

MARCH
2021



Crown Managers
Partnership

FORUM REPORT

FIRE IN THE CROWN OF
THE CONTINENT

Proceedings from the Crown Managers Partnership's
2021 Fire in the Crown of the Continent Forum

The Crown of the Continent Ecosystem is an iconic landscape. As we work to connect the lands, waters, and life in this region, we recognize they were not always divided as they are today. Many Tribes and First Nations have traditionally used fire on this landscape, and we acknowledge that the fire suppression and prohibition that followed colonization and disrupted traditional practices is rooted deeply in racist ideologies.

We thank all Indigenous Peoples who call this land home for their continuing stewardship. We honor their sovereignty and respect their unique connections and knowledge of these places. We are committed to being more conscientious and inclusive by working closely with Indigenous Peoples who call the Crown of the Continent home, to create a just and equitable future.

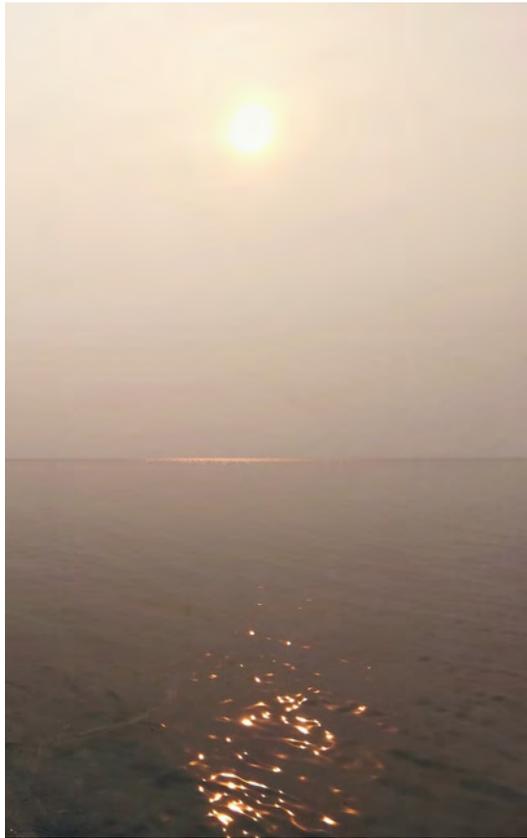




About the Crown Managers Partnership

The Crown Managers Partnership (CMP) is a voluntary group comprised of federal, state, provincial, Tribal, and First Nation land and resource managers and universities in Montana, Alberta, and British Columbia. We recognize that no single agency has the mandate or resources to wholly address common ecological challenges throughout the Crown of the Continent Ecosystem. We therefore work together across borders to tackle shared ecological challenges and priorities.

Poised to embark on our third decade of collaborative stewardship, the CMP continues to foster collective, landscape-scale management guided by science and culture. We are inspired by the understanding that water, fish, and wildlife do not recognize borders, and that shared resources require shared management. Also, that Americans, Canadians, and sovereign Indigenous nations can work together to conserve this shared landscape for generations to come.



Forum Objectives

- Deepen understanding of past, present, and future Traditional Ecological Knowledge of fire and its use in the Crown;
- Present current understandings of how and why fire regimes and intensities are changing
- Integrate climate change and fire and explore its relationship to terrestrial and aquatic systems and the human environment
- Provide tools, lessons learned, and effective best management practices for managers to take home and utilize.



AGENDA OVERVIEW

MARCH 22ND | SESSION 1

Fire Past and Future: Fact, Fiction, and Uncertainty

MARCH 23RD | SESSION 2

Traditional Ecological Knowledge and Active Fire Use in the Crown

MARCH 24TH | SESSION 3

Fire in the Human Environment

MARCH 25TH | SESSION 4

Fire Management in Practice: Obstacles, Implementation and Successes

MARCH 26TH | SESSION 5

Fire in Terrestrial and Aquatic Systems

About the Forum

From March 22nd to March 26th, 2021 the Crown Managers Partnership gathered experts from across the Crown of the Continent Ecosystem in a virtual setting. There were 126 attendees from over 50 organizations across the Crown geography in attendance.

SESSION 1

Fire Past and Future: Fact, Fiction, and Uncertainty

During this session, we were presented with the projected changes in wildfire patterns across the U.S. Rocky Mountains as the climate continues to shift. We were also provided a comparison of projections from different sites, including the Crown of the Continent, the Greater Yellowstone Ecosystem (GYE), and the Bitterroot Valley and mountains south of Missoula. The Crown of the Continent appears to be significantly more resilient to changing climatic conditions with regard to impacts on fire regimes than the GYE.

A number of case studies of severe wildfire events (like Fort McMurray) were presented. Some of these boreal fire events are catastrophic, although each one appears to have a unique set of initial conditions driving the actual event, so extrapolating lessons learned across events is not necessarily straightforward.

Multiple speakers discussed research on fire scars on trees. It was clear that Indigenous knowledge and practices concerning fire as an ecosystem management tool removed ingrowth, reduced the density of stems per hectare, and affected the spatial configuration of trees in space for extremely long periods to time. This practice was severely disrupted by colonialism and the advent of colonialist policies.



ANNE CARLSON

Moderator; Senior Climate Adaptation Specialist,
The Wilderness Society



BOB KEANE

Research Scientist, US Forest Service, Rocky
Mountain Research Station



MARC-ANDRE PARISIEN

Research Scientist, Canadian Forest
Service



LORI DANIELS

Faculty of Forestry, University of British
Columbia-Vancouver



DON GAYTON

Keynote Speaker, Consulting
Ecologist and Writer

BOB KEANE

Interacting interactions: effects of climate change on forest vegetation and wildland fire in the Northern Rockies

WHEN ASKED "WHAT WILL BE THE IMPACTS OF CLIMATE CHANGE ON WILDLAND FIRE IN THE CROWN OF THE CONTINENT"

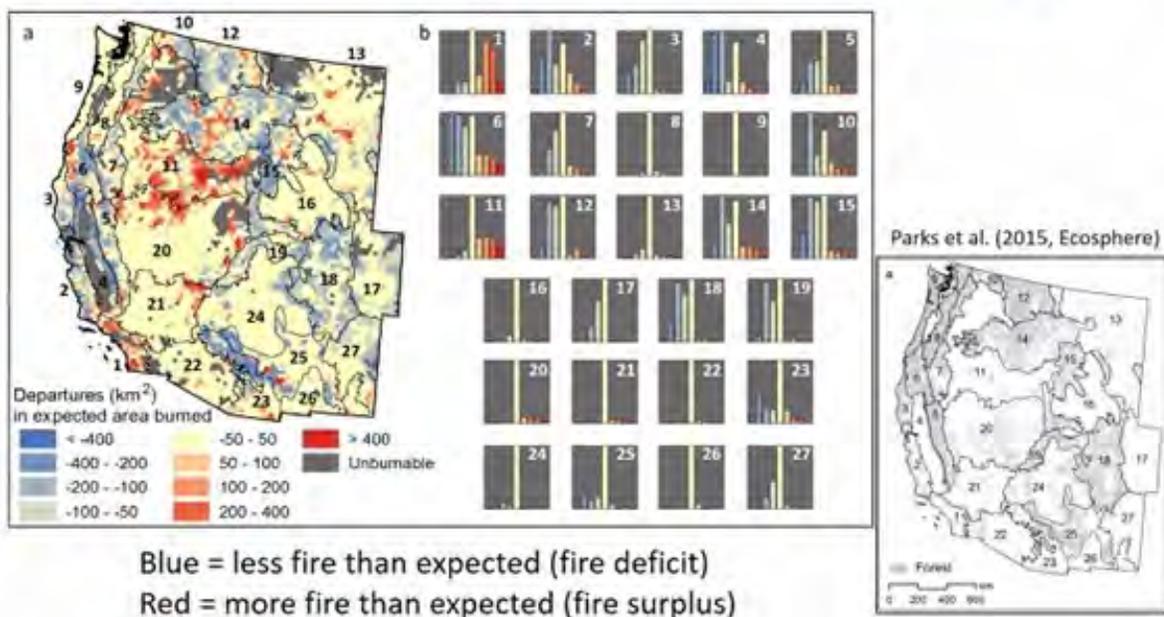
68% OF FORUM PARTICIPANTS RESPONDED THAT CLIMATE CHANGE WILL HAVE A HUGE IMPACT, TO **COMPLETELY CHANGE THEIR CURRENT FIRE MANAGEMENT APPROACH.**

- As fires burn it creates fuel breaks for future fires. Burn history is really important in determining how fire burns in the future.
- Interactions drive future landscape responses
- Interactions are spatial, temporal, and functional
- Each landscape will respond differently to management actions and climate change
- A model is only as good as authors. Many models are based off of historical empirical data, but if the historical data is not what is in the future, then the model may not be helpful. Planning for only 5-10 years and updating models based on new, empirical data will be important for adaptive management.

MARC- ANDRE PARISIEN

Wildland fire deficit and surplus in western North America

Wildland fire deficit and surplus in the western US, 1984-2012

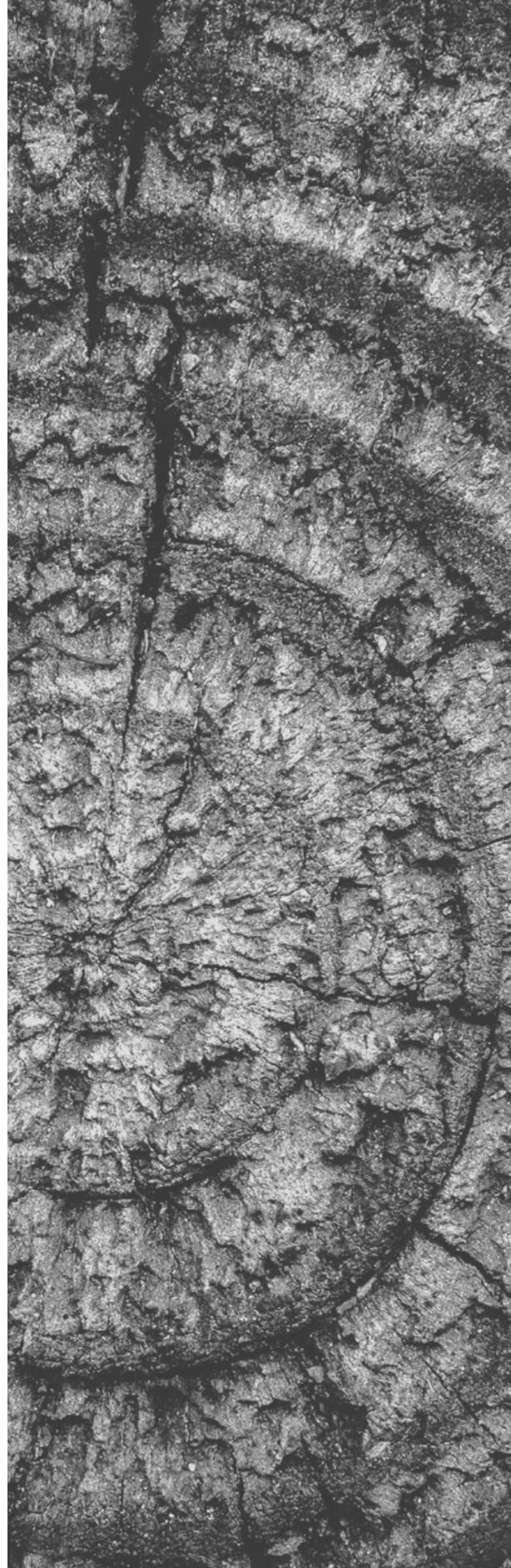


- Most forested regions continue to experience less fire than expected (fire deficit)
- Fire surpluses tend to occur in the non-forested areas subject (and sometimes contributing) to ecological degradation
- Further support for the need for large-scale adaptation and mitigation strategies
- Surplus-deficit maps should be compared with fires of recent years
- Decades of fire suppression have likely resulted in a fire deficit around many communities in boreal Canada
- Suppression activities can offset the increased fire likelihood...until they don't
- Future fire-fuels interactions create uncertainty
- Possibility to prioritize mitigation action, but communities are extremely case specific and resources are often limited

LORI DANIELS

Disrupted Fire Regimes in the Canadian Montane Forests

- Fire history reconstructions show that historical fire regimes in montane forests of southeastern British Columbia were dominated by frequent lower-severity surface fires, that burned and scarred trees every 5 to 40 years for several centuries up to the 1900s.
- Despite the historical frequency of fires and recent periods of suitable climate, these forests last burned causing fire scars 40 to 160 years ago – providing strong evidence of the effects of disrupted fire regimes during the 20th century.
- The lack of recent fires is reflected in changes in tree composition and tree density.
- In absence of surface fires, dense understories of fire-intolerant trees persist, altering forest composition, structure and fuels.
- Beginning in the 19th century, colonialist fire exclusion policies had a profound impact on First Nations' homelands and cultural resources that persist today. The exclusion of Indigenous cultural burning, followed by the cumulative effects of land-use change, early 19th century logging, even-aged silviculture, and fire suppression during the 20th century have altered the fire regimes and reduced the resilience of Canada's montane forests.



DON GAYTON

Fire in the Dry Forest: A Pilgrim's Progress

"How systems function historically is a road map for how they will function in the future, but keep in mind we have climate change. So we need to create resilient ecosystems and to understand resilience - we need to use the archival information."



SESSION 1

GROUP DISCUSSION

How have you/your agency integrated climate science into your fire management program(s)?

Program planning

- Agencies are still in reactive mode, but...
- Having a fire ecologist on staff has been a positive change
- Develop management plan that integrates climate science; prescribed burning and reduction burning
- Use science, research, and Indigenous knowledge in management
- Do not plan for a long time ahead - re-evaluate every 5 to 10 years

Communication

- Education of the public - Wildland-Urban Interface work with communities
- Work with genetics, work with communities adjacent to forests, working closely with researchers, trying to understand optimal tree densities and spatial patterns and what is possible

Management Strategies and Tactics:

- Do no harm! Stop or prevent the spread of invasive species
- Active fuels management program, attack it with a lot of mechanical treatment; habitat shifts, boundary edges; active underburn program
- Conduct habitat-specific enhanced burning
- Invasive plant management is now incorporated into all our projects with mixed results
- Low elevation environments at high risk, undertaking prescriptions and prescribed burn implementation & forest thinning program
- Creating landscape level fuel breaks to protect interior cedar hemlocks and old-growth
- Fire management zones promoting low-severity fire in dry forests, based on climate projections

SESSION 1

GROUP DISCUSSION

What would you do differently as a result of what you learned today and/or what information has reinforced what you're doing already?

Human components

- Importance of integrating traditional knowledge and western science
- The need to make it acceptable for humans to put fire on landscape
- Traction in idea that human managed fire is natural, this builds a stronger link and argument to promote Rx fire in wilderness.

Communication

- Need for better integration with nations and other land managers of prescribed fire – ranching communities' low tolerance with fire
- Engage Indigenous communities/ Nations and regional universities more extensively in long-term management and monitoring programs, and work together to address monitoring funding issues

Urban interface

- Continue to use urban-interface management plan and burn grass around houses; take lower branches off trees around homes to eliminate fuel
- Spatial distribution of where we should do work to reduce risk to communities is important
- look at age of forest around communities - even montane and grasslands; pressure not to have denser older forests around community; need more intensive management around communities
- Use of temporal illustrations to help land owners become comfortable with the benefits of fire
- It's a big job to initiate long-term discussions with the general public around the need to change our approach to fire to have more resilient landscapes
- Mitigation most definitely needed, especially around large communities

Management

- Fire suppression will reduce number of fires but not necessarily area burned
- It's not if, it's when
- The need to better understand impacts of enhanced burning on invasive plants
- Reintroducing burn intervals, need more fire on the landscape; right fire at the right time; TEK, different targets (values, holistic perspective)
- Expand understanding about ways in which fire has changed over time through comparisons with modern communities; recognizing that the context is very important; diverse, flexible toolboxes needed for more effective management
- Importance of fire –understanding the fire regimes and having discussions around them
- Concern that the south half of BC is quite a bit different than the upper north in regards to fire behavior and effects.

SESSION 2

Traditional Knowledge and Active Fire Use in the Crown

Session two opened with a panel on past, present, and future use of fire on the land through the framework of Traditional Knowledge. Some panelists spoke of fire as something that is cleansing and capable of bringing in new life (ie. grass and berries).

Suppression of fire has led to deterioration of the vegetation across regions and led to significantly larger and more severe fires over time. We learned about Traditional approaches to prescribed burns relating to improvement of wildlife habitat – particularly for buffalo.

Now, managers are increasingly working more and more to return fire to the landscape, using Traditional Knowledge with scientific knowledge to inform where work is needed and how those prescribed fires are introduced as a key restoration tool.

We were provided Canadian case studies (of collaborative prescribed burns and community based films) that braided Indigenous and scientific knowledges of fire management to enhance climate change resilience.



MIKE DURGLO, JR.

Moderator; Department Head, Historic Preservation Department, Confederated Salish & Kootenai Tribes



MIKE BRUISED HEAD

Ninna Piiksii



LAURA LYNES

Co-founder and President, The Resilience Institute



ELLIOT FOX

Indigenous Community Liaison, The Resilience Institute



TONY HARWOOD

Land Resource Consultant



MARTY WILLIAMS

K'tunaxa Nation Council



MONIQUE WYNECOOP

Fire Ecologist, USFS



BOB GRAY

Fire Ecologist, R.W. Gray Consulting



JULIE COUSE

Director, Lands and Natural Resources, ?aq'am

TRADITIONAL KNOWLEDGE PANEL

Past, Present, and Future Use of Fire on the Land

Mike Bruised Head (Ninna Piiksii)

- Lightning is a natural, cleansing process - a rebirth of forest and plants
- Following the Waterton fires, aspen and trees burned away and native grasses emerged
- Burned areas to get rid of small pox historically - fire used to chase away the bad spirit - fire in the metaphysical - the spiritual protection
- Elders spoke of buffalo that avoid areas with the smell of death. Elders burned portions of the buffalo harvest area so the buffalo would not be afraid to come back. The burning would draw the buffalo to the new grass.
- Fire is to be respected - there has to be a reason and intention when starting a fire

Tony Harwood (Land Resource Consultant)

- Management relies on cultural ecology - based on life of subsistence lifestyle
- There is a monoculture from lack of fire where there used to be diverse patchworks of forest (see photos below). Elders can't reach whitebark pine and medicinal plants.
- CSKT has a 20 year forest plan that incorporates prescribed fire





TRADITIONAL KNOWLEDGE PANEL

Past, Present, and Future Use of Fire on the Land

Marty Williams (K'tunaxa Nation Council)

- Trees speak of the fire history
- Numa (thunder) makes fire so new life will grow and there will be food for human beings
- Fire is linked to food security and medicine plants. After fire went through a huckleberry area, there were enough berries for humans and bears to pick side by side.
- Current policy in BC is to put out fires, but fires are a natural process.
- In the future we will have more huge fires because the cycle has been broken

Monique Wynecoop (Fire Ecologist, USFS)

- Programs should manage for social and cultural values.
- When managing with Tribal communities, trust and respect are key.
- How values are addressed and how those values are impacted for future generations are considered when determining fuel treatment effectiveness and decisions
- Online participatory GIS program was used to "spray can" values on a map without providing specific culturally sensitive locations.

Additional Resources about Tribal Relationships with Fire in the Crown, courtesy of the Confederated Salish and Kootenai Tribes and the CSKT Salish-Kalispel Culture Committee

- “When early non-Indian visitors reported the great bounty and pristine quality of the region’s natural resources, few had any idea that they were observing a landscape that was not only the gift of the Creator, but which had also been shaped and nurtured for millennia by tribal people and tribal ways of life.
- For cultural information on the tribal relationship with fire and a series of forty historical essays on the tribal use of fire and its repression over the past two centuries, and extensive scientific material on the ecology of fire, see the Confederated Salish and Kootenai Tribes’ website, Fire on the Land: Native Peoples and Fire in the Northern Rockies (originally published as an award-winning interactive DVD (Lincoln: distributed by the University of Nebraska Press, 2007, hereinafter Fire on the Land), <http://fwrconline.csktnrd.org/Fire/index.html>, accessed 2021-05-17.
- For the 2021 Montana Forest Action Plan, the SQCC condensed those forty essays into a single essay on “Indigenous Peoples and Forests” for the 2021 Montana Forest Action Plan. See pp. 6-13 of “Montana Statewide Assessment of Forest Conditions,” <https://www.montanaforestactionplan.org/pages/assessment>, accessed 2021-05-17.”
- Lastly, a series of fire history essays can be accessed here: <http://fwrconline.csktnrd.org/Fire/FireOnTheLand/History/>

JULIE COUSE & BOB GRAY



Building Resilience in Dry Forests of the East Kootenays: Planning, Operations, and Lessons Learned

2018 Prescribed Burn

❖ Cost: \$342/ha



2017 Wildfire

❖ Cost: \$1385/ha and counting

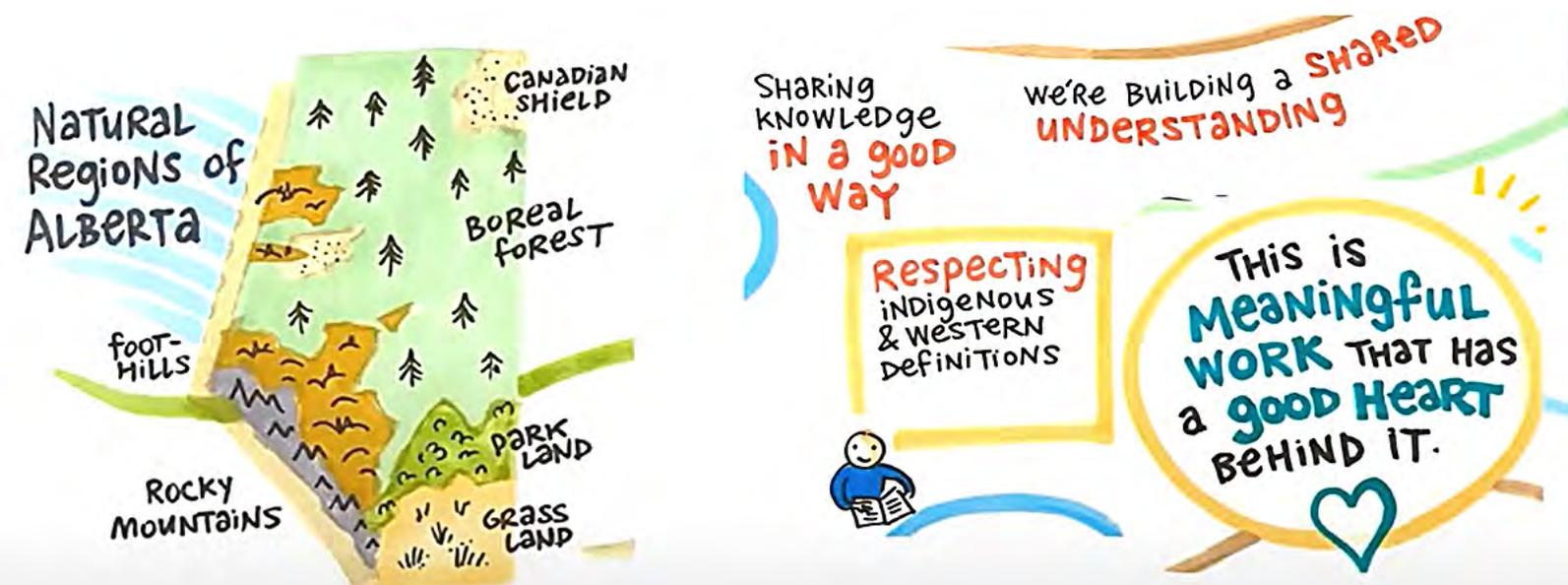


- Need more capacity - Not enough burn bosses
- A unified command structure was successful
- Systems have strayed so far from the historic that BEC zones were reclassified in 2018
- Burn boundaries need to be laid out with burning success as major criteria
- Wildfire tree patches need to be treated to reduce negative fire impacts
- Need markets for small diameter trees – small diameters are difficult to burn in place

ELLIOT FOX & LAURA LYNES

Fire With Fire: Braiding Indigenous and scientific knowledges of fire management to enhance climate change resilience in Alberta

- Fire with Fire aims at building capacity for climate adaptation by braiding Indigenous, local and scientific knowledges. Building understanding hinges on having access to the best available knowledge irrespective of its origin.
- Focus on adaptation
- Watch Participatory Videos made by Kainai First Nation. You can find them [here](#).
- When climate changes, all the other relationships change too - this is cultural chaos. For example, the first thunder use to come in late spring; now we hear them in March. This throws off the timing of our relationship with the natural world.



SESSION 2

GROUP DISCUSSION



What have you learned or heard today that might provide ideas on how to integrate Traditional Knowledge for current and future fire management?

- The right time to light the fire is when the eagles are riding the thermals.
- Appropriate collaboration vs cultural appropriation – how to ask for participation
- Work towards understanding Indigenous world view, as opposed to simply western view.
- Importance of cultural values when designing projects and seeing “other values”.
- Importance of land based learning – getting people back on the land and passing on knowledge.
- How can we change our systems and the requirements to suit a different context
- Prescribed fire is the work that can bring together Traditional Ecological Knowledge and western science

Are you incorporating Traditional Knowledge when doing fire management plans - if no, what are some of the barriers; if yes, how did you incorporate Traditional Knowledge?

- Relationship building; however, facing difficulty with internal obstacles (laws, capacity issues)
- What we are incorporating - traditional fire into Western fire or the other way around? Alberta doesn't do prescribed fire at all as a province. Co-training in management.

SESSION 3

Fire in the Human Environment

During this session, forum attendees unlearned some common mischaracterizations of the public's perception of fire. Sarah McCaffery dispelled many myths that land managers hold about the public, and warned us to "beware of the imagined public." In her second presentation, she helped us understand the true barriers to use of prescribed and wildfire.

Peter Lahm outlined the large costs associated with wildfire smoke, mainly the tremendous impacts to public health and safety. We looked at trends in air quality and learned ways that we can help our communities be smoke ready before the fire.



CHAD WILLMS

Moderator; Director, Land and Environmental Planning South, Alberta Environment & Parks



SARAH MCCAFFREY

Research Social Scientist, USDA Forest Service, Rocky Mountain Research Station



PETER LAHM

Air Resource Specialist, USDA Forest Service)

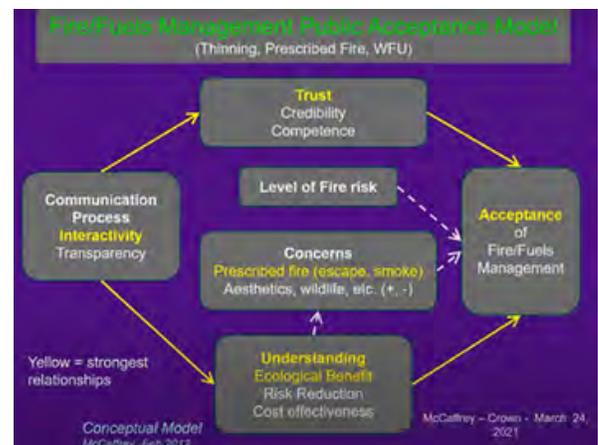
SARAH MCCAFFERY

Observations and myths about public perceptions of fire and fire management

- Beware of the imagined public – many of the narratives surrounding the public and fire are not backed up by data.
- Behavior change is more complicated than just providing information – it's about engagement.
- False Narrative #1 – they don't understand the fire risk; Reality: people know they live in high fire risk areas; risk is a complex and subjective concept – Higher risk perception does not necessarily lead to action. It is a necessary but not sufficient condition
- False Narrative #2 – Smokey has taught the public to think all fire is bad; Reality: Consistent evidence that public has a good understanding of fire ecology, including beneficial role of fire. 80% see prescribed fire and thinning as appropriate management tools
- False Narrative #3 – people don't take responsibility; Reality: Strong sense of shared responsibility
- False Demographic Narratives – ie. New residents are less aware of fire mitigation
- What is influential? 1. Knowledge, 2. Trust, 3. Interactive communication
- Terms that are not useful: mega-fire, devastating, catastrophic; overly simplistic or binary framing

Barriers to use of prescribed and wildfire

- Fire management is a social process. Social dynamics determine what we value and the decisions we make
- The more people know about the ecological benefits and trust those doing the prescribed fire, the more their acceptance of prescribed fire and smoke increases
- A key selling point for prescribed fire is that we have a greater ability to manage smoke
- Internal agency considerations tend to limit fire as a management tool (lack of funding – the right funds at the right time for the right workforce, consistent leadership and personal commitment, endangered and invasive species; small burn windows)
- Social license and air quality may be less of a barrier to prescribed fire than often described
- Prescribed fire opportunities: Importance of coordination amongst burners and air quality regulators; multilevel governance approaches; create organizational structures similar to those that exist for wildfire; improve smoke modeling/monitoring
- The limiting factors for wildfire resource benefit include resources, social acceptance, and internal concerns



PETER LAHM

The Challenge of More Smoke



Other considerations can include economics, type of community (retiree, tribal, other) and opportunities for NGO partners.

- Smoke impacts health, safety, economics, and disrupts lives; no particulate matter is healthy – can we manage and reduce the level of impact?
- US Air Quality Index – there are a growing number of days of communities being exposed to unhealthy levels
- Smoke poses challenges to transportation (fatalities and injuries from smoke on road) and to personnel (wildland fire fighters)
- We need to understand that those impacted the most by smoke are usually not the same as those that benefit from prescribed fire
- Ways to effectively deal with smoke: Interagency Wildland Fire Air Quality Response Program, EPA – USFS Fire and Smoke Map Pilot, be smoke ready before the fire

SESSION 3

GROUP DISCUSSION

What tools might help you in your communication with the public and policy makers?

Outreach

- Engage with local community groups through existing networks. Go to the public instead of expecting them to come to you
- Fire Info/Communication Office on staff
- Need to develop resources in additional languages and platforms

Trust Building

- Emphasis on listening rather than talking
- Trust must be earned and can be easily lost
- Become knowledgeable in local concepts, expressing their importance. Make sure folks know what they're sharing really matters.
- Once analysis is complete and decisions are made to move onward with prescribed fire implementation, go back to the community and share the details.
- It's okay to use nuance with the general public

What have you heard from your public/stakeholders that we should be paying more attention to as we go forward with fire management?

- Generational disconnect exists in the ways that fire is perceived
- Indigenous perspectives
- The public is wanting more fire management. Growing amount of funding for wildland urban interface work and thinning on public land, but no funding for private land.
- Wildland firefighters as stakeholders: what are we doing to train and prepare fire workers? No regulations or guidance about wearing masks or respirators, training is inconsistent

SESSION 4

Fire Management in Practice: Obstacles, Implementation and Successes

Session four opened with a scientific analysis of trends in burn severity and reburns, and what glimpses that may give us into the future of our forests.

Several talks allowed us to visit the sites of wildfires and prescribed burns in the Bob Marshall Wilderness in Montana as well as sites in British Columbia. Through photos and storytelling about different fire events over many years, it allowed us to see the benefits of the large scale prescribed burns that some managers in the Crown have been able to carry out. It was clear through these anecdotal success stories that there is room for scientific research on these observed benefits.

Attendees also learned about the numerous tools, analyses and support systems that exist in the U.S. to help fire managers and crews with decision-making and strategies during and before fire events.



VITA WRIGHT

Moderator; Science Application Specialist, Rocky Mountain Research Station)



BRIAN HARVEY

Assistant Professor, School of Environmental and Forest Sciences, University of Washington



MIKE MUÑOZ

District Ranger, Helena Lewis & Clark National Forest; CMP Steering Committee member)



TAMI PARKINSON

Fire Management Specialist –Wildfire, USDA Forest Service, Rocky Mountain Research Station

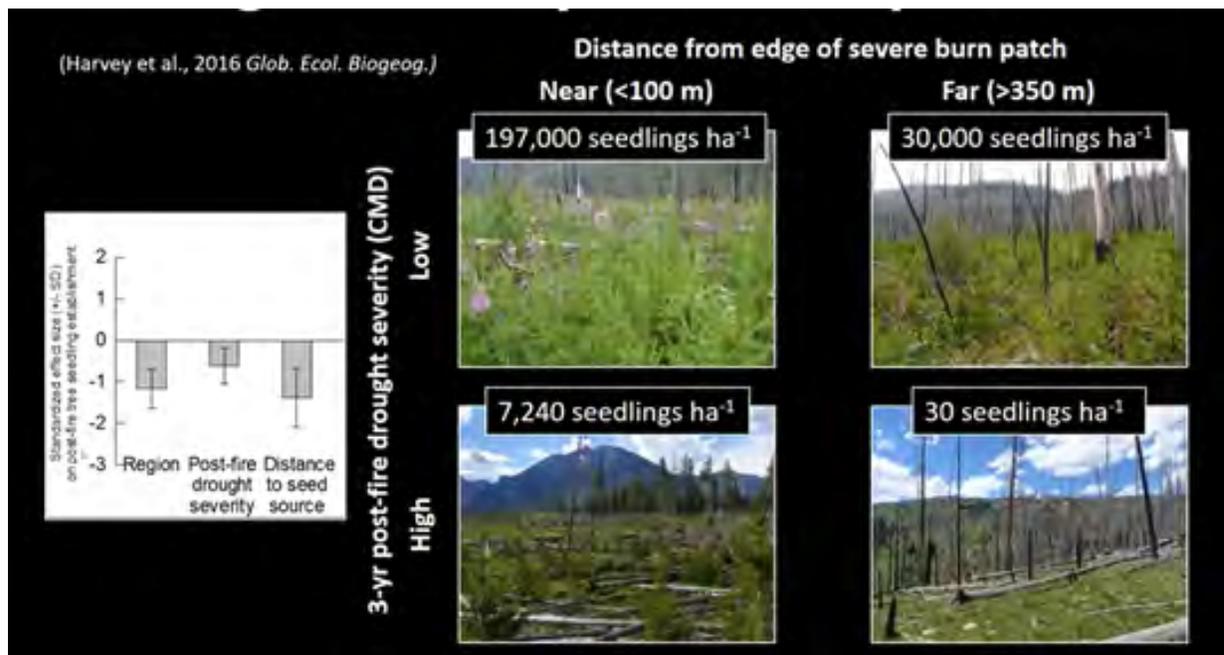


AL NEAL

Senior Ecosystem Restoration Specialist, BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development

BRIAN HARVEY

Regional trends in burn severity, tree regeneration and reburns in the Northern Rockies



- Forests in the US northern Rockies have been resilient to fire – even large and severe fires (ie. 1988 Yellowstone Fires)
- Total area burned and high burn severity is increasing, as is average level of burn severity
- Large fires are still heterogenous, but as area burned is increasing, so is the proportion and total burned as stand replacing fire. Also, patterns of stand replacing fires are becoming more and more homogenous over time.
- In subalpine/mid-montane forests, post fire tree establishment declines sharply with drought severity and burn patch size; is the lower right quadrant a glimpse into the future?
- At lower treeline, warm and dry areas nearest to ecotone may be converting to non-forest post-fire
- Past fires limit likelihood, size, and severity of a subsequent high-severity fire; however, effects wear off by 10-15 years and can be overridden by extreme fire weather
- When short-interval severe reburns occur, post-fire tree regeneration and carbon recovery slows

MIKE MUÑOZ

Managing Wildland Fire for Landscape Benefit and Beyond

“MANY PEOPLE OFTEN ASK, ‘IS IT TOO LATE TO MANAGE WILDFIRE FOR BENEFIT?’ WELL, IF THE BEST TIME TO BEGIN WILDFIRE MANAGEMENT FOR BENEFIT WAS 50 YEARS AGO, THE NEXT BEST TIME, I WOULD SAY, IS UPON US. AND IT’S GOING TO OCCUR WHETHER WE PARTICIPATE OR NOT.”

- Managing wildfires for benefit creates resilient ecosystems and we need more research on a landscape level regarding positive impacts
- In the Bob Marshall Wilderness Complex, we’re practicing what used to be present on the landscape
- Diverse age-class and arrangements of fuels on large landscape affects snow accumulation and snowpack retention, creating a myriad of snow melt rates and runoff events
- Every 1% increase in organic matter results in as much as 25,000 gallons of available water per soil acre and multiplies with increased residual charcoal
- The benefits of wildfire for benefit: increased nutrient flows for aquatic critters, opened up new ski recreation areas, made clearing trails easier. Between 1990- 2015 there were 450+ fatalities that occurred on wildland fires – all were suppression fires, not benefit fires. Far more costly to suppress than manage for long term benefit.
- Managing fires for benefit still takes active management. Have contingency plans because not everything goes as planned (ie. wrap structures, use water drops to redirect fire and reduce intensity)

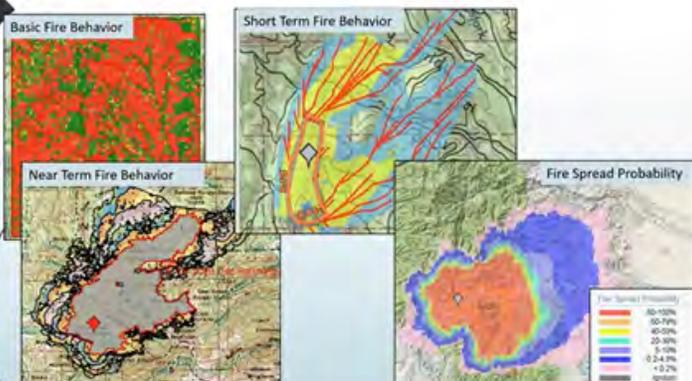


TAMI PARKINSON

Programs and Tools for Integrating local objectives with incident management

- Applications for Wildfire Decision support include [IFTDSS](#) and [WFDSS](#)
- IFTDSS – used by entities to complete NEPA reports, write prescribed fire plans, quantitative risk assessments, hazard analysis, public meetings, and more! Data layers to access include fuels treatment, fire history, infrastructure, designated areas, and jurisdictional boundaries; this application is open to all with helpful tutorials and resources.
- WFDSS – a one-stop shop for Wildfire decision documentation; creates more consistent planning and data across agencies; developing a more cloudbased WFDSS 2.0
- Other useful applications include [Wildfires Near Me](#) (tracking wildfires and alerting you when they are near), [WindNinja](#) (computes spatially varying wind fields), [Wildfire Safe App](#), [predictive services website](#) (links to 7 day forecast products), [Risk management assistance dashboard](#)

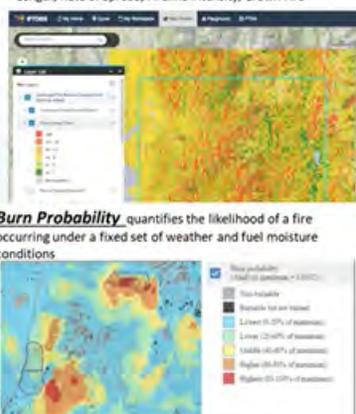
Spatial Models – Fire Behavior Analysis



Fire Behavior Modeling



BASIC LANDSCAPE FIRE BEHAVIOR

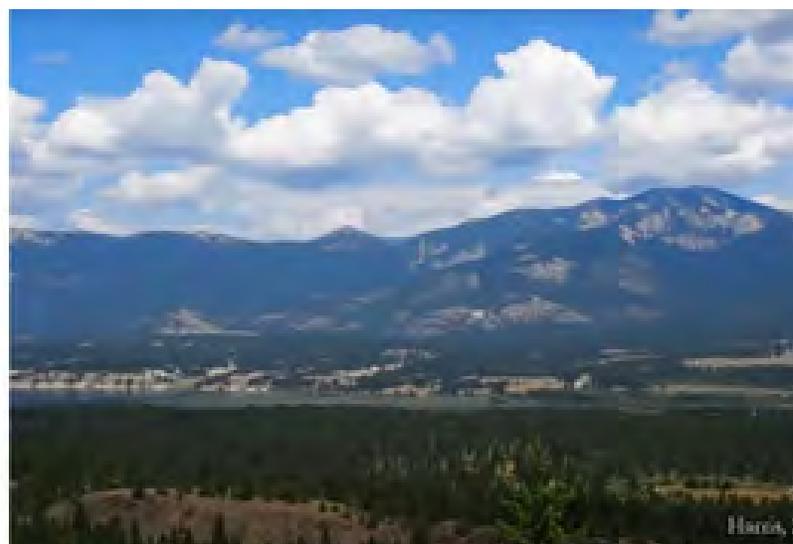


AL NEAL

British Columbia Ecosystem Restoration Program

- Dry forest restoration typically uses a suite of treatments – conventional harvesting, prescribed fire, slashing/spacing
- Prescribed fire project managers must understand the density, distribution and biological characteristic of invasive plants in the area, minimize potential for introduction or spread, and limit resources available to invasives; [website](#) which monitors changes to land base
- Important guiding pieces in BC: we need to work collaboratively, we need more use of prescribed fire on the land, emphasis on Traditional knowledge
- It doesn't have to be a single entity doing work on the land base – the important thing is that we all get together, have dialogue, and coordinate

The change that occurs to a land base when you take four fire intervals out of the system...



SESSION 4

GROUP DISCUSSION

What do you take away from what you learned today that you could take back to your agency/organization?

- The importance of coordinating with partners
- Water movement in our landscapes as it relates to fire needs to be more closely studied/considered
- We need a way of capturing the wealth of knowledge that is “anecdotal evidence”
- Canada could benefit from the tools/modeling that the US has at their disposal
- The cost of various management scenarios was very informative and useful as another argument for more proactive fire management

How has/is your agency or organization preparing to respond to large scale fire events in this era of climate change?

- Having conversations with private landowners to identify good areas for treatment to help defend against fires, among other benefits.
- Fire risk modelling under current conditions and for future scenarios
- Importance of building relationships/ trust over time in advance of fire events
- Tribes and Forest Service neighbors are looking at interagency efforts to partner on strategies that are multijurisdictional
- In AB, fire management plans are being completed and one focus is prioritization of fire response -which fires should be suppressed and which allowed to burn? There are concerns again about budget/funds -will we have the ability to act on good planning?

SESSION 5

Fire in Terrestrial and Aquatic Systems

During the final session of the forum, we were presented with case studies that revealed the impact of fire on hydrologic processes. However, we were cautioned in making broad generalizations about how fire effects water resources.

We explored fire and its impact on native fescue prairie in Waterton Lakes National Park and the Blood Timber Limit. On the landscape, there was de-wilding that accompanied colonialism: extirpation of buffalo, wolves, and fire on the landscape. The result was an overpopulation of elk, which led to degradation of ecosystems through overgrazing. We learned about focused, community centered work that addresses the long-term impacts of these changes and the outcomes of severe wildfires on the prairie vegetation and tree species.

This session also included best fire and post-fire management practices for Low Elevation Dry Forest and the potential for limiting invasive plants by seeding post-fire. as well as best fire management practices for endangered, high-elevation pines in the Crown of the Continent



SEAN FINN

Moderator; Science Coordinator, US Fish & Wildlife Service



ULDIS SILINS

Professor, Agricultural Life and Environmental Sciences, University of Alberta



CRISTINA EISENBERG

Oregon State University



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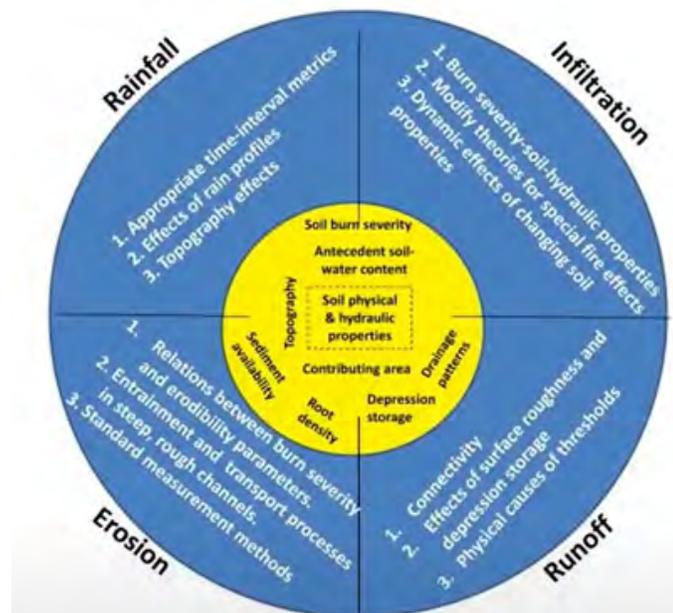
MICHAEL MURRAY

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ULDIS SILINS

Wildfire impacts to water in the Rocky Mountains: How much can we generalize?

- After fires there is concern about ash, fire debris, flooding, “emergency” sediment. These effects are catastrophic, but relatively short lived
- Post-fire watershed response domains (Moody et al. 2013) - see figure
- After Lost Creek fire, snowpack snow water equivalent increased with fire, as did net rainfall and net precipitation
- For Lost Creek, there was very little effect of fire on peak flows; however, there was earlier melt runoff.
- In Lost Creek area, impact of fire on stream temperature is minimal, mainly because stream temperature is groundwater controlled. However, there were large effects on water quality (sediment concentration and phosphorus concentration increases were persistent throughout 10 years; Nitrogen concentrations drop below baseline after 6 years post-burn)
- Post fire, increased sediment, which increased bioavailable phosphorus. The macroinvertebrate community then increased in abundance, which led to increased growth of trout
- Similar mechanisms and processes govern responses, but different processes dominate responses across biogeoclimatic regions. Caution in broad generalizations on scope of fire effects to water resources



CRISTINA EISENBERG

Restoring Native Fescue Prairie Using Fire and TEK in Waterton Lakes National Park and the Blood Timber Limit

- Issues in southwest Alberta are the same issues everywhere where there has been settlement and traditional ways have been disrupted
- In the Crown, aspen tend to be taking over what used to be grassland. Waterton and the Blood Timber Limit contain some of the most intact areas of fescue prairie
- This landscape has changed a lot since the 1800s: bison, fire, and wolves were eliminated; the elk population exploded; and cattle were brought in.
- To be effective, ecological restoration should draw on all types of knowledge including local knowledge and TEK (knowledge and practices passed orally from generation to generation informed by strong cultural memories, sensitivity to change, and values that include reciprocity)
- Grasslands co-evolved with people using fire on them and bison grazing. TEK practices can increase biodiversity and ecological resiliency by creating fine-grained patchy landscape mosaics
- Over the years had about 130 members of Kainai First Nation received fellowships to join in the field study. Many of them were hired as technicians and are now leaders in the natural resource field.
- The Kenow wildfire did not cause non-native grasses to erupt. The proportion of native grass stayed the same, detection of invasive grasses was the same or lower, aspen canopy was reduced, and the winter diet for elk and bison were remarkably similar
- Created an index that was peer reviewed to break out into extreme fire severity
- The proportion of mineral soil skyrocketed, grass cover decreased, but shrub cover remained similar post Kenow fire. The proportion of native grasses in prairie was unchanged from before and after the Kenow fire
- Fires are helping keep aspen down in aspen stands. There is no to extremely low ungulate herbivory on aspen post fire.



3 MONTHS LATER



ELEANOR BASSETT

Post-Wildfire Seeding in a Low Elevation Dry Forest and a Decade of Vegetation Monitoring

Common name	Scientific name	% by weight	% by density	Seeds/kg	Seeds/m ²
Italian ryegrass	<i>Lolium multiflorum</i>	32	22	501,000	80
Rambler alfalfa	<i>Medicago sativa</i>	20	12	441,000	44
Canada bluegrass	<i>Poa compressa</i>	4	31	5,511,500	110
Timothy	<i>Phleum pratense</i>	4	15	2,712,000	54
Western wheatgrass *	<i>Pascopyrum smithii</i>	35	12	243,000	43
Creeping red fescue	<i>Festuca rubra</i>	5	8	1,068,380	27

- Study area was the 2003 Strawberry Hill Wildfire. This area was aerially seeded using Kamloops blue tag mix – the seed mixes have been revised and changed since 2003 version
- Invasive plants can change fuel properties. For example, cheatgrass can grow really quickly and shorten the period of time between the next fire, altering fire cycles.
- Most seeded species established as expected and there was some persistence, except for Timothy. There were unexpected species – smooth brome and Kentucky bluegrass; these seeds could have come in through contaminated seed.
- Invasive plants were higher in unseeded control, suggesting that seeding of agronomics can be effective at blocking early wind borne invaders
- Forage production was similar when taking into account the forage provided by native plant community. The seeded plant community was different, especially when looking at forbs versus grasses
- When deciding to seed, consider your objectives, choose the species wisely, consider timing

MICHAEL MURRAY

Best Fire Management Practices for Endangered Pines in the Crown of the Continent

- Whitebark Pine is above 1500m, poor competitor, long lived. It has cultural and ecological value.
- Limber Pine is found from 900-1,700m, a poor competitor, long lived, and high ecological value.
- Threats to these species include mountain pine beetle and blister rust. The Crown is the hot spot for mortality. Government of Canada declared Whitebark as endangered in 2012, and Whitebark is on the verge of being listed under the Endangered Species Act in the US
- We are seeing more stand replacing fire in Whitebark Pine forests
- Even modest scorching can kill whitebark and limber pine. Fire is not just a friend to five needle pines, but it can also be a foe
- Ways fire management can work in tandem with five needle pines: Avoid/reduce mortality of healthy trees (avoid cutting them down), dig handline below drip line of each tree, reduce ladder fuel (competing tree species), seed post-fire – [see this resource](#) to manage fire in Whitebark stands





SESSION 5

GROUP DISCUSSION

How has fire management/science shaped strategic planning for your resource program area that you manage?

- Snowpack data and management plans. We are noticing differences between US and Canadian management plans;
 - Missing topic: removing livestock after fire; Forests, Lands, Natural Resource Operations and Rural Development keeps stock off of rehab for 3 yrs; challenges among production and restoration goals
 - Indigenous science informing strategic planning
 - Community Forest near Nelson, focus was and is on watershed and drinking water protection alongside sustainability and resilience. Fire wasn't really a big part of the discussion at that point. In the last 20 years that's changed
 - When managing fire, we do our best to protect the whitebark because we know they're important
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SESSION 5

GROUP DISCUSSION

Are there any new ideas or projects that were spurred during this past week that you hope to explore and pursue beyond this forum?

- Need context-specific information on invasive plants & seeding post-fire; huge barriers to restoring fire-dependent ecosystems
- Need for better representation of fuels & modelling fire in Canada, especially in the Crown with complex fuels, fire, topography
- Need more information on grass-seeding
- US fuel typing, modelling, is so far ahead of where we are in Canada. The base data isn't even there.
- Major hurdle of pulling off prescribed fires on private conservation land
- Importance of charcoal in retention of moisture and nutrients
- Would like more info & data on soil microbiology; nutrition for cattle and wildlife post-burn and rehab
- Conducting research on unmanned aerial systems for fire
- Best way to prepare ecosystems for climate change is to help them be as resilient as possible, and only way to do that is to look backward to very old photos and listen to Traditional Knowledge and expertise and consider historical ecology; how to package this information so we can more effectively engage the public in this conversation?
- Seeking more opportunities to use prescribed fire to help with elk habitat and weeds.

Interested in learning more about the Crown Managers Partnership?

Recognizing that no single agency has the mandate or resources to address regional environmental issues, the Crown Managers Partnership (CMP) formed in 2001. The CMP is a voluntary partnership amongst federal, state, provincial, Tribal and First Nation agency managers and universities in Alberta, British Columbia, and Montana. We are a community of practitioners that collaborate on common issues, share resources, & exchange knowledge.

Our current shared conservation priorities include five needle pines, fire on the landscape, invasive species, native salmonids, watershed integrity, forest carnivores, and fish and wildlife habitat connectivity. Any experts are welcome to join our working groups - we are a coalition of the willing!

To learn more about the work that we do, check out our [website](#) and our [2021-2025 Strategic Framework!](#)

OUR STEERING COMMITTEE

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