Burned Area Rehabilitation Treatment Selection

A Case Study from the Structured Decision Making Workshop
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Decision Problem

How can limited resources be allocated to a diverse group of projects in an equitable way that addresses the highest priorities? Decision makers are the Interior Fire Executive Council (IFEC) members with input from the National post fire recovery program technical representatives from the Department of the Interior agencies, and field level project development and implementation teams. Decisions to allocate resources are made annually and/or quarterly if funding is available. The decision process has been required to be rigorous and competitive, which has at times become contentious when not enough funding is available to meet project requests. There are additional requirements that projects are to be funded on a priority basis in a fair and unbiased manner that recognizes and acknowledges the various bureaus' missions and needs.

Background

The origins of the program and mandated changes have driven the need to have a priority ranking of projects (treatments?) and a process in place to control project spending. Early on, the Burned Area Rehabilitation (BAR) program was part of the emergency fire operations account. This funding was generally not constrained because of the emergency nature of the work and that the primary purpose of this account is to fund the emergency fire suppression. After the wildfire seasons of 1999 and 2001 there was a concern that longer term resource issues that had an urgent need, but did not warrant an emergency status were spending funds on treatments that may not have met the intent of the appropriators. Therefore a separate funding account was created and the BAR program was established. This program was originally funded at $24 million as established by analysis of treatment types and the associated planned costs imbedded as a subset of the emergency operations data. From fiscal years 2004-2008 the BAR funding was a fixed allocation of $24 million. The BAR funding is carried over from year to year, but was also subject to transfer for emergency suppression or other needs. In 2009, $4 million of the BAR funding was reprogrammed to BLM wildlife program account for the native plant materials development program. Then in 2010 the allocation was further reduced by $2 million for total available funding of $18 million. The budget projections for out years further reduces funding to a level that is below the BAR fund request average for the period from 2004-2011.

The BAR program policy has been evolving since the 1996 fire season~~s~~ and was revised in 1999, 2001, and 2004. The 2004 revision is the current Departmental Manual 620 chapter 3 version. This version established a policy that directs DOI agencies to fund projects or treatments on a priority basis, as established by the National Burned Area Response (NBAER) coordinators in consultation with the Office of Wildland Fire Coordination (OWFC). This policy provides for the development of a rigorous and competitive process and priority setting for BAR treatments and projects. The first need to prioritize projects did not occur until fiscal year 2007, when treatment requests exceeded available funding. This created very competitive and contentious atmosphere between the DOI agencies. Because of feedback from the agencies leadership, the DOI upper management engaged and directed a program review effort, the result of which was not accepted. One of the members of the failed program review suggested that the IBAER coordinators participate in the Structured Decision Making (SDM) workshops to help resolve BAR project priority and allocation issues.

At the recommendation of the Interior Burned Area Response coordinators group, the Interior Fire Executive Council directed a review of the prioritization process and evaluate alternatives in October 2010. Subsequently, the IBAER submitted an abstract of the problem statement to the SDM selection panel and was approved for the January 24-28 2011 workshop session.

Decision Structure

The assumption of the IBAER at the beginning of the workshop was that the problem was an allocation issue, but as the process was employed the group realized that the more contentious part of the process was the prioritization criteria. The ProACT approach helped to focus and deconstruct the problem to clarify and provide a sound foundation from which to progress through the problem analysis cycle.

The IBAER developed and assessed four potential alternative models for the allocation and prioritization proces.

- **Status Quo** - current process constrained by National Fire Plan Operations and Reporting System, {NFPORS} database)
- **Historic Agency Workload Percentage Formula** – determined by the amount of burned acres on Bureau lands in the lower 48 U.S. as a portion of all DOI burned acres.
- **Multiple Objective Composite Scoring** – Framework developed by IBAER through ProAct cycle utilizing subject matter expert elicitation, swing weighting, normalization, and other trade off analysis techniques (BAER PAWS).
- **Linear Decision Rule** – Stratified treatment types and assigned values in order to the high priority resource objectives.

The IBAER group identified the fundamental objective for this problem with several means objectives that supported and created a basis for assigning values to the step down components. The group agreed to maintain the consistency and basis for the program through the use of the Departmental Manual policy for the BAR program. From this foundation, the four categories of high priority resource values and performance objectives provide the structure to a ranking criterion.

The following priority values represent the primary BAR program tenets.

Ecosystem – encompasses the biotic and abiotic BAR values.

Legal – encompasses the laws, regulations and policies.

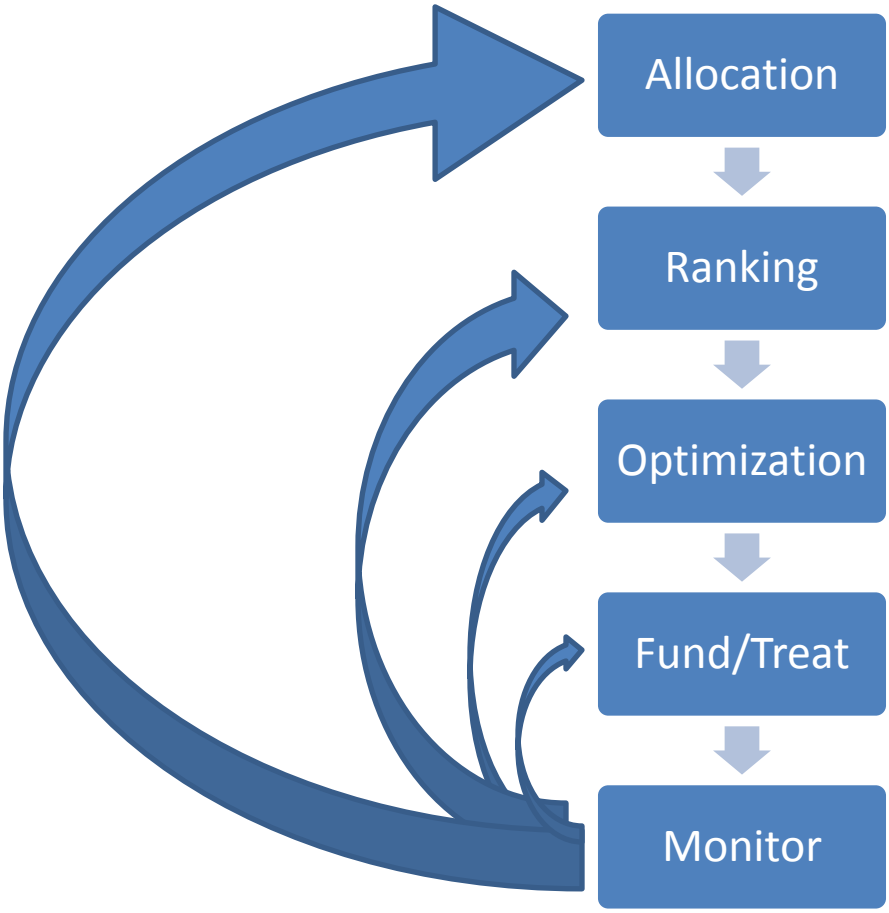
Social – Encompasses the importance of the human environment within the BAR treatments.

Performance – Encompasses the capability of a field unit to accomplish BAR treatments.

The group then utilized the high priority resource value objectives as variables in the treatment prioritization model equation. A swing weighting technique was used to establish weights associated with these variables based on the relative importance to the bureau representatives involved.

Decision Analysis

The IBEAR group utilized process flow modeling to diagram the steps involved that result in the ultimate decision to fund projects. This flow modeling provided some insights that were not outwardly apparent to the group and suggest additional focus and direction in achieving an enhanced process that integrates learning and adaptive management.



The two points that were identified through the modeling exercise were:

1. Monitoring is a critical feedback mechanism at all scales and needs to inform decisions throughout the process
2. The allocation and prioritization processes are linked decisions and needed to work in tandem to achieve the expected results.

The group developed a Burned Area Emergency Response Prioritization Allocation Weighting System (BAER PAWS) and tested it by constructing scenarios that were typical of the types of treatments requesting BAR funding. By inserting true to life examples, the group was interested to see the performance weighting influence as well as the results of the swing weighting on what treatments were identified as the most important. Listed below are the examples used to "calibrate" the BAR prioritization process:

- Interior Pasture Fencing
- Wildlife Guzzler repair
- Buffle grass spraying and physical removal from Saguaro National Park
- Reforestation of tribal commercial forest lands in the Northwest
- Great Basin invasive species seeding
- Lower Colorado River tamarisk tree removal and native tree planting

The results showed that the weighting scheme produced the expected results by scoring those treatment types that addressed ecosystem health characteristics above other treatments that rated high in the other high resource value categories. When overlaying the performance values and including a probability of success factor, the results of the weighting met the expectations of the group for prioritizing the various positive and negative attributes involved for treatment selection.

When evaluating the process developed against the status quo, the IBAER group found that the inclusion of the performance metrics influenced the outcome of the weighted scoring of the treatments enough to shift how the treatments were ranked against each other. As a result, the IBAER group felt more confident in this scoring scheme as it had the benefits of a documented process in its construction and common sense alignment of the resource value weights relative to the fundamental objective of the program. The status quo criteria system was not grounded in the core tenets of the BAR policy and shows a weakness in the prioritization of treatments because of the inherent limitations of the *National Fire Plan Operations and Reporting System (NFPORS)* database. Extracting data from NFPORS for an additional allocation and prioritization processes for which the database was never intended did not create an optimal end result for project selection for funding.

Uncertainty

The IBAER group had recognized that there would always be some level of uncertainty in regards to the problem of allocating funding to treatments in a priority based system, especially as priorities change and/or political issues arise. To try and address these issues, the use of an adaptive management approach was suggested that would allow for flexibility by adjusting the weighting of categories or the addition of categories as the group and decision makers see fit. With the diversity of treatment types, bureau mission objectives, and local level priorities, there will always be some level of argument about the importance of one project over another, but with the allocation and prioritization structure in place, the group felt that the transparency, and linkages back to Departmental policy would resonate with people that may not agree with the results, but could come to a consensus and understand about how the results were derived.

Discussion

The IBAER group was able to take advantage of the benefits of a good working relationship and that the members were able to transcend their individual bureau cultural and mission perspectives to reach an agreement about what the fundamental objective of the BAR program is. Additionally, the group recognized the need to be informed by the monitoring results of treatments at every level of the prioritization and allocation process(es). The value of decision structuring for this problem has shown to be invaluable. The tools that the SDM leadership team was able to bring and share with the IBAER were both informative and effective in addressing how the group valued resources, and placed importance on addressing resource damage issues through appropriate management actions. As both a consensus building exercise and a decision support process, the group was satisfied with the work completed during the workshop and looking to carry the BAER PAWS product to fire leadership for additional input and approval.

It is assumed that the process developed through the SDM workshop will be tested in future years to see how it performs in meeting the expectations of the agencies and Fire Management

Leadership. Several steps to incorporate the decision process have been identified and await approval from leadership. The group also assumes that there are significant needs to adjust the NFPORS database to accommodate and allow for the subjective elicitation and assignment of ~~a~~ numerical values for high priority resource value categories. This could be a significant barrier, which may force the group to go elsewhere to incorporate and or automate the decision support process. Standard operating procedures will need to be written and have been suggested to be incorporated into the revision efforts for policy and guidance for the post fire programs. For the BAER PAWS to work, the agencies must elicit values, and provide the oversight to scrutinize the assignment of those values consistently. Additional work of the IBAER will be needed to establish guidance for the high resource values at the local, regional, and national program coordinator level for elicitation of values and to set standards for high, medium, and low as appropriate for treatments. Once a common framework has been set, then the BAER PAWS can be beta tested and evaluated against the status quo process. Additional training and informational sessions would need to be scheduled for field and regional staff to be trained on process.

The prototyping process was informative and helpful in providing a logical progression through steps that required thoughtful analysis and the relationships to prior steps in the process. When dealing with complex and interrelated problems, people have the tendency of jumping ahead or skipping over seemingly mundane or inconsequential issues resulting in a disjointed or poorly connected decision. The rapid prototyping approach required the group to maintain focus, and ensure that each aspect of the problem~~s~~ solving effort was addressed sufficiently. Having coaches and apprentices was ~~also very~~ helpful for the IBAER group because the experience level in such decision science was low, and historically, the group had never spent the time needed to dissect and analyze programmatic problems. Establishing a goal of developing a rapid prototype and then refining the product was also a benefit because the decision problems can get bogged down in details. Creating an incentive to keep discussion moving towards resolution rather than revisiting the same issues contributed to the success of making significant progress on the decision problem in one weeks' time.

Recommendations

The IBAER group plans to present the prioritization and allocation weighting system to leadership for approval. A testing and evaluation phase is needed to make sure that team member's expectations are met. The team feels that there is flexibility in the design to incorporate new direction as it evolves, as well as the ability to integrate lessons learned from treatment monitoring efforts. In the future, when dealing with group dynamics similar to the IBAER (good working relationships, trust in team members, open communication, and in depth knowledge, history, and experience with the problem), the SDM effort should engage upfront and expose the group to the various tools, and techniques that could be applied to the decision problem and decision modeling. In an effort to come away from the workshop with a full set of products, it may be helpful to dedicate some time each day in either a progress review session or recap that could be used to build the final report on the go during the week. The prioritization and allocation problem is not unique to the IBAER group, and lessons learned could potentially help others dealing with a diverse pool of projects that have needs greater than what can be addressed with available funding. The SDM workshop helped the IBAER group by establishing a framework that is both connected to the fundamental purposes for the work, with a structured

value elicitation process that can train projects towards the most effective and most important work.

Literature Cited

Hammond JS, Keeney RL, Raiffa H. 1999. Smart Choices: A Practical Guide to Making Better Life Decisions. Broadway Books, New York.

Tables

Swing weighting

		Objectives						
		Legal	Social	Ecology	Performance			
Rank		(0-4) Max	(0-41) Max	(0-60) Max	(0-10) Max	Score	**Weights**	**Objective**
5	Baseline (Worst)	0	0	0	0	0	0.00	
3		4	0	0	0	30	0.14	Legal
3		0	41	0	0	30	0.14	Social
1		0	0	60	0	100	0.48	Ecology
2		0	0	0	10	50	0.24	Performan
						210	1	

Evaluation of prioritization framework with hypothetical scenarios

	WEIGHTS	Total Points					
Ecological	**0.48**	60					
Performance	**0.24**	14					
Legal	**0.14**	4					
Social	**0.14**	41					
		Internal Fence	**Guzzler**	**Saguaro Invasiv**	**Reforestatior**	**Great Basin Ir**	**Tamarisk**
	Ecological	0.250	0.267	0.633	0.483	0.533	0.400
	Performance	0.571	0.357	0.786	0.643	0.500	0.357
	Legal	0.250	0.000	0.250	0.250	0.500	0.500
	Social	0.268	0.195	0.366	0.561	0.341	0.049
	Total	**0.330**	**0.241**	**0.579**	**0.500**	**0.494**	**0.355**
	No Prob Success	**0.385**	**0.275**	**0.582**	**0.466**	**0.494**	**0.365**
	Good Performance (8/1(	**0.330**	**0.292**	**0.579**	**0.551**	**0.545**	**0.423**
	Poor Performance (3/10	**0.244**	**0.207**	**0.493**	**0.466**	**0.460**	**0.337**

Figures

Graphic depicting number of Burned Area Rehabilitation treatments by category 2004-2010