

THE CROWN OF THE CONTINENT ECOSYSTEM HIGH FIVE WORKING GROUP

Pilot Whitebark Pine Restoration Strategy

**Whitebark Pine Ecosystem Foundation Meeting
September 13, 2019**

Melissa Jenkins

***Pilot Restoration Strategy Technical Team Lead
Silviculturist, USFS Flathead NF***

Pilot CCE Whitebark Restoration Strategy

Outline

- Background
- Pilot Process
- Unique Methods and Findings



CMP Priority- Whitebark Conservation

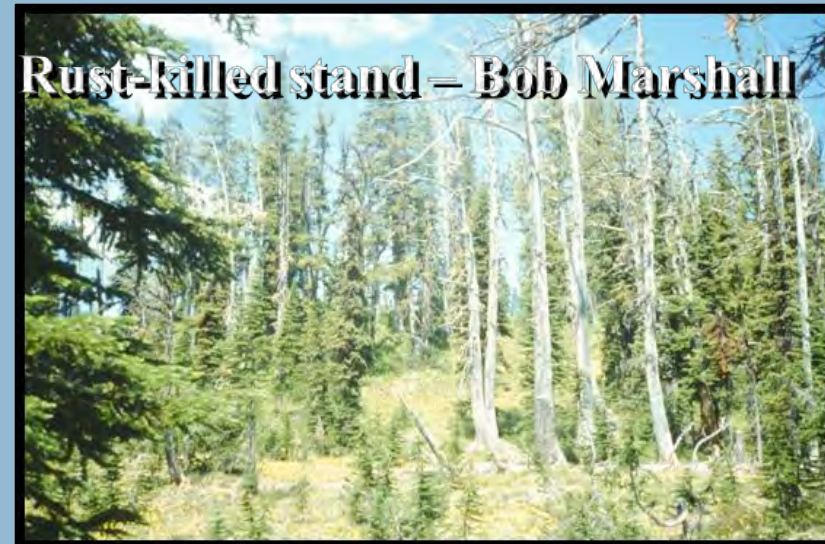
2016 Crown Managers Partnership Conservation Priorities



- * Bull trout/Westslope cutthroat
- * Grizzly bear
- * **Whitebark pine**
- * Meso-carnivores

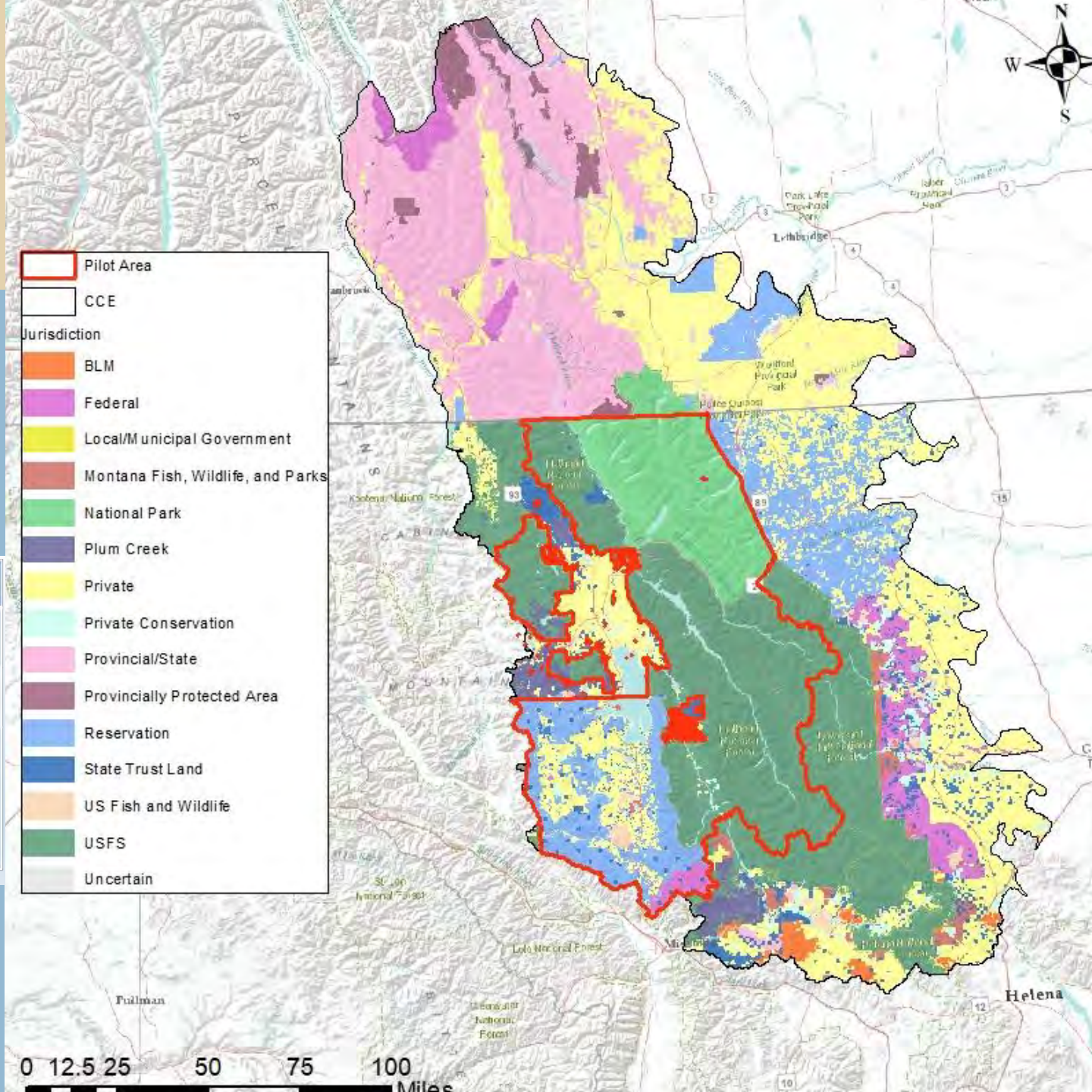
Highest Mortality Rangewide

- ❖ Canada & Glacier NP ~80% infection levels wbp & limber (Smith et.al. 2013)
- ❖ In BC, only ~10% wbp healthy (Moody and Murray 2015)

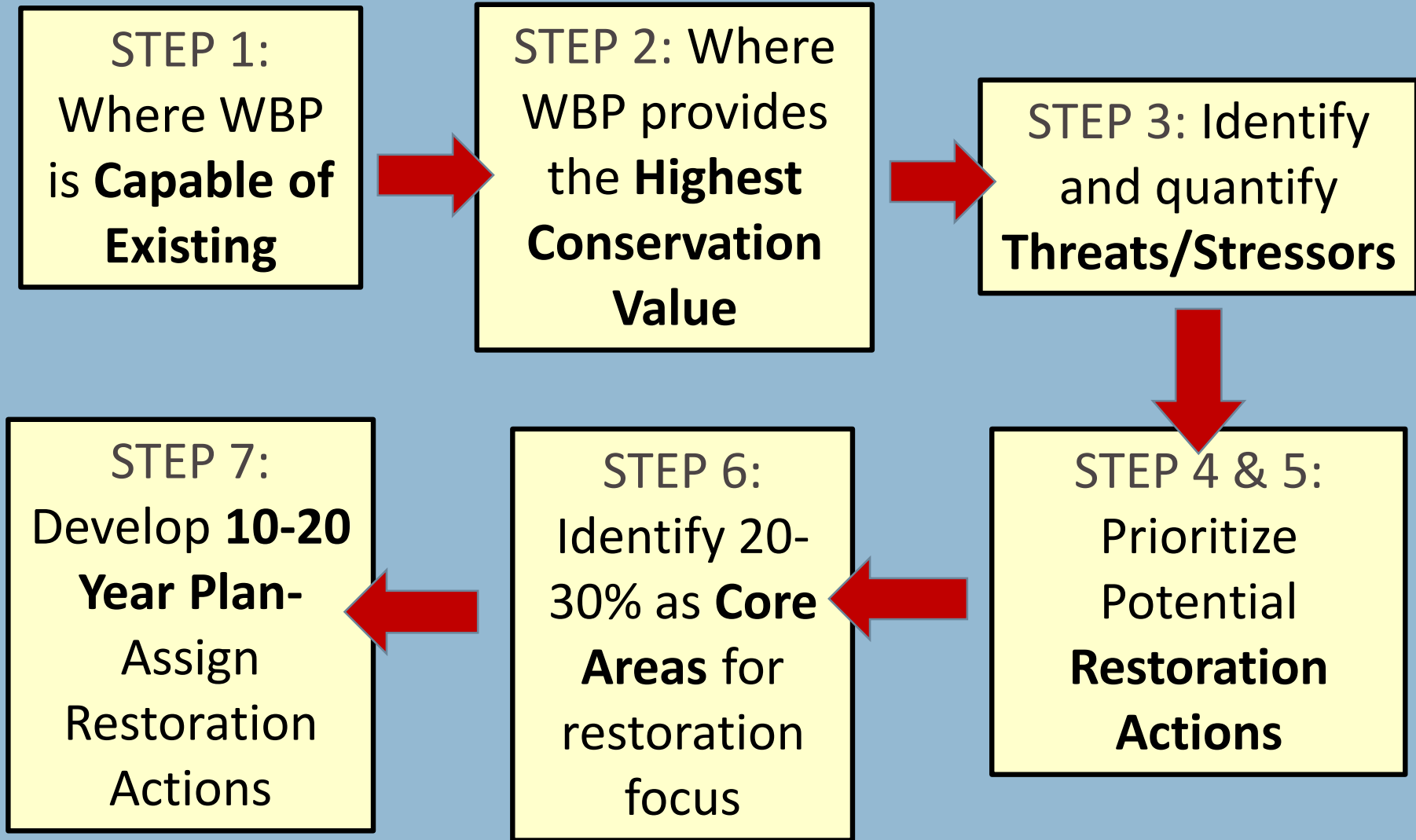


CCE Pilot Restoration Strategy Project Area

Unit	Acres
Glacier NP	1,000,000
Flathead NF	2,400,000
Confederated Salish and Kootenai	1,300,000

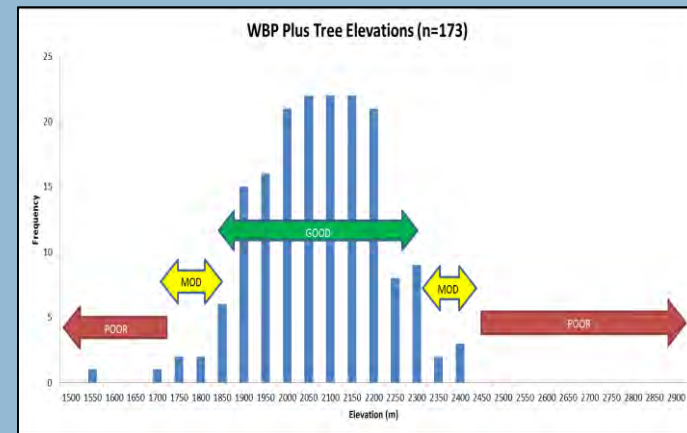


Pilot Restoration Strategy Process



Step 1: Where is WBP Capable of Existing

- **Previous Mapping Efforts**
 - RSAC (Housman, 2013)-Potential range and relative % canopy cover
 - Landfire- Biophysical and Existing Vegetation Type Layers
 - Montana Natural Heritage Spatial Lab 1991-92 distribution model
- **Biophysical Conditions Conducive to Survival and Growth**
 - Elevation limits of 5200' and 5600', slope position, shape, soil moisture, percent slope, aspect
- **Dropped Very Small Isolated Areas**



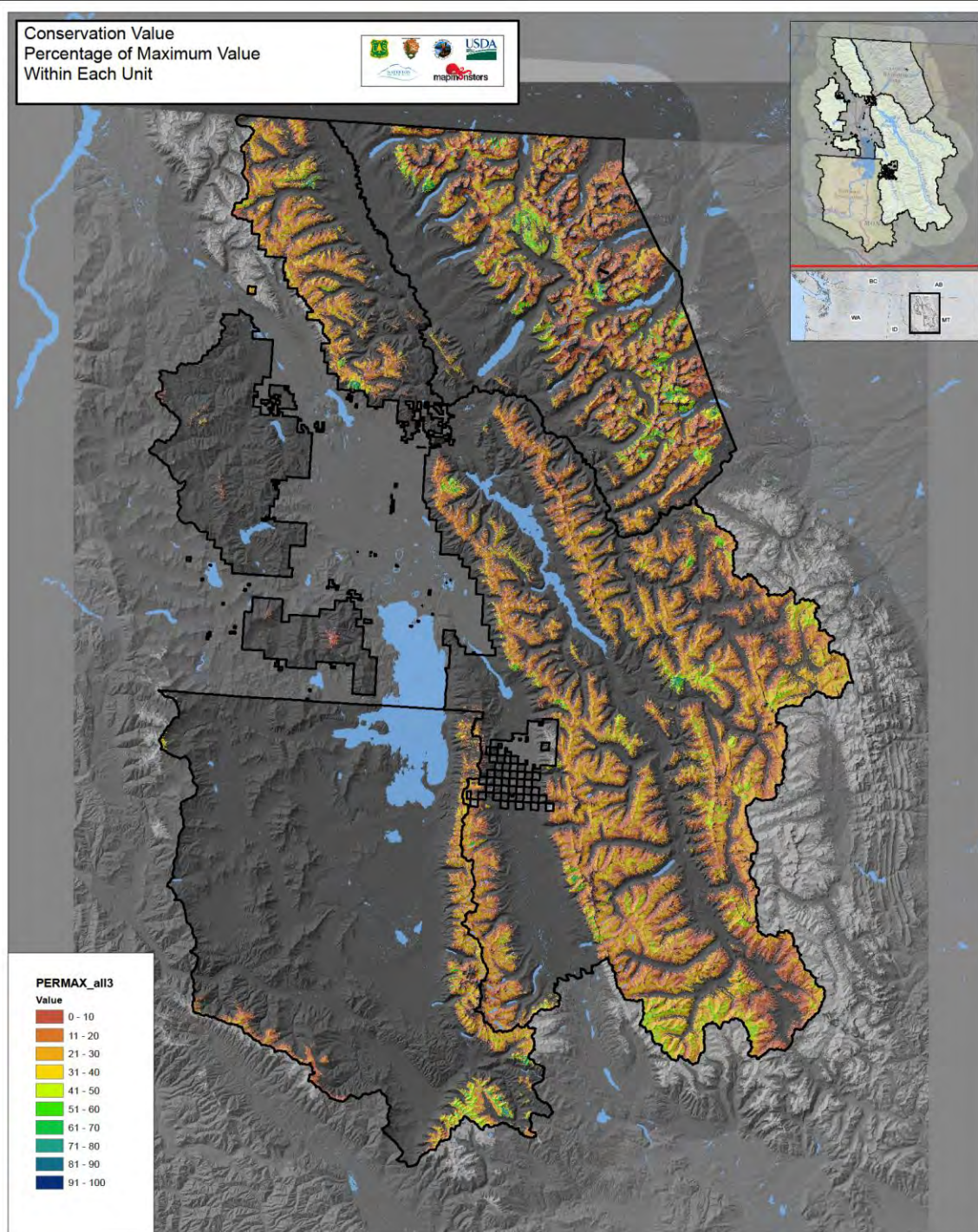
Step 1: Where is WBP Capable of Existing; Potential Range

Unit /Acres /Percent

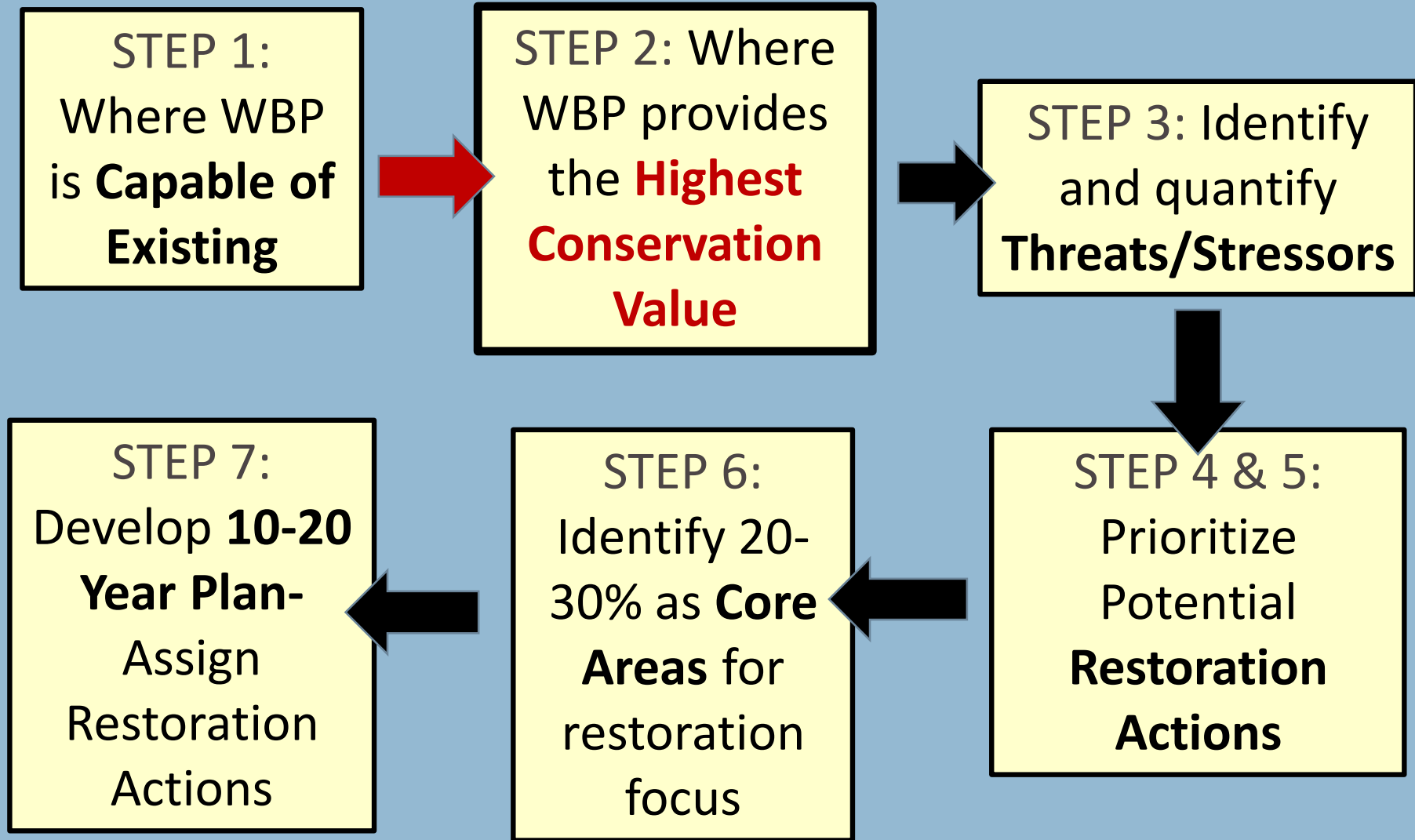
Glacier NP = 348,000/35%

Confederated Salish and
Kootenai = 101,000/8%

Flathead = 947,000/36%



Pilot Restoration Strategy Process



Step 2: Where is the Highest Conservation Value

Conservation Value= Currently providing ecosystem services or capable of providing ecosystem services

Important Ecosystem Services WBP Provides

- Wildlife Food Source (GB Habitat)
- Watershed Protection (Municipal or At Risk)
- Scenic/Recreation/Education Value

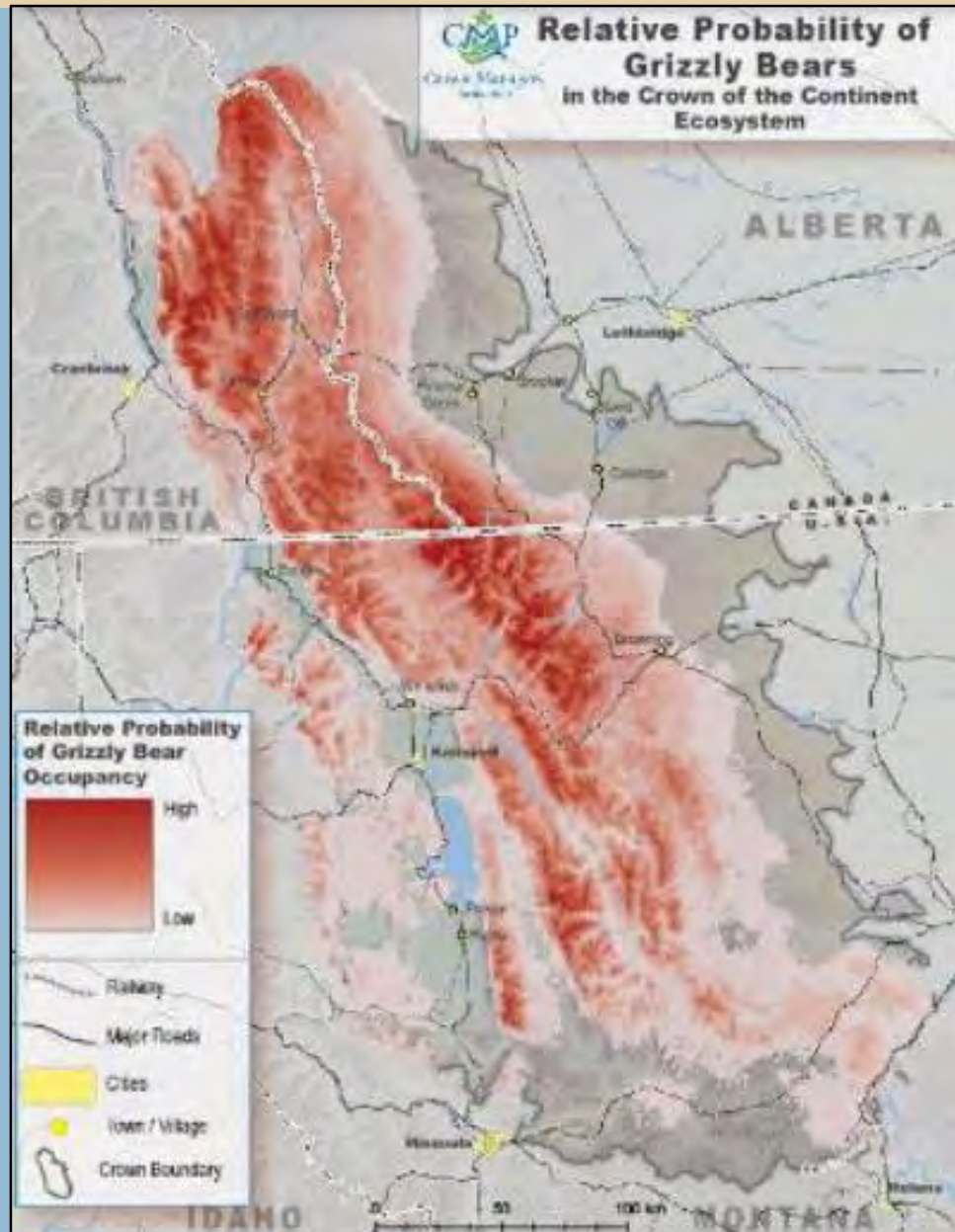
Likelihood WBP Can Provide Ecosystem Services

- Areas with cone production
- Rust resistance
- Biophysical characteristics conducive to establishment, growth and survival
- Persist under future climate
- Recent burns- planting opportunities



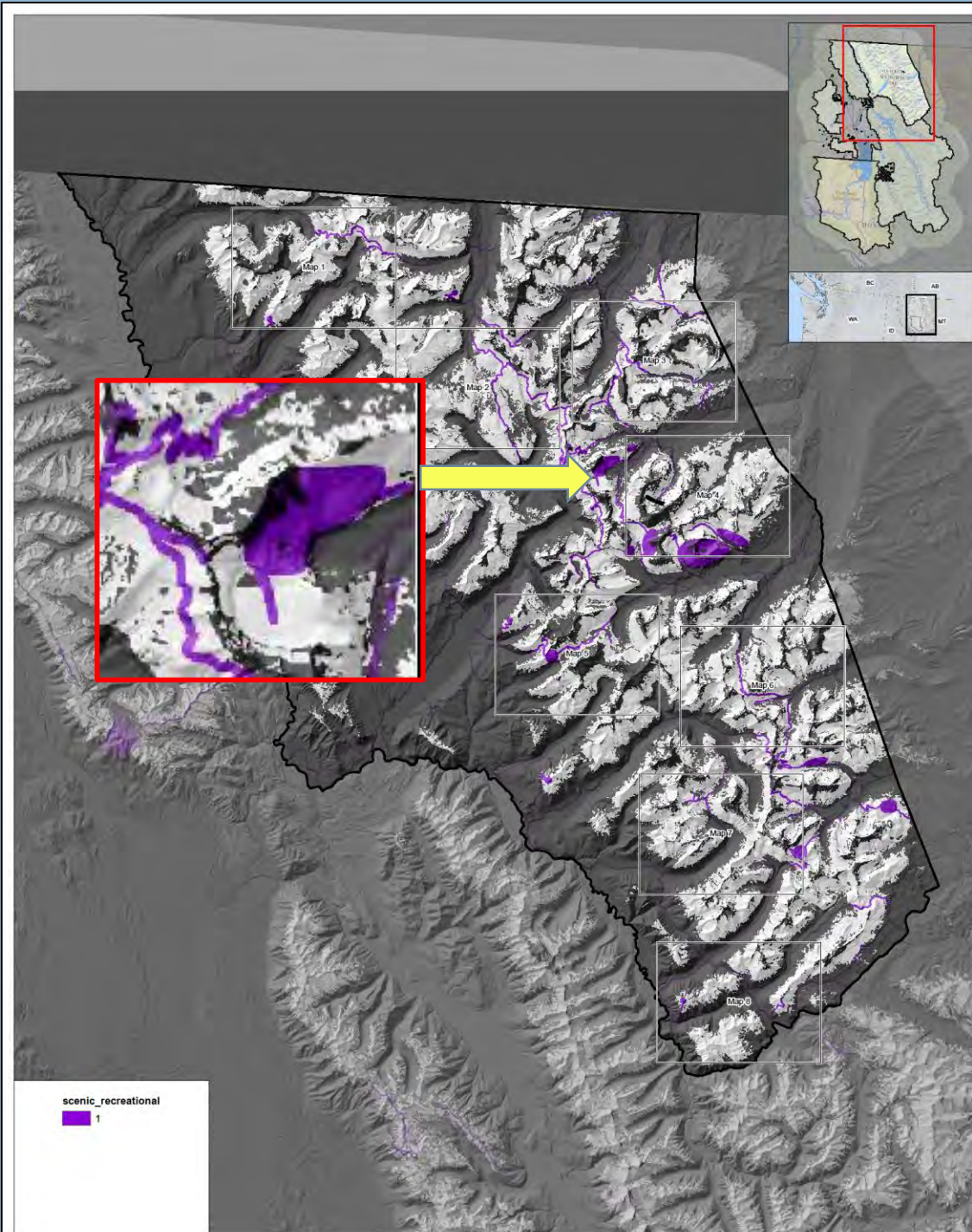
Step2: High Conservation Value- Grizzly Bear Habitat

Areas predicted to have higher grizzly bear occupancy received additional weight



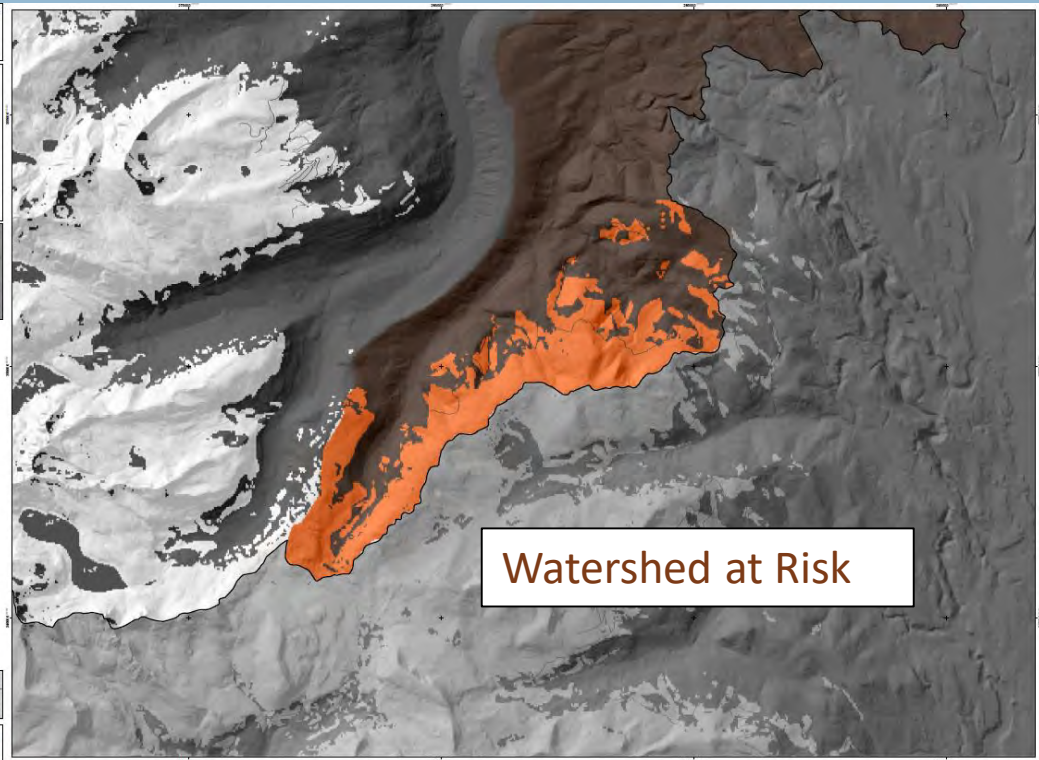
Step2: High Conservation Value- Scenic, Recreation and Educational Values

Areas near trails,
lookouts, ski areas,
scenic vistas/pullouts
received additional
weight that varied by
unit

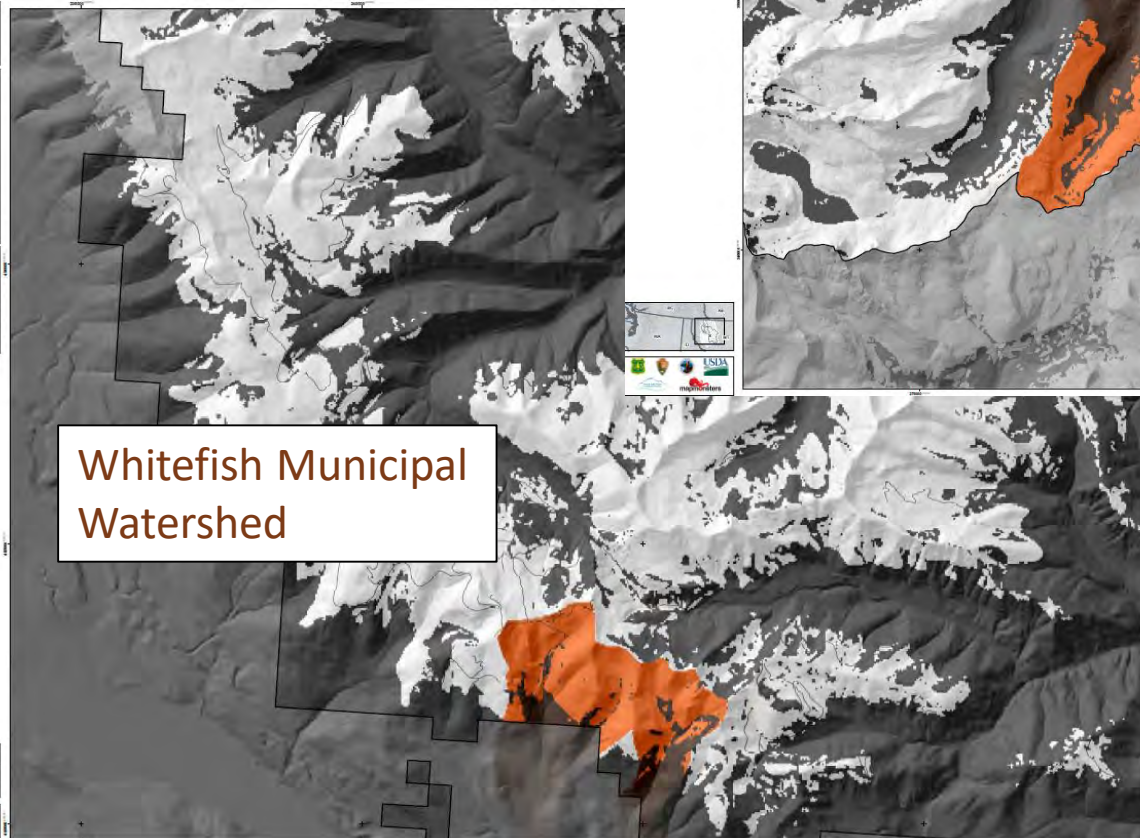


Step2: High Conservation Value- Watersheds

Municipal watersheds
or watersheds at risk
received higher weights



Watershed at Risk



Whitefish Municipal
Watershed

Step2: High Conservation Value- Potential Cone Production

Attributes

RSAC Relative %canopy cover

MT Natural Heritage Spatial

Lab presence/absence model

Landfire Existing Veg Type

Plot data

Map 1 of 13

Flathead National Forest

Core BND, ~25% of WBP Pot. Range

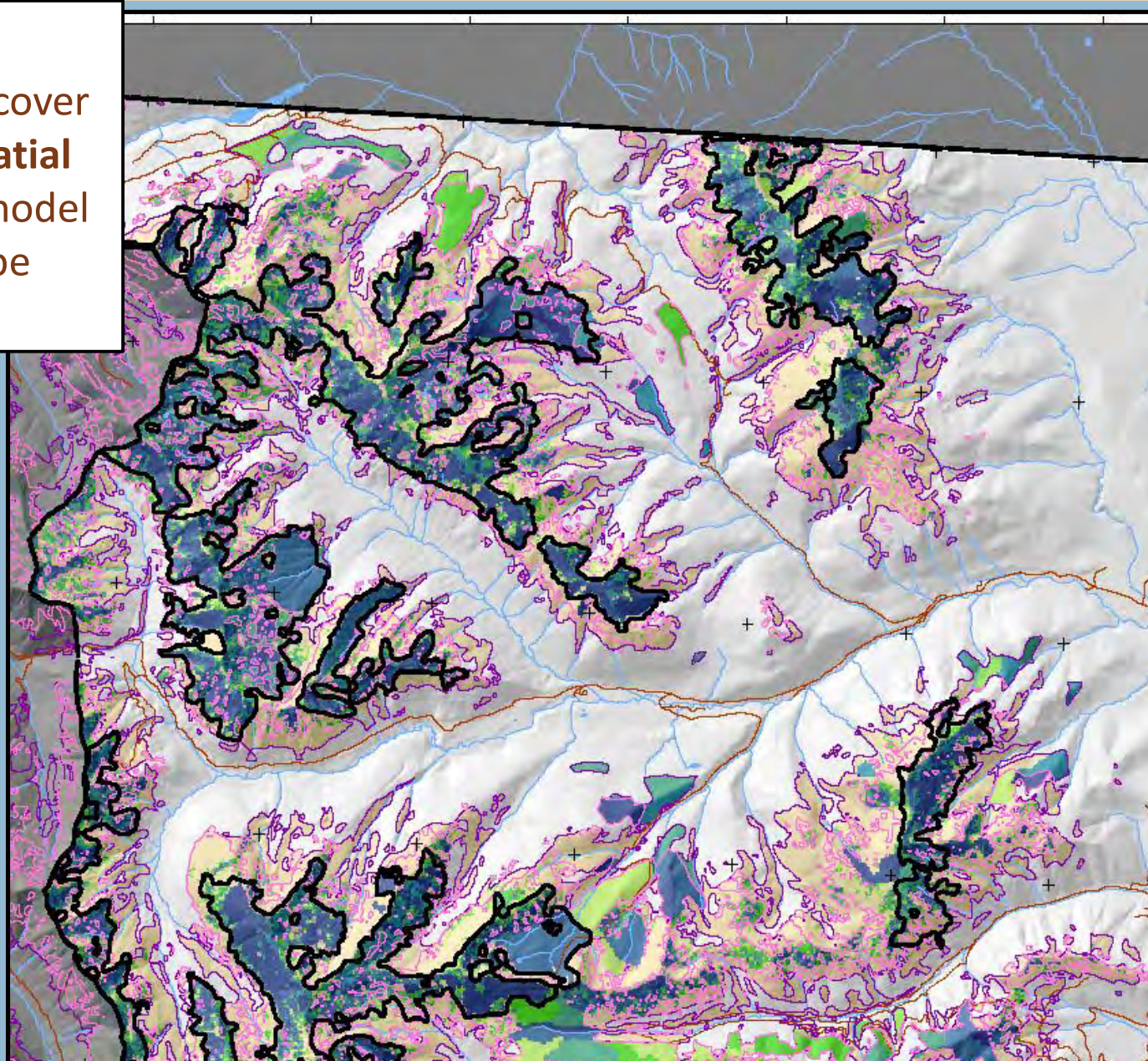
PRED_RANGE_WBP

POT_RANGE_WBP

Capability Score

Value

	0 - 20
	21 - 30
	31 - 45
	46 - 54
	55 - 60
	61 - 81
	82 - 100
	110 - 110
	120 - 150
	160 - 200

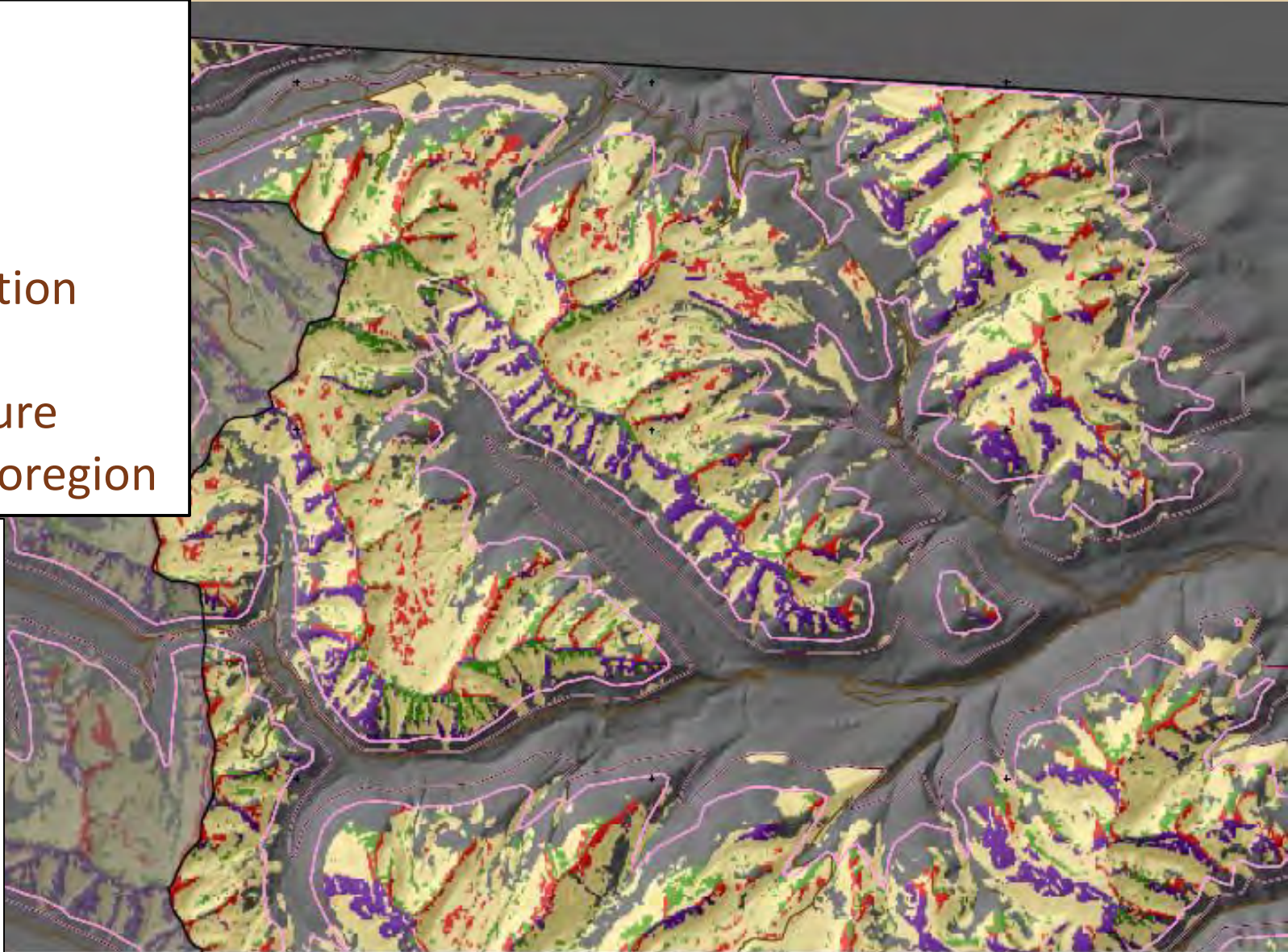
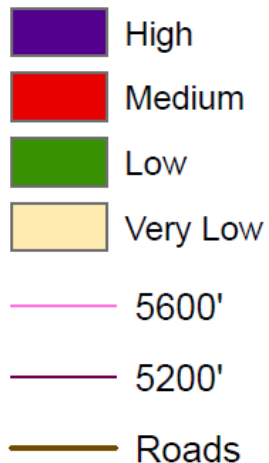


Step2: High Conservation Value- Cone Production Potential

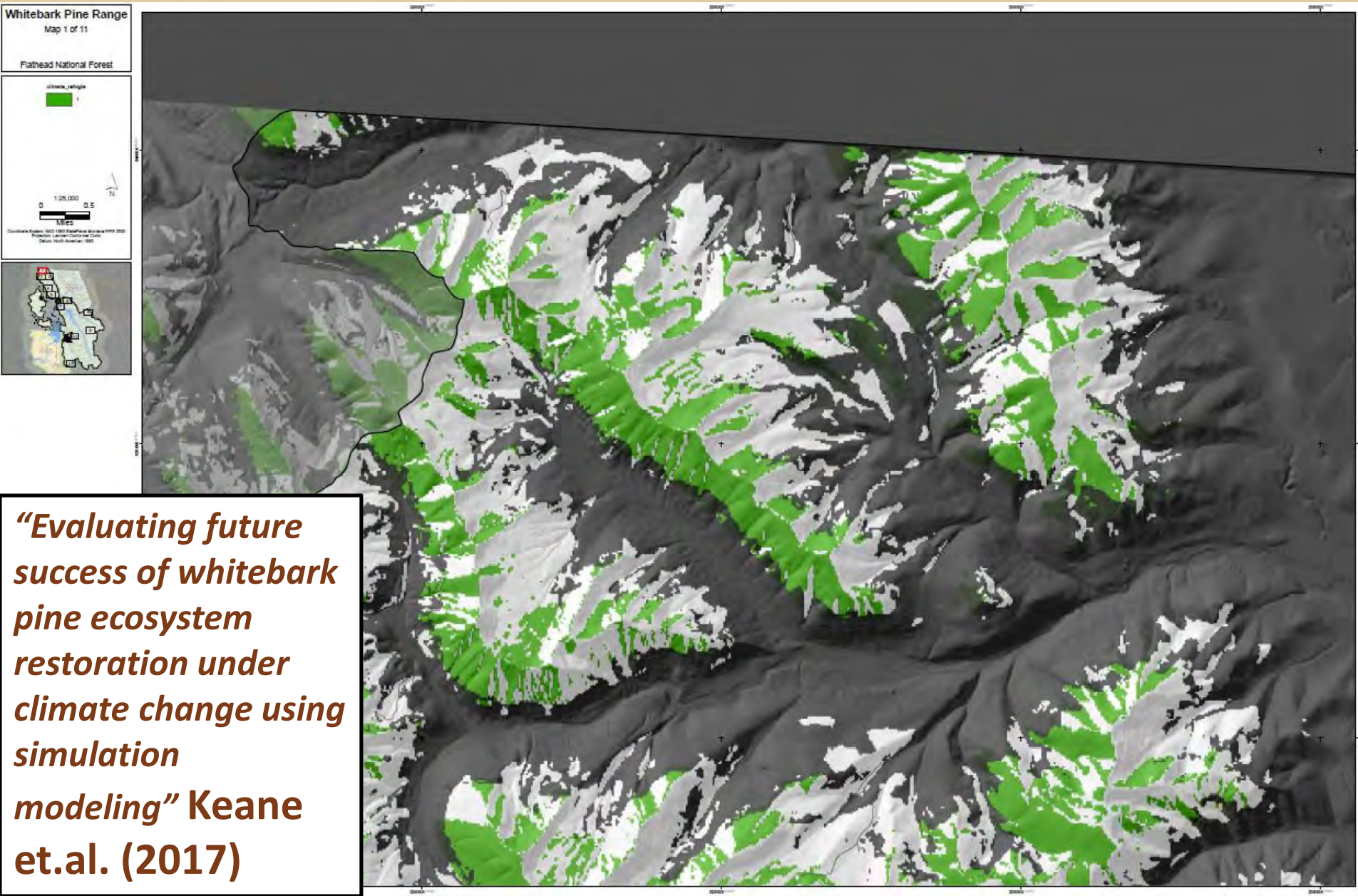
Attributes

- *Elevation
- *Aspect
- *Slope
- *Slope position
- *Shape
- *Soil Moisture
- *Level III Ecoregion

Biophysical Model



Step2: High Conservation Value- Persistence Future Climate

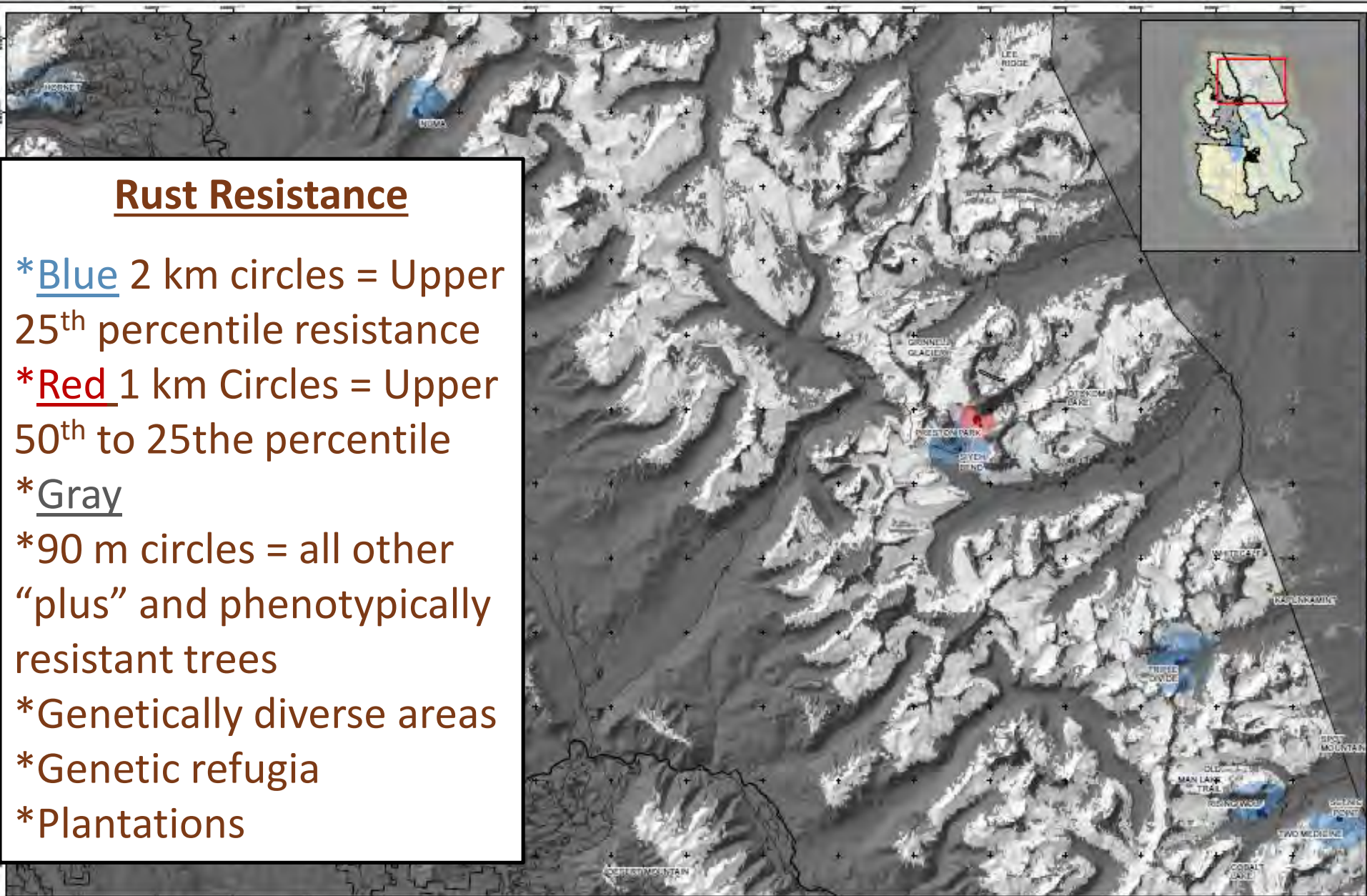


“Evaluating future success of whitebark pine ecosystem restoration under climate change using simulation modeling” Keane et.al. (2017)

Step2: High Conservation Value- Rust Resistance

Rust Resistance

- * Blue 2 km circles = Upper 25th percentile resistance
- * Red 1 km Circles = Upper 50th to 25th percentile
- * Gray
- * 90 m circles = all other “plus” and phenotypically resistant trees
- * Genetically diverse areas
- * Genetic refugia
- * Plantations

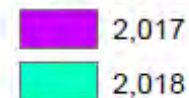


Step 3a Input
Fire - April 17, 2019
Burn Severity and Current Fires

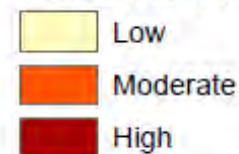


Step 2: High Conservation Value-Regeneration Potential in Recent Burns

Current Fires (year)



Burn Severity (fires < 30yrs)

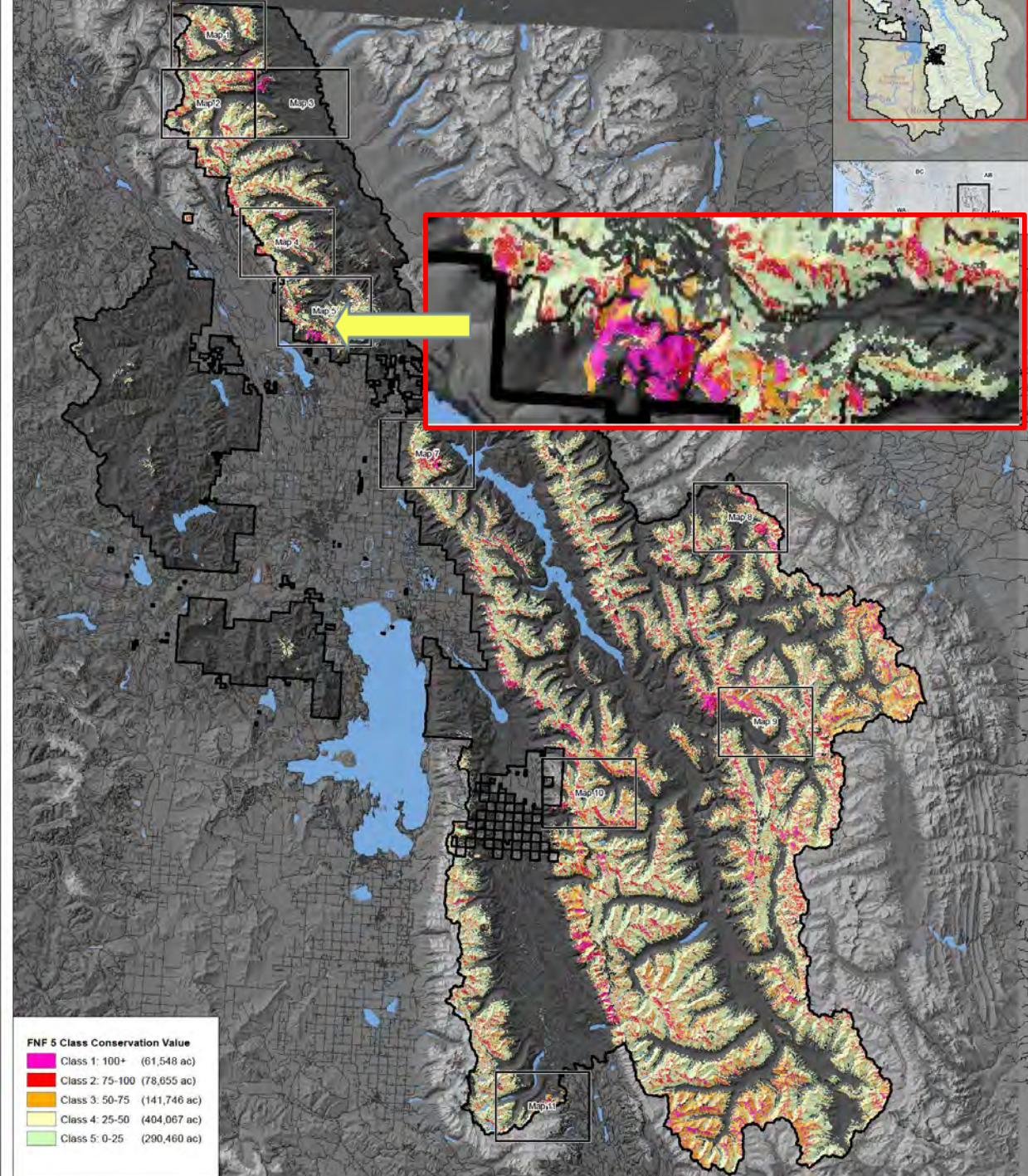


Current Fires (year)
2,017
2,018
Burn Severity (fires < 30yrs)
Low
Moderate
High






Step 2: Units Weight Conservation Values

Priority Ecosystem Services (2a)	Binary Description	All Units Weight	FNF	CSKT	GNP
CCE Grizzly Bear Occupancy (Wildlife Food Source)	GB Habitat: $\geq 50\%$ occupancy= Y, $< 50\%$ = N	10			
Watershed Protection	Municipal or Watershed in Need of Restoration	15			
Scenic/Rec/Education Site	Rec/Scenic/Ed Benefit= Y/ N		20	10	30
Current/Future Capability (2b)					
Current cone production (Wildlife Food Source)	WBP Cover $> 0\%$ = Y; 0%=No	40			
Cone Production Potential	Biophysical Rating; Hi/Med=Y; Low/Very Low=N	30			
Persist Under Future Climate	Meets Holsinger model = Y, Does not Meet = N	40			
Rust Resistance	Y/N = *Plus/Operational *Plantations/restor. sites *Genetically diverse areas *Genetic refugia *Phenotypic resistance	50			
Regeneration Potential (Recent Burns < 30 yrs)	Y= Med/High Severity Fire; N= No or Low Severity	40			

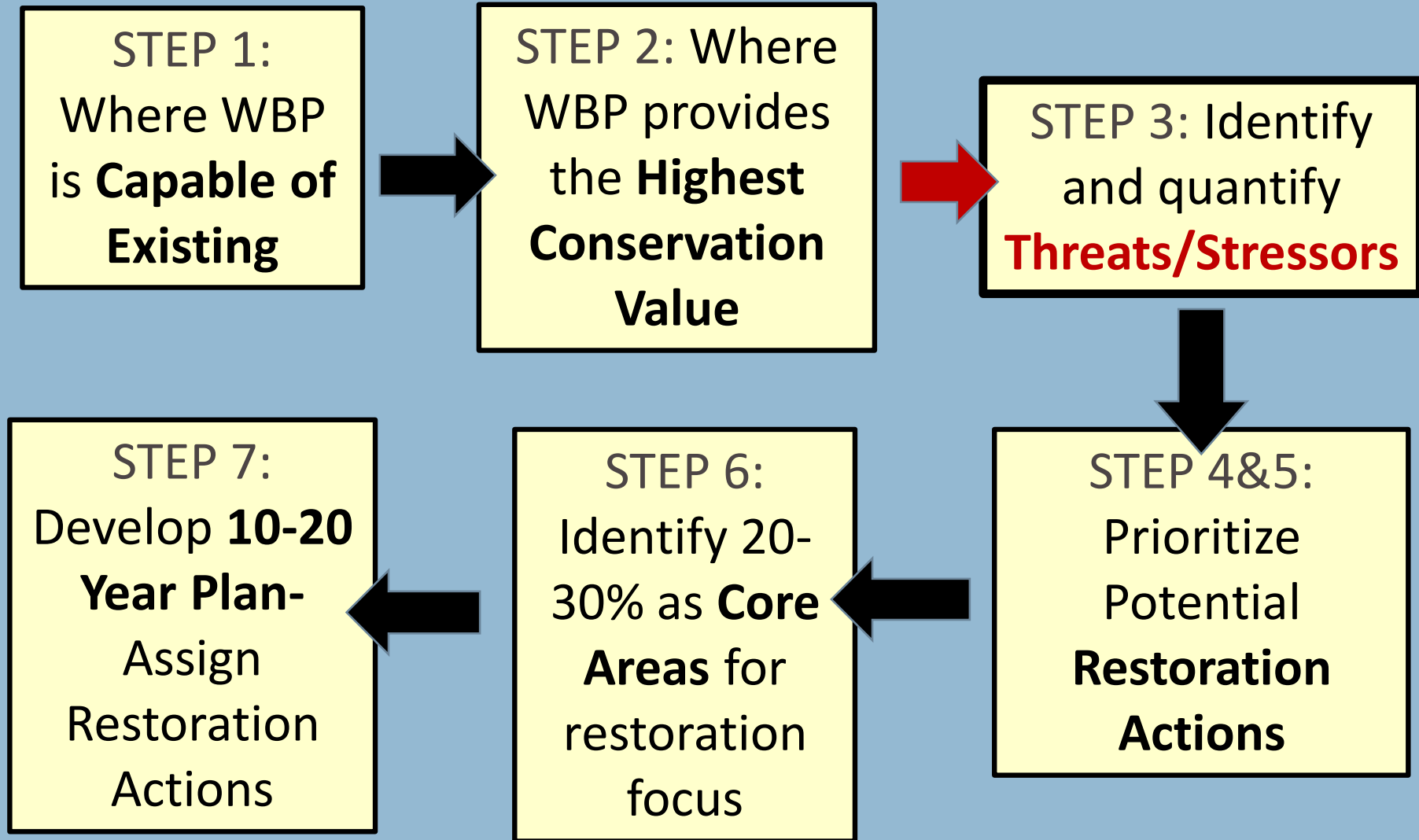
Step 2: Flathead NF- Overall Conservation Value Rating



FNF 5 Class Conservation Value

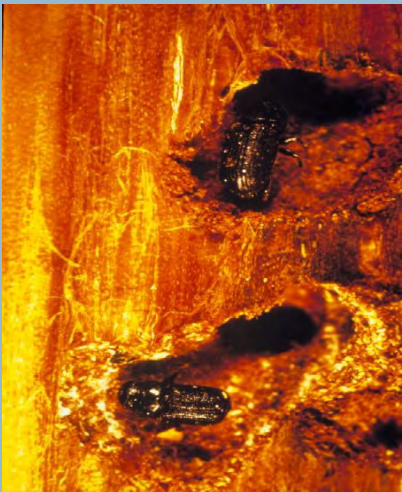
	Class 1: 100+	(61,548 ac)
	Class 2: 75-100	(78,655 ac)
	Class 3: 50-75	(141,746 ac)
	Class 4: 25-50	(404,067 ac)
	Class 5: 0-25	(290,460 ac)

Pilot Restoration Strategy Process



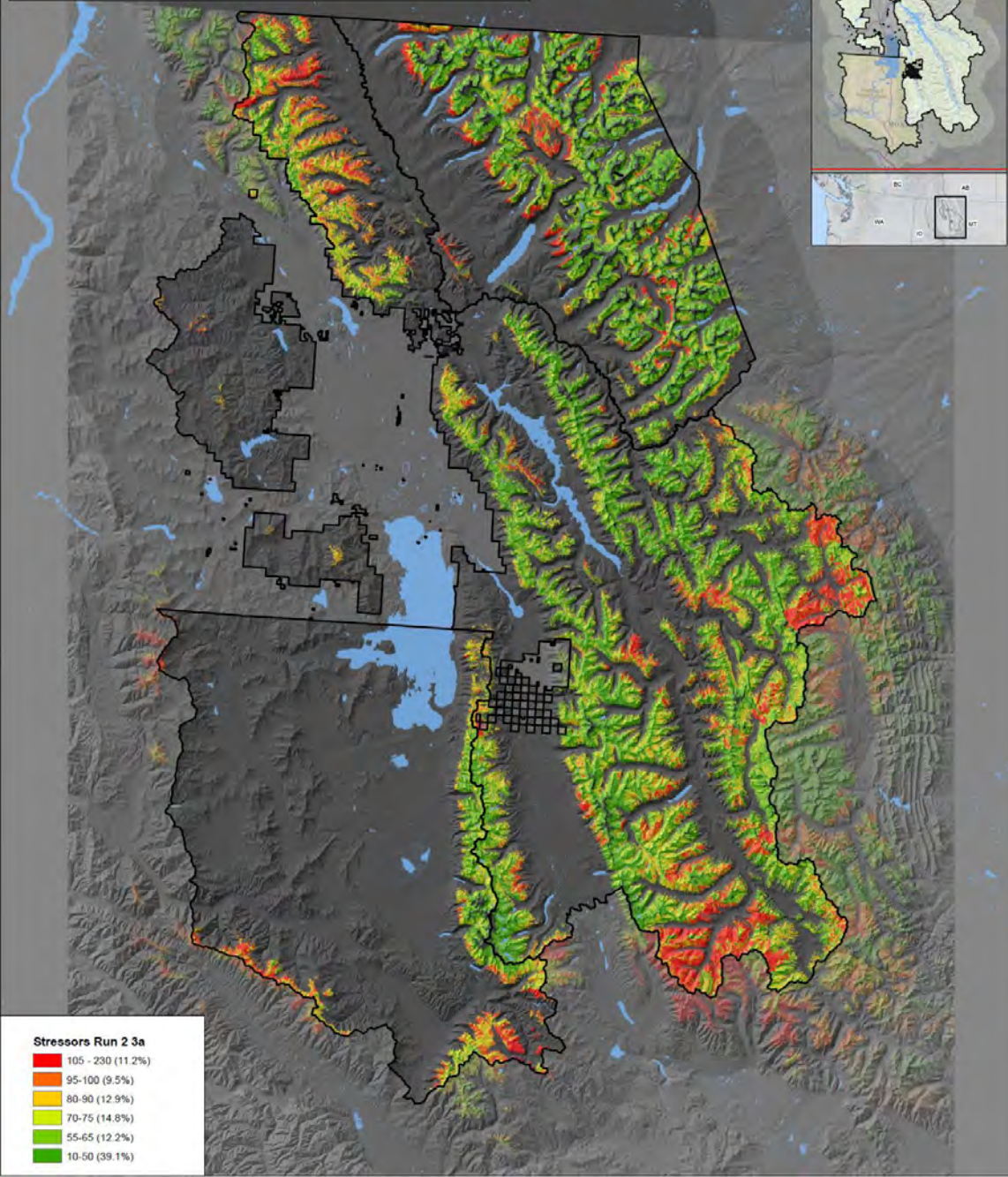
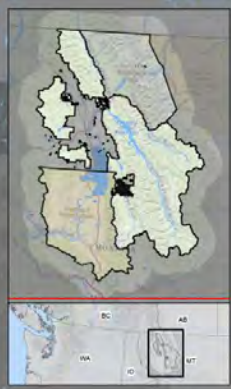
Step 3: Identify and Quantify Threats and Stressors

- White Pine Blister Rust
- Mountain Pine Beetle
- Succession
- Fire
- Climate Change

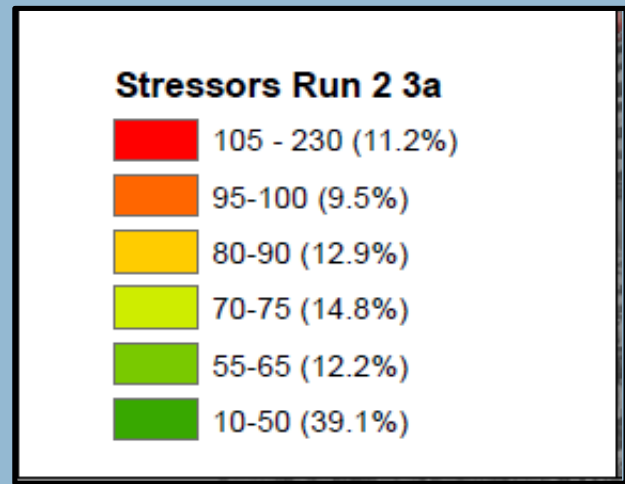


Step 3a: Stressor Class and Assigned Weight

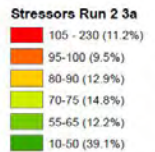
CV Impacted By (Step 3a)	Current Stressor Weight by Class				
	Data Source	Class 1	Class 2	Class 3	Class 4
Succession	Encroachment- VMap Shade Tolerant Canopy Cover	10-25% Canopy Cover	25-40% Canopy Cover	40-60% Canopy Cover	>60% Canopy Cover
Weight		10	20	25	30
Fire	Burn Severity, 1988-2016 and Recent Burns 2017, 2018	Unburned	Low Burn Severity	Moderate Burn Severity	High severity and Recent burn polys = Y
Weight		0	10	40	50
Blister Rust	Mahalovich BR Infection levels also BR from Aerial Detection 97-2017 (yes or no)	-20 Score where wetness > 2	-10 Score where wetness > 2	-5 score where wetness > 2	Aerial detection polys = Y
Blister Rust Hazard	Based on Wetness index	Subxeric to very xeric (very low risk) Submesic to subxeric (Low risk)	Mesic (moderate Risk but most chance of overlap)	Subhygric (High Risk)	Suhhydric-Hygric (Very High Risk)
Weight		10	20	30	40
MPB	Cumulative MPB Severity; Jenne and Egan, 2019; Mortality from 2016-2017 aerial detection surveys	Light 1-10%	Moderate 11-29%	Severe high 30-50%	NA, only 3 classes
Weight		20	30	40	



Step 3a: Existing Stressors and Weights Combined



Combined Stressors into 6 Classes

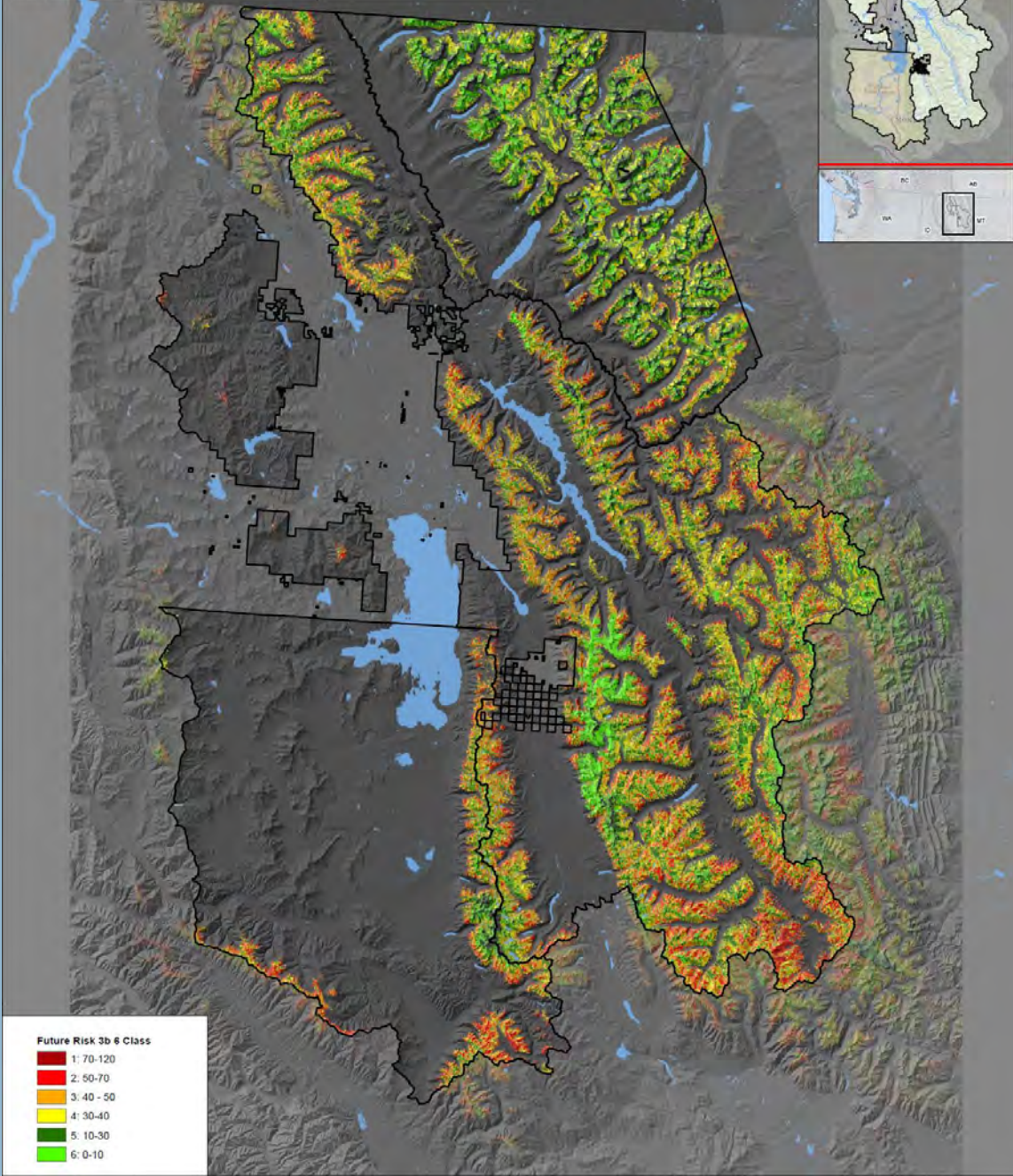


Step 3b: Future Risk- Stressors and Weights

Conservation Value at Risk (Step 3b)	Future Stressor Weight by Class					
		1	2	3	4	5
Wildfire Hazard Potential	USDA Fire Modelling Institute	Very Low	Low	Moderate	High	Very High
Weight		0	0	10	20	30
Future MPB Risk 2013-2027, %BA Loss	USDA, National Insect and Disease Forest Risk Assessment	0-15%	15-30%	30-45%	45-60%	60-80%
Weight		10	20	30	40	50
Future Climate Risk	Holsinger, Crookston A1B models and Mahalovich genetic refugia model.	Meets Mahalovich genetic refugia model	Meets Holsinger and Crookston A1B	Meets Holsinger Model Only	Meets Crookston A1B Only	Does not meet any climate prediction models
Weight		0	10	20	30	40



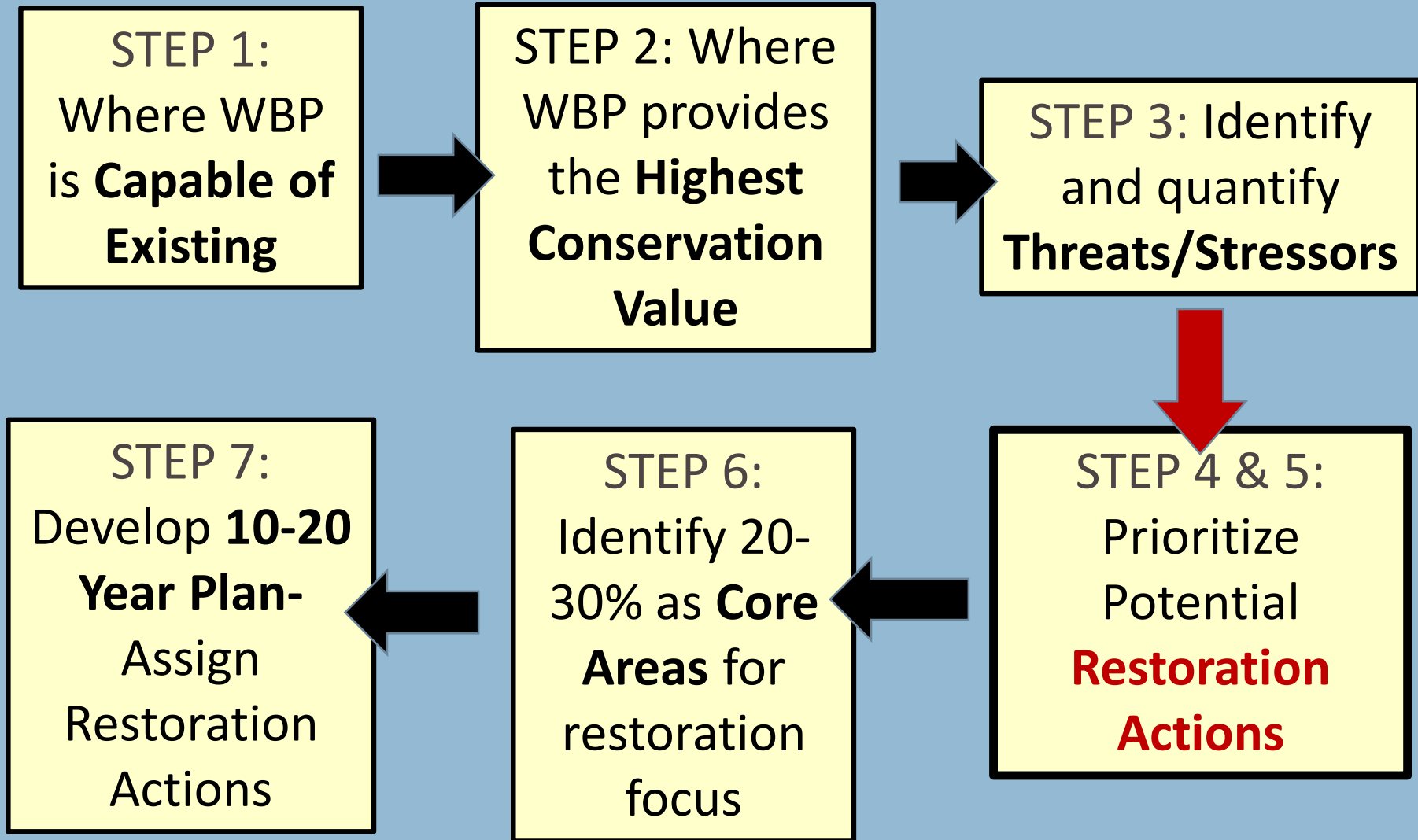
Step 3b: Future Stressors- Combined Weights



Combined Stressors into 6 Classes



Pilot Restoration Strategy Process



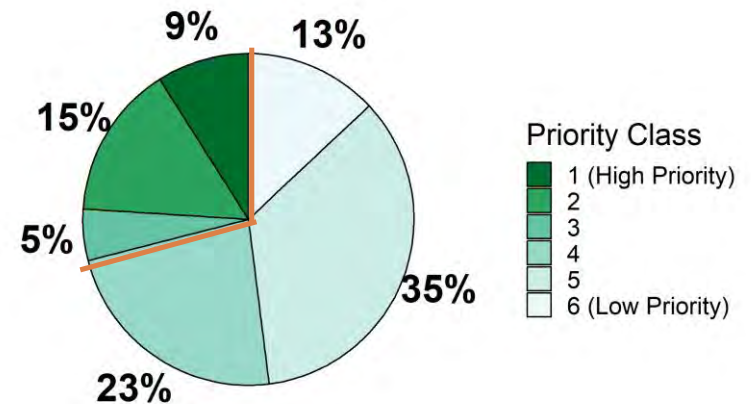
Step 4: Prioritize Where to Apply Restoration Actions

Conservation Value ->	1	2	3	
	High CV Low Stress	High CV Medium Stress	High CV High Stress	
	6	5	4	
	Low CV Low Stress	Low CV Medium Stress	Low CV High Stress	
Level of Stressor--->				

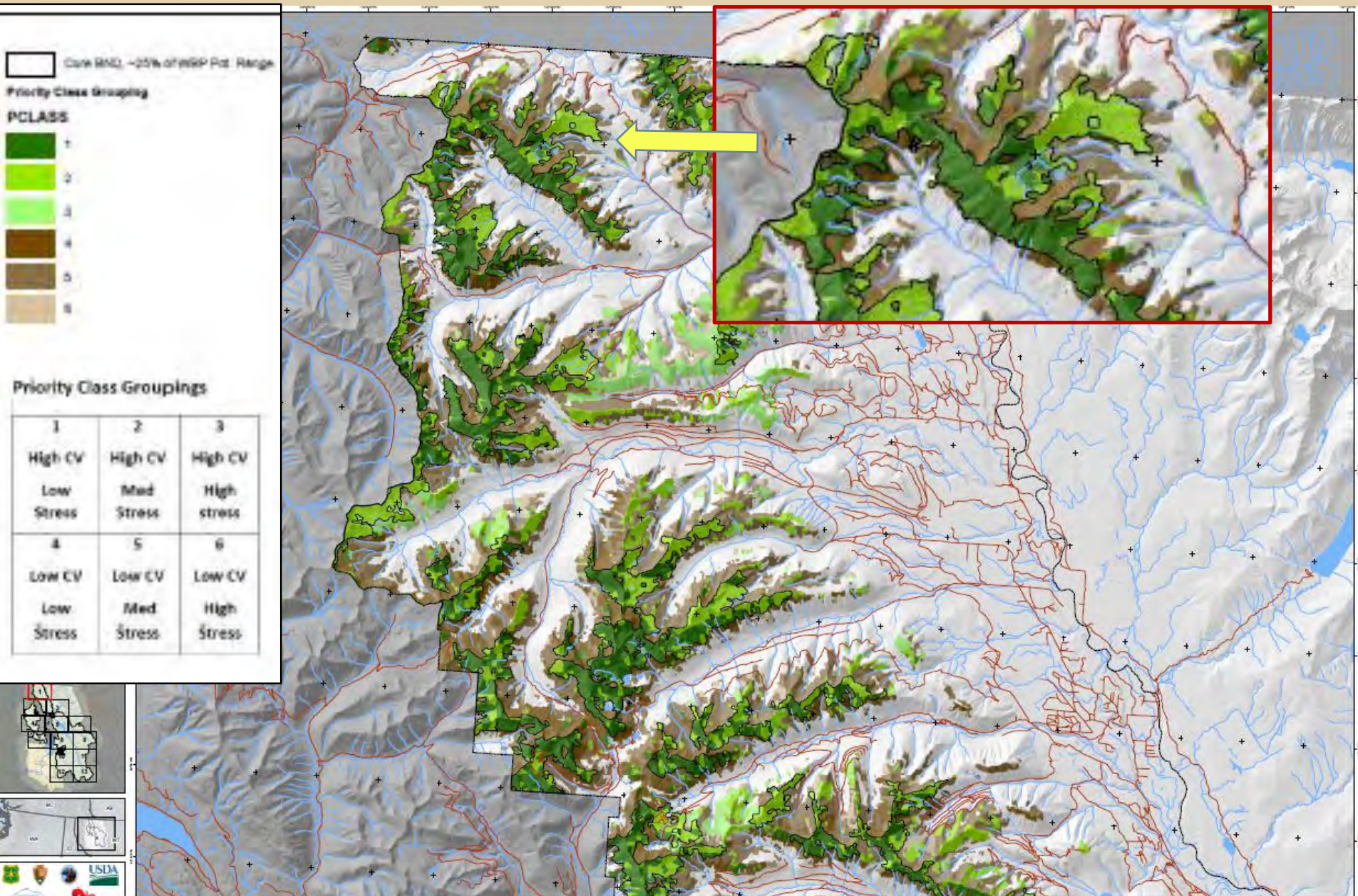
29%

71%

CV Within Potential Range



Step 4: Where Restoration Activities Should Occur



Step 5: Potential Restoration Actions to Apply

Activity	Code
Planting	PLANT
Thinning	THIN
Daylighting or Pruning	DAYLT
Mechanical Treatments (i.e. create openings for natural regen or reduce competition)	MECH
Rx Burning (Hand Crews)	Rx FIRE
Rx Burning (Heli-torch)	Rx FIRE
Rx Burning (Wildfire)	Rx FIRE
Direct Seeding	SEED
Cone collection	CONE
Scion collection	SCION
Pheromones/Chemicals	PHER



Step 5: Restoration Actions – Likelihood of Success

Stressor	Rating	PLANT or SEED	MECH	RxFIRE	THIN or DAYLT	CONE	SCION	PHER
Succession	low		1	1	1			
	high	-7	1	1	1			
Past Fire	low							
	high	1		-7				
Past Rust & Hazard	low	1	1	1	1			
	high	-7	-7	-7	-7	1		
Past MPB	low							
	high	1		1	1			
Fire Hazard	low							
	high		1	1	1			
MPB Hazard	low							
	high		1	1	1	1		1
Climate Hazard	low	1	1	1	1			
	high					1		
1= treatment under that stressor/stress level would likely improve ability to provide ecosystems services								
Conservation Value								
Watershed Protection								
-7 = Likelihood of success low or stressors negatively impact treatment benefit								
Species/Spec / Education Site								
		15						

Stressors

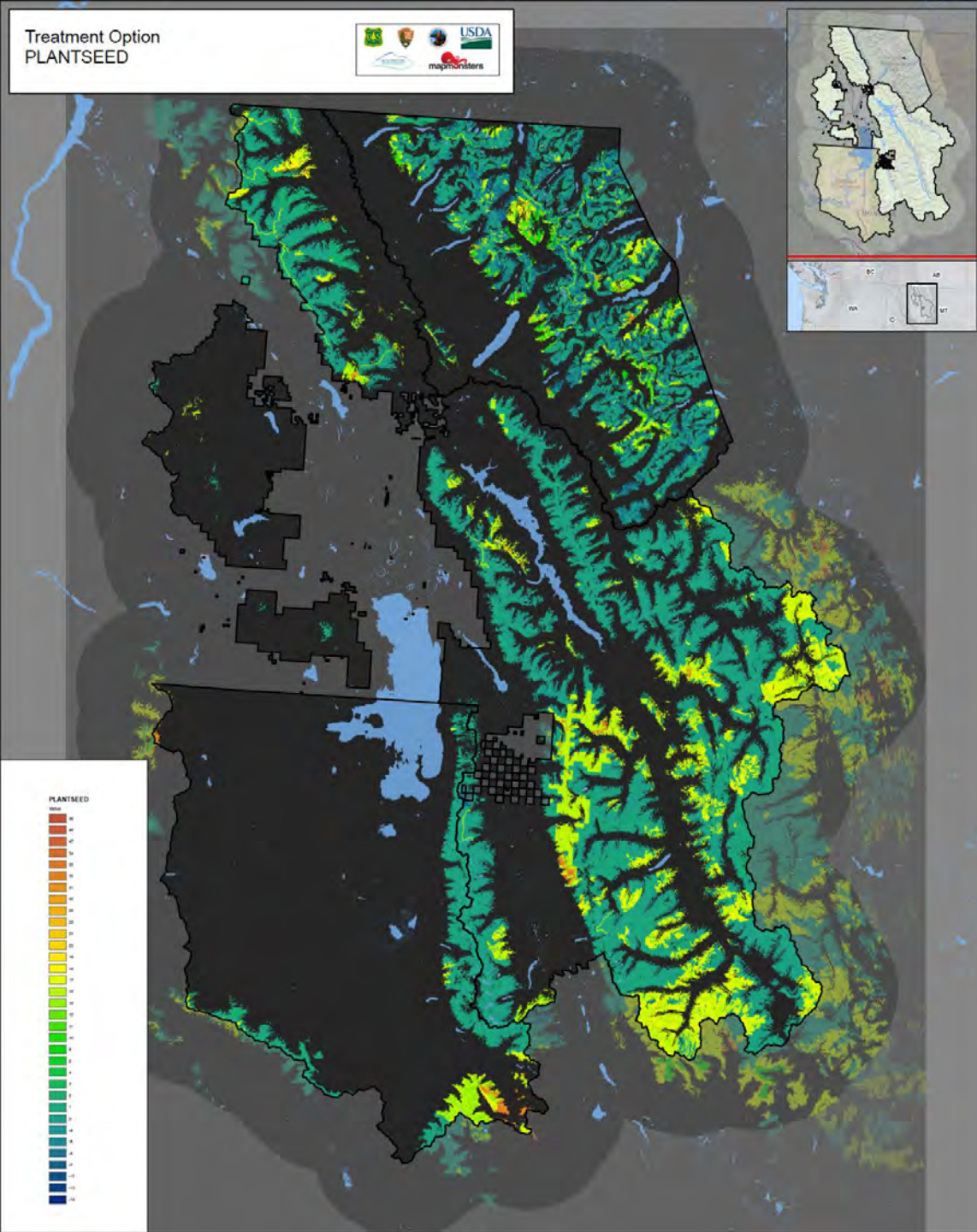
Conservation Values

Examples

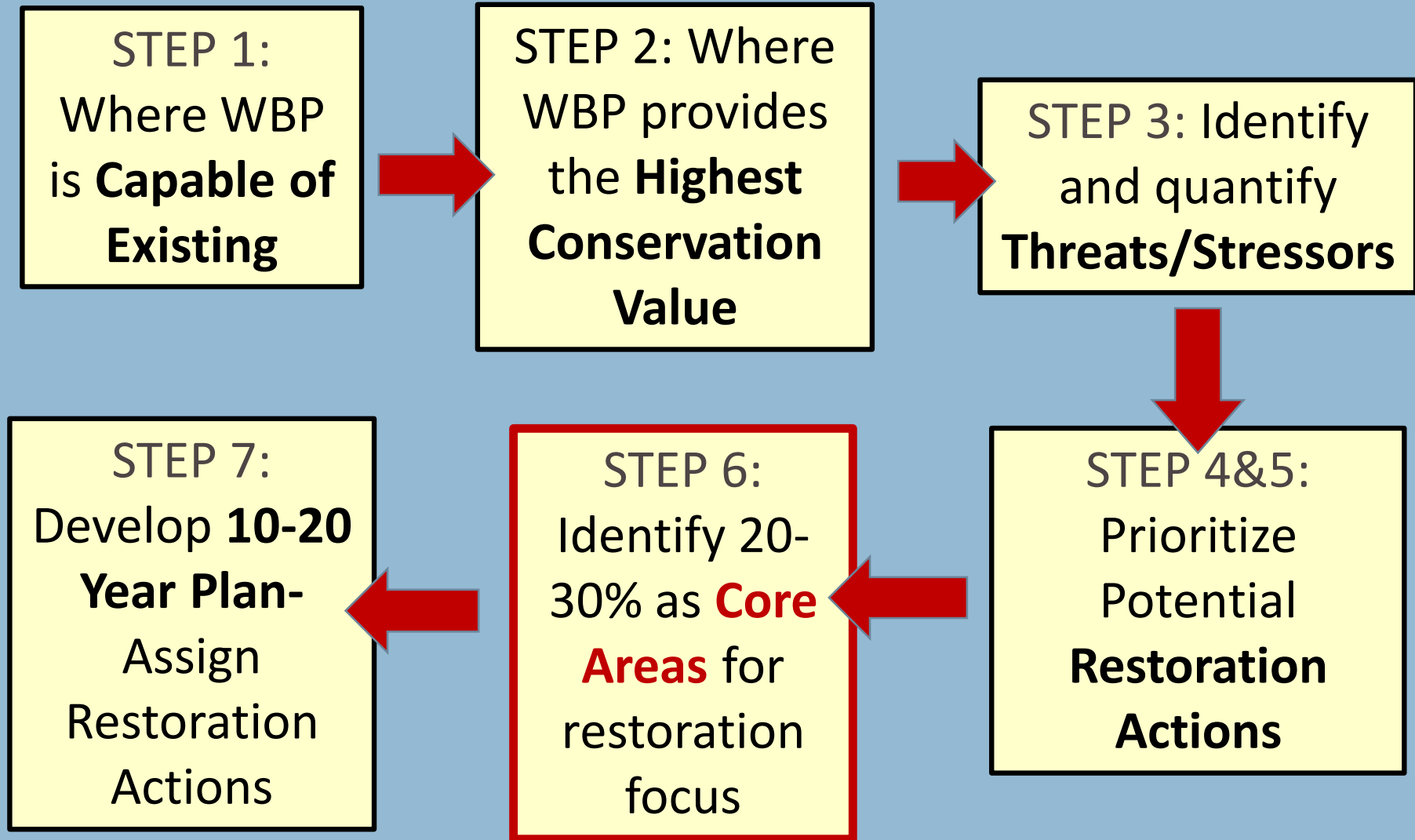
Stressor	Rating	PLANT or SEED	MECH	RxFIRE	THIN or DAYLT	CONE	SCION	PHER
Succession	low		1	1	1			
	high	-7	1	1	1			
Past Fire	low							
	high	1		-7				
Past Rust & Hazard	low	1	1	1	1			
	high	-7	-7	-7	-7	1		
Past MPB	low							
	high	1		1	1			
Fire Hazard	low							
	high		1	1	1			
MPB Hazard	low							
	high		1	1	1	1		1
Climate Hazard	low	1	1	1	1			
	high					1		
Conservation Value								
Watershed Protection	n							
	y	15						
Scenic/Rec/ Education Site	n							
	y	15						
Genetic Refugia	n							
	y	15	8		8	1		
Rust Resistance	n							
	y					1	1	1
Regen Potential, recent burns	n							
	y	15						
Examples								
Hi stress and CV=Y for all factors		48	4	-10	5	5	1	2
Hi stress, no special CV conditions		-12	-4	-10	-3	3	0	1
low stress and CV=N for all factors		2	3	3	3	0	0	0



Step 5: Restoration Treatment Likelihood of Success- Plant/Seed



Pilot Restoration Strategy Process

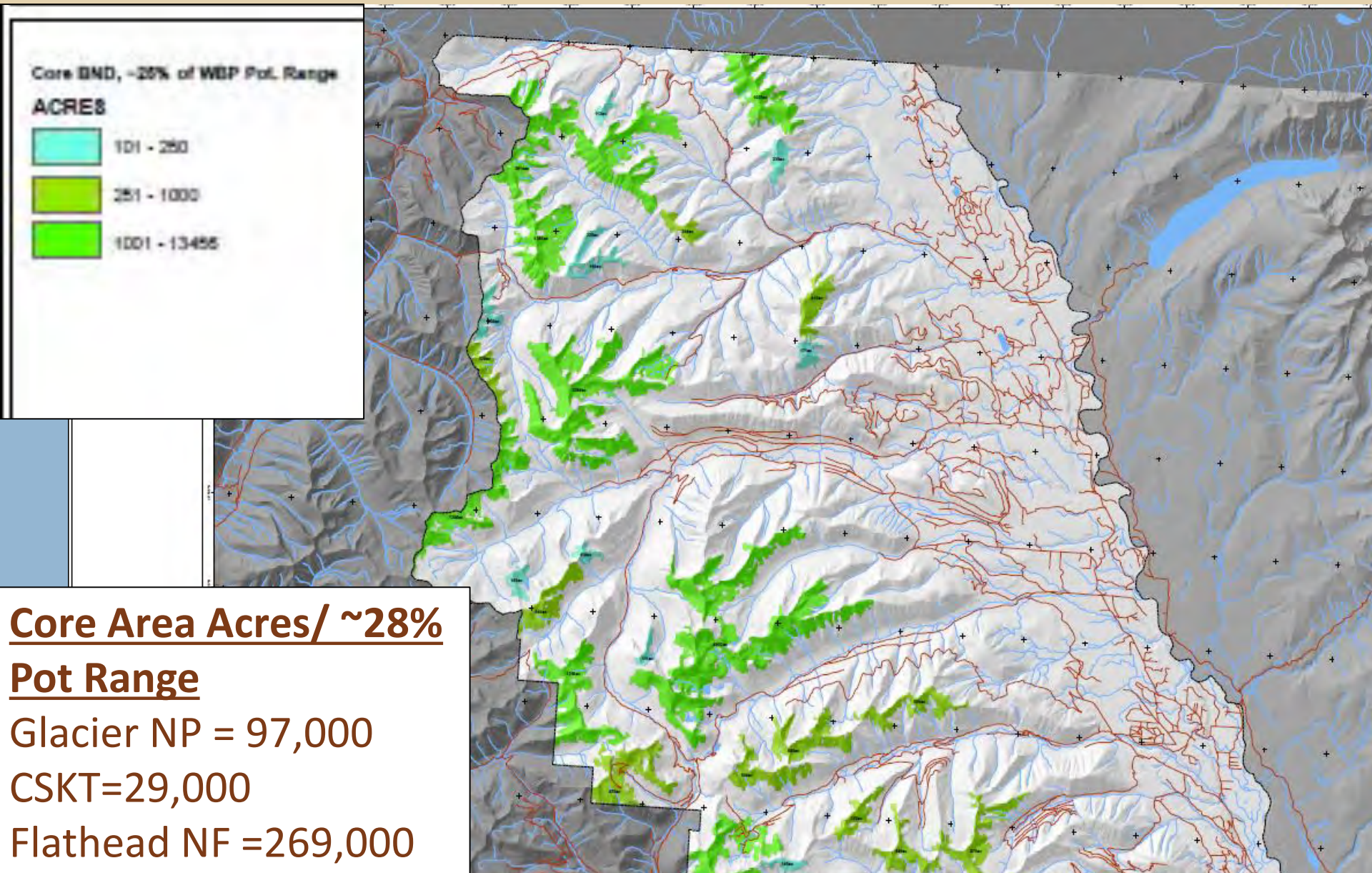


Step 6: Identify Core Areas

- 20-30% of wbp distribution
- Highest conservation value
- Connectivity = minimum population size polygons
 - ❖ Population = 1000 individuals, at least 100 ft apart with ≥ 50 trees per acre
 - ❖ 250 acres = minimum area (only 4 tpa count as individuals)



Step 6: Identify Core Areas

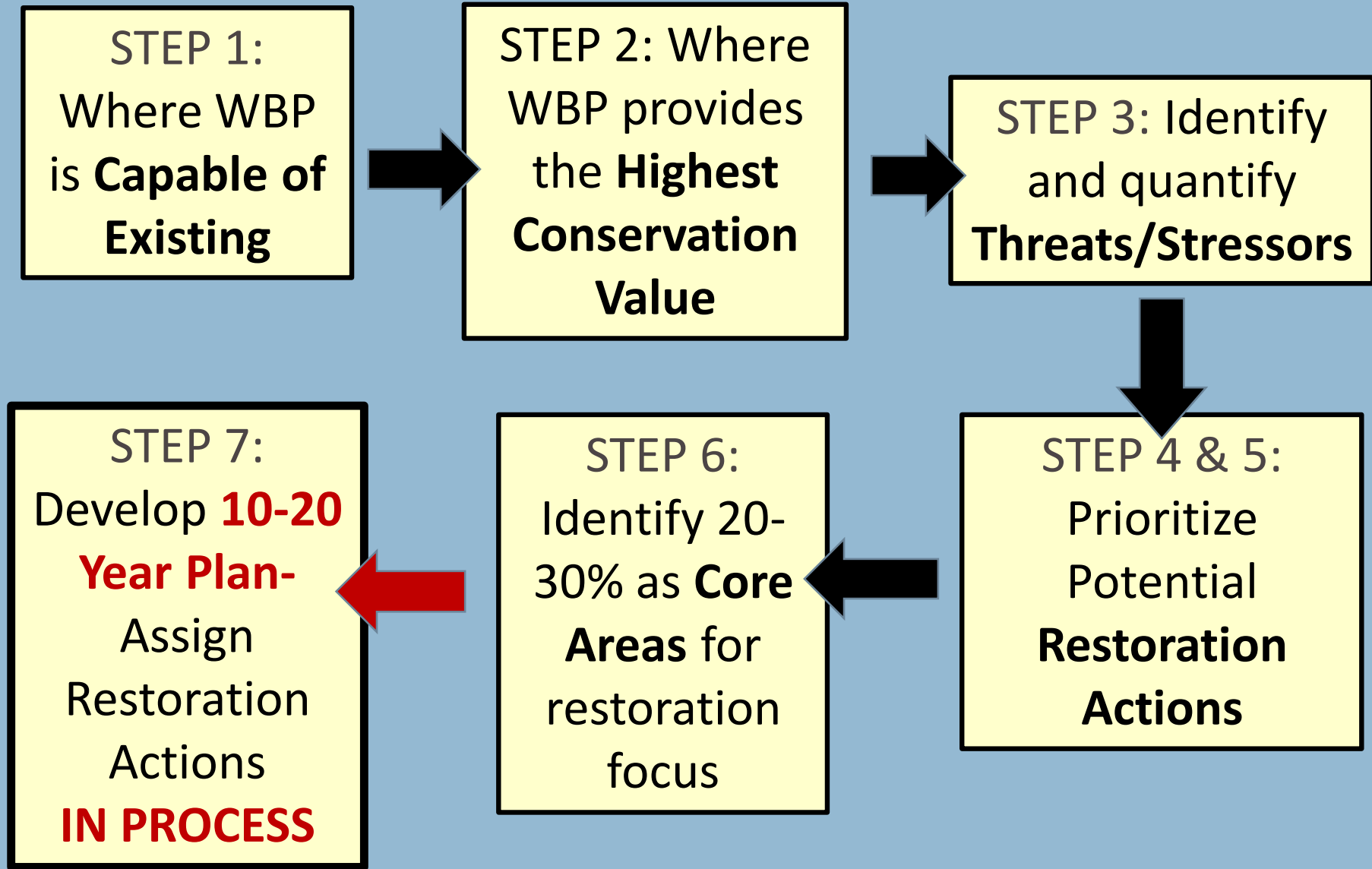


Percent of Core Area in Wilderness/Roadless

Unit	Wilderness	Recommended Wilderness	Roadless	Other
CSKT	65%	0%	12%	23%
Flathead	65%	15%	15%	5%
Glacier	0	>90%	0	Facility Corridors

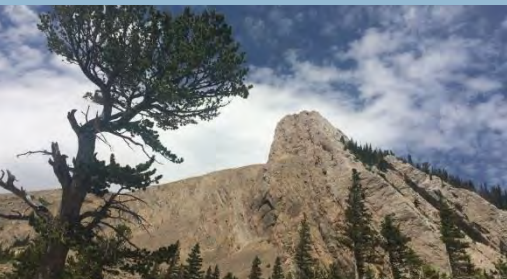


Pilot Restoration Strategy Process



CCE Pilot Strategy —Unique Methods

- Consider Effects of Climate Change
- Allow Variable Conservation Value Weights Among Units
- Evaluate Likelihood of Treatment Success- *avoid high stress if treatments will not improve condition*
- Do Not Consider Non-Biological Limitations Until the End
- Emphasize Minimum Size and Re-Establishing Populations



CCE Pilot Strategy —Challenges and Unique Findings

- **Inconsistency with data sets is challenging- does not allow units to be compared against each other**
- **Majority of High Conservation Value Whitebark is Within Wilderness or Recommended Wilderness**
- **Emphasis on minimum size and re-establishing populations with diverse genetics**
 - ❖ **Minimum pop size = 250 ac, 50 tpa**
 - ❖ **Plant with multiple 25th percentile rust resistance seedlots**
- **Next Step= CCE-Wide Restoration Strategy for Whitebark and Limber Pine!**

Thank You CCE Pilot Strategy Technical Team!

- **Melissa Jenkins (Lead), Flathead NF**
- **Tony Incashola, CSKT**
- **Dawn LaFleur, Glacier NP**
- **Linh Hoang, FS Region 1**
- **Katie Renwick, FS Region 1**
- **Anna Schoettle, RMRS**
- **Sabine Mellman-Brown, FS R1**

****Special thanks to our GIS Contractor,
Mapmonsters Inc., BC Canada**

QUESTIONS?

With Contributions From:

James Lozeau, CSKT

Kelly Rose O'Bennick, CSKT

Elliott Meyer, Flathead NF

Karl Anderson, Flathead NF

Phil matson, Flathead Lake Biological Station

Rob Sissons, Waterton NP

Mary Frances Mahalovich, FS Geneticist

Bob Keane, RMRS Fire Sciences

Brad Jones, Alberta Env & Parks



END

