



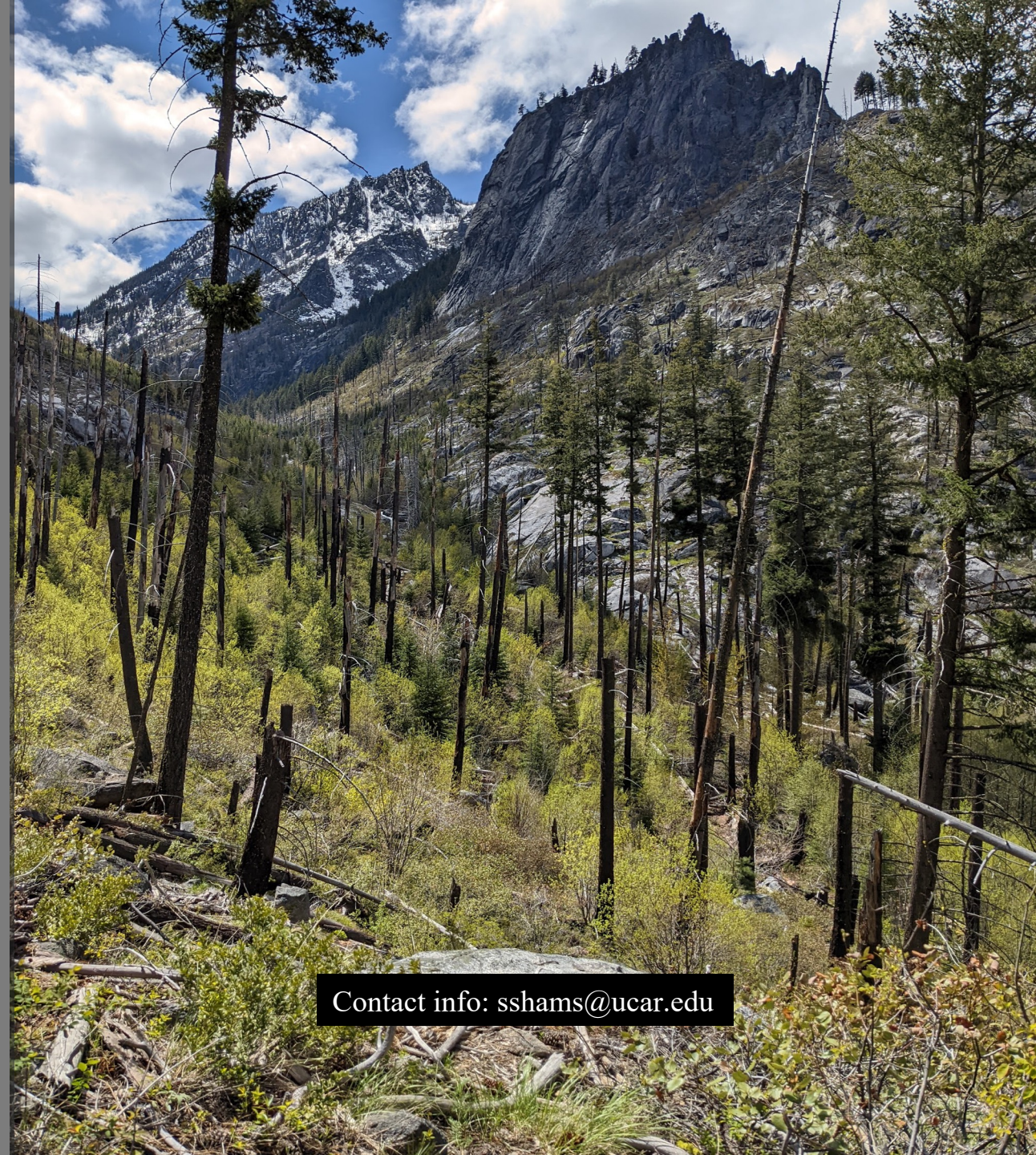
The Impact of Land Management Activities on Post Wildfire Recovery

Shima Shams

Collaborators: Jennifer Boehnert, David John Gagne, John Schreck, Kevin Sampson, and Olga Wilhelmi

NCAR
RAL

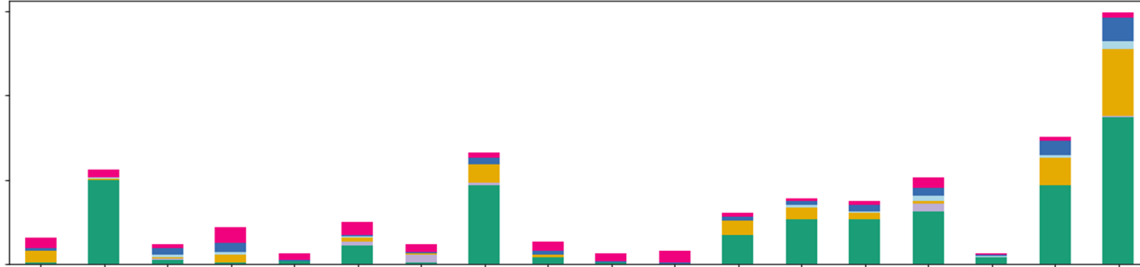
Research application laboratory, National Center for Atmospheric Research, Boulder, CO



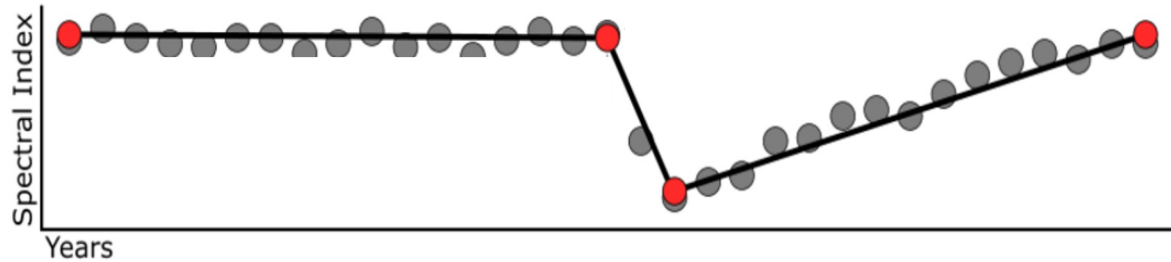
Contact info: sshams@ucar.edu



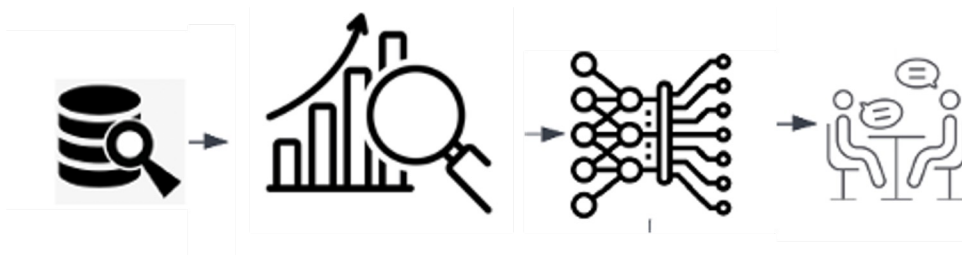
Outline



Project overview, Datasets
and methods



Recovery diagnostics and
recovery simulations



Conclusion, takeaways,
next step, plans



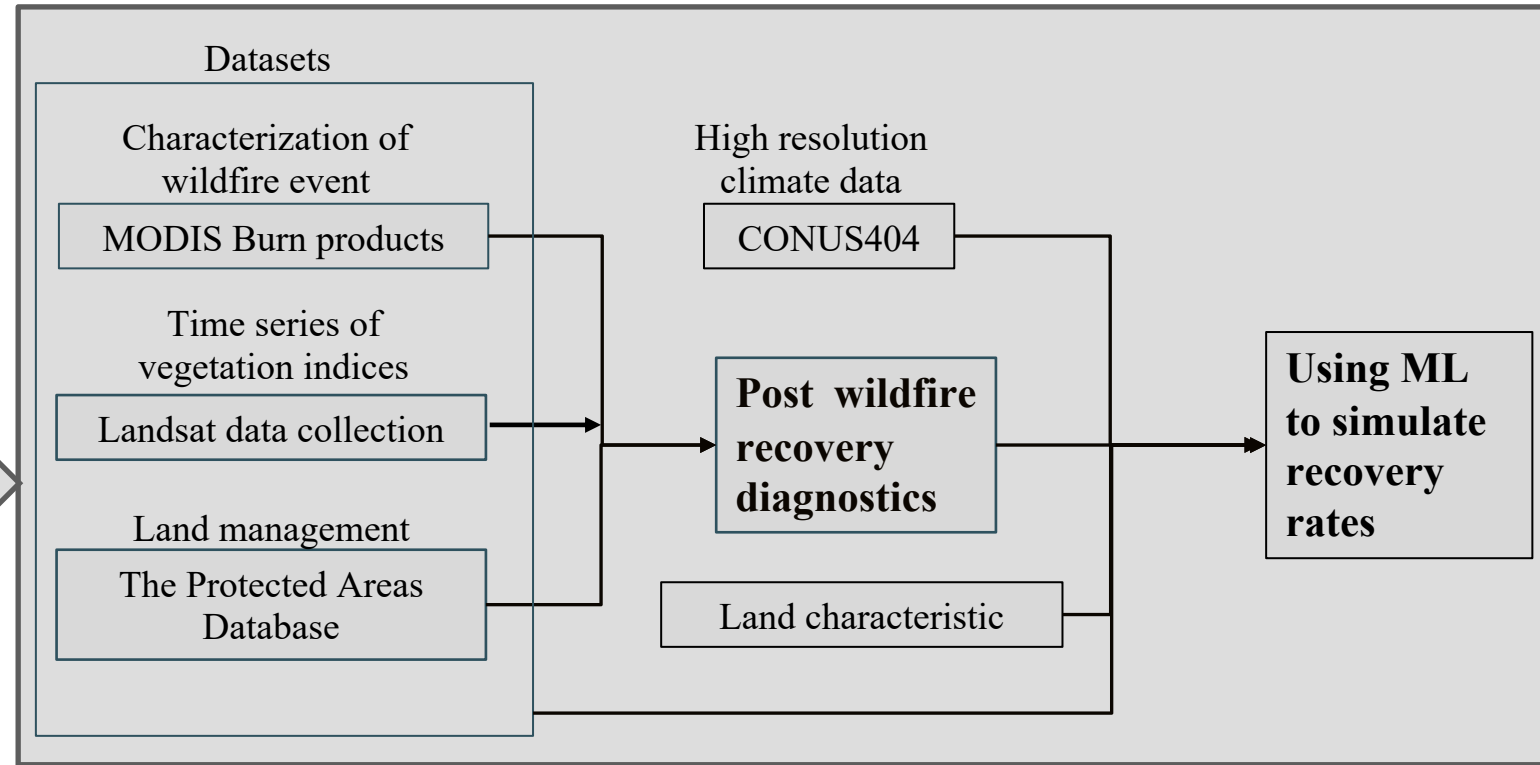
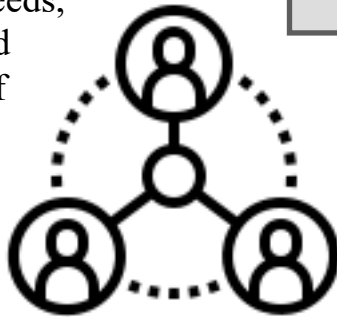
Project overview

Can we quantify the impact of land management activities on post-wildfire recovery using remote sensing data?

What are influential predictors of on post-wildfire recovery?



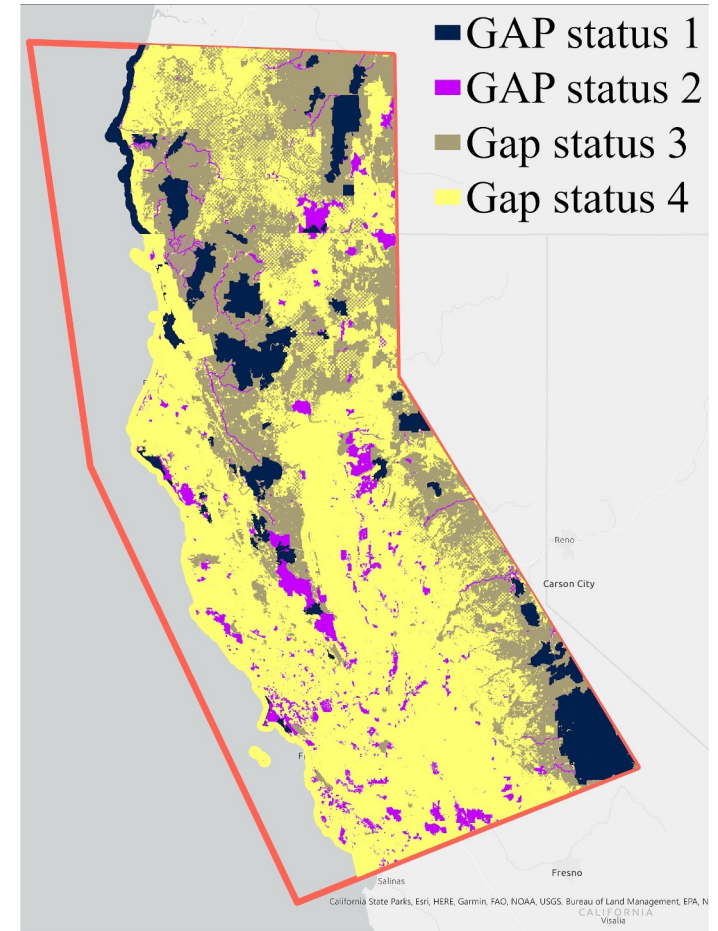
Determine the needs, priorities, and challenges of stakeholders





USA Protected Areas Database (PAD)

- GAP Status 1 : Areas managed for biodiversity where natural **disturbances are allowed** to proceed
- GAP Status 2 - Areas managed for biodiversity where natural **disturbance is suppressed**
- GAP Status 3 - Areas protected from land cover conversion but subject to **extractive uses** such as logging and mining
- GAP Status 4 - Areas with **no** known mandate for protection





Recovery Diagnostics

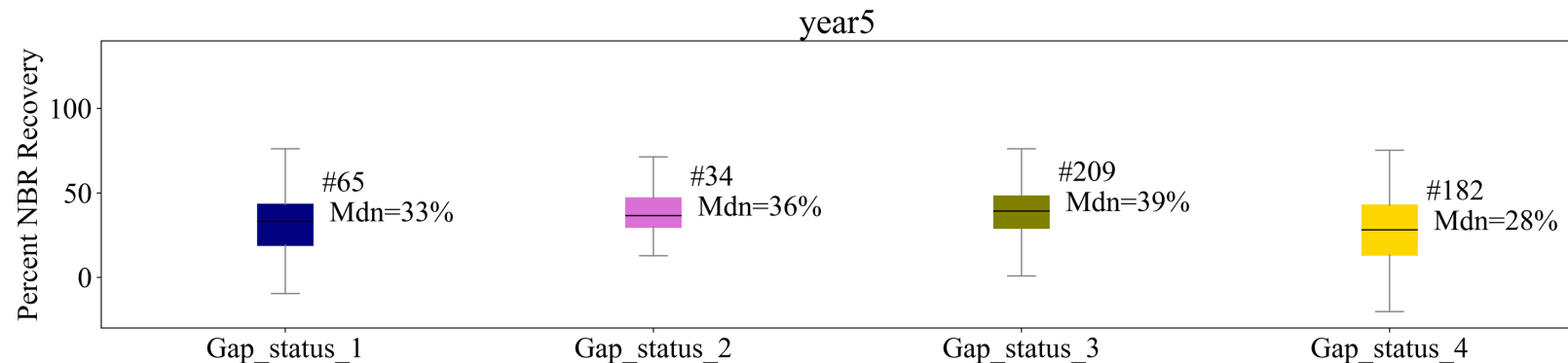
$$\text{Normalized burn index (NBR)} = \frac{NIR - SWIR}{NIR + SWIR}$$

$$dNBR = NBR (\text{Pre wildfire}) - NBR (\text{post wildfire})$$

$$\text{Percent NBR Recovery} = \frac{NBR_{n'+5} - NBR_{n'}}{dNBR} * 100$$

- Where n' is the year that has the minimum of NBR between year of the wildfire (n) or the following year ($n+1$).
- The advantage of this ratio is normalizing each wildfire event based on its $dNBR$, which corresponds to the wildfire intensity.

In this study area the wildfire recovery is more lingering in unmanaged areas





Driving factors of post wildfire recovery

Can we simulate the post wildfire recovery using ML?

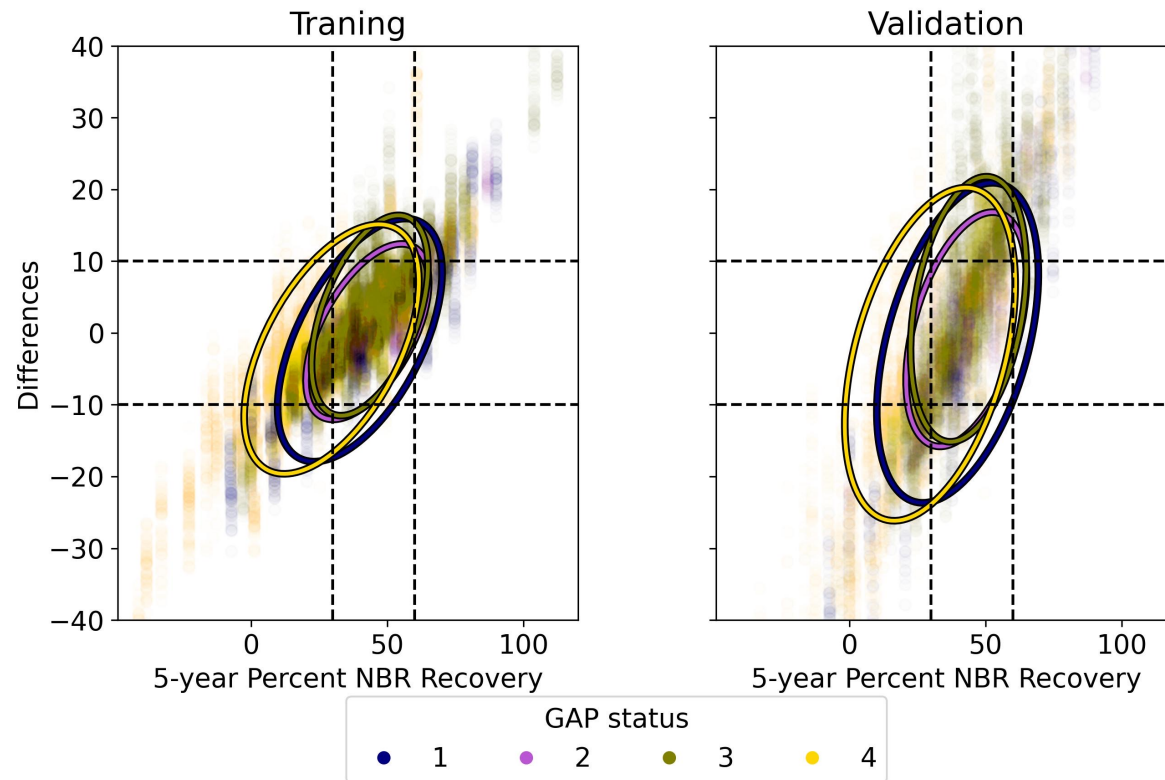


The list of all predictors

Predictors used in RF simulation	predictor	Explanations
Burn scar/fire characteristics	Area (km2)	The total area of wildfire polygon
	f_duration	The duration of wildfire
	dNBR	Delta NBR as a measure of fire severity
	f_NBR	The low NBR value after wildfire
	std_f_NBR	Max NBR std after wildfire (between n, n+1)
Pre-fire vegetation status	pre_f_NBR	NBR value for the year prior to the wildfire
	std_pre_f_NBR	mean std NBR for 5 years pre wildfire
Landform	physiographical characteristics (the % coverage)	
	peak_ridge_cliff	peak_ridge_warm, peak_ridge, peak_ridge_cool, mountain_divide, cliff
	flat	upper_slope_flat, lower_slope_flat
	valleys	valley, valley_narrow
	warm_slope	upper_slope_warm, lower_slope_warm
	cool_slope	upper_slope_cool, lower_slope_cool
	neutral_slope	upper_slope, lower_slope
Climate variable	The anomalies of n, n+1, n+5 is used for each predictor for annual as well as monthly data (total 3*13*2= 78 predictors)	
	T2	2-meter temperature
	Prec	Total precipitation



Random Forest Results



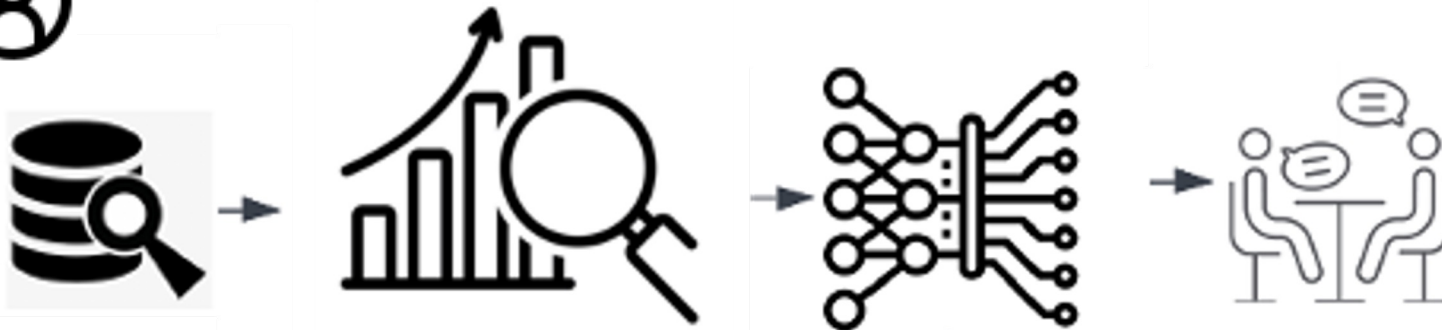
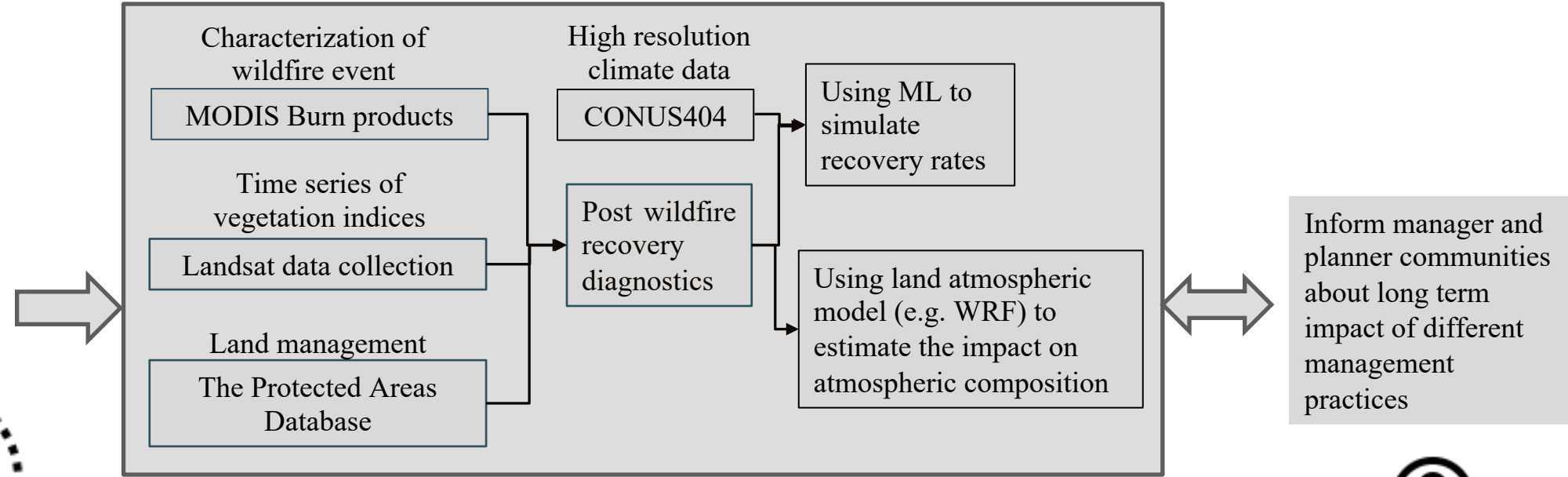
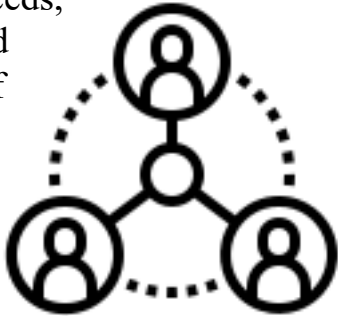
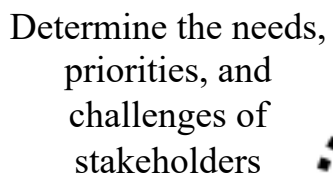
100 ensemble runs of random selection of validation vs training data. Differences are estimated as the observed 5-year percent NBR recovery minus predicted by the model.



Summary: the preliminary results motivate further investigation

We studied moderate to highly severe burned needleleaf forest larger than 1 km in subset of California and Oregon

- The post wildfire recovery is shown to be more lingering for the needleleaf forests in areas with no known mandate for protection
- RF is able to reasonably simulate moderate recovery rates





Questions?

Contact info:
sshams@ucar.edu

Tweeter account:
[@Shima__Shams](https://twitter.com/Shima__Shams)

