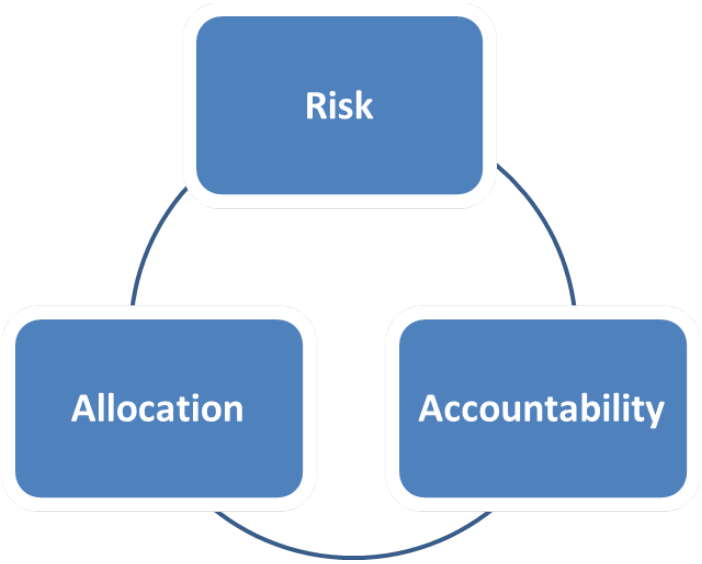
Fuels Management Allocation and Accountability System (FAAS)

FY2016-2018

Version 1.0



U.S. Fish and Wildlife Service
National Wildlife Refuge System
Branch of Fire Management

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EXECUTIVE SUMMARY

The U.S. Fish and Wildlife Service (FWS) has a long history of effectively managing fire to conserve, protect, and enhance fish, wildlife, and plants and their habitats while protecting FWS facilities and surrounding communities. The Fire Management program is administered under the National Wildlife Refuge System (NWRS), which consists of over 560 National Wildlife Refuges, Waterfowl Production Areas, Wildlife Management Areas, National Fish Hatcheries, and other units grouped into eight geographic Regions. The NWRS Fire Management Program is funded by the U.S. Department of the Interior (DOI) Office of Wildland Fire (OWF) through a variety of subactivities including Fire Preparedness, Emergency Fire Suppression, Burned Area Rehabilitation, and Fuels Management. Service funds assist the fire program throughout the Service.

This guide provides an overview of the Fuels Management Allocation and Accountability System (FAAS), a process used by the FWS National Fire Branch to allocate Fuels Management program funding to the eight Regions for fiscal years (FY) 2016-2018. Fuels Management funds are used to implement treatments, including prescribed fire, that reduce wildfire risk to people, infrastructure, and resources.

FAAS is composed of three integrated modules:

- The **Risk Module** uses several datasets, including FWS unit boundaries, infrastructure locations, population density, and fuel models to spatially delineate areas on FWS land that are in close proximity to values at risk from wildfire.
- The **Allocation Module** uses outputs from the Risk Module and applies weighting based on fuel type complexity and expected fire behavior to determine the percentage of Fuels Management funding that will be allocated to each Region.
- The **Accountability Module** uses a performance-based process to ensure that Fuels Management funding is applied appropriately on the landscape to reduce wildfire risk, and that the Fuels Management program is managed efficiently and according to established business rules and policies.

FAAS Version 1.0 was partially implemented in FY2016 to set Regional Fuels Management allocation percentages through FY2018. FY2017 will bring FAAS into full implementation mode by using the results of the FY2016 accountability analysis. FAAS is maintained by the FWS National Fuels Team, and will be evaluated and updated every three years.

INTRODUCTION

The use of fire as a tool to protect and manage U.S. Fish and Wildlife Service (Service) lands and resources enables the Service to meet its core mission. As a result of past fire management, the Service manages a greater percentage of its lands through the use of fire than any other Department of the Interior (DOI) bureau. Mounting challenges such as climate change, increased urbanization, and ongoing budget reductions put into jeopardy continued excellence for fire-managed habitats and the wildlife that rely on them. The Service's fire program must safely and effectively manage wildfires, lower wildfire risk, and manage ecologically resilient landscapes and habitat that meet resource and wildlife management objectives.

DOI Risk Based Wildland Fire Management

OWF has the responsibility to allocate Preparedness and Fuels Management funding to the DOI bureaus. The Bureaus, in turn, are responsible for implementing and executing the programs in collaboration with other Federal, Tribal, state, and local partners to support the three goals of the National Cohesive Wildland Fire Management Strategy (Cohesive Strategy). In fiscal year (FY) 2007, OWF developed the Hazardous Fuels Prioritization and Allocation System (HFPAS) in an effort to provide a common tool for ranking fuels projects and making allocations to the Bureaus. HFPAS is no longer used by OWF to allocate fuels funding. Recently, OWF has led efforts to develop a unified approach for management of the Preparedness and Fuels Management programs. This approach relies on a common risk-based framework to quantify risk and inform allocations of funding to the Bureaus to accomplish the objectives of the Preparedness and Fuels Management programs. This common approach is called "Risk Based Wildland Fire Management" (OWF 2014).

Developmental Process

Fuels management funding in the NWRS is insufficient to meet the Service needs and with expectations from DOI, OMB, and Congress to reduce wildfire risk in high priority areas generated the need for a process to prioritize the distribution of funds. Previously, Regions were provided an individual fixed percentage of the National fuels allocation based on past FIREBASE results. FIREBASE was discontinued in FY 2012, and the fuels allocation adapted as informed by the OWF analysis, and the discussion, negotiation, tradition and consensus amongst Regional and National fire management personnel. This process, although serviceable, was considered to lack transparency, a robust risk justification, and fund use accountability. The FWS National Fire Leadership Team (NFLT) assembled a National-level team to develop alternatives, select and recommend the best alternative, and design an allocation model to fairly distribute Fuels Management funding to the Regions.

The Team developed a risk-based allocation model, Fuels Management Allocation and Accountability System (FAAS), which was approved by the NFLT. In developing alternatives for allocating Fuels Management funding to the Regions , the FAAS Team recognized that there are many factors that affect the range of choices available and that some were beyond the scope of the Team for the first generation of FAAS. Among those constraints and considerations were:

- Existing DOI policy for Risk Based Wildland Fire Management;
- Reduced budgets that continue to decline;
- The Fuels Management need greatly exceeds available funding;
- Fuels Management only partially funds Refuge fire programs;

- Existing fire staffing and equipment;
- Firefighter and public safety, and resource protection needs.

The FAAS Team utilized a Structured Decision Making (SDM) process to develop FAAS. SDM is a general term for carefully organized analysis of problems in order to reach decisions that are focused clearly on achieving fundamental objectives. Based in decision theory and risk analysis, SDM encompasses a simple set of concepts and helpful steps, rather than a rigidly-prescribed approach for problem solving. Key SDM concepts include making decisions based on clearly articulated fundamental objectives, dealing explicitly with uncertainty, and responding transparently to legal mandates and public preferences or values in decision-making; thus, SDM integrates science and policy explicitly (USFWS 2008).

FAAS Objectives

FAAS was developed to:

- Characterize wildfire risk to key values on and near lands managed by FWS;
- Allocate Fuels Management funding to the eight FWS Regions based on wildfire risk using a repeatable, transparent, and science-based process;
- Implement performance and accountability measures to ensure Fuels Management treatments are placed appropriately on the landscape to reduce wildfire risk, and to maximize overall Fuels Management program efficiency and effectiveness.
- Contribute towards the successful implementation of the goals of the FWS National Wildlife Refuge System and the FWS Fire Management program.

FAAS was designed to complement the National Cohesive Wildland Fire Management Strategy (Cohesive Strategy):

- **Resilient Landscapes**: FAAS allows FWS to evaluate changes in expected fire behavior and quantify the proportion of acres that have been restored to a more natural fire regime;
- **Fire-Adapted Communities**: FAAS identifies areas on FWS lands that are in close proximity to local communities and supporting infrastructure;
- **Wildfire Response**: FAAS identifies areas where the highest fire intensity is expected, and DHS data to identify where there are FWS or community values, allowing the Service to better focus our limited resources.

At the Department level, FAAS is consistent with OWF Policy Memorandum 2013-003. DOI policy revised the Fuels Management program to focus on a risk-based approach that supports the Cohesive Strategy and focuses on identifying wildfire risk to key values, determining treatment and funding priorities based on those risks, and measuring accomplishments and program success in terms of reducing risks.

FAAS is consistent with the FWS Fire Management Strategic Plan (USFWS 2016) by focusing limited Fuels Management funding to meet overall Fire Management program goals and strategies for success.

Assumptions and Limitations

The following assumptions and limitations have been recognized for FAAS:

- The Fuels Management program allocation is intended to reduce wildfire risk to key values, increase resilient landscapes, and provide for firefighter and public safety during wildfire response.
- Risk is perpetually changing and never constant (e.g., fuels loads increase; new infrastructure is built, etc.).
- FWS will never eliminate all high-risk areas on its lands; an overall goal of the Fuels Management program is to reduce wildfire risk to key values. Describing the "acceptable risk level" at the National or Regional scale is very complex, variable from place to place, and difficult to model for allocation purposes.
- FWS treatments to reduce wildfire risk are expected to do no harm to natural resources. Fuels Management goals support overall land management goals; therefore, treatments to reduce wildfire risk will also maximize conservation benefits.
- FAAS was developed to provide the National Fire Branch with a process for managing Fuels Management allocation to the Regions. It was not designed to allocate funding to individual units or to make site-specific decisions regarding treatment priorities. The Regions are responsible for prioritizing and approving individual projects/treatments during development of the annual Program of Work.
- FAAS cannot affect how much Fuels Management funding FWS receives from DOI.
- FAAS does not apply to Resilient Landscapes program funding.

Desired Outcome

By focusing Fuels Management funding to the Region, where they are better to be able to determine proximity to values at risk from wildfire, and by holding Regions accountable for doing so, the goal is to reduce wildfire risk and potential damage to those values. Ideally, within the Region, the number of acres classified as "high" and "very high" risk should decrease over time, and the number of acres classified as "low" and "moderate" risk should increase. Ensuring that Regions are following established business rules for the Fuels Management program will increase overall effectiveness and efficiency of the program. Ultimately, the Fuels Management program will contribute towards the successful implementation of the goals of the NWRS and the FWS Fire Management, Cohesive Strategy, and the DOI Wildland Fire Management.

FAAS Stewardship

Starting in FY2016, the FAAS Team will transition ownership of FAAS to the FWS National Fuels Working Team (Fuels Team). The Fuels Team will be responsible for developing FAAS 2.0, which will be run in FY2018 to set the Regional Fuels Management allocation percentages for FY2019-2021. The Fuels Team will recommend system updates to the NFLT, ensure that input data is updated, and facilitate the accountability process for FAAS 1.0.

THE FUELS MANAGEMENT ALLOCATION AND ACCOUNTABILITY SYSTEM (FAAS)

The Fuels Management Allocation and Accountability System is composed of three integrated modules that together inform the process of allocating Fuels Management funding to the eight Regions.



The **Risk Module** uses several datasets, including FWS unit boundaries, infrastructure locations, population density, and fuel models to spatially delineate areas on FWS land that are in close proximity to values at risk from wildfire.

The **Allocation Module** uses outputs from the Risk Module and applies weighting based on fuel type complexity and modeled fire intensity to determine the percentage of Fuels Management funding that will be allocated to each Region.

The **Accountability Module** uses a performance-based process to ensure that Fuels Management funding is applied appropriately on the landscape to reduce wildfire risk, and that the Fuels Management program is managed efficiently according to established business rules and desired outcomes.

The Risk and Allocation Modules fix Regional Fuels Management allocation percentages for a period of three fiscal years. The Accountability Module will be implemented each fiscal year, and will be based on performance results from the previous fiscal year; 10% of a Region's Fuels Management allocation (as determined by the Allocation Module) is subject to distribution through the Accountability Module.

The FAAS 1.0 Risk and Allocation Modules were implemented in FY2015 to set Regional Fuels Management allocation percentages for FY2016-2018. The Accountability Module will be implemented in FY2017 and will be based on performance from FY2016. At the end of the first three-year cycle, FAAS will be re-evaluated to determine if any modifications are necessary, and input data will be updated to the latest and/or best available.

FWS Lands Included in FAAS

Continental U.S.

All National Wildlife Refuges, National Fish Hatcheries, Waterfowl Production Areas, Wildlife Management Areas, and other units within the continental United States for which FWS has management responsibility are included in the FAAS process described in this document.

Alaska

Historically, Alaska (R7) has received a 3.3% allocation of Fuels Management funding each year. Including R7 in the initial FAAS analysis, however, resulted in an unrealistic allocation of 52% due to the Region's massive land base. An alternative methodology was developed to include R7 in the FAAS process; these protocols are described in detail later in appendix F.

Puerto Rico, Hawaii, and the Pacific Islands

FWS units in Puerto Rico (R4), Hawaii (R1), and the Pacific Islands (R1) are not included in FAAS 1.0, primarily due to uncertainty with FSim outputs for DOI properties in these areas. The FSim outputs showed unrealistic results, such as high burn probabilities and high flame length probabilities in rainforest vegetation on the island of Oahu. There was also uncertainty about the underlying fuel model

data. Fuel model maps for the island of Puerto Rico were only recently developed for LANDFIRE and are not fully calibrated yet. The FSim model for these environments should be improved for the next iteration, and outputs should then be reassessed for inclusion into FAAS.

Roles and Responsibilities

Fire Managers and Agency Administrators all have roles and responsibilities in support of the FAAS process (see Appendix G).

Risk Module



For the purposes of this module, risk is defined as where a wildfire of damaging intensity (typically high or very high intensity) intersects with a value. *"Just because there is a fire, it does not mean that the area is at risk."*

The Risk Module uses several datasets, including FWS unit boundaries, infrastructure locations, population density, and fuel models to spatially delineate areas on FWS land that are in close proximity to values at risk from wildfire. The final product of the Risk Module is a summary by FWS unit of the total number of weighted acres within the Hazard Zone.

The Hazard Zone consists of two components – the Risk Zone, which is the FWS land on which a wildfire will pose a threat to identified values, and the Risk Category, which is a combination of the degree of potential risk from a wildfire based on modeled fire intensity (Risk Level), and existing Fuel Types.

The Risk Module will be run every three years in conjunction with the Allocation Module. The current FAAS 1.0 analysis was implemented in 2015 and defined the Hazard Zone for FY2016-2018. FAAS 2.0 will be implemented in 2018 to define the Hazard Zone for FY2019-2021.

Risk Module Input Data Layers

To delineate areas most at risk from wildfire, it was important to use the best available spatial data that provide a good representation of values, including but not limited to population density, commercial developments, and critical infrastructure. Furthermore, the data needed to be consistent and available at a national scale, and generally accepted by the fire community for use in similar analyses. While some of the inputs are extremely accurate, others are more general in nature and will not necessarily be entirely representative of a specific acre of FWS lands.

No complete national-level spatial datasets exist for Threatened and Endangered Species, Critical Habitats, other sensitive habitats, and cultural or historical resources; therefore, these values were not included in the current FAAS Risk Module analysis. Because wildlife and habitat management is a primary responsibility of FWS, these values are assumed to be present and of equal value on all units on all acres. These factors may be considered during Regional-level approval of specific Fuels Management projects and treatments or during funding allocation.

Although FWS assets data was determined to be important for the FAAS process, it was not available at the time the FAAS 1.0 Risk and Allocation Modules were implemented. The existing dataset was very inconsistent and inaccurate, and was not used. A subset of the assets data (those that could be

threatened by wildfires) has since been developed and corrected and may be used in the Accountability Module (see Performance Measure 1A). Standards are being developed which will turn this data into a nationally consistent and reliable data source for the future. The FWS assets database will be included in FAAS 2.0 when it is implemented in FY2018.

All values within the Hazard Zone are considered to be equal in value. For example, the Space Shuttle Storage Facility at Merritt Island NWR is valued the same as a communication tower. Assigning monetary values to individual values is not possible at this time.

The FAAS Team selected the following data layers for use in the Risk Module:

FWS Cadastral Database: The Surface Management Area layer utilized for FAAS is the 2013 FWS Interest Simplified layer from the FWS Cadastral database. The layer includes lands owned by FWS (fee-title), lands on which FWS has secondary interest, lands owned by another entity but managed by FWS through agreements, and easements. It does not include private inholdings or other lands not managed by FWS, and acquisition boundaries were not considered for the analysis. The same layer is being utilized by DOI in its risk-based model for distributing Fuels Management funding to its bureaus. This layer was reviewed and approved for FAAS by the NFLT in May 2014. Metadata for this layer has been posted on the FWS SharePoint site.

HSIP Gold: The Department of Homeland Security (DHS) HSIP Gold database is a unified homeland infrastructure geospatial data inventory assembled by the National Geospatial Intelligence Agency (NGA) in partnership with the Homeland Infrastructure Foundation-Level Data (HIFLD) Working Group. It is a compilation of geospatial data layers characterizing domestic infrastructure and boundaries assembled from Federal agencies, commercial vendors, and State mission partners. HSIP Gold data is the best available and most consistent national-scale data, and is used by DOI and the fire community for similar analyses.

The following twenty-two 2013 HSIP Gold data layers (listed by theme) were selected by the FAAS Team and approved by NFLT to represent communities and their infrastructure in and around FWS lands. Metadata for these layers has been posted on the FWS SharePoint site.

- *Aviation:* *Airport Boundaries, Aero-Navigational Aids, Runways, Public Use Airports;*
- *Communication:* *Cellular Towers, FM Antennas, AM Antennas;*
- *Energy:* *(Major) Transmission Lines, Electric Power Generation Plants, Electric Generating Units, Pipelines;*
- *Commercial:* *Hotels/Motels, Shopping Malls, Grocery Stores;*
- *Government:* *Space Research and Technology, General Services Administration Owned/Leased Properties;*
- *Public Venues:* *Ski Resorts, Mobile Home Parks, Campgrounds;*
- *Education:* *Public Schools, Private Schools, Day Care Centers, Colleges/Universities.*

The following HSIP Gold data layers were considered but not included in the FAAS analysis:

- *City Limits:* The City Limits layer was dropped from the FAAS model run because it resulted in an unrealistic representation of where people and infrastructure are located, and in many cases is politically-driven.
- *Military:* The Military layer was initially considered because several refuges have military overlays, and fire starts from military operations are relatively common. However, inclusion of the Military layer resulted in unrealistic Hazard Zones around bombing ranges where no people or infrastructure are allowed.
- *Railroads:* The FAAS Team determined that the HSIP Gold Railroads layer did not significantly affect the total footprint of the Hazard Zone, and therefore was not necessary to include.

FWS Oil Wells: HSIP Gold Oil and Natural Gas Wells were used as the base where inactive, capped, or dry wells were removed. (HSIP Gold 2013 – NHS)

Pipelines: HSIP Gold, (2013). The Oil and Natural Gas Pipeline geospatial data layer contains gathering, interstate, and intrastate natural gas pipelines, crude and product oil pipelines, and other hazardous liquid pipelines throughout North America. (HSIP Gold 2013 – NHS)

Major Roads: National Atlas, (2013). Major roads include Interstate routes, U.S. routes, State routes, and other large roads. Map Layer info (National Atlas – USGS).

LandScan USA: National-level building or structure location datasets currently do not exist. Alternatives such as parcel data and census population data (Dobson et al. 2000, Radeloff et al. 2005, Theobald and Romme 2007) are often used to estimate potential wildland fire impacts. The Oak Ridge National Laboratory (ORNL) has developed a U.S. population database known as LandScan USA. LandScan produces a high-resolution assessment of the number of people present in a given area. The database was derived from the best available census counts and coefficients related to slope, road proximity, land cover, nighttime lights, and urban density. Although LandScan does not attempt to represent structure location, a strong positive correlation is expected to exist between population count and structure location. The LandScan Global Population(2012) dataset was used for this analysis. Detailed documentation for LandScan is available through the ORNL website

Large Fire Simulation (FSim) Model: FSim was created for the now-defunct national interagency Fire Program Analysis (FPA) system (Finney et al. 2011), and was more recently used for the Wildfire Hazard Potential project (Dillon et al. 2015, USDA 2015). FSim produces spatial estimates of the probabilistic components of wildfire risk, including burn probability and the conditional probabilities of six fire intensity levels defined by flame length classes. These FSim products are output for all lands in the United States, including Alaska, Hawaii, and Puerto Rico, and are based on a number of input data sources including fuel models from the LANDFIRE project and historic weather station and fire occurrence data. Estimates of burn probability and intensity from FSim can be used to characterize the potential for wildfire to cause harm to resources and assets (Scott et al. 2013). The DOI 2013 version of the FSim outputs was used for the FAAS analysis.

LANDFIRE FBFM40: The 40 Scott and Burgan Fire Behavior Fuel Model (FBFM40) layer represents distinct distributions of fuel loading found among surface fuel components (live and dead), size classes, and fuel types (LANDFIRE 2012). FBFM40 was produced through a series of workshops held across the

nation with fire and fuels specialists to determine surface fuel model rule sets using unique combinations of existing vegetation type, cover, and height. The LANDFIRE 2012 (LF 1.3.0) version was used for the FAAS analysis.

Development of the Hazard Zone Layer

The Hazard Zone consists of two components – the Risk Zone, which is the FWS land on which a wildfire will pose a threat to an identified value, and the Risk Category, which is a combination of the degree of potential risk from a wildfire based on expected fire intensity (Risk Level), and existing Fuel Types. A simplified process for developing the Hazard Zone layer from spatial data inputs is shown in Figure 1, with details for each step outlined below.

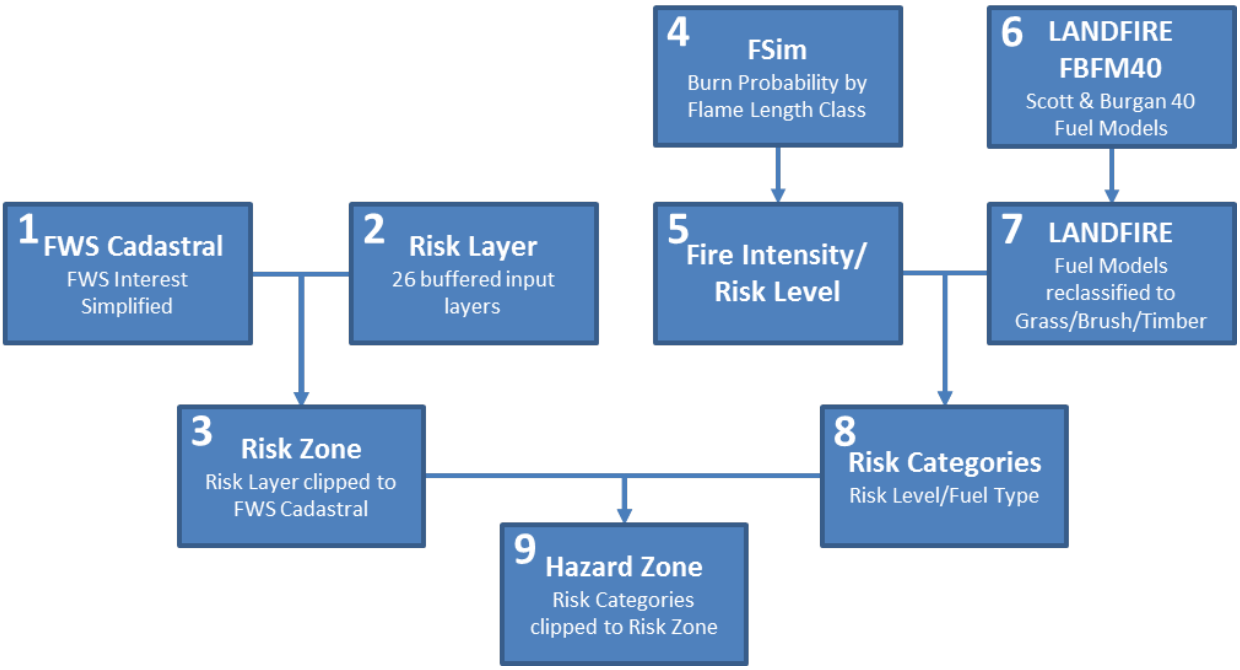


Figure 1. General steps to develop the Hazard Zone layer from spatial data inputs.

1. The FWS Interest cadastral layer was further simplified by dissolving FWS fee-title, secondary interest, agreement, and easement lands into a single polygon feature representing the entirety of lands managed by FWS.
2. The Risk Layer is a composite footprint of 26 buffered input layers – 22 HSIP Gold layers, Oil Wells, Pipelines, Primary Roads, and LandScan (Figure 2A, 2B). To aid with geo-processing, the layer was buffered by 1 mile to capture values outside of Service boundaries. The input layers were then clipped to the buffered cadastral layer to isolate features located within one mile of FWS boundaries. The clipped input layers were then buffered, and the buffer distance was one mile out from the perimeter of polygon features, one mile on each side of line features, and a one-mile radius from point features. Finally, all processed input layers were merged and dissolved to create the Risk Layer.
3. The Risk Zone was produced by clipping the Risk Layer to Refuge boundaries in the FWS Cadastral layer (Figure 2C). A detailed flowchart outlining the processing steps required to produce the Risk Zone is posted on the FWS SharePoint site.

4. FSim calculates the probability of each 270 x 270 meter (18-acre) pixel on the landscape burning by simulating 20,000 to 50,000 fire seasons. For each pixel that is predicted to burn, FSim calculates the probability of the fire burning at six flame length categories – 0-2 ft, 2-4 ft, 4-6 ft, 6-8 ft, 8-12 ft, and over 12 ft.
5. For the FAAS model, the flame length category with the highest conditional probability was assigned to each pixel that was predicted to burn. The six flame length categories were then classified into four categories, and a Fire Intensity Level (FIL) was assigned to each: 0-2 ft = low; 2-6 ft = moderate; 6-12 ft = high; over 12 ft = very high. These measures of fire intensity are generally equivalent to wildfire risk (i.e., very high fire intensity = very high risk, etc.).
6. The LANDFIRE FBFM40 (40 Scott & Burgan Fuel Models) layer is a primary input to FAAS. Pixel size for this raster layer is 30 x 30 meters (0.2 acres).
7. For the FAAS model, the LANDFIRE FBFM40 layer was resampled to match the FSim 270 x 270 meter (18-acre) pixel size using the ArcGIS "Resample" tool with the "Nearest" resampling algorithm (ESRI 2014). This algorithm determines the new value of the 270 x 270 meter pixel based on the eighty-one 30 x 30 meter pixels sampled (see Appendix D). The 40 Scott & Burgan Fuel Models were then classified into three general fuel types – grass, brush, and timber.
8. The products from Steps 5 and 7 were combined to produce the Risk Category layer. Each 18-acre pixel is identified with a Fuel Type (grass/brush/timber) and a Risk Level (low/moderate/high/very high). The "Risk Category" is the combination of the two attributes (e.g., Grass Low, Brush High, Timber Very High, etc.). The Risk Category raster dataset for each region can be found on Fishnet
9. The Risk Category layer from Step 8 is intersected to the Risk Zone layer from Step 3 to produce the final Hazard Zone layer (Figure 2D). The Geo-spatial Modeling Environment (GME) from Spatial Ecology (version 7.4) was used to intersect layers.

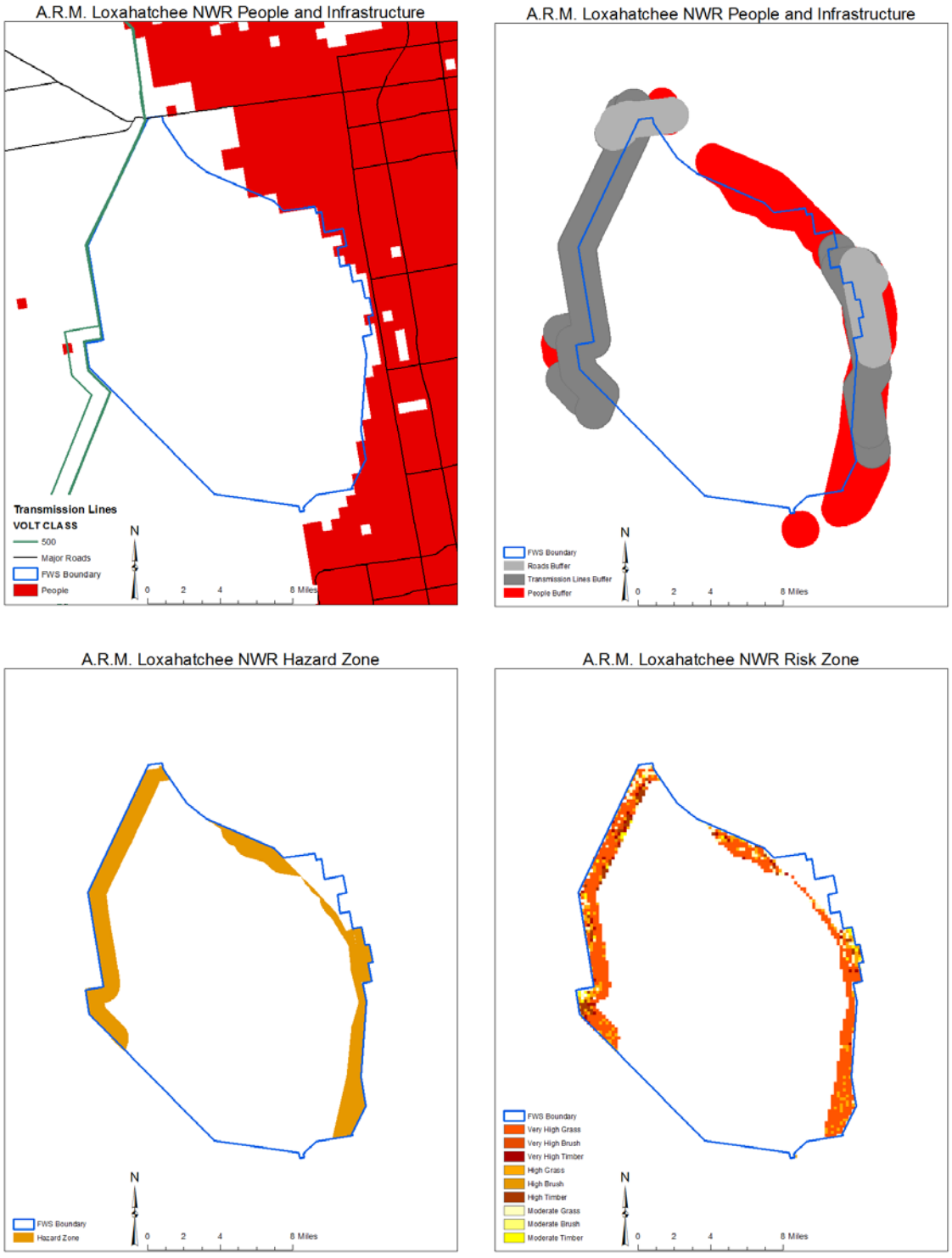


Figure 2. Example of Hazard Zone development for Arthur R. Marshall Loxahatchee National Wildlife Refuge (FL). A: All input data (before processing) in relation to the Refuge boundary; B: Input layers within 1 mile of the refuge boundary buffered by 1 mile (Risk Layer; Figure 1 Step 2); C: Buffered input layers clipped to the Refuge boundary (Risk Zone; Figure 1 Step 3); D: Risk Categories clipped to the Risk Zone(Hazard Zone; Figure 1 Step 9).

Risk Module Results

For each FWS Unit, the Risk Module produces a tabular breakdown of the Hazard Zone acres for each Risk Category (e.g., Low Grass, Moderate Brush, etc.). These numbers are rolled up to the Regional Level (Appendix E, Table 4A) for analysis and input to the Allocation and Accountability Modules. The data can also be summarized by Risk Level or Fuel Type (Appendix E, Table 5A). Figure 3 below is a graphical representation of the Regional Risk Level summary (Risk Profiles). A spreadsheet containing the Hazard Zone data for all FWS units has been posted on the FWS SharePoint site.

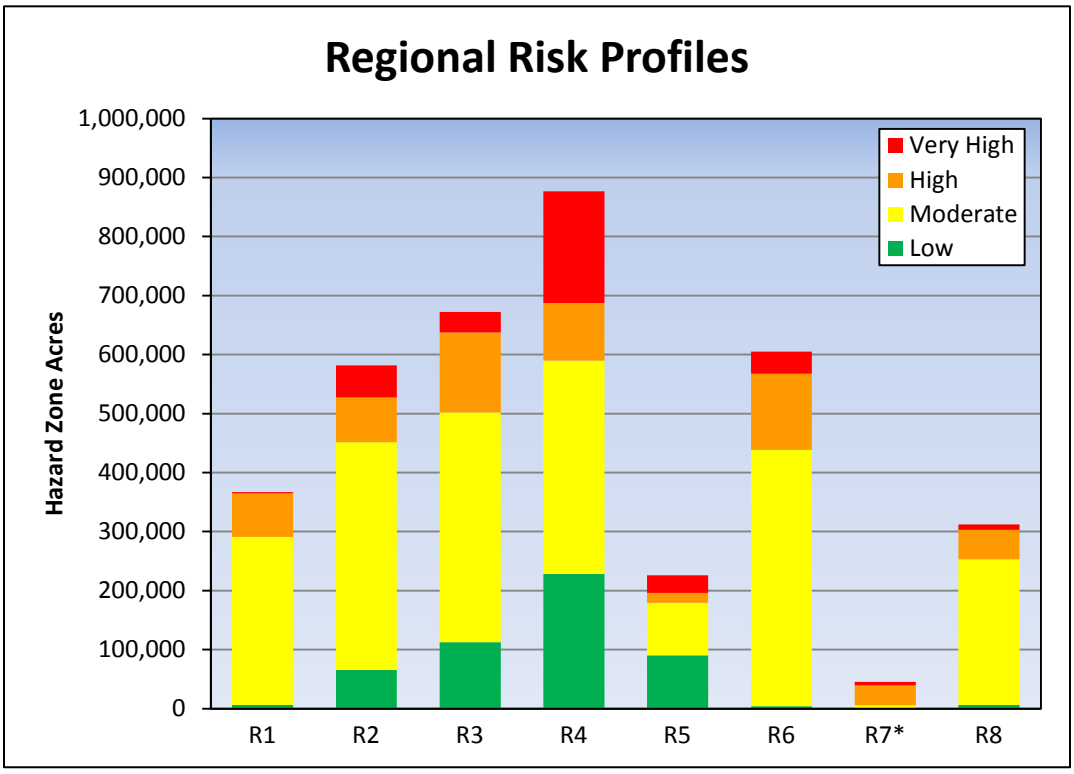


Figure 3. Hazard Zone acres by Risk Level for each Region. *The Hazard Zone for Alaska (R7) was derived separately with a different process than that used for the other Regions (see Alaska Protocols section).

Allocation Module

The FAAS Allocation Module determines the percentage of Fuels Management funding allocated to each FWS Region. It uses the Hazard Zone outputs from the Risk Module and applies a multiplier based on weighting of Fuel Type and Risk Level to prioritize areas of higher fire behavior potential (higher risk) and treatment effectiveness duration within the Hazard Zone. The Regional allocation percentages are calculated by dividing a Region's total weighted Hazard Zone acres by the National total.



The Allocation Module will be run every three years in conjunction with the Risk Module. The current FAAS 1.0 analysis was implemented in 2015 and set the Regional allocation percentages for FY2016-2018. FAAS 2.0 will be implemented in 2018 to set Regional allocation percentages for FY2019-2021.

Weighting Factors and Risk Category Multipliers

It was necessary to apply weighting to the Risk Zone results to recognize differences in fuel types and wildfire risk. Several weighting options for Fuel Types and Risk Levels were reviewed and evaluated by the FAAS Team in consultation with experts at the Missoula Fire Sciences Laboratory.

Treatment cost and duration of effectiveness were considered for the Fuel Type weights. Treatments in timber fuels generally cost significantly more than treatments in grass or brush fuels, but are effective for a much longer time period. Therefore, timber acres in the Hazard Zone are given a higher weight. For the Risk Levels, higher weights were given to the higher levels to represent greater potential fire behavior and increased threat of damage from wildfires.

Table 1 shows the weights assigned to each Risk Level and Fuel Type. For each of the twelve Risk Categories (e.g., Low Grass, Moderate Brush, etc.) the corresponding Risk Level and Fuel Type weights are multiplied. The resulting Risk Category multiplier is then applied to the number of Hazard Zone acres in each Risk Category (from the Risk Module). For example, the "Very High Grass" Risk Category has a multiplier of 4 (1 x 4); 100 acres of Very High Grass has a weighted value of 400 acres (100 x 4). The "Moderate Timber" Risk Category has a multiplier of 6 (3 x 2); 100 acres of Moderate Timber has a weighted value of 600 acres (100 x 6).

Table 1. Risk Level and Fuel Type weights and resulting Risk Category multipliers. The Risk Category multiplier is derived by multiplying the Risk Level weight by the Fuel Type weight.

Risk Category Multipliers			Fuel Type		
			Grass	Brush	Timber
		Weight	**1**	**2**	**3**
Risk Level	Low	**1**	1	2	3
	Moderate	**2**	2	4	6
	High	**3**	3	6	9
	Very High	**4**	4	8	12

Calculation of Regional Allocation Percentages

After the Risk Category multiplier is applied to the Hazard Zone acres within each Risk Category, the total weighted acres are summed for each Region. Each Region's percentage of the National total weighted Hazard Zone acres determines the Fuels Management allocation percentage for that Region. Results from the allocation module are used to inform the recommendations for allocation decisions.

The R7 (Alaska) allocation was set at 3.3% by NFLT decision (see Alaska Protocols section), but the R7 adjusted weighted Hazard Zone acres were less than 3% of the National total. Therefore, the R7 weighted Hazard Zone acres required adjustment before the final percentages for all Regions could be calculated. The calculations required to adjust the R7 total weighted Hazard Zone acres are detailed in Appendix F. In order to bring R7 up to 3.3%, the R7 total weighted Hazard Zone acres needed to be adjusted from 365,490 to 459,502 (+94,012).

Final Regional Fuels Management Allocation Percentages for FY2016-2018

The Allocation Module produces a tabular breakdown of the weighted Hazard Zone acres for each FWS Unit in a format identical to that of the Risk Module output. The number of weighted Hazard Zone acres for each for each Risk Category (e.g., Low Grass, Moderate Brush, etc.) is summarized to the Regional Level (Appendix E, Table 4B), and can also be summarized by either Risk Level or Fuel Type (Appendix E, Table 5B). A spreadsheet containing weighted Hazard Zone data for all FWS units has been posted on the FWS SharePoint site.

The NFLT did not make any additional adjustments to the calculated Regional allocation percentages for the FY2016-2018 model run (after R7 was factored in). A summary of the total weighted Hazard Zone acres and the final allocation percentages for each Region are shown in Table 2. These percentages will be in effect through FY2018.

Table 2. Total weighted Hazard Zone acres by Region and final Fuels Management allocation percentages for FY2016-2018.

Region	Total Weighted Hazard Zone Acres	FAAS Fuels Management Allocation	**Final Adjusted Fuels Management Allocation**
R1	1,394,838	10.1%	10.0%
R2	2,065,158	14.9%	14.9%
R3	2,454,678	17.7%	17.7%
R4	3,732,534	26.9%	26.8%
R5	890,856	6.4%	6.4%
R6	1,838,286	13.2%	13.2%
R7*	416,437	3.0%	3.3%
R8	1,088,460	7.8%	7.8%
TOTAL	13,881,247	100.00%	100.0%

* Allocation to Region 7 (Alaska) was fixed at 3.0% by NFLT decision. The total weighted Hazard Zone acres for Alaska was set to equal 3.0% of the National total.

Accountability Module



The FAAS Accountability Module uses a performance-based process to ensure that Fuels Management funding is applied appropriately on the landscape to reduce wildfire risk, and that the Fuels Management program is managed efficiently and according to established business rules and desired outcomes. The Accountability Module affects 10% of a Region's total Fuels Management allocation in a given fiscal year, and is implemented on a time lag – fund distribution for the current fiscal year is based on reporting and performance for the previous fiscal year. The Accountability Module will be implemented starting in FY2017, and will be based on performance in FY2016 (FY2018 funds are based on FY2017 performance, etc.).

Performance measures have been established to evaluate each Region's effectiveness in implementing the Fuels Management program. Performance will be evaluated based on:

- Placement of treatments in relation to the Hazard Zone and to high and very high risk categories within the Hazard Zone;
- Reporting of accomplishments in FMIS and NFPORS;
- Financial reporting and adherence to established Fuels Management program business rules;
- Community Assistance.

It is expected that Regions not fully meeting the performance standards will improve annually. Within three years, with few exceptions, all Regions should be able to meet the performance standards. Sharing performance expectations with field units will be essential to success at the Regional level.

Withholding and Distribution of Performance Incentive Funds

Each fiscal year, the National Fire Branch will withhold 10% of each Region's Fuels Management Allocation (as determined by the Allocation Module) as a performance incentive until accomplishments from the prior fiscal year are reported by the Regions and evaluated. This "incentive fund" will then be distributed back to the Regions based on the results of performance evaluations.

A Region that meets all performance measures for the previous fiscal year will receive the full 10% of its total Fuels Management allocation that was initially withheld for the current fiscal year. A Region that does not meet a particular performance measure will forfeit the incentive funds associated with that performance measure, and the forfeited funds will be divided proportionately among the Regions that do meet that performance measure. No Region can lose more than the 10% that was withheld; however, a Region may receive more than the 10% that was withheld.

If no Region meets a performance measure, all incentive funds associated with that performance measure will be retained by the National Fire Branch. Retained funds will contribute to special projects or areas that benefit all Regions, such as assistance with developing risk assessments, sending a small team to develop FTEM reports to document interactions between wildfires and fuels treatments, or development of fire and fuels treatment effects monitoring plans.

Evaluation Team

An Evaluation Team will be established to assess Regional performance through the Accountability Module. The Team will include the National Fuels Specialist plus two ad hoc National Fire Branch staff. The intent of using a team is to ensure that the subjective evaluation of performance measures is not biased. The FWS Fuels Team will provide assistance as necessary to support the Evaluation Team.

Evaluation Process and Timeline

1. **Accomplishment Reporting:** At the end of each fiscal year, field staff will complete accomplishment reports in FMIS (including FTEM) and NFPORS. Reports are typically due by October 15.
2. **Treatment Shapefile Validation:** Shortly after the reporting deadlines, perimeter shapefiles for FMIS treatments marked as "*Approved Fuels Management treatment that is reported in the NFPORS HFR module*" will be downloaded by the National Fire Branch and sent to each Region for review and validation. Validation should be completed by November 1.
3. **Performance Evaluations:** The Evaluation Team will use GIS analyses, accomplishment reports, financial reports, and other relevant information to rate each Region according to the performance measures listed below. The Team will complete a Regional Performance Scorecard (Appendix H) for each Region, as well as a National Performance Summary Scorecard (Appendix I) that will be shared with all Regions. Evaluations should be completed by November 15.
4. **Performance Reviews:** The National Fire Branch will provide each Region with its Regional Performance Scorecard and the National Performance Summary Scorecard. The National Fire Branch Chief and the National Fuels Specialist will contact each Regional Fire Management Coordinator to share results of the evaluations and discuss any performance issues. The target date for completing performance reviews is December 1.

FAAS Performance Measures

Regions will be evaluated according to the criteria outlined below. Each measure will be considered yes/no either the Region met the criteria or they did not. The Evaluation Team will complete a Regional Performance Scorecard (Appendix H) for each Region, as well as a National Performance Summary Scorecard (Appendix I) that will be shared with all Regions.

1. PLACEMENT OF TREATMENTS: 30% of Total (1A = 10%; 1B = 10%; 1C = 10%)

A. 50% or more of Region's approved Fuels Management treatments are at least partially in the Hazard Zone.

Metric: (# of treatments overlapping Hazard Zone)/(total # of treatments) ≥ 0.50.

Score: "Yes" or "No."

A GIS analysis will overlay validated treatment perimeter shapefiles with the Hazard Zone to determine the number of treatments that overlap the Hazard Zone for each Region (a treatment does not need to be entirely within the Hazard Zone to count). To receive a passing score, at least 50% of the Region's approved Fuels Management Treatments must overlap the Hazard Zone. If a Region does not initially pass this performance measure, the Region's assets dataset with 1-mile buffer will be added to the Hazard Zone and the analysis repeated. If the 50% threshold is then met, the Region will receive a passing score. Note: the 50% benchmark may increase in the future.

B. Region's treated acres are focused on high and very high risk areas within the Hazard Zone.

Metric: (# of acres treated in high and very high risk areas)/(total # of treated acres)

Score: "Yes" or "No."

A GIS analysis will overlay validated treatment perimeter shapefiles with the Hazard Zone to determine the number of acres treated in each Fire Intensity/Risk Level for each Region. To receive a passing score a region should be treating a commensurate percentage of high and very high risk acres as compared to their risk profile. Results for this performance measure will be based on a comparison of the Regional Risk Profile and the acres treated during the fiscal year.

C. Region's treated acres in each Fuel Type within the Hazard Zone reflect the funding allocation to each Fuel Type.

Metric: Percentage of allocation compared to actual treated in each fuel type.

Score: "Yes" or "No."

A GIS analysis will overlay validated treatment perimeter shapefiles with the Hazard Zone to determine the number of acres treated in each Fuel Type for each Region. The acres in each fuel type treated will be compared to the acres in each fuel type that make up the Regional Risk Profile. The treated acres in each fuel type should be commensurate with the percentage of the Fuel Type in the Regional Risk profile.

Example:

1B and 1C	**Allocation %**	**Actual %**
Very High	27.57%	9.64%
High	13.77%	16.33%
Moderate	41.03%	60.95%
Low	17.63%	13.08%
Grass	25.49%	20.73%
Brush	19.99%	14.53%
Timber	54.53%	64.73%

2. REPORTING: 30% of Total (2A = 15%; 2B = 15%)

A. Region reported all fuels and non-fuels accomplishments appropriately in FMIS, including FTEM reports.

Metric: (# FMIS Treatment reports completed)/ (# FMIS Treatment reports initiated) ≥ 90%; all instances of wildfire-treatment interactions reported in FTEM; FMIS business rules followed appropriately.

Score: "Yes" or "No."

Evaluation Team will review FMIS reports and evaluate performance. End of the FMIS reports will be provided that will allow the Evaluation Team to determine if a region followed business rules correctly. FTEM reports will be compared with fuel treatment polygon history and wildfire location data to determine if all FTEM reports that needed to be completed were completed. FWS acres reported will be measured against GIS acres to ensure spatial reporting requirements are being met.

B. Region reported fuels accomplishments appropriately in the NFPORS HFR Module.

Metric: Requirements for Fuels Management PPOW and FPOW followed appropriately; all due dates met; NFPORS business rules followed appropriately.

Score: "Yes" or "No."

Evaluation Team will review NFPORS reports and evaluate performance. How well did the Region follow the FWS requirements for PPOW and FPOW? This typically includes guidance on funding amounts, planning activities inputted, other data (communities identified, T&E species, partners, etc.) documented, and if due dates were met. In addition, how well NFPORS and FMIS accomplishments match will be considered.

3. BUSINESS ACUMEN: 30% of Total (3A = 15%; 3B = 10%; 3C = 5%)

A. Region managed FBMS appropriately.

Metric: 98% of Fuels Management funding for the fiscal year spent or obligated.

Score: "Yes" or "No."

National Fire Budget Officer will provide a fiscal year Fuels Management budget report to the Evaluation Team. Evaluation Team will review report to determine if Region spent or obligated 98% of fuels funding (excluding Resilient Landscapes funding).

B. Region followed Fuels Management Program business rules appropriately.

Metric: 95-105% of Fuels Management target acres achieved; business rules followed appropriately; fire and non-fire expenditures on Fuels Management projects tracked appropriately.

Score: "Yes" or "No."

National Fire Budget Officer will provide a fiscal year budget report to the Evaluation Team showing fire and non-fire charges to each project code. Evaluation Team will review budget report and NFPORS accomplishments vs. targets report to determine if Region properly tracked project expenditures and achieved 95-105% of Fuels Management target.

C. Region managed Undelivered Orders (UDOs) for contracts/agreements appropriately.

Metric: Number of UDOs with Fuels Management funding is zero, or has declined from the last fiscal year.

Score: "Yes" or "No."

National Fire Budget Officer will provide a fiscal year Fuels Management UDO report to the Evaluation Team. Evaluation Team will review report to determine if Region's number of UDOs (over 365 days old and with zero spending) is zero or has declined from the last fiscal year (excluding Resilient Landscapes funding).

4. COMMUNITY ASSISTANCE: 10% of Total (4A = 5%; 4B = 5%)

A. Region submitted a minimum of two Fuels Management success stories or similar reports to the National Fuels Specialist and National Outreach Specialist.

Metric: Minimum of 2 success stories or similar reports submitted.

Score: "Yes" or "No."

Suggested format for success story report can be found in Appendix J.

B. Region reported Community Assistance activities appropriately.

Metric: Community Assistance reporting completed adequately and by due date; OWF/FWS policies followed appropriately.

Score: "Yes" or "No."

Evaluation Team will determine if Region followed OWF and FWS policies and responded to all Community Assistance reporting requirements by due dates to the National Fuels Specialist.

Review of Performance Standards

When the Risk and Allocation Modules are re-analyzed in 2018, the performance standards will be assessed and modified as needed to continue to ensure wildfire risk is being reduced in the Hazard Zone, and that the Fuels Management program is being implemented according to established business rules and desired outcomes. Annual results will be used to inform the model revision process and may influence the percentage of Regional allocations subject to the Accountability Module.

Alaska Protocols

Historically, Alaska (R7) received a 3.3% allocation of the Fuels Management funding each year. Including R7 in the FAAS analysis, however, resulted in an unrealistic allocation of 52% due to the region's massive land base. A very small percentage of Refuge lands in R7 are actually in close proximity to communities or critical infrastructure that could be threatened by wildfires. It was evident that an alternate process for defining the Hazard Zone and setting the Region's Fuels Management allocation percentage needed to be implemented. The NFLT tasked the FAAS Team with developing and evaluating options for incorporating R7 into the FAAS process.

Allocation Percentage

The FAAS Team, with involvement from R7, developed several alternatives for including R7 in the FAAS process and presented three to the NFLT for their consideration (Table 3). The NFLT ultimately selected Alternative 1, which kept the Fuels Management allocation for R7 at the historical level of 3.3%. It was also decided that the Hazard Zone for R7 would be based on spatial data developed for the Alaska Interagency Wildland Fire Management Plan (AWFCG 2010).

Table 3. Alternatives for including R7 (Alaska) in the FAAS process.

ALT	Description	Comments	Fuels Management Allocation
1	Traditional approach (allocation fixed at 3%); no FAAS analysis.	Current number generated outside of FAAS. Not scientifically justifiable. Difficult to measure performance and accountability.	3%
4c	Hazard Zone clipped to AK Interagency FMP Critical and Full Management Option areas using the FAAS analysis (only the four* R7 identified Refuges)	Includes more FWS Refuge lands in the analysis. Full Management Option is unrepresentative of the Hazard Zone due to lack of consistency between values at risk as compared to CONUS. Adjusted to meet AK's unique conditions but retains FAAS methodology.	10%
4e	Hazard Zone clipped to AK Interagency FMP Critical Management Option areas. Input layers buffered 1.5 miles using the same FAAS methodology as CONUS for all R7 Refuges.	Near historical funding level. Buffered area excludes less of the Hazard Zones near communities. Adjusted to meet AK's unique conditions. Better alignment with cost/benefit standards allows for accountability within the FAAS system. Buffer distance differs from CONUS	2.6%

		FAAS analysis.	

Risk Module – Definition of the Hazard Zone

The process of defining the Hazard Zone for R7 was very similar to that used for the other Regions; the only step that differed was Step 2 – Risk Layer (Figure 1). The FAAS Team recognized that the spatially-defined fire management options from the Alaska Interagency Wildland Fire Management Plan (AWFCG 2010) would be a good surrogate for the Risk Layer that was developed for the other Regions. The plan defines four fire management options – Critical, Full, Modified and Limited – that set resource assignment priorities and describe the standard response to a wildland fire within the option boundaries. Fire occurrence, suppression costs, population density, values-at-risk, fuel types, and ecological considerations were factors used to develop the management option criteria. Specifically, the Critical and Full Management Options define the areas most at risk from wildfires.

The FAAS Team felt that the Full Management Option was not focused enough on high-priority values, and therefore decided to use only the Critical Management Option. The Alaska Interagency Wildland Fire Management Plan defines the Critical Management Option as "the highest priority areas/sites for suppression actions and assignment of available firefighting resources; lands in wildland urban interface and other populated areas where there is an immediate threat to human life, primary residences, inhabited property, and community-dependent infrastructure…qualify to be considered for this designation" (AWFCG 2010). The Team decided on a 1.5-mile buffer to delineate the Risk Layer, and was confident that this represented the majority of values at risk. After the Risk Layer was defined, the final Hazard Zone was developed using the steps shown in Figure 1. The R7 Hazard Zone acres by Risk Category and by Risk Level and Fuel Type are shown in Appendix E, Tables 4A and 5A, respectively. A graphical representation of the Hazard Zone by Risk Level is shown for all Regions in Figure 3.

Allocation Module – Adjustment of Weighted Hazard Zone Acres

After weights were applied to the Hazard Zone acres using the same process as that used for the other Regions (see Allocation Module section), R7 was only 2.64% of the National total. Therefore, the R7 total weighted Hazard Zone acres needed to be adjusted to bring it up to 3.3% of the National total. The calculations required to perform this adjustment are detailed in Appendix F. The final Regional Fuels Management allocation percentages are listed in Table 2.

Accountability Module – Performance Standards

R7 will be held to the same performance standards as outlined for the other Regions in the Accountability Module section.

The NFLT Briefing Statement on the R7 situation, including a full list of alternatives considered, is posted on the FWS SharePoint site.

THE FUTURE OF FAAS: VERSION 2.0

The FWS Fuels Team will be responsible for developing FAAS 2.0, which will be implemented in FY2018 to set Regional Fuels Management allocation percentages for FY2019-2021. During implementation of FAAS 1.0 in FY2016-2018, the Fuels Team will monitor the System, note deficiencies, and evaluate

opportunities for improvement. Some ideas that may be explored by the Fuels Team while developing FAAS 2.0 include:

- Evaluating the usefulness of applying the Risk Module at a more local (unit?) level to inform Regional funding allocation to field stations.
- Evaluating potential additional data requirements.
- Locating and evaluating the most accurate FWS data layers (IE: infrastructure).
- Potential (and value) to include Critical FWS Habitat Layers in FAAS
- Potential (and value) to include Strategic Habitat Conservation into FAAS
- Evaluate FAAS in terms of Calkin Risk Paper/ ROI Paper
- Determine and integrate appropriate acreage credit for linear treatments in various fuels.
- Evaluate value of and opportunities to incorporate additional Habitat Management Funding for prioritizing habitat management needs.Whether to and how to incorporate Climate Change into FAAS.
- Potential (and value) to include Resilient Landscapes into FAAS.
- Potential to incorporate Preparedness Model (combine both into one if appropriate).
- Re-evaluating options for incorporating Alaska, Puerto Rico, Hawaii, and the Pacific Islands into FAAS.

APPENDICES

Appendix A: References.

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Appendix B: Acronyms

DOI	Department of the Interior.
FAAS	Fuels Management Allocation and Accountability System.
FBFM	Fire Behavior Fuel Model.
FMIS	Fire Management Information System.
FSim	Large Fire Simulator.
FTEM	Fuels Treatment Effectiveness Monitoring.
FWS	U.S. Fish and Wildlife Service.
HFPAS	Hazardous Fuels Prioritization and Allocation System.
LANDFIRE	Landscape Fire and Resource Management Planning Tools.
NFLT	National Fire Leadership Team.
NFPORS	National Fire Plan Operations and Reporting System.
NWR	National Wildlife Refuge.
NWRS	National Wildlife Refuge System.
OWF	Office of Wildland Fire.
SDM	Structured Decision Making.

Appendix C: Glossary

Accountability Module – The portion of the FAAS that is used to evaluate and provide feedback on regional hazardous fuels program performance.

Allocation Module – The portion of the FAAS determines the proportion of regional distribution of national hazardous fuels funds.

Alaska Fire Management Options – Interagency spatially defined wildfire response areas for the state of Alaska; ranges from Limited, modified, full and critical.

Buffer – A geoprocessing tool that creates a polygon around a feature to a specified distance.

Burn probability – The probability that a given 18-acre pixel as determined will burn annually as modeled by FSIM.

Cadastral/Boundaries/Surface Management Area - This data layer depicts the lands and waters administered by the U.S. Fish and Wildlife Service (USFWS) in North America, U.S. Trust Territories and Possessions. The primary source for this information is the USFWS Realty program.

Clip – A geoprocessing command that extracts features from one feature class that reside entirely within a boundary defined by features in another feature class.

Dissolve – A geoprocessing command that removes boundaries between adjacent polygons that have the same value for a specified attribute.

FAAS Risk –A spatial representation of risk that is defined by an area where a wildfire of damaging intensity (typically high or very high intensity) intersects with a value.

FAAS Threat – A possible source of harm or danger from wildfire as determined by the large fire simulator (FSIM) fire intensity level output.

FAAS Values – A developed national data set that includes; community support infrastructure, presence of humans, transportation -used to inform creation of hazard zones on Service lands.

FIL Classes – Fire Intensity Level classification as measured in flame length classes.

Fuel Type – One of three categories (Grass, Brush, Timber) resulting from the reclassification of the LANDFIRE FBFM40 fuel models.

Fuels Management – Act or practice of controlling flammability and reducing resistance to control of wildland fuels through mechanical, chemical, biological, or manual means, or by fire, in support of land management objectives.

GIS – A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.

Hazard Zone – The spatial intersection of values, risk and threat within FWS boundaries.

HSIP Gold – Unclassified version of 2014 Homeland Security Infrastructure Program

Intersect – A geometric integration of spatial datasets that preserves features or portions of features that fall within areas common to all input datasets.

LandScan – A dataset used for global population distribution (see metadata.)

Merge – A geoprocessing tool that combines features from multiple data sources of the same data type into a single, new dataset.

Preparedness – Activities that lead to a safe, efficient, and cost-effective fire management program in support of land and resource management objectives through appropriate planning and coordination.

Risk – Anywhere a wildfire of damaging intensity (typically high or very high intensity) intersects with a value.

Risk Category – A combination of Risk Level (Low, Moderate, High, Very High) and Fuel Type (Grass, Brush, Timber). For example, Low Grass, Moderate Shrub, High Timber, etc.).

Risk Layer – A composite footprint of 26 buffered input layers (22 HSIP Gold layers, FWS Oil Wells, FWS Pipelines, Primary Roads, and LandScan) that represent values at risk from wildfire.

Risk Level – The degree of potential risk from a wildfire based on expected fire intensity.

Risk Module – The portion of the FAAS that is used to spatially depict risk associated with values.

Risk Profile – A Refuge's representation of Risk Categories within the Hazard Zone.

Risk Zone – The FWS land on which a wildfire will pose a threat to values.

Scorecard – Results of annual accomplishments for the FAAS Accountability Module.

Simplify – A type of cartographic generalization in which the important characteristics of features are determined and unwanted detail is eliminated to retain clarity on a map whose scale has been reduced.

Treatment – Manipulation of vegetation on FWS lands that modifies the fuel bed.

Appendix D: Frequently-Asked Questions (FAQs)

Resampling – What is it and why was it used?

To compare LANDFIRE and FSim raster data, the LANDFIRE raster had to be resampled to match the cell size of the FSim raster. The LANDFIRE raster cell size is 30 meters (30 x 30 meter pixel) while the FSim raster cell size is 270 meters (270 x 270 meter pixel). To match up pixel size, the LANDFIRE raster was recalculated to the 270 meter cell size by using the resample tool (nearest) in ArcGIS. Raster data are always resampled to the largest cell size because the resolution of the output cannot be more accurate than that of the coarsest of the input cell sizes. In this case the 270 meter cell size for the FSim raster sets the accuracy for the model. More information on raster resampling is available at the ESRI ArcGIS Desktop Help.

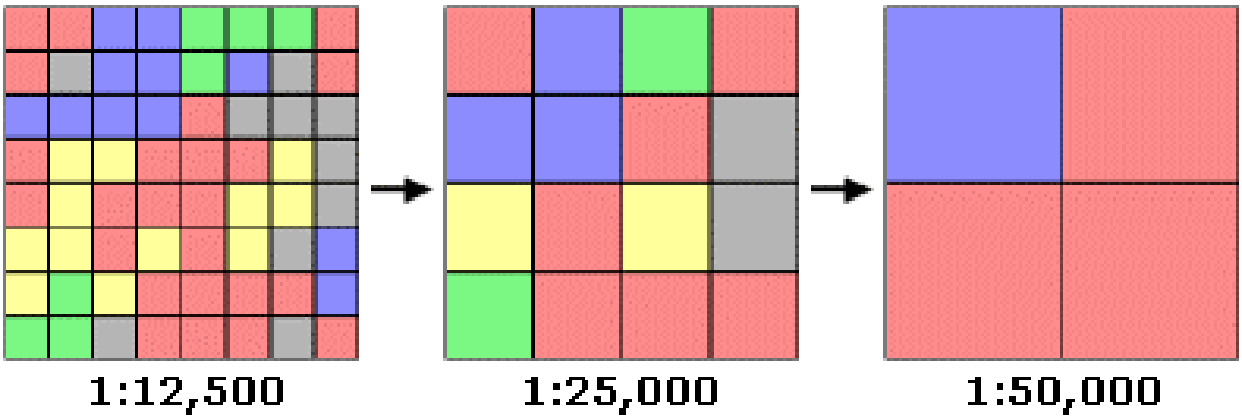


Figure 1 Raster resampling explained in diagram. As pixels are resampled to larger cell size accuracy is reduced but overall trends are carried over in larger cells.

What is the difference between raster and vector data?

Most of us are more familiar with vector data in GIS, vector data consists of spatially referenced points that make up a point, line or polygon dataset; perimeter data uploaded in FMIS is a polygon shapefile which is vector data. Raster data is a spatially referenced grid, the most common raster dataset in fire management is the LANDFIRE Fire Behavior Fuel Model layer.

For this model both vector and raster data is used. Vector data such as roads (line), airport boundaries (polygon), structures (point) are used to develop the vector based polygon that defines the hazard zone on Service lands. Raster data within this model consists of LANDFIRE, FSIM and LandScan raster datasets. The combination of the LANDFIRE Fuel Model raster with the FSIM Fire Intensity Level raster makes up the risk category element in this model.

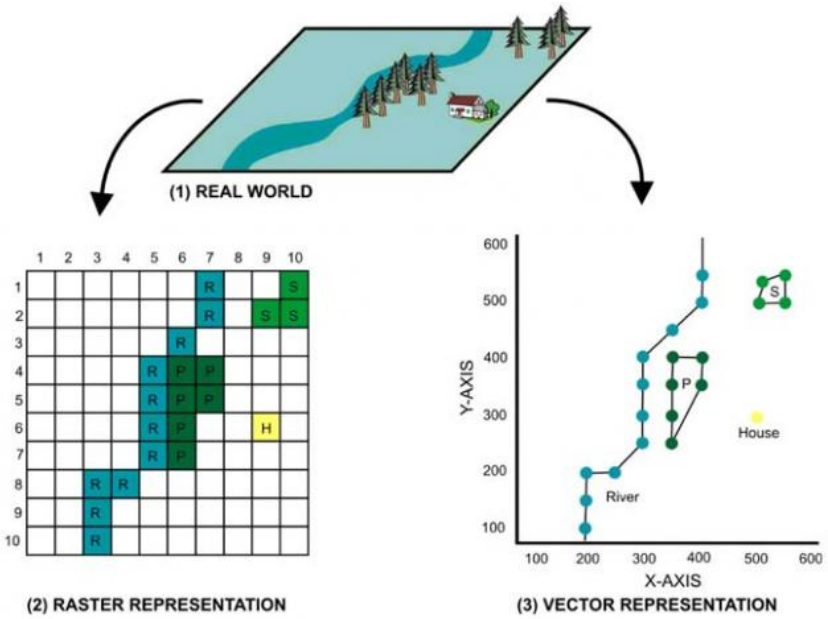


Figure 2 Raster and vector data compared in diagram form.

Why were Military Lands removed?

Military lands were considered in the model but after analyzing the use of this layer as part of the hazard zone it was determined it didn't match well with the purpose of this model. The infrastructure on military lands that would need to be protected from a fire on Service lands shows up in the other risk layers such as transportation, communication, commercial, energy, e.g. While there is typically an increase of fire frequency on Service lands that are directly adjacent to Military lands the military lands themselves do not need protection from fire. The increased fire frequency is captured in the FSIM data and will show a higher fire frequency. NFLT was briefed on the recommendation of removing this layer and they agreed to remove it from the analysis.

Why were railroads removed?

Railroads were removed in the most part because railroads are typically included in areas that have major roads or power lines. Protecting the railroads typically does not fall as a responsibility of the Service. Any increased fire frequency due to the proximity of railroads is captured within the FSIM fire probability model. NFLT was briefed on the recommendation of removing this layer and they agreed to remove it from the analysis.

Why was City Limit Boundary layer removed?

The City Limit Boundary layer was originally considered for one of the data layers that would represent the Wildland Urban Interface. After some analysis and review of the data it was determined that while it could be an added value not all city limits are established in an way that would be equal across state/county lines. The city limit determination is set by political and financial interests in many cases and sometimes city limits are drawn in a way that encompasses large areas of land that have little to no population. NFLT was briefed on the recommendation of removing this layer and they agreed to remove it from the analysis.

Why did the name of the model change from FAS to FAAS?

The team developing the model started with the name Fuels Allocation System (FAS) but decided that because an integral part of this model had to do with accountability the model was changed to Fuels Allocation and Accountability System (FAAS).

Why is Alaska's Critical Management Option buffered 1.5 miles while the rest of the values and refuge boundaries in the continental US is buffered 1 mile?
After Region 7 asked to be included in the FAAS model the FAAS team gathered in Denver to review options to include Service lands in Alaska. When the team looked at all the various options to include Alaska there was no simple solution. The 1.5 mile buffer is only applied to the Alaskan Critical Management Option area which indicates highest priority for suppression actions. If the FAAS team used the exact same criteria as used in the continental US the model indicated that Alaska should receive 51% of the allocation. Many of the areas in Alaska that would make up the 51% figure would be in areas where fuels treatments wouldn't be feasible so focusing on areas in the critical response zone where treatments would be feasible was determined to be the best option.

Why aren't FWS assets included in the FAAS Hazard Zone?
While FWS asset data was determined to be important to the FAAS model at the time of development of the Hazard Zone the asset dataset hadn't been reviewed and cleaned by regions. The FWS asset data was very inconsistent and there were many refuges where all assets were given the same latitude and longitude and without regional review and correction the dataset wouldn't be consistent and valuable. The FWS asset data will be used as a portion of the accountability module in this version of the FAAS model, if a region doesn't meet the 50% or greater of treatments within the hazard zone the asset data will be used to determine if some of the treatments not landing in the hazard zone did in fact protect Service assets. The FWS asset database can be integrated in the rest of the model when the FAAS Team revisits the process to update and improve the model in 3 years.

How will treatment polygons be used to determine whether or not they are in the FAAS Hazard Zone?
At the end of the fiscal year after regions have a chance to review and fix their treatment polygons in FMIS the Fuels Team will be provided all of the fiscal year treatment polygons which will then be used for analysis. Treatment polygons that overlap the hazard zone are considered to be in the hazard zone. The portion of the Accountability module that asks if a region placed at least 50% of their fuels funded treatments in the hazard zone just looks at the number of fuels funded treatments that overlap the hazard zone versus the total number of fuels funded treatments. Treatments that are directly adjacent to a hazard zone but do not overlap it wouldn't be counted in this process. If there are circumstances that exist that make it necessary to place the treatment outside of the Hazard Zone but still reduce the risk to the assets in the Hazard zone the regional fuels coordinator could communicate the rationale to the national fuels coordinator and those treatments/acres MAY be included in the count of treatments in the Hazard Zone.

Appendix E. Regional Summaries of Hazard Zone Acres.

Table 4. Non-weighted (A) and weighted (B) Hazard Zone acres by Risk Category (Risk Level + Fuel Type) for each Region, and Fuels Management allocation percentages for FY2016-2018.

Risk Level / Fuel Type	Low Grass	Low Brush	Low Timber	Moderate Grass	Moderate Brush	Moderate Timber	High Grass	High Brush	High Timber	Very High Grass	Very High Brush	Very High Timber	TOTAL
Region 1	738	378	5292	124,470	127,656	32,652	17,748	49,950	5,832	522	702	738	366,678
Region 2	9,558	3,186	52,686	196,956	126,342	62,838	36,594	34,146	5,148	45,522	7,758	810	581,544
Region 3	16,020	15,102	81,216	198,324	66,006	125,244	98,748	18,594	18,414	27,702	3,114	3,618	672,102
Region 4	9,198	7,362	211,410	134,280	50,904	176,562	49,302	22,752	25,488	131,400	48,888	9,360	876,906
Region 5	4,824	6,948	78,444	18,576	23,400	46,836	8,712	4,806	3,672	25,992	2,430	1,134	225,774
Region 6	2,358	936	972	313,812	95,328	24,948	93,546	30,240	5,238	35,064	1,260	1,080	604,782
[1]Region 7	72	18	1,206	432	504	3,690	3,690	2,358	27,198	1,134	324	4,968	45,594
Region 8	5,022	774	630	135,900	96,534	13,986	10,098	38,394	1,386	2,988	6,336	198	312,246
TOTAL	**47,790**	**34,704**	**431,856**	**1,122,750**	**586,674**	**486,756**	**318,438**	**201,240**	**92,376**	**270,324**	**70,812**	**21,906**	**3,685,626**

Risk Level / Fuel Type	Low Grass	Low Brush	Low Timber	Moderate Grass	Moderate Brush	Moderate Timber	High Grass	High Brush	High Timber	Very High Grass	Very High Brush	Very High Timber	
[2]Multiplier	1	2	3	2	4	6	3	6	9	4	8	12	TOTAL
Region 1	738	756	15,876	248,940	510,624	195,912	53,244	299,700	52,488	2,088	5,616	8,856	1,394,838
Region 2	9,558	6,372	158,058	393,912	505,368	377,028	109,782	204,876	46,332	182,088	62,064	9,720	2,065,158
Region 3	16,020	30,204	243,648	396,648	264,024	751,464	296,244	111,564	165,726	110,808	24,912	43,416	2,454,678
Region 4	9,198	14,724	634,230	268,560	203,616	1,059,372	147,906	136,512	229,392	525,600	391,104	112,320	3,732,534
Region 5	4,824	13,896	235,332	37,152	93,600	281,016	26,136	28,836	33,048	103,968	19,440	13,608	890,856
Region 6	2,358	1,872	2,916	627,624	381,312	149,688	280,638	181,440	47,142	140,256	10,080	12,960	1,838,286
[3]Region 7	72	36	3,618	864	2,016	22,140	11,070	14,148	244,782	4,536	2,592	59,616	[3]459,502
Region 8	5,022	1,548	1,890	271,800	386,136	83,916	30,294	230,364	12,474	11,952	50,688	2,376	1,088,460
TOTAL	**47,790**	**69,408**	**1,295,568**	**2,245,500**	**2,346,696**	**2,920,536**	**955,314**	**1,207,440**	**831,384**	**1,081,296**	**566,496**	**262,872**	**13,881,247**

[1] The Hazard Zone area for Region 7 (Alaska) was derived separately with a different process than that used for the other Regions (see Alaska Protocols section).

[2] Risk Category Multiplier is the product of the Risk Level Weight (Low = 1; Moderate = 2; High = 3; Very High = 4) and the Fuel Type Weight (Grass = 1; Brush = 2; Timber = 3). The multiplier is applied to the non-weighted values listed in A to derive the weighted values listed in B.

[3] Allocation to Region 7 (Alaska) was fixed at 3.3% "historical average" by NFLT decision. 94,012 acres were added to the R7 weighted Hazard Zone total to bring it up to 3.3% (see Appendix F).

Table 5. Non-weighted (A) and weighted (B) Hazard Zone acres summarized by Risk Level (left) and Fuel Type (right) for each Region

Region	Risk Level				TOTAL		Region	Fuel Type			TOTAL
	Low	Moderate	High	Very High				Grass	Brush	Timber	
Region 1	6,408	284,778	73,530	1,962	366,678		Region 1	143,478	178,686	44,514	366,678
Region 2	65,430	386,136	75,888	54,090	581,544		Region 2	288,630	171,432	121,482	581,544
Region 3	112,338	389,574	135,756	34,434	672,102		Region 3	340,794	102,816	228,492	672,102
Region 4	227,970	361,746	97,542	189,648	876,906		Region 4	324,180	129,906	422,820	876,906
Region 5	90,216	88,812	17,190	29,556	225,774		Region 5	58,104	37,584	130,086	225,774
Region 6	4,266	434,088	129,024	37,404	604,782		Region 6	444,780	127,764	32,238	604,782
[1]Region 7	1,296	4,626	33,246	6,426	45,594		[1]Region 7	5,328	3,204	37,062	45,594
Region 8	6,426	246,420	49,878	9,522	312,246		Region 8	154,008	142,038	16,200	312,246
TOTAL	**514,350**	**2,196,180**	**612,054**	**363,042**	**3,685,626**		**TOTAL**	**1,759,302**	**893,430**	**1,032,894**	**3,685,626**

Region	Risk Level				TOTAL		Region	Fuel Type			TOTAL
	Low	Moderate	High	Very High				Grass	Brush	Timber	
Region 1	17,370	955,476	405,432	16,560	1,394,838		Region 1	195,912	52,488	8,856	1,394,838
Region 2	173,988	1,276,308	360,990	253,872	2,065,158		Region 2	377,028	46,332	9,720	2,065,158
Region 3	289,872	1,412,136	573,534	179,136	2,454,678		Region 3	751,464	165,726	43,416	2,454,678
Region 4	658,152	1,531,548	513,810	1,029,024	3,732,534		Region 4	1,059,372	229,392	112,320	3,732,534
Region 5	254,052	411,768	88,020	137,016	890,856		Region 5	281,016	33,048	13,608	890,856
Region 6	7,146	1,158,624	509,220	163,296	1,838,286		Region 6	149,688	47,142	12,960	1,838,286
[2]Region 7	3,726	25,020	270,000	66,744	[2]459,502		[2]Region 7	16,542	18,792	330,156	[2]459,502
Region 8	8,460	741,852	273,132	65,016	1,088,460		Region 8	83,916	12,474	2,376	1,088,460
TOTAL	**1,409,040**	**7,487,712**	**2,724,138**	**1,843,920**	**13,881,247**		**TOTAL**	**2,898,402**	**586,611**	**203,268**	**13,881,247**

[1] The Hazard Zone for Region 7 (Alaska) was derived separately with a different process than that used for the other Regions (see Alaska Protocols section).

[2] Allocation to Region 7 (Alaska) was fixed at 3.3% "historical average" by NFLT decision. 94,012 acres were added to the R7 weighted Hazard Zone total to bring it up to 3.3% (see Appendix F).

Appendix F: Regional Allocation Percentage Calculations to include R7 (Alaska) 3.3%

The R7 (Alaska) allocation was set at 3.3% by NFLT decision (see Alaska Protocols section); however, the R7 weighted Hazard Zone acres were less than 3.3% of the National total. Therefore, the R7 weighted Hazard Zone acres required adjustment before the final percentages for all Regions could be calculated. Given the total weighted Hazard Zone acres for the other Regions, we can calculate the number of acres R7 would need to have in order to be 3.3% of the total using the following formulas:

The total weighted Hazard Zone acres without R7:

$$(\mathrm{R1} + \mathrm{R2} + \mathrm{R3} + \mathrm{R4} + \mathrm{R5} + \mathrm{R6} + \mathrm{R8}) = X = 13{,}464{,}810$$

The total weighted Hazard Zone acres with R7 (add R7 to both sides):

$$(\mathrm{R1} + \mathrm{R2} + \mathrm{R3} + \mathrm{R4} + \mathrm{R5} + \mathrm{R6} + \mathrm{R8}) + \mathrm{R7} = X + \mathrm{R7} = 13{,}464{,}810 + \mathrm{R7}$$

If R7 is 3.3% of the total weighted Hazard Zone acres with R7, then:

$$\frac{\mathrm{R7}}{X + \mathrm{R7}} = 0.033$$

Solving for R7:

$$\mathrm{R7} = \frac{0.033X}{0.967} = \frac{0.033(13{,}464{,}810)}{0.967} = 459{,}502$$

Therefore, the total weighted Hazard Zone acres with R7 adjusted to 3.3%:

$$X + \mathrm{R7} = 13{,}464{,}810 + 459{,}502 = 13{,}924{,}312$$

Now that the total weighted Hazard Zone acres including R7 adjusted to 3.30% are known, the final Regional percentages can be calculated. In order to bring R7 from 2.64% to 3.30%, the R7 total weighted Hazard Zone acres needed to be adjusted from 365,490 to 459,502 (+94,012).

	Before Adjustment		After Adjustment	
Region	**Acres**	**%**	**Acres**	**%**
R1	1,394,838	10.09%	1,394,838	10.05%
R2	2,065,158	14.93%	2,065,158	14.88%
R3	2,454,678	17.75%	2,454,678	17.68%
R4	3,732,534	26.99%	3,732,534	26.89%
R5	890,856	6.44%	890,856	6.42%
R6	1,838,286	13.29%	1,838,286	13.24%
R7	**365,490**	**2.64%**	**459,502**	**3.30%**
R8	1,088,460	7.87%	1,088,460	7.84%
TOTAL	13,830,300	100.00%	13,924,312	100.00%
TOTAL (-R7)	13,464,810			

Appendix G: FAAS Roles and Responsibilities

PERFORMANCE REQUIRED	Agency Administrators				Fire Management Staff		
	FWS Director	Regional Director	Regional Refuges Chief/Refuge Supervisor	Project Leader/ Refuge Manager	FWS Fire Chief	Regional Fire Management Coordinator	Zone/Unit Fire Management Officer
POLICY							
Ensures use of fuels management funding is in compliance with DOI and FWS policies.	X	X	X	X	X	X	X
Ensures use of fuels management funding is in compliance with national and regional guidance.	X	X	X	X		X	X
FUELS PROGRAM MANAGEMENT							
Ensures periodic reviews of fuels management program, including evaluations of both performance and fiscal elements of the program.	X	X	X	X			
Funds fuels management projects to meet the objectives of FAAS through funding projects that reduce proportion of the Regional total acres in "very high" and "high" risk category, or prevent acres from moving into those categories.			X				
Designs and implements fuels management projects to meet the objectives of FAAS.				X			
Ensures fuels management projects are appropriately located to maximize reduction in threat by wildfires to values identified in the Hazard Zone (as identified in FAAS).					X	X	X
Monitors and provides annual fuels management program performance reports for use in out-year allocation distribution decisions.					X		
Allocates fuels management funding to reduce the Regional total acres in "very high" and "high" risk categories.						X	
Manages regional fuels management program to ensure performance metrics (score card items) are met. Keeps fire director and Agency Administrators informed on progress.						X	
Manages zone/refuge fuels management program to ensure performance metrics (score card items, fuels treatment effectiveness reports) are met. Focuses fuels management treatments in the "very high" and "high" risk categories, or prevents acres from moving into those categories. Keeps RFMC informed on annual progress.							X

Appendix H: FAAS Regional Performance Scorecard

Fuels Allocation and Accountability System Regional Performance Scorecard							
Region:		**Date:**		**Performance Fiscal Year:**		**Funding Fiscal Year:**	
Evaluation Team:							
PERFORMANCE MEASURES		**% of Total**	**Score (Yes/No)**	**Points Earned**	**Comments**	**(include justification if score was adjusted for mitigating circumstances)**	
1	**PLACEMENT OF TREATMENTS**	**30**	**PM1 TOTAL:**				
1A	50% or more of Region's approved Fuels Management treatments are at least partially in the Hazard Zone.	10					
1B	Region's treated acres are focused on high and very high risk areas within the Hazard Zone.	10					
1C	Region's treated acres in each Fuel Type within the Hazard Zone reflect the funding allocation to each Fuel Type.	10					
2	**REPORTING**	**30**	**PM2 TOTAL:**				
2A	Region reported all fuels and non-fuels accomplishments appropriately in FMIS, including FTEM reports.	15					
2B	Region reported fuels accomplishments appropriately in the NFPORS HFR Module.	15					
3	**BUSINESS ACUMEN**	**30**	**PM3 TOTAL:**				
3A	Region managed FBMS appropriately.	15					
3B	Region followed Fuels Management Program business rules appropriately.	10					
3C	Region managed Undelivered Orders (UDOs) for contracts/agreements appropriately.	5					
4	**COMMUNITY ASSISTANCE**	**10**	**PM4 TOTAL:**				
4A	Region submitted a minimum of two Fuels Management success stories or similar reports to the National Fuels Specialist and National Outreach Specialist.	5					
4B	Region reported Community Assistance activities appropriately.	5					
			TOTAL SCORE:				

Appendix I: FAAS National Performance Summary Scorecard

Fuels Allocation and Accountability System National Performance Summary Scorecard										
Date:		**Performance Fiscal Year:**		**Funding Fiscal Year:**						
Evaluation Team:										
PERFORMANCE MEASURES		**% of Total**	**Points Earned:**							
			R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**
1	**PLACEMENT OF TREATMENTS**	**30**								
1A	50% or more of Region's approved Fuels Management treatments are at least partially in the Hazard Zone.	10								
1B	Region's treated acres are focused on high and very high risk areas within the Hazard Zone.	10								
1C	Region's treated acres in each Fuel Type within the Hazard Zone reflect the funding allocation to each Fuel Type.	10								
2	**REPORTING**	**30**								
2A	Region reported all fuels and non-fuels accomplishments appropriately in FMIS, including FTEM reports.	15								
2B	Region reported fuels accomplishments appropriately in the NFPORS HFR Module.	15								
3	**BUSINESS ACUMEN**	**30**								
3A	Region managed FBMS appropriately.	10								
3B	Region followed Fuels Management Program business rules appropriately.	10								
3C	Region managed Undelivered Orders (UDOs) for contracts/agreements appropriately.	10								
4	**COMMUNITY ASSISTANCE**	**10**								
4A	Region submitted a minimum of two Fuels Management success stories or similar reports to the National Fuels Specialist and National Outreach Specialist.	5								
4B	Region reported Community Assistance activities appropriately.	5								
	TOTAL SCORE:									

Appendix J: Success Story Template

Suggested Success Story Format for DOI Accountability Report Submissions

(Note: The purpose of this format is to keep information clear and concise by showing accomplishments graphically and minimizing the use of text.)

Title: *State the "bottomline" e.g.* Fuels Treatments Reduce Suppression Costs at Merritt Island

Type(s): *Choose HFR, stewardship, biomass, post-fire rehab, community wildfire protection, fire prevention, e.g.* HFR. *If collaborative with state or local agency, indicate who e.g.* in collaboration with Florida State Forestry.

Summary: *who, what, where, how e.g.* U.S. Fish and Wildlife Service estimated $3.8 million savings in wildfire suppression costs in areas with treated fuels at Merritt Island National Wildlife Refuge in northern Florida. Savings were measured using FSPRO modeling and a Stratified Cost Index for three wildfires in FY2012, in areas with fuels treated from 2008-2012.

Accomplishment(s): *List major quantifiable results, e.g.*
$3.8 million savings in projected suppression and post-fire recovery costs.
Avoided damage of NASA and Refuge structures and infrastructure valued at $xx million.
Reduced risk of injury to xx,xxx visitors and x,xxx employees present during wildfires.
Prevented prolonged smoke effects to neighboring Titusville, population: xx,xxxx

Visuals: *include 1)* basic location map *(e.g. State of Florida with box around refuge) 2)* graph or chart depicting accomplishment. *These graphics should "tell the story" at a glance. Be sure to title and/or caption these to make basic outcomes clear without reading extensive text.*

More information: *Provide link to longer report or story e.g. the refuge study, the descriptiive "success story" template/layout published by the Regional Cohesive Strategy Committees, or the "success story" posted on www.forestandrangelands.gov. List also name and contact info.*