



Understanding FPA and the Performance Measures Used in Analyzing Investment Alternatives PM_021_WP

Topic

Understanding Fire Program Analysis (FPA) and the calculated performance measures used for analyzing the effectiveness of Fire Planning Unit (FPU)-developed investment alternatives.

Revision History

Revision Description	Date
Redefined Performance Metric #3, added definition and description of Performance Measures #6 and #7. Clarified distinction between performance measures and metrics.	9/9/2009

Purpose

Performance measures provide insight to fire planners as to the trade-offs in different investment alternatives within local fire program strategies. When incorporated into a national goal programming process, performance measures provide a consistent method of characterizing the trade-offs between different investments at the FPU level. Performance measures provide valuable information for national-level decision makers when recommending out-year fire program budgets.

Terms

Performance Measure - Ways to objectively measure the degree of success a program has had in achieving its stated objectives or goals.

Performance Metric - A measurement of performance.

Goal Programming - An analysis used to determine the way to achieve the best outcome given a list of requirements and multiple, often conflicting, objective measures.

Trade-off Analysis - A systematic approach to balancing the pros and cons of investment alternatives when the objective is to simultaneously meet multiple goals.

Exceed Simulation Limits - A fire that exceeds the limits of the Initial Response Simulator based on either time or size, as defined by FPU level planners.

Stratified Cost Index (SCI)¹ - Regression equation that calculates the expected suppression cost of a large fire (greater than 300 acres) given its characteristics.

¹ See http://www.fs.fed.us/rm/pubs_other/rmrs_2007_gebert_k001.pdf for more information.



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Discussion

In 2006, the Wildland Fire Leadership Council (WFLC)² identified five broad management concerns that FPA was chartered to address:

- Growing annual suppression costs for large fires.
- Fires that occur and cause significant damage within the Wildland Urban Interface (WUI.)
- Attaining fire and fuels management objectives on federal lands.
- Fires that cause severe impacts to highly valued resources.
- Concerns with prevention and suppression of unwanted and unplanned fires.

Seven FPU investment performance objectives were created to address these WFLC concerns:

1. Reducing the probability of occurrence of costly fires
2. Reducing the probability of occurrence of costly fires within the Wildland Urban Interface (WUI)
3. Increasing the proportion of land treated in order to reduce wildland fire risk
4. Protecting highly valued resources areas from unwanted fire
5. Maintaining a high initial attack success rate
6. Decreasing the proportion of land burning above the damaging threshold
7. Increasing the proportion of land burning at or below the damaging threshold

This paper identifies the seven performance measures that FPA calculates to provide indicators used for comparative analysis of investment alternatives at the FPU level. These seven performance measures, when used in the national goal-program, have outcomes consistent with fire management objectives. Each FPA performance measure is listed below along with of its corresponding assumptions.

² See

http://www.fpa.nifc.gov/Library/Docs/Science/FPA_Exec_Summary_overview_proposed_global_architecture_final_061006.pdf for more information.



Understanding FPA and the Performance Measures Used in Analyzing Investment Alternatives PM_021_WP

Performance Measure #1: The expected total suppression cost for all unplanned and unwanted fires.

Assumptions:

- The total cost of managing fires contained in the Initial Response Simulator (IRS) are calculated from an average acre cost estimate, and
- The total cost of fires that exceed the simulation limits in IRS are modeled using the Stratified Cost Index (SCI).

Performance Measure #2: The total Wildland Urban Interface (WUI) acres burned.

Assumptions:

- Fires at any Fire Intensity Level (FIL) are undesirable in the WUI, and
- WUI is defined using the University of Wisconsin's SILVIS³ Laboratory definitions for Interface and Intermix, with an additional 1.2-mile buffer to account for urban growth since the 2000 Census.

Performance Measure #3: The total number of acres treated to minimize the effect of hazardous fuels on fire behavior.

Assumption:

- All acres treated in FPA use Fuel Program funding for the purpose of achieving fire and fuels management objectives.

Performance Measure #4: The total Highly Valued Resources (HVR) acres burning above FPU-defined Fire Intensity Levels (FIL) damage thresholds.

Assumptions:

- HVR is a nationally defined and geospatially delineated data layer as accepted by all participating bureaus/agencies. For the FY2009 analysis year, this layer is comprised of or a subset of the following nationally valued resources:
 - Endangered Species Critical Habitat as represented by Federally registered species and sage grouse critical habitats that are negatively impacted by fire
 - Municipal Watersheds as represented by Level 6 Hydrologic Unit Codes
- The HVR layer indicates what areas or features of the national landscape are nationally significant. A point on the landscape is either significant or not. The HVR performance measure does not provide for levels of significance.

³ http://silvis.forest.wisc.edu/projects/WUI_Main.asp



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- All fires burning above the FPU-defined flame length threshold set for each Fire Workload Area (FWA) are undesirable. FPU's can indicate that all flame lengths are unacceptable by specifying a zero threshold when assigning the threshold for each FWA.
- These thresholds correspond to the fire and fuels management objectives of the FPU.
- By definition, some portions of locally significant FPU landscapes may not fall within the area defined by the national HVR layer used for calculating the HVR performance measure.

Performance Measure #5: The number of fires contained in IRS and the number of fires prevented in the Prevention Module.

For each investment alternative, FPA models the number of fires:

- Contained in the Initial Response Simulator (IRS).
- Exceed Simulation Limits in IRS.
- Prevented in the Prevention Module.

Assumption:

- FPA models containment from the FPU's LMP/FMP goals. These goals may differ for every FWA within the FPU.

Performance Measure #6: The number of acres burned above the damaging threshold.

Assumptions:

- The FWA damage thresholds correspond to the FPU's local fire and fuels management objective.
- All fires burning above the FPU-defined threshold within a Fire Workload Area (FWA) are undesirable.

Performance Measure #7: The number of acres burned at or below the damaging threshold.

Assumptions:

- The FWA damage thresholds correspond to the FPU's local fire and fuels management objective.
- All fires burning at or below the FPU-defined threshold within a Fire Workload Area (FWA) are desirable. FPU's can indicate that all flame lengths are acceptable by specifying a very high threshold.

Interpreting the Measures

FPA modeled results are in terms of probability distributions (e.g. probability of burning, probability of damage,). The metrics used in the calculations are single expected values for each



Understanding FPA and the Performance Measures Used in Analyzing Investment Alternatives PM_021_WP

of the distributions rather than ranges of probabilities. This method reports one value for each performance measures per investment alternative proposed at the FPU level.