Fire Effects Planning Framework: mapping benefits and risks of fire to support wildland management

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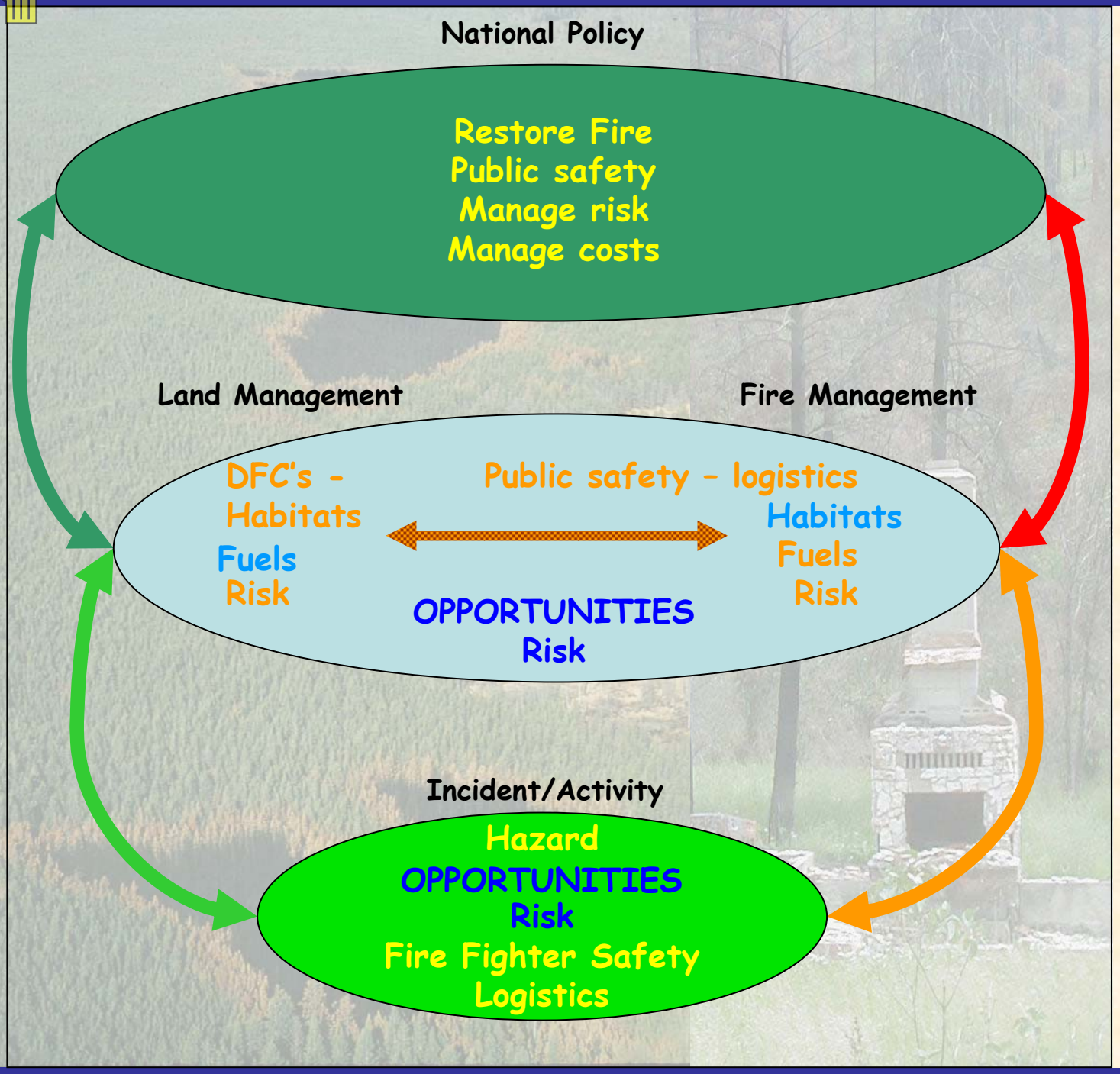
Albuquerque, NM

National Fire Plan

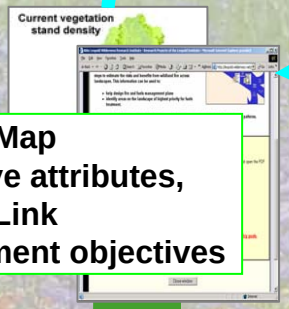


FEPF:
Provide means to identify benefits and risks

- Best available science
- Existing data, and tools
- At scale
- Within and between work units
- Common units
- Insert into planning

Fire Effects Planning Framework (FEPF)

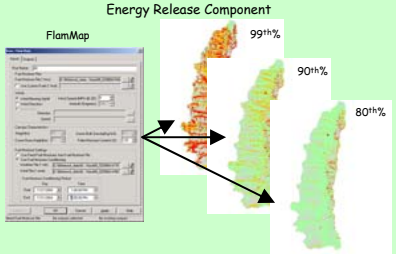
Landscape Dynamics Simulation Models



1 Map vegetative attributes, Link to management objectives

2 Model fire behavior

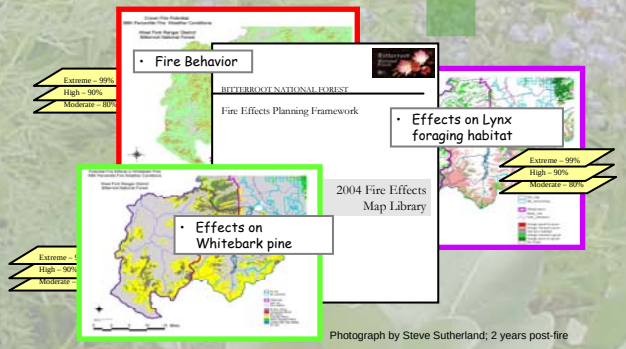
Based on FireFamilyPlus weather analysis for Energy Release Component



3 Crosswalk fire behavior to fire effects on values/objectives

Vegetative attributes		Fire Behavior	Fire Effects		Desirability	Source
Species	**Size/ Structure**	**Crown fire potential**	**1st Order Fire Effects**	**Effect on whitebark pine**	**Mapping Multiplier**	**Information Source**
WB-only	Seed/sap	1, 2, or 3	High	**Undesirable Effects** WB established but not reproducing yet	-1	Tomback et al. 2001, FOFEM
	All except seed/sap	1,2, or 3	High	**Desirable Effects** restore native fire regime	+1000	Tomback et al. 2001, FOFEM
All other species	All	2 or 3	High	**Highly Desirable Effects** provide potential WB habitat	+100	Keane, Arno Pers. Comm.

4 Use resulting maps for
- land, fuels, fire planning,
- AMR/WFU activities



Photograph by Steve Sutherland; 2 years post-fire

5 Update vegetative attributes post-season

Step 1: Identify and Map Key Conditions

Weather Observations

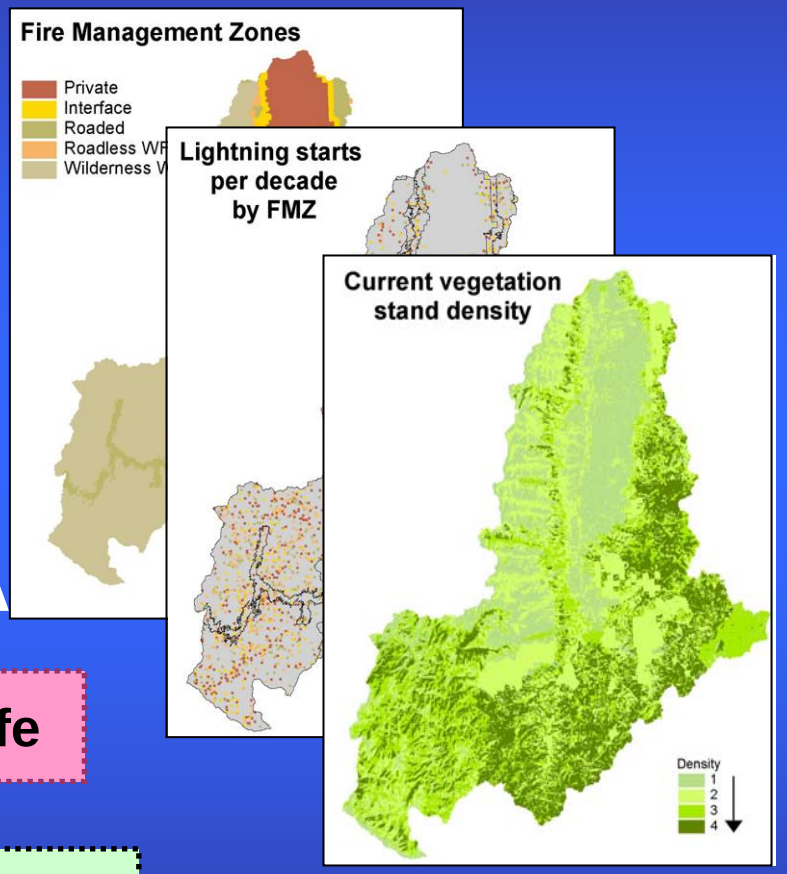
Topography

DATA

Fuels

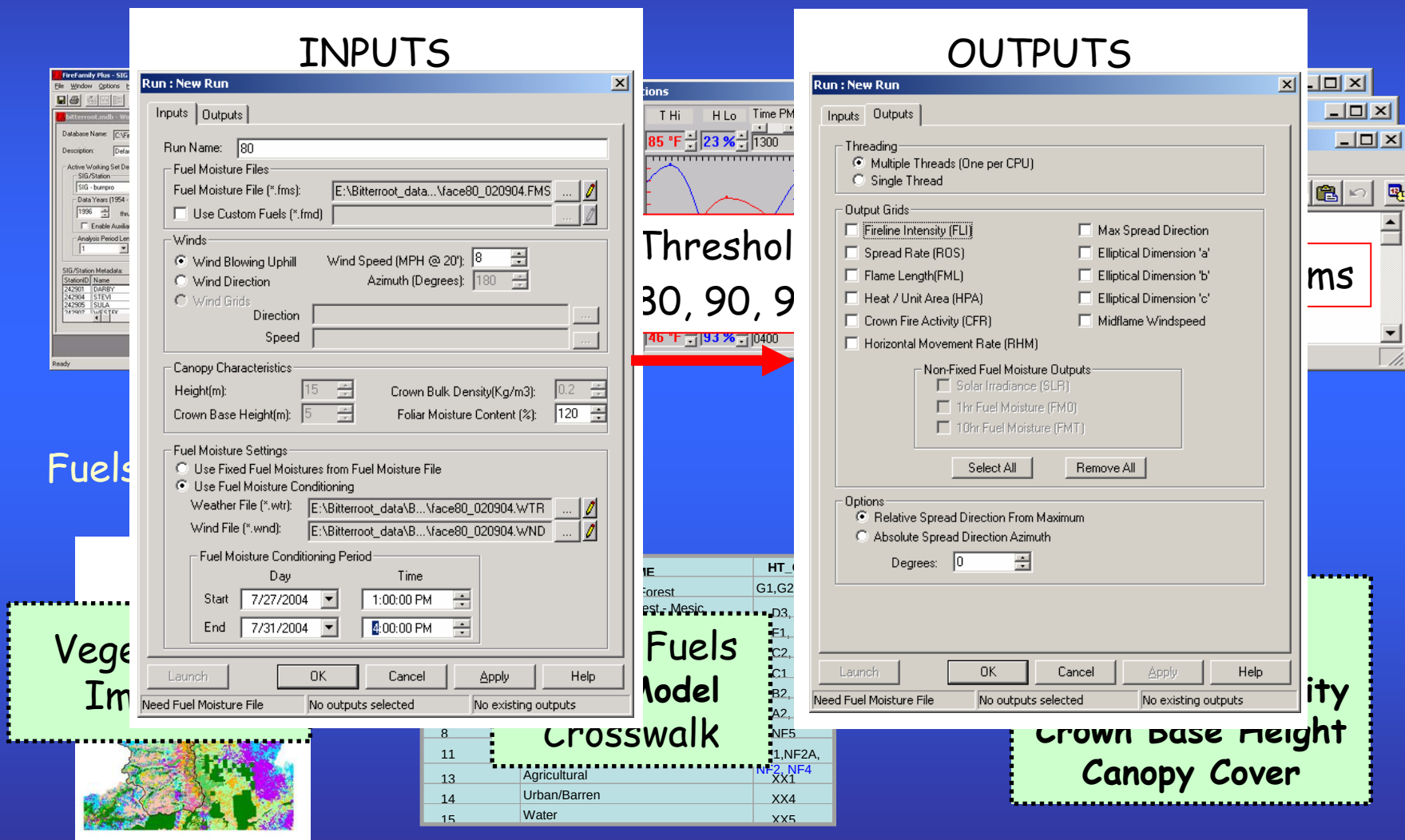
Wildlife

Vegetation



Step 2: Model Fire Behavior

Weather data



Step 3: Create Fire Effects Crosswalks

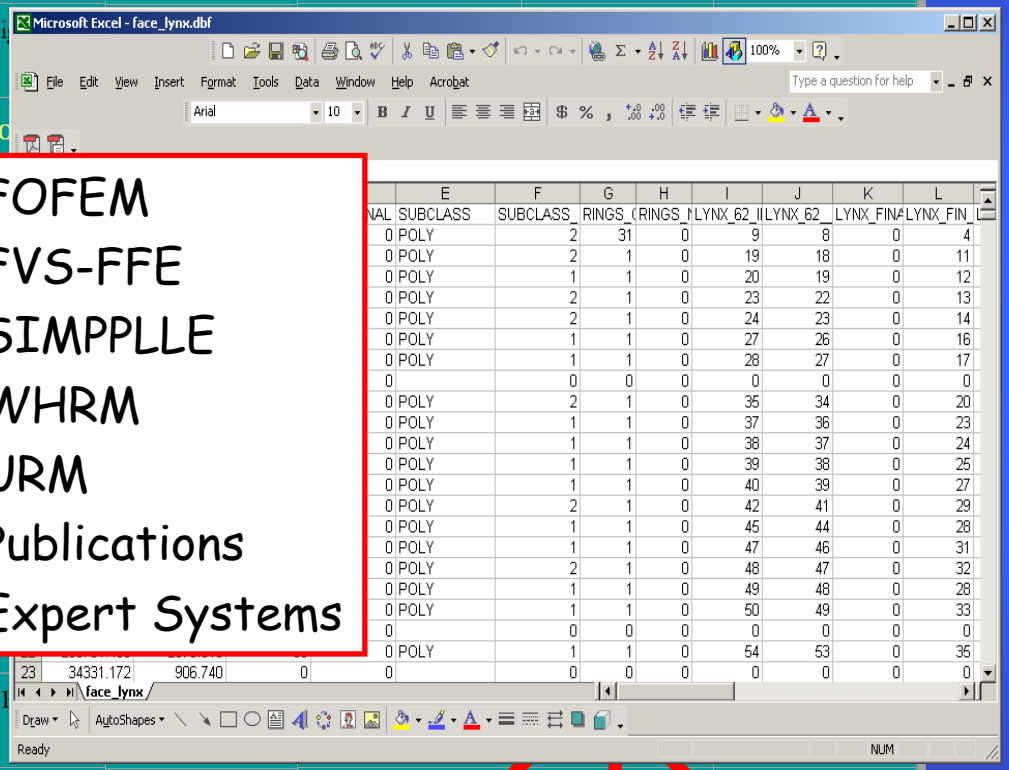
Species/ Species Mix	Size/ Structure	Fire Severity	Fire Behavior	0-14years post-fire	15-39 years post-fire	40+years post-fire
WB, DF, L, PP, LP, L-mixes, mixes	Single story	Low	1	-1	-1	-1
	Single or multi-story	Mixed	2	1	1	-10
	Single or multi-story	Hi				
Mixtures of DF, ES,AF, WB, LP, AL, L, GF	Single story	Lo				
	Single story					
	Single or multi-story					
ES, GF,AL, C, QA, WH, MH, AF, CW	Single story					
	Single or multi-story					
All forested	Seed/sap					
Shrubs	All					
		No I				
Non-stocked, non-forest, forbs, grasses	All	Low, Mixed, No Burn	0,1, or 2	-1	-1	-1
Unburnable, Agriculture, No Data	n/a	All	0,1,2,or 3	0	0	0

Physical habitat characteristics

Ecological Fire Behavior

Physical Fire Behav

FOFEM
FVS-FFE
SIMPPLLE
WHRM
URM
Publications
Expert Systems

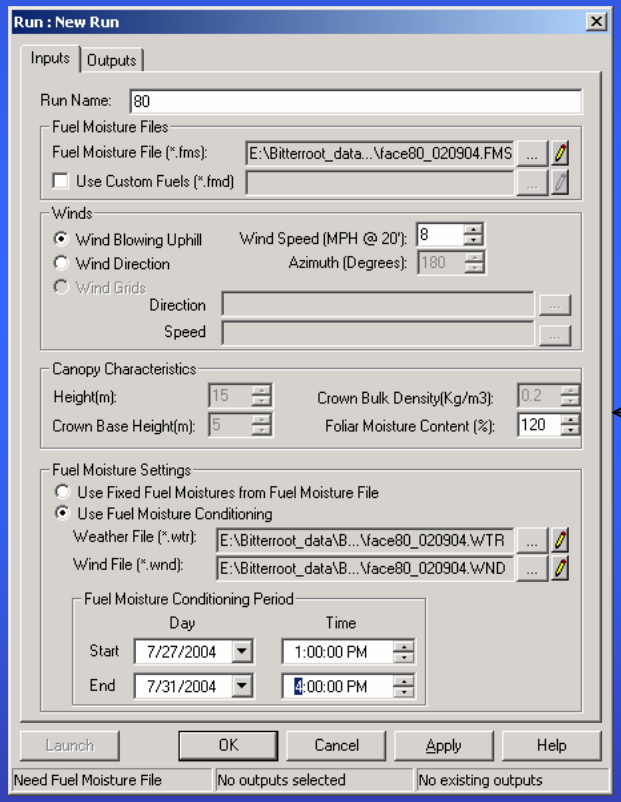


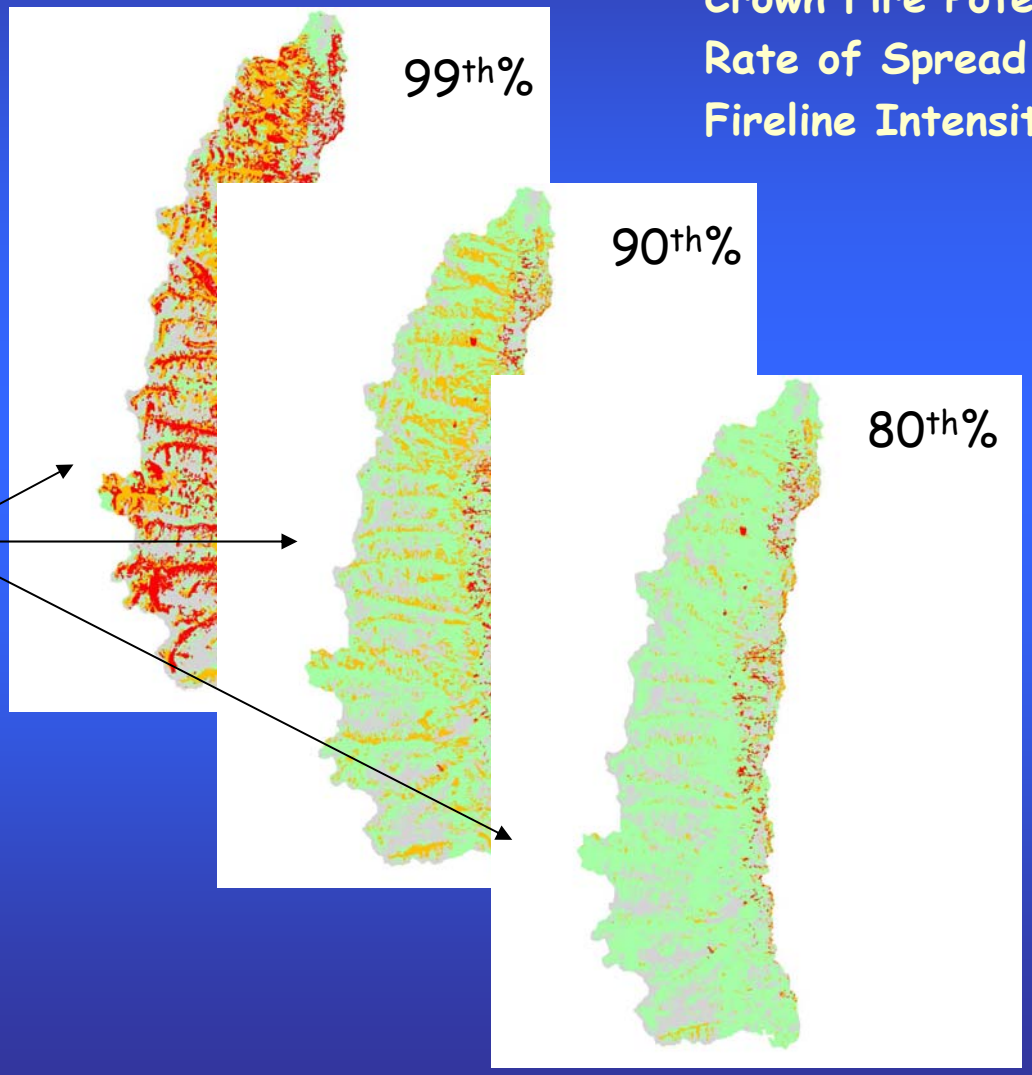
NAL	E SUBCLASS	F SUBCLASS_	G RINGS_(	H RINGS_N	I LYNX_62_II	J LYNX_62_	K LYNX_FIN	L LYNX_FIN_
0	POLY	2	31	0	9	8	0	4
0	POLY	2	1	0	19	18	0	11
0	POLY	1	1	0	20	19	0	12
0	POLY	2	1	0	23	22	0	13
0	POLY	2	1	0	24	23	0	14
0	POLY	1	1	0	27	26	0	16
0	POLY	1	1	0	28	27	0	17
0		0	0	0	0	0	0	0
0	POLY	2	1	0	35	34	0	20
0	POLY	1	1	0	37	36	0	23
0	POLY	1	1	0	38	37	0	24
0	POLY	1	1	0	39	38	0	25
0	POLY	1	1	0	40	39	0	27
0	POLY	2	1	0	42	41	0	29
0	POLY	1	1	0	45	44	0	28
0	POLY	1	1	0	47	46	0	31
0	POLY	2	1	0	48	47	0	32
0	POLY	1	1	0	49	48	0	28
0	POLY	1	1	0	50	49	0	33
0		0	0	0	0	0	0	0
0	POLY	1	1	0	54	53	0	35
23 34331.172	906.740	0	0		0	0	0	0

Illustrative *only*

Step 4a: Create Fire Behavior Library

FlamMap





Crown Fire Potential
Rate of Spread
Fireline Intensity

Step 4b: Use the Crosswalk to Create Fire Effects Library

Restoration/Fuels

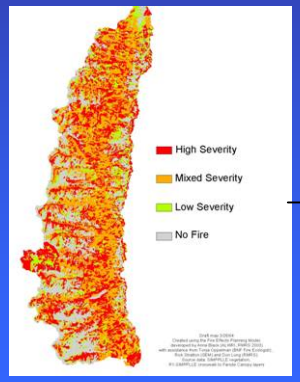
Lynx

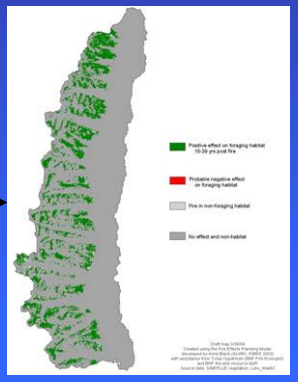
Fire Behavior Library

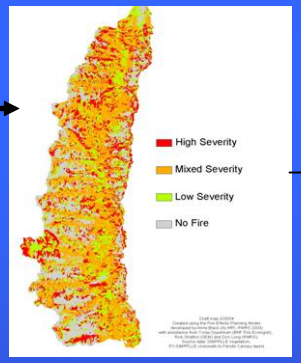
99th%

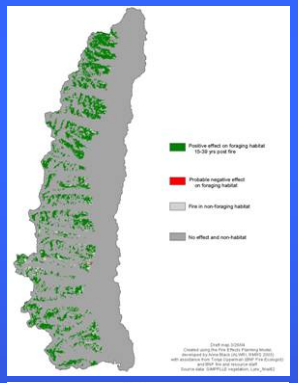
90th%

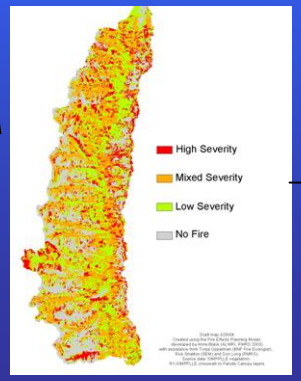
80th%

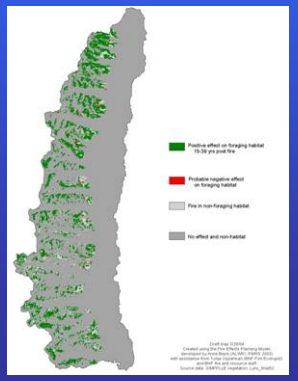












Aquatics

Fire Fighter Safety

Cavity Nester

Photo: YNP Archives

Successional Pathways for Whitebark Pine in YNP

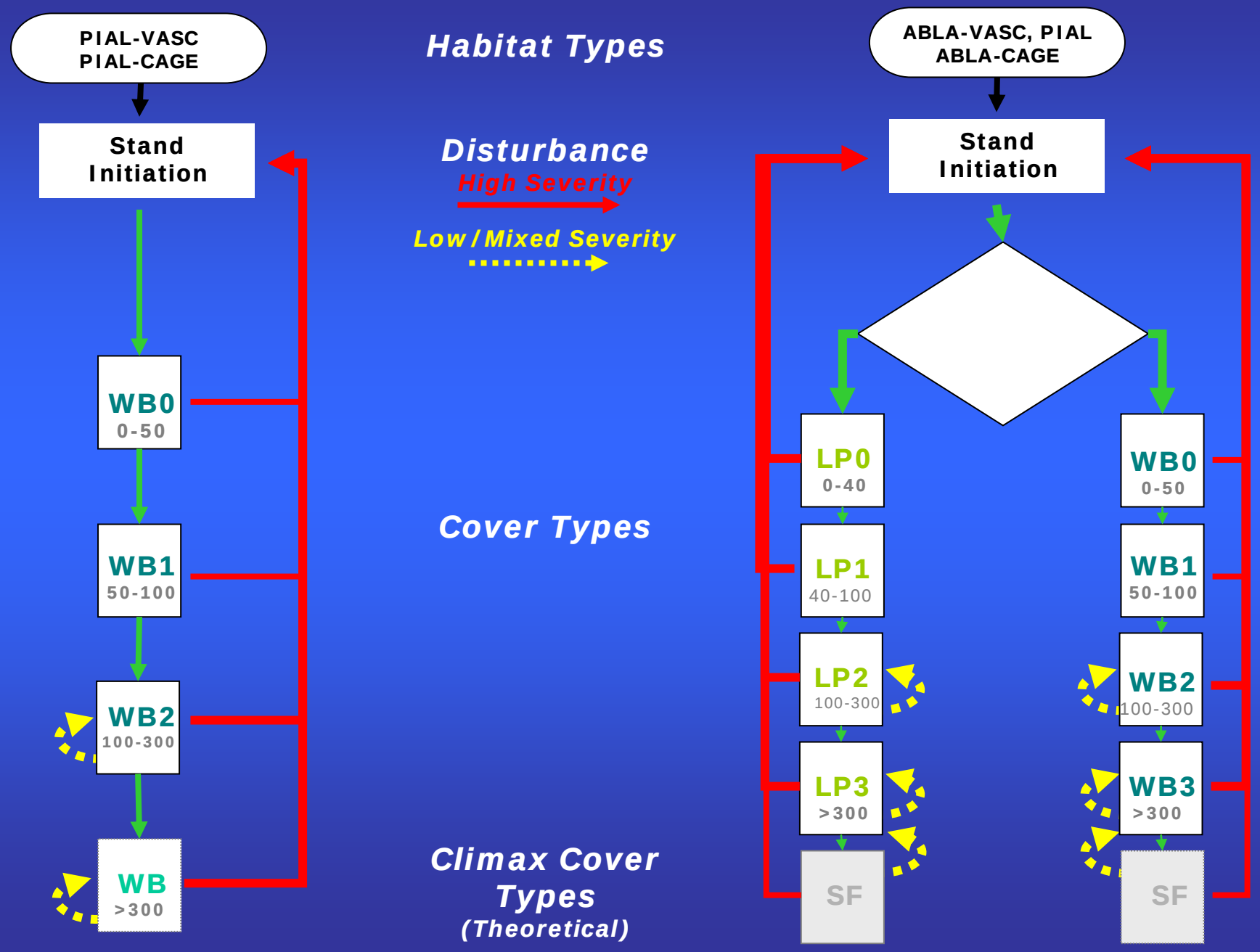


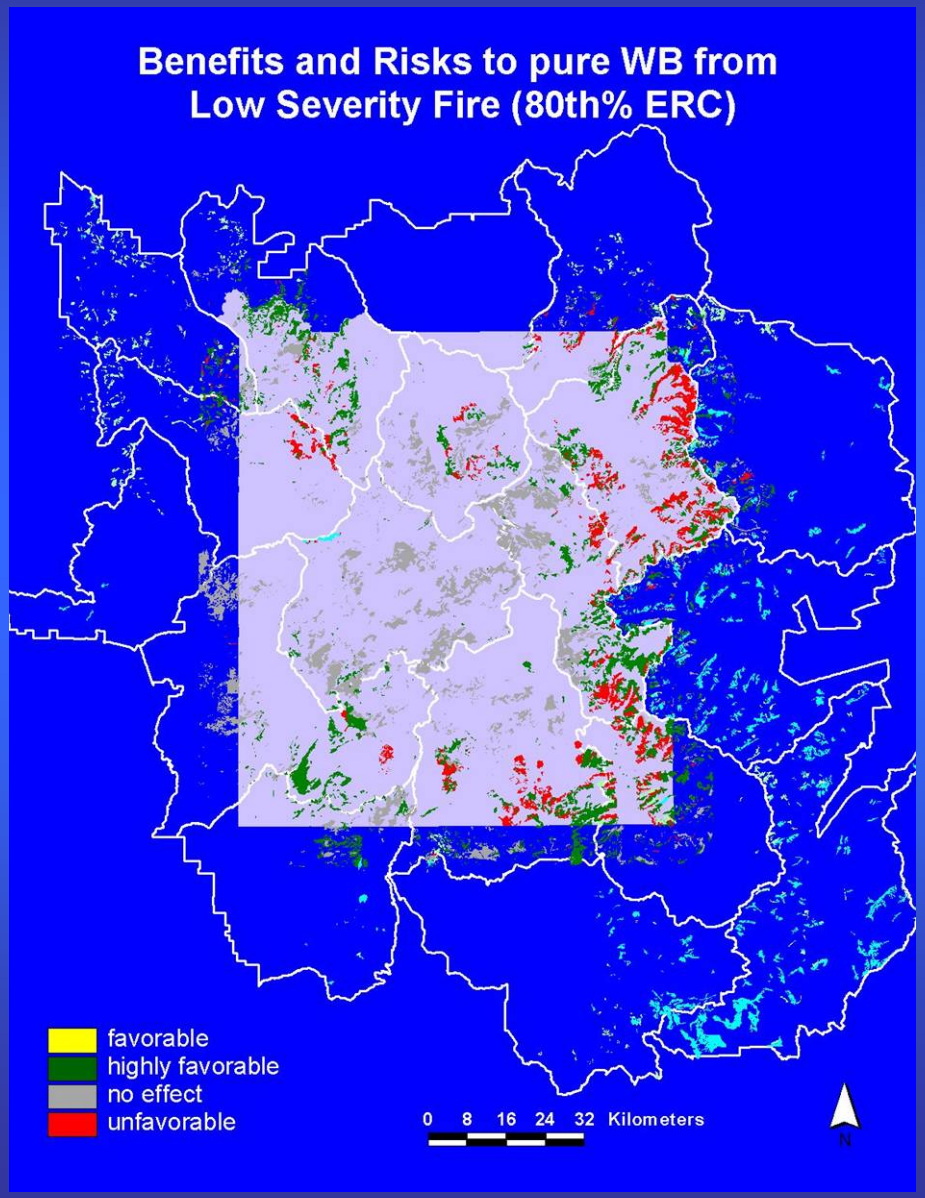
Table 1. Fire Effects Crosswalk

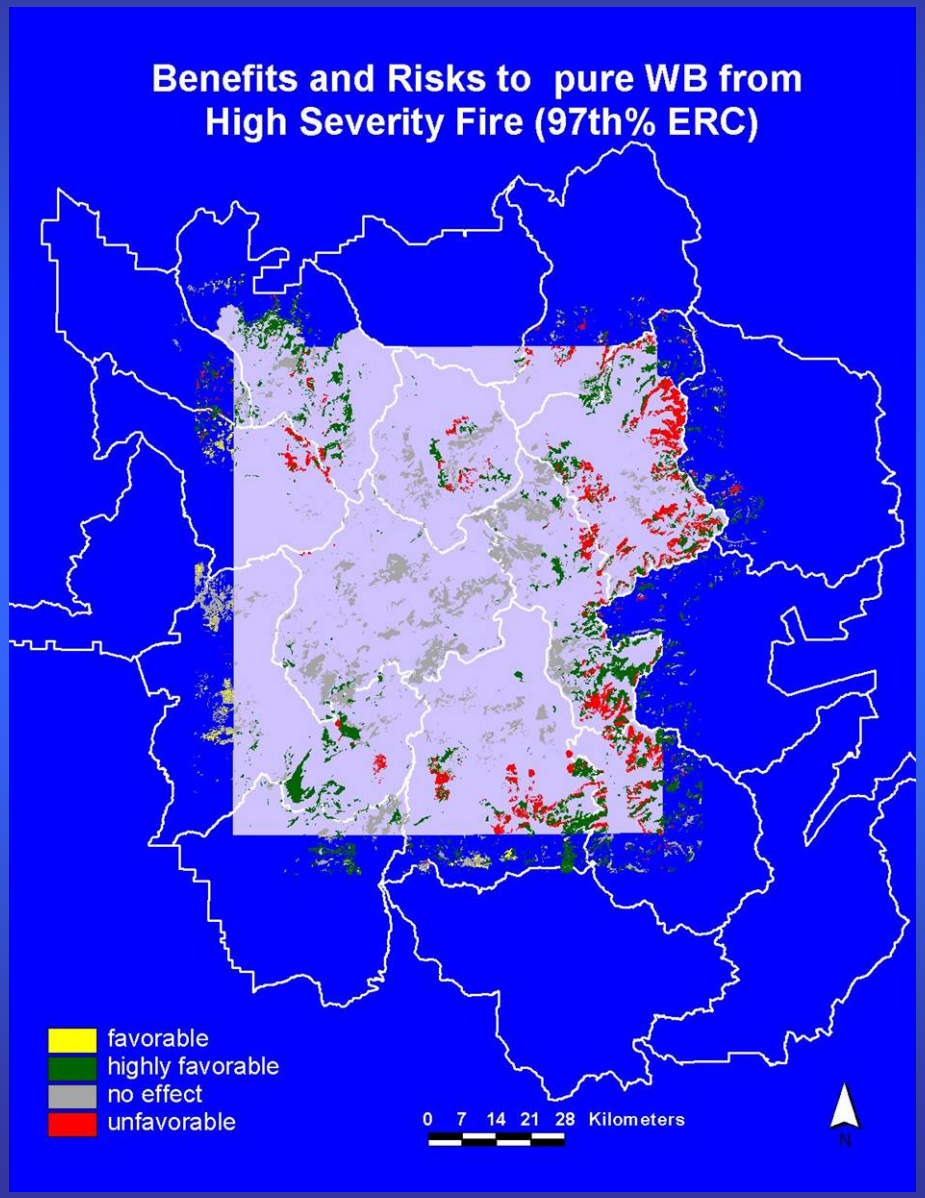
for Whitebark Pine Cover Types in YNP

Cover Types[x]	Severity	Benefits/Risks
WB0: Newly disturbed sites to ~50 years of age. Seedlings and saplings. WB1: Stands ~50-100 years old. Young trees entering cone-producing years.	All fires	Unfavorable—whitebark pine has established, but trees may not have reached age of reproduction. Even low intensity fire likely to kill whitebark pine less than 80 years of age.
WB2: Stands ~100-300 years of age in prime cone producing years. Understory may contain SF in SF habitat types; overstory may contain LP.	High	3% of Favorability determined at landscape scale; stands burned per decade recommended. Minimum and maximum acreage burned may need to be established; extensive fires of 1988 may have already met minimum recommendation for foreseeable future.
	Low/Mixed	Highly favorable— mature whitebark pine moderately fire-tolerant; competitors less fire-tolerant. May create caching sites.
WB3: Stands older than ~300 years. Late seral whitebark pine with moderately dense SF clearly dominating the understory and co-dominating the overstory. Cone productivity declining.	High	Favorable—stands are declining in cone productivity and subject to beetle attack. Some productivity may be lost in stands at the earlier end of this stage.
	Low/Mixed	Highly favorable —co-dominant species are less fire-tolerant; will out-compete WB without fire. May create caching sites.
WB: Climax whitebark pine forest; may have minor component of SF in understory.	All fires	Favorable—stands are declining in productivity and subject to beetle attack, although some productivity may be lost in stands at the earlier end of this stage. WB may persist without periodic fire in this cover type, but recruitment of WB is low and may depend on disturbance.

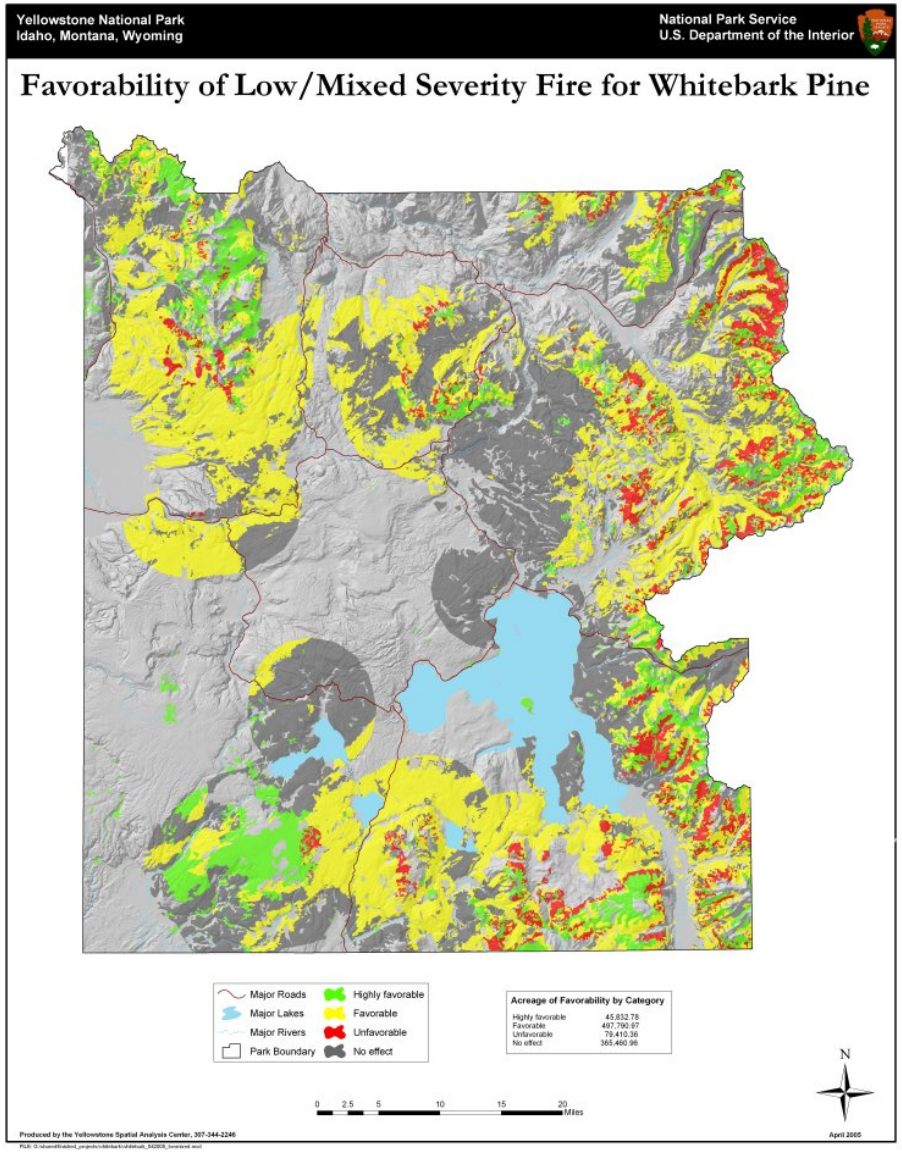
(After Despain 1990)

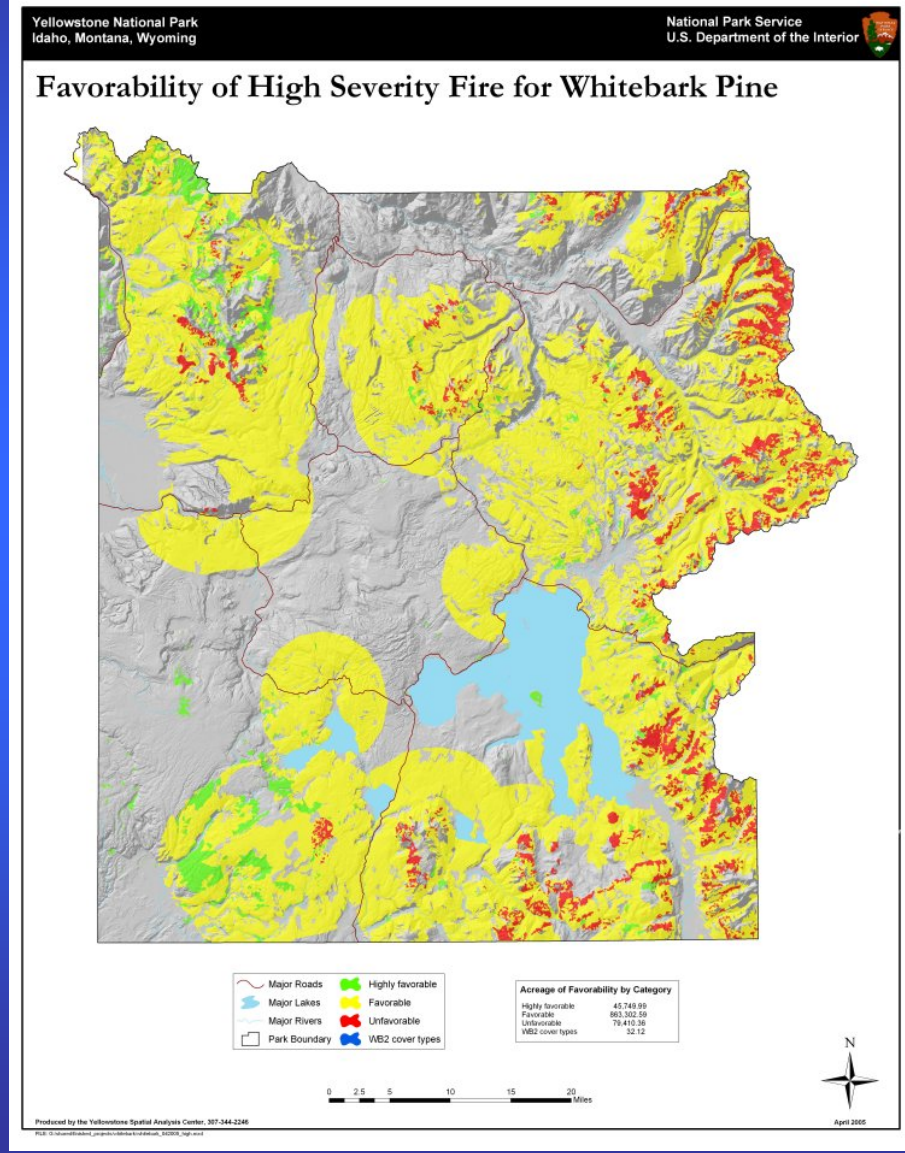
Fire effects modeled using fire behavior parameters



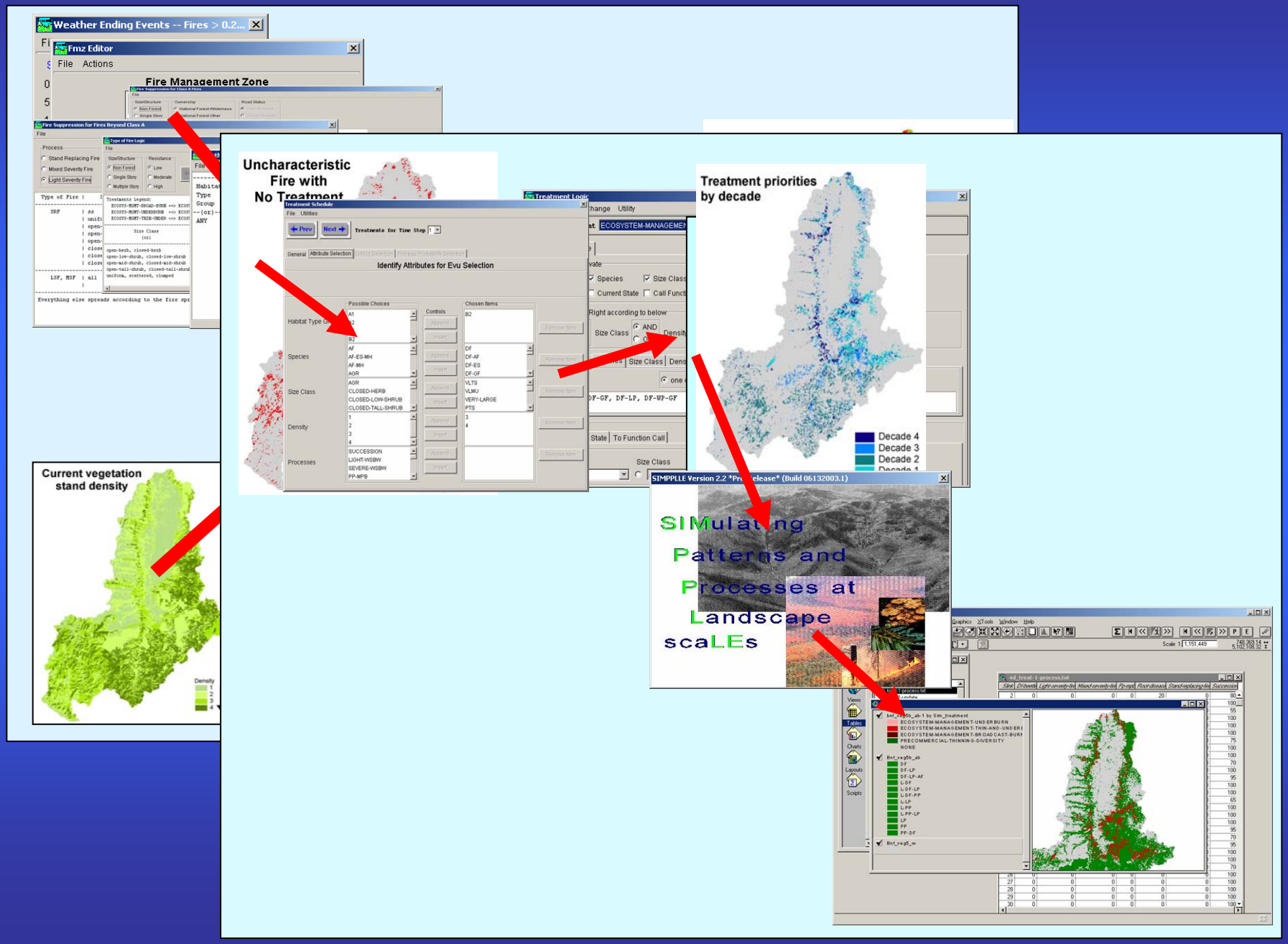


Effective areas of fire effects given Clark's Nutcracker known caching distances

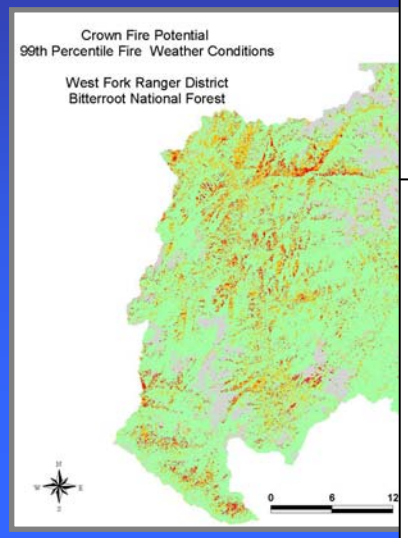




Uses: Model alternatives and future consequences

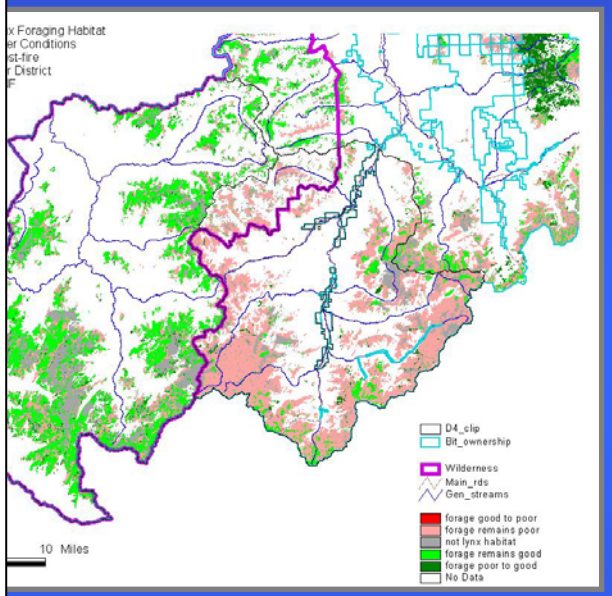


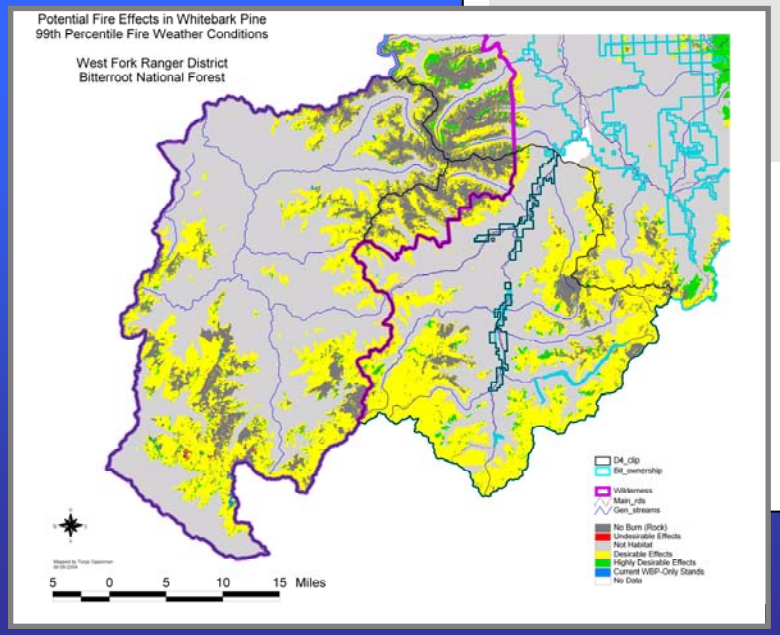
Uses: Map Library for Fire Planning



BITTERROOT NATIONAL FOREST

2004 Fire Effects
Map Library



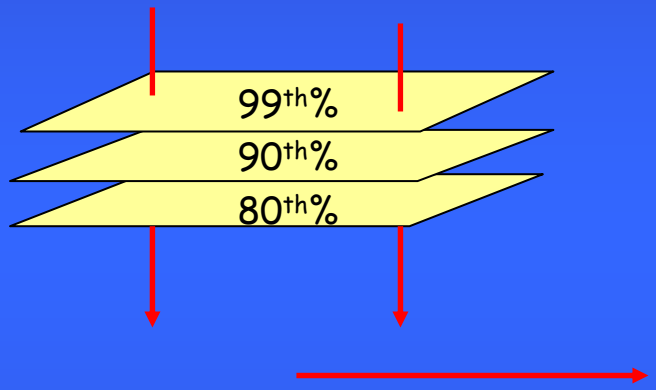


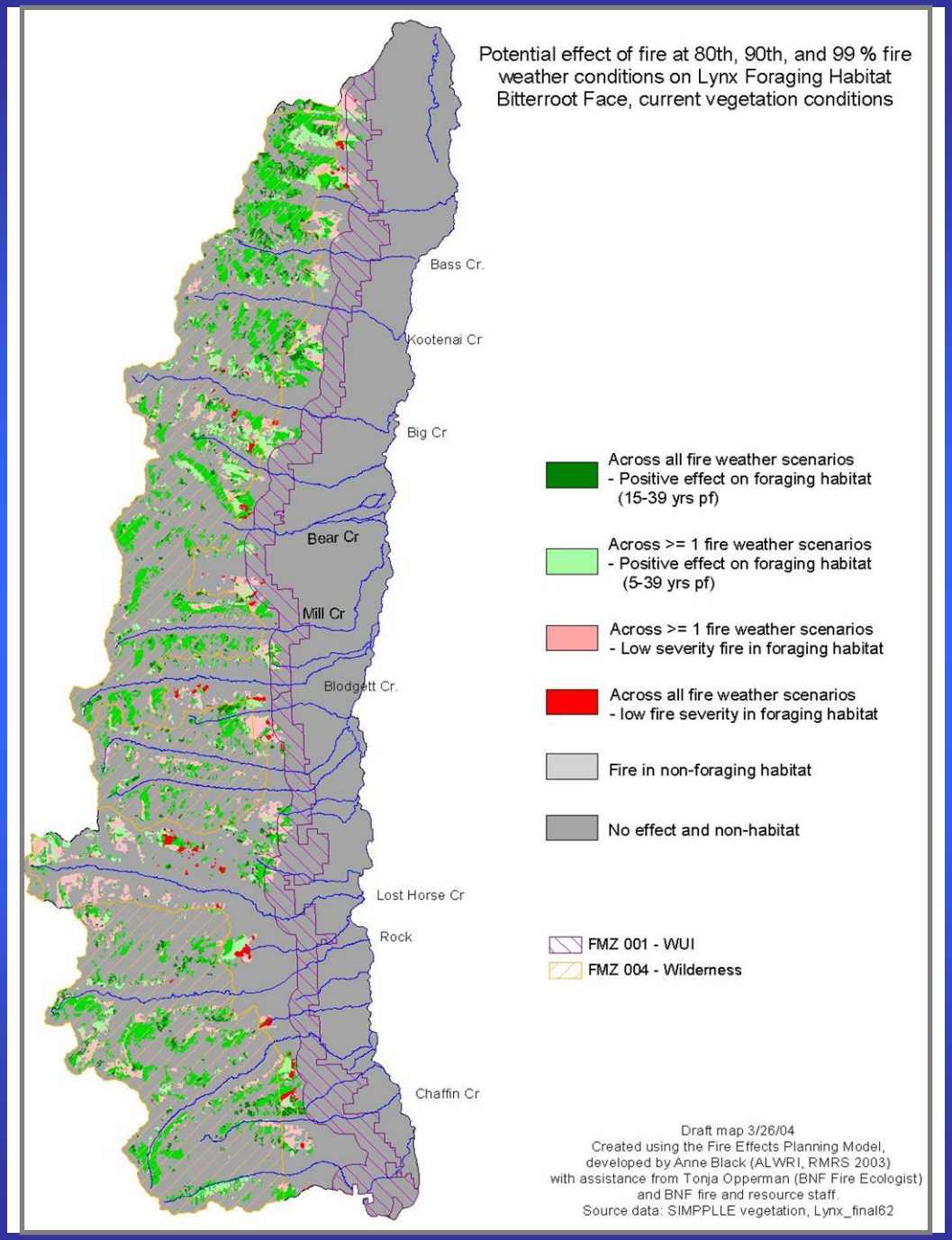
- Fire Behavior
- Fire Effects

Uses:

Set fuel treatment priorities

Fire Effects Library



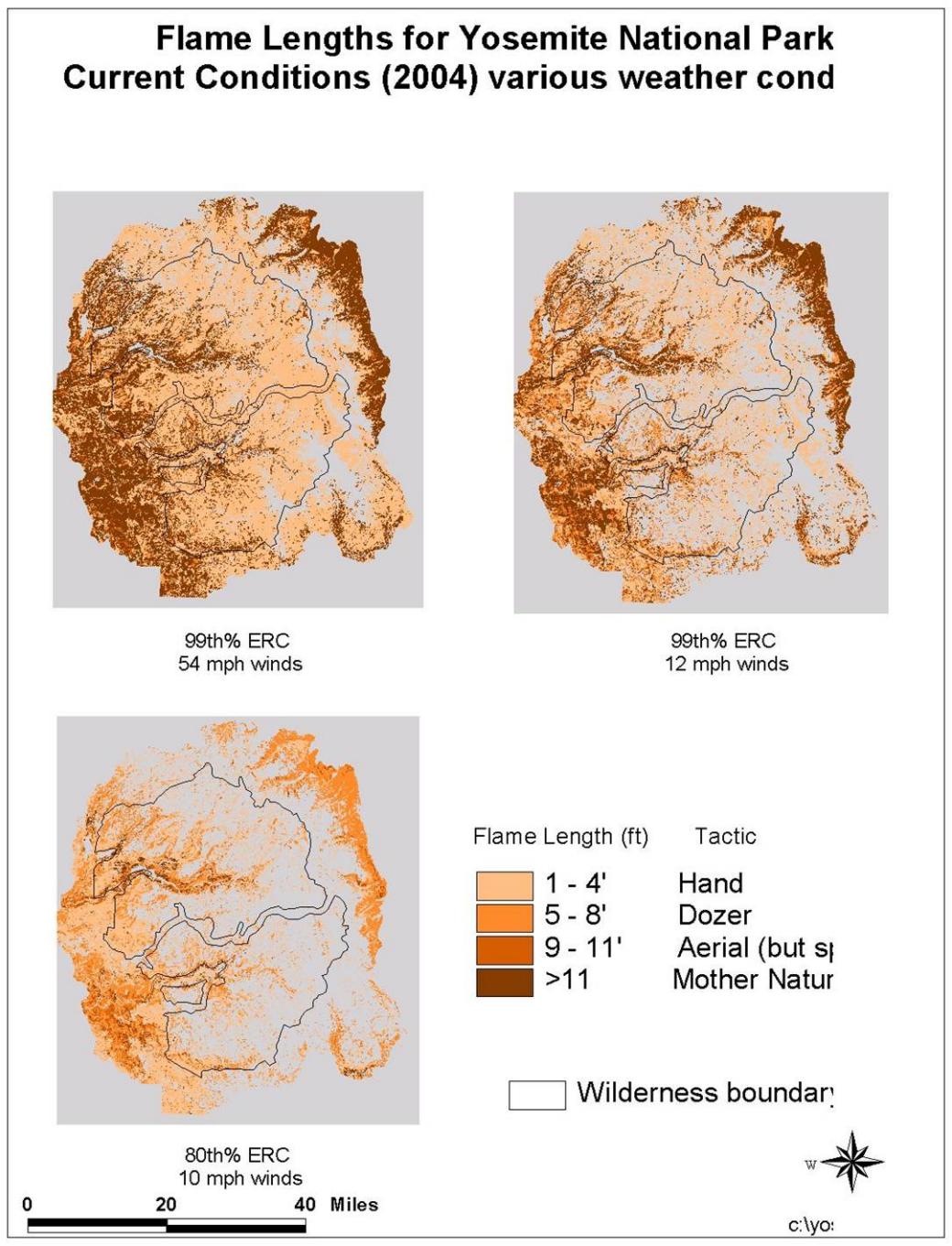


Uses:

Measure progress, consequence of actions

Fire Fighter Safety

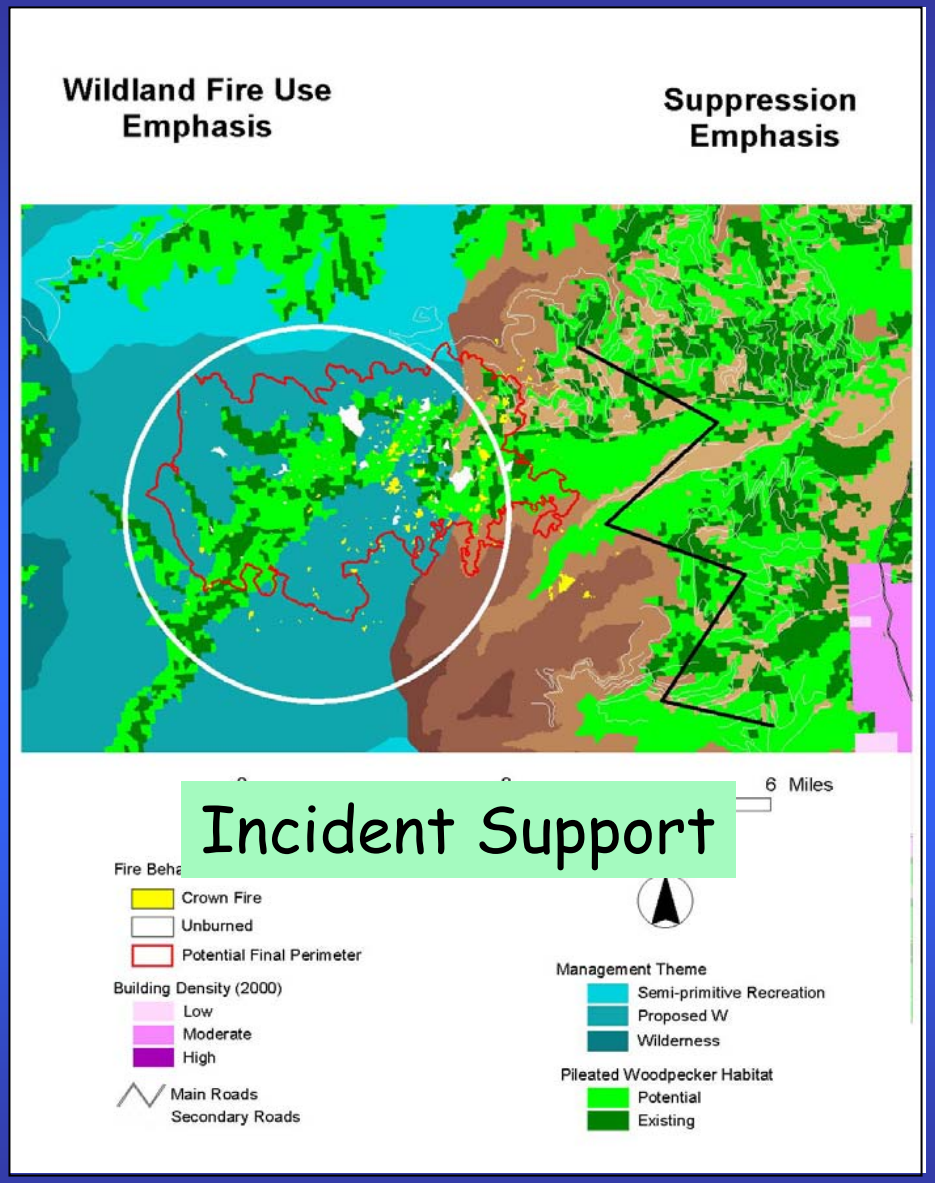
Wildland Fire Use



Uses: Incident Planning

WFIP/WFSA

- Go/No Go
- cost containment

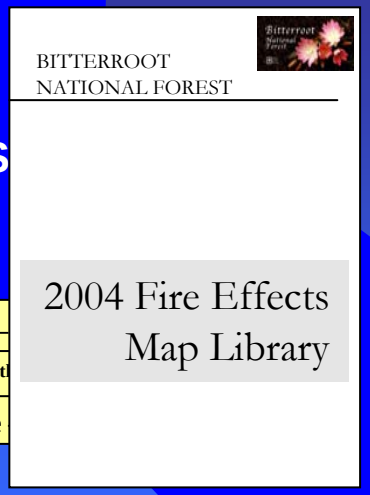


Quantify benefits or reductions in risk within MMA

Consider potential benefits when determining suppression strategy by flank

Maps are draft, and illustrative only

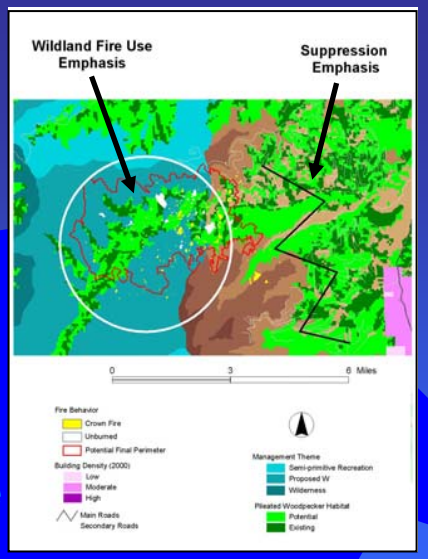
MAP LIBRARIES



Extreme –
High – 90th
Moderate

APPLICATIONS

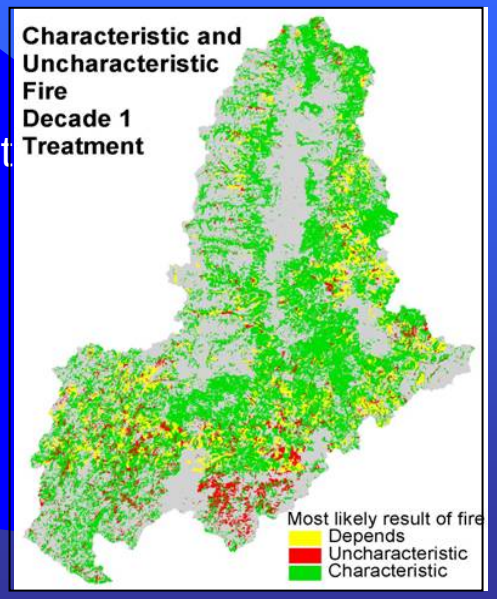
Short-range (< 1 year)



Incident Support

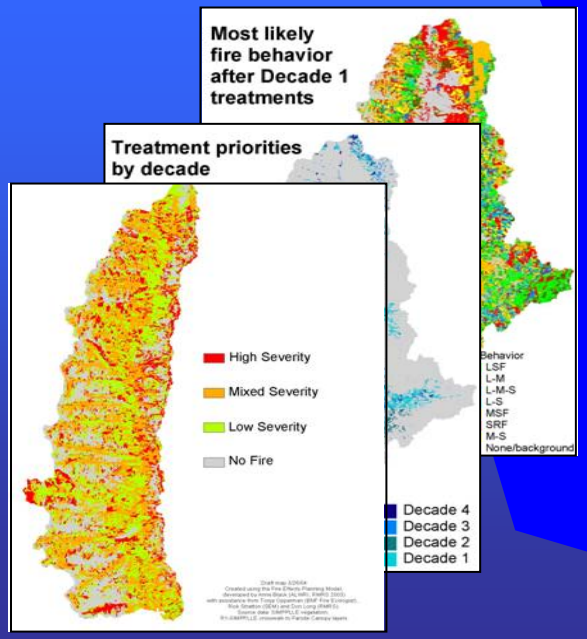
Mid-range (1-5 years)

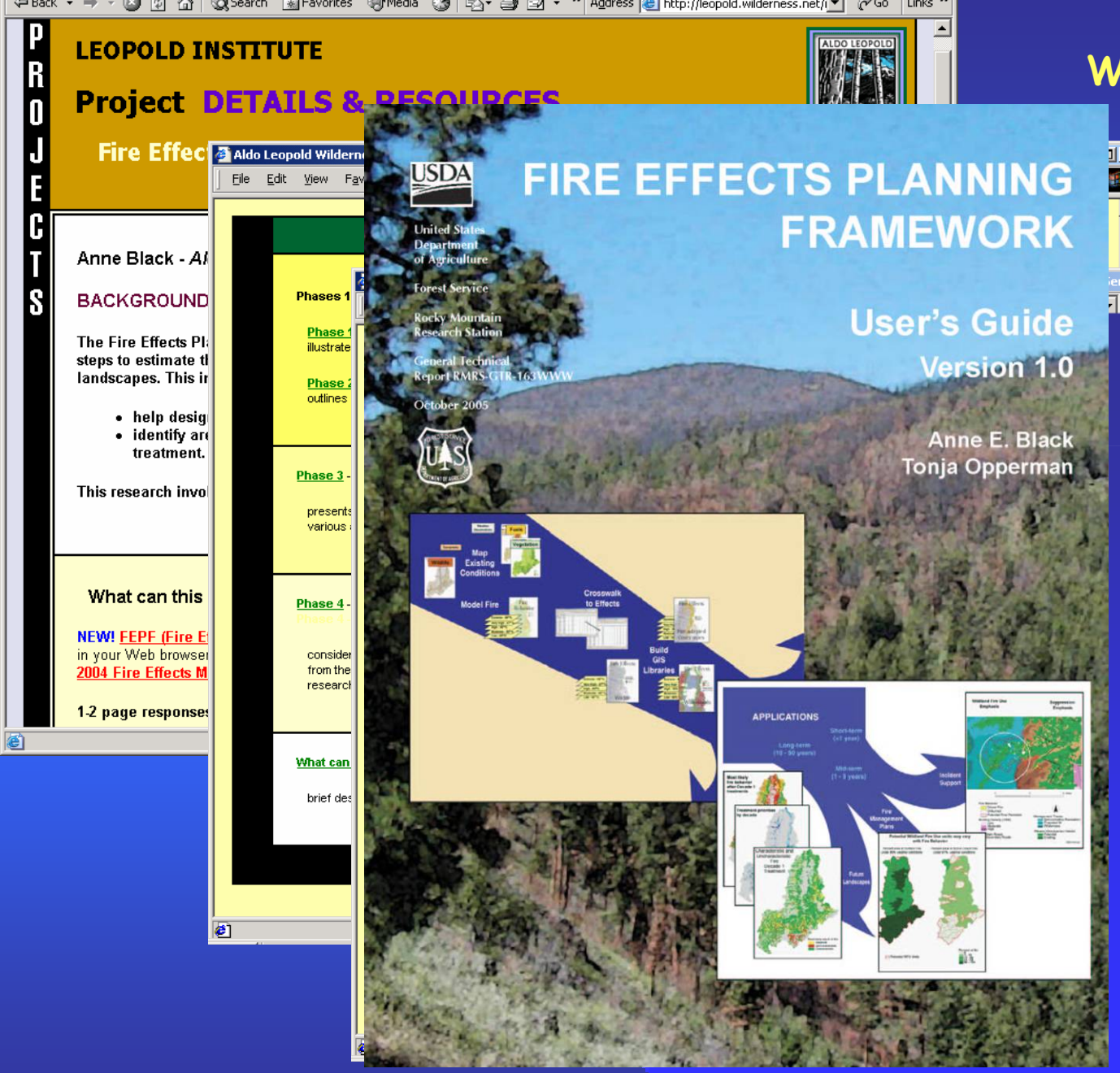
Fire Management Plans



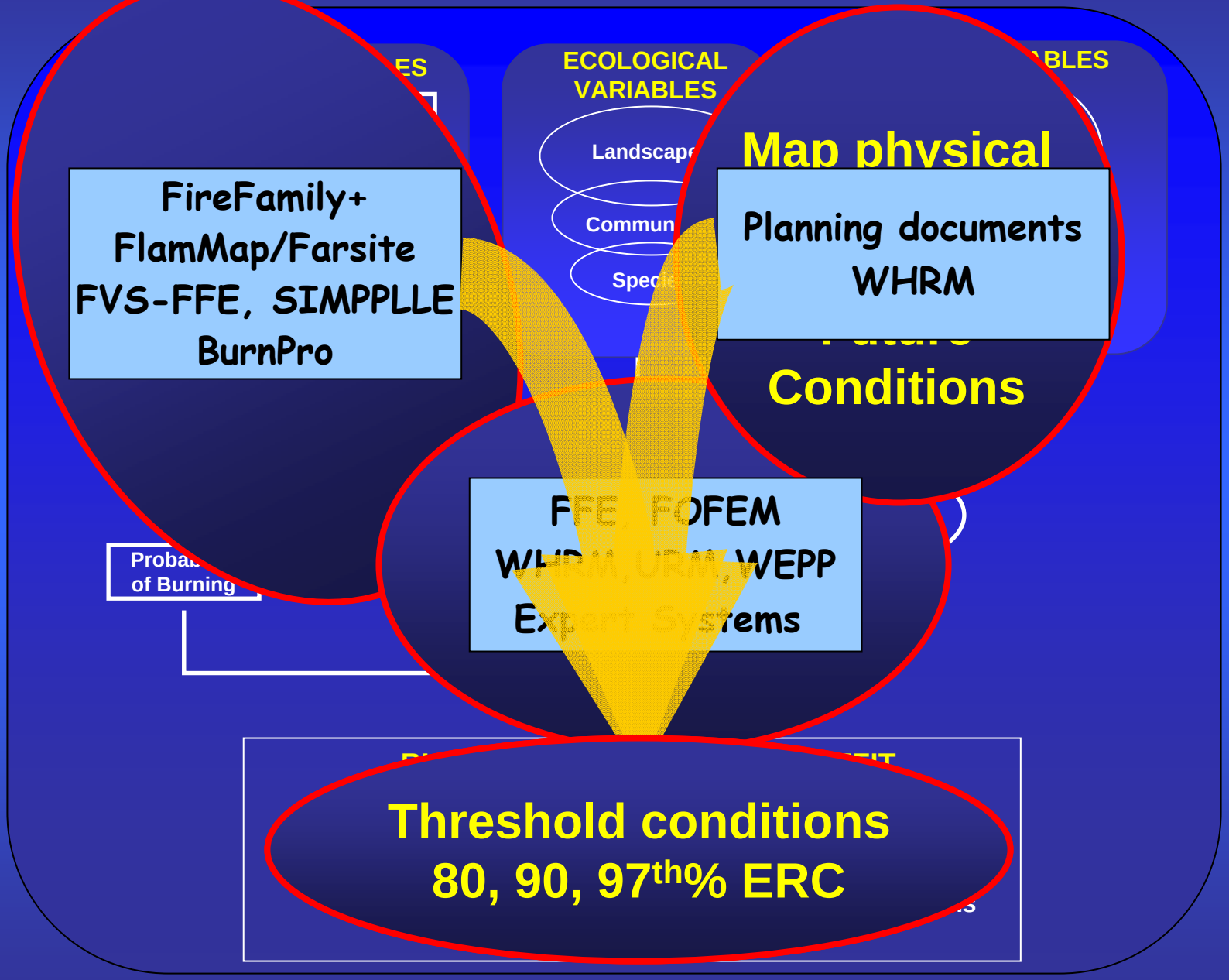
Long-range (10-50 years)

Alternatives Analysis





Website
background
demonstrations
fact sheets

http://leopold.wilderness.net/research/fprojects/F005.htm

Conceptual Model and Tools