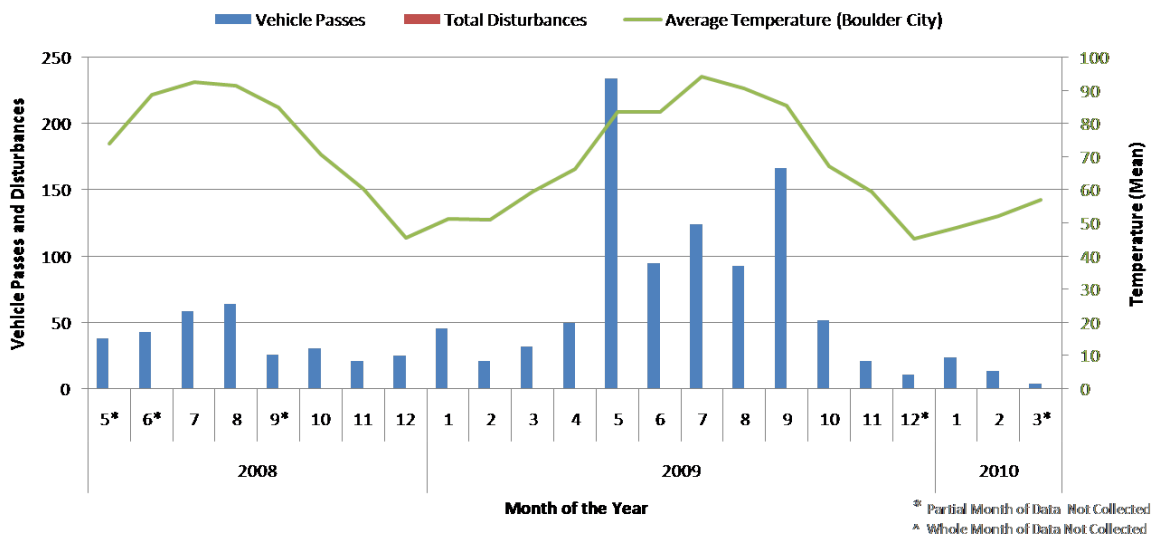
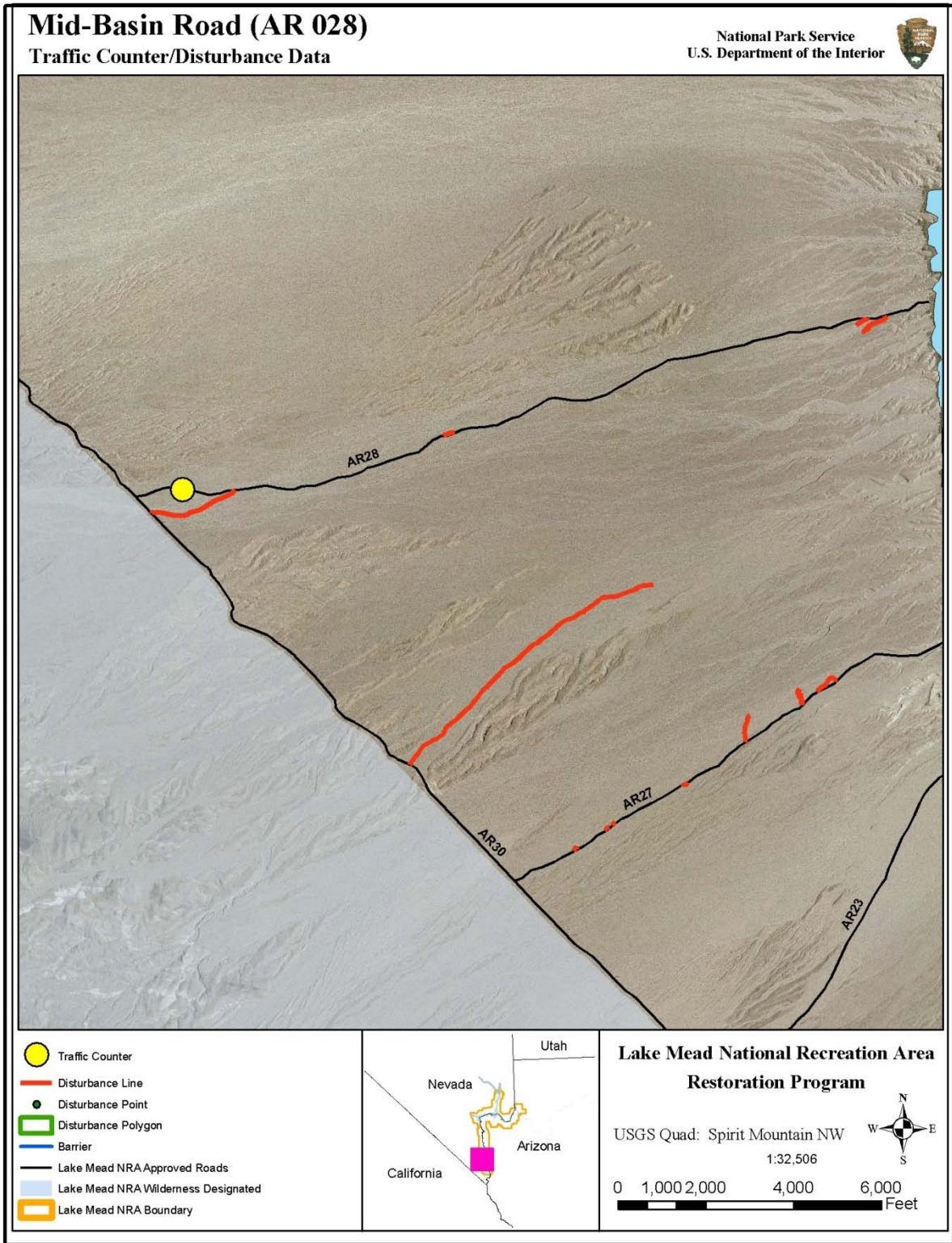


FIGURE 14. Location of traffic counters and disturbances on AR 028



AR 024

Nellis Cove road (AR 024) is located in the Cottonwood cove area south of AR028. This road provides lake access and popular camping and swimming opportunities. AR024 received the most vehicle traffic during the summer due to lake access. This road received low traffic counts; recorded counts ranged from 0-41 per month. Vehicle use on this road was closely associated with temperature; vehicle passes increased and decreased as the temperature did. This road received very little disturbance; the disturbances that occurred were usually in the winter months. Of the project roads in the Cottonwood Cove area, this road received the least amount of traffic due to it being the farthest down backcountry AR030.

Comparing Vehicle Passes on AR 024 and Disturbance Data with Temperature (Mean)

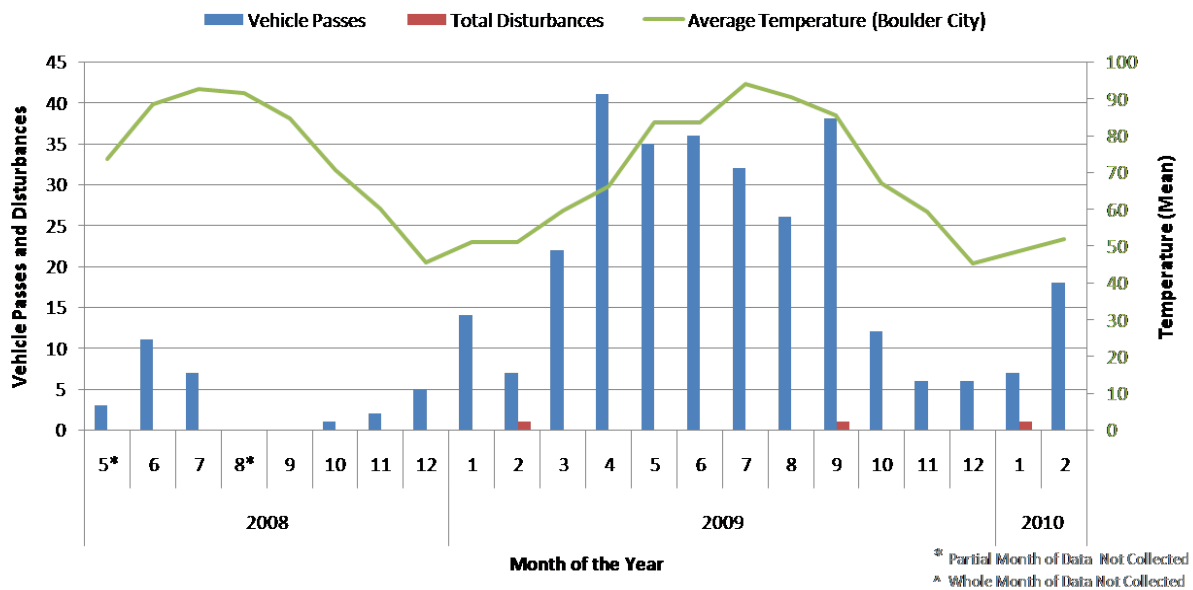
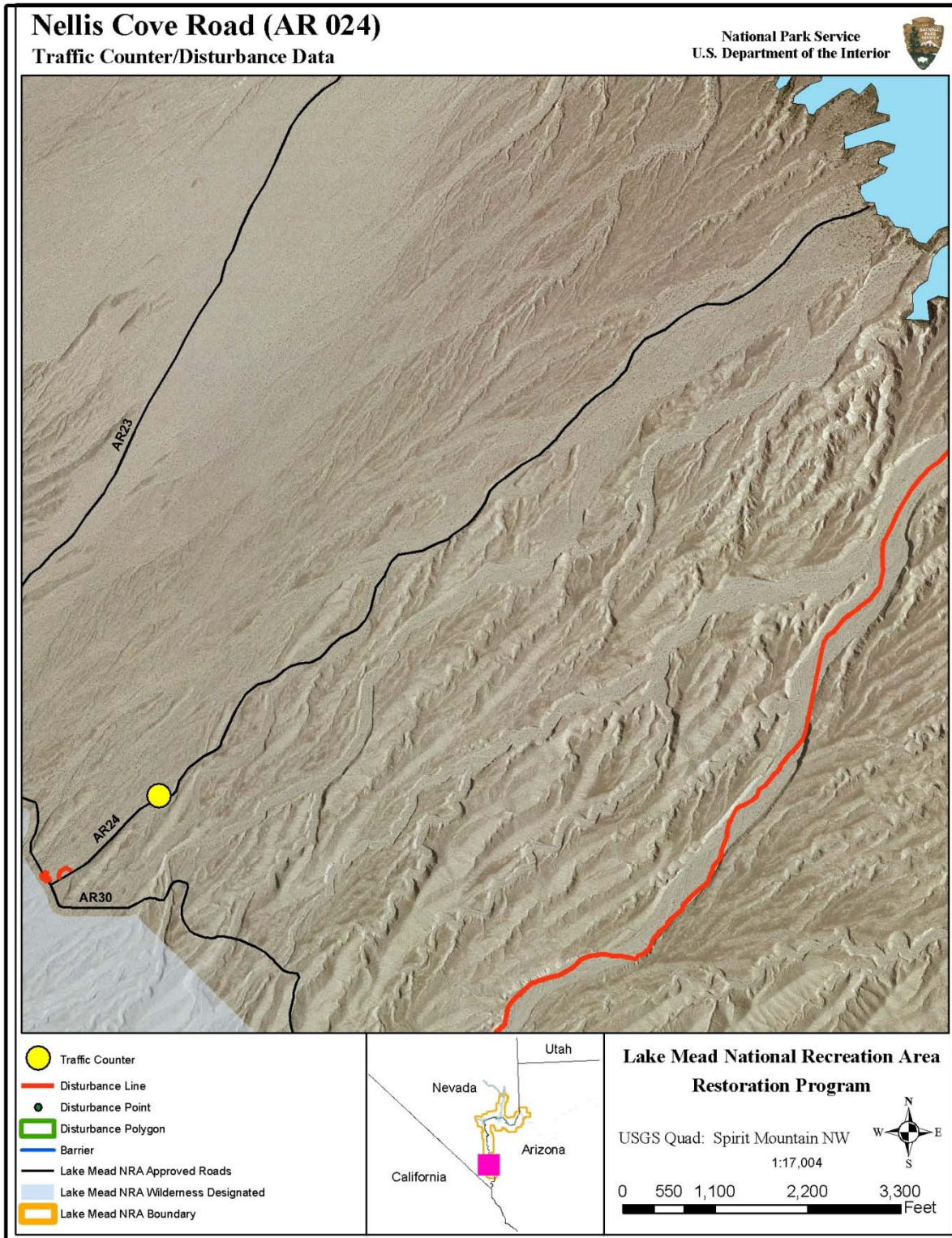


FIGURE 15. Location of traffic counters and disturbances on AR 024



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AR 154

West River Mountains road (AR 154) is located east of Henderson, NV in the River Mountains. This area received mainly ATV and dirt bike use. This road received low traffic counts; recorded counts ranged from 0-134 per month. The month with 134 vehicle passes is an extremely high count for that road; the next highest count is 47 passes. Not only were traffic counts low, but disturbances were also low, which was surprising considering the road's close proximity to Henderson. The even lower traffic counts later in the study could be attributed to a major entry point being closed to the public on BLM land during the same time period. There were a few illegal roads that stemmed from the middle and end of the road; these illegal roads were closed off with barriers by the LMNRA restoration crew. The disturbances that did occur were mainly by dirt bike, but also other vehicles ripping out the barrier at the end of the road to access the powerline road beyond which provides a good viewpoint of Lake Mead.

Comparing Vehicle Passes and Disturbance Data with Temperature (Mean) for AR 154

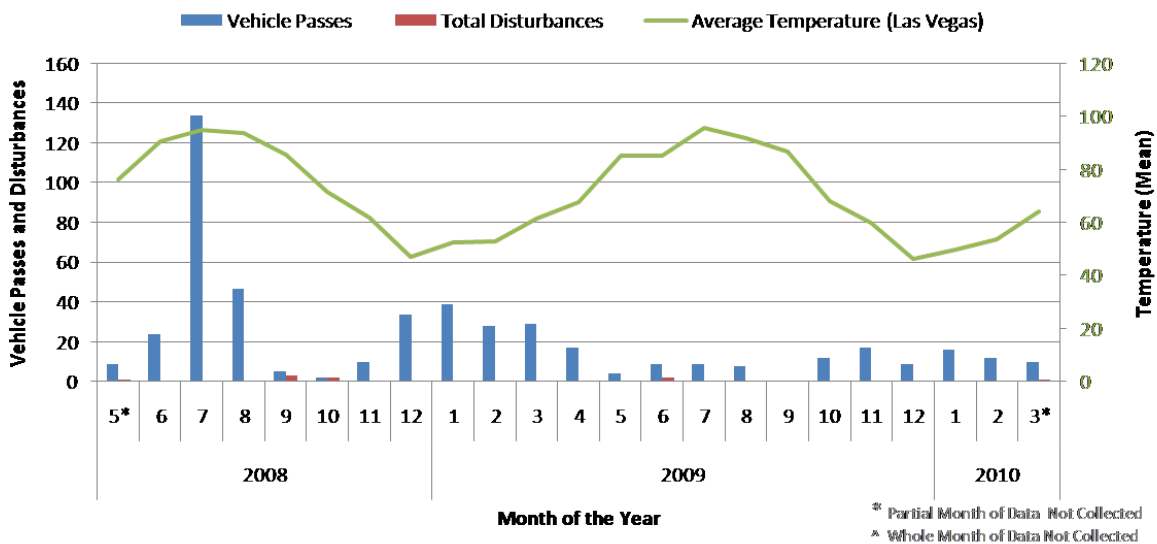
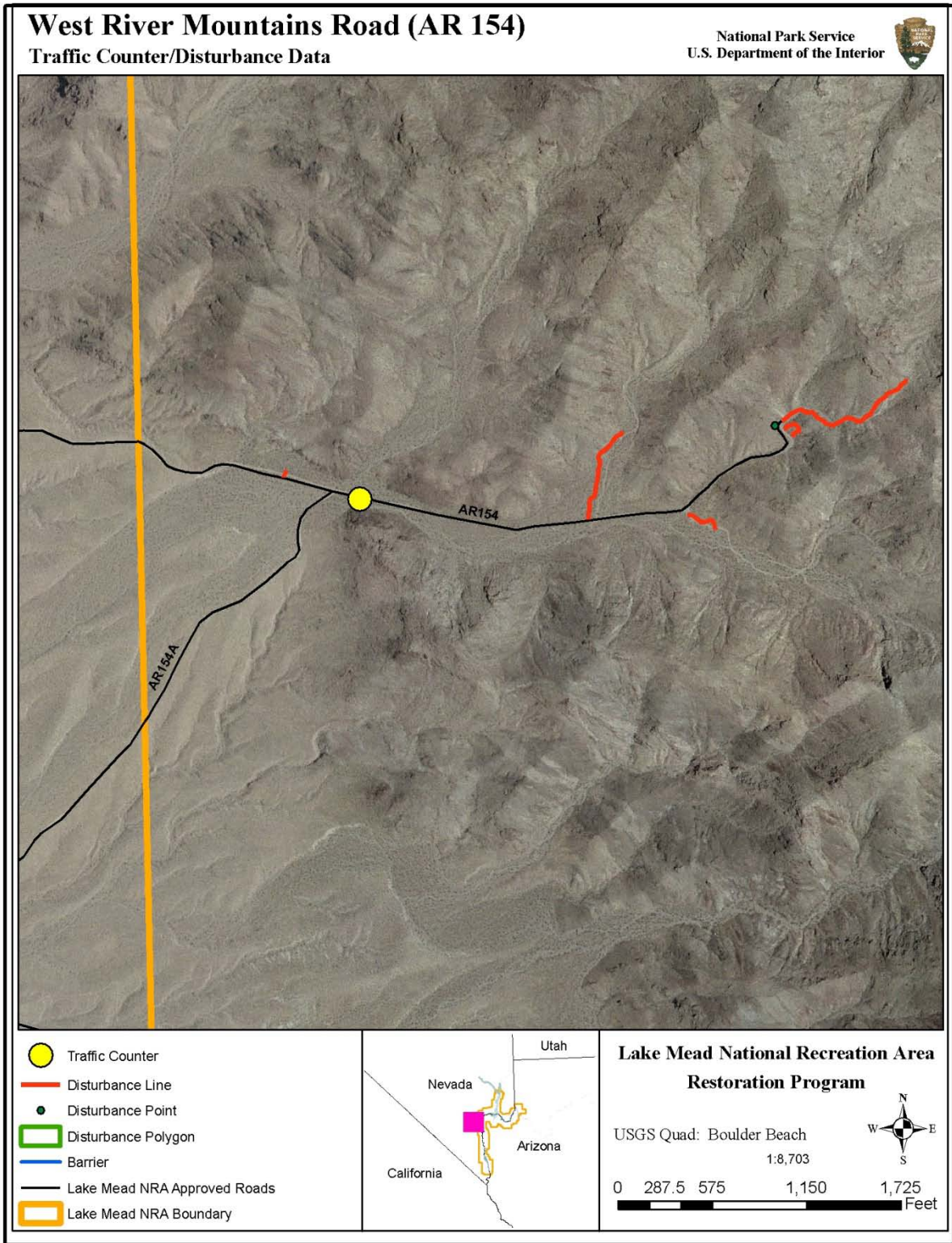


FIGURE 16. Location of traffic counters and disturbances on AR 154



AR 155

River Mountains South Power Line Road (AR 155) is located east of Henderson, NV in the River Mountains. This road provides access to an overlook of Boulder Beach and Boulder Basin. This road was mostly used by ATVs and dirt bikers. AR155 received greater vehicle traffic during the winter months. This road received low traffic counts; recorded counts ranged from 4-35 per month. During this study, one disturbance was recorded on AR155. The nu-metric counter had higher traffic counts than the TRAFx counter. The even lower traffic counts later in the study could be attributed to a major entry point being closed to the public on BLM land during the same time period.

Comparing Vehicle Passes and Disturbance Data with Temperature (Mean) for AR 155

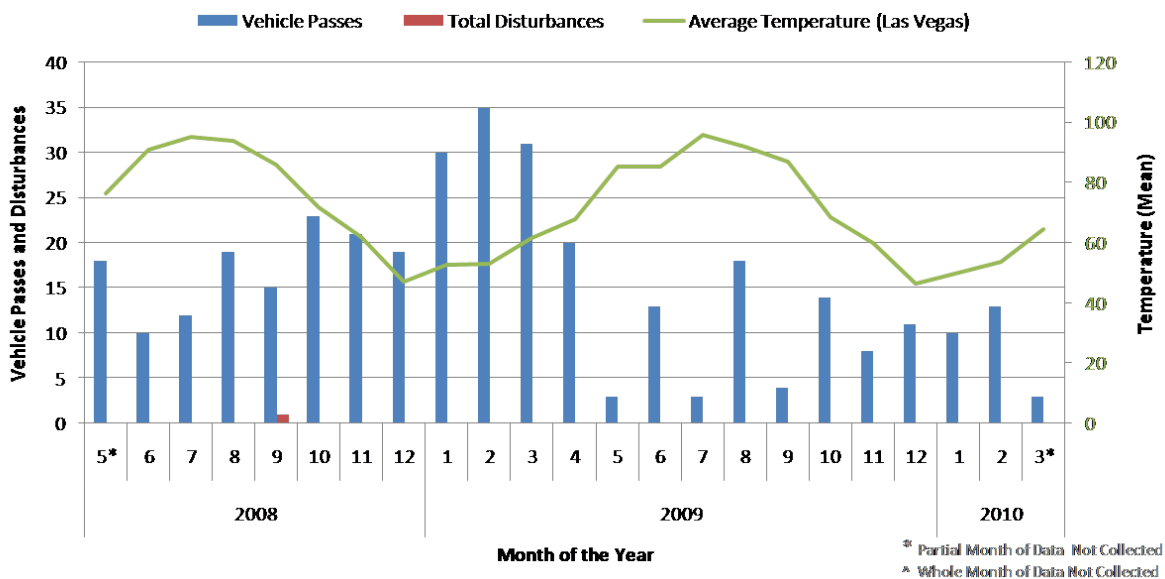
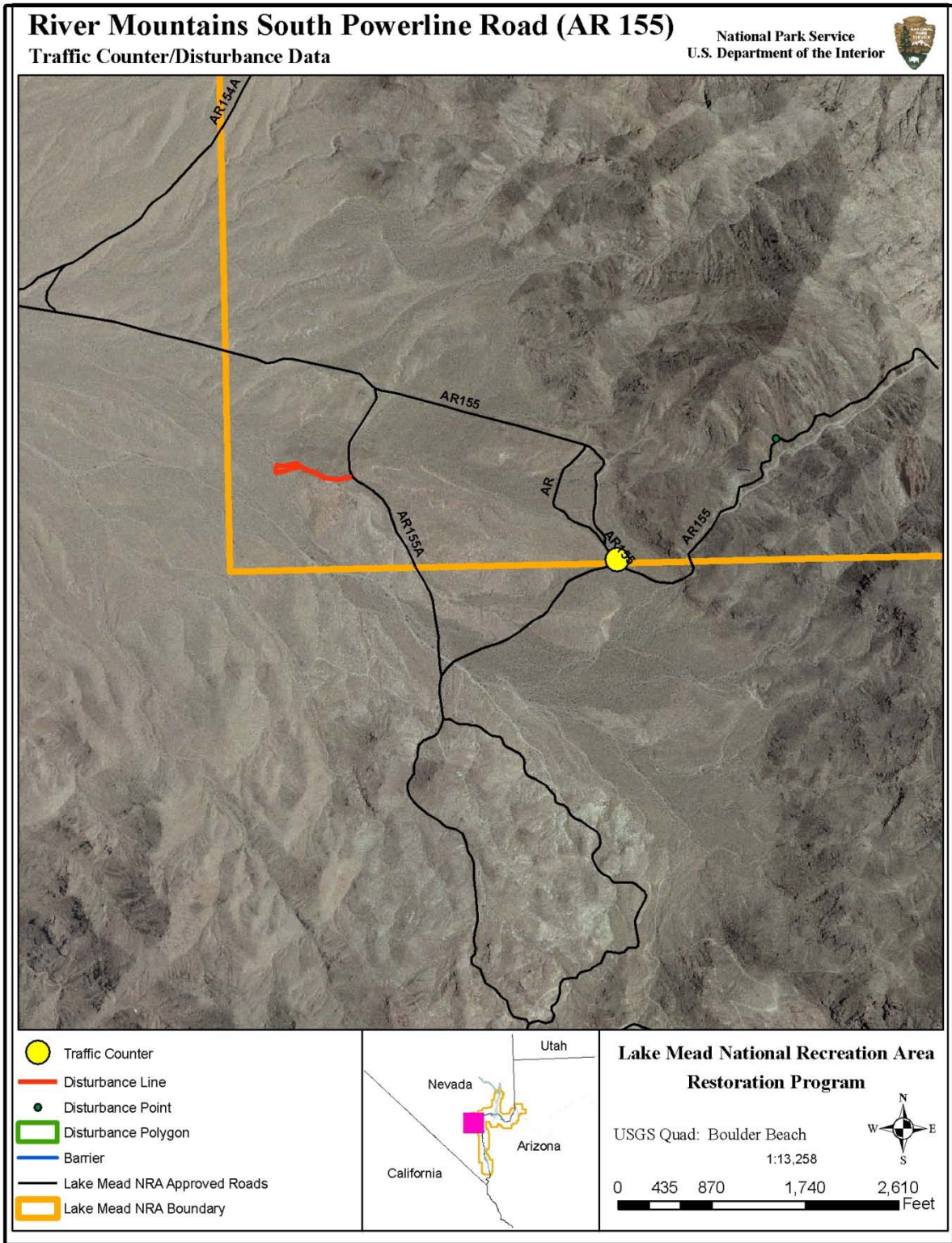


FIGURE 17. Location of traffic counters and disturbances on AR 155



AR 020A

Pipe Springs road (AR 20A) is a cherry-stemmed road in the Spirit Mountain Wilderness area off of Christmas Tree Pass road (AR20), which is a well-travelled road. This road provides access to a hiking trail for Spirit Mountain. This road sees moderate traffic counts, recorded counts ranged from 8-162 per month. Only a few disturbances were recorded on this road largely due to the roads short length. Most of the disturbances occurred near the end of road in close proximity to the hiking trail. During the month of 03/2009 traffic counter data was only partially collected because the traffic counter was accidentally turned off at the end of the previous collection period.

Comparing Vehicle Passes on AR 020A and Disturbance Data with Temperature (Mean)

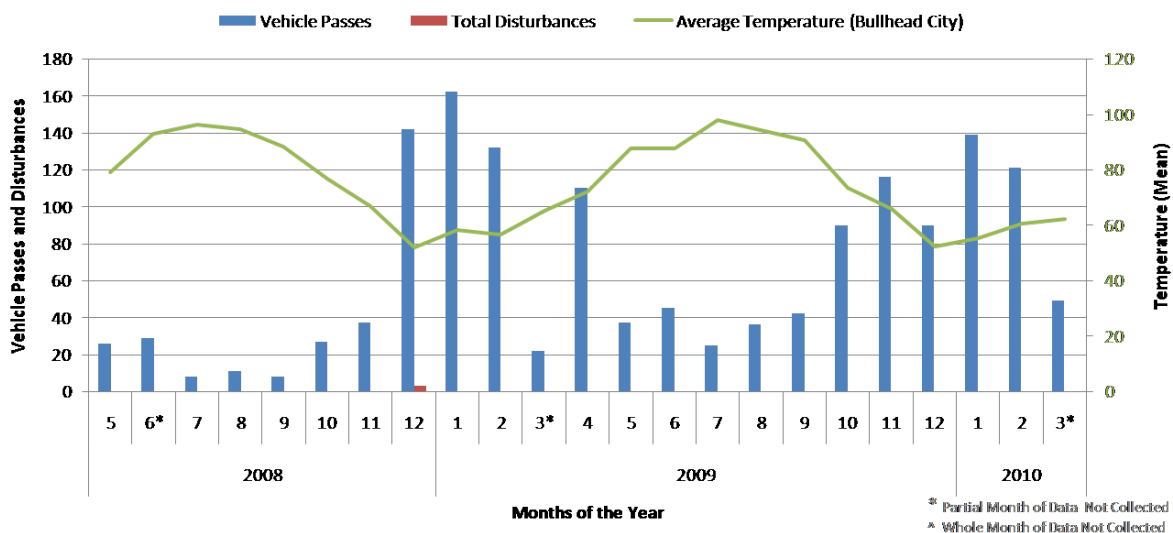
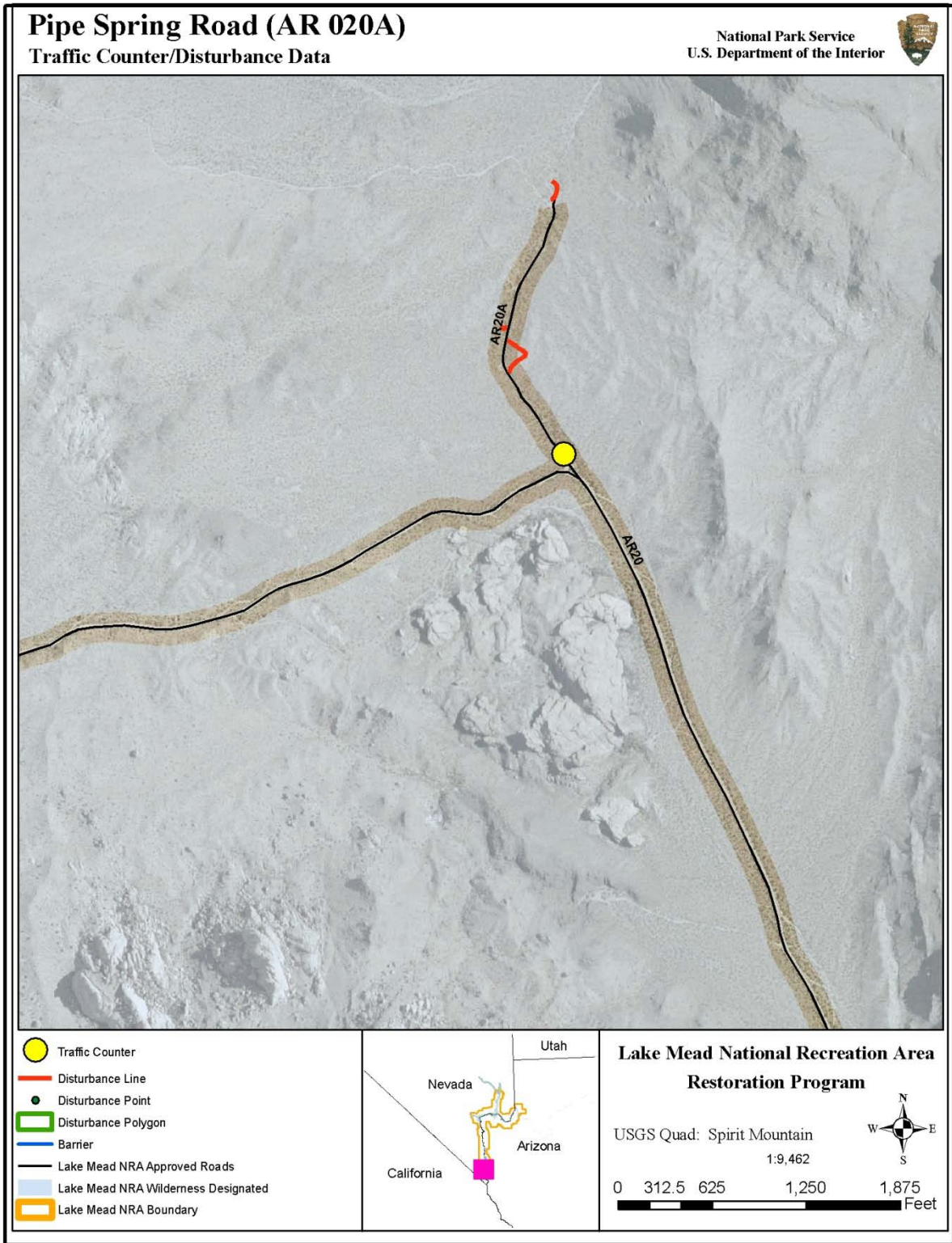


FIGURE 18. Location of traffic counters and disturbances on AR 20A



Summary/Conclusions

During the summer, visitor use is concentrated near the water such as Placer Cove (AR047), Montana Wash (AR045), and Six Mile Cove (AR031). Disturbances mainly occur at the coves such as graffiti and shoreline driving. During the winter, off-road travel occurs predominantly in the Boulder City (AR059 & 060) and Overton areas (AR110 & AR111) of the Park.

Goal Fulfillment

Goal #1: Discover incidents of ORV disturbances on a timely basis before they become established illegal routes.

By monitoring the 18 traffic counter roads on a monthly basis, the restoration staff was able to detect disturbances before they became major issues i.e. two tracks did not become well-used routes and illegal tracks did not proliferate as subsequent visitors created new tracks off of the original illegal tracks. However, some illegal tracks needed repeated restoration because visitors continued to use them. For example on AR044, visitors repeatedly drove off-road in order to go around a rough section of the road. This disturbance was restored 3 times during this project, but has not been disturbed since September, 2009. Resource management staff have concluded that monitoring the Park backcountry roads on a regularly basis is important. It not only prevents disturbances from proliferating, but it also keeps Park staff informed about what areas are receiving more off-road travel, and restoration projects can be more effectively planned for high priority areas. If timely restoration does not curtail inappropriate visitor activities in certain areas, Park management can use then determine whether a change in management strategy is necessary such as the new regulations enacted in the vicinity of Placer Cove prohibiting camping and alcoholic beverages.

Goal #2: Provide timely and accurate information to law enforcement and the restoration program that will result in more effective management in the selected areas.

The study provided important information about which areas of the park need to be monitored regularly and which areas did not need to be monitored as often. This study resulted in a closer partnership between the restoration crew and law enforcement staff. The restoration program was able to use information from the study to assist the law enforcement division in targeting particular areas for both day-to-day and saturation patrols. The information from this study was also used to provide vital information to Lake Mead Management in making decision regarding backcountry visitor use such as the prohibitions enacted in the Placer Cove area.

Through information collected by the traffic counter project, Park staff concluded that even though historically the Calville Bay and River Mountains areas received high levels of disturbance, disturbance was no longer a major issue in either of these areas. Thus, it was concluded that the restoration program, law enforcement and other Park staff did not need to concentrate as many resources and personnel in these areas. These areas will be monitored regularly in the future to ensure that visitor use remains appropriate

and follows the rules and regulations of the Park, but staff focus will shift from these areas to other more heavily used areas such as Placer Cove and Boulder City areas.

During the traffic counter project, it was concluded that Pipe Springs road (AR020A) no longer had the same visitor use problems that it had in the past. This road is in a popular hiking and recreating area. In the past, visitors drove off-road to access hiking and resource viewing opportunities. Barriers were installed at the end of 20A to keep visitors on the road. These barriers appeared to have curtailed off-road travel on this road. Park staff will continue to be concerned about this area because it is a resource sensitive area, but the restoration program will shift its focus to current problem areas.

From monitoring visitor use, and traffic in the Overton area, the restoration program has decided to continue to focus resources in this area. A traffic counter will be installed on AR112A to further monitor use. Disturbances continue to occur in this area. The restoration program plans to work with law enforcement to further curtail off-road travel and barrier breaches in this area.

Goal #3: Provide timely and accurate visitor information to help determine long-term management strategies for the park.

This project helped prepare the National Park Service for the future of Natural and Cultural Resource Protection at Lake Mead National Recreation Area. This project provided important information on which areas of the park received heavy use whether from legal or illegal use, as well as areas where visitor use has declined. During the summer, Placer Cove Road (AR 047) and Six-Mile Cove Road (AR 031) have been areas of both resource and safety concern. Both roads received high vehicle traffic during the summer, and users varied from Boy Scout troops to gangs. During the winter, Boy Scout Canyon Road (AR 059) and Burro Wash Road (AR 060) have been areas of resource concern. Both these roads received greater vehicle traffic during the winter months (and greater off-road use) because they were more appealing to hikers and ORVs. Through communication with the restoration program, law enforcement targeted these areas during times of the year when use and disturbance was greater.

From input from the restoration program, law enforcement, and other Park staff, Park management enacted new laws and regulations at Placer Cove prohibiting camping, and alcoholic beverages. The Park is continuing to develop and implement a plan to address Placer Cove visitor use issues.

Information gained through the traffic counter program also led to an interdisciplinary management approach in the Boulder City area in the Fall 2009 and Winter 2010. Law enforcement, restoration, interpretation, and volunteer staff worked together to target users in the Boulder City area. The volunteer program visited the Boulder City High School, and presented on the importance of staying on approved roads, and not denuding the landscape with party events such as the spot on AR058A. They also informed the students of the consequences that could result from not following Park rules and regulations. A volunteer event was setup for the high school students to restore the party site on AR058A. Law enforcement did 3concentration patrols in the

Boulder City area prior to the event and patrolled during the event. Law enforcement, restoration, interpretation, and volunteer staff worked alongside the students to restore the party side. Afterwards, the students went on an interpretive hike lead by the interpretation staff. This same approach was used again with college students; the interdisciplinary team worked alongside the students to build a barrier in the Boulder City area to prevent off-road travel beyond the end of AR75D. This interdisciplinary approach was well received by Park management, and will be used as a model for long-term management of other areas of the Park.

Recommendations

The backcountry traffic counter project should be continued as a long-term program. This will give Lake Mead NRA a larger dataset to draw conclusions regarding trends in traffic counter and disturbance data. Traffic counters from some roads should be re-located and the entire project should be extended to the Arizona side of the Park. Traffic counters from AR 154 and AR 155 should be removed due to low visitor and disturbance use. The traffic counter on AR 20A should also be removed; the area is already covered by two law enforcement traffic counters, and the wilderness program has a people counter off of AR 20 monitoring visitor use of the Spirit Mountain hiking trail. The traffic counters on AR 24 and AR 28 should be removed, and one of them re-located to AR 23 in the Cottonwood area which has a nice beach and bathroom facilities, and most likely has greater vehicle use than either AR 24 or AR 28. The traffic counters on AR 94, AR 97, AR 98, AR 106 and AR 51 should also be removed due to low disturbance levels and use. The remaining traffic counters on AR 110, AR 111, AR 59, AR 60, AR 44, AR 45, AR 47, and AR 31 will continue to provide important information in protecting both the natural resources and visitors in the area.

Other roads that would benefit from traffic counter placement would be AR 115, AR 36, AR 38, AR 112A, AR 58A, AR 136, and AR 145. AR 115, in the Gold Butte area has historically received high ATV and jeep traffic during the fall-spring months especially during hunting season. AR 36 and AR 38 in the Cottonwood East area is a popular area in the summer due to various coves and tree cover. AR 112A in the Overton area has several issues pertaining to off-road vehicles and cattle use. It is anticipated that the backcountry roads in the Willow Beach area, particularly AR 55 and AR 56, will receive more use when the Hoover Dam Bypass Bridge across Black Canyon opens providing easier access to the area. Backcountry use may also increase as visitors try to circumnavigate the entrance station that is schedule to open this year. AR 58A has a popular party site that is regularly denuded and trashed. There are several off-road vehicle use issues along AR145 in the Meadview area, and AR 136 is a popular road in the Temple Bar area.

Management should concentrate more resources and personnel to the Cottonwood, and Nelson cove areas during the summer, and the Overton area during the winter. The restoration staff should work with interpretive staff to have more of a presence in the backcountry during peak use times. Interpretive rangers could disseminate information regarding the importance of staying on roads, backcountry regulations and rules, and provide information on what the restoration program does and why. Visitor

contacts by interpretive and restoration staff coupled with increased law enforcement presence during peak use times would likely further reduce backcountry disturbance.

Literature Cited

- Pica, E. Smith, J., Kripke, G. (1998). Trails of Destruction. Friends of the Earth

DISTURBANCE MONITORING

STANDARD OPERATING PROCEDURE

METHODS

1. Examine the park map and project map to get familiar with the approved road(s) before starting.
2. Identify what the historic disturbances, barriers, and signs are and where they are.
3. Radio (#700) or call (293-8988) into dispatch and notify them: Radio call number in service and checking approved road(s) number, number of people, and estimated time of return.
4. Slowly drive down the road and document incidents of illegal vehicle activity (called disturbances, re-disturbances), sign condition, road condition, and other observations which may be of interest. Please make notes or comments for sign recommendations with details about conditions, location, and type of sign.
5. Take photos of all signs if none have been taken.
6. If possible correct any conditions which can be performed immediately such as putting a barrier post or sign back in the ground.
7. Submit completed forms to project personnel in the Restoration Program.

DOCUMENTATION

Monitoring Assessment Form

Date	- the date of the monitoring (mm/dd/yyyy)
Approved	
Road #	- record the road #
Entire Road	
Monitored?	- check Y if the entire road was monitored and N if the entire road was not monitored. If N was checked then document how much and where the road was monitored and why it wasn't entirely monitored.
Assessing Party	- first and last names of observers (primary first), initials are ok
Additional	
Monitoring	
Documentation	- check the appropriate box for documentation collected other than the Monitoring Assessment Form.

Road Condition	- for initial monitoring provide detailed road conditions. Subsequent monitoring should note any changing road conditions, potential hazards, etc... Note locations for observations as applicable.
Description of any	
New damage	- describe illegal vehicle activity including: type of vehicle (length if known), where it goes or what occupants were doing (if inferable), missing or damaged signs or barriers, etc...
Other comments	- use this section to document any interesting observations such as exotic species, litter, wildlife, cattle, burros, cultural sites, etc... Suggestions or ideas for signs, barriers or other types of recommendations can be put in here.

Locations

Four ways to document locations:

- Descriptive – provide an estimated distance from landmarks and directions to. Road proximity to topographic features (e.g. wash, side hill, ridge, saddle, etc...)
- Mile Marker – at the start of the road, set the trip odometer to zero. When an item of interest is found, note the trip mileage, side of road, perpendicular distance from road, and provide a brief description.
- Map – mark the location on a map with corresponding labels for narratives.
- Coordinates – record the location with a GPS unit and indicate the coordinate system projection (if any) and datum (UTM, Zone 11, and NAD 83 are preferred). *This is the preferred method.*

Photos & GIS

Take initial photos of all signs, disturbances, unique road conditions, or other interesting observations. Photos for multiple signs of the same type are not required (e.g. AR ###, 4x4).

Photos are not required during subsequent monitoring events unless something changes. Provide descriptions of the photos and associated names if it is not evident in the data sheet comments or if there are duplicate features. Electronic files should be placed in the corresponding road folder under: S:\DisturbanceAssessment\Adopt_A_Road\Inbox\AR#.

Signs

A table of signs for the approved road is provided. If a sign is damaged or missing document it on the monitoring assessment form. Take a photo of damaged signs. Document new signs encountered that are not in the tables. Carsonites with signs are not inventoried.

DEFINITIONS

Disturbance – an initial recording of a site that is altered, degraded, or destroyed due to direct or indirect human activities.

Redisturbance – an area which has already been recorded as a disturbance (most likely it has been restored, but it may not always be the case) but has new tracks; often associated with breached barrier occurrences.

Barriers - prevents additional resource damage

- Boulders
- Gate
- Tank Traps
- Metal Post & Cable
- Telephone Post & Cable
- T-Posts &/or Carsonites
- T-Post Fences

The Traffic Counter Standard Operating Procedures (SOP) for the NC-30X goes as follows:

Each nu-metric traffic counter comes with an instruction booklet. These particular traffic counters use a magnetic field to count cars that pass within its magnetic field. They come with a steel casing that protects them from the weight of vehicles. Each traffic counter must be placed inside its protective casing and buried 2-4 inches below ground. The further below the ground they are installed, the less accurate they will be. They should be put below ground to protect them from theft/vandalism. Placing them below ground gives them extra protection from the weight of cars.

When placing them in the ground, place them in a section of the road where the road narrows. This should force the vehicle to pass over the counter and results in an accurate count of visitors. Keep in mind the possibility of flash floods on the AR. It is best to place the traffic counter on higher ground, if possible. If the traffic counter encounters a flash flood, the counter will not travel far from original placement.

Install the battery with the positive side facing up. When you first install the battery make sure the traffic counter completes the self-test. The self-test should start by flashing 888888. After the 888888 flash the numbers will count down from 000000, 111111, 222222 ... 999999. Each traffic counter should have 9 (P) functions in the computer. Some traffic counters come with 7 (P) functions, do not to use those traffic counters. The standard set-up for the traffic counters should go as follows.

Pressing the "P" key will change the function. When you are in the correct "P" function e.g.- P6, you can change the settings using the "S" key. Continue to press the "S" key until you have reached the desired setting. After you have reached the desired setting press the "P" key to go to the next function.

- P1- this function is used to set the interval time. The computer will break down traffic counts for the interval time you set. Set for 1 count per day "PEr-dA", this will keep track of visitors each day for 90 days maximum. The battery usually will last no longer than 45 days, so gather information every 30-40 days.
- P2- if set as listed above (per day) this function will automatically skip. If P1 is set at 15min or 1 hour you will have to set this function for when you want the counter to stop. Your options are continuously (oo), 1, 6, 12 hours or 1-7 days.
- P3- this function is not available if P1 is set to (per day). P3 function is for start time. See instruction booklet for details.
- P4- this function is for the internal clock. You have to set the clock after replacing the battery. After you replace the battery set the time to 23:58. This way you will start

APPENDIX 2. The Traffic Counter Standard Operating Procedures (SOP) for the NC-30X

gathering data immediately. The counter doesn't begin recording until the clock hits 24:00, after that it resets the day and begins recording.

- P5- this function is the sensor mode. The operator should select "SEnSor" if placing into the ground. If counting manually select "U-PUSH".
- P6- this function selects the average pace of traffic the counter should expect. Every selection should be "H-3000"
- P7- NA
- P8- We will not use. Leave at default, do not touch.
- P9- this function is used to sense the speed of traffic. For the programs purposes set to "-OFF-"

After the functions have been set you need to clear previous data, (after you've recorded the data) and start the counter. To start the counter:

1. Press the P key until it reads P0:-----
2. Press the S key twice, or until it reads -CLEAR
3. Press and hold the P key so it remains on clear
4. While holding down the P key press and hold the S key. Once "CLEAR" becomes "---run" stop pressing the key and the survey is ready to be conducted.

*Make sure the back of the counter is locked in place, the hardware will not fit into the protective slip if it is not closed correctly.

After the survey has been completed (30-40 days) collect the data. To view collected data:

1. Hold the P key until P0:----- is displayed. You may need to hold the P key for several minutes.
2. Press the S key once and the first number that is displayed is the total of the survey.
3. Continue pressing the S key to gather how many visitors the Park had each day. Your first day will read "01: (# of visitors)", your second day will read "02: (# of visitors)", etc...
4. Record the vehicle counts for each respective day in the "# of Vehicle Pass¹" column. The roads being studied are one way, not loop roads. Dividing the number in half and rounding up doesn't count the same visitor twice and provides an estimate of the number of vehicles. Record this number in the "# Vehicles²" column.

Each battery has a **maximum** life of 90 days, but the battery should be replaced every time you collect data from the counter (every 30-40 days), in order to avoid losing data. In the monitoring field book write the date each battery was installed.

GPS the location where the counter is installed. Use a data point to mark the area, also place some flagging parallel to the counter for backup purposes.

APPENDIX 2. The Traffic Counter Standard Operating Procedures (SOP) for the NC-30X

There are two data sheets that you must fill out when gathering the traffic counter.

One data sheet is for recording the number of visitors. The sheet is self explanatory, except for dividing the number of visitors in half. Also record the date in the area supplied. At the bottom of the sheet please fill out the remaining variables (Appendix 7.).

For example: If a traffic counter is reset at 2:30 PM on 1/1/06 and then picked up on 1/31/06 at 10:30 AM, your study would have only lasted 30 days. On 1/31/06 you will not be able to record that date until the next time. This is also why it is important to set the clock on the traffic counter to 23:58.

Site Selection

1. Select a straight stretch of road where traffic flows freely at a steady speed without stopping and where it is safe to work.
2. Find a place where the traffic counter can be hid easily and if water collects then the ground will drain the water.
3. Do not install near electrical transformer boxes or power lines.
4. Use safety precautions when installing and collecting data: hazard lights, road pylons, bright vests, and other safety equipment.

Data Collection

1. Check G3 Dock station and make sure the green blinking light is on, “Shuttle Mode.”
 - a. If the green blinking light is on “PC Mode” then press the small button on the right side of the G3 Dock Station until the green blinking light is on “Shuttle Mode”
2. Attach the G3 Dock station to the TRAFx Advanced Counting System
 - a. Keep the TRAFx Advanced Counting System Level to the ground, because if you tilt the counter this could lead to a light blinking at “Replace Counter’s Batteries”
 - i. If this happens remove dock station from TRAFx Advanced Counting System and then re-attach the dock station to the TRAFx Advanced Counting System. **(Keep the Dock Station Level)**
 - ii. If the “Replace Counter’s Batteries” Light comes on again then replace the batteries and re attach the dock station
 - b. Also assess the batteries and make sure they are located in the proper position in the Counting system
3. When the Data is Downloading the “Downloading, etc. –wait–” button should be blinking
4. When the Data has finish collecting the “Finished –Disconnect now–” should be blinking.
 - a. If lights are blinking next to the below Modes

LED	Comments	Blink Pattern
Replace Counter Batteries	Low Batteries. Disconnect, replace counter’s batteries, then re-connect	4x/1 Second
Counter Alert	-Counter Problem; bring to office -or not a valid counter (G1)	4x/1 Second (fast)
Dock Alert	Dock has invalid date/time; connect to PC and configure date/time	1x/2 Seconds (Slow)

Memory Full	Do not download anymore counters	4x/1 Second (Fast)
>75% Warning	Warning	1x/2 Second (Slow)

5. Insert New Humi Dri Desiccant Packs
6. Put TRAFx Counter back in original position
 - a. Make sure traffic counter is perpendicular to the road
 - b. Make sure that the traffic counter is 5 meters (16.5 ft.) from the opposite side of the road

Creating ArcMap Layouts/Maps Standard Operating Procedure

1. Open the *lakemeadrestoration* file. This will either be under S:\DisturbanceAssessment\ArcMap&ReportMaps or an icon on your desktop. This project has all the base data layers saved.
2. Add new data as needed. The *Add Theme* button (a plus sign with a 3-D yellow triangle) is located on the standard (2nd) tool bar. Merging layers will be done by the Data Manager in the program.
3. Once you have the data you need, save the project labeled with the project code *Save As* under the appropriate folder. Crew members will save maps in a different folder than the disturbance manager.
 - The disturbance manager would save CC0390204A under C:\DisturbanceAssessment\Cottonwood&Nelson\ArcMap\AR39 \CC0390204A.
 - Crew members would save CC0390204A under S:\DisturbanceAssessment\Cottonwood&Nelson\ArcMap\AR39\Restoration_Maps_FY(current fiscal year)\CC0390204A.This makes it easier for the Data Manager to find your maps. Approximately every 3 months the disturbance manager would copy his or her maps to the S:\ drive and transfer the maps out of the “restoration_maps_FY___” folder into the regular disturbance assessment road folder e.g. AR39 on both the C:\ and S:\ drive. This ensures that all the maps have a backup copy.
4. Delete any layers you don't need for the map. Almost always, you keep datalines (or poly or points), barrier, approved roads, lame_boundary, lame_colordoqqq.
5. Zoom in to the area you are creating the map for. There is a template layout already created by AlaskaPak. Click on the layout button.
6. Label all major roads. In the lower left hand corner of the screen, on the drawing toolbar, click on the 3-D A. Then click on the road you want to label. Make sure it is bold with black text.
7. Label all the appropriate disturbances and barriers. On the drawing toolbar, click on the down arrow next to the 3-D A. Choose the blank bubble symbol. Then click on the disturbance you want to label. If you only want to view (and print) the disturbances relative to the map, you need to query just those disturbances. This is done by double clicking on the layer you want to query. Choose *Properties*. Click on the Definition Query Tab. Click on Query Builder. Choose PROJCODE under Fields, =, click on *Unique Fields*, then the appropriate code. If you are doing more than one, click on *or* after you've finished the first code and follow the same steps e.g. "PROJCODE" = 'BC0510504A' OR "PROJCODE" = 'BC0510504B'

Monitoring Data Sheet/New Disturbances

Monitored Area Code: _____ Date: _____

Number of Visitors/Month: _____ Approved Road # _____

Graffiti: Yes No

Trespass Violation Number(s): _____/_____/_____

_____/_____/_____/_____

Type of Vehicle Tracks: ATV Motorcycle Truck/SUV

Damage of trespass: Severe Moderate Minimal or Graffiti

Length of trespass(s): _____ ft. Length of Approved Road: _____ ft.

_____ ft. _____ ft.

_____ ft. _____ ft.

Does the AR provide Lake Access: Yes No

Soil Type(s) of Disturbances: _____/_____/_____

_____/_____/_____/_____

Description of Trespass(s): _____

Slope of area trespassed (approximately): _____% Hill Climb: Yes No Maybe NA

Reason for trespass: fun/recreation looking for campsite did not know regulations
water/beach access unknown power line access goes to mine goes to inholding
turning around looking for old road graffiti hunting access shortcut

Previous Preventative Measures (check that apply): carsonite boulders t-post and/or
fence tank trap telephone post & cable gate vertical or horizontal mulch
permeon rip soil fill soil metal post & cable replanting/reseeding graffiti
removed none raked sign graffiti removal

Court Case: Yes No

Court Case Number: _____

Actions taken by monitor: _____

Monitoring Data Sheet/Redisturbances

Monitored Area Code: _____ Date: _____

Number of Visitors (traffic counter #): _____ Approved Road # _____

Graffiti: Yes No

Trespass Violation Number(s): _____/_____/_____
_____/_____/_____/_____

Type of Vehicle tracks: ATV Motorcycle Truck/SUV

Does the AR provide Lake Access: Yes No Length of Approved Road: _____ft

Previous Preventative Measures (check that apply): carsonite boulders t-post and/or fence tank trap telephone post & cable gate vertical or horizontal mulch permeon rip soil fill soil metal post & cable replanting/reseeding graffiti removed none raked sign graffiti removal

Describe how barrier, sign, mulch, etc... was breached: _____

Reason for re-trespass: fun/recreation looking for campsite did not know regulations water/beach access unknown power line access goes to mine goes to inholding turning around looking for old road graffiti hunting access shortcut; and describe _____

Road description: 4X4 necessary 4X4 recommended 2WD satisfactory

Are any raked/rehabilitated areas revegetating: no sparsely moderate abundant

Describe rehabilitated amount: _____

Actions taken by monitor: _____

Traffic Numbers

Date's Monitored: _____ to _____ Approved Road # _____
 Observer: _____

<u>Counter Day</u>	<u># of Vehicle Pass¹</u>	<u># Vehicles²</u>	<u>Date</u>
5			
10			
15			
20			
25			
30			
35			

of new trespasses _____ # of reoccurred trespasses _____

Other (graffiti, barrier damage, garbage, comments,
etc...)

Supply Check List for Traffic Counter Road Monitoring

Tools:

- Leaf Rake
- Rock Rake
- McLeod
- Pick Mattock
- Shovel
- Rock Bar (Tamping Bar)
- GPS System
- Small TRAFx screw driver

Consumable Supplies:

- Lithium Batteries (one every 30-40 days)
- C – Alkaline Batteries
- Desiccant packs
- Duct Tape

Personal Protection:

- Eye protection
- Safety Vest
- Ear Protection
- Gloves

GPS Standard Operating Procedure Thales Mobile Mapper CE units

COLLECTING DATA:

1. Be sure the gps is charged before taking out into the field. This is done by attaching the pronged charger to the back of the unit (chargers are plugged in next to our computers). You can check the battery status by clicking on the Start button (lower left-hand corner of the Windows screen)/Settings/Control Panel/Power.
2. Turn on the unit using the red button. You may need to hold the button for a few seconds (loading...) if the unit was in full shut down mode. Otherwise just tap the button.
3. Using the stylus (plastic pen), double-click on the restore icon. If the restore icon is unavailable, open the Arc Pad icon. This will work the same, but you will need to individually add each layer. The restore file has them loaded for you.
4. Click on the satellite button in the menu bar (in between the notepad and identify tool). Activate the gps.
5. See manual for more information regarding when to gps disturbances as points, lines, or polygons. Click on the down arrow of the notepad button on the menu bar and choose the feature you will be gping. This will activate the tool bar (turn it into bold print).
6. Click on the point, line, or polygon button (depending on what feature you choose). This will activate the satellite buttons on the same tool bar. **BEFORE** clicking on the satellite buttons, be sure you are ready to collect data. Once you click on the satellite buttons, the gps will be active and it will start collecting data. If you are standing on one spot, it will collect multiple points at once and we will end up with jagged lines going all over the place. The idea is to click on the feature button and then the satellite button. It is best to walk an even pace and keep the gps at the same level. Make sure you are collecting data. You must stop and start again until you are collecting data.
7. Choose the 1st point satellite button (without the 'x') for point features and the 3rd satellite button for lines and polygons. Unless you are collecting a point, begin walking. If you need to break for a moment (dropped a pen, tie your shoe, bathroom break), click once on the satellite button. This will turn what you've collected blue and 'pauses' the gps for a moment. Click on the satellite button again to resume.
8. Once you are finished, click on the satellite button (turns your data blue) and then on the feature button (just left of the satellite buttons). A form will pop up.
9. See manual for instructions on how to fill out the forms.

10. Once the form is complete, you will see a dotted line around your new data. Follow steps 5-10 for further data collection.

11. To collect sign data or to edit sign data, click on the sign icon on the lower tool bar (should be the only icon on this tool bar). Wait a moment and it will activate the tool bar just above it with different icons than the feature icons.

12. To collect new sign data, click on the satellite button. There is only one. Fill out the form. Be sure not to miss any fields. If there is more than one sign to collect, click 'ok' after you've entered in data for one sign and it will shoot you back to the add sign option. Repeat as necessary. Once finished, click ok.

13. To edit a sign you've just entered in or another sign, click on the "E" button next to the "S" button and then click on the point (sign) and you can edit the signs information. This is necessary if the sign has been altered and needs replacement or if you've entered incorrect information.

14. Follow the same steps to edit post information.

15. To go back and forth between sign data collection and feature data collection, you must click on the sign button on the lower tool bar to de-activate the sign tools. This will bring you back to the feature options. Begin with step 5.

16. Be sure to turn off the gps when not in use. You can suspend the unit or use the full shut down mode option. This will depend on what you are doing. Most times you suspend the unit. You can do this by clicking on the start button and choosing suspend mode or by tapping on the red button and choosing suspend.

Trouble Shooting and A Few Other Notes:

- The gps will automatically save after each feature you collect. It is not a bad idea, however, to save your data if you are zoomed in at a certain location or you have other settings set.
- If you are unable to get satellites or receive an error where you can not get satellites, turn off the gps by holding the red button/ESC/ENTER at the same time until it turns off. Turn the unit back on and try starting all over. This usually works.
- If the screen blanks out, it is just "resting". Tap on the red button or the large circle button (arrows on it) to refresh the screen. This is very similar to a computer.
- Be aware of your battery life. There is an extra battery pack available (if you brought it with you). The battery lasts about one field day when the backlight setting is low and you are sure to suspend the unit when you are not using it.
- To add a layer, click on the down arrow of the open folder button in the menu bar. Choose Add Layer. Navigate SDCard\gis\Base. Choose layer you want. Click yes if it asks you to change it to NAD83 coordinate system.
- To change a color of a layer (this is very helpful), click on the down arrow of the open file button and choose Layers. Double click on individual layers you want to change the color. Click on the 3rd tab for style change. You can change the line

- width or color by clicking on those boxes. **DO NOT** fill polygon features. Just choose an outline width and color for polygon features. Filling them will take up a lot of data space and it will take forever to zoom in or zoom out or refresh. Trust me!
- Sometimes when you are trying to identify a feature, different data information comes up. This may be due to larger base files overlaying other ones, so you are only able to access the larger file data. For example, under Layers in the open file button, lame_boundary is at the top of the list overlaying datalines, datapoints, postsign. To change this, click on lame_boundary (highlight it) and click on the down arrow (lower right hand side on this box) until it moves it to the bottom of the list. You may need to do this if the larger files are on top of the smaller ones. Now try identify.
 - Options should be pre-set, but sometimes the gps does not want to get satellites or you are getting weird pop-up errors. Options should be set as follows: Protocol Tab-uncheck Automatically Activate, GPS Tab-Port is COM2, Quality Tab-Non-Compulsory Warnings/Max PDOP 6/ check 3D Mode Only, Alerts Tab-The only alert which should have a check under the eye is the 1st one (No data being received. Check cables and configurations). All the other alerts just have the sound checked, AUX Tab-COM2. All other tabs are left alone!!

DOWNLOADING/UPLOADING DATA:

1. Attach charger to the back of the gps unit. Plug in gray USB cable on the right side of the charger. We use the same USB cable for our cameras. The unit needs to be turned on.
2. Microsoft ActiveSync begins working (or it should). Click No for a Partnership. We are always Guests. If ActiveSync doesn't work, you may try detaching the charger and starting again or you may need to reboot the computer.
3. Click on Explore. Navigate to SD Card\gis\Base or Field.
4. To add new layers, copy from your computer and paste in the Base data folder. The only data you paste in the field folder is the signs data located in S:\DisturbanceAssessment/Sign/checkout folder. Otherwise, download data into the Base data folder.
5. To retrieve data from your unit, cut files from the Field folder and paste in the appropriate folder on the computer.
 - Data is stored on the S drive. This is the place where everyone but the Disturbance Manager will download and retrieve data.
 - Download newly collected data into S:\Disturbance Assessment\temp and rename if appropriate
 - Download sign data after renaming it (i.e. signcond_editAR44-47_20080523) and put into S:\DisturbanceAssessment/Signs/signstobmerged folder
6. Corresponding pictures are renamed and downloaded into S:\MichelleZ\foldername of your choice. This is usually by date and area/project code (i.e. 2008-5-23 Nelson Monitor)