**AIM Monitoring Design Worksheet**

*(Updated June 2024)*

Project Name:

Date:

**Author Log**

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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 detailed information on concepts described below and instructions on how to complete each step, please reference the [AIM Desk Guide](blm.gov/aim/deskguide). 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 and the National AIM team.

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 goals or monitoring objectives (Steps 1 and 2).

**Step 1: Develop management goals; select additional ecosystem attributes and indicators to monitor.**

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

Management goals should provide the context for why monitoring information is needed and how it will be used.

**Step 1b: Select indicators to monitor and additional ecosystem attributes.**

**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.

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| --- | --- | --- | --- |
| **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 |  |  |
| *density* |  |  |
| Ecological processes | Bare ground |  |  |
| Vegetation composition (foliar cover) |  |  |
| Non-native noxious species cover |  |  |
| Proportion of plot in large, intercanopy gaps |  |  |
| Soil aggregate stability |  |  |
| *Write in supplemental indicator (s), if needed* |  |  |
| Habitat Quality | Bare ground |  |  |
| Vegetation composition |  |  |
| Non-native noxious species |  |  |
| Plant species of management concern |  |  |
| Vegetation height |  |  |
| Proportion of plot in large, intercanopy gaps |  |  |
| *Write in supplemental indicator (s), if needed* |  |  |
| 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.

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| --- | --- | --- | --- | --- |
| **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 / riparian habitat quality | Benthic macroinvertebrates | Core |  |  |
| 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 |  |  |  |

**Riparian and Wetland AIM Indicator Table**. Identify which indicators 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 Riparian and Wetland 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.

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| --- | --- | --- | --- | --- |
| **Land Health Fundamental or Management Goal** | **Indicators/Group Indicators** | **Method Type** | **Collected (Y/N)** | **Collected at all plots (Y/N)? If no, specify where** |
| Watersheds, Ecological Processes, Habitats | *Species richness (diversity)* | *Core* |  |  |
| *Vegetation composition* | *Core* |  |  |
| *Vegetation cover* | *Core* |  |  |
| *Plant species of management concern* | *Core* |  |  |
| *Nonnative invasive species* | *Core* |  |  |
| *Vegetation height* | *Core* |  |  |
| *Bare ground* | *Core* |  |  |
| *Litter and thatch cover* | *Core* |  |  |
| *Woody structure* | *Core* |  |  |
| *Hummock cover and dimensions* | *Contingent* |  |  |
| *Stubble height* | *Annual use* |  |  |
| *Soil alteration* | *Annual use* |  |  |
| *Riparian woody species use* | *Annual use* |  |  |
| Write in supplemental indicator(s), if needed | *Supplemental* |  |  |
| Write in supplemental indicator(s), if needed | *Supplemental* |  |  |
| Water Quality | *pH* | *Contingent* |  |  |
| *Specific Conductance* | *Contingent* |  |  |
| *Temperature (instantaneous)* | *Contingent* |  |  |
| *Total Nitrogen and Phosphorous* | *Contingent* |  |  |
| Write in supplemental indicator(s), if needed | *Supplemental* |  |  |
| Write in supplemental indicator(s), if needed | *Supplemental* |  |  |
| Covariate or Plot Characterization | *Hydrology and surface water characteristics* | *Covariate* |  |  |
| *Wetland type (classification)* | *Covariate* |  |  |
| *Soil profile description* | *Covariate* |  |  |
| *Soil vouchers* | *Supplemental* |  |  |
| *Plant vouchers* | *Supplemental* |  |  |

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

During this step, you will fill out the **Resource Condition and Trend Objectives Tables** (below).

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

**Step 2b: Develop monitoring objectives related to resource condition and/or resource trend.**

Begin by listing management goals that were set in step 1 in Column 1 of the Resource Monitoring and Trend Objectives Tables. While filling out the table, each management goal should have one or more corresponding monitoring objectives.

**Resource Monitoring 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.

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| --- | --- | --- | --- | --- | --- |
| **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 Monitoring Objective 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.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 (only if necessary)**

First, identify whether strata are necessary. If so, identify which strata will be utilized, how many sample points will be collected in each strata, and the amount of resource that will be represented by each stratum. Begin filling out the **Sample Design Table** (below).

**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 disproportionally 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.

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

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

**Step 4a: Select and document supplemental monitoring methods (optional/if required).**

**Step 4b: Collect and evaluate available data to determine sampling sufficiency and the validity of the strata (if available).**

**Step 4c: Estimate sample size (in coordination with National AIM Team).**

**Step 4d: Define revisit parameters if using a revisit design (use the Revisit Frequency Table to document decisions made in this section).**

**i) Determine the revisit frequency/interval and the number of years sampled per cycle.**

**ii) Set number of cycles and the total duration of the design.**

**iii) Set the proportion of design points which will be revisited.**

**Revisit Frequency Table** Use this table to document the decisions made in Step 4d.

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |
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**Step 4e: Develop implementation rules.**

Implementation rules are those that guide the rejection, movement, and merging of points. Standard rules are outlined in the Lotic Evaluation and Design Management Protocol, Riparian & Wetland Design Management and Plot Evaluation Protocol, and Terrestrial Data Management Protocol. Review the standard implementation rules to identify whether they need to be customized to meet the monitoring objectives. If so, consult with the National AIM Team when developing the additional criteria to ensure the design will remain statistically valid.

**Step 5: Select monitoring locations.**

In this step the final sample design, or monitoring locations, are selected, reviewed, and documented.

**Step 6: Data management plans.**

Review the standard QA and QC procedures for AIM efforts to ensure understanding of the roles and responsibilities for data management. Data management for BLM AIM efforts is supported by the National AIM Team through standardized electronic data capture and management.

**References**

**APPENDIX**

**Stratification look-up table**

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| --- | --- | --- | --- |
| **Feature Name** | **Group Name** | **Source** | **Stratum** |
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