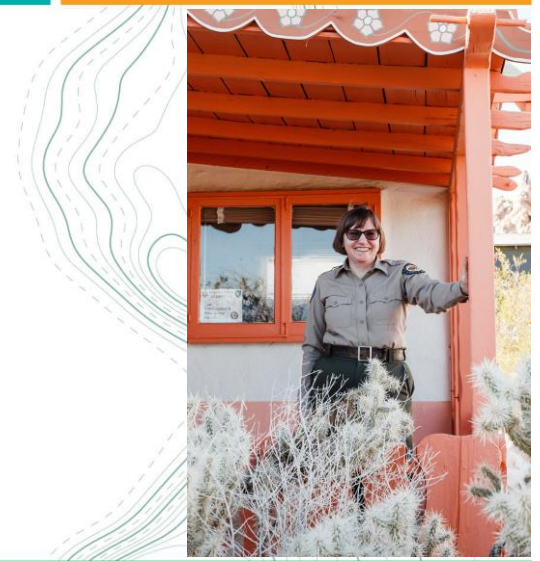




Oregon State University



Visitor Use Management Protocol

# Introduction to the Visitor Use Monitoring Protocol Catalog

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## The Protocol Catalog

We have created a collection of existing protocols that can be adapted for visitor use monitoring. Each protocol document gives an overview, notes important considerations, and provides the protocol and an example datasheet with notes for adapting them to your monitoring. The catalog includes protocols for monitoring:

- Parking Lot Turnover
- Parking Lot Utilization
- Social Trails
- Visitor Encounters on Hiking Trails
- People at One Time
- Trail Use (with Automatic Trail Counters)
- Leash compliance

## Sampling Decisions

### Will you monitor year-round or during a specific season of the year?

An important consideration when making this decision is that you want to **ensure that the data you collect are representative of the time period for which you plan to make management decisions**. For example, you might choose to sample only during your high use season, as this is the time when certain visitor use issues would be most likely to occur. Alternatively, you might be interested in differences throughout the year.

### Will you use random sampling or convenience sampling to schedule dates of data collection?

#### Random Sampling

- All dates within the sampling time period have an equal probability of being sampled.
- Ensures a higher level of confidence when making conclusions about trends over time.
- Necessary for statistical analysis.
- Requires more staff resources.
- Randomly sampled dates need to be chosen ahead of the monitoring season.

#### Convenience Sampling

- Sample based on staff availability.
- Easier to combine with other tasks and staff schedules.
- Not appropriate for statistical comparisons or tracking trends over time.

#### Probability Proportional to Use Sampling

- The probability of a date or time being selected is proportional to the amount of use at that time.

### Do you want to make conclusions about specific park units or zones?

Management concerns might vary from one unit of the park to another and may be addressed differently in different park units. Therefore, it may be useful to sample each site independently. You can aggregate data for analysis across sites if needed, but you cannot make conclusions for individual sites using data that was collected as an aggregate.

### Do you want to stratify your data by any variable?

Some of the behaviors you are monitoring may differ depending on other variables, such as weekdays versus weekends and holidays, or time of day. In these cases, it is useful to sample from each of the strata of interest, so that you are able to make comparisons.

Example: Not stratified

Su	M	T	W	R	F	Sa

Example: Stratified by weekday vs. weekend/holiday

Su	M	T	W	R	F	Sa

### How many samples do you need?

There are tradeoffs between the cost of obtaining large samples and the benefit of making valid and precise estimates. We recommend considering the following:

- How **controversial** is the visitor use issue you are monitoring? Controversial issues may benefit from higher sample sizes that allow for more confidence in statistical comparisons.
- How much **variation** is there in the data? If variation is high, more samples will be needed than when variation is low. You may be able to estimate variation based on professional judgement, but in many cases, you will need pilot data to make this decision.
- What is your desired level of **confidence** in your conclusion? Additional samples will increase your confidence when your sample size is small but will have less impact when your sample size is large.
- How many **comparison units** are you monitoring? Examples of comparison units are locations, seasons, days of the week, or times of day. Your sample size requirement will generally double if you want to compare two groups, compared to analyzing the population as a whole.

### What level of precision do you need?

In some cases, you may be able to collect less precise data to reduce data collection effort. For example, if you are monitoring parking lot utilization, estimating the percent of the lot that is full rather than counting the precise number of cars in the lot.

### Sampling Tips

- Drawing **sample dates randomly from each week** ensures that the data points will be spread throughout the season of interest, which is not guaranteed in a simple random sample.
- Following the **sliding scale** recommendation from the Interagency Visitor Use Management Council (IVUMC 2019), data from a monitoring program can be used to identify whether more intensive monitoring is needed in subsequent years. Examples of this would include high amounts of variations in the data or conditions that are near or over a threshold.
- We recommend including **backup dates** in your sample, in the event that data collection cannot occur on the originally sampled dates.
- **Document your sampling strategy thoroughly!** This is necessary to ensure that monitoring can be repeated each year using the same approach, which allows for a comparison of trends over time.
- **Staff availability** may impact your ability to sample.
- If you are monitoring multiple indicators (e.g., parking lot counts and people at one time counts) or park units, consider **bundling** sites or monitoring to facilitate logistics and transportation.
- Data may not need to be collected annually. If you make the decision to increase the yearly interval, for example a five-year interval, options for scheduling would be:
  - Collect all monitoring data in one year, every five years.
  - Stagger data collection so that some portion of monitoring (e.g., certain sites) occurs each year.

**Table 1.** An example of bundling sites for monitoring from Golden Gate National Recreation Area (Hall et al. 2023, p.62).

	Muir Beach & Rodeo Beach	Alta & Stinson Beach	Fort Funston & Baker Beach
Morning	Rodeo Beach <ul style="list-style-type: none"> <li>• Vehicle count</li> <li>• Sensitive habitat</li> <li>• Vehicle count</li> </ul>	Alta <ul style="list-style-type: none"> <li>• Vehicle count</li> <li>• Leash compliance</li> </ul>	Fort Funston <ul style="list-style-type: none"> <li>• Clean transects</li> <li>• Vehicle count</li> <li>• Dogs per group</li> </ul>
Afternoon	Muir Beach <ul style="list-style-type: none"> <li>• Clean transects</li> <li>• Vehicle count</li> <li>• Sensitive habitat</li> <li>• Leash compliance</li> <li>• Excrement count</li> <li>• Vehicle count</li> </ul>	Stinson Beach <ul style="list-style-type: none"> <li>• Vehicle count</li> <li>• Leash compliance</li> </ul>	Baker Beach <ul style="list-style-type: none"> <li>• Vehicle count</li> <li>• Leash compliance</li> </ul> Fort Funston: <ul style="list-style-type: none"> <li>• Vehicle count</li> <li>• Dogs per group</li> <li>• Excrement count</li> </ul>

## Managing Changes to Monitoring

Monitoring protocols must be implemented the same way each year to be valid for monitoring trends over time. Consistent training and well-documented protocols can help to avoid differences in the interpretation of the protocol. **We strongly recommend that protocols not be altered**, with three exceptions:

- 1) An existing measure may be subdivided into more refined measures, so long as future data can be reaggreated into a form comparable to earlier years of data.
- 2) Additional fields may be added to existing measures or new measures may be created, so long as the original measures continue to be collected.
- 3) Sampling intensity may be increased to obtain more data points than the minimum, so long as the sampling approach remains consistent. If data collection is added outside of the original monitoring period (e.g., the high use season), only observations within the original monitoring period should be compared when assessing long term trends.

If a protocol is updated, it should be updated to reflect the change. For example, from “BBRSP Parking Lot Protocol, Version 1” to “BBRSP Parking Lot Protocol, Version 2.” The protocol and version used to collect data should be noted in any reports or products.

## Field Season Preparation

It is important to set aside adequate time for planning the data collection effort, analysis, and reporting.

- Confirm which measures will be monitored and at which sites.
- Create a calendar of dates for monitoring following the sampling protocol.
  - Include backup dates in case a sampling date is missed.
- Confirm who will collect the data.
  - Designated technicians are ideal to reduce biases from many different observers.
  - Volunteers can be used in monitoring.
  - If using existing staff are collecting data, confirm that the calendar fits with their other duties.
- Plan for training field technicians and volunteers, including time to calibrate observations for consistent measurements. Training should take place onsite and include time to practice collecting data, ideally when visitation levels are high.
- Designate who will be responsible for data management, analysis, and reporting. Confirm that a data management plan is prepared.

## Data Management

Careful data management is one of the most important elements of producing quality monitoring data. A data management plan should be developed and maintained by the monitoring program lead.

### Data Entry Set-Up

An Excel workbook (or other database) should be created for each protocol. Best practices for structuring the database include (Borer et al. 2009, Broman and Woo 2018):

- The first worksheet of the workbook should be the Metadata and include:
  - The name and full citation of protocols used, as well as the permanent file location.
  - The structure of each worksheet in the workbook.
  - Field naming conventions for each element in the database (i.e., a data dictionary).
  - Lists of valid values for each measure and the required format for field types.
  - Units for each type of measure.
  - Value used for missing data.
  - The relationship of the file to other monitoring files
- Data should be entered in a worksheet labeled “Raw Data” and cleaned in a separate worksheet.
- Use consistency in naming variables. Choose short but meaningful variable names
- Be consistent when entering data (e.g., site names, formatting dates).
- Use a consistent indicator of missing data (e.g., “999” or “NA”)
  - Note the best indicator of missing data may depend on what software you plan to use for data analysis. Check to see if the software has a default for missing data and use that if possible. If the analysis will be done in R or Excel, “NA” is best. “999” is recommended for analysis in SPSS.
- Avoid spaces in names and values.
- Use consistent case rules.

**Table 2.** An illustration of the metadata worksheet for monitoring data.

Field Name	Variable	Data Type	Values
Unit	<b>unit</b>	Text (abbreviation)	MD = Main Day Use Area RDO = Rancho del Oso
Parking Lot	<b>lot</b>	Text	Reservation FCFS = first-come, first-served
Date	<b>date</b>	Date (MM/DD/YYYY)	
Start time	<b>start</b>	Time (HH:MM), 24-hour clock	

## Data Entry Steps

- 1) Review the Metadata and follow the definitions and directions exactly.
- 2) Enter data in the “Raw Data” worksheet. Enter the header information (date, weather, etc.) with each observation from the data collection session.
- 3) Flag any problems in the data using the “Comment” feature in Excel (or a similar feature in other databases).
- 4) If fields are blank, use the predefined missing value.

## Data Quality Control Steps

- 1) Resolve any flagged issues in the dataset.
- 2) Verify the accuracy of data entry. Give the paper datasheets to an individual who did not enter the data. The second person should review all entered data to make sure data were entered accurately and flag any issues.
- 3) If error rates are low (<5%), proceed to step 4. If error rates are greater than 5%, it may be necessary to validate all the data.
- 4) Add the names of all individuals who completed data entry and QA/QC and the date of each to the “Metadata” sheet.
- 5) Copy the raw data worksheet into a new worksheet, labeled “working data.”
- 6) Make at least one backup copy of the entire workbook, label as a “backup” with the date of backup. Store on a local computer or secure cloud storage.

## Data Analysis Considerations

### Outliers

- Check the data for outliers prior to data analysis.
- If outliers are present in the dataset:
  - Determine if obtained values are plausible or if they are due to an error.
  - Decide if you will remove outliers for analysis.

### Using Sources of Data Together

- Combining data from multiple measures can enable you to better assess an indicator.
- Example: Examine the relationship between daily visitation collected by entrance kiosk staff and visitor encounters on a popular hiking trail.
- Example: Compare reported length of stay from a visitor survey with observed turnover rates in the parking lot to assess any bias in the survey responses.

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## RESOURCES

### Visitor Use Management Framework.

Interagency Visitor Use Management Council. Framework & Guidebooks

<https://visitorusemanagement.nps.gov/VUM/Framework>

### Designing a Monitoring Program

Hall, T. E., Engebretson, J., & D'Antonio, A. (2023). Visitor Use Monitoring Program for Golden Gate National Recreation Area. Report prepared for the National Park Service. Corvallis, OR: Oregon State University, Department of Forest Ecosystems & Society.

<https://calparks.sharepoint.com/:u:/r/sites/VisitorUseManagementToolkit/SitePages/Visitor-Use-Monitoring-at-Golden-Gate-National-Recreation-Area.aspx?csf=1&web=1&e=ScVRcS>

Reynolds, J. H., Knutson, M. G., Newman, K. B., Silverman, E. D., & Thompson, W. L. (2016). A road map for designing and implementing a biological monitoring program. *Environmental Monitoring and Assessment*, 188, 1-25

<https://doi.org/10.1007/s10661-016-5397-x>

### Data Management

Borman, K. W., & Woo, K. H. (2018). Data Organization in Spreadsheets. *The American Statistician* 72, 2-10.

<https://doi.org/10.1080/00031305.2017.1375989>

Borer, E. T., Seabloom, E. W., Jones, M. B., & Schildhauer, M. (2009). Some Simple Guidelines for Effective Data Management. *Bulletin of the Ecological Society of America* 90, 205-214.

<https://www.jstor.org/stable/bullecosociamer.90.2.205>

McCord, S. E., Webb, N. P., Van Zee, J. W., Burnett, S. H., Christensen, E. M., Courtright, E. M., .... & Tweedie, C.. (2021). Provoking a Cultural Shift in Data Quality. *BioScience* 71, 17-28. <https://doi.org/10.1093/biosci/biab020>

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## SUGGESTED PROTOCOL CITATION

Hall, T. E., D'Antonio, A., & Aberg, M. (2023). Introduction to the Visitor Use Monitoring Protocol Catalog. Protocols prepared for the Visitor Use Management Toolkit. Corvallis, OR: Oregon State University, Department of Forest Ecosystems & Society.