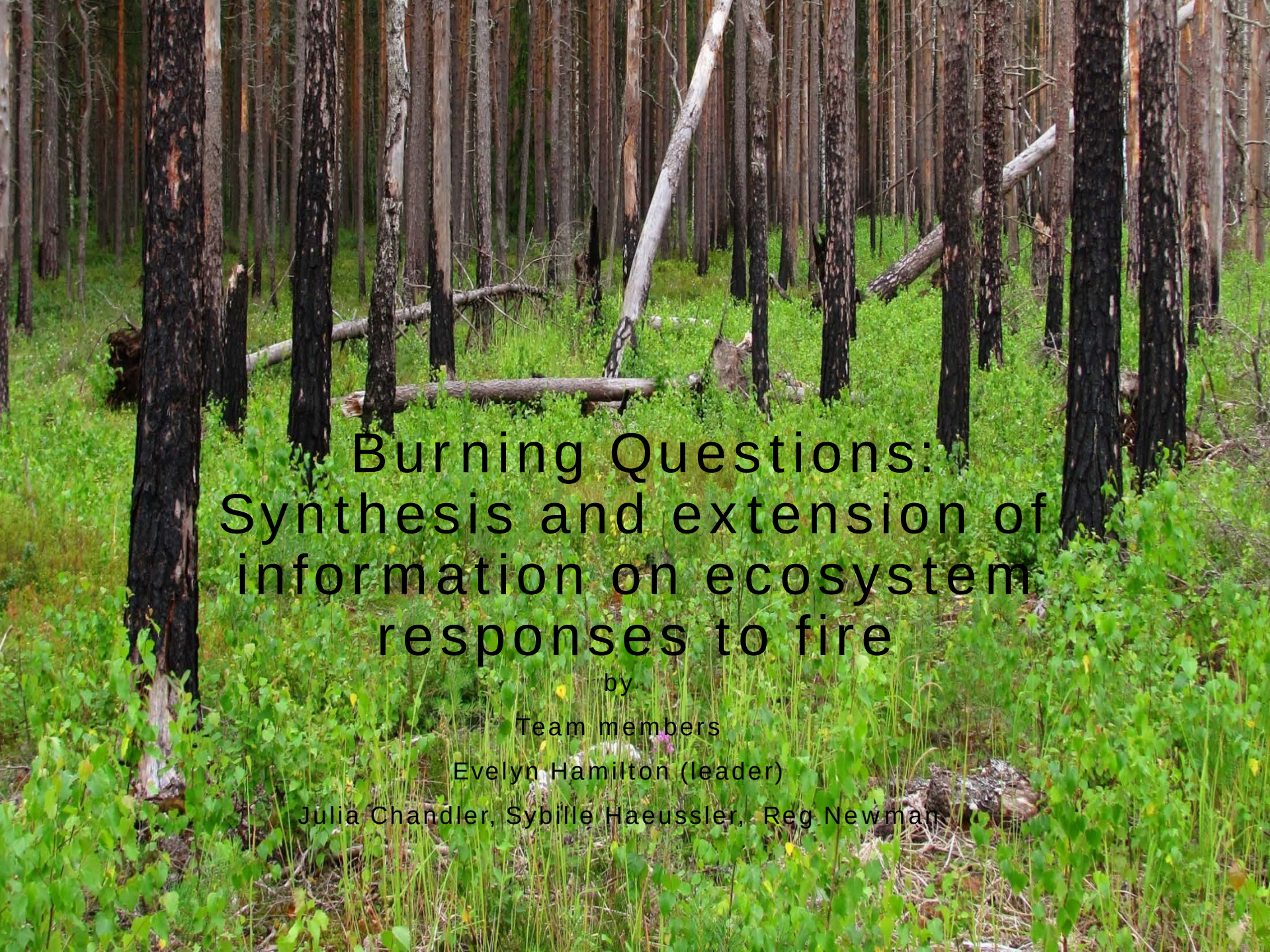

Burning Questions: Synthesis and extension of information on ecosystem responses to fire

by

Team members

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Outline

- Project background
- Methods
- Questions identified by decision makers
- Results (some examples)
- Lessons learned
- Options for next steps
- Helpful to us

Project background and rationale

- Understanding response of ecosystems to fire and risks for BC's forests and rangelands is a priority.
- Effects of fire on fuels, soils, vegetation, tree growth studied since 1970s.
- Limited meta-analysis and synthesis relevant to current priorities. Databases at risk of being lost. New questions
- Our project builds on our considerable fire ecology experience. Funded by FESBC and MFLRNORD for 2017/18 ($77K)

Methods

1. Determined key questions and data sources
   - Over 40 decision makers and specialists interviewed to identify priority questions and data sources.
   - We determined which questions we could address within timeframe.
2. Compiled and analyzed data
   - 78 datasets describing BC ecosystem responses to fire (i.e. slashburns, restoration, wildfire) were acquired.
   - Data (some sites monitored >20 years post-fire) were updated & analyzed. Information includes treatments, ecosystem, site and soil, vegetation, regen, fuel consumption
   - Multivariate and univariate analysis used to identify responses

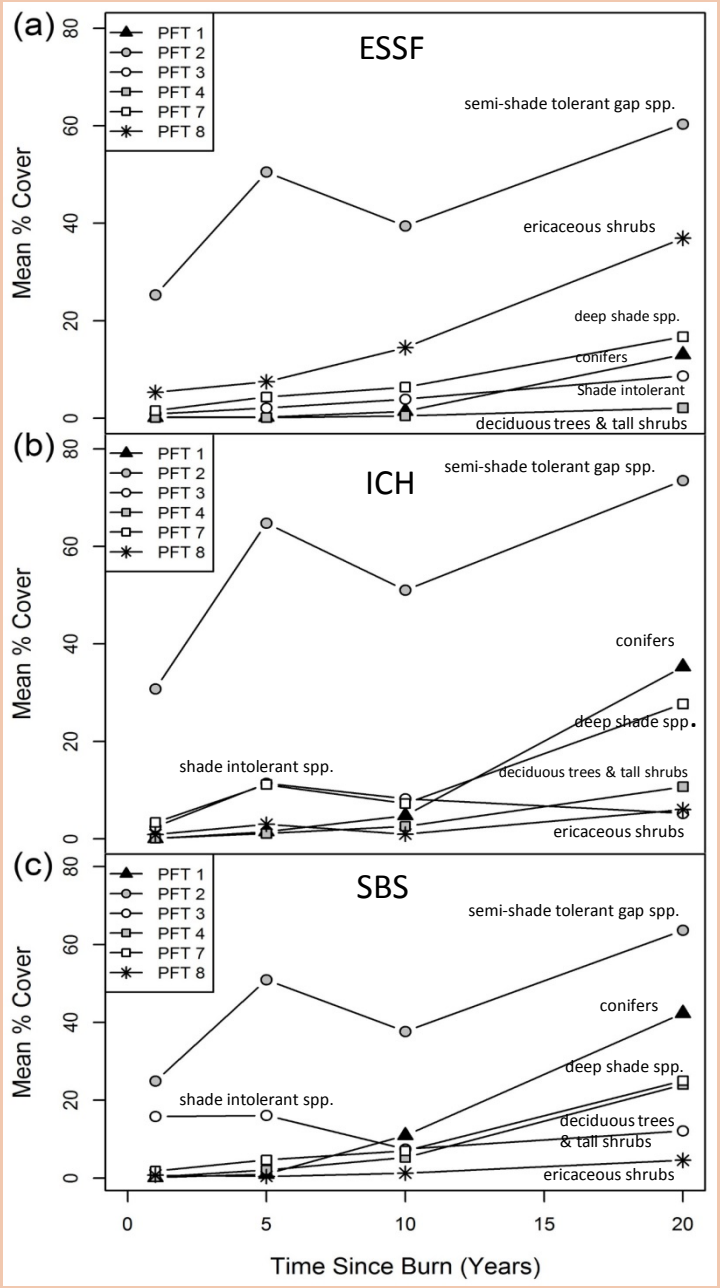
Questions identified by decision makers:

1. **General** - What are the general ecological effects of fire on ecosystems? Has there been a change in return interval?
2. **Watershed integrity** – What are effects on site stability, rates of revegetation?
3. **Landscape flammability** - Does prescribed burning reduce risks of wildfires? What practices are feasible?
4. **Reforestation** - What are the effects of fire (esp. severe wildfires) on regeneration and G&Y?
5. **Climate change** - What are likely fire effects in the future and how will they change?
6. **Carbon, GHG and smoke** – What are effects of fire on emissions (GHG, smoke) & carbon balance?
7. **Restoration** – What are effects of fire in terms of restoring ecosystems?
8. **Vegetation** - What are effects on plants (e.g. wildlife browse, forage, invasives, alterative hosts, sensitive and culturally important plants)?

Results – *some examples*

Question	Answers **General**	**Dry Fire-prone Southern Interior (IDF & PP in RM Trench)**	**Wet South-Central Interior (ICH, ESSF, SBS)**	**Fire-prone Northern Interior (drier SBS, SBPS BWBS)**
1. General - What are the general ecological effects of fire on ecosystems?	• Most BC ecosystems resilient to historic fires, this may change • Significant shifts in composition and structure can occur due to lack or extreme fires. • Desirability of shifts depends on objectives (e.g. delayed conifer=more forage	• Very slow return to reference ecosystem condition. • Very little late seral bunchgrass even after 14-17 years.	• Most SBS & ICH and drier, warmer ESSF ecosystems are fairly resilient to historic fires • Wetter, cooler ESSF & SBS ecosystems less resilient • Cover of mature forest species increases over time, returning to preburn composition	• (Sub)boreal forests are generally, well adapted to fire. • Abrupt shifts in fire regimes/fire frequency and CE may lead to poor outcomes.

Change in cover of lifeforms over 20 years in broadcast burned sites in ESSF, ICH, & SBS zones



ESSF

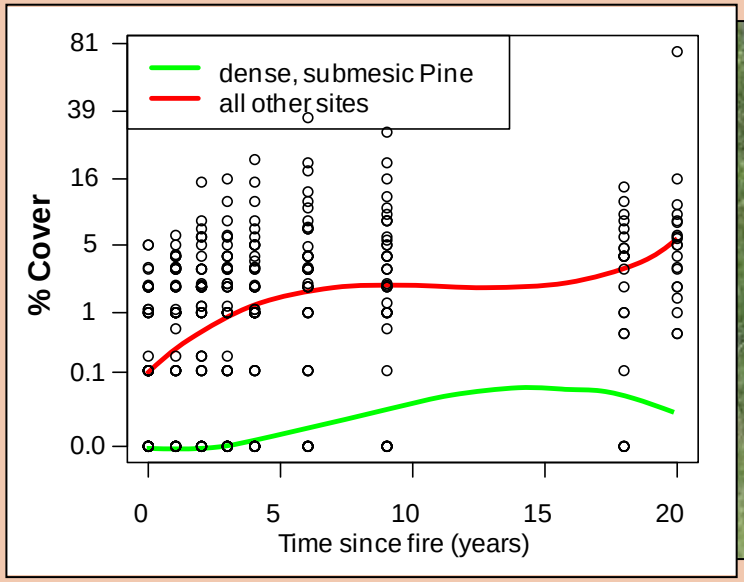
Conclusions: These ecosystems are fairly resilient to burning

- Cover of plants associated with mature forests increased forming >40% of cover by year 20
- Faster recovery & conifer growth in SBS vs. ESSF
- Greater, more persistent deciduous tree & tall shrub cover in SBS vs. ESSF
- Ericaceous shrubs prominent in ESSF by yr. 20
- Few invasive weeds

Management Implications: Moderate to low severity broadcast burning is consistent with maintaining ecological values.

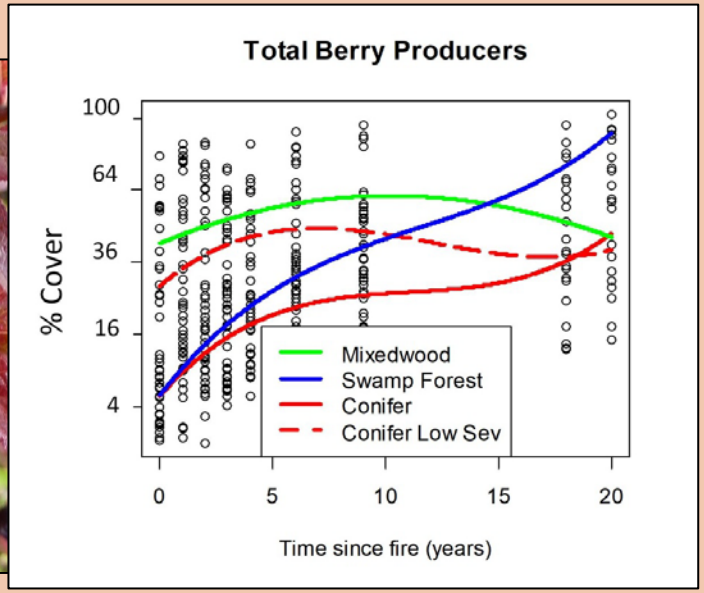
SBS

Response of moose browse and berry producing shrubs in drier SBS - Swiss wildfire



Moose browse (deciduous trees, shrubs) cover increased slowly after wildfire, persisting for at least 20 years. Very little in dense Pl sites. Conifer abundance has significant impact.

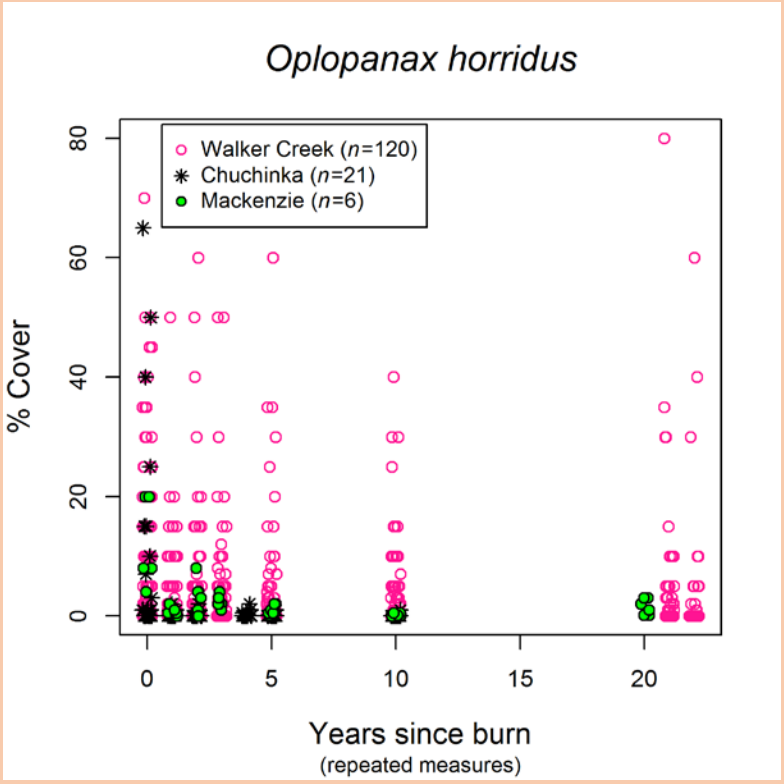
Berry producing shrubs cover increased after wildfire in 3 forest types. May be declining by year 20. More abundant in wetter sites.



This part of the Swiss Fire was not replanted, only natural regeneration

Oplopanax horridus (Devil's club) response to logging and broadcast burning in SBS and ICH sites

Devil's club typically occurs on moist rich sites in the ICH and SBS. Not typically found in BWBS, ESSF or dry SBS. When present pre-burn, it generally resprouted and slowly increased in cover over time. It did not achieve pre-burn cover by yr 20.



Roots of Devil's club are used as a medicinal plant by some BC First Nations and others.

Responses of some non-native plant species over time on 21 restoration burn sites in the Rocky Mountain Trench (IDF & PP zones)

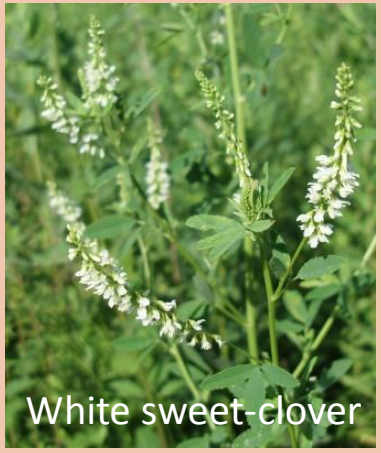
Non-native species	Category	Common Response
common dandelion	nuisance	Increased
black medic	nuisance	Incr/decr
yellow salsify	tracked	Increased
Canada bluegrass	agronomic	variable
cheatgrass	tracked	variable
field filago	nuisance	variable
Kentucky bluegrass	agronomic	Lost
perennial sow-thistle	tracked	Decreased
Canada thistle	FRPA listed	Incr/decr
quackgrass	agronomic	variable
red clover	agronomic	variable
bull thistle	FRPA listed	Incr/decr
common St. John's-wort	FRPA listed	Increased
white sweet-clover	agronomic	Lost
sulphur cinquefoil	FRPA listed	Increased
alsike clover	agronomic	Lost

Increasers


Sulphur cinquefoil


Yellow salsify

Decreasers

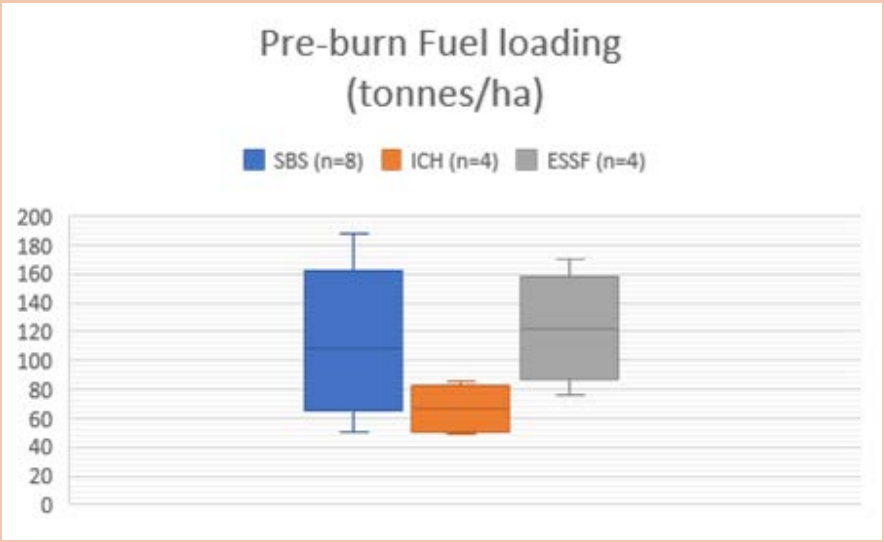

White sweet-clover

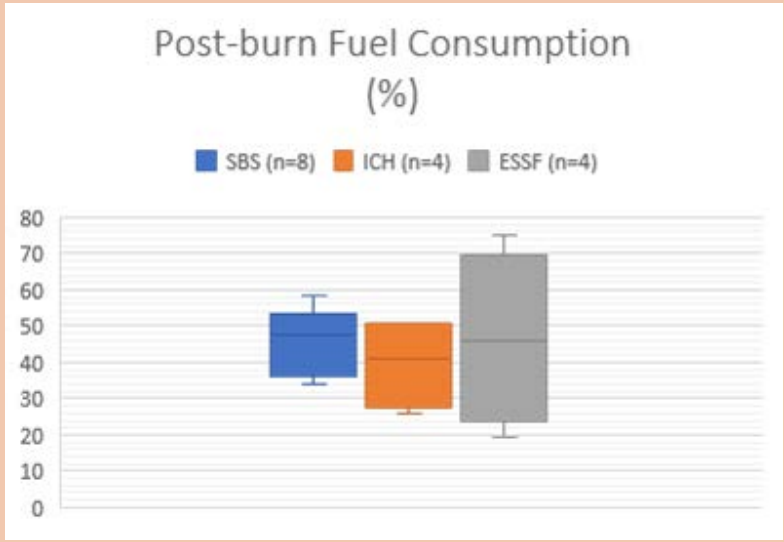

Kentucky blue-grass

Some non-native species increased in frequency – most were not serious concerns. Two are FRPA listed. Others decreased, varied or disappeared.

Fuel loading and consumption after logging and broadcast burning in SBS, ICH & ESSF zones

Broadcast burning resulted in significant reductions (average 41%-48%) in fuel loads.
Post-burn reforestation was successful.



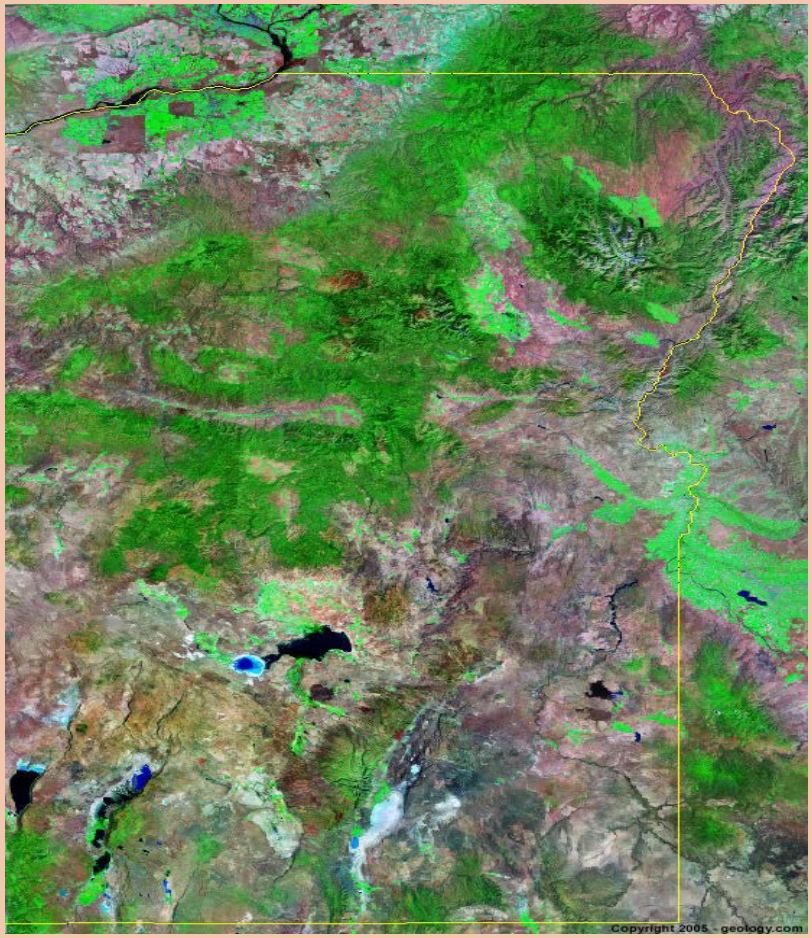


Some lessons learned

- BC ecosystems are adapted to and fairly resilient to fire. Responses are variable and largely determined by ecosystem, site factors and adaptation to fire. Predictable to a degree.
- Importance of well designed research/monitoring with controls, pre- and post-treatment multi-year sampling & exclosures.
- Research/monitoring is stand level, decision making at landscape level - need to bridge scale difference.

Potential Next Steps

- Carbon – Provide data to support carbon models (e.g. residue levels, consumption, biomass)
- Landscape flammability – link to fuel load analysis
- Linking plot data to landscape level through satellite imagery
- Fine tune analysis, compile additional databases
- Literature reviews on key topics
- Extension, links to First Nations TEK



Helpful to us and Acknowledgements

- Ideas regarding a strategy for next steps (links to government priorities, collaborators, funding)
- Feedback from decision makers (i.e. what was/would be most useful, how to share these results - what, when, how, who)
- New priorities?

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To provide feedback or for more information, contact Evelyn Hamilton at ehhamilton16@gmail.com or (c) 250 514 4887

THANK YOU for your interest and support