Welcome and Meeting Agreements (10 minutes)

- Introductions
  - Danny Margoles (DWRF), Anthony Culpepper (MSI), Mike Remke (MSI), Paulette Church (___), Brett Wouldk (CFRI), Ken Curtis, Marcie Bidwell (MSI), Tim Leishman, Bill Baker, James Simino, Eric Janes (Hydrologist, ret. USDI), John Miles, Steve Garchar, Becca Samulski, Rachel Medina, Stephanie Mueller, Gigi Richard (Four Corners Water Center at Fort Lewis College), Rich Landreth (City of Cortez), James Dietrich (___) (Montezuma County)
- Operating Principles

Stakeholder Responsibilities/Expectations
1. Stakeholder will strive to support the above stated mission.
2. Each stakeholder is committed to participating in collaborative dialogue that builds trust, striving for agreement on issues, program direction, recommendations, and other matters of joint interest.
3. Stakeholders will be responsible for their own decisions or actions and will not be responsible for the actions of other stakeholders or of DWRF.
4. Stakeholders will only speak for themselves and their respective entities, not for other members of the group or for the group as a whole, unless they are responsible to communicate on behalf of DWRF through endorsed outreach or education activities.
5. Stakeholders are encouraged, but not required, to provide input, contribute funding, provide resources, and to serve as project sponsors and liaisons within their community and with respect to their respective constituencies on topics and activities that support the DWRF mission.
6. Each stakeholder will strive to support DWRF decisions, recommendations, and activities made cooperatively with other stakeholders. Notwithstanding this goal, it is understood that all stakeholders may not support every decision, recommendation or activity of the DWRF.
7. Stakeholders are encouraged to refer media representatives to the public meeting agendas and meeting summaries. General media inquiries can be referred to the DWRF Coordinator, Danny Margoles.
8. Stakeholders will disclose any conflicts of interests, or issues that may be perceived as a conflict of interest.

Ground Rules/Meeting Agreements
- Participate with the facilitator/presenter and other participants
  - Read materials prior to meetings and be prepared
  - Speak up (volume)
  - Ask questions, share experiences and introduce ideas
  - Avoid side conversations
- Show respect for others' input and opinions
  - Listen
  - Consider opinions of others
  - No idea is a bad idea
  - Tough on ideas, easy on people
- Show respect for others' time
  - Honor time limits
  - Avoid repeating things that already have been said by others
- Minimize interruptions (agree on rules for cell phones, breaks)
- Take responsibility for own learning/participation

- Recap and how we got here
  - Origin story: Southwest Wildfire Impact Fund (SWIF)
    - Find resources to accumulate and aggregate funds to do mitigation in WUI in La Plata County
    - We know priority areas and WUI are important, but it's *all* important, so how do we rank importance in WUI? – 1 potential tool: RADS
      - IE: SWIF & RADS in Chaffee County
    - Four Rivers group was approached to provide value feedback for RADS
      - Completed work years ago – preliminary run for DWRF group and Brad Pietruszka
      - Was surprising how some HVRAs were ranked and weighted previously
      - Looking at larger geography now than previously because some key watersheds were missed
  - GOALS
    - Would like to frame this effort for DWRF and 4Rivers as a planning tool
    - Take a refresh on this process, reassess, "why do we need to go through quantifying values using a quantitative risk assessment tool?"
    - Reframe and see utility in process
    - Understand why to proceed with conversation and potentially use RADS tool
    - Reduce risk to HVRA's

Risk Assessment Decision Support (RADS) overview - Brett Wolk (45 minutes)

- GOALS
  - Want to provide background of tool
  - Have a better foundational understanding of possibilities and limitation of this tool
  - Think through how tool is useful/not useful for Southwest Colorado
  - Use RADS as a tool to bridge science and local knowledge to produce *actionable knowledge* = combination of science and knowledge with an understanding that science doesn't always have all the answers
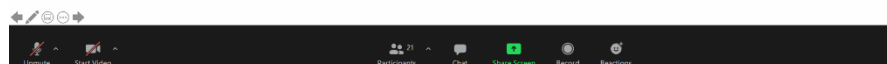
- RADS
  - Flexible tool to encompass a range of values and help people synthesize information when there are complex problems

Risk Assessment and Decision Support: Our RADS Approach

Create a framework to identify, prioritize, and quantify YOUR values at risk to wildfire with CFRI technical assistance

COLORADO FOREST RESTORATION INSTITUTE
COLORADO STATE UNIVERSITY

  - Using existing data and fire behavior models in new ways
  - NOT just highest risk or cheapest treatment opportunities

Our RADS Approach

RADS is a modeling framework to synthesize many values in one analysis.
  - Based on Wildfire Risk Assessment framework from RMRS-GTR-315 (Scott et al 2013)
  - RADS links multiple existing models and outputs together, and adds prioritization to the risk assessment framework.

  - Have gone through process of using RADS with other groups several times
    - IE: Post-fire erosion mitigation efforts, treatments in broader context

Our RADS Approach

Bang for the buck: identifies where you can make the biggest impact to reduce wildfire risk to high priority values, not just the cheapest / easiest place to work.
  - Often used to prioritize pre-fire vegetation management activities (e.g. thinning, Rx fire, etc.).
    - Peaks to People Water Fund, Jefferson County Open Space, Denver Water-USFS Forest to Faucets Partnership, Chaffee County, Lake County, Arapaho Roosevelt National Forest.
  - Also used to prioritize post-fire watershed management activities (e.g. mulching, etc.)
    - City of Boulder watershed protection plan
    - Wildfires: Cameron Peak, East Troublesome, Cal-Wood

  - Values that are *not* evaluated in RADS, IE: Chaffee County
    - Climate change is informing land use planning
    - There are other benefits and products that can inform other decisions → RADS CAN'T DO EVERYTHING

Our RADS Approach

Lots of other solutions to reduce risk besides vegetation management *not* evaluated in RADS!
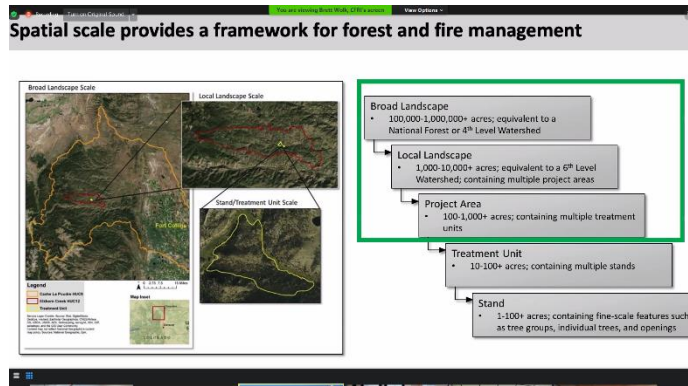
Examples:
- Reduce human caused fire ignitions
- Land use planning
- Wildfire management strategies

But intermediate RADS Outputs can help inform other strategies too.
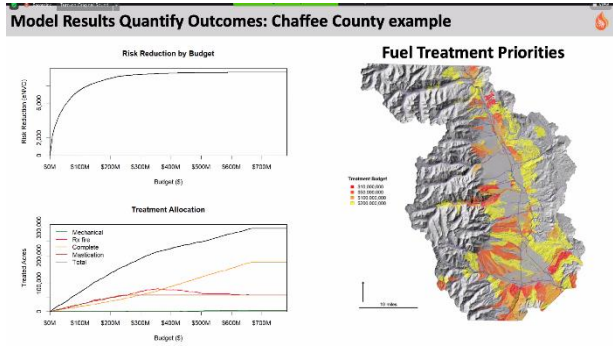
- Scale
  - Operates on broad scale: 100,000 – 1,000,000+ acres
  - Does not prescribe or suggest
  - Most often applied and useful and more detailed than other assessment models


- Settings
  - Useful tool vs blunt tool
- Budget
  - Useful for building staff and capacity
 - Can put in any variety of treatments
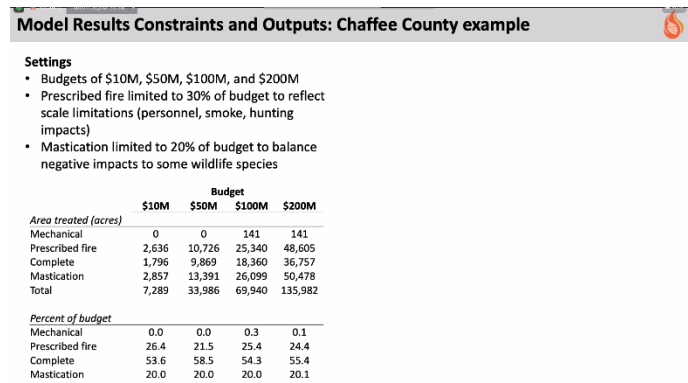
- Model Results, IE: Chaffee County
  - More focused and detailed than other processes
  - Cost-benefit curve
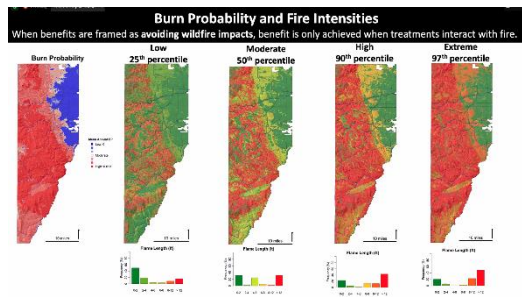 - Interplay of science and collaboration to get to knowledge
    - Want to balance science and management
    - Focus on Higher elevation forests (spruce fir and beetle kill, changing dynamics)
    - Increased values at Monarch Pass showed up
    - Decreased priorities in lower valley
- Can be used in project-level decisions but not recommended
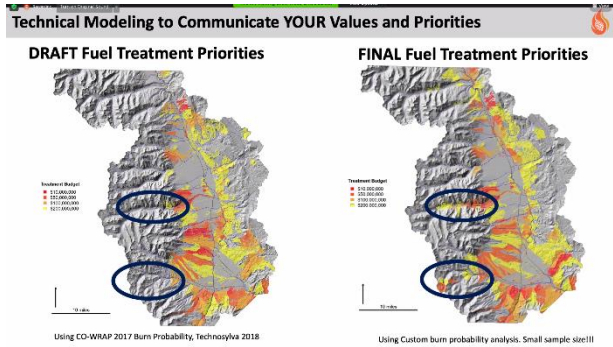
- How we get there
  - Treatment risk reduction box, adding real-world constraints
  - Linear optimization
    - Puts info/inputs all together and balances trade-offs to produce optimal treatment plan
    - Technical and social component
    - Different model inputs want critique for local needs and appropriately local; model inputs like from IE: Flam Maps
    - Burn probability, flame length, crown fires – can holds all kinds of data
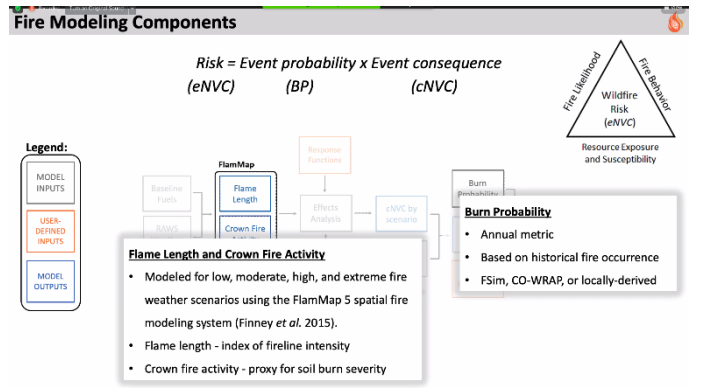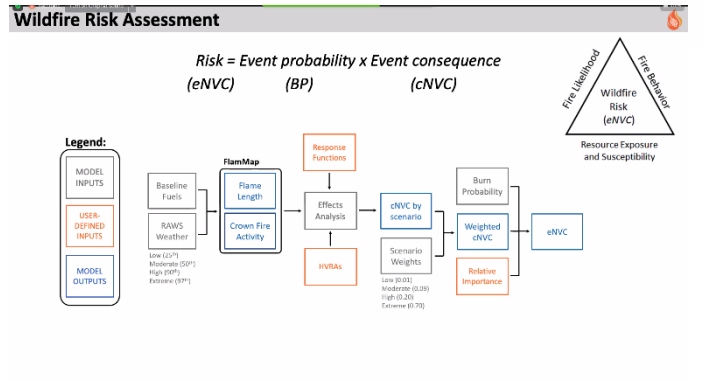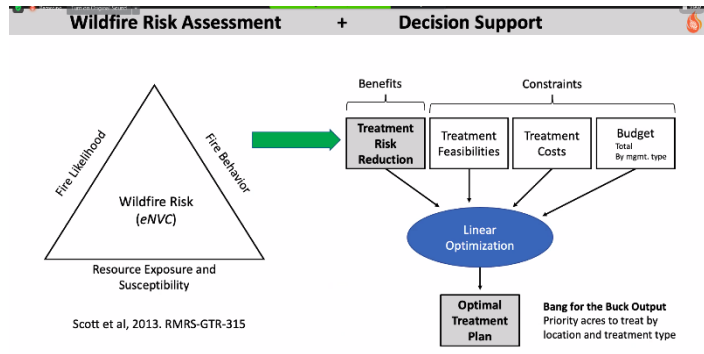
  - IE: Jefferson County
    - Low elevation outside of Denver
    - Want treatments when interacting with fire, but in risk assessment framework benefits must be captured
  - Generally want longer vs shorter lists

- Relative Importance is subjective!
  - Too many = no priority
  - Too few will pop out and there will be no need to use RADS
  - Priorities + complexities = great for RADS

- Influence Zones
  - IE: 400m buffer to reduce fire intensity and keep open this safe rout
  - Road is not just asphalt but is evacuation route – think heat pulse or flames across road

- 30m resolution won't pick up on finer scale issues/challenges like a fallen tree

- Response Functions
  - Grey areas show positive responses, no need to do treatments here
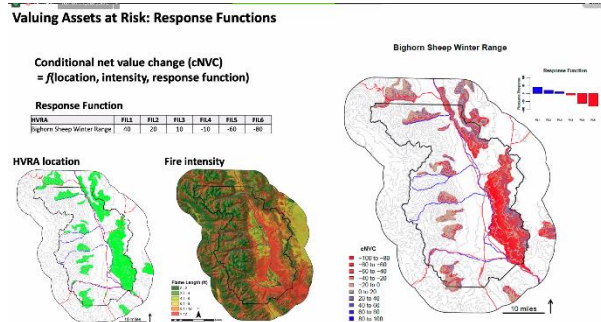
- Include secondary analysis
  - Put as much stuff in as possible and synthesize as much as possible
  - Linked to 2ndary analysis that drives….
  - Built to include many values side by side

- IE: Peaks to People Water Fund in Northern Colorado, SWIF
  - Dollar values difficult
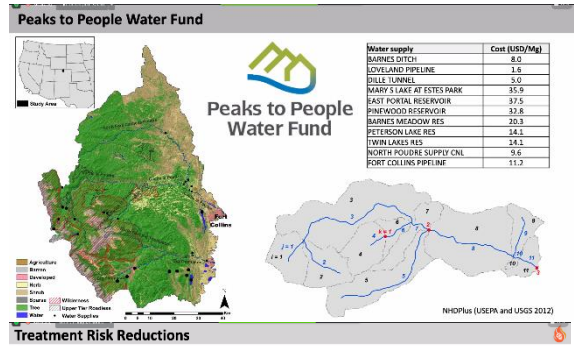
- Risk assessment within risk assessment
- IE: Chaffee County
  - Crown fuels vs surface fuels + mastication
  - Balance of science and collaboration
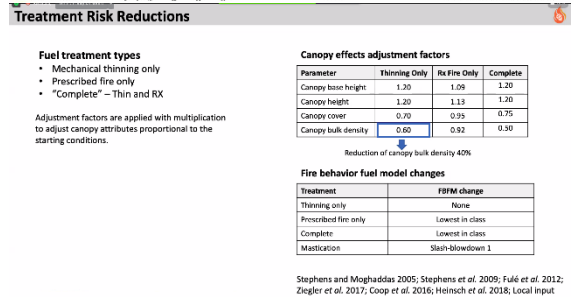
- Can use any decision units
  - Often NHD Plus units, but can use parcels, etc.
  - Been good intermediate point to focus people but not identifying magic acre
  - What are SW CO management units?
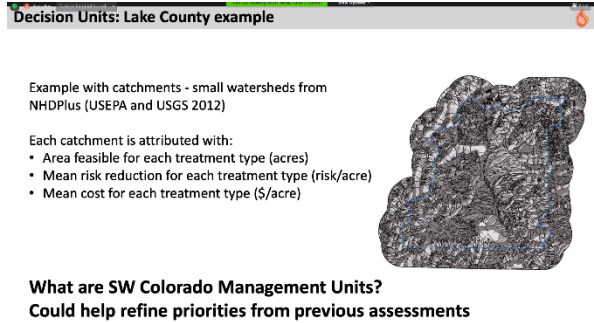
- Secondary Fire Effects
  - Burn probability
  - Some are more at risk others less
- *Priorities by budget
  - Where is 1st $5,000,000 to reduce risk and help focus efforts
- Measuring outcomes by each resource
- Trade-offs and bringing values to forefront
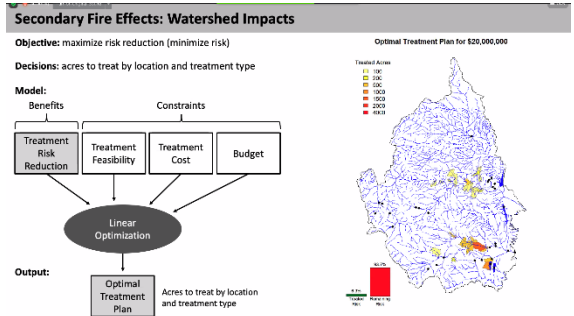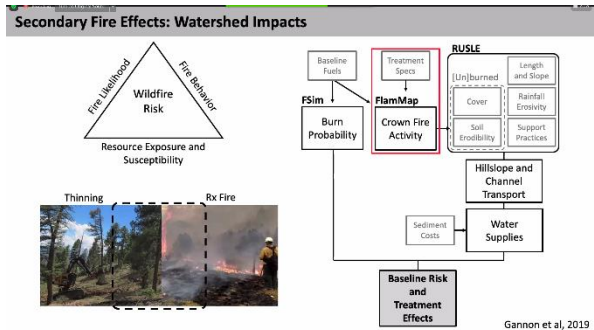
- Feasibility, costs, and net value change…where can we make biggest difference on landscape?
- Remember: RADS not end-all-be-all tool → there are so many efforts that have already been done and all assessments/models have limitations
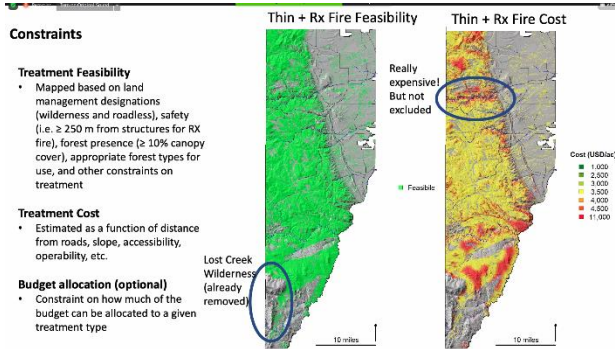
- PODS
  - Implemented across the country
  - Spatial fire management process
  - Container to inform natural resource planning but not framework within itself

- RADS PODS
  - More opportunities for firefighters to choose where to work
  - Developed same risk assessment, but develops strategic response zones how to attack fire

- Could benefit SW CO groups to go through this process and add missing things to give more detail and synthesize more info than in the past – conversations have been ongoing for many years

- *Questions/Comments*
  - *How does this modeling or analysis process account for forest health conditions on the stand level? My primary thought is with bark beetles in our low and mid-elevation forest types.*
    - *Use baseline fuels, like LANDFIRE veg data. It's important to calibrate to local conditions. If recent fires or beetle activity is not captured in LANDIFRE or other veg data, modify layers to be more appropriate and represent what's on landscape. Also important to have current assessment in order to plan how to manage landscape*
  - *Par before the horse*
    - *Complex situation with lots of interest. Need to ensure everyone and interests okay with RADS before we have horse out of the barn. Should have a working group of where we want to go with wildfire risk assessment. Have trouble with RADS if this is feasible in private lands in WUI because we can't predict fire behavior in WUI. Treatments planned can be adequately modeled or impact on flame length which may not be issue, but talking about house to house ignitions and ember streams; RADS not able to model that. RADS commodifying situation that's not healthy for the group, looking at cost and fuel, turning living ecosystems into fuel or cost.*
    - *All these questions and concerns have come up before. There's no perfect answer for everyone. Have dealt with particularly WUI convo in Chaffee where fire chiefs know home to home ignitions change how fires are fought depending on density of neighborhoods. Instead of creating separate models, created varying levels of WUI densities and changes priorities on landscape. Secondary values are a way to represent that without rewriting equations. Higher density = higher risk vs lesser density. Incorporating fire modeling components in planning framework. Example of how to handle that in the past, ember production not modeling this. At the end of the day, if fire burns through landscape and veg catches fire either through fire spread or embers, how will it burn based on veg structure.*
  - *I would like to hear more about Rx fire limits, 30%.*
    - *How does that interact with 5-10-20 year planning horizon? Couldn't you do more over time? How is secondary analysis done and integrated into model analysis? Are fire limits set at 30% of optimal budget and how does that interact with 20yr years in Chaffee County?*
      - *Whole landscape prioritized, if you want to reduce 70% of risk potential, this is how much you'd want to do. If we want to treat 30,000 acres over next 10-15 years, 30% of 30,000 would be Rx fire. Can come in 1st year or 5 years.*
  - *I would think you could also add the beetle killed areas as a discrete value if cleaning those up is important. Commodification is strength of this particular model. If trying to get social license to invest local money, or investors to buy-in,*

we need people to know we're making sound investments. Still struggling with treatment benefits – seems arbitrary on treated areas beyond initial treatment. how long it lasts in the cost.

- *The emotional component, or inherit value of forests being forests – agreed! Hard to represent this via spatial layers in a model. This came up in Lake County – if they burned intensely, there would be a big impact on the emotional wellbeing of the community. Can mark those places and give values etc., but the bigger challenge is the inherit value of all forests across the landscape. Veg layers and forest types can be included, but not a perfect way to represent values because spatial variability isn't taken into account. RADS is NOT a perfect tool – can help inform decision but won't make decisions at the end of the day.*
  - *Front Range: smaller uncoordinated treatments not taking into account ecological values, room to both enhance ecological value and concentrate into making difference and reducing fire risk*
  - *Disconnect treatment and WUI and what we should do: needs to be set-aside for other projects. We're saying as broader community pooling money, focus collective efforts in certain places and need to invest in programs to achieve other projects on individual basis – how do we ensure we can invest in programs that allow for individual action, but then get landscape scale treatments lined up with values with greatest benefit?*
- *Secondary analysis: fire behavior modeling, take how that's going to change veg cover (high severity fire bigger impact, post-fire erosion impacts) and transport to specific water resources, soil erosion and sediment transport to specific resources, combining multiple models to determine where fuels could be changed to changed fire intensity to changed post fire erosion – that produces a raster across landscape of expected response of vegetation to fire*

- *Secondary effects: lot of concerns on post-fire erosion and impacts to watersheds. So far RADS has been used to prioritize veg mgmt., but might not be appropriate. Has RADS been used to locate post-fire erosion structures in secondary analysis or would that be a different decision support tool?*
  - *Have done that, still calling different flavor of RADS. IE City of Boulder: watershed wildfire protection planning. Indian Peaks Wilderness is a vital water source and and want to be ready if fire happens to provide water to Boulder. Fire behavior and erosion modeling instead of mechanical thinning or Rx fire, mulching dropped on hillside or straw waddles, build sediment basins where resources can be moved post-fire – here's where we'll move quickly and here's cost/benefit in net value change. Impact of mulch to reduce sediment, not to zero, but have some mitigating effects at scale to match fire intensity. Useful last summer on Cameron and East Troublesome Fires – worked with Boulder on Calwood fire to apply model, one of many inputs of where to put mulch and other activities.*
- *County perspective*
  - *James – interested in it*

- *RMRI*
  - *There's lot of utility relative to next steps in terms of PODS prioritization, could help to get to next level. Levels of risk to levels if investment. Confusion of untangling HVRAs talk to each other and layering of HVRAs, confusing how they nest together vs making sure they're not redundant – could have 1,000 acre parcel and HVRA out of this process, two HVRA assessments on same footprint.*
    - *Encourage leveraging assessments as much as possible. Lists may not line up 1 to 1, but leverage previous work*
- *Untangling the relationship between use of RADS for high value risk assessment vs POD prioritization process*
  - *In prioritization, helped to look at 1,000,000 or 800,000 acre scale where values and subsets of pods where values were in PODS where we can develop strategies at scale in near term to take action on. Are there places with shared values and priorities at the 10-500,000 scale? PODS highlighted dozens of pods that were elevated as high priority, this assessment would take that to next level and help validate if we're looking in the right place. Give an opportunity to look in more detail where projects need to be, and where over time to sequence investments and returns.*
- *RADS not validated model for use in WUI – rx fire high standards bc human health, talking here about communities at risk, must have high standards predicting outcomes of treatments, don't have with WUI. Double blind to show RADS works. Go to places that burned, look at pre-fire data, put in model, see if accurately predicts. Must have highly predictive model to be useful.*
  - *Great point – all models are wrong, some are useful, others more so. Have ability to do double blind studies and tests. Have been lots of assessments burn through communities and how homes acted as fuels (studies done), CFRI involved in some, not all translate into this model process. Haven't done WUI retrospective, have done with water where Cameron Peak fire burned, validated inputs.*
- *Appreciate samples shown where RADS has been used in post-fire and water resources. Treatment is just 1 way we can respond. Testing validity, want to advance science can't wait for perfect answer going forward. We are evolving in understanding of landscape and tools at hand. Find ways to take suggestions testing validity to continue to learn and improve. Lot of uncertainty but the challenge in WUI is scale – try to find ways to name or reduce uncertainty.*
- *And home hardening/ structure hardening, smoke readiness programs, etc.*
  - *Yes, or even where larger culverts need to go, etc. It seems that secondary response to watershed was also one piece that was starting to get at avoided costs. Of course, we didn't quite get there because it becomes too complex and less useful to try to monetize avoided costs of structure loss, power line impacts, etc.*
- *Using a model that is not validated for prediction in the WUI is what we will get if RADs is used, and many key issues will not be addressed at all, leaving priorities identified by the model likely wrong and many key matters not addressed.*

- *I also really like displaying the risk v benefit by various values, because it can help identify specific tasks for specific partners and how they may work together where values overlap.*
  - *Yes, but if those risk v benefit estimates are wrong, as they likely will be, these outputs will be mis-leading and unreliable. This model is NOT validated for these predictions.*
  - *And that is partially assuming that our pre-fire data is adequate and relevant*
    - *Models are as good as the data put into them and I believe that Montezuma County has good data. We may not have all the data but we have most*
    - *We also have the opportunity moving forward for more science and experience informed discussion to determine the model risk v benefit of various fire intensities to the various values on the landscapes and to weight our collective values. That is the other place where we can inform our outputs.*
      - *Not talking about a "perfect" model. I am talking about making sure the model predicts reasonably accurately. That is essential before flying a plane, before taking a prescription, or when addressing fires. These are all highly important matters that must have a high level of accuracy before use.*
        - *We need to be careful about not conflating landscape scale treatments too much with interface protection. RADS can be a great tool for prioritizing landscape treatments but won't replace those other tools for helping our sw CO communities to live with wildfire.*
          - *OK, that could be correct. Let's see what the level of validation has been. We need to see the details.*

How are we using this tool? (10 minutes)
- Defining and articulating the geography/geographies
- The steps needed moving forward regarding HVRA/sub-HVRA input

Revisit the Highly Valued Resources and Assets from mtg 1 (35 minutes)
- Comparison between large list and refined list
- Anything we should change/add in the context of RADS as a planning tool?
- Are data available for each sub-HVRA?
  - GEOGRAPHY
    - DWRF AND Four Rivers have different populations and densities
    - Run separately so that DWRF outputs are scaled to La Plata County and LPC isn't scaled to DWRF to help collaborative and specific geographies prioritize efforts
    - Lots of stakeholders between SW CO counties with lots of distinct participants

- *Question: Do DWRF and Four Rivers each need to use the same high value risk assessment method? What is the downside of not using the same method?*
  - *Have capacity to support to engage with this current tool. Efficiency of looking at data using tool ensuring we are distinct with RADS on each geography. Articulating values together because of large landscape projects happening like CFLRP, RMRI. Water is value, same sub-categories, same RI or response functions will be run separately. Background information is good to have; also the same veg layers from LANDFIRE, same fire behavior layers to match up different HVRAs having some same inputs but some additional differences between SWIF Four Rivers vs DWRF, IE: the railroad.*
    - *Yes, definitely run separately and with slightly different background HVRAs. No priorities that pop up in DWRF landscape are going to make the SWIF cut if that funding mechanism is designed around the Four Rivers landscapes. Yes, WUI density was the primary piece I was concerned with being the same across the landscapes.*
  - *2 points → 1ˢᵗ: 2 landscapes, in the past – Poudre and Thompson watershed modeled together, but different stakeholders with different values on each watershed. Easy technically to do 1 big prioritization and then just prioritize, IE: Poudre, adds complexities but has come up before. 2ⁿᵈ: lots of different ways to go at this.*
    - *HVRAs: no problem with validation. Getting maps can be helpful and powerful. Would like to map as much as possible, have as much data to work with. Don't want to prioritize sub-HVRAs. See maps and evaluate what's involved in treating all things, feasibility, costs, suitable treatments, etc. help to make judgements on how to spend money. → EXACTLY where we want to go!*

Next steps (15 minutes)
- Develop small group to define sub-HVRA relative importance and response functions
  - 7-9 value areas
    - Should life safety be merged with infrastructure, etc.? Needs more input.
    - Break into subgroups for each sub-HVRAs and look at how they relate
    - Secondary components like buffers, definitions of evacuation areas, etc.
    - Think through response functions of HVRAs to fire.
- Response functions
  - fundamental component to risk assessment – what type of subgroup or who is/are the most important to be involved in that conversation?
    - Should be defined as objective and transparent as possible. CFRI science literature and background research, some literature lacking. Not a RADS thing, very common process.

- Does convening sub-work groups seem reasonable?
  - Don't like being divided so early in process would like to work as a whole for a while.
    - Concerned about people's investment level, would be great to have comprehensive conversations, but logistically may be easier to break up and go over components of each sub-HVRA and then bring recommendations back to larger group to be vetted
  - Smaller groups' goal to:
    - Work through sub-HVRA list and have more focused discussion which should and shouldn't be involved
    - Identify sub-HVRA relative importance (RI)
    - Response functions
    - Work through value specific components IE: buffers, etc. – does data exist to incorporate into risk assessment?
      - Need to continue conversation from funding source opportunities, planning horizons having information is getting to mission critical point, but conversations need to move forward whether we're in full agreement or not
        - Want to open up to other folks, but there's concern about asking a lot from a lot of people. We don't want to overextend people's interest and energy. Being effective and efficient is important.
        - The path going forward is never going to be perfect. If there are better choices based on forthcoming/future information, we have to adapt as we move forward. Will give guidance 5 years planning and investment and refine. Would love to dig deeper into WUI side of things. Great overall fire adapted approach.
  - Need to have hard conversations. Can work on HVRAs, no way to predict using RADS. No response function because we have no model to use.
    - Response function part of GTR
      - Much better to have subgroups to look for science and have background to find information. Do we have data to back up brick structure vs wood sided structure; won't work with every single stakeholder. Need to use expertise.
        - Can be done in subgroups. Won't be one and done.
- Communications coming on scheduling sub-HVRA groups.
  - Brett, please share some about how to incorporate 'treatment durability/ time of effectiveness into prioritization when you're getting back to responses. Thank you so much for sharing where RADs are at.
  - Thank YOU to Brett Wolk-- a very good overview of RADS. I am not sure that I am yet ready to say that this is the method we should use to get to that next level of where we start work within the priority PODS