Pilot Test of Monitoring Sampling and Protocol

Bureau of Land Management
West Mojave Plan Area
March 27, 2013

Background

The West Mojave (WEMO) Plan area contains around 5,000 miles of designated routes. BLM will be conducting monitoring of the designated route network to evaluate public compliance with travel management designations established in the Final West Mojave Plan (2005), as modified by court order. Specifically, monitoring will evaluate public compliance with route closures and the creation of new illegal routes, by monitoring incursions along the designated route network. Incursions are defined as locations where visitors have used a closed route, developed a new route, or expanded an existing route through shortcutting, new staging area development, or similar activity. Incursions do not include hiking, mountain biking or equestrian (non-motorized) trails, and do not include plan-authorized stopping, parking and camping locations in previously disturbed areas.

BLM drove the designated open network and collected quantitative data on the number of current incursions (and associated feature information) during the baseline data collection that was completed in 2012. This 2012 incursion dataset is considered the "complete" inventory for statistical comparison purposes. This baseline inventory will be examined to determine route non-compliance (i.e., identifying incursions along designated routes), and establish the baseline for identification of new incursions. With baseline data for non-compliance on current closed routes and the numbers and locations of incursions identified, changes will be determined by monitoring a statistically valid sample of designated (open and limited) routes.

Prior to adoption of the sampling protocol, a pilot test of variables and sampling methodology and assumptions is being conducted in a smaller area to compare results to the actual population, and make adjustments to the sampling protocol.

Purposes of Monitoring

Monitoring will be conducted to determine the level of compliance with the designated route network, i.e., are visitors staying on the designated routes, are the routes being used by the appropriate types of vehicles, are route closures working, i.e., are visitors avoiding closed routes, and if not, is non-compliance associated with a particular type of vehicle use. To do this, BLM will be monitoring incursions (evidence of route usage off of the designated route) along designated routes and recording specific information about each incursion.

Introduction

The WEMO OHV monitoring sampling process and protocol will be pilot tested on the Black Mountain subregion. There are 202.55 miles of designated OHV routes in the

Black Mountain subregion and a total of 42 existing incursions (based on 2012 monitoring). On average, there are 0.21 incursions per mile of designated route in this subregion placing it within the "moderate" incursions per mile stratum in the WEMO Planning Area.

Purposes of Pilot Test

The purpose of the pilot test is to determine if the monitoring protocol and sampling strategy developed (described below under *General Methodology*, *Data Collection*, and *Information to be Collected*), is an efficient and effective mechanism to identify compliance with route closures and identify whether, and to what degree, new illegal routes are being created. The pilot test will identify if the monitoring variables provide an adequate picture of compliance with route closures and identification of new, illegal routes and if the sampling methodology is going to be a statistically valid representation of compliance within the WEMO Plan area.

General Methodology

Samples are used to approximate and make inferences about a population of interest when a census is not feasible (e.g., due to size, costs). In the case of the WEMO Plan Area OHV monitoring protocol, the population of interest is all designated OHV routes within the WEMO Plan area and incursions off those routes. BLM will select a random sample of designated routes that will be monitored for new and existing incursions, as well as other related variables (see *Information to be Collected* below). Samples can only approximate a true population, and statistical parameters or targets are used to help establish "how close" the sample is to the true population.

The precision (or "closeness") of a sample size to the true population is typically communicated in terms of a confidence level and sampling error. A confidence level (or interval) is the range around a measurement that conveys how precise the measurement is. Using the pilot as our example, an 80 percent confidence level indicates that if a sample was selected 100 times, measurements in 80 of these samples would be within the established range of the true population. Twenty percent of the samples would not be representative of the true population. This pilot will indicate the relative precision of each variable in this particular sampling event.

A sampling error helps define the range around which a sample measurement varies from the true population (in general, the larger the sample size, the lower the sampling error). Continuing with the example from above, a sampling error of +/-10 percent indicates that in 80 of 100 samples the sample measurement will be within +/-10 percent of the true population measurement. For example, the number of incursions will be within 10% either way of the number indicated by the sample. When the size of a true population is known, a representative sample size can be calculated with a confidence level and sampling error.

2

Sampling error may also be the result of bias. It is important that variables give a good indication of overall trends, whether upward or downward, or the sampling will reflect a bias.

The pilot sampling in the Black Mountain subregion uses a random sample of routes within this subregion, without any stratification.

<u>Data Collection</u>

Staff will drive designated routes identified in the sample and note where incursions are located and some key information regarding each incursion (see *Information to be Collected* below). Staff will start at the beginning of the designated route and drive the entire length of the route, stopping at every incursion point to record data into the monitoring form or Trimble GPS unit. Staff will have access to active incursion locations from previous monitoring efforts on the selected routes to be monitored. If a previously active incursion is no longer being used, staff will note this under incursion use (none) in order to identify "rehabilitating" incursions. Since data collected is geographically referenced, results of previous monitoring are to determine if an incursion is new or not.

<u>Information to be Collected</u>

The following is a list of the monitoring variables and the information to be collected for each variable.

1. **Name(s)** – names of the people conducting monitoring activities.

2. **Monitoring Date**

3. **Subregion** – the subregion within which the designated route being monitored is located.

4. **Designated Route Number** – number of the route being monitored.

5. **# Incursions** – GPS coordinates of where each incursion begins (i.e., where it branches from the designated route).

6. **Incursion Usage** – To provide better information on overall trends and consistency in reporting, use levels are grouped into more distinguishable categories. Numbers of vehicle tracks are totals and can be a combination of vehicle types.
   a. **None** – no visible vehicle tracks and vegetation would be starting to come back, i.e. you would be able to see vegetation within the road width.
   b. **Light** – light use with some natural re-vegetation occurring, 0-10 vehicle tracks.
   c. **Medium** – Moderate use with 11-25 vehicle tracks.
   d. **Heavy** – Route is widening, noticeable ruts, whoop-de-do's present, gully erosion, or more than 25 vehicle tracks.

7. **Incursion Width**
   a. **Motorcycle** – up to 3 feet wide.
   b. **Quad** – 3 to 6 feet wide.
   c. **Truck** – 6+ feet wide.

8. **Type of Incursion Use**
   a. **Single track** – only motorcycle tracks.
   b. **2 track** – only 4-wheel vehicle tracks (e.g., ATV, OHV, truck, jeep).
   c. **Multi-track** – both 4-wheel vehicle tracks and motorcycle tracks.
   d. **Other** – animal tracks or other kinds of tracks.

9. **BLM Closure Action in Place**
   a. **Yes**
   b. **No**

10. **Describe Closure Action** – If there is a Closure Action in place (see #9), a brief description of the BLM Closure Action that is currently in place on the incursion. Examples include vegetation, closure sign, boulders, fencing, and logs.

Pilot Test Sample and Protocol

The Black Mountain subregion contains 202.55 miles of designated routes. To reach an 80% confidence level and 10 percent sampling error, about 60 miles of designated routes (total sample miles adjusted to account for a finite population) will be monitored as part of the pilot test. Table 1 provides a summary of the key statistical parameters that were used to calculate the sample size.

Table 1. Black Mountain Statistical Parameters

Total # of Routes	155
Total Miles	202.55
Confidence Level (Type 1)	80%
Sampling Error (Type 2)	10%
Mean (incursions/mile)	0.11
Pop Standard Deviation	0.358
Total Incursions	42
% of Routes w/ Incursions	20

For the pilot test, all 10 variables listed above will be monitored for each designated route within the sample. It is anticipated that the pilot test will take 3 weeks to complete, using a two-person team. Data will be collected with the same tools as the 2012 baseline data collection.

Results

Once data has been collected for all of the designated routes in the pilot test sample, monitoring data from 2013 will be compared to baseline inventory data from 2012 for the designated routes included in the sample. This will allow the BLM to assess:

1. The representativeness of the sample and associated appropriateness of the selected sampling methodology to make inferences about the true population; and
2. The applicability of the monitoring variables to address the primary goals (e.g., compliance with route closures and creation of new, illegal routes) of the monitoring protocol.

Subsequently, the BLM may revise the proposed sampling methodology and monitoring protocol to address any difficulties and/or critical flaws identified during the pilot test.

Glossary Items

Closure Action – an action that is in place on an incursion (e.g., closure sign, logs, fencing, vertical mulching, boulders)

Confidence Level – the percentage of all possible samples that can be expected to include the true population parameter

Incursion – a location where visitors have used a closed route, have developed a new route, or have gone off a designated route. Incursions do not include driveways, other agency roads, routes designated as administrative use only, or non-motorized trails.

Incursion Usage – the relative amount of use received at an incursion location.

Sampling Error –There are two kinds of sampling error: random error and bias. Random error is a pattern of errors that tend to cancel one another out so that the overall result still accurately reflects the true value. For instance, if incursion width is mostly 4 wheel drive, but type of incursion is mostly motorcycle, a sampling error may be to blame. Every sample design will generate a certain amount of random error. Bias occurs because the pattern of errors is loaded in one direction or another and therefore do not balance each other out, producing a true distortion.

Stratified random sampling – a sampling method in which the total population is divided into non-overlapping subgroups. Each of the subgroups is called a **stratum**, and two or more subgroups are called **strata**.

Subregion – One of 34 smaller geographical areas within the West Mojave planning area, generally consistent with law enforcement patrol sectors.

Type of Incursion Use – a variable that further clarifies incursion width to indicate the type of vehicles that are currently using an incursion.

Type I Error – this type of error occurs when a researcher states there is a difference (in the planning area) in mean, but in fact there is no difference. The researcher thinks there's a difference in the planning area because, thanks to random variations, the sample was different enough from the population to be misleading.

Type II Error – this type of error occurs when a researcher states there is no difference in mean, but in fact there is a difference.

Appendix 1 – List of Black Mountain Routes to be Monitored

The table below lists a random selection of designated routes in the Black Mountain subregion. These routes were determined through the use of a random number table by the contractor, with routes included until a route was included that met or exceeded the trigger number of miles. The list of routes provides a cumulative mileage of at least 60 miles to meet the statistical targets outlined above.

Designated Route ID	Route Mileage	Cumulative Mileage
BM7410A	0.12	0.12
BM7479	0.48	0.60
BM7468	1.37	1.97
BM6321	0.41	2.37
BM6337A	0.11	2.48
BM6265C	0.02	2.50
FP6237	0.02	2.52
BM7483A	0.03	2.55
BM6357	0.70	3.25
BM7414	1.34	4.59
BM6327	0.32	4.91
BM6368	2.14	7.06
BM7487	0.50	7.55
BM7401A	0.05	7.61
BM7477	4.37	11.97
CG6285A	0.00	11.98
CG7225	0.01	11.98
BM6251	3.74	15.73
BM7468B	0.06	15.78
BM6332	0.54	16.32
BM7153	11.42	27.74
BM7154B	0.07	27.81
BM6367	0.16	27.97
BM6330	1.02	28.99
BM5395	0.70	29.69
BM6355	4.22	33.91
BM6334	0.09	34.01
BM7495	0.85	34.86
CG7223	0.01	34.87
BM6382	0.15	35.01
BM7474	1.21	36.23
BM6366	3.71	39.94
BM7469	1.24	41.18
BM7153B	0.09	41.27
BM6344	1.32	42.60
BM7483	0.63	43.23
BM6362	1.99	45.22

Designated Route ID	Route Mileage	Cumulative Mileage
BM6233	1.86	47.08
BM6337	1.21	48.29
BM6375	1.62	49.91
BM7483B	0.05	49.96
BM6343C	0.04	50.00
BM7227	0.64	50.64
BM6237	1.70	52.33
BM6425	0.10	52.44
BM6241C	0.16	52.59
BM6329	0.28	52.87
BM7417A	0.14	53.02
BM6260	3.79	56.80
BM7484	0.47	57.27
BM6343A	0.15	57.42
BM7410	1.92	59.34
BM6384	1.23	60.58