The Interagency Fuels Treatment Decision Support System (IFT-DSS)

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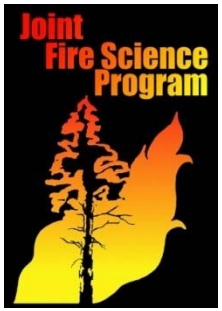

October 2009

Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

PROTECTING COMMUNITIES & ENVIRONMENTS
Fuels Management Committee

Overview of Presentation

- Brief introduction and background
- What does IFT-DSS do?
- How is IFT-DSS related to other systems?
- The stakeholder operational environment
- The vision for organizing fire related software

Introduction and Background
Software Tools and Systems (STS) Study

Software Engineering Institute performed strategic analysis of problem space

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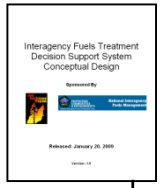
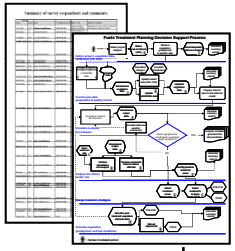
Recommendations:
- SOA framework needed
- BlueSky on right track
- JFSP funds BlueSky SOA as test

IFT-DSS Conceptual Design Document

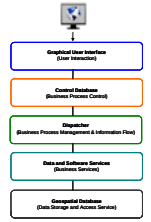


Current Practices & Needs Assessment



Software Architecture Study

IFT-DSS Architecture Design



STS Study – Phase I

STS Study – Phase II

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
2007												2008												2009		

February 2007 Initiation of Phase I of the STS Study

February 2008 Conclusion of Phase I of the STS Study

June 2008 Initiation of Phase II of the STS Study

March 2009 Conclusion of Phase II of the STS Study

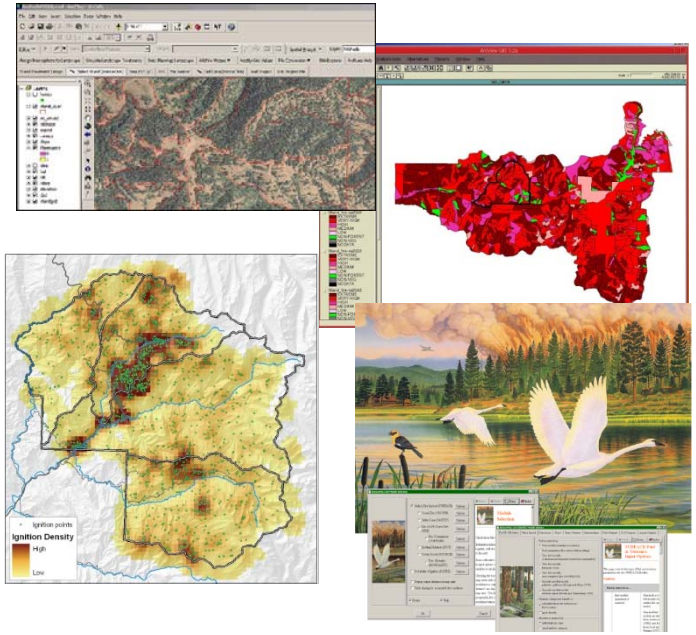
STI Sonoma Technology, Inc.

STS Phase III Plan

- Dec 2009: Proof of Concept v.1 ready for the Savannah Fire Ecology Conference
- May 2010: Proof of Concept version of IFT-DSS completed
- Oct 2009 – Nov 2010: Long term contract team assembled and contract put out for bid with Forest Service as managing partner

Current State of the Fuels Treatment Community

- Currently an assortment of data, software applications and systems



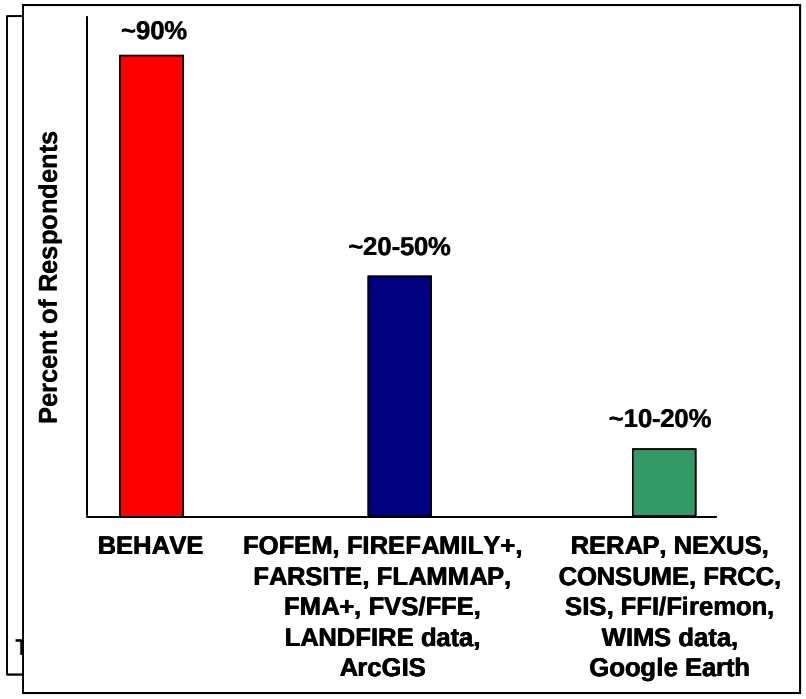
- ❖ Not all are accessible to the community
- ❖ Most are problem-specific
- ❖ Some are comprehensive but only support specific data and use-cases
- ❖ It is difficult to “string” them together
- ❖ Not always supported

Current State of the Fuels Treatment Community

- What does this mean for the user community?

❖ Users use what they know
❖ Use tools that are user-friendly, simple
❖ May not know that other tools exist
❖ Limited guidance on which to use
❖ A lot of time is spent "stringing" tools together for specific purposes
❖A lot of time is spent acquiring and preparing data

IFT-DSS must facilitate the most difficult and time consuming tasks to ensure success



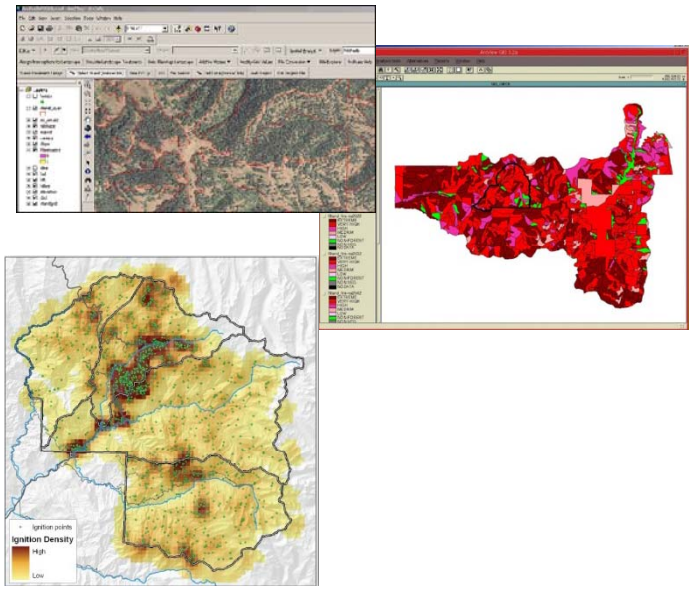
Current State of the Fuels Treatment Community

- What about the existing comprehensive systems that “string” models together?

ArcFuels, INFORMS, LANDFIRE-IFP = **VERY USEFUL SCIENCE**

- Some are agency specific
- Some require “expert” knowledge
- Do not address all fuels treatment use cases

User groups are small
Systems are not widely adopted
Do not facilitate collaboration
Systems don’t “talk” to each other

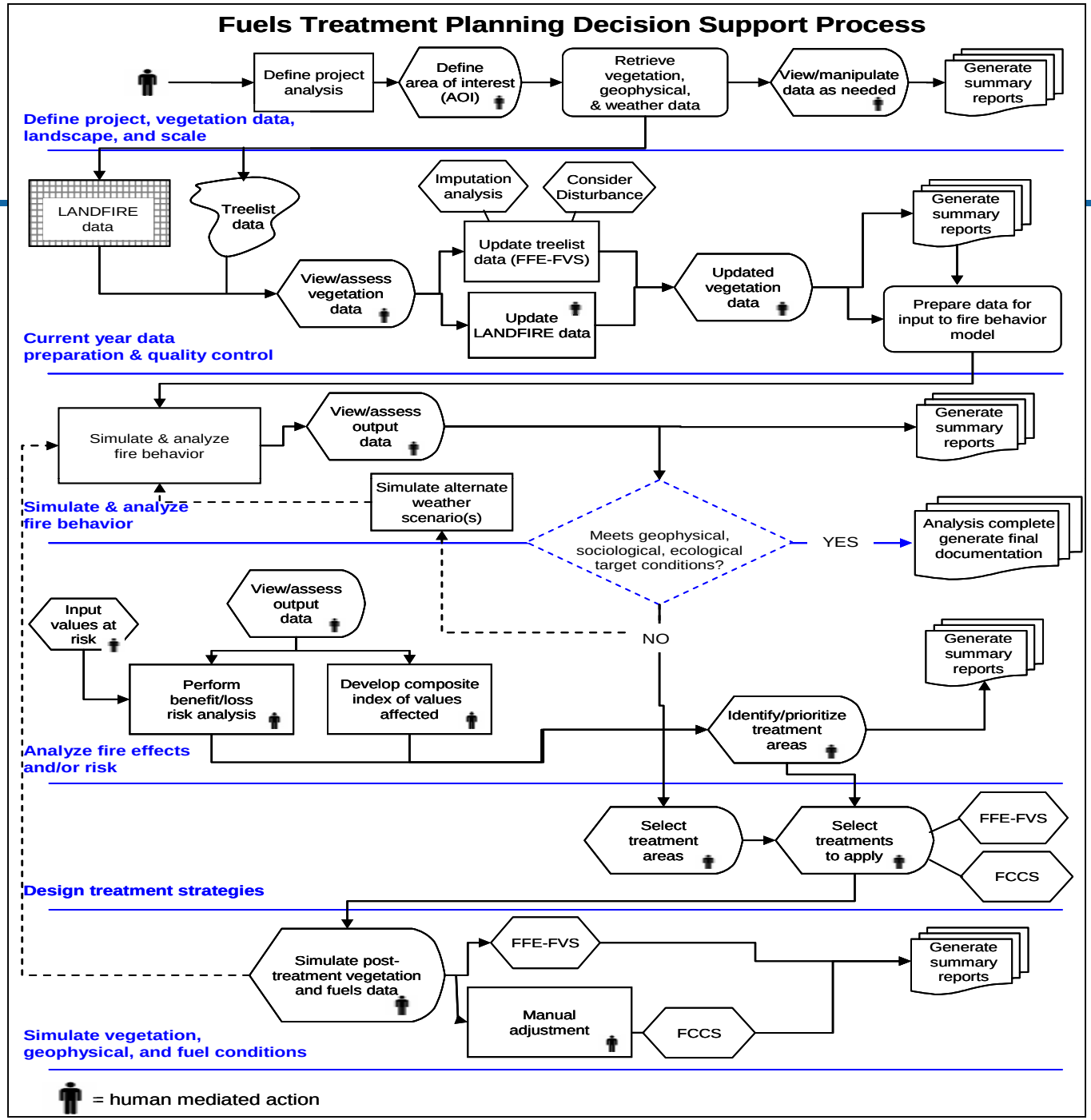


Overview of Presentation

- Brief introduction and background
- What does IFT-DSS do for Users?
- How is IFT-DSS related to other systems?
- The stakeholder operational environment
- The vision for organizing fire related software

IFT-DSS is designed to solve these 7 fuels treatment issues

1. Locate needed data and prepare it for use
2. Find high fire hazard areas within an area of interest
3. Analyze placement of fuels treatments spatially
4. Gauge fuels-treatment effectiveness over time
5. Support prescribed burn planning
6. Support risk assessment = f(prob(ignition) & value gain/loss)
7. Support user created solutions for unique situations



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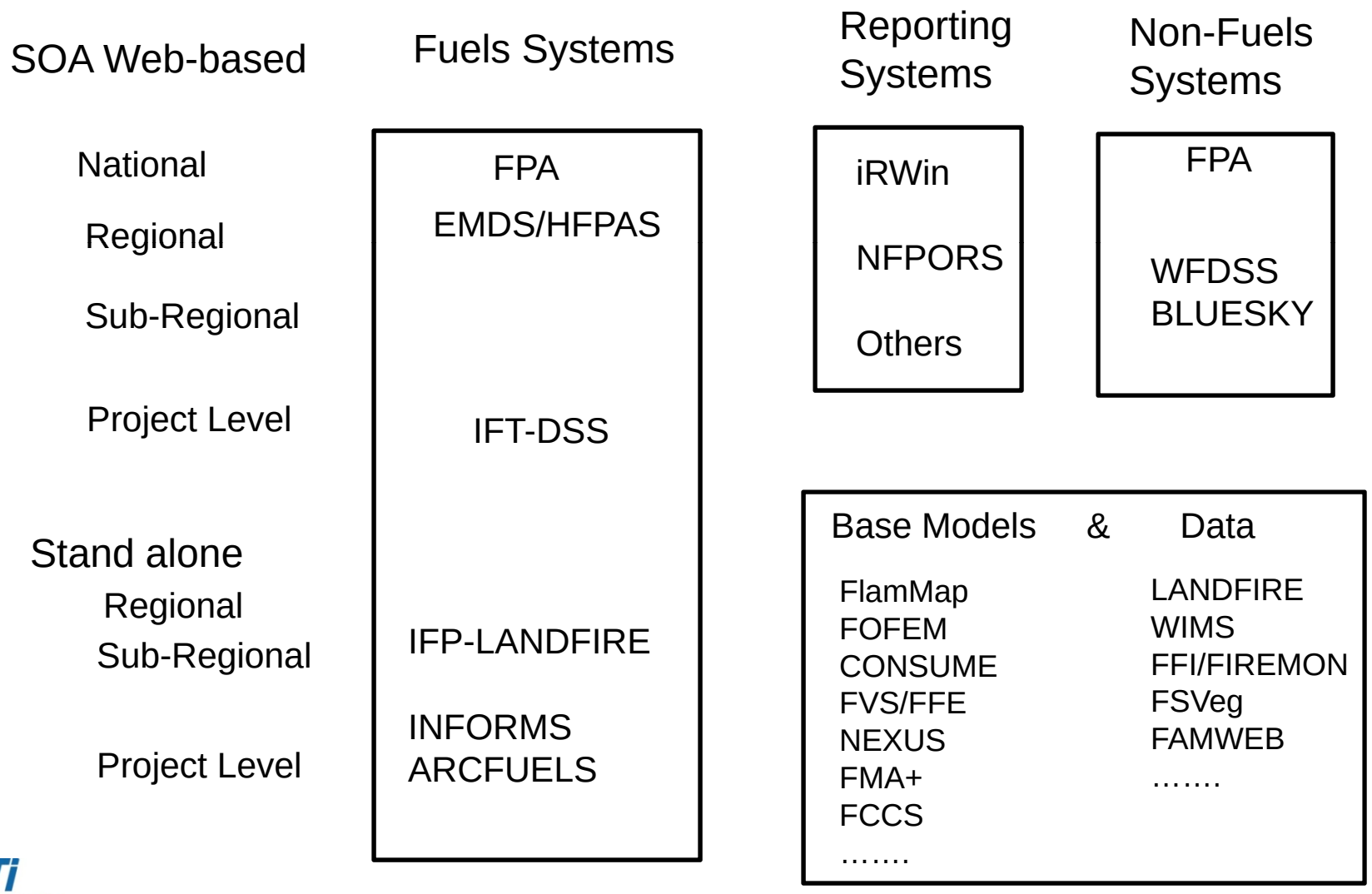
Many Systems - Little Interaction



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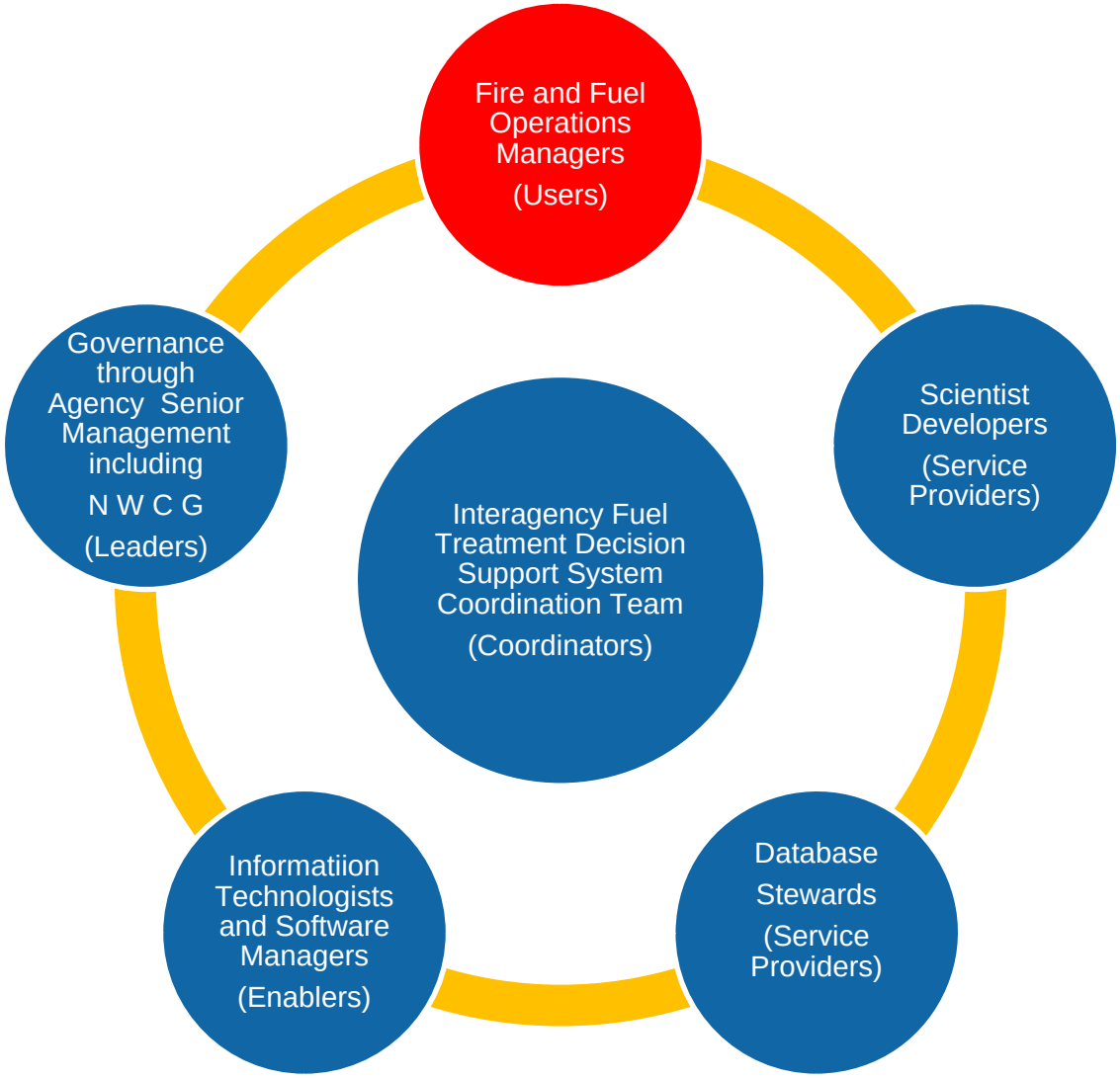
The Stakeholder Operational Environment



What Does IFT-DSS Do for Stakeholders?

- Advantages for Users
  - Universal access and version control through the Internet
  - Easy access to the necessary available data
  - Choice of software tools from a common interface
  - Easy setups for the most common analyses
  - Custom solutions for advanced users for unique situations
  - A single Graphical User Interface to master

- Advantages for Service Providers
  - Provides developers with software-software communications standards
  - Allows developers to improve functionality behind the scenes
  - Provides developers instant access to a large user community
  - Reduces the cost of developing and fielding software tools
  - Useage reports automatically sent to developers periodically

What Does IFT-DSS Do for Stakeholders?

- Advantages for the IT/Software Managers
  - Ensures that security requirements are met
  - Ensures that agency IT policy has been followed

- Advantages for the Governance Community
  - Organizes all fuels management software services into a single SOA system making supervision manageable
  - Enables informed management decisions on funding, expansion of functions, and prioritization of effort
  - Enhances ability to provide guidance on process and quality control
  - Increases agency operating capabilities by focusing scarce resources on high priority functions
  - A Proof of Concept test case, along with WFDSS and Bluesky, of whether a few SOA systems can organize all or most fire related software tools

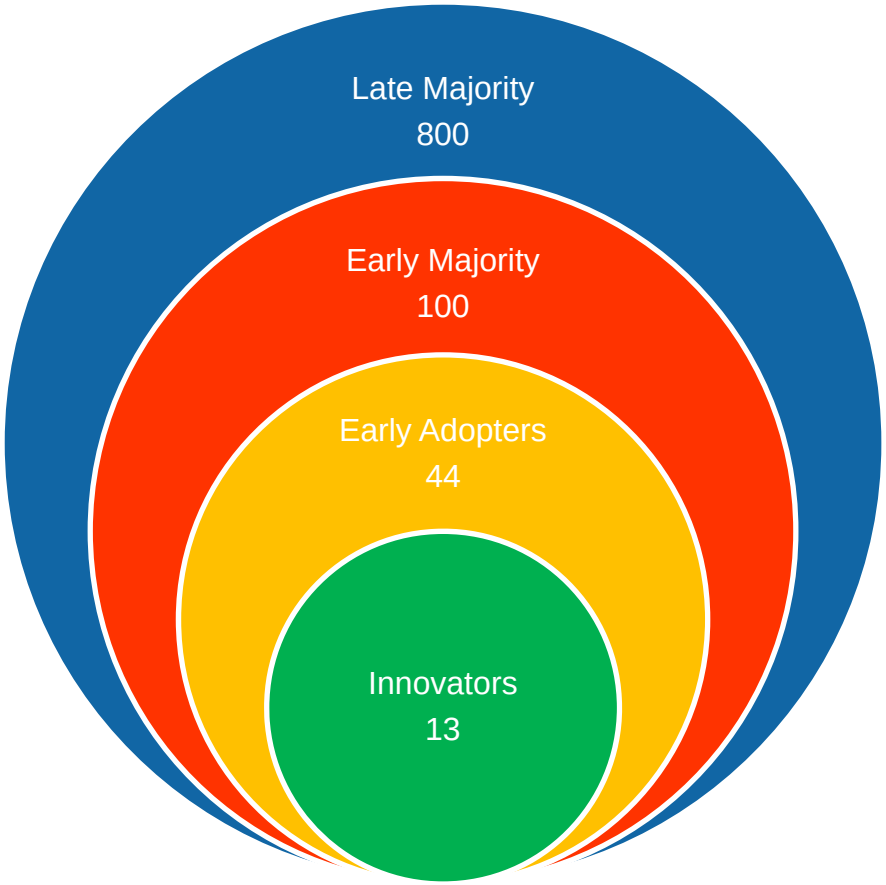
The Diffusion of IFT-DSS Awareness & Use in a Stakeholder Community

Awareness

Understanding

Trial Use

Adoption



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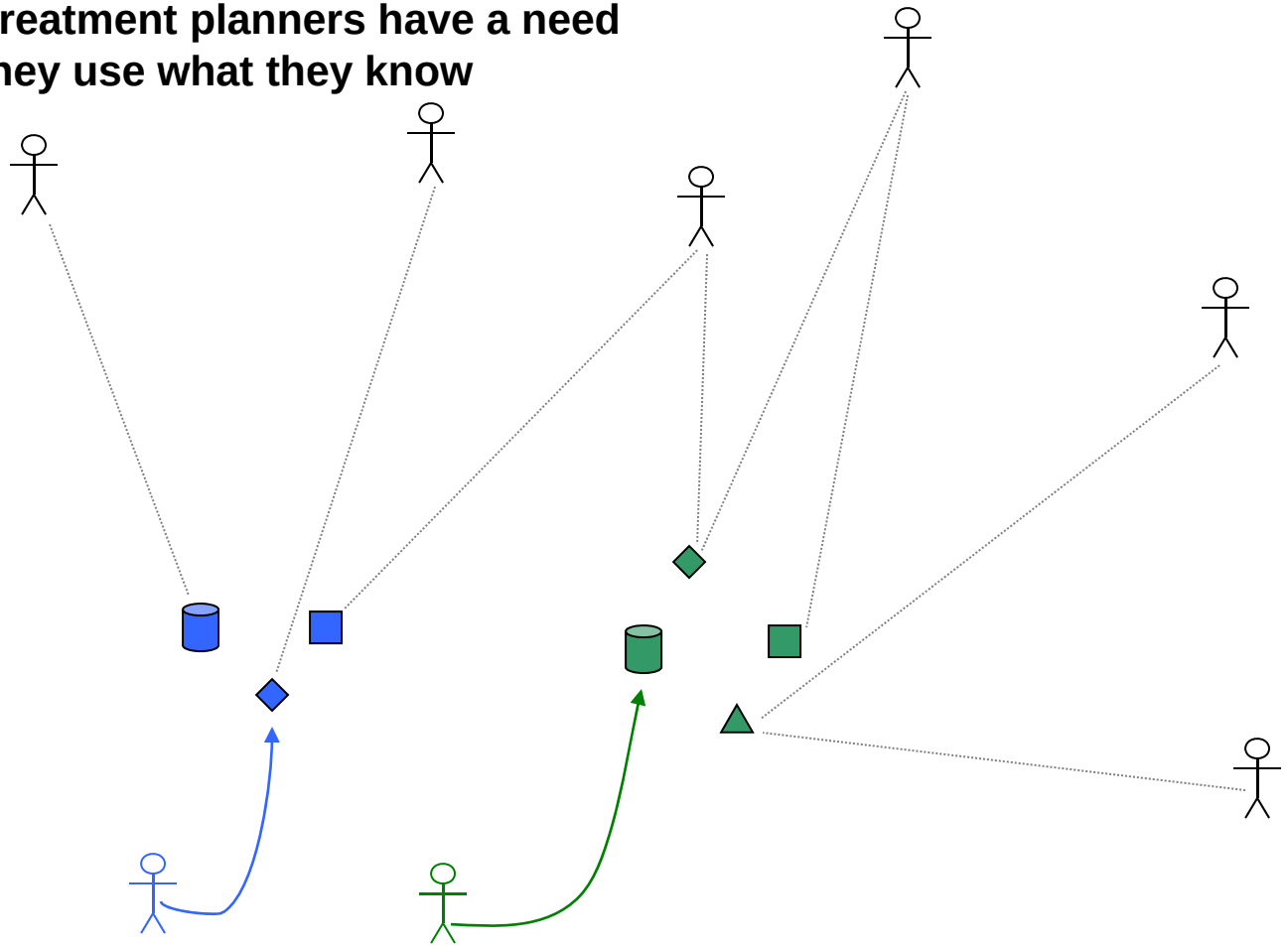
Vision for the Fire & Fuels Community

Fuels treatment planners have a need and they use what they know



Scientists and data providers create tools

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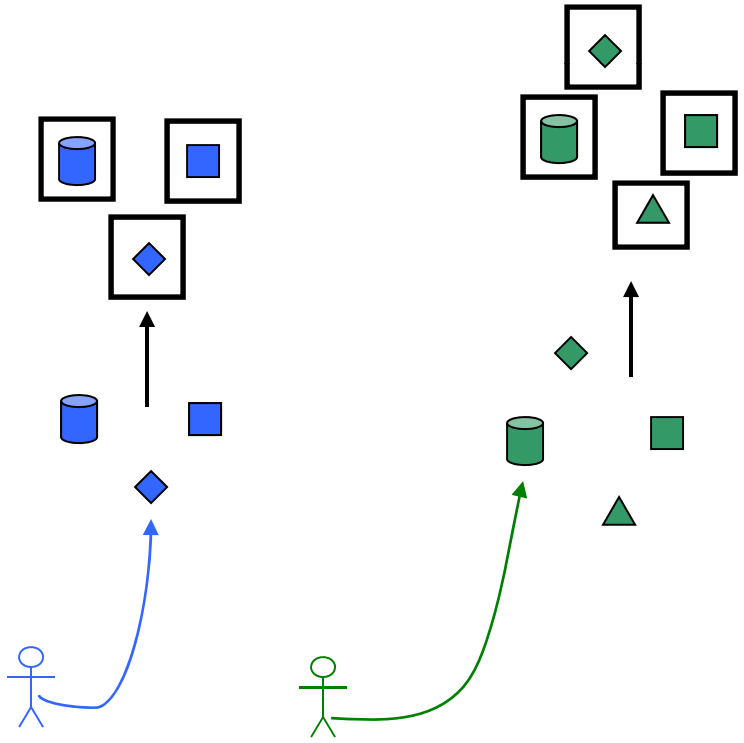
Vision for the Fire & Fuels Community



New technologies allow existing tools to be wrapped (standard interfaces)

Scientists and data providers create tools

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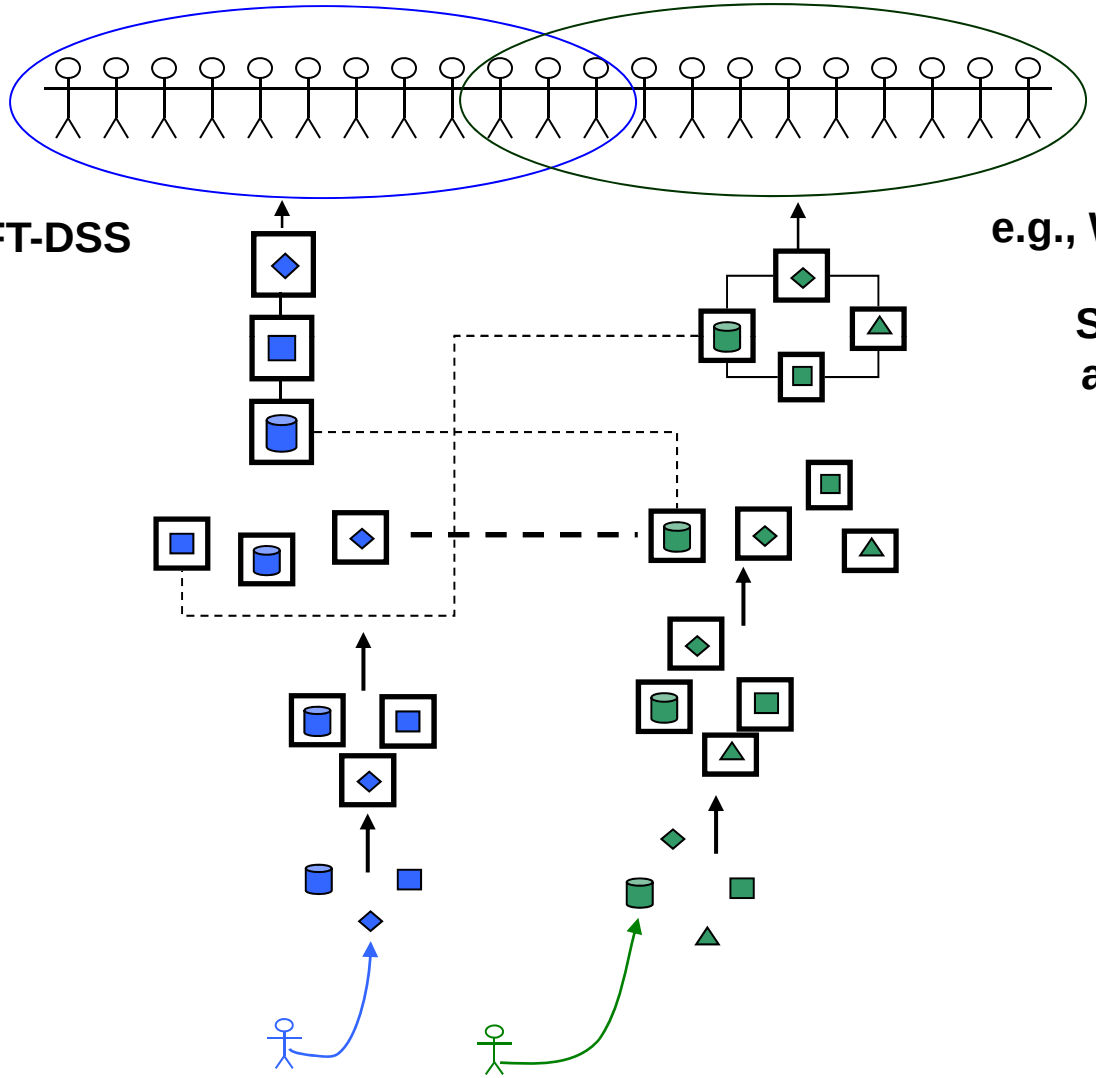
Vision for the Fire & Fuels Community



e.g., IFT-DSS

e.g., WFDSS

Standardized interfaces also allow inter-system communication

Scientists and data providers create tools

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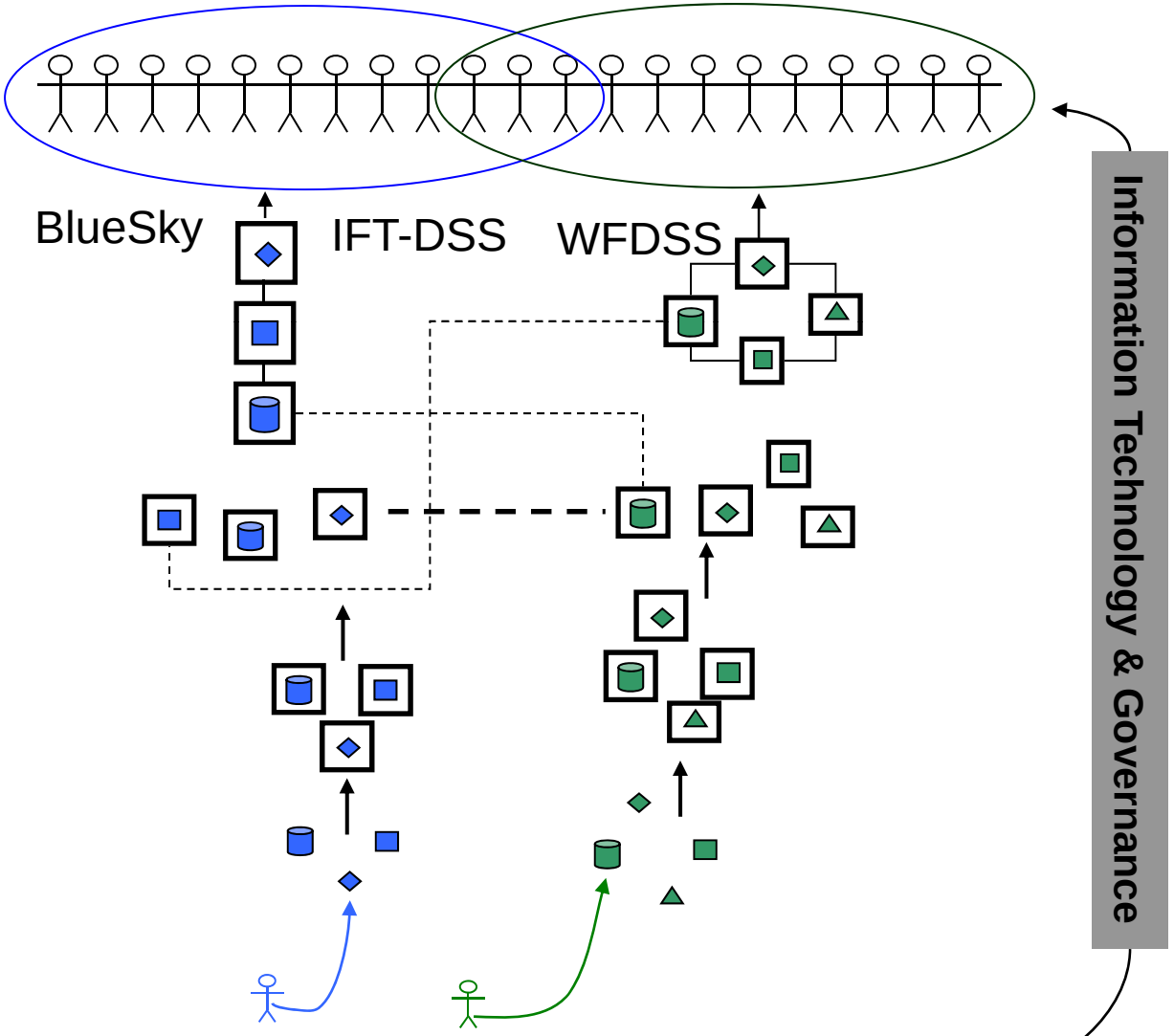
Vision for the Fire & Fuels Community

User communities

SOA Systems
(IFT-DSS, BlueSky, WFDSS, …..)

Common Interface Standards
(allows for connections)

Capabilities/Services
(algorithms, models, data)



Acknowledgements

- John Cissel and Tim Swedberg (JFSP)
- Erik Christiansen (NWCG FMC)
- JFSP fuels treatment work group
- STS Study advisory committee
- 49 field fuels treatment specialists
- ~15 software developers
- IT specialists

Documentation produced from the STS Study can be found at:
http://frames.nbii.gov/JFSP/STS_Study

IFT-DSS Online Documentation

- Complete Documentation of all products produced by the IFT-DSS project can be found online:
  - frames.nbii.gov/jfsp/sts_study
- Mockup version of the Graphical User Interface is available:
  - staging.sonomatech.com/iftdss

Appendix: Workflow Scenarios

Intended to capture the problem-solving needs of the fuels treatment analysis and planning community

Includes:

- Data acquisition and preparation
- Strategic planning
- Spatially explicit fuels treatment assignment
- Fuels treatment over time
- Prescribed burn planning
- Risk assessment

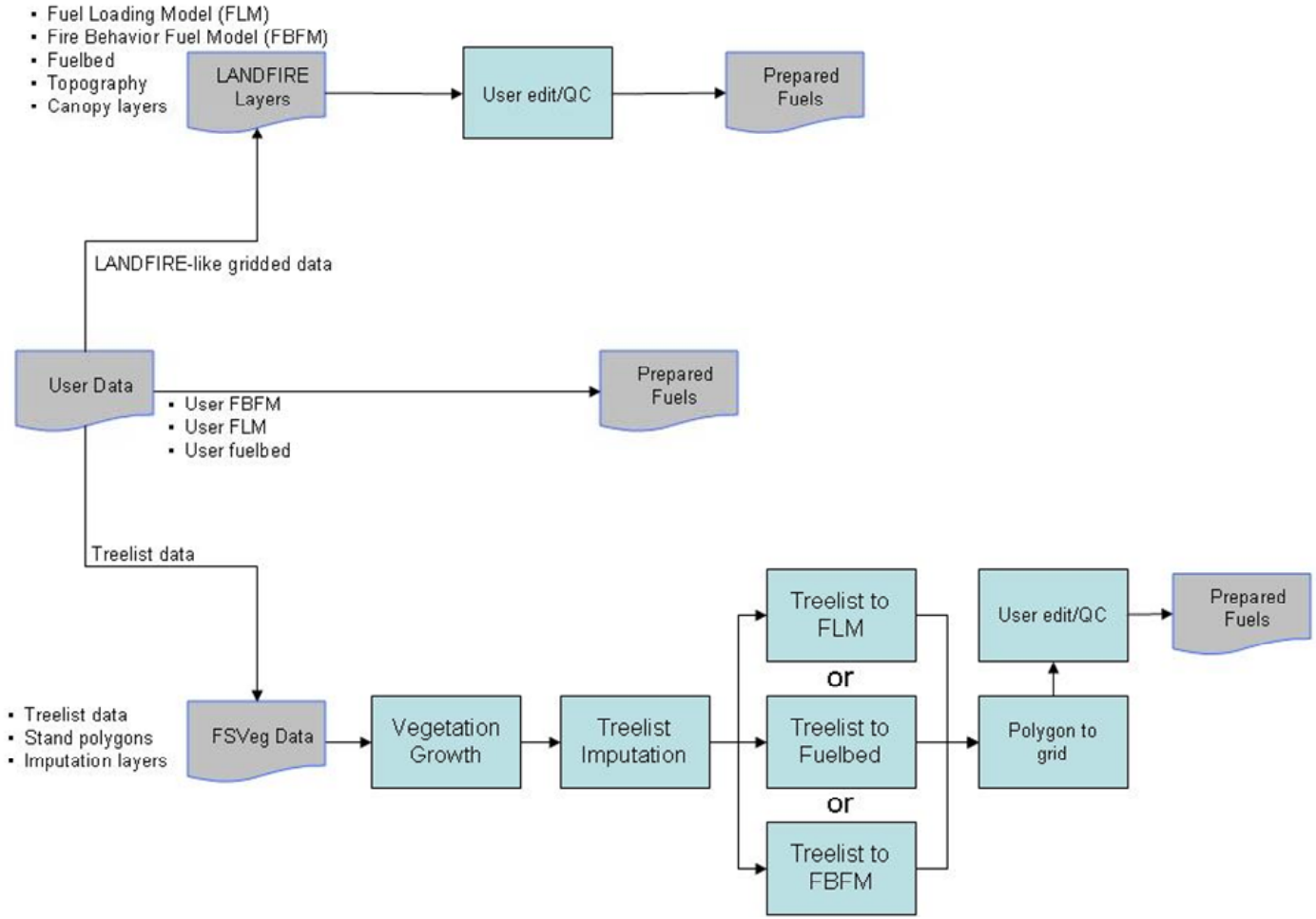
Data Acquisition and Preparation (1 of 2)

Objective: Acquire, prepare, and assure the quality of vegetation data for use in fuels treatment planning.

Inputs	Vegetation/ Fuels Data Types	Workflow	Outputs
Tree-lists	FSVeg point data FSVeg spatial user upload	Growth → Imputation → QC/edit	Current, complete fuels data for further analysis
Gridded fuels	LANDFIRE user upload	QC/edit	

Data Acquisition and Preparation (2 of 2)

Objective: Acquire, prepare, and assure the quality of vegetation data for use in fuels treatment planning.



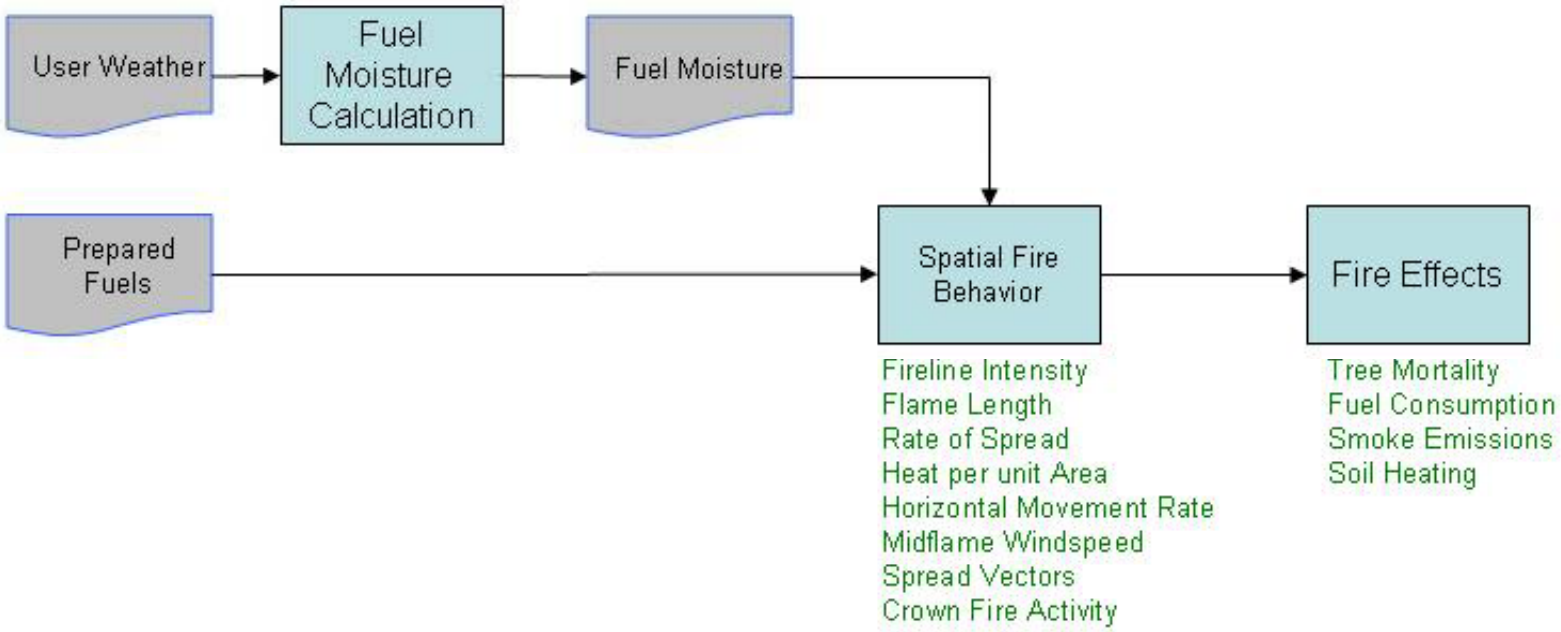
Strategic Planning (1 of 3)

Objective: Identify high fire hazard areas within an area of interest and identify where further analysis may be warranted based on potential fire hazard. High fire hazard is expressed by high potential fire behavior and/or undesirable fire effects.

Inputs	Vegetation/ Fuels Data Types	Workflow	Outputs
Current, complete fuels; topography	Tree-list Polygon data LANDFIRE grid data	Fire Behavior → Fire Effects → QC	Maps and data of fire behavior and fire effects

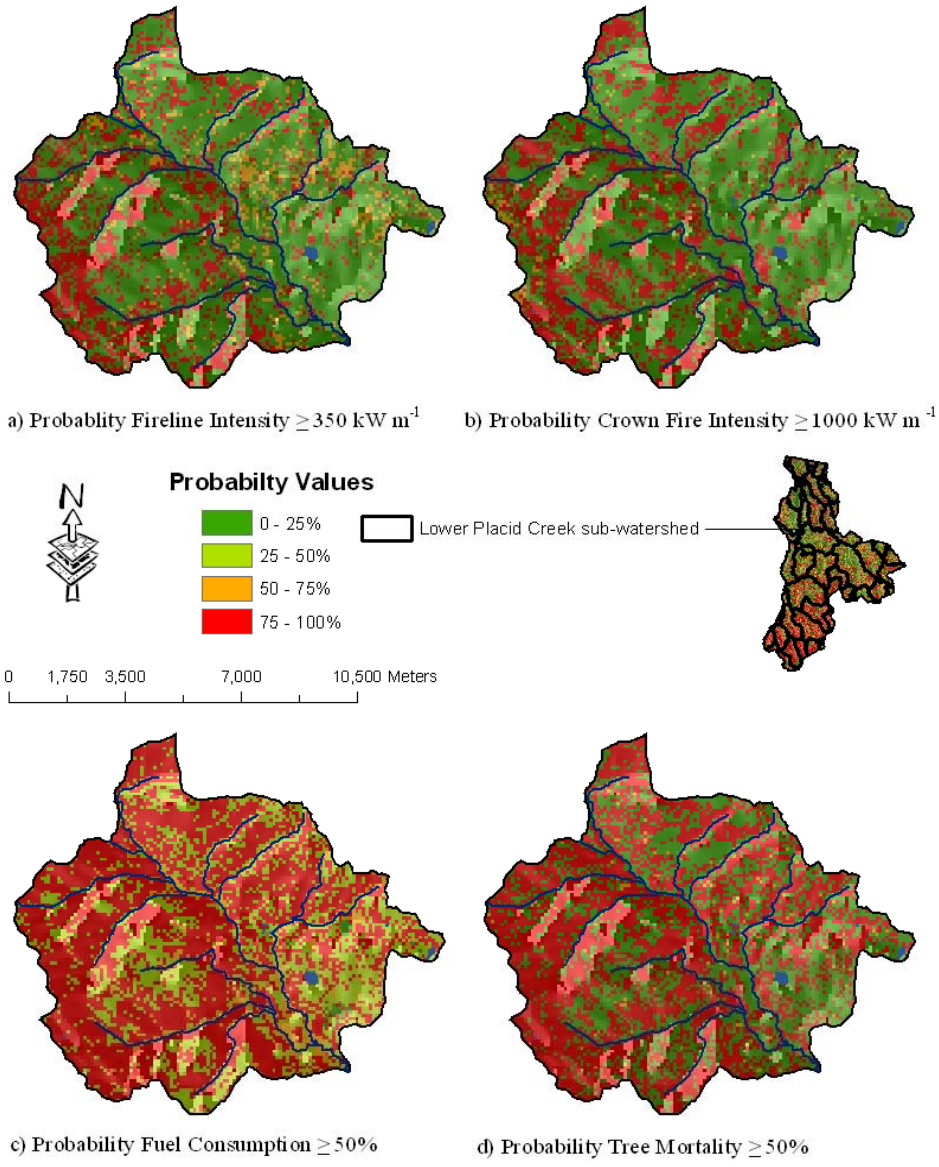
Strategic Planning (2 of 3)

Objective: Identify high fire hazard areas within an area of interest and identify where further analysis may be warranted based on potential fire hazard. High fire hazard is expressed by high potential fire behavior and/or undesirable fire effects.



Strategic Planning (3 of 3)

Example of strategic planning output



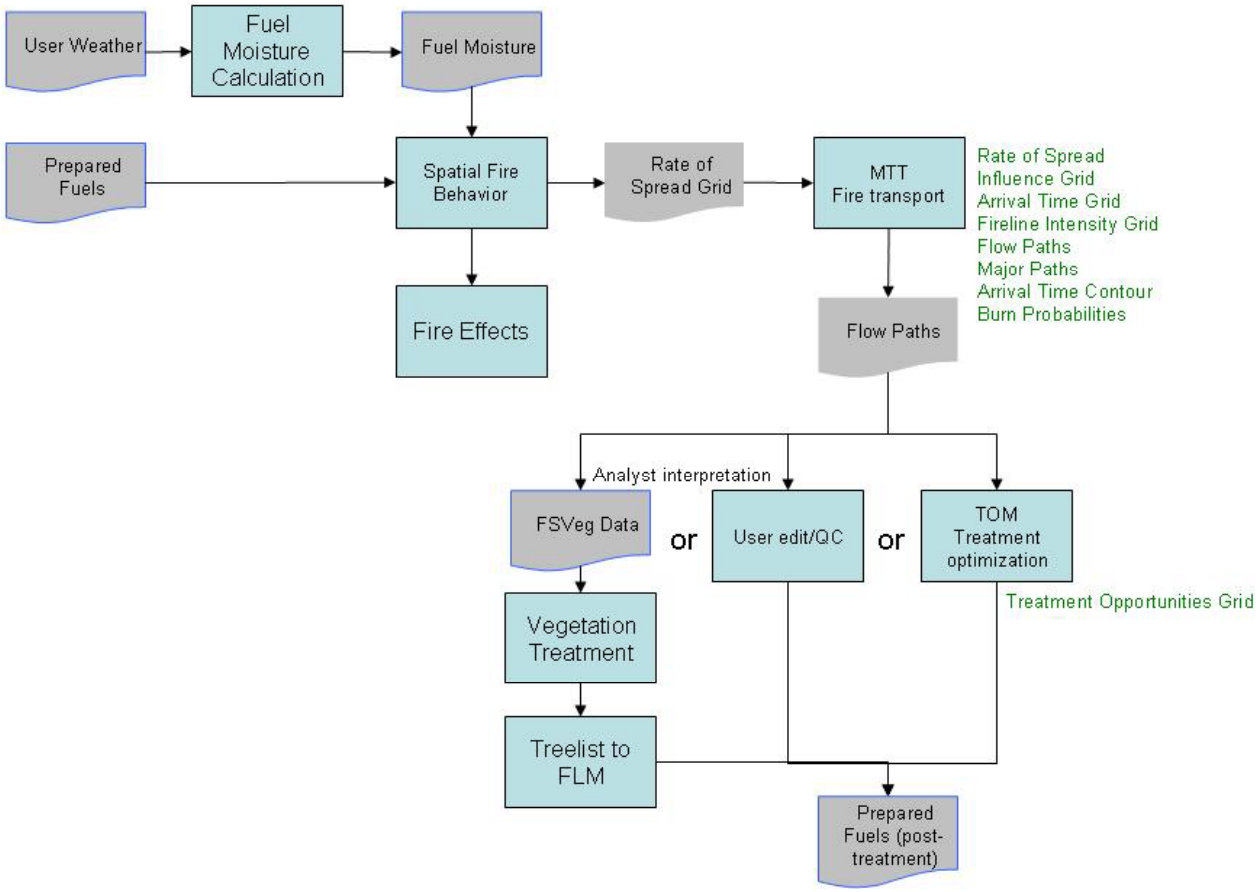
Spatially Explicit Fuels Treatment Assignment (1 of 3)

Objective: (1) Simulate fuels treatment placement in areas of high fire hazard within an area of interest and (2) simulate post-treatment influences on fire behavior and fire effects potentials.

Inputs	Vegetation/Fuels Data Types	Workflow	Outputs
Current, complete fuels; topography	Tree-list polygon data LANDFIRE	Fire Behavior/Effects/MTT → User Treatment → Fire Behavior/Effects/MTT	Maps and data of treatment locations; pre- and post-treatment fire behavior and fire effects
		Fire Behavior/Effects/MTT → FVS Treatment → Fire Behavior/Effects/MTT	
		Fire Behavior/Effects/MTT → TOM → Fire Behavior/Effects/MTT	

Spatially Explicit Fuels Treatment Assignment (2 of 3)

Objective: (1) Simulate fuels treatment placement in areas of high fire hazard within an area of interest and (2) Simulate post-treatment influences on fire behavior and fire effects potentials.

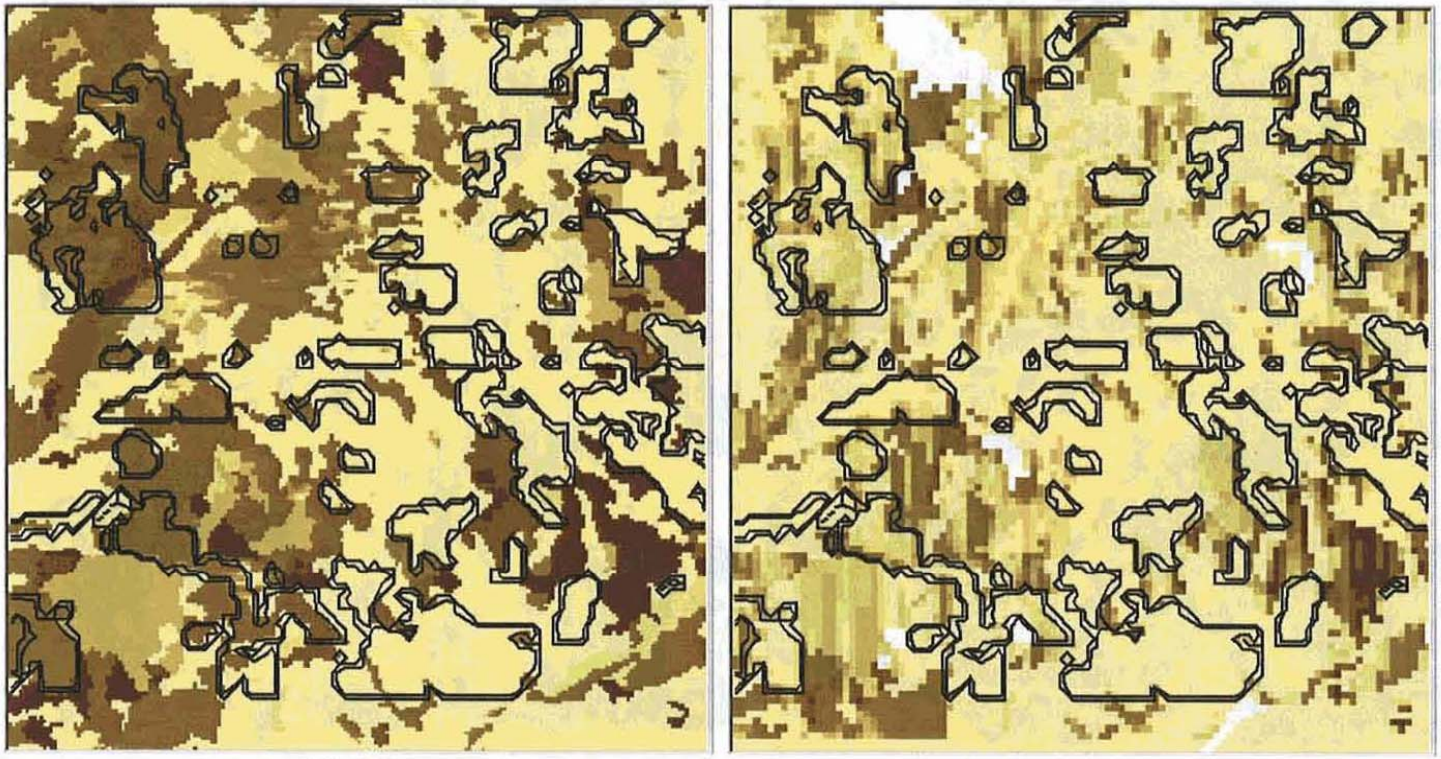


Spatially Explicit Fuels Treatment Assignment (3 of 3)

Example of fuels treatment optimization

Pre-treatment

Post-treatment



Simulated fireline intensity for a hypothetical landscape. Light colored areas indicate low fireline intensity potentials and dark colors represent high fireline intensity potentials (from Finney et al., 2006).

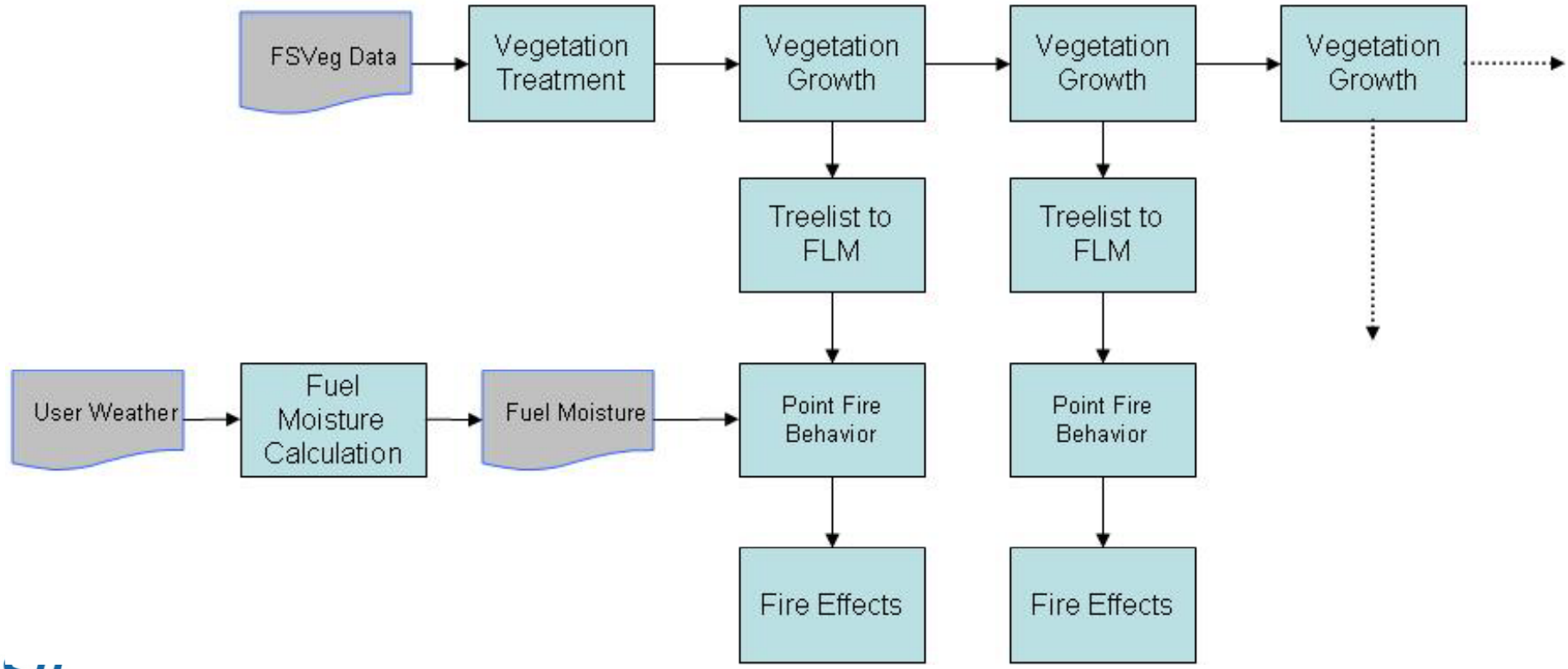
Fuels Treatment Effectiveness Over Time (1 of 3)

Objective: Evaluate the temporal durability of fuels treatments; i.e., how long, in years to decades, a treatment will continue to lower potential fire behavior and fire effects.

Inputs	Vegetation/Fuels Data Types	Workflow	Outputs
Current, complete fuels; topography	Tree-list polygon data User supplied data	Growth → Fire Behavior → Fire Effects → Growth → Fire Behavior → Fire Effects → Growth…	Graphs and data of fuels, fire behavior, and fire effects over time

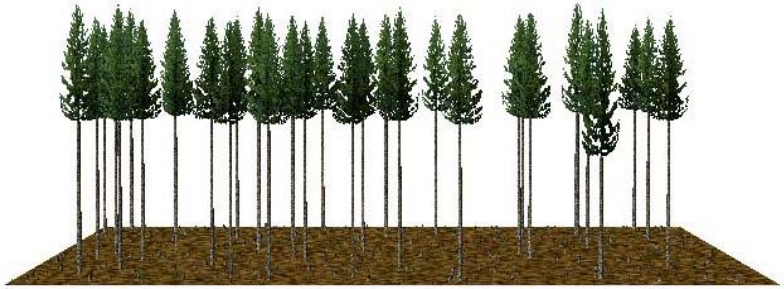
Fuels Treatment Effectiveness Over Time (2 of 3)

Objective: Evaluate the temporal durability of fuels treatments; i.e., how long, in years to decades, a treatment will continue to lower potential fire behavior and fire effects.



Fuels Treatment Effectiveness Over Time (3 of 3)

Example of vegetation growth over time



Post-treatment

+10 years

+ 20 years

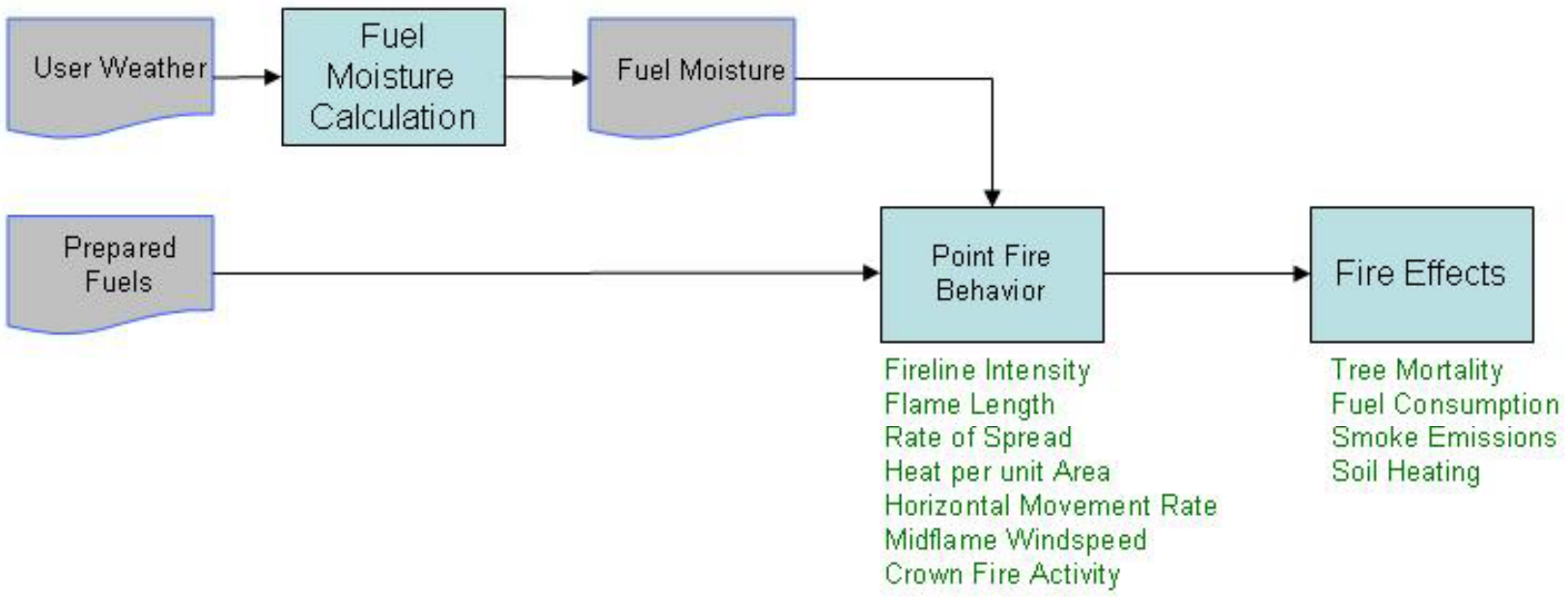
Prescribed Burn Planning (1 of 3)

Objective: Provide the information needed to plan, document, and conduct a proposed, prescribed fire.

Inputs	Vegetation/ Fuels Data Types	Processes	Outputs
Fuels; range of weather conditions	User entered single stand level data	Fire Behavior → Fire Effects → QC	Graphs and data of fire behavior and fire effects over a range of conditions

Prescribed Burn Planning (2 of 3)

Objective: Provide the information needed to plan, document, and conduct a proposed, prescribed fire.



Prescribed Burn Planning (3 of 3)

Risk Assessment

Objective: Provide a probabilistic risk assessment for fuels treatment planning.

Inputs	Vegetation/ Fuels Data Types	Processes	Outputs
Current, complete fuels; topography	Tree-list polygon data LANDFIRE data User supplied data	Fire Behavior → MTT Burn Probability Mode → QC	Maps and data for fire behavior, burn probability, and values at risk

Fire risk = (burn probability) × (fire hazard index) × (value at risk)