



# Monitoring Hazardous Fuels Treatments

Southeast Regional Plan  
US Fish and Wildlife Service

*August 15, 2013*

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## ***Executive Summary***

This US Fish and Wildlife Service (Service) Southeast Regional Plan for Monitoring Hazardous Fuels Treatments provides a framework for monitoring the immediate effects of fuels treatment applications on refuges within the Southeast Region. It relies on both established monitoring data collection standards as well as integration with the Service's newly formed Inventory and Monitoring Standards. This plan has been developed to help refuges and the Service provide the needed basic scientific information to make sound management decisions based on adaptive management principles. It is designed to be updated as processes are accepted, rejected and refined.

This document provides a guidance plan detailing what information is required by the region to monitor, and recommendations for additional monitoring standards to include immediate treatment effects observed within one year. Guidance and recommendations cover all fuels treatments that primarily meet hazardous fuels reduction treatment objectives. Prescribed fire applications that are implemented to meet other objectives, i.e., biological objectives or habitat improvement objectives should be addressed in the overall Inventory and Monitoring Plan (IMP) for each refuge. The IMP developed for each refuge will include hazardous fuel treatment monitoring goals once it is fully developed. The guidance and recommendations here are meant to serve as an interim plan to allow refuges within the region to continue to perform hazardous fuel treatment monitoring while the IMPs are developed. Details of field techniques and protocols for each monitoring level of variables are provided in the *Monitoring Hazardous Fuels Treatments: Southeast Regional Field Guide* (USFWS 2013).

Inputs into this document have been provided by regional fire, inventory and monitoring (I&M), and biological staff, and has been peer reviewed both within and outside the agency.

## ***Introduction***

The US Fish and Wildlife Service is arguably the most productive and cost-effective bureau within the Department of Interior (DOI) regarding its on-the-ground implementation of hazardous fuels treatments. Fire and fuel treatments on refuge lands protect life and property on and off Service lands as well as contribute toward achievement of refuge wildlife and habitat management objectives derived from Comprehensive Conservation Plans (CCPs) and other resource management planning documents (e.g., Habitat Management Plans (HMPs)). Fuel treatments have primarily included prescribed fire, mechanical and chemical treatments or a combination of all, as well as current policies to include the monitoring of wildfires for resource benefit.

Legal mandates, policies and the National Fire Plan (NFP) require monitoring to evaluate management actions, including approved hazardous fuels reduction and prescribed fire treatments, in support of science-based decision making (adaptive management) on refuge lands.

As with other wildlife and habitat management actions on refuge lands, monitoring to evaluate fuels treatments and prescribed fire is an integral component for implementing adaptive management. Adaptive management is a process that promotes flexible decision making that can be adjusted over time recognizing that there would be uncertainties as outcomes from management actions and other events are more understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust resource management actions as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a trial and error process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits (Williams et al. 2009).

## Justification

In 2002, the Southeast Region (R4) of the US Fish and Wildlife Service established a fuels monitoring program that utilized FIREMON protocols (Lutes et al. 2006). Monitoring the effects of fuels treatments has been largely missing at refuges throughout the region. For most refuges, monitoring has only included documenting the implementation of treatments in the Service's Fire Management Information System (FMIS). Occasionally, some photopoints have been taken. However, very little quantitative data have been collected to show whether treatment objectives have been met. Throughout the region, monitoring has been rather haphazard, dependent on the presence of a person or small group of people with the interest and drive to conduct (or review) any collection of monitoring data and only a few refuges in the region with consistent monitoring programs. Upon request, the Regional Office has assisted refuge fire personnel with monitoring plot setup and design. Student Conservation Association (SCA) interns have been hired occasionally by the Regional Office to provide some additional assistance with data collection. Otherwise all design, data collection, archiving and reporting has been the responsibility of each refuge. The Regional Office maintains an archive of all backup data collected as a separate repository from the refuge.

Currently all fuels treatment monitoring data that existed before 2012, with the exception of photopoint data, have been converted into the newly adopted FEAT/FIREMON Integrated (FFI) database (Lutes et al. 2009). This database is considered a replacement database for FIREMON (Lutes et al. 2006). FFI provides flexibility for a variety of monitoring needs and can serve as a forum for integrating resource management needs. It is a national standard monitoring software that allows for analysis of fuel treatment monitoring data between units within a refuge, among refuges and among nearby land management units of agencies that also use FFI. Links to FFI software and manuals are located at: [www.frames.gov/ffi](http://www.frames.gov/ffi). The application of FFI is described further below in the Level 2 Variables section.

## New Direction for 2013

New standards for fuels treatment monitoring in this plan include capturing a set of defined core monitoring variables for all fuels treatments entered into FMIS as the Service's National Standard Database housing required core monitoring data (see Level 1, Core Monitoring Elements below). In addition, Level 2, Immediate Response Monitoring Variables, are strongly recommended to be collected for all National Fire Plan fuels treatments approved and implemented on a refuge as well as any other select fuels treatments as identified by refuge staff. These data will be stored in FFI and will be run on local desktops to build refuge level data sets. Backup copies of the refuge FFI data sets will be periodically delivered (at least annually) to the Regional Fire Ecologist to incorporate into the Regional Centralized Database supported by the Regional Inventory and Monitoring Program.

New 2013 principles include:

- A set of Level 1, Core Monitoring Elements that are required for all fuels treatments implemented on refuge lands.
- A set of Level 2, Immediate Response Monitoring Variables that should be collected on all hazardous fuels reduction treatments on refuge lands. Service-wide accepted standardized databases for data entry, storage, reporting and analysis are identified (FMIS and FFI).
- Inclusion of all National Fire Plan hazardous fuels treatment projects (chemical and mechanical), not just those treated with fire.
- Cost of data collection and input is to be included in estimated treatment costs.
- This monitoring plan does not replace already existing and established monitoring programs in other disciplines, but instead, coordinates with and supplements them.

- The approval of this Regional Fuels Treatment Monitoring Plan serves as an Interim Monitoring Plan for all refuges conducting hazardous fuels treatment monitoring in the Southeast Region. It supplements all previously approved Refuge and Complex Fire Effects Monitoring Plans for Southeast Refuges.
- In the near future, fuels treatment monitoring activities will be described in a refuge-wide Inventory and Monitoring Plan (IMP). No additional refuge Fire Effects Monitoring Plans will be needed once a refuge's IMP is in place.
- Data standards are established and approved by the Regional Fire Ecologist and I&M Staff as appropriate.

## Regional Monitoring Plan Objectives

The basic concepts of this Regional Monitoring Plan:

The objective of the Regional Monitoring Plan is to define monitoring objectives that can be scaled to address a variety of fuels treatment objectives. Differing **levels of monitoring variables** will allow for graduated types of monitoring while maintaining a consistent database system for collection and analysis. The level of effort for monitoring beyond the first level will be related to the amount of funds, personnel and time available.

Under the hazardous fuel program, prescribed fire, chemical and mechanical fuels treatments are implemented to modify fire behavior by manipulating fuels (vegetation) in order to reduce fire hazard to communities, municipal watersheds, and key wildlife habitat. To meet this goal, the Regional Plan is designed to describe a practical, feasible (doable) set of variables to monitor to show whether a reduction in fuel loading and ultimate reduction in fire hazard are met. The monitoring data collected is geared to address the question: Is the level of accumulated fuel loads, fire behavior, fire line intensity or potentially hazardous conditions that threaten life, property and resources in and around our refuge lands reduced, and if so, what level of reduction has been observed?

Monitoring data will provide a pre and post-burn assessment of fuel load changes following applied fuels treatments (chemical, mechanical, or fire application) and demonstrate through data whether identified fuels treatment objectives were accomplished.

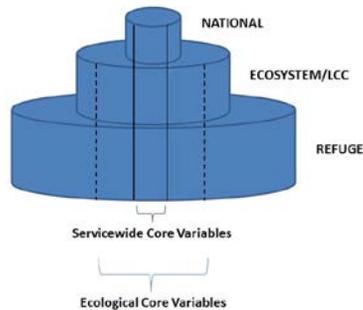
The objectives of this plan are as follows:

- Help define objectives that are clearly defined, attainable and follow SMART criteria (USFWS 2004).
- Monitoring fuels treatments should be designed within the context of the entire fuels and vegetation management program for a given refuge or complex.
- Monitoring protocols and requirements should be practical with reasonable costs and based on treatment objectives, not on "wish lists" and minimal staff requirements.
- The monitoring program should be flexible enough to monitor any fuel type.

## Monitoring Scale and Scope

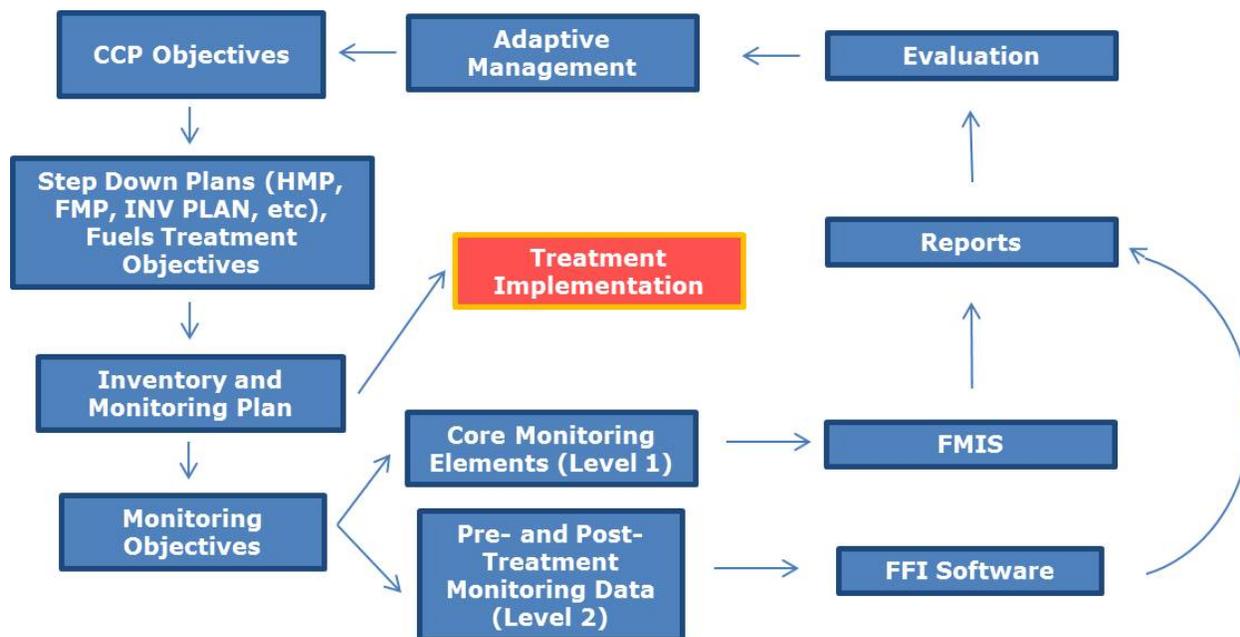
A critical component of any monitoring plan is to define the scale and scope of the work that needs to be completed. This monitoring plan is designed to be conducted at the local refuge scale while remaining functional at the Landscape/Ecosystem and Regional scales. The monitoring levels identified in this document define national, regional, landscape/ecosystem and refuge level needs (Figure 1).

This plan is designed to consider the impacts from hazardous fuels treatments on refuges without excluding other potential resource monitoring objectives. It is developed to be included in an overall I&M program on each refuge. The science driven information collected from this Regional Plan should complement any additional monitoring efforts on going or planned in the future and remove any duplication of monitoring effort between resource management objectives and fuel treatment objectives. While standardized monitoring data protocols may be used to meet one or more objectives, it is envisioned that additional monitoring techniques will be employed to address additional monitoring objectives in other disciplines.



**Figure 1.** Levels of Monitoring Efforts as described by “the cake”.

Figure 2 below shows the relationship between National Core Monitoring Elements, level of monitoring and scale for project planning and implementation. The National Core Monitoring Elements of the plan begin with the objectives described by the CCP and step-down plans (i.e., Habitat Management Plan (HMP), Fire Management plan, Invasive Species Management Plan, etc.) that define the objectives of fuels treatments. Objectives are stepped down into a refuge Inventory and Monitoring Plan. Core Monitoring Elements (Level 1 data) are entered into FMIS automatically as part of required fire reporting. Level 2 data are entered into a local refuge FFI database. Level 3 data are either entered into FFI or other monitoring software as specified in the refuge-level Inventory and Monitoring Plan (IMP).



**Figure 2.** Monitoring planning structure in relation to treatment implementation and data collection.

## ***Refuge Planning Structure***

### **Comprehensive Conservation Plans**

CCP objectives will serve as the variables to be monitored as they pertain to the hazardous fuels treatment objectives. In general, treatment objectives in CCPs are not specific but may be the only documentation of treatment descriptions available until step-down plans are in place.

### **Step-down Plans**

Step-down plans vary refuge by refuge and include all management activities implemented at the refuge level to meet CCP Goals and Objectives. Step-down plans more specifically describe treatment objectives and strategies whether they be specific habitat management treatments, invasive species management activities, fire management activities, etc. For the most part, monitoring treatment objectives that are described in this Regional Fuels Treatment Monitoring plan can be found in plans such as the refuge (or refuge complex) HMPs, Fire Management Plans, Invasive Species Management Plans, Pest Management Plans or IMPs. For a refuge unit, the IMP steps down from the CCP (602 FW 1.3). If more specific, recent, or concise objectives have been developed in the HMP (620 FW 1) and/or other relevant Service policies and programs, the IMP will be developed from the more recent and concise objectives.

### **Refuge Inventory and Monitoring Plans**

The IMP is designed to describe all of the processes and systems used to monitor refuge activities pertaining to the CCP implementation, with hazardous fuels treatments being just one of the activities occurring. An IMP is a summary, ranking, and justification of surveys and assignment of protocols for surveys that a station plans to conduct. It includes a signature page documenting review and approval at the Regional level, an introduction

linking the station's primary purpose to surveys, and a description of the process used to develop the IMP, prioritize surveys, and assign a status for implementing each survey. The IMP also includes a narrative for each selected survey that summarizes the station management goals addressed by the survey and justifies why the station selected the survey for implementation (from I&M Policy 701 FW 2.8, draft, Jan 2013).

The IMP process is designed to undergo four developmental steps:

Step 1 (List Surveys) - a comprehensive list of surveys is obtained

Step 2 (Rank Surveys) - each survey is prioritized

Step 3 (Select Surveys) - review and approval of prioritized survey list by Regional Refuge Biologist and Refuge Supervisor

Step 4 (Assign Protocols and Write IMP) - review by I&M Coordinator and approval by Refuge Supervisor

## **Refuge Fire Management Plans**

Refuge Fire Management Plans (FMPs): Sections 5.2.1-4 describe the policy and implementation for fuels treatments on the refuge. While an FMP does describe monitoring treatment effects, each plan should refer to the refuge IMP for further details that describe the relationship between the implementation of fuels treatments and the monitoring objectives for each treatment. The IMPs will describe what level of effort is needed to monitor implemented fuels treatments.

## ***Monitoring Variables***

### **Level 1 – Core Monitoring Elements**

All hazardous fuels treatments will complete this level of monitoring data collection and the data will be entered into FMIS. This level requires variables that identify basic descriptive information about the treatment and its location (see Core Data, Table 1). This data meets the requirements for the Service's Fuels Treatment Reporting Standards as well as Core Element Standards of the Service's I&M program. Data is entered into the Service's FMIS.

### **Level 2 – Immediate Response Monitoring Variables (<1YR)**

Level 2 is comprised of immediate response variables measured within the first year following treatments (i.e., first order fire effects or direct effects, see Table 2 below). Collection of these data is recommended for all hazardous fuels reduction treatments that are approved in the National Fire Plan Operations and Reporting System (NFPORS). Level 2 data can be entered into FFI (see Data Management Section below). To find out more information for FFI, please go to: <http://www.frames.gov/partner-sites/ffi/ffi-home/>.

Monitoring at Level 2 consists of a qualitative assessment of immediate responses to the treatment implemented.

Qualitative monitoring is useful for determining general trends, spot checking that basic assumptions appear to be correct, and aiding in determining which treatments may need further quantitative monitoring due to unexpected outcomes or developing controversies. Qualitative monitoring is very useful during intermediate stages of linked treatments to determine if one part of the treatment regimen may have a greater influence on the data during quantitative monitoring. The FFI software includes methods to record and report the results of qualitative monitoring.

Methods to conduct this level of monitoring include walk-through exams, use of photo guides, photographs/photopoints and a write-up that qualitatively answers the basic principle questions of hazardous fuels reduction:

- How was the fuels profile altered?
- How were fuels immediately reduced by the treatment?

Refuge personnel in concert with both Regional Fire Management Staff and Regional Inventory and Monitoring Personnel should determine the best method to answer this question.

**Table 1.** Required Level 1 Core Data for every Hazardous Fuels Reduction Treatment.

<b>Core Elements</b>
USFWS Unit Name
USFWS Unit Location
Management Activity Name
Management Activity Type
Management Activity Location
Management Activity #
Management Activity Size, acres
Objective(s)
Fire Regime
Dominant Fuel Model
Initiation Date and Time
Completion Date and Time
Qualitative Narrative
Comments (pictures, additional info, etc.)
Contact Information

**Table 2.** Level 2 Immediate Response Monitoring Variables

<b>R4 Category (FFI)</b>	<b>FFI Protocol</b>	<b>Prescribed Fire Data</b>	<b>Required / Recommended</b>
Fuel Moisture	Fire Behavior	Duff/Litter/Live Fuel Moisture (%)	Recommended
Fuel Moisture	Fire Behavior	Fine Fuel Shading	Recommended
Weather	Fire Behavior	Dry Bulb/Wet Bulb Temperature	Required
Weather	Fire Behavior	Relative Humidity	Required
Weather	Fire Behavior	Wind Speed/Direction	Required
Weather	Fire Behavior	Gust Speed/Direction	Required
Weather	Fire Behavior	Cloud Cover	Required
Fire Behavior & Smoke	Fire Behavior	Fire Activity	Required
Fire Behavior & Smoke	Fire Behavior	Rate of Spread	Required
Fire Behavior & Smoke	Fire Behavior	Flame Length or Height	Required
Fire Behavior & Smoke	Fire Behavior	Spotting Distance	Required
Fire Behavior & Smoke	Fire Behavior	Smoke Impacts, Dispersal, and Intrusions	Required
Fire Behavior & Smoke	Fire Behavior	Plume Behavior	Required
Dead/Downed Fine and Coarse Woody Debris	Surface Fuels	1, 10, 100, 1000-hour Fuels Count	Recommended
Duff/Litter	Surface Fuels	Duff and Litter Depth	Recommended
Live and Dead Standing Vegetation	Surface Fuels - Vegetation	Live/Dead Woody and Non-woody (cover, height)	Recommended
Alternative Biomass Sampling In Marshes and Grasslands	Biomass - Plants	Live Fuel Moisture (%)	Recommended
Alternate Biomass Sampling Using Photo Series	Biomass - Fuels	Digital Images	Recommended
Composite Burn Index	CBI	CBI Score	Recommended
Photopoints	--	Digital Images	Required

## **Level 3 - Long Term Variables (>1YR)**

Level 3 is longer term data that describes responses greater than one year following treatment (i.e., second order or indirect effects). These data may relate to other resources monitoring objectives as described in the refuge IMP and are not described further in this plan.

This is the most data intense level of quantitative monitoring and includes plot level sampling. Level 3 uses long-term monitoring plots (i.e., the same location) for both pre- and post-treatment measures. Objectives for Intensity Level 3 monitoring are determined at the refuge level. There are no Regional requirements to complete Level 3 monitoring at this time.

Each refuge with a fuels treatment program may choose to conduct Level 3 monitoring, but it is dependent on refuge management objectives and what has been described in the overall refuge IMP. Refuge personnel should determine the best method(s) to answer whether objectives were met and document the preferred method(s) in the Planning and Review of Inventory and Monitoring on Refuges (PRIMR) database, to be included within the refuge's IMP.

## ***Integrating Fuels Monitoring With Other Resource Monitoring***

As much as possible, fuels treatment monitoring should be integrated with other refuge resource monitoring objectives. Integration saves time and costs and helps build common information and understanding between various specialties. It can also bring to light important information that may not otherwise become known when monitoring is segregated by specialty.

One place to begin this integration is during project planning. The IMP supports cooperative surveys which address joint management information needs or needs of other agencies or organizations. By using the PRIMR database, regional and national I&M staff identify common survey activities occurring across the National Wildlife Refuge System. Interdisciplinary teams should discuss what monitoring is needed pertinent to the treatment objectives and specific treatment prescriptions. The hazardous fuels program is responsible only for that portion of the monitoring that is a direct effect of the hazardous fuels treatment (Level 1 and Level 2 monitoring). All other effects are indirect effects that arise because of these direct effects.

## **Measuring Success - Strategic Habitat Conservation**

The level of success or failure of a fuels treatment is dependent on a well-defined monitoring objective tied to the overall refuge management objectives. A well-defined monitoring objective must be quantifiable (i.e., Specific and Measurable), Achievable, Realistic and include a Time Frame for the desired change (SMART criteria).

## ***Data Management***

All hazard fuels treatment monitoring data will be entered by refuge staff and stored in the National FMIS database (Level 1, Core Monitoring Elements) and the FFI database (Level 2, Immediate Response Monitoring Variables). Backup copies of the local refuge FFI database will be submitted to the Regional Fire Ecologist on a yearly basis, or more frequently if needed, to build a centralized dataset for all refuges within the region collecting Level 2 monitoring data. Information and training materials for using the FFI database can be found at: [www.frames.gov/ffi](http://www.frames.gov/ffi). Periodic workshops will be held by the Regional Fire

Management Staff and Regional I&M Staff on the use of FFI. Additional information for formal classroom training for FFI is also included on the website above. Login and limited use instructions for login to the server will be forwarded as and when needed.

FFI contains simple and robust statistical reporting and analysis options. Analysis descriptions and options are discussed in detail in the FFI user's guide. Refuges will complete the level of analysis and reporting needed using FFI to determine accomplishments of hazardous fuels reduction treatment objectives and support the adaptive management process. Data will be entered into FMIS and FFI as required. It is recommended that each refuge hold an annual collaborative (e.g., fire and biology staff) post-season review of the treatments applied that year and a summary of the data analysis and results.

Regional fire managers will serve as data administrators who assign users and access and will be responsible for all data management and backup on the server.

While it is expected that many of the data management particulars will be handled adequately by FFI, additional direction will be developed as needed to cover data stewarding, including data storage, requirements for consistency and other specifics as need arises. A unified approach to data collection, storage and reporting will be ensured between the Division of Fire Management and the Regional I&M Program Staff.

## **Databases**

### **Fire Management Information System - FMIS**

The FMIS is a Service provided database used to track all fuels treatments conducted on refuges. It provides a means of reporting data for wildfires and prescribed fire, chemical and mechanical treatments. This fire reporting tool was developed in the 1990s and has since undergone several changes for data entry since its inception. A new version of FMIS is expected to be released in spring 2013. In addition to simplifying data entry screens, FMIS will now be able to house geospatial data for fuels treatments and photo documentation data. This would satisfy the refuge system need for storing Level 1, required Core Monitoring Elements (see Level 1 Core Monitoring Elements Section above) into a standardized national database.

### **FEAT/FIREMON Integrated Database – FFI**

The FFI database was developed for collection, storage and analysis of ecological information. The tool combined two fire effects monitoring systems commonly used in the United States: FIREMON (Lutes et al. 2006) and the Fire Ecology Assessment Tool – FEAT (Sexton 2003). FFI provides software components for data entry, data storage and management, Geographic Information System (GIS), summary reports, data analysis tools and Personal Digital Assistant (PDA) use. FFI supports scalable (project to landscape scale) monitoring at the field and research level, and encourages cooperative, interagency data management and information sharing.

Monitoring methods and protocols are addressed in both the Regional Field Guide (USFWS 2013) and FFI user guide which are easily accessible via the internet (see link in Justification). Refuges with established monitoring programs may continue to use already established protocols and monitoring software as necessary, providing it is approved by the Regional Fire Ecologist and Regional I&M Coordinator or their representatives.

### **FFI Training**

It is recommended that fire and biology personnel on each refuge attend FFI training. Local workshops on FFI will be offered occasionally by regional fire and I&M staff. Instructor lead trainings are offered 3-4 times annually across the country. Upcoming training whereabouts

and logistics are found at: [www.frames.gov/ffi](http://www.frames.gov/ffi). FFI self-guided training is also available at the same website.

### **Planning and Review of Inventory and Monitoring on Refuges (PRIMR) Database**

The PRIMR database has been designed to help field stations facilitate development of an Inventory and Monitoring Plan as defined in the "Draft Inventory and Monitoring Policy" (863 FW 1). The database was designed with policy requirements and formatting in mind. Once data is entered into the system it is formatted into the reporting tables required for submittal to the Refuge Supervisor and others for approval. This database facilitates the completion of Part I (and II) of a refuge's IMP. The PRIMR database can also be used by regional and national I&M staff to identify common survey activities occurring across the National Wildlife Refuge System.

## **Data Reporting**

All reporting for hazardous fuels treatment monitoring will be entered, housed and reported through established databases including FMIS, FFI, and PRIMR databases. All Level 1 data will be entered into FMIS, including geospatial data. All Level 2 data, with the exception of photopoint data, will be entered into FFI. Backup copies of the refuge FFI datasets and photo documentation reports will be sent to the Regional Fire Ecologist ([sue\\_wilder@fws.gov](mailto:sue_wilder@fws.gov)) or Regional I&M Botanist ([Maxwell\\_Boyle@fws.gov](mailto:Maxwell_Boyle@fws.gov)) or other designee repository for establishing a Southeast Regional Centralized Database for fuels treatment across the region. This centralized database will be used for reports and analysis at the refuge, ecosystem, landscape or regional levels as needed.

## **Implementation**

Data collection is the responsibility of the individual refuge. All Level 1 and certain Level 2 categories (e.g., weather, fire and smoke behavior, photopoints) are required and will be collected with hazardous fuels funds on all refuge hazardous fuels funded treatments. Level 1 and Level 2 monitoring should be relatively easy and inexpensive to complete and implement with existing personnel.

Avenues for physical data collection for Levels 2 and 3 may include, but are not limited to: force account, IDIQ contracts, I&M contracts, multi-party or third party monitors, students, volunteers or some combination of all the approaches. Use of multi-party or third party monitors is already encouraged by various variables of the National Fire Plan. Refuges with small programs may elect to combine their monitoring programs with other units in order to leverage scarce funds with a single person managing the program for multiple refuges. As much as possible, fire-related monitoring should be integrated with other resource monitoring to reduce overall costs, increase efficiency, and better tie first order effects to second order effects.

Field data may be collected on hard copy paper forms or with a PDA where available. Descriptions of field methods are provided in the Monitoring Hazardous Fuels Treatments: Southeast Regional Field Guide (USFWS 2013). The FFI program provides synchronization to upload and download information to and from the program if a PDA is used. The FFI user guide, available on the *Manuals* tab here: [www.frames.gov/partner-sites/ffi/software-and-manuals/](http://www.frames.gov/partner-sites/ffi/software-and-manuals/), provides details on how to set up and use this function as well as hard copy forms that can be used directly or modified to specific refuge needs.

## **Roles and Responsibilities**

*Project Leader / Refuge Manager*

The Project Leader is responsible for:

- Approving Refuge IMP which will include monitoring for hazard fuels reduction treatments. This regional monitoring plan serves as an interim Hazardous Fuels Treatment Monitoring Plan for each refuge within the Southeast Region until the IMP is fully developed and approved.
- Implementing fuels treatments and developing monitoring objectives.
- Funding Level 2 and 3 monitoring protocols as needed for resource based objectives.

#### *Refuge Fire Management Officer*

The Fire Management Officer (FMO) is responsible for:

- Assisting in preparing the hazard fuels treatments portion of the IMP.
- Ensuring that the required Level 1 Core Monitoring Data and Level 2 Immediate Response Monitoring Variables are collected and populated into the FMIS or FFI databases as appropriate.
- Facilitating coordination between the refuge fire management staff and resource management staff to identify appropriate monitoring objectives and ensure they are included in the PRIMR database.
- Managing hazardous fuels funding to include costs for Level 1 monitoring activities and Level 2 "required" activities for each fuel treatment and Level 2 "recommended" activities and Level 3 activities as deemed appropriate by IMP (see cost section below).
- Coordinating fire staff to complete all data collection and other fuels treatment monitoring activities as identified in the IMP.
- Ensuring the Regional Fire Ecologist receives annual backup copy of refuge level FFI data annually or more frequently as requested.

#### *Refuge Biologist*

The Refuge Biologist is responsible for:

- Assisting with preparation of the hazard fuels treatments portion of the IMP.
- Facilitating coordination between biology and fire management staff to identify appropriate monitoring objectives within the PRIMR database, which will be included in the IMP.
- Designing Level 2 and 3 monitoring protocols as needed for resource based objectives (see Costs section below).

#### *Regional Inventory and Monitoring Program*

The Regional Inventory and Monitoring staff is responsible for:

- Assisting refuge staffs with preparation of hazard fuels treatments portion of the IMP.
- Approving individual protocols for hazardous fuels treatments within Part II of the IMP with the Regional I&M Coordinator.
- Working with Regional Fire Management Staff to collectively manage the FFI Database for use by Region 4 refuges.

- Providing assistance with training for refuge staff to support data entry, basic reporting, and information summaries for FFI data. Training will be provided through workshops, webinars, website information, and periodic newsletters.
- Conducting analyses at the ecosystem and LCC-scales.

### *Regional Fire Ecologist and Fire Management Staff*

The Regional Office Division of Fire Management is responsible for:

- Maintaining the Southeast Region centralized FFI database:
  - Perform quality assurance checks on the database and data entry.
  - Maintain backup copies of database.
  - Ensure that data requests and information summary reports are addressed in a timely fashion.
  - Ensure even flow of data between Regional I&M Staff and Regional Fire Management Staff.
- Performing periodic analyses of monitoring data and developing periodic reports of Region 4 refuge fuels monitoring data as requested at refuge, landscape, regional or interagency scales.
- Coordinating training for refuge staff to support data entry, basic reporting and information summaries for FFI data. Provide training through workshops, webinars, website information and periodic newsletters.
- Coordinating with the National and Regional I&M Staff to ensure database development is in line with policy and accepted standards.
- Coordinating with Regional I&M Staff to support transition in the development of refuge IMPs. Review IMPs and contribute data and reports as needed.
- Updating the Monitoring Hazardous Fuels Treatments: Southeast Regional Plan as needed.
- Prioritizing and distributing any available funding to support fuels treatment monitoring, including interns, temporary staff and project funds (Level 2 and where possible Level 3) on Southeast Region refuges.

## **Monitoring Program Costs**

The cost of Level 1 monitoring is contained in existing refuge hazardous fuels funding. Level 1 information should be currently collected (per policy), and the data transfer time into FMIS insignificant.

Level 2 Monitoring data collection funding will be estimated and added to the overall cost of a fuels treatment and can be accomplished with existing fuels treatment funds and personnel once approved. A general price of between 1-5% of treatment cost is a good estimate to cover the cost of monitoring per treatment.

Level 3 monitoring will incur more costs which will have to be paid with refuge funds or other funding opportunities outside of the hazardous fuels treatment costs. Actual costs will vary depending on who actually conducts the monitoring, the level of expertise required of the monitors, and the amount of data collected. Costs may also fluctuate from year-to-year depending on the timing of pre- and post-treatment data collection in relation to the timing of treatment completion. These estimates should include additional time needed to manage

the monitoring program and analyze the data collected. Estimated costs for Level 3 Monitoring will be considered as part of the total planning costs for each refuge.

Costs of collecting additional data should be distributed across the disciplines that want or need the data, taking into account the purpose of a given project and its fund source. Current Southeast Region Hazardous Fuels Treatment funding does not include funds to implement Level 3, long term monitoring beyond the first year following treatment.

## ***References***

- Lutes, D.C., Keane, R.E., Caratti, J.F., Key, C.H., Benson, N.C., Sutherland, S., Gangi, L.J. 2006. FIREMON: Fire Effects Monitoring and Inventory System. U.S. Department of Agriculture, Forest Service. Rocky Mountain Research Station, RMRS-GTR-164-CD, 400 pp. Website: <http://www.frames.gov/partner-sites/firemon/sampling-methods/>
- Lutes, D.C., Benson, N.C., Keifer, M., Caratti, J.F., and Streetman, S.A. 2009. FFI: A software tool for ecological monitoring. *International Journal of Wildland Fire* 18: 310-314.
- Sexton, T.O. 2003. Fire ecology assessment tool - monitoring wildland fire and prescribed fire for adaptive management, Second International Wildland Fire Ecology and Fire Management Congress and Fifth Symposium on Fire and Forest Meteorology, 16-20 Nov 2003, Orlando, FL. American Meteorological Society, Boston, MA. P. 108-109.
- U.S. Fish and Wildlife Service. 2004. Writing Refuge Management Goals and Objectives: A Handbook. US Department of Interior, US Fish and Wildlife Service, Washington, DC 34 pp.
- U.S. Fish and Wildlife Service. 2013. Monitoring Hazardous Fuels Treatments: Southeast Regional Field Guide. Southeast Regional Office, Atlanta, GA. 56 pp.
- Williams, B.K., Szaro, R.C., and Shapiro, C.D. 2009. Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.