

Endangered Ecosystems Research in Parks and Protected Areas of West Central British Columbia

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Achieving Protected Area status is the first line of defense for endangered ecosystems, but what happens when the factors that conspire against vulnerable ecosystems don't respect park boundaries?

The Bulkley Valley Research Centre, together with BC Parks and other community partners is studying the ecological resilience and restoration needs of two endangered ecosystems in west central British Columbia:

- Low elevation dry grasslands (red-listed SBSdk/81 & /82)
- Subalpine whitebark pine–lichen woodlands (blue-listed ESSFmk/02 & /03)



Endangered SBSdk/81 grasslands (scrub-steppe) in Uncha Mtn - Red Hills Provincial Park, at risk from woody plant invasion.



Endangered ESSFmk/02 Whitebark pine - lichen woodlands in Nanika - Kidprice Provincial Park, at risk from mountain pine beetle & white pine blister rust.

Although SBS grasslands and ESSF lichen woodlands are very different, these two endangered ecosystems share many common features:

- Both are keystone ecosystems that support complex animal foodwebs. Although they occupy a tiny portion of the landscape, they are disproportionately important for wildlife. We hypothesize that their complex foodwebs makes them less resilient than a simpler ecosystem with fewer critical interdependencies.
- Both are dry ecosystems. We hypothesize that a shift to cloudier summer weather since the mid-1970s (due to weakening of the North Pacific High over west central BC) is a key ecological driver that has undermined their resilience.
- Both have developed under a regime of occasional, low intensity fire that prevents them from reverting to closed forest. Changes in fuel conditions make it difficult to restore the historical fire regime.
- Both are rare and fragmented ecosystems, surrounded by a sea of mesic forest and other land uses. As they become more isolated, their resilience decreases and it is more difficult to restore essential ecological processes.
- Both are endangered because of cumulative and interacting effects of: (1) directionally changing climate; (2) invasive native and alien species; (3) altered disturbance regimes (including fire & herbivores); (4) fragmentation.

Our research program uses stand reconstruction methods and permanent monitoring plots to document the disturbance dynamics of these ecosystems and agent-based computer simulation techniques to model their ecological resilience and predict vulnerabilities. We are working with BC Parks Regional Staff and Conservation Corps crews to test and apply effective restoration methods. For research details, please contact haeussl@unbc.ca



Restoration Research in Red-Listed Grassland Ecosystems

Since the mid-1990s there has been major progress in protecting red-listed dry grasslands of the Bulkley Valley and Lakes Districts within Provincial Parks and through private land acquisitions.

New Provincial Parks:

- Uncha Mountain – Red Hills
- Sutherland River
- Call Lake

Private Land Acquisitions in the Bulkley Valley:

- Hubert Hill/Toodienia Nature Reserve
- Det San Ecological Reserve

Unfortunately, these protected grasslands are shrinking and their condition is deteriorating due to invasions by native trees, shrubs and various alien weeds. Moreover, the wildlife that depend on them are affected by habitat fragmentation and changes in predator-prey dynamics that destabilize their highly dynamic foodwebs.

The Bulkley Valley Research Centre is monitoring grassland condition and wildlife use, as well as testing and implementing restoration treatments:

1. Prescribed fire (Hubert Hill/Toodienia Spring 2005; Red Hills Spring 2008, proposed Spring 2010)
2. Aspen girdling and brush-sawing of shrubs (Hubert Hill/Toodienia 2005–2008; Call Lake 2006–2008)
3. Manual cutting & drying of fuels, followed by prescribed fire (Hubert Hill/Toodienia 2008-09)
4. Mulching hawkweed & thistle with black plastic & native grasses (Det San & Hubert Hill/Toodienia 2008)

Prescribed Burning Results



Nadina Fire Centre unit crews blacklining and wetting the burn perimeter. Red Hills prescribed burn, May 2008.

On the fireline 5 months after the burn. Kinnikinnick resprouted well and there was a slight decrease in grass abundance. Note dead aspen & pine with green regrowth at rear.

- Spring burns have low severity and most vegetation sprouts back with little change in species composition or cover
- Aspen mortality is higher than expected due to fungal infections (stem decay & Venturia tip wilt).
- Decreases in woody vegetation cover have not lead to increases in grasses & forbs.
- Burning has not yet caused any increase in invasive alien plants.
- We are attempting to increase burn severity by cutting & curing fuels and are also testing the effect of repeated burns.

Control of Invasive Alien Plants



Mulching for yellow hawkweed control (Det San Ecological Reserve) may create dead zones that are difficult to revegetate.



Pulling thistles (Hubert Hill/Toodienia) feels good but is ineffective because we lack the continuity to do this repeatedly for many years.

- Kentucky bluegrass, timothy and dandelion are widespread and we have not attempted to control these species.
- The best way to slow the arrival of new plants is to avoid creating roads and trails in or near grasslands. Cattle, deer, rodents, ants & hikers also spread invasives.
- Manual pulling of rhizomatous species is largely ineffective. Mulching is appropriate for severely disturbed areas, but may create more problems than it solves in more intact grasslands
- Carefully targeted chemical control may be the least damaging technique, but we need to consult with stakeholders before testing because of public opposition.
- There is little point in removing invasives unless you can revegetate the bare patch. Focus on what you want to grow rather than what you want to eradicate!

Proposed 2010 burn at Red Hills on Francois Lake



Girdling and Brush-sawing



Brush-sawing and aspen girdling (Hubert Hill/Toodienia) effectively recreates the appearance of the Juniper savanna steppe but shrub regrowth is still vigorous after 3 years of cutting.

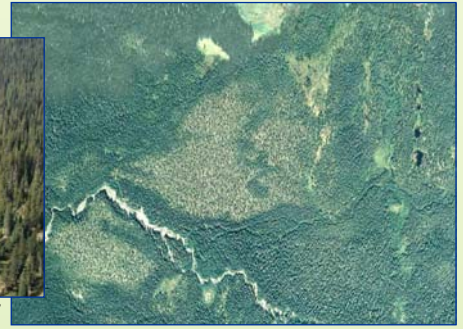
- Girdling effectively kills aspen with less resprouting than cutting or burning.
- Annual brush-sawing quickly creates the desired open appearance and visibly enhances forage quality for wildlife, but we are uncertain if there will be a lasting effect when the treatment is discontinued.

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Whitebark Pine – Lichen Woodland Ecosystems in Peril

Several new Provincial Parks and Protected Areas include blue-listed Whitebark pine – Cladina lichen woodland ecosystems near the northwest limit of their range:

- Babine Mountains Provincial Park
- Tazdli-Wyiez Bin/Burnie-Shea Provincial Park
- Nanika-Kidprice Park
- Morice Lake Park
- Atna River Park
- Nadina Mountain Park
- Burnie River Protected Area



Whitebark pine – lichen woodland ecosystems provide important habitat diversity in Nanika-Kidprice Provincial Park

These are keystone ecosystems for wildlife

because the highly nutritious whitebark pine seeds support a complex subalpine foodweb.



Bear scat composed of 100% whitebark pine seed coats (S. Curtis-McLane near Takla Lake)



Whitebark pine cone partially eaten by red squirrel



Clark's Nutcracker caching seeds (note swollen throat pouch)

In 2007, the Bulkley Valley Research Centre undertook a research project to investigate how Whitebark pine – Cladina lichen ecosystems are responding to cumulative stress from:

- mountain pine beetle (*Dendroctonus ponderosae*) – a native insect that affects all species of pine
- white pine blister rust (*Cronartium ribicola*) – an introduced disease that affects only 5-needle pines
- climate change
- changing wildfire dynamics

We revisited 30-year old plots first described during biogeoclimatic classification fieldwork in the 1970s, and two 30-yr old wildfires. We established stand reconstruction plots and measured tree rings, forest health, vegetation and soils.

Key Findings

- 80-85% of the whitebark pine basal area has been killed by mountain pine beetles
- Blister rust damage is high in all stands. Mortality rates as high as 10% per year were recorded in a 30 yr old wildfire-origin stand.
- Submesic ESSFmk/03 ecosystems appear to have lost lichens and shifted to mesic vegetation since the 1970s, but there is no evidence that this is yet occurring in drier ESSFmk/02 ecosystems.
- Low intensity wildfire appears responsible for maintaining open pine-lichen woodlands. Some fire-scarred pines were 400 – 500+ yr old.
- Recent wildfires are not regenerating to Pine-lichen woodlands.

Recommendations

- Seed collections from rust-resistant whitebark pine seedlings should begin immediately to prepare for future restoration plantings.
- Park managers will need to find ways of reintroducing low intensity fires to maintain endangered whitebark pine lichen woodlands.



Whitebark pine stands at 800-1000 m elevation now have few live mature trees



White pine blister rust damage in young whitebark pine trees. Photos by S. Curtis-McLane



White carpets of reindeer (Cladina) lichens are a distinctive feature of these ecosystems



This old whitebark pine experienced several wildfires

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