

AIM Monitoring Design Worksheet

Updated September 2020

This worksheet provides a step-by-step template for designing BLM Assessment, Inventory, and Monitoring (AIM) efforts. This template should be used to document the development of monitoring program objectives, benchmarks, sample design, and steps to ensure data quality. For additional information on the concepts described here, see the [AIM Landscape Toolbox website](#). We encourage you to work through the implementation steps as an interdisciplinary team, but completion of the worksheet should be done in coordination with the AIM state monitoring coordinator (contact list can be found [here](#)) and the National AIM team (contact list can be found [here](#)).

Designing an AIM project is an iterative process. After completing each step, be sure to review the results of previous steps, as the outcome of later steps may cause a need to modify earlier decisions. For example, design decisions made when stratifying the study area (Step 3) often reveal issues that lead to new management or monitoring objectives (Steps 1 and 2).

Step 1: Develop management objectives (or goals); select ecosystem attributes and indicators to monitor

Step 1a: Develop management objectives or goals related to resource condition and (if necessary) resource trend

Step 1b: Select ecosystem attributes and indicators to monitor

Terrestrial Indicators Table. Identify which indicators will be monitored as part of this effort and where the associated data will be collected. For monitoring efforts that seek to evaluate RMP/LUP effectiveness all BLM AIM core terrestrial indicator data should be collected in all locations, but contingent and supplemental indicators may be collected at a sub-set of monitoring locations. Specify which contingent and supplemental indicators you will monitor and describe the types of monitoring locations at which you will collect these data. Record the monitoring locations where contingent indicators should be denoted in the Core and Contingent column. Supplemental indicators should be written into their own row and the locations where these data will be collected should be recorded in the Supplemental column.

| Land Health Fundamental or Management Goal | Indicators | Core + Contingent | Supplemental |
|---|---|--------------------------|---------------------|
| Watershed Function | Bare ground | | |
| | Vegetation composition (foliar cover) | | |
| | Proportion of plot in large, intercanopy gaps | | |
| | Soil aggregate stability | | |

| | | | |
|-------------------------------------|---|--|--|
| | <i>density</i> | | |
| Ecological processes | Bare ground | | |
| | Vegetation composition (foliar cover) | | |
| | Non-native noxious species cover | | |
| | Proportion of plot in large, intercanopy gaps | | |
| | Soil aggregate stability | | |
| | <i>Write in supplemental indicator (s), if needed</i> | | |
| Habitat Quality | Bare ground | | |
| | Vegetation composition | | |
| | Non-native noxious species | | |
| | Plant species of management concern | | |
| | Vegetation height | | |
| | Proportion of plot in large, intercanopy gaps | | |
| | <i>Write in supplemental indicator (s), if needed</i> | | |
| Plot characterization or covariates | Topography, Landscape unit and position, Soil profile | | |

Lotic AIM Methods Table. Identify which methods will be utilized as part of this effort and where the associated data will be collected. For monitoring efforts that seek to evaluate RMP/LUP effectiveness, all Lotic AIM core methods should be collected in all locations, but contingent and supplemental indicators may be collected at all or a sub-set of monitoring locations. Specify which contingent and supplemental methods you will monitor and describe the types of monitoring locations at which will you collect these data. Supplemental indicators should be written into their own row and the locations where these data will be collected should be recorded.

| Land Health Fundamental or management goal | Method | Method type | Collected (Y/N) | Collected at all reaches (Y/N)? If no, specify where |
|---|---|-------------|-----------------|--|
| Water quality | pH | Core | | |
| | Specific conductance | Core | | |
| | Temperature (instantaneous) | Core | | |
| | Total nitrogen and phosphorus | Contingent | | |
| | Turbidity | Contingent | | |
| | Write in supplemental indicator(s), if needed | | | |
| Watershed function and instream habitat quality | Pool dimensions (frequency, length, depth) | Core | | |
| | Streambed particle sizes | Core | | |
| | Bank stability and cover | Core | | |
| | Floodplain connectivity | Core | | |
| | Large wood | Core | | |
| | Thalweg depth profile | Contingent | | |
| | Bank angle | Contingent | | |
| | Pool tail fines | Contingent | | |
| | Write in supplemental indicator(s), if needed | | | |
| Biodiversity / | Benthic macroinvertebrates | Core | | |

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|-------------------------------------|---|------------|--|--|
| riparian habitat quality | Canopy cover | Core | | |
| | Priority noxious vegetation (frequency of occurrence) | Core | | |
| | Priority native woody riparian vegetation (frequency of occurrence) | Contingent | | |
| | Greenline vegetation composition | Contingent | | |
| | Write in supplemental indicator(s), if needed | | | |
| Covariate or reach characterization | Bankfull width, wetted width, flood-prone width, human influence, photos, and slope | | | |

Step 2: Set the study area and reporting units; develop monitoring objectives

During this step, you will fill out either the **Resource Condition and Trend Objectives Tables** (below) or the Monitoring Objectives Worksheet in the terrestrial and lotic benchmark tools (download from <http://AIM.landscape toolbox.org>). Instructions on how to fill out the Monitoring Objectives table in the benchmark tools can be found in the benchmark tools themselves.

Step 2a: Set the study area, reporting units, define the target population, document the geospatial layers used to describe these areas. For revisit designs select the existing sample designs to be used for revisits.

Step 2b: Develop monitoring objectives related to resource condition and (if necessary) resource trend

Resource Condition Objectives Table. Use this table to identify a set of specific, quantifiable, and attainable monitoring objectives. Identify which indicator data will be used to support each management goal, the methods that will be used to make condition determinations, and the benchmarks that will be used to identify different condition classes (i.e., minimal, moderate, and major departure from reference). Also identify the proportion of the resource that is required to meet the benchmarks before changes in management are required. All columns combined form the monitoring objectives for this effort. Detailed instructions for completing this table can be found in the description of Step 2b.

| Management Goal | Monitoring Indicator | Condition determination method and source | Benchmark | Percentage achieving desired conditions (% of acres or stream km) | Time Frame |
|-----------------|----------------------|---|-----------|---|------------|
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Resource Trend Objectives Table. Use this table to identify a set of specific, quantifiable, and attainable monitoring objectives related to changes in resource values or condition through time. Identify which indicator data will be used to support each management goal, the magnitude of change to be detected, and the time period over which trend will be assessed. Detailed instructions for completing this table can be found in the description of Step 2b.

| Management Goal | Monitoring Indicator | Units (e.g., percent, absolute value, or condition category) | Direction of change (positive or negative, or no change) | Magnitude of desired change | Time period for assessing change |
|-----------------|----------------------|--|--|-----------------------------|----------------------------------|
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Step 3: Select criteria for stratifying the study area (as appropriate)

In this step you will identify strata or different types of land or water body types to be used for your design and begin filling out the **Sample Design Table** (below). Specifically, you will identify which strata you will use and the amount of resource that will be represented by each stratum.

Sample Design Table. Summary of strata, and associated sample sizes and weights used in terrestrial or lotic monitoring designs. Points can be allocated proportionally or disproportionately to the amount of the resource represented by a stratum. If the GIS information required to complete this table is not readily available, consult with the National AIM Team to complete the table.

| Stratum Name | Approx. stratum acres or km | Proportional area or length | Proportional points per stratum | Final Points per stratum per cycle | Approx. point weight |
|---------------|-----------------------------|-----------------------------|---------------------------------|------------------------------------|----------------------|
| | | | | | |
| | | | | | |
| | | | | | |
| <i>Total:</i> | | | | | |

Step 4: Select and document supplemental monitoring methods; estimate sample sizes; set sampling frequency; develop implementation rules

Step 4a: Review and document supplemental monitoring methods (if required)

Step 4b: Estimate sample sizes (Completed by National AIM Team)

Step 4c: Define revisit parameters (*revisit designs only*)

i) Set the revisit frequency and the number of years sampled per cycle

ii) Set number of cycles and the total duration of your design

iii) Set the ratio of revisit points to non-revisit points per cycle in your design

Revisit Frequency Table Use this table to document the decisions made in Step 4c

| Revisit Frequency | Number of Years Sampled per cycle | Number of Cycles | Design Duration | Total number of points/cycle | Ratio of revisit to non-revisit points/cycle | Total number of revisit points/cycle | Total number of non-revisit points/cycle |
|-------------------|-----------------------------------|------------------|-----------------|------------------------------|--|--------------------------------------|--|
| | 5 | 4 | 20 years | | | | |

| Revisit Frequency | Number of Years Sampled per cycle | Number of Cycles | Design Duration | Total number of points/cycle | Ratio of revisit to non-revisit points/cycle | Total number of revisit points/cycle | Total number of non-revisit points/cycle |
|-------------------|-----------------------------------|------------------|-----------------|------------------------------|--|--------------------------------------|--|
| | 5 | 4 | 20 years | | | | |

Step 4d: Develop implementation rules

Step 5: Collect and evaluate available data to determine sample size requirements

In this step, you will use existing data to determine if you need to make any adjustments to the sample sizes that you identified in step 4. Consult with the AIM team to implement this step.

Step 6: Apply stratification and select statistically appropriate monitoring locations

Use this space to document the process of creating, reviewing, and finalizing the sample design. Additionally, document how the design(s) were created, any additional notes and information on the sample frame, what revisions were made and why. If the design process or sample sufficiency analysis resulted in different sample sizes than those identified in step 4b, document those changes here as well.

Step 7: Develop quality assurance and quality control (QA and QC) procedures and data management plans

References

APPENDIX

Stratification look-up table

| Feature Name | Group Name | Source | Stratum |
|---------------------|-------------------|---------------|----------------|
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Author Log

| Name | Contact Information | Description of Edits | Date Edited |
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