Using AIM Data for Land Use Planning

DRAFT Land Use Planning Handbook

I. Principles for data analysis.

1. Analyses should be as simple as possible, but not simpler. At minimum, any analysis should have a straightforward descriptive sentence identifying what data were used, how the data were analyzed, and why the analysis matters. When more complicated descriptions of analytical methods are appropriate, provide this simple description first, then proceed to additional details.

2. All models are wrong, some models are useful. Ecology is complicated, our data are always incomplete, and our analyses require simplifying assumptions. Our understanding of the world will always be inaccurate in various ways. We should approach data analysis by trying to understand and describe these limits and inaccuracies. Then we can evaluate whether or not the analysis is useful.

3. When we don't know, write "We don't know." We often do not have the appropriate data, or perhaps the expertise, time, or analytical tools, to provide a useful answer to an important resource question. We should assume that this is common knowledge among both BLM staff and the public. Our role in NEPA, then, is to identify the gaps in our knowledge and state them clearly. For resource questions that are particularly important or occur frequently, "We don't know" should be followed by "and here's how we're going to find out."

4. Data is not decoration. When we present an analysis in a NEPA document, the reader should not wonder why it is there. The analysis might measure the likely effects of alternatives, explain how a proposed action or mitigation measure was developed, provide the context a reader will need to understand a subsequent effects analysis, and so on. When the data is intended to play a decisive role, we should demonstrate to the reader that different analytical results lead to different management decisions.

5. If we can't fail, we can't succeed. Whenever we will use data to measure the outcome of a resource use or management action against our objectives, there is a temptation to provide some wiggle room so that we don't force our future selves to admit failure. This is normal. However, when an objective isn't clear enough for us—and the public—to tell when we have failed, is isn't clear enough for us to tell when we have succeeded. We also learn from failure. If we want to make better decisions in the future, failure is part of the process.

6. Match the analysis to the question. In land use plans, the analyses we are likely to use can be divided into four categories: condition; effects; sustainability; trend. Each is appropriate in some contexts and inappropriate in other contexts. The next section describes these categories as well as the data and context appropriate for each.

II. A taxonomy of analyses.

- Condition analyses report on measured indicator values, or other ecosystem attributes calculated from measured indicator values, either directly or in relation to benchmark values or reference conditions.

- Trend analyses report change in indicator values over time. As with condition analyses, these may be in relation to benchmarks or reference conditions.

- Effects analyses measure the change in ecosystem attributes caused by an action, whether a resource use, management action, form of mitigation, &c.

- Sustainability analyses measure the effect of current resource use on future resource availability. This may be limited to a single resource use / resource, or may evaluate the effects of one resource use on a different resource. Sustainability analysis is a specialized form of effects analysis.

Further detail on each analysis type is provided below. Condition and effect analyses are divided into several subtypes.

Condition analysis.

- Descriptive condition analysis. In the simplest case, ecosystem attributes are presented as-is, without interpretation that relates the values to management objectives or resource uses. This is generally appropriate when an analysis is used to provide context. A good descriptive condition analysis requires data that are representative of the analysis area: plots that are randomly sampled from throughout the analysis area, or plots from a stratified random sample are used in a weighted analysis to correct for different sampling probabilities on different parts of the landscape. When the ecosystem attributes we're interested in vary seasonally, we may also need to check whether or not the sampling times are representative. Limitations in time or analytical staff may make it appropriate to use an unweighted plot-count analysis with stratified random sample designs, although this reduces our ability to infer the condition of the analysis area.
    - Examples: % cover of sagebrush; average soil stability; number of species per plot; mapping of plant community types.

- Benchmark analysis. We can use a defined threshold, or benchmark, to separate data into two categories, typically representing desired vs. unwanted outcomes. Sometimes we may use three or more categories. Then we can report the number of plots or proportion of the analysis area in each category. This is generally appropriate whenever management decisions or downstream analytical results will be based on categorical management objectives. These management objectives may be established by external regulations, agency policy, or prior NEPA. In developing a land use plan we will often find ourselves both defining benchmarks and evaluating current conditions relative to them in the same document. When we are defining benchmarks we should provide a clear rationale—perhaps with its own supporting analysis—explaining how we arrived at the benchmark value. As for a descriptive condition analysis, representativeness is the primary criterion for evaluating whether data is suitable to use in a benchmark analysis.
    - Examples: meeting / not meeting land health standards; suitable / marginal / unsuitable Habitat Assessment Framenwork (HAF) categories; evaluating plots against a canopy gap size threshold for wind erosion.

- Reference condition analysis. Reference conditions are those we believe would exist on the landscape in the absence of any adverse impacts from resource uses or management actions. A measure of similarity to / departure from reference conditions can provide a useful interpretive framework for our data. Other measures, for instance habitat suitability for a focal species, can also place data on a numerical scale of more suitable / less suitable or more desirable / less desirable conditions. In some cases, a single scale may be applied to an entire analysis area. In other cases, we divide the landscape into parts with different reference conditions. Ecological sites are often used for this purpose. When we partition the landscape, we need to consider whether or not our data are representative relative to each ecological site. Reference condition analyses are also sensitive to how the data are associated with ecological sites. The same data may indicate either reference or highly departed conditions, depending on which ecological site it is evaluated against.

- Examples: range condition scores and related similarity indices; categorization of plots into ecological states that correspond to different levels of departure from reference.

Trend analysis. Trend analyses are similar to condition analyses, except reported over time rather than for a single time period, and can be broken into the same subcategories: descriptive trend; benchmark trend; reference trend. Trend analyses are most informative when change over time is inferred from repeated measurements at the same monitoring plots. Trend can also be inferred from multiple representative samples using different monitoring plots, but in this case a portion of the change between time points will be attributable to the change in sampling. Interpretation of trend should take condition into account. Increasing, decreasing, or stable trends have different meanings depending on where the starting and ending values are relative to the potential variation in indicator values. Also, decreasing trends may not be possible if initial values are near the low end, and increasing trends may not be possible if initial values are near the high end, of the potential variation.

- Examples: change in % cover of sagebrush over time; change in % of plots meeting land health standards over time; change in range condition scores over time.

Effects analysis.

- Categorical effects analysis. When an action is either present or absent, an effects analysis measures the difference between areas where the action has occurred and areas unaffected by it. The ideal sample design uses randomized treatment / control pairs of monitoring plots. This standard is often difficult to meet in practice and requires sampling designed specifically for this purpose. When we conduct an effects analysis using existing data from other sample designs, we need to address what other differences between the affected and unaffected plots, apart from the action being evaluated, are likely to affect our understanding of the action's effects.
    - Examples: vegetation treatment effectiveness; grazing effects measured using grazing exclosures; measuring fire effects at burned vs. unburned sites.
- Continuous effects analysis. When an action occurs on an intensity gradient rather than being present or absent, an effects analysis may measure the correlation between that intensity gradient and ecosystem attributes. When evaluating the suitability of data for this kind of analysis, we need to consider whether or not the entire range of the intensity gradient is represented and what other factors may vary along with intensity in our sampling. A sample designed specifically for this purpose may be needed, in which case systematic sampling (e.g., monitoring plots at fixed intervals along the intensity gradient) may be an alternative to random sample designs.

- Examples: indirect effects, e.g. spread of invasive plants, radiating outward from disturbance; effects of different grazing intensities across an allotment; effects of varying levels of recreational use; effects of different levels of fuel removal.

Sustainability analysis.

This is the most complicated of the analysis types. Sustainability analyses can be broken into two parts. First, we need to understand the relationship between current resource use and future resource availability. We can visualize this as a response curve, with resource use on the *x* axis and future resource availability on the *y* axis (Figure 1). Depending on context, resource use might be expressed as an absolute amount of use or as a percent use of the currently available resources. Three general patterns of response are shown. A: resource use has no effect on future resource availability. B: resource use has no effect on future resource availability below a threshold value (dashed line), and above that threshold increased resource use causes declines in future resource availability. C: resource use increases future resource availability up to a threshold value (dashed line), and above that threshold increased resource use causes declines in future resource availability. "A" indicates that all levels of resource use are sustainable. "B" indicates that values below the threshold are sustainable. "C" indicates that sustainability is highest at an intermediate level of resource use. Research to create a response curve for a particular resource use in a given ecosystem is generally difficult and time-consuming. Where published data establishing response curves is not available, a sustainability analysis may not be possible and collaboration with external research partners might be needed to resolve the issue. However, a given response curve may have broad applicability in an ecoregion and support many sustainability analyses.

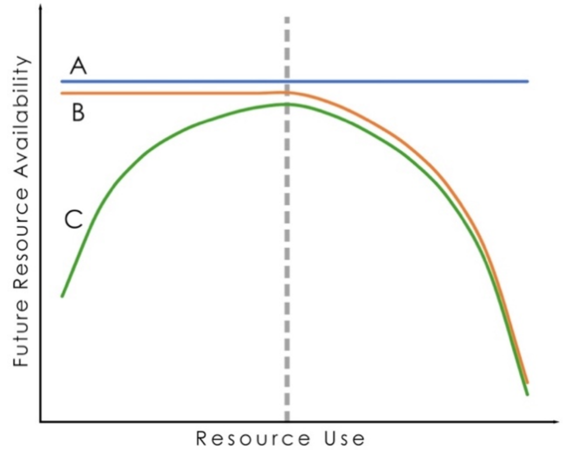

Figure 1. Three generalized response curves for relationships between resource use and future resource availability.

Second, once we understand the relationship between resource use and future resource availability, we can use data about levels of use and levels of current resource availability to understand where we are on the response curve. Current levels of use give us insight into the sustainability of current use. Because current resource availability depends on past resource use, this can give us insight into the sustainability of past resource use. For instance, suppose we are working with a response curve of type "B" and both current use and current resource availability are low (relative to the threshold and relative to the maximum resource availability, respectively). This would suggest that current resource use is sustainable, but resource availability is reduced by unsustainable use in the past. If current use and current resource availability are both high, on the other hand, that would suggest past resource use has been sustainable but current use is unsustainable and likely to cause a decline in future resource availability.

- Examples: grazing sustainability for a particular species of grass or a particular plant community; forest product sustainability in a particular woodland type.

III. Role of AIM data in different stages of the land use planning process.

Preparation Plan.

- Use the AIM data portal to summarize the AIM and LMF data available in the planning area. Also consult with the local and state AIM project leads to understand what data is being collected and is likely to become available in the immediate future.

- In addition to direct use of AIM data, consider remote-sensing products, many of which use AIM data:

  - LANDFIRE

  - Landscape Cover Analysis and Reporting Tools (LandCART)

  - Rangeland Analysis Platform (RAP)

- Keep AIM data in mind when developing the preliminary planning criteria. The planning criteria describe what kinds of analysis needs and methods are expected in the LUP process. Can we meet the analysis needs using existing AIM data? Are there data gaps that the AIM program could fill within the expected timeline of LUP development?

Analysis of the Management Situation (AMS).

- Providing context for the LUP is the primary purpose of the AMS.

- Condition analyses are generally a good fit. Descriptive analyses are sufficient in some cases. Benchmark analyses are appropriate when benchmarks are established above the LUP level but may be predecisional in contexts where the LUP will play a role in developing benchmarks. Trend analyses are also a good fit for the AMS, depending on the time scale of the available data and the appropriate time scale for relevant ecosystem processes.

- Existing effect or sustainability analyses should be included when they provide useful context (e.g., describing the effects of a resource use in the ecoregion), but developing new effect or sustainability analyses is generally not a priority at the AMS stage.

- The planning criteria of the Preparation Plan are more fully developed in the AMS:

  - What kinds of questions will analyses need to answer?

  - What kinds of analyses will we need?

    - Land health standards apply in most LUPs. Benchmark analyses are usually appropriate for land health standards.

    - The use of HAF in LUPs that address sage-grouse also implies a benchmark analysis, following established HAF protocols.

    - Benchmark analyses are likely to apply to other habitat suitability questions, as well.

- Direction for managing National Conservation Lands usually includes avoiding harm to certain resources. This implies effects analyses, evaluating the effects of resource uses or planned management actions on the protected resources.

- Endangered Species Act compliance is based primarily on effects analyses.

- Vegetation treatments are usually best evaluated by categorical effects analyses.

- For resource uses that include substantial surface disturbance (e.g., renewable and non-renewable energy development, OHV use), both categorical analyses of direct effects & reclamation or mitigation measures and continuous effects analyses of indirect effects may be needed.

- The multiple use / sustained yield mission established by FLPMA implies sustainability analyses for resource uses.

NOI and Scoping

- Can communicate AIM as the BLM natural resource monitoring approach which will inform the RMP/EIS

- Can highlight some of the current conditions and changes that you are addressing with the planning effort

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- Affected Environment
    - Draws heavily on the AMS

- Environmental Consequences/Alternatives analysis based on AMS
    - AIM provides a common set of indicators that can connect to field office monitoring, the literature, and remote sensing datasets to help structure the effects of planned actions on natural resources
    - RMP objectives (part of each alternative)
        - Specifying RMP objectives
        - Benchmarks where feasible and defensible (e.g., invasive plants, state water quality standards)
    - Look to analyses of past AIM data in the office – what worked and didn't? including land use plan effectiveness reports, treatment effectiveness reports, land health assessments, etc.
    - Look to research that uses AIM methods or data to link condition to land uses (e.g., SageSTEP treatment effectiveness)

- Look to predictions from modeling which may use AIM data (e.g., John Bradford climate predictions, Sofaer)

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Proposed RMP

- Monitoring plan -- how will you monitor whether the plan is effective
    - Including implementation level monitoring
    - Provide standard language to use AIM for effectiveness monitoring, e.g. (from Carlsbad RMP):

Assessment Inventory Monitoring (AIM): At the implementation phase, after the record of decision for the RMP has been signed, AIM monitoring objectives will be developed. Monitoring objectives will include monitoring indicators, the condition determination method, the condition benchmarks, a time objective for achieving the desired results, and the proportion required to meet the benchmark. The data will be used to determine landscape condition and inform management decisions.

Chapter 2:

Assessment Inventory Monitoring (AIM): At the implementation phase, after the record of decision for the RMP has been signed, AIM monitoring objectives will be developed. Monitoring objectives will include monitoring indicators, the condition determination method, the condition benchmarks, a time objective for achieving the desired results, and the proportion required to meet the benchmark. The data will be used to determine landscape condition and inform management decisions. AIM monitoring objectives will be developed for soils, wildlife habitat condition, special status species habitat condition, NLCS units, treatment effectiveness, rangeland health and permit renewals, fuels treatment effectiveness, and reclamation effectiveness. However, AIM monitoring objectives are not limited to these resources and land use activities. Additional resources or land use activities, for which monitoring objectives can be developed, may be identified at the implementation phase as needed