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Preparedness Levels Study
Final Report

JFSP Project Number 01-1-7-06

Techniques for Creating a National Interagency Process for Predicting Preparedness Levels

Sponsored by:

Joint Fire Sciences Program

produced by:

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Management Summary

A critical operational need exists for dispatch coordinators, fire managers and agency administrators to determine preparedness levels on a national, multi-agency basis. The preparedness planning processes now in place resulted from mandates and direction following the Yellowstone Fires in 1988. Today, however, the country requires an enhanced and standardized preparedness level forecasting system that is proactive and can respond to emerging situation as well as disastrous and tragic fires along with critical resource shortages we now face along with future changes in fire policy and management.

The Joint Fire Sciences Program funded Preparedness Levels Study Project sets the stage to address these challenges by creating a blueprint, the National Preparedness Level Business Model. Developed by an interagency team of business experts and technical specialists, the model was developed using a structured business process approach to design and build a National Preparedness Level Planning System.

Vision for the next generation of Preparedness Level Planning

The National Preparedness Level Business Model serves as a reference and initiation point for the development of a future national preparedness level system. This system would be developed for use at the National Interagency Coordination Center (NICC), each of the Geographic Area Coordination Centers (GACCs) and also designed for use at Sub-Geographic Area levels. Such a future preparedness planning process would anticipate future scenarios, thereby providing the opportunity to implement actions targeted at desirable future conditions and outcomes. The process would identify and lessen risks and better position fire management to accomplish more work in a reduced risk environment.

The next generation of preparedness level planning would involve a “full-spectrum” assessment of activities that contribute to the “workload” confronting the wildland fire community; and the “capability” of the wildland fire community to accomplish the workload. The tools used to “assess” components that comprise workload and capability would be made using the best available science.

Such a process would support national, regional, and local interagency management decisions by providing information that could characterize and reduce uncertainty and identify risk. Specifically, this process would enhance decision support regarding: determination of prescribed fire opportunities and risk, wildfire threats to local communities and natural systems, wildland fire use, prioritization of multiple ignitions, prioritization criteria for fuel treatment investments in the wildland/urban interface, and allocation of scarce fire management resources.

The future system would bring uniformity and consistency to a process that is engaged on a daily basis across the country. As Dispatch Coordinators across the country use this future system they would establish the Preparedness Levels using a standardized process resulting in comparable outputs more effectively consolidated into a national mosaic.

The complexity of the task of developing a National Preparedness Level Planning Process led the project sponsors and advisors to structure the project into two distinct phases; a project scoping and planning phase and a design / development / implementation phase.

Phase I – Scoping & Planning

The Joint Fire Sciences Program Pre-Proposal "*Techniques for Creating a National Interagency Process for Predicting Preparedness Levels"* was approved July 16, 2001 (JFSP Project Number: 01-1-7-06 - *Task 7, JFSP Request for Proposals, 2001-1 to: Develop scientifically-based support tools to improve fire management decision processes)*. This phase included:

- Project scoping
- Project planning
- Development of a high-level, logical business model
- Project Report
- Project Charter for Phase II
- Recommended approach for Phase II
- Identification of a Phase II Project Leader(s) or Investigator(s)

Phase II – Designing, Developing & Implementing

Phase Two will develop and deliver a new, proactive national preparedness planning process. This process will gauge workload demands and needs with the fire management community's capability to respond to the workload, as well as actions to maximize the accomplishment of work at a reduced state of risk. The assessment and analysis necessary to accomplish the development of this preparedness planning process will include:

- Application of innovative, statistical and modeling methods and techniques
- Construction of a detailed business analysis (both physical and data models)
- Creation of an automated decision support tool
- Development of an implementation strategy.

Deliverables

The primary deliverable of Phase One is a nationally validated high-level business model of the Preparedness Level process that can be applied across the nation by all of the wildland fire agencies. The model depicts the business processes necessary to establish Preparedness Levels in any organizational entity in any part of the country. However, it is not specific as to the precise components that go into the calculation of a Preparedness Level for a particular unit or area. It describes what primary components are included in the calculation as opposed to the specific details of the components or "how" the calculation is processed. The project team used validation sessions with subject matter experts from across the country to document positive and negative attributes of the current methods used to establish Preparedness Levels as well as determine what a future system should include.

Two of the deliverables: "Project Charter for Phase II" and "Identification of a Phase II Project Leader(s) or Investigator(s)" were not completed as part of this project (Phase I). Rules guiding the development of automated systems have changed since the project was originally approved and these will be completed in the future should be project proceed into the next phase. Specifically, completion of the OMB CPIC (Capitol Planning and Investment Control) process will serve as the Project Charter for Phase II. In addition, the CPIC process facilitates the development of a Project Plan for Phase II including the identification of a project management structure.

In December 2000, the National Geographic Area Center Managers agreed that a national interagency process to determine preparedness levels was necessary and essential to effectively manage wildland fire resources in a proactive manner. They tasked a group to *"submit a research proposal to develop a national preparedness planning process with supporting tools."* Initial scoping for this effort was completed in February 2001. A proposal to create a national interagency preparedness planning process was discussed with individuals in the science and research communities, as well as with fire managers at the national and geographic area levels and a subsequent JFSP Pre-Proposal was submitted and approved.

A quantitative national preparedness planning process reflecting the best available science that is coordinated across all agencies throughout the country at all geographic levels is needed because:

- The National Interagency Coordination Center (NICC) and all Geographic Area Coordination Centers (GACCs) currently utilize different methods to establish daily preparedness levels.
- Current processes do not provide a complete and detailed assessment of risks and benefits associated with decisions being made with regard to wildland fire and prescribed fire operations. This includes assessing a wide array of risks—including risks to people and urban/interface communities associated with not accomplishing critical fire projects and their related potential benefits.
- The preparedness planning processes now in place resulted from mandates and direction following the Yellowstone Fires in 1988. Today, however, the country requires an enhanced and superior preparedness level forecasting system that is capable of proactively responding to disastrous and tragic fires and is capable of adjusting to changes in fire policy and management.
- A standardized process currently does not exist that supports national, regional, and local interagency management decisions by providing information that could characterize, reduce uncertainty, identify risk and enhance decision support regarding: determination of prescribed fire opportunities and risk, wildfire threats to local communities and natural systems, wildland fire use, prioritization of multiple ignitions, prioritization criteria for fuel treatment investments in the wildland/urban interface, and allocation of scarce fire management resources.

A new preparedness planning process would anticipate future scenarios, thereby providing the opportunity to implement actions that can influence desirable future conditions and outcomes. The process would identify and lessen risks and better position fire management to accomplish more work in a reduced risk environment.

Intent

The purpose of the Joint Fire Sciences Program funded Preparedness Levels Study Project is to design and build a National Preparedness Level Planning System. A new standardized national system would gauge / estimate the expected workload that confronts the wildland fire community; gauge / estimate the ability of wildland fire organizations to respond to current and expected workload; including assessing and accounting for "other" factors that influence "workload" and "capability to respond".

Introduction

Objectives

Primary Objectives

- Development of a Joint Fire Science Program or NWCG proposal for construction of the physical process and data models necessary to develop and deploy a national interagency preparedness level prediction system.
- Create a project charter/plan for the preparedness planning project that will result from this pre-proposal.
- Determine a methodology to define the process and methods for developing preparedness levels.

Secondary Objectives

- Establish a consistent method of predicting preparedness levels throughout the United States and demonstrate how this will benefit end-users.
- Link users and the scientific community together to develop a procedure that uses the latest approaches for creating appropriate scientific models for predicting preparedness levels.
- Align the existing preparedness planning process with current national interagency policy and direction by developing a decision support infrastructure.
- Align with the Federal Wildland Fire Management Policy's (1995, updated 2001) conceptual framework to manage wildland fire suppression, wildland fire use, and prescribed fire programs equally, consistently, and concurrently.
- Meet the National Fire Plan and Congressional 2001 Appropriation Act goals for reducing wildland fire hazards to communities and increasing wildland firefighting capabilities and resources, and simultaneously plan and implement fire and resource management activities to rehabilitate and restore ecosystems.
- Attain the National Wildfire Coordinating Group's (NWCG) recommended resource allocation process.
- Achieve the comprehensive goals for restoring and maintaining ecological integrity while reducing the risks and consequences of unwanted wildland fires described in the USDA Forest Service's *A Cohesive Strategy for Protecting People and Sustaining Resources in Fire-Adapted Ecosystems* (October. 2000); and the Department of the Interior's pending *Integrating Fire and Natural Resource Management—A Cohesive Strategy for Protecting People By Restoring Land Health.*

Methodology

The National Preparedness Level (NPL) Project Team used a business re-engineering methodology developed by Brian Dickenson and explained in his book *Strategic Business Re-Engineering* (1994).

The methodology for constructing the National Preparedness Level Business Model is a "business-event-driven" approach. A business event is created when an external person or organization "triggers" a process into action. The flow of information and required processes that occur as a result of each trigger is represented in the business model.

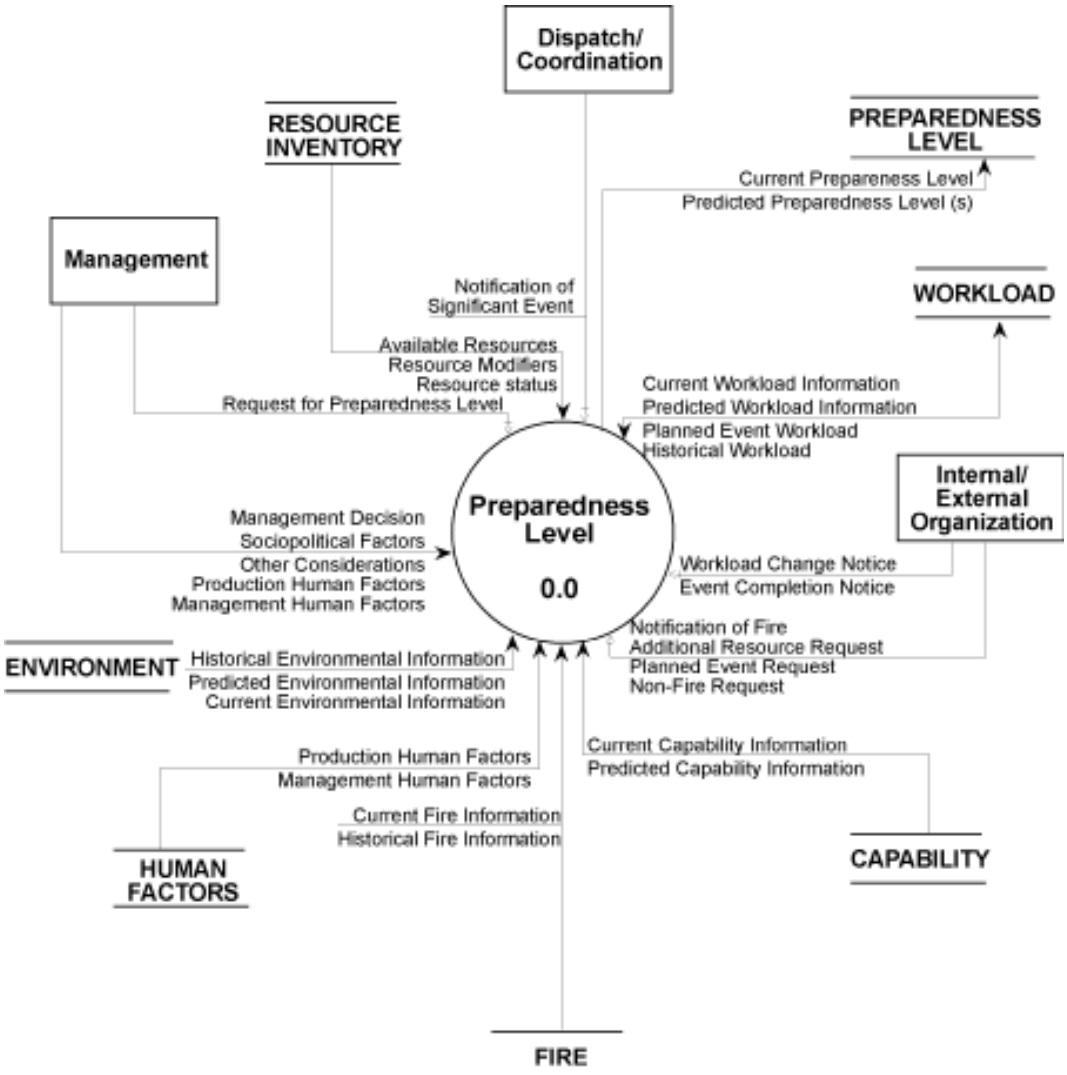
The model is intended to provide an overview of the business of setting the Preparedness Level(s). The details of how a business event occurs, including the smallest required tasks, will be defined during the analysis phase of future projects. This type of model, termed a “logical business model”, does not attempt to show any methods to accomplish tasks (such as existing manual forms or automated systems) or who accomplishes tasks (such as a particular agency or person). As a “high-level” logical business model, it does not specify the most detailed subprocesses of a business event, but only the basic steps of the process.

Project Overview

The Analysis Process

The Context Diagram

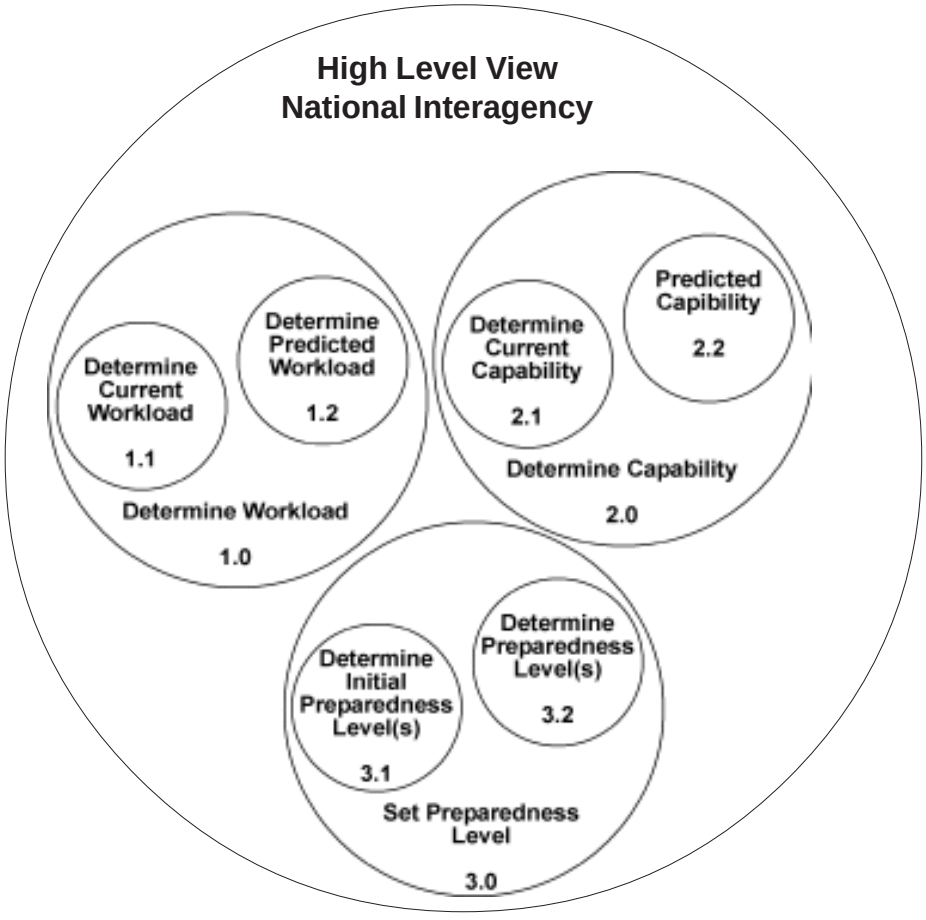
The first step of the analysis process was the creation of a context diagram. Context diagrams serve as a reference to define the scope of the area of study. The team constructed the following Context Diagram, which portrays the entire business of Preparedness Levels as a single process.



The boxes on the model identify the external interfaces (those persons, organizations, etc.) with whom Preparedness Level Process must interact. The arrows to and from the process circle depict information that flows in and out of the Preparedness Level Process. Finally, the parallel lines with a title between them indicate a data store. A data store can be thought of as a file cabinet, a database, or simply a place that you would go to retrieve information. The Context Diagram is a good tool for defining the scope of the Preparedness Level Business Process.

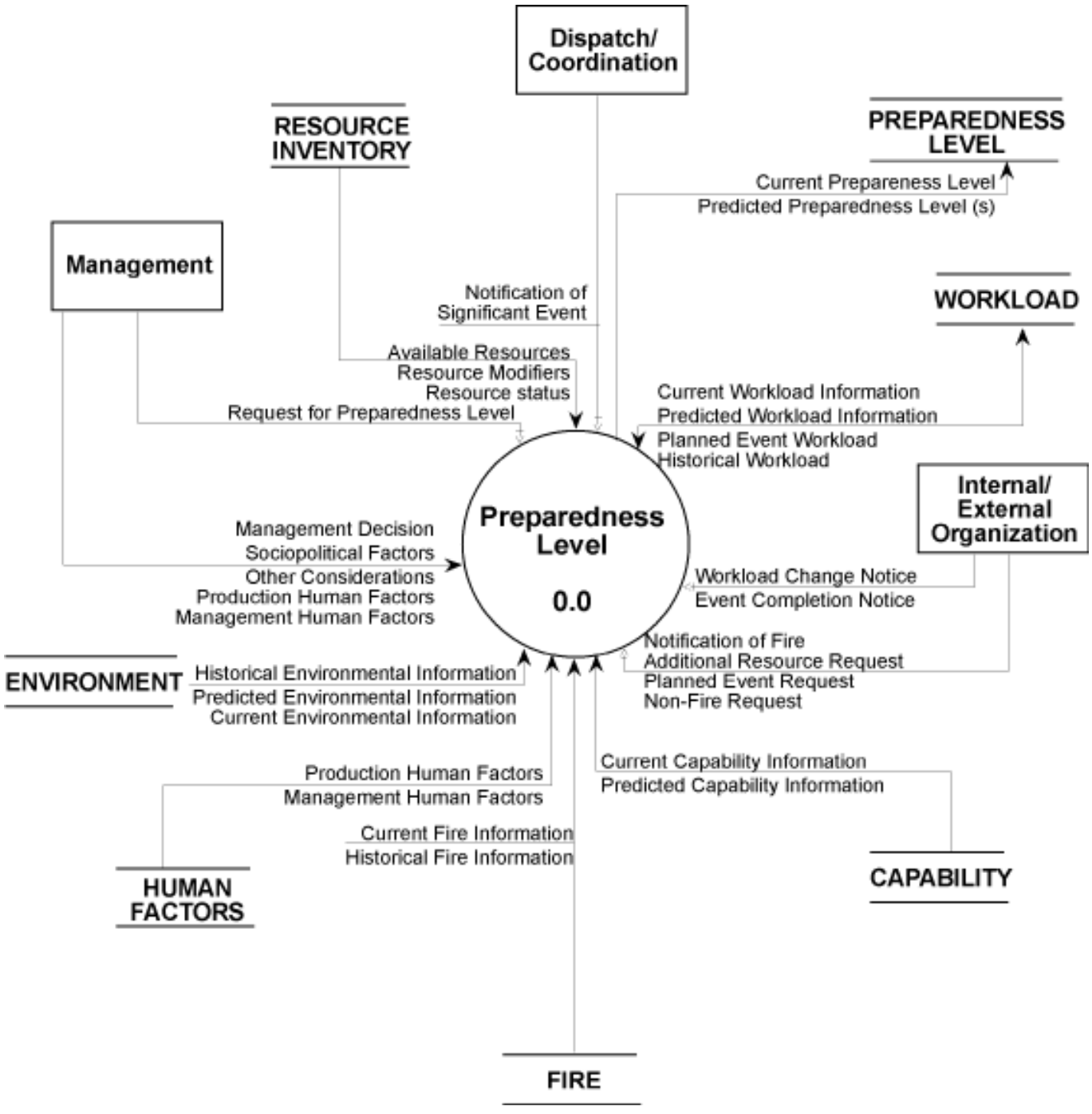
Process Models

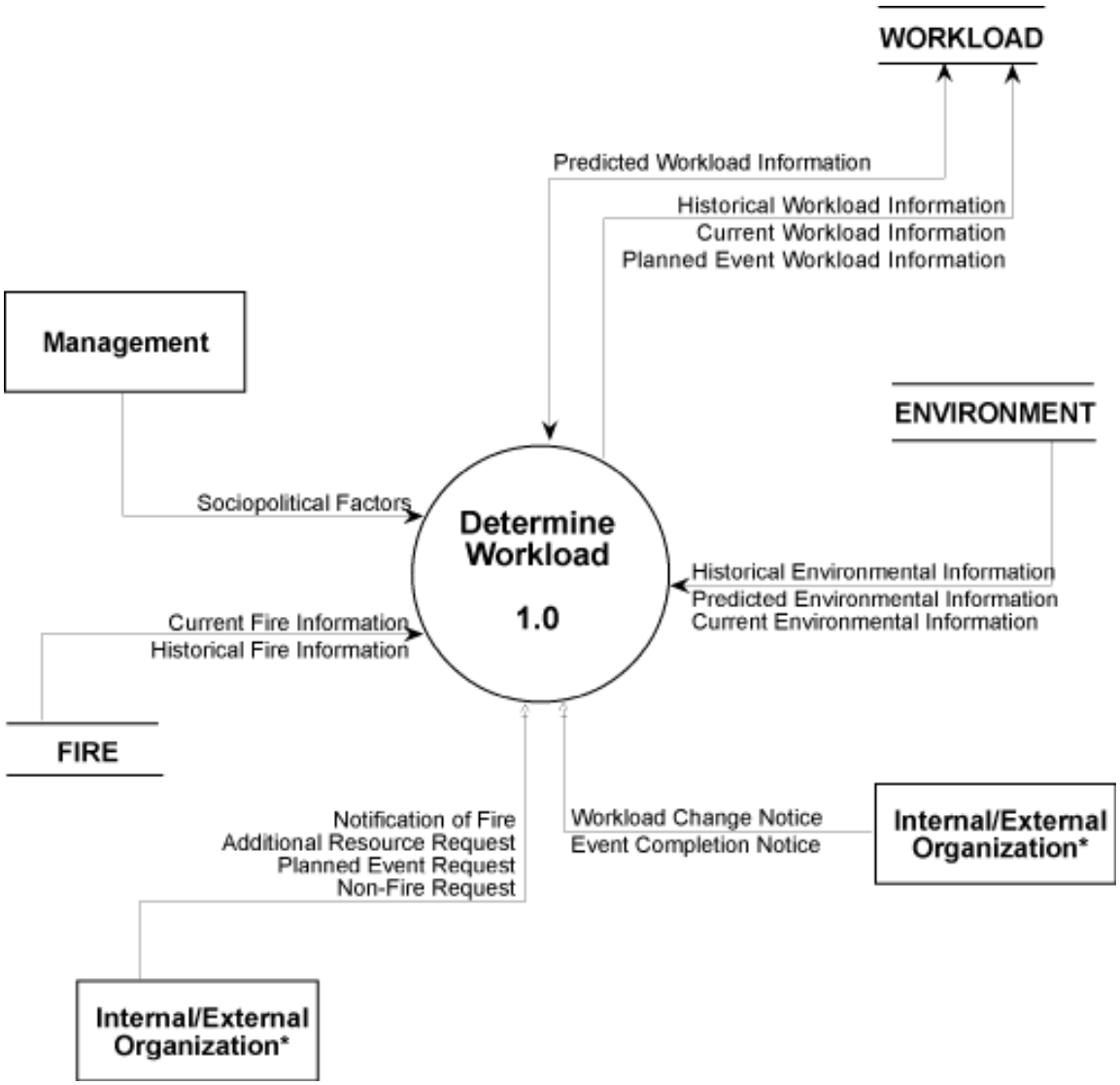
The next step in the analysis process was to develop process models for each task required in establishing preparedness levels. Process models document the series of tasks (processes) and the information (data) necessary to meet the demand of each business event trigger. Each process model consists of a data flow diagram (DFD), a process description, and associated data dictionary definitions (see appendix). The data flow diagram graphically depicts the process, while the process description provides a narrative explanation to support the data flow diagram. Data dictionary definitions are provided to data flows, data stores, and external interfaces shown on the data flow diagram. The process descriptions for 0.0, 1.0, 2.0, and 3.0 are contained with the detailed breakdown of the processes (e.g. 1.1, 1.2, etc.).

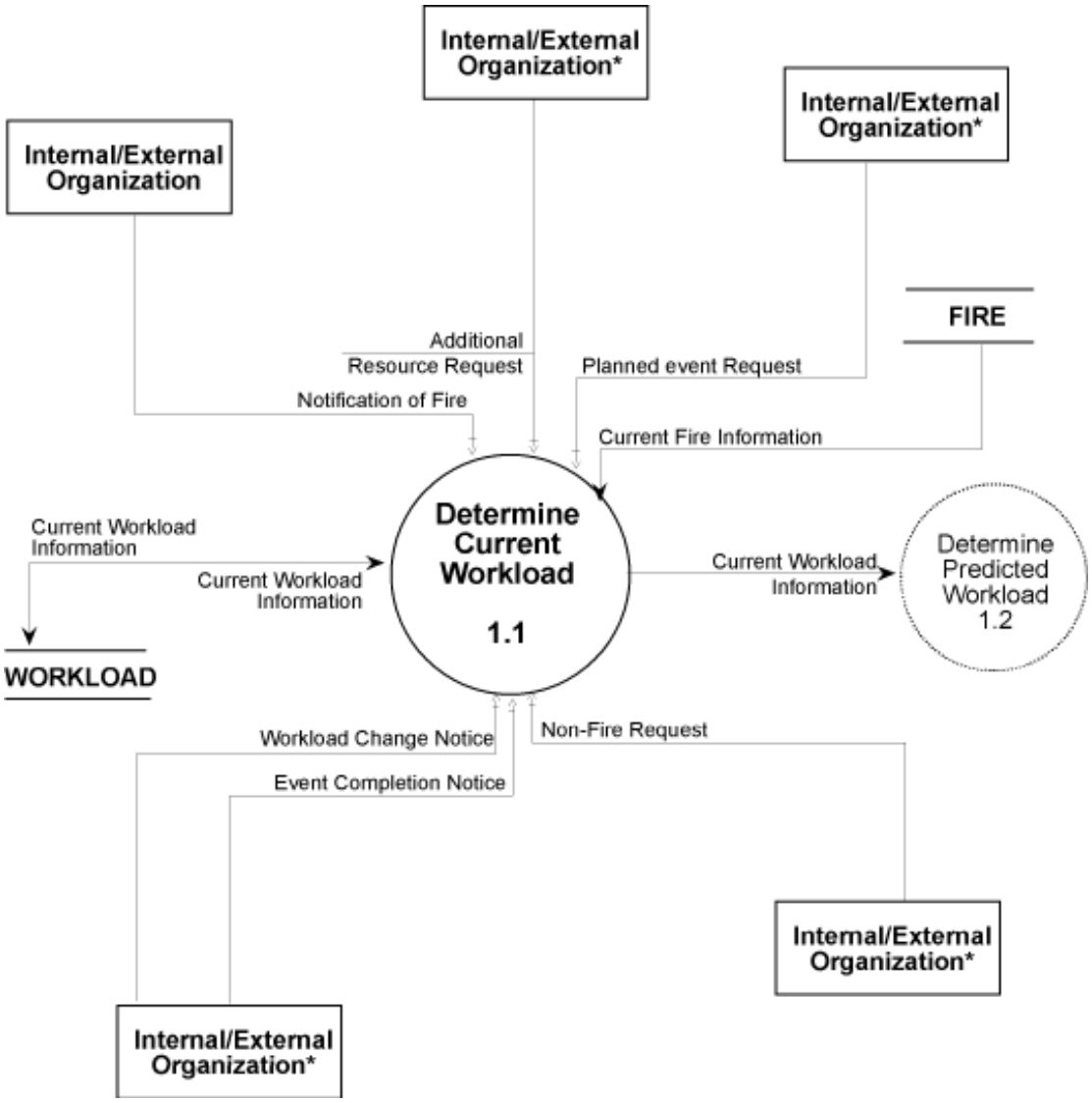


This graphic depicts the major components that comprise the national Interagency Preparedness Level Process. Each of the components are described in the detail of the process models. This is simply another way to view the entire model and its primary components.

Preparedness Level Business Model and Processes


Dispatch/ Coordination
RESOURCE INVENTORY
PREPAREDNESS LEVEL
Current Prepareness Level
Predicted Preparedness Level (s)
Management
Notification of Significant Event
WORKLOAD
Available Resources
Resource Modifiers
Resource status
Request for Preparedness Level
Current Workload Information
Predicted Workload Information
Planned Event Workload
Historical Workload
Internal/ External Organization
Management Decision
Sociopolitical Factors
Other Considerations
Production Human Factors
Management Human Factors
Preparedness Level 0.0
Workload Change Notice
Event Completion Notice
Notification of Fire
Additional Resource Request
Planned Event Request
Non-Fire Request
ENVIRONMENT
Historical Environmental Information
Predicted Environmental Information
Current Environmental Information
Production Human Factors
Management Human Factors
Current Capability Information
Predicted Capability Information
Current Fire Information
Historical Fire Information
HUMAN FACTORS
CAPABILITY
FIRE


WORKLOAD
Predicted Workload Information
Historical Workload Information
Current Workload Information
Planned Event Workload Information
Management
ENVIRONMENT
Sociopolitical Factors
Determine Workload 1.0
Historical Environmental Information
Predicted Environmental Information
Current Environmental Information
Current Fire Information
Historical Fire Information
FIRE
Notification of Fire
Additional Resource Request
Planned Event Request
Non-Fire Request
Workload Change Notice
Event Completion Notice
Internal/External Organization*
Internal/External Organization*



Triggers:

Planned Event Request
Additional Resource Request
Notification of Fire
Workload Change Notice
Event Completion Notice
Non-Fire Request

Business Rules which affect Current Capability

Program or project planning will not be included for purposes of determining workload for setting preparedness level

PROCESS Description:

Get Current Workload Information from WORKLOAD

If Receive Non-Fire Request from Internal/External Organization

Determine Non-Fire Workload
Add Non-Fire Workload to Current Workload Information
Store Current Workload Information to WORKLOAD
End if

If Receive Additional Resource Request from Internal/External Organization
Determine Additional Resource Workload
Add Additional Resource Workload to Current Workload Information
Store Current Workload Information to WORKLOAD
End if

If Receive Notification of Fire from Internal/External Organization
Get Current Fire Information from FIRE
Determine Assessment Workload
Add Assessment Workload to Current Workload Information
Determine Response Workload
Add Response Workload to Current Workload Information
Store Current Workload Information to WORKLOAD
End if

If Receive Planned Event Request from Internal/External Organization
Determine Planned Event Workload
Add Planned Event Workload to Current Workload Information
Store Current Workload Information to WORKLOAD

End if

If Receive Workload Change Notice from Internal/External Organization
If Workload is required
Determine Additional Workload
Add Additional Workload to Current Workload Information
End if
If Workload is reduced
Determine Reduced Workload
Subtract Reduced Workload from Current Workload Information
End if
Store Current Workload Information to WORKLOAD

End if

If Receive Event Completion Notice from Internal/External Organization
Subtract Remaining Workload associated with Event Completion Notice from Current Workload Information
Store Current Workload Information to WORKLOAD
End if

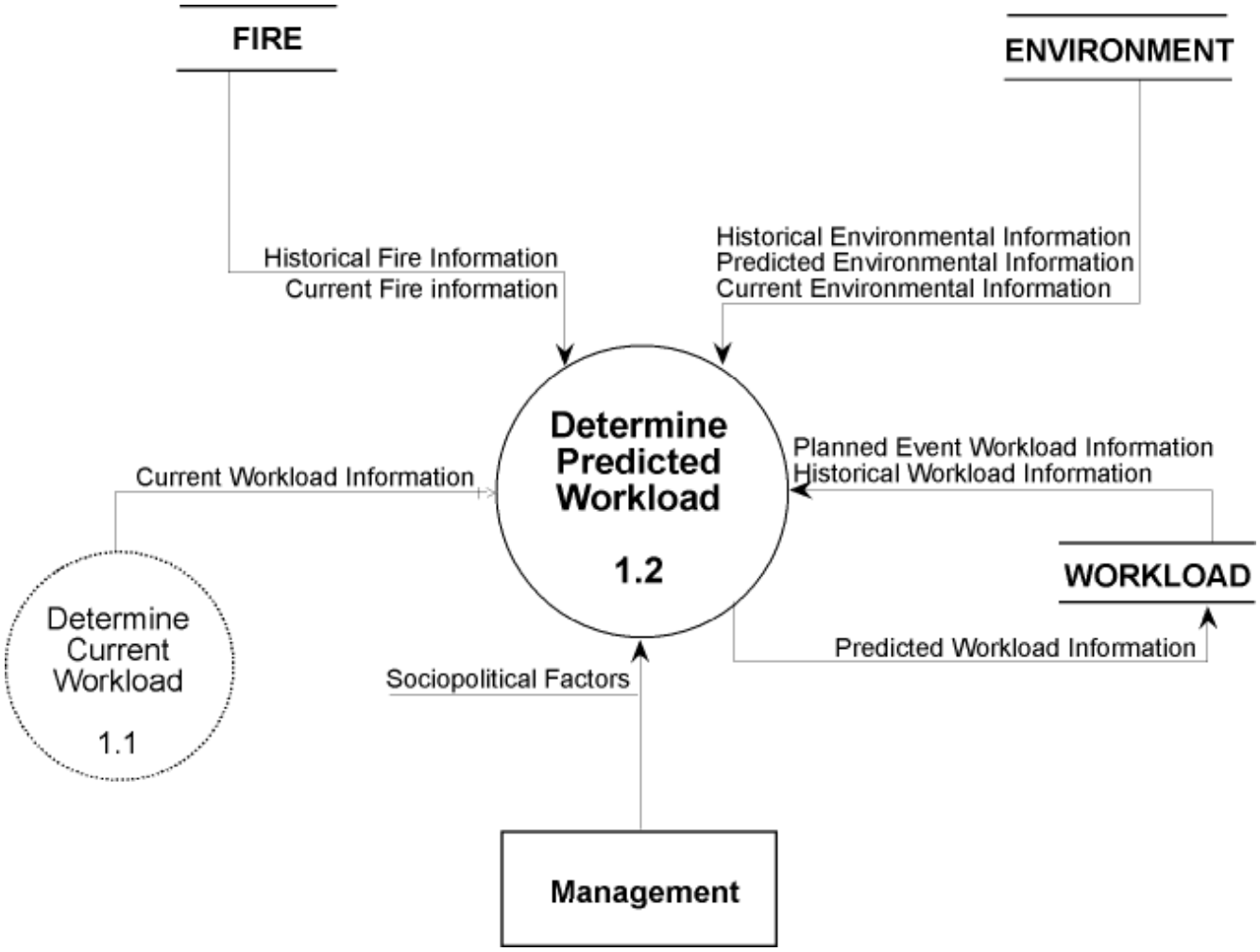
Current Workload Information is a function of Non-Fire Workload, Assessment Workload, Fire Workload, Planned Event Workload, Additional Resource Workload, Additional Workload, Reduced Workload and Remaining Workload, which is documented with the following formula:

$$W_C = \int(W_{NF}, W_A, W_F, W_{PE}, W_{VM}, W_R, W_{RM}, W_{AD}, ECN)$$

Where:

W_A = Assessment Workload
W_{AR} = Additional Resource Workload
W_C = Current Workload Information
W_{NF} = Non-Fire Workload
W_F = Fire Workload
W_{PE} = Planned Event Workload
W_R = Reduced Workload
W_{RM} = Remaining Workload
W_{AD} = Additional Workload
ECN = Event Completion Notice

Store Current Workload Information to WORKLOAD



Triggers:

Current Workload Information

Business Rules which affect Predicted Workload

Demand is considered only when it directly affects resources available for fire management

Process Description:

Receive Current Workload Information from "1.1 Determine Current Workload"
Get Historical Environmental Information from ENVIRONMENT
Get Current Environmental Information from ENVIRONMENT
Get Predicted Environmental Information from ENVIRONMENT
Determine Predicted Environmental Conditions, which is a function of Historical Environmental Information, Current Environmental Information, and Predicted Environmental Information and can be documented by the following formula:

$$EC_P = ¦(E_H, E_C, E_P)$$

Where:

EC_P = Predicted Environmental Conditions
E_H = Historical Environmental Information
E_C = Current Environmental Information
E_P = Predicted Environmental Information

Get Current Fire Information from FIRE
Get Historical Fire Information from FIRE
Determine Fire Potential, which is a function of Current Fire Information, Historical Fire Information and Predicted Environmental Conditions and can be documented by the following formula:

$$FP = ¦(FI_C, FI_{H,} EC_P)$$

Where:

FP = Fire Potential
FI_C = Current Fire Information
FI_H = Historical Fire Information
EC_P = Predicted Environmental Conditions

Get Historical Workload Information from WORKLOAD
Get Planned Event Workload Information from WORKLOAD
Get Sociopolitical Factors from Management

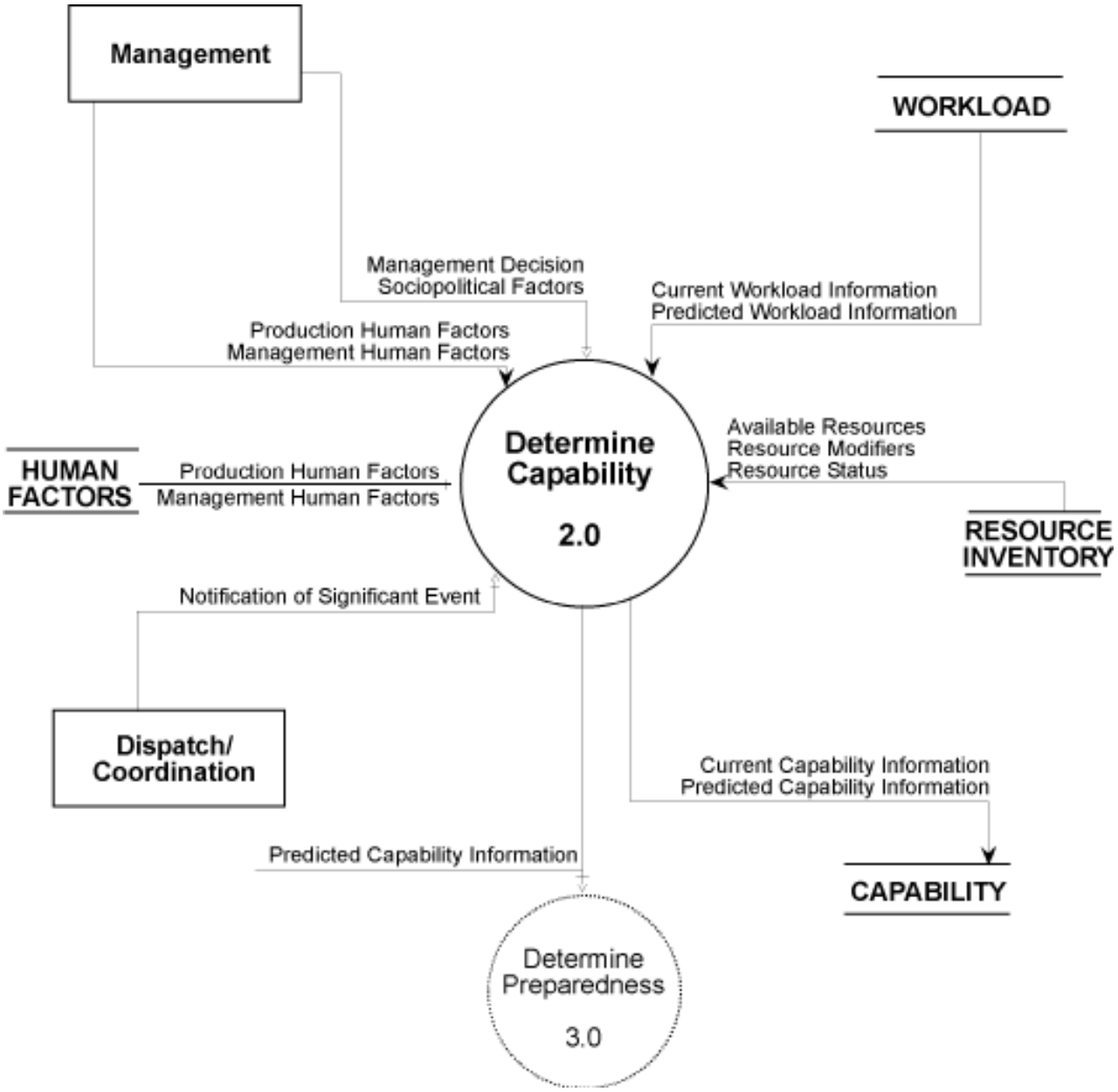
Determine Predicted Workload Information, which is a function of Fire Potential, Current Workload Information, Historical Workload Information, Planned Event Workload Information and Sociopolitical Factors which is documented with the following formula:

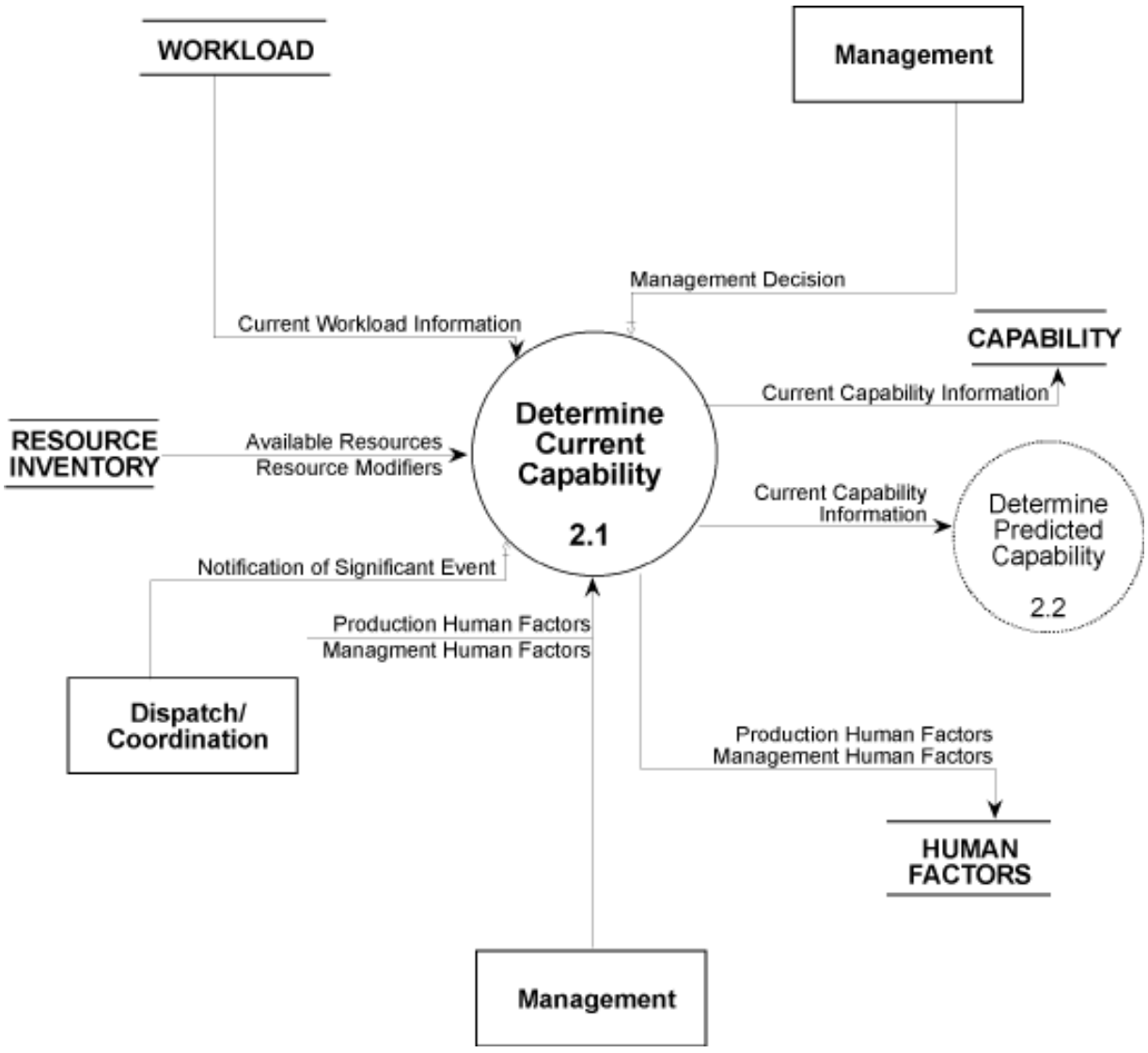
$W_P = ¦(FP, W_C, , W_H\ W_{PE}, SPF)$

Where:

W_P = Predicted Workload Information
FP = Fire Potential
W_C = Current Workload Information
W_H = Historical Workload Information
W_{PE} = Planned Event Workload Information
SPF = Sociopolitical Factors

Store Predicted Workload Information to WORKLOAD


Management
WORKLOAD
Management Decision
Sociopolitical Factors
Current Workload Information
Predicted Workload Information
Production Human Factors
Management Human Factors
Determine
Capability
2.0
Available Resources
Resource Modifiers
Resource Status
HUMAN
FACTORS
Production Human Factors
Management Human Factors
RESOURCE
INVENTORY
Notification of Significant Event
Dispatch/
Coordination
Current Capability Information
Predicted Capability Information
Predicted Capability Information
CAPABILITY
Determine
Preparedness
3.0



Triggers:

Notification of Significant Event
Management Decision

Process Description:

Receive Notification of Significant Event from Dispatch/Coordination
Get Available Resources for each Resource Type from RESOURCE INVENTORY
Get Current Workload Information from WORKLOAD
Get Resource Modifiers from RESOURCE INVENTORY
Determine Resource Availability Factor, which is a function of Available Resources, Current Workload Information and Resource Modifiers and can be documented by the following formula:

$$R_{AF} = \int(R_M, R_{A,} WI_C)$$

Get Management Human Factors from Management and/or HUMAN FACTORS
Get Production Human Factors from Management and/or HUMAN FACTORS
Determine Current Capability, which is a function of Resource Availability Factor, Management Human Factors, Production Human Factors, and Available Resources and can be documented by the following formula:

$$C_C = \int(R_A, HF_M, HF_{P,} R_{AF})$$

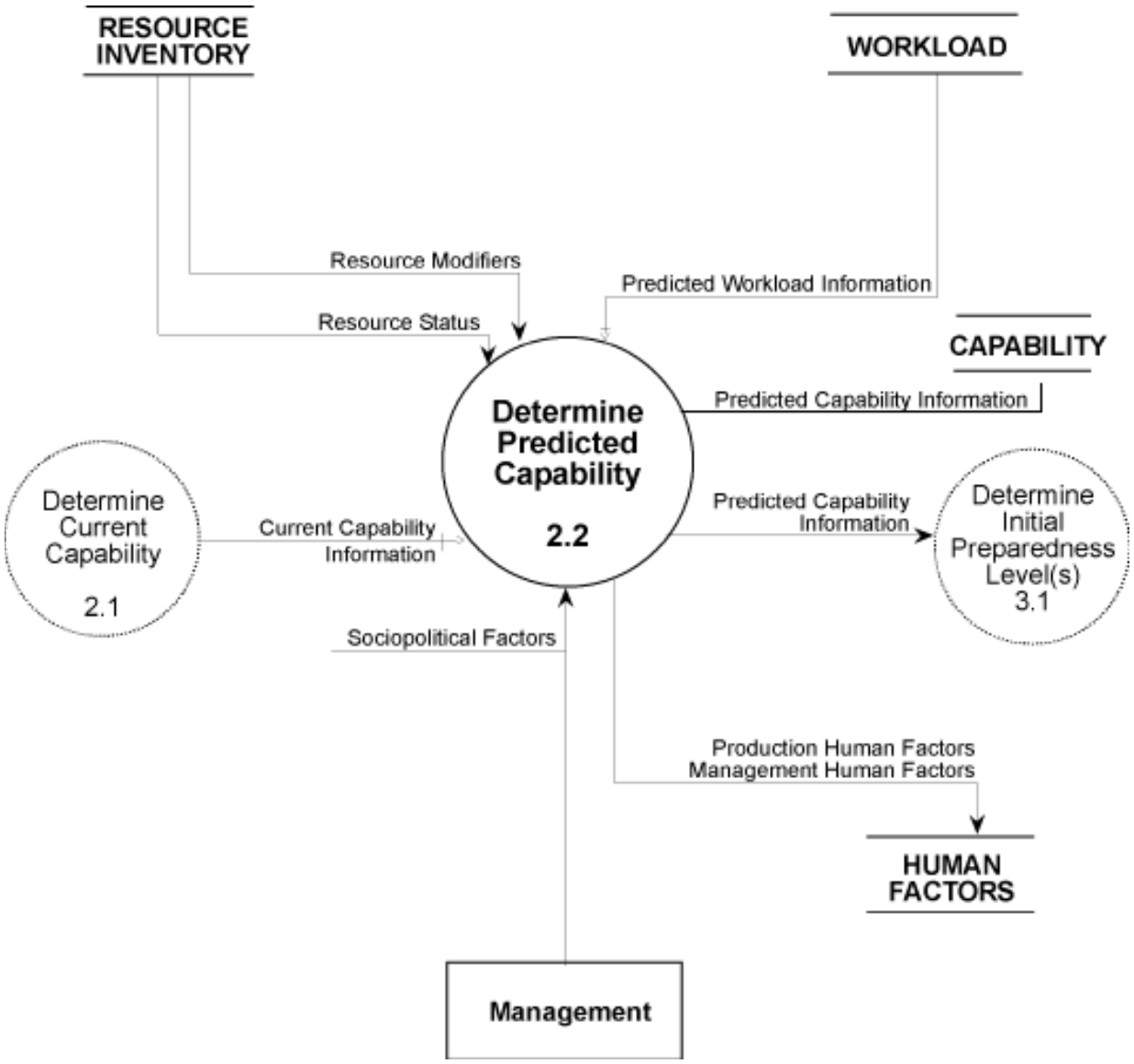
Store Current Capability Information to CAPABILITY
Store Management Human Factors to HUMAN FACTORS
Store Production Human Factors to HUMAN FACTORS

Where:

C_C = Current Capability
HF_M = Management Human Factor
HF_P = Production Human Factor
R_A = Available Resources
R_{AF} = Resource Availability Factor
R_M = Resource Modifiers
WI_C = Current Workload Information

Send Current Capability Information to "2.2 Determine Predicted Capability" Business Rules which affect Current Capability

- Resource Availability Policy
- National/Geographic Area/Sub-Geographic Area Mobilization Guides
- Interagency incident business management handbook
- National MAC Directives
- Geographic Area MAC Directives
- Compacts
- Other Agreements
- The Red Book
- There is no judgment regarding the condition of nonhuman resources. They are either available or not available.



Triggers:

Current Capability Information

Business Rules which affect Predicted Capability

Temporal and spatial rule

Process Description:

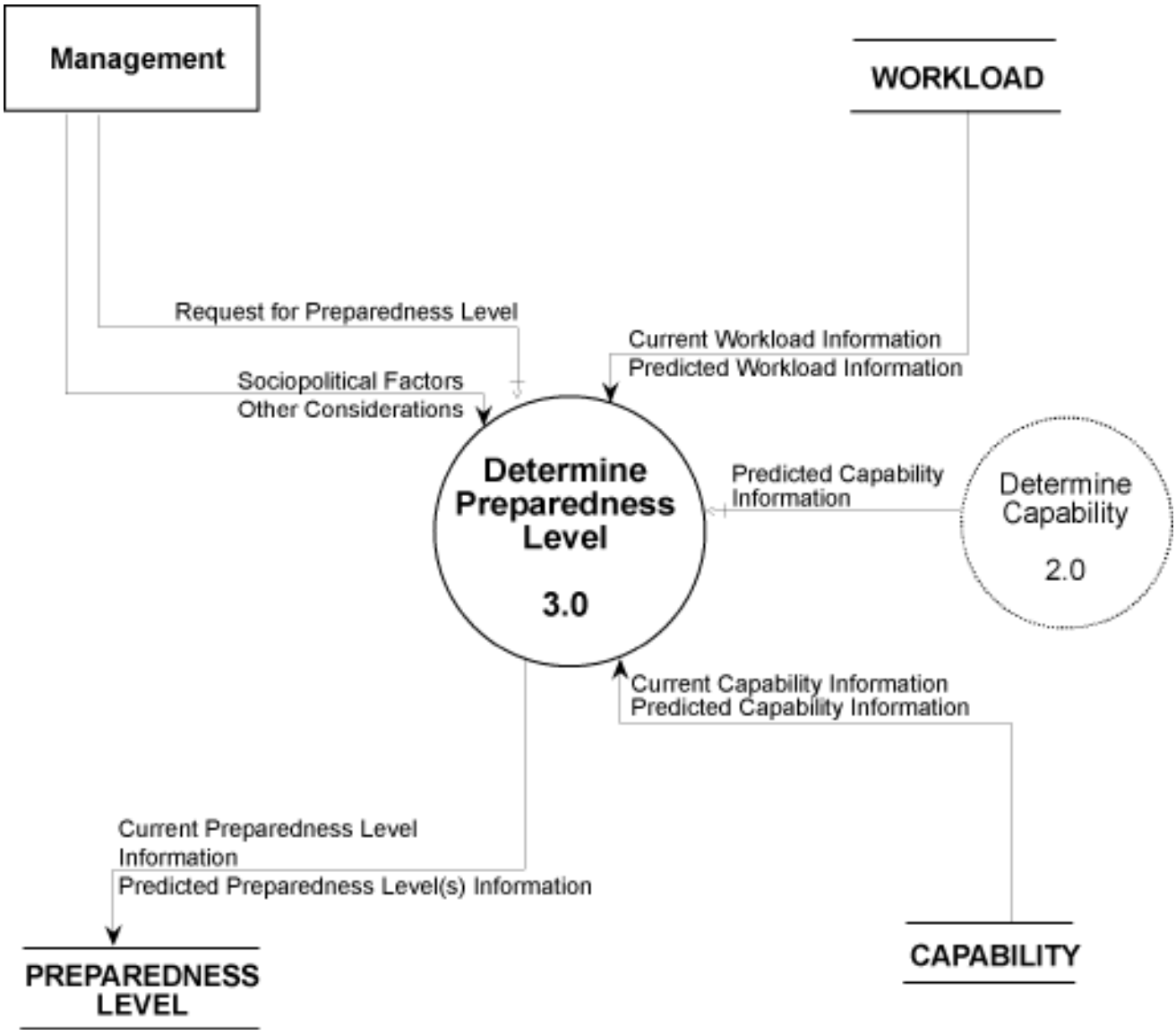
Receive Current Capability Information from "2.1 Determine Current Capability"
Get Resource Status from RESOURCE INVENTORY
Get Resource Modifiers from RESOURCE INVENTORY
Get Predicted Workload Information from WORKLOAD
Get Management Human Factors from HUMAN FACTORS
Get Production Human Factors from HUMAN FACTORS
Get Sociopolitical Factors from Management
Determine Predicted Capability Information, which is a function of Resource Status, Resource Modifiers, Predicted Workload Information, Current Capability Information, Management Human Factors, Production Human Factors and Sociopolitical Factors and can be documented by the following formula:

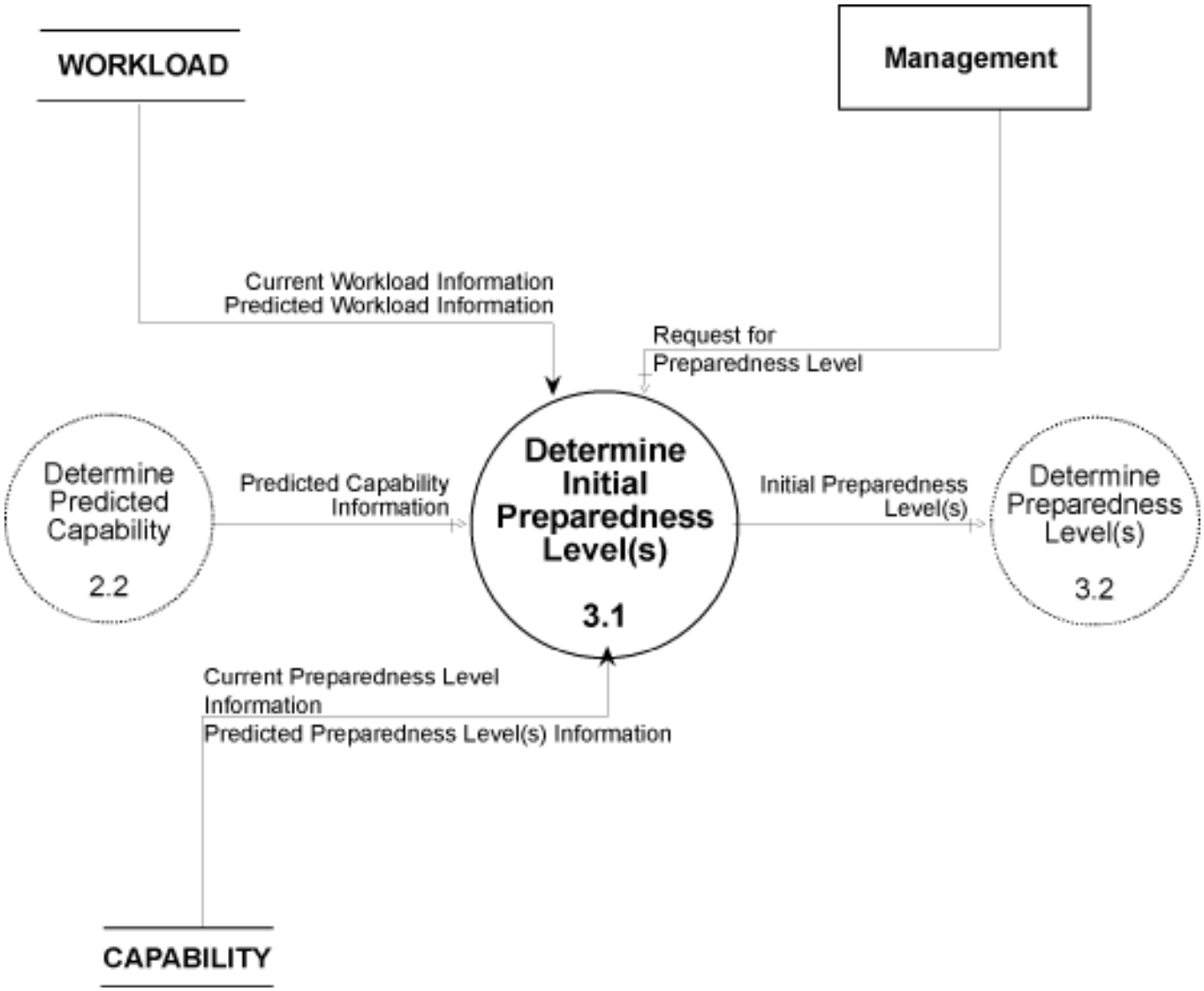
$$C_P = \int_i (RS, R_M, W_P, C_C, HF_M, HF_P, SPF)$$

Where:

C_P = Predicted Capability Information
RS = Resource Status
R_M = Resource Modifiers
W_P = Predicted Workload Information
C_C = Current Capability Information
HF_M = Management Human Factors
HF_P = Production Human Factors
SPF = Sociopolitical Factors

Store Predicted Capability Information to CAPABILITY
Send Predicted Capability Information to "3.1 Determine Initial Preparedness Level(s)"


Management
WORKLOAD
Request for Preparedness Level
Current Workload Information
Predicted Workload Information
Sociopolitical Factors
Other Considerations
Determine Preparedness Level
3.0
Predicted Capability Information
Determine Capability
2.0
Current Capability Information
Predicted Capability Information
Current Preparedness Level Information
Predicted Preparedness Level(s) Information
PREPAREDNESS LEVEL
CAPABILITY



Triggers:

Request for Preparedness Level
Predicted Capability Information

Business Rules which affect Predicted Capability

Temporal and spatial rule

Process Description:

If Receive Request for Preparedness Level from Management
Get Predicted Capability Information from CAPABILITY

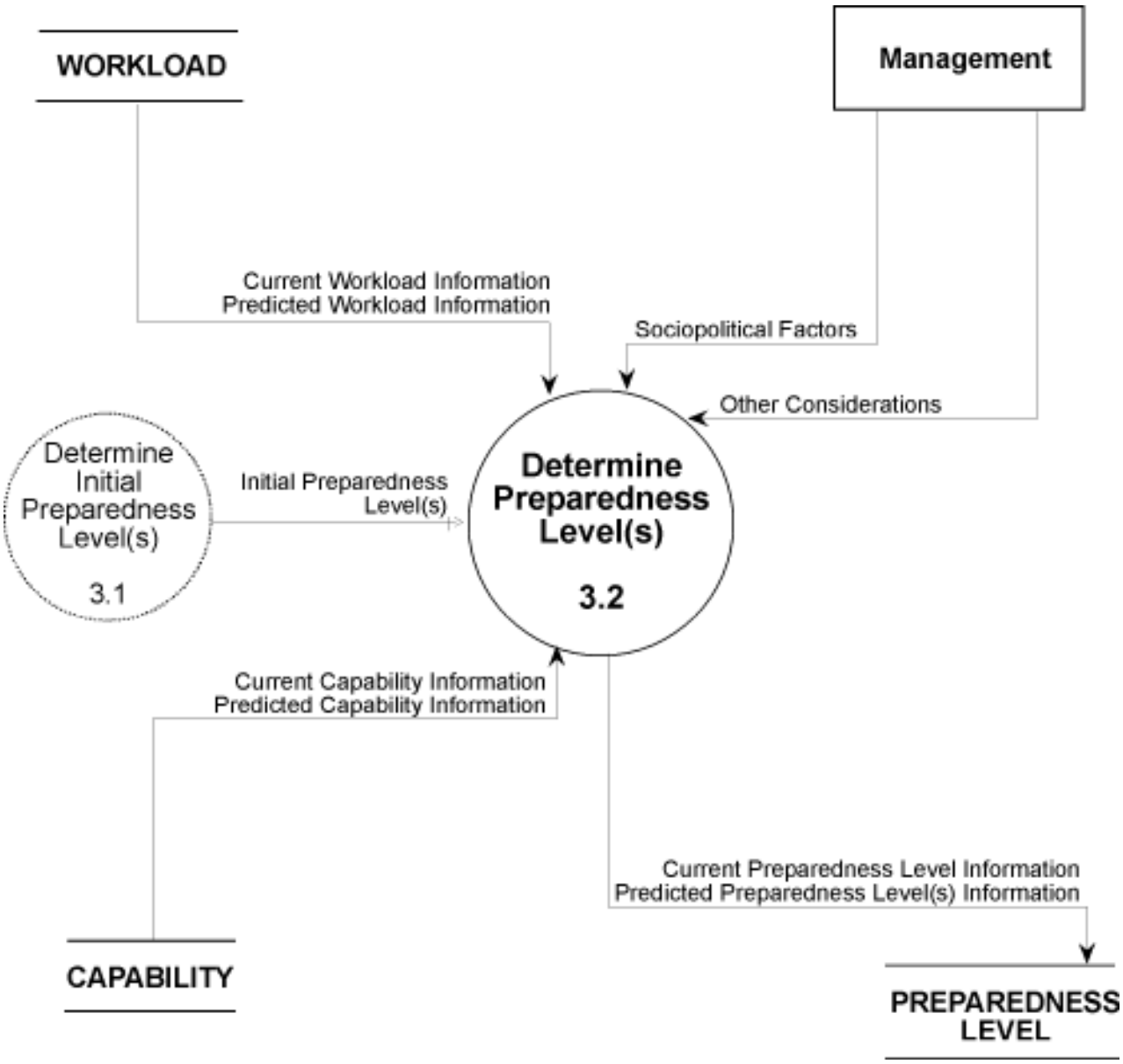
Else
Receive Predicted Capability Information from 2.2 Determine Predicted Capability
End If

Get Current Workload Information from WORKLOAD
Get Predicted Workload Information from WORKLOAD
Get Current Capability Information from CAPABILITY
Determine Initial Preparedness Level(s), which is a function of Current Workload Information, Predicted Workload Information, Current Capability Information and Predicted Capability Information and can be documented by the following equation:

$PL(s)_I = ¦_I(W_C, W_P, C_C, C_P)$

Where:
$PL(s)_I$ = Initial Preparedness Level(s)
C_P = Predicted Capability Information
W_P = Predicted Workload Information
W_C = Current Workload Information
C_C = Current Capability Information

Send Initial Preparedness Level(s) to "3.2 Determine Preparedness Level(s)"



Triggers:

Initial Preparedness Level(s)

Business Rules which affect Predicted Capability

Temporal and spatial rule

Process Description:

Receive Initial Preparedness Level(s) from "3.1 Determine Initial Preparedness Level(s)"
Display Current Workload Information from WORKLOAD
Display Predicted Workload Information from WORKLOAD
Display Current Capability Information from CAPABILITY
Display Predicted Capability Information from CAPABILITY
Get Other Considerations from Management that affect Preparedness Level(s)
Get Sociopolitical Factors from Management

Determine Current Preparedness Level considering Workload Information and Capability Information, which is a function of Initial Preparedness Level(s), Sociopolitical Factors and Other Considerations and can be documented by the following equation:

$$PL_C = \int_I (PL(s)_I, SP, OC)$$

Determine Predicted Preparedness Level(s), considering Workload Information and Capability Information, which is a function of Initial Preparedness Level(s), Sociopolitical Factors and Other Considerations and can be documented by the following equation:

$$PL(s)_P = \int_I (PL(s)_I, SP, OC)$$

Where:

$PL(s)_I$ = Initial Preparedness Level(s)
$PL(s)_P$ = Predicted Preparedness Level(s)
PL_C = Current Preparedness Level
SP = Sociopolitical Factors
OC = Other Considerations

Store Current Preparedness Level Information to PREPAREDNESS LEVEL
Store Predicted Preparedness Level(s) Information to PREPAREDNESS LEVEL

Validation Process

Reviewers

To validate the Preparedness Level Business Model, eight review sessions at various locations across the U.S. were conducted with representatives of the wildland fire community. The purpose of the review sessions was to validate specific business event processes and data, and to improve the business model. Each session was facilitated and the reviewers were asked to examine a given task within the entire preparedness level process and develop their own process model for that task. Only after they had created their own process model did the NPL project team share what they had come up with for the same task. A list of reviewers is located in Appendix B.

The models developed by the reviewers at the validation sessions were evaluated by the project team and used to update the existing models as appropriate.

Review Results

As part of model validation, the project team documented what the reviewers liked and did not like about the current system and what they would like to see in a future system. This information is located in Appendix C.

Review Locations

Conclusions and Recommendations

Conclusions

The NPL Study Team that developed this model believes that a national Interagency Preparedness Level Process can and should be developed and implemented. A uniform method of setting preparedness level at the eleven Geographic Area Coordination Centers and the national Interagency Coordination Center is long overdue.

Recommendations

- Develop and implement a uniform national interagency process for setting preparedness levels.

- Consider development of a "proof of concept" version of the system that:
  - Identifies existing knowledge that can be applied
  - Identifies limits of "off the shelf" knowledge
  - Identifies where additional knowledge has to be developed
  - Is tested and validated in the field

- Develop a national system (application) to aid the preparedness level setting process.

- The system should:
  - Accommodate scenario (what if) planning
  - Provide sufficient information regarding what caused the PL and its components to change
  - Incorporate draw down thresholds.
  - Include on-line training capability
  - Include documentation of the system logic
  - Include the capability to perform trend analysis or interface with "off the shelf" trend analysis software

- Actions to be taken at each Preparedness Level need to be developed and agreed upon at the national, geographic area and sub-geographic area level

- Inventory existing models and ongoing research that has applicability to this project / model. Identify points of contact, etc.

- Develop a web site and keep it updated with project status and information

- Develop a Communication Plan to disseminate project information to stakeholders

Benefits

Through the development of this national multi-agency preparedness planning process, the fire management decision process will be maximized to accomplish more work and benefits at less risk and cost across the full range of fire management activities. Such an innovative, universal preparedness planning model will also help reconcile those situations in which either wildland or prescribed fire demands are projected to exceed available resources.

The primary group of federal, state, and local users and customers who will directly benefit from this project include: agency administrators, fire managers, dispatch and intelligence coordinators, predictive services, and numerous people inside and outside the various wildland fire agencies.

A common set of benefits applies to each user group, such as the knowledge of current and future scenarios, or the forecast of future fire management workload and capability. Benefits include but are not limited to: integration of the new evolving methods to assess and predict environmental conditions (atmospheric and vegetative), and direct use of information available from the Resource Ordering and Status System (ROSS). ROSS provides a more realistic view of wildland fire agency capability to respond to workload demands, thus simplifying a complex set of dynamic factors—each with their own probabilities and associated uncertainty.

Providing this information to decision makers will result in accomplishing more work in a reduced-risk environment through the allocation of the right resource, to the right place, at the right time. "Poor" or "late" decisions within the wildland fire environment have significant potential to initiate or multiply adverse impacts socially, ecologically, and fiscally. The wildland fire program has long needed better decision support methods and tools that facilitate proactive decisions and the corresponding desired results.

Recommended Approach for Phase II

1) Present the models and findings from Phase I to the Managers of the National and Geographic Area Coordination Centers who are the Principal Project Sponsors.
2) If the Coordination System Managers support the recommendation to proceed with the next phase to develop and implement a national preparedness level process, have them task a group to develop the "Business Case" according to the All-300 OMB Capital Planning and Investment Control (CPIC) process. This process includes a feasibility study.
3) Completion of the OMB CPIC process will serve as the Project Charter for the next phase and it will facilitate development of a Project Plan for Phase II including the identification of a project management structure.

Data Element Dictionary

Data Element	Definition	Reference
Additional Resource Request	Request for Additional Resources	1.0, 1.1
Additional Resource Workload	Workload associated with a request for additional resources	1.1
Administration Willingness to Release Resources	Agency administrator's and supervisors responsibility and willingness to support wildland fire projects and tasks through the commitment of resource items. This is a component of Management Human Factors	
Assessment Workload	Workload associated with assessing the appropriate response to a reported fire up to initiating the response.	1.1
Available Resources	Resources available for assignments by type and constraint.	2.0, 2.1
Capability	The ability of the wildland fire program to respond to current and anticipated workload needs	
CAPABILITY	Data Store containing information about Current Capability and Predicted Capability	2.0, 2.1, 3.0, 3.2
Constraints	Component of Resource Modifiers	2.1
Cumulative Fatigue	The increasing state of weariness from mental and/or physical exertion over an extended period of time. Component of Production Human Factors	
Current Capability	The ability of the wildland fire program to respond to workload needs at the present time.	2.1, 2.2
Current Capability Information	Information in the CAPABILITY Data Store pertaining to Current Capability	2.0, 2.1, 2.2, 3.0, 3.1, 3.2
Current Environmental Information	Factual information relating to present meteorological/atmospheric, geographic and vegetative/terrestrial variables which influence workload	1.0,1.2
Current Fire Information	Factual information relating to present wildland fire situation	1.0, 1.1, 1.2

Data Element	Definition	Reference
Current Preparedness Level	Determined Preparedness Level for the current period	3.2
Current Preparedness Level	Information about the preparedness level for the current period stored Information in the PREPAREDNESS LEVEL data store.	3.0, 3.2
Current Workload	Present workload in an incomplete or unfinished state.	1.0, 1.1, 1.2
Current Workload Information	Information from the WORKLOAD Data Store pertaining to the Current Workload	2.0, 2.1, 3.0, 3.1, 3.2
Depth of Experience	Component of Production Human Factors	2.1
Dispatch/Coordination	A unit within the wildland fire organization responsible for coordination, resource movement and logistical support to wildland fire and other events. The unit is also responsible for resource statusing, situation reporting, and may be responsible for predictive services.	2.0, 2.1
Distance	Number of miles from the place where resource is located to the incident. May be calculated by statute miles or nautical miles. Component of Resource Modifiers	2.1
ENVIRONMENT	Data Store containing Historic Environmental Information, Predicted Environmental Information, and Current Environmental Information. Meteorological/atmospheric, geographic and vegetative/terrestrial variables which influence workload	1.0, 1.2
Event Completion Notice	Notification of the completion of an event.	1.0,1.1
External Organization	Local, state or federal organization or group that is organized for some specific purpose, that is not represented under the NWCG. Component of Internal/External Organization	1.0,1.1,1.2

Data Element	Definition	Reference
FIRE	Data Store containing Current Fire Information and Historic Fire Information. Information relating to wildland fire situation including components such as fire behavior and "threats", and number of fires and acres burning or which have burned, or which may burn.	1.0, 1.1, 1.2
Fire Potential	An assessment derived from current and historical fire information combined with predicted environmental conditions	1.2
Historical Environmental	Information Factual information relating to past meteorological/atmospheric, geographic and vegetative/terrestrial variables which influence workload	1.0, 1.2
Historical Fire Information	Factual information relating to past wildland fire situation	1.0, 1.2
HUMAN FACTORS	Data Store containing information related to Production Human Factors, and Management Human Factors. Psychological and physiological characteristics of an individual that affect human performance in the context of the wildland fire system.	0.0, 2.0, 2.2
Initial Preparedness Level(s)	Preliminary determination of Preparedness Level(s).	3.1, 3.2
Internal Organization	Local, State or Federal organization represented under the National Wildfire Coordinating Group that provides resources or support to incidents. (Adapted from ROSS glossary) Component of Internal/External Organization external entity.	1.0, 1.1, 1.2
Internal/External Organization	Combination of Internal and External Organizations	1.0,1.1,1.2

Data Element	Definition	Reference
Location	Physical location of a resource as it relates to the location of an incident. (ROSS: Defined physical site of significance) Component of Resource Modifier	
Management	Combination of resources under common direction with responsibility for effectively accomplishing stated objectives pertaining to a project or organization. (yellow book – component definitions – 101 and 134)	1.0, 1.2, 2.0, 2.1, 2.2, 3.0, 3.1, 3.2
Management Decision	Issuance of new or changed regulations or rules that affect capability, such as: work/rest guidelines, willingness to release resources.	2.0, 2.1
Management Human Factors	Human factors relating to Management (e.g., Supervisory Oversight, Rules and Regulations, Manuals, Span of Control, Administration Willingness to release resources, Workforce Ethics and Values, Work/Rest Requirements)	2.0, 2.1
Manuals	Body of policy that regulates the management of incidents. Component of Management Human Factors	2.1
Non-Fire Request	Any request for resources for a non-fire event such as natural disaster, homeland security, which is unscheduled and have not planned a response	1.0, 1.1
Non-Fire Task	Non-discretionary workload that must be performed by the land management agencies in addition to Wildland fire. (e.g., terrorist attack, natural disaster)	
Non-Fire Workload	Workload associated with a request for fire resources for a Non-Fire Task.	1.0, 1.1
Notification of Fire	Notification of a sighting of a potential wildland fire requiring action by the wildland fire community.	1.0, 1.1

Data Element	Definition	Reference
Notification of Significant Event	Notification of an event or collection of events Dispatch/Coordination	2.0, 2.1
Organization	internal or external group forming a unified body of persons organized for some specific purpose	
Other Considerations	Other things that management takes into account when setting final preparedness level(s)	3.0, 3.2
Planned Event	Unanticipated event that has an impact on capability and/or workload. (e.g., training, vegetation modification, prevention) which the wildland fire community prepares for and responds to.	
Planned Event Request	Request for wildland fire support for participation in a Planned Event.	1.1
Planned Event Workload	Information pertaining to the workload associated with a planned event	1.2
Predicted Capability	The ability of the wildland fire program to respond to predicted workload needs.	
Predicted Capability Information	Information in the CAPABILITY Data Store pertaining to the Predicted Capability and is input to Determine Preparedness.	2.0, 2.2, 3.0, 3.1, 3.2
Predicted Environmental Conditions	A future condition calculated from (Historic) Environmental Information, (Current) Environmental Information, and (Predicted) Environmental Information	1.2
Predicted Environmental Information	Forecast or modeled information relating to meteorological/atmospheric, geographic and vegetative/terrestrial variables which influence workload	1.0, 1.2
Predicted Preparedness Level(s)	Determined Preparedness Level(s) for one or more future time periods.	3.2
Predicted Preparedness Level(s)	Information relating to the Predicted Preparedness Level(s) Information	3.0

Data Element	Definition	Reference
Predicted Workload	Expected amount of tasks determined by combining Planned Event Workload, Fire Potential and Current Workload adjusted by Sociopolitical Factors	
Predicted Workload Information	Information in the WORKLOAD Data Store pertaining to the Predicted Workload	1.0, 1.2, 2.0, 2.2, 3.0, 3.1, 3.2
Preparedness	The condition or degree of being ready to cope with a situation.	
PREPAREDNESS LEVEL	Data Store for storing information about Preparedness Levels	3.0, 3.2
Preparedness Level(s)	A numeric value representing a combination of components to gauge workload, capability and associated actions. The actions associated with preparedness levels are intended to accomplish more work at a lower state of risk.	3.2
Production Human Factors	Human factors relating to Production (e.g., Cumulative Fatigue, Skill level, Depth of Experience, Training)	2.1
Remaining Workload	The amount of work that was requested and not filled when a Workload Completion Notice is received	1.1
Request for Preparedness Level	Management request to evaluate and set Preparedness Level	3.0, 3.1
Resource Availability Factor	Function of Resource Modifiers, Available Resources, and Current Workload Information	2.1
Resource Information	Information in the RESOURCE INVENTORY DATA data store pertaining to RESOURCE INVENTORY	
RESOURCE INVENTORY	A listing of all resources that could potentially be mobilized to support incidents or events. May be outside the resources accounted for in ROSS.	2.0, 2.1, 2.2

Data Element	Definition	Reference
Resource Modifiers	Response Time, Distance, Location, Rotation Time frames, Transitions, Constraints	2.0, 2.1
Resource Status	Description of the current state of all resources in Resource Inventory	2.0, 2.1, 2.2
Resource Type	Classification of the capability of a particular resource	2.1
Response Time	Time it takes from initial incident resource order to check in on incident. Component of Resource Modifier	2.1
Response Workload	Workload associated with implementing the appropriate response to notification of fire.	1.1
Rotation Time frames	Component of Resource Modifiers	2.1
Rules and Regulations	Written policies that govern fire management. Component of Management Human Factors	2.1
Significant Event	Any event or collection of events that causes a reconsideration of a model component	
Skill Level	Combination of training and experience. Assessment of competence to perform as assigned. Component of Production Human Factors.	1.2
Socio-political Factors	Impacts to agency activities from non-agency sources. (e.g., special interest groups, local communities, political factors)	1.0, 1.2, 2.0, 2.2, 3.0, 3.2
Span of Control	The ability of the organization to field effective management, measured by the ratio of resources to supervisors. Component of Management Human Factors. The supervisory ratio of from three-to-seven individuals, with five-to-one being established as optimum (NWCG glossary)	2.1
Supervisory Oversight	Oversight by individual responsible for command of resources on an incident. Component of Management Human Factors	2.1

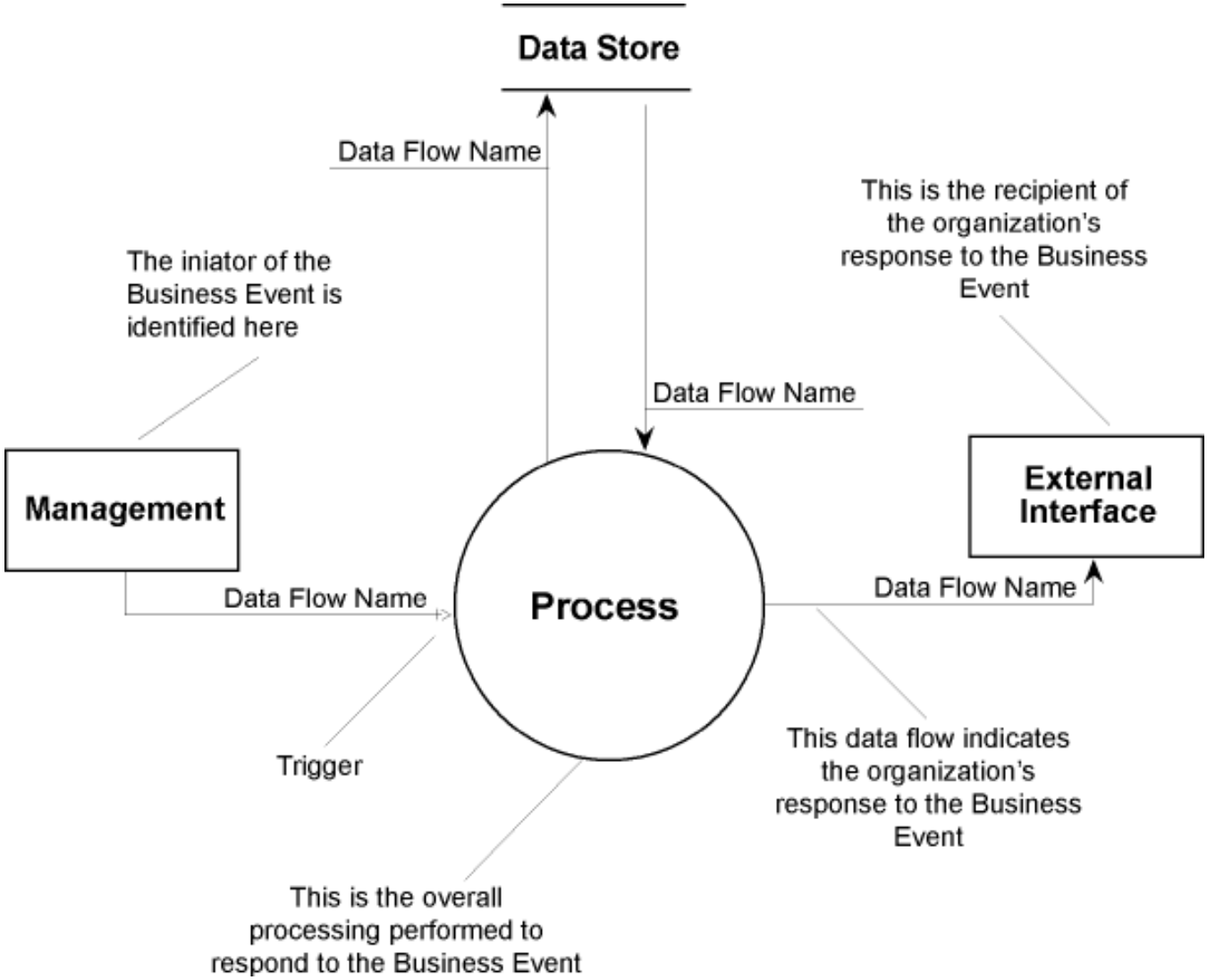
Data Element	Definition	Reference
Training	Programs established to develop employees' qualifications. Component of Production Human Factors	2.1
Transitions	Transfer of command from one entity to another. Component of Resource Modifiers.	2.1
Unplanned Event	Information pertaining to the workload associated with an unanticipated event.	1.2
Vegetation Modification	Modification of vegetation in support of cultural and historical objectives, ecosystem maintenance, fuel modification, and restoration (recreation, business, biological) for habitat improvement. (Yellow Book – page 145)	1.1
Work/Rest Requirements	Ratio of work to rest as defined by policy. Component of Management Human Factors	
Workforce Ethics and Values	Generational and cultural changing social mores and added emphasis on home and family life over commitment to long term and multiple assignments. Component of Production Human Factors	2.1
WORKLOAD	Data Store containing Current Workload Information and Predicted Workload Information	1.0, 1.1, 1.2, 2.0, 2.1, 3.0, 3.1, 3.2
Workload	The effort required to complete a task considering basic characteristics, complexity and time required for completion.	
Workload Change Notice	Notification that triggers a recalculation of current workload.	1.1

Appendix A
How to Read and Understand the Business Model

How to Read the Data Flow Diagram

Find the "Trigger Data Flow" (the arrow with the "hash mark") on the data flow diagram. The Trigger Flow identifies what type of information is being received regarding the Business Event. The initiator of the information flow is identified in the External Interface box. Definitions of symbols (external interfaces, data stores, data flows, and trigger data flows) and a list of their components can be found in the data dictionary at the back of the Model.

Read through the Business Event Process description to obtain an understanding of the activities that occur inside the process circle.



Appendix B
Business Model Reviewers

Validation Session Interagency Participants

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Rusty Billingsley	NWS
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Appendix C
User Wants in a Preparedness Level System

What do you want to see in a future system that determines Preparedness Level's?

- Consistency in application / calculation of Preparedness Levels
- Consider status of all resource types (different types may need to be weighted)
- Keep the PL system simple
- Setting of PL should be a collaborative effort among agencies
- Accepted and understood by all agencies / stakeholder
- Stability / sensitivity of model is balanced / changing daily
- Maintain flexibility in the system of how levels are set
- Clear definition of the key elements of the system to reduce subjective interpretation
- Consistency across the country in how the PL is determined
- Output PL's mean the same thing across the country
- Benefits prescribed fire activities and targets including flexibility to conduct RX fire when some areas are at high PL's
- Improved mechanism for prioritizing the full range of activities including fire suppression, fuels management, wildland fire use, and other critical activities
- System reliability
- Capability to include "subject" inputs which provides system flexibility
- Maintain the strength of the current system at defining the level of activity at the national and geographic area level
- Maintain the current numbering structure (i.e. PL 1-5) that works well especially at preparing folks for rising fire probability and corresponding resource needs
- The influence of draw down levels need to be included in system
- Performance needs and expectations of the individuals who operate or influence the system inputs needs to be made clear
- System should include and consider all-risk or non-fire type of workload
- System should allow for subjective management overrides
- Remove the "game playing" from the system
- Ability to compare major system components between geographic areas
- More objectivity and less subjectivity
- A "bottom-up" as opposed to a "top-down" process
- A standard template of inputs and processes from the local area to the national level
- Flexibility to include considerations and factors not normally in the process
- A proactive system that goes out beyond 24 hours to days and weeks in the future
- A system that facilitates understanding of the implications of PL changes on neighboring geographic areas and local units
- A system that measures like things in a similar manner
- Wild field involvement in the development and validation process
- Applicable to all organizational levels as well as all agencies
- Incorporates "hard target, non-fire workload"
- A system that facilitates accountability commitment to taking the necessary actions
- Attention to fire prevention and its essential role

- Highlighted information regarding the reasoning for changes in the PL
- Established guidelines on the actions to be taken for each PL
- Ability of the system to display information as to why the PL's are predicted to change may facilitate discussion of actions that might have a positive influence on the PL (e.g. the types and number of resources that are made available)
- Facilitate the discovery of actions that reduce the PL to acceptable levels (e.g. movement of resources between geographic areas)
- There are defined actions & responsibilities at all different levels

What do you NOT want to see in a future system that determines Preparedness Level's?

- An implemented system where each area has their own interpretation of terms
- The term "Preparedness" - change the term back to "Planning" levels
- Systems complexity to the point where the process does not make sense
- Inconsistent application and process
- Less ownership and involvement in the system than the current process
- A system that is not useful at the local level
- A process that is so "black box" oriented that it inhibits communication
- A "tail wagging the dog" type of system
- A predominantly fire centric process as it needs to address all kinds of incidents
- A system that adds workload without a commensurate increase in value or efficiency
- Poor lead times to initiate actions
- A system that is focused on the national level at the expense of reflecting local needs and conditions
- A system that does not incorporate "agency" needs
- A "black box" system that is difficult to understand in concept and in operation and can not be "over ridden"
- A system that is difficult to see how it accommodates prescribed fire
- A standard and uniform process that is too restrictive
- A newly developed system that is severely limited in functionality by funding
- A system that is limited to looking at "committed resources"
- A system that is overly subjective and susceptible to manipulation or misinterpretation
- A system that allows arbitrary decisions
- A system that lacks consistency
- A process that focuses solely on Calculating the PL's at the expense of taking a fresh look at the "action" tied to the PL's
- A process that is so centrally controlled that local managers have no decision space
- A process that is built on enforceable consequences related to "actions"

Appendix D
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Appendix E
Process Description Terminology

Term	Definition
Determine	Gather and use existing objective and subjective information to establish a value to be factored into the process
Display	Show data on screen and/or report
Get	Retrieve data from a data store
Identify	No judgment is involved
If, Else, Endif not met	Everything between the Else and the Endif is processed only if the “IF” condition is
If, Endif	Everything between the If and Endif is processed only if the specified condition is met
Receive	Information sent from an entity external to the process
Store	Adding or updating information in a data store

Appendix F
Glossary

Acronym	Definition
AKC	Alaska Interagency Coordination Center
BI	Burning Index
CEFA	Climate, Ecosystem and Fire Applications
EAC	Eastern Area Interagency Coordination Center
EBC	Eastern Great Basin Interagency Coordination Center
ERC	Energy Release Component
FBAN	Fire Behavior Analyst
FUMT	Fire Use Management Team
GACC	Geographic Area Coordination Center
GB	Great Basin
IA	Initial Attack
ICS	Incident Command System
IMT	Incident Management Team
IRM	Information Resources Management
IRMWT	Information Resources Management Working Team
JFSP	Joint Fire Sciences Program
KBDI	Keech-Byram Drought Index
LTAN	Long Term Analyst
MM5	Mesoscale Meteorological Model
NDVI	Normalized Difference Vegetation Index
NFDRS	National Fire Danger Rating System
NICC	National Interagency Coordination Center
NMAC	National Multi Agency Coordination
NPL	National Preparedness Level
NRC	Northern Rockies Interagency Coordination Center
NWC	Northwest Interagency Coordination Center
NWCG	National Wildfire Coordinating Group
ONC	Operations, Northern California Interagency Coordination Center
OSC	Operations, Southern California Interagency Coordination Center
PDSI	Palmer Drought Severity Index
PL	Preparedness Level
RAC	Resource Advisory Council
RAWS	Remote Automated Weather Stations
RMC	Rocky Mountain Area Interagency Coordination Center

Acronym	Definition
ROSS	Resource Ordering and Status System
Rx Fire	Prescribed Fires
SA	Southern Area
SAC	Southern Area Interagency Coordination Center
SWA	Southwest Area
SWC	Southwest Area Interagency Coordination Center
WBC	Western Great Basin Interagency Coordination Center