

DRIPTORCH CONSULTING INC

# **Square Butte Ranch Timber Damage Assessment and Recommendations**

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# Square Butte Ranch

## Timber Damage Assessment and Recommendations

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## Executive Summary

The Square Butte Ranch falls within the Montane Sub Eco-Region which has a long history of a disturbance-renewal cycle, much of it anthropogenic in nature. Indigenous peoples used fire to keep the forests from expanding into the grasslands and to keep them in the younger seral stages to suite the habitat needs for the species they depended upon.

Since European settlement, the disturbances have been less frequent resulting in older forest cover. As trees/forests age, they become much more susceptible to damage from insects, disease, or environmental impacts.

Recently, wind events have caused some significant wind throw or blow down in the forested areas on the Square Butte Ranch. In addition there has been a dramatic increase in damage from Spruce Budworm infestations. While a single attack may not have a significant impact on the forest cover, repeated attacks will cause mortality levels to spike.

Options include:

1. Do nothing, which is really not an option. It adds exceptional risk to the community as well as a loss of land base for use by the community.
2. Salvage only, which will limit the current mechanical footprint but will likely set the stage for further mechanical interventions due to ongoing blow down, mortality, etc.
3. Salvage and harvest in effort to reset the clock, minimize further interventions with mechanical equipment as well as reduce costs.
4. A combination, salvage and harvest selected areas. The areas left will need further maintenance in the future, and is likely the approach for areas in close proximity of the residences. Areas away from the residences could have some selected harvesting but the areas left would be smaller, less likely to be wind firm, would still be susceptible to insect attack, and would have an increased cost for maintenance. Harvesting near the residential areas will need consultation with the residents to determine what could/should be harvested or left. A detailed harvest or block plan should be done for those two areas if more than just salvage is to occur on those sites.

Salvaging the damaged trees coupled with the harvesting the of the mature trees will reset the ecological succession clock so that younger and healthier forests can establish. To a degree, this approach will also bring disturbance processes back in line to historic norms.

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## 1.0 Introduction

The Square Butte Ranch is a private bare land condominium development on 480 acres of land located in Foothills County. Historically, the region was settled at the turn of the century, largely used for ranching. The Condominium development was established in the late 1990's as a bareland Condominium and zoned for part time recreational use.

The vegetation cover on the Ranch consists of open pasture as well as forested areas which are composed mostly of mature coniferous trees. White Spruce dominates on the lower areas and northerly slopes with Lodgepole pine established on the upper slopes and ridges. For the most part, the forested areas are in a latter successional stage, having evolved from Deciduous forest cover to Coniferous.

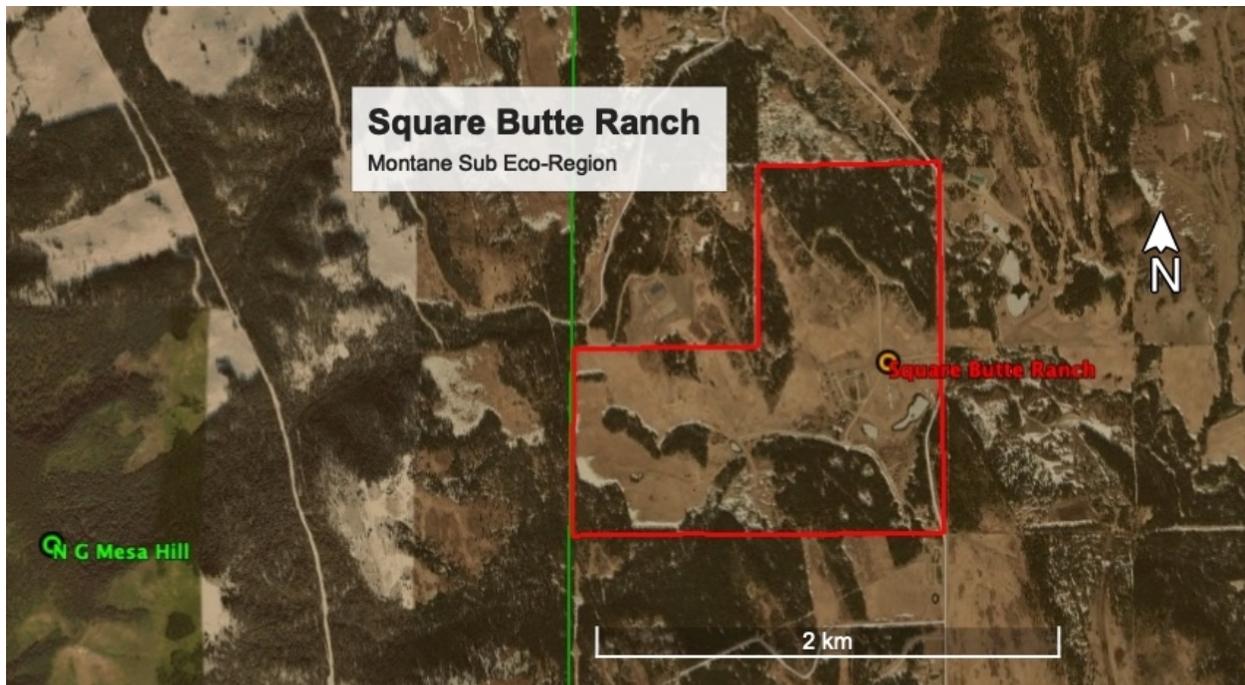


Square Butte Ranch Area 1958 Aerial Photograph

The property is surrounded by private land to the north, east, and south sides. The western side butts up against public land within the Forest Reserve in Kananaskis

Country. There is a single road access to the property with only one way out as the road dead-ends north of the Square Butte Ranch property.

There are 48 owners or units within the condominium which is managed by a board made up from owners of the project. In addition to the private single homes, town houses, etc, there are common areas such as horse barns, riding areas, ponds, social areas, etc. Residential development can be found both in the open pasture areas as well as imbedded within the forested areas.



In keeping with western theme, equestrian use is a passion amongst many of the owners. Riding trails can be found throughout the property as well as westwards onto the crown land within the Kananaskis Country and the Forest Reserves.

Foothills County provides all of the municipal services common for rural communities including land use planning, development, road maintenance, fire response, permitting, etc. Foothills County has mutual aid agreements in place with Kananaskis as well as Alberta Wildfire.

Recently several strong wind events caused extensive timber wind throw throughout the forested areas. This report attempts to provide some background to aid the Square Butte Ranch Community in understanding these forested eco-systems along with some science based recommendations for the cleanup of the wind thrown areas as well as managing the remaining standing timber.

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## 2.0 Natural Regions and Sub Eco-Regions

The Square Butte Ranch is located within the Rocky Mountain Natural Region and specifically, the Montane Sub Eco-Region along the Foothills. Alberta's Natural Subregions are composed of areas with similar landscape patterns and landforms. The Rocky Mountain Subregions are distinguished by differences in environmental conditions largely driven by changes in elevation.

The Land Classification system developed by Alberta Parks is based on natural or biogeographic features such as geology, landform, soils and hydrology. Other factors affecting classification include an area's climate, vegetation and wildlife.

Interestingly, historic anthropogenic disturbance patterns, which weighed heavily in the formation of the vegetation cover and patterns of the various Sub-Eco-Regions, is not one of the criteria for this classification. This is important in that if we wish to maintain healthy and biodiverse ecosystems, we need to understand the historic disturbance patterns and their frequency.

The Montane Sub Eco-Region has an average elevation of 1400 metres with a range between 825-1850 metres. It is the lowest in elevation of the Sub Eco-Regions within the Rocky Mountain Natural Region. It is a transitional area between the Foothills Parkland Sub Eco-Region which is more grassland in nature to the more forested Sub Eco-Regions to the west.

The vegetation of the Montane Sub Eco-Region is characterized by open meadows and grasslands with forests of Trembling Aspen, Douglas Fir, and Lodgepole Pine on dry sites. White spruce, Balsam Poplar and shrub meadows generally occur on wetter sites and northerly aspects. Being a transitional Sub Eco-Region, there has always been a close relationship with the grasslands and forested areas. Today, without frequent disturbance, traditional grasslands are evolving into closed forest canopies.

*References and suggested reading:*

***Natural Regions and Subregions of Alberta***

<https://www.albertaparks.ca/media/6256258/natural-regions-subregions-of-alberta-a-framework-for-albertas-parks-booklet.pdf#:~:text=Six%20natural%20regions%20are%20recognized%20in%20Alberta%20%28see,are%20divided%20into%2021%20subregions%20%28see%20Map%201%29.>

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### 3.0 Regional Montane Pre-History Disturbance

Regionally, at this time, the earliest known evidence of human habitation in this region was in the St. Mary's Reservoir area with encampments dating back approx. 13,000 years. Since then, human habitation has been continuous throughout the region. Up until the signing of Treaty 7 in 1877, the use of fire by First Nations peoples in the region was frequent, extensive and practised by all of the various First Nations.

Fire was not just a tool to the Indigenous People. It was part of the fabric of their lives and central to all aspects of their culture. They depended on it for warmth, cooking, tool making, part of their spirituality and maintaining community. They also used fire at a landscape level as a disturbance and renewal mechanism. It was used frequently, targeting defined areas with specific objectives.

Understanding the historic relationship between Indigenous peoples and the ecosystems that they dwelled in was far more complex than anthropologists acknowledged. Their knowledge of the use of fire as well as the response by flora and fauna in that era likely exceeds the knowledge of many wildfire professionals today. As with modern prescribed burns, the fires were lit at specific times with the intent of specific results. Henry T. Lewis documented over 70 reasons why Indigenous People used fire. Undoubtedly, the extent and frequency of fire use has been largely underestimated. At a landscape level, the use of fire-maintained habitat created greater abundance of the species that they depended upon. As a side effect, many other species benefitted from the use of frequent fire.

Bison were central to the Blackfoot culture, and fire was the key tool to maintain and renew habitat for that species and numerous other species. Early French fur traders saw and noted that the peoples' moccasins were blackened on the soles from walking through burnt prairie areas and referred to them as "pen wa" which meant black foot. The use of fire across North America at the time of European contact was so extensive that in the journals of a Dutch trader, it was recorded that they "could smell the land, long before they could see it."

Various early European explorers commonly referenced Indigenous burning practices in their journals. Peter Fidler travelled from Buckingham House (near present day Elkpoint) to Livingstone Gap. They started their journey in November 1792 and returned in March 1793. In his journals for that period, Fidler recorded references of fire use in various forms 33 times. In his journals, Paul Kane noted seeing three Indigenous men trapped in front of a fast moving prairie fire east of Edmonton. He was certain that they were going to perish when he saw them quickly light a line of fire which burnt back towards the oncoming prairie fire. They then stepped into the blackened area and the main fire passed by them, leaving them unharmed. He is describing the technical use of a "back fire" which is a sophisticated technique used only by experienced fire practitioners today.

Indigenous fire management was likely not practised everywhere across the landscape and certainly not at the same frequency. The use of historical fire by Indigenous Peoples has been easy to document, but difficult to substantiate. In many ecosystems, lower



Square Butte Ranch Area 1916 (Courtesy Mountain Legacy Project)

intensity fire would have been used to burn at the surface level without impacting the established forest over-story. With the use of frequent fire, the footprint left behind would not be easily identifiable due to limited intensities as well as the quick response by vegetation after burning.

With the expiration of the vast herds of bison, the increased numbers of European settlers, and the signing of Treaty 7, the use of fire on these landscapes came to an end. Most Europeans saw the landscapes in which they were settling as “natural”, well suited to farming and ranching. They did not recognize or acknowledge that most of vegetation across these landscapes had been managed by Indigenous People using fire for thousands of years. Europeans did not continue to use fire as a landscape renewal tool. With settlement came a concern over the threat of wildfire.

*References and suggested reading:*

***Forgotten Fires: Native Americans and the Transient Wilderness*** Omer C. Stewart  
***Yards Corridors and Mosaics:How to Burn a Boreal Forest*** Henry T. Lewis, Thersa A.Ferguson 1986

***Fire: A Brief History*** Stephen J. Pyne 2001

***Fires of Spring*** Henry T. Lewis 1979 (16 mm film, edited version available on YouTube)

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## 4.0 Changing Fire Regimes

Evidence of the frequent use of fire and the changing fire regime of these ecosystems is clearly seen. Numerous fire regime studies are repeatedly demonstrating that the fire return interval across the region has gotten considerably longer between fire events.

Some would attribute this to fire suppression policies, wildfire suppression, wildfire prevention programs, and that “natural” (i.e., lightning) caused wildfire was the single largest contributor to the historic frequency of wildfire events on the landscape. This assumption fails to recognize the considerable influence that Indigenous Peoples had in managing these landscapes for thousands of years.

It is well documented that the eastern slopes of the Rockies in Southern Alberta are in a lightning shadow resulting from the Rocky Mountains. Storms which produce lightning start to generate near the mountains. As they move eastwards, lightning potential increases as thunderstorms develop. Much of the lightning generated is east of the forested regions resulting in a lower incidence of lightning caused wildfires.

While “natural” wildfires do occur, they do not contribute to the fire frequency as much as some may suggest. As noted above, fire was the single most effective tool available to Indigenous Peoples and they used it extensively to shape and maintain the Foothills ecosystems. Numerous Fire Regime studies have been completed in the Montane Sub Eco-Region in the Forest Reserves along the Eastern slopes of the Rockies. The Square Butte Ranch falls fully within the Montane Sub Eco-Region. While no Fire Regime studies have been conducted outside of the Forest Reserves, those that have been done are applicable to the Square Butte Ranch area.

The following table summarizes the Fire Regime Studies that have been completed regionally within the Montane Sub Eco-Region. It has likely been well over 100 years since a major fire event has occurred in the Square Butte Ranch area.

**Table 1: Montane Sub Eco-Region Historic Mean Fire Return Interval.**

<b>Bow Corridor</b>	<b>7 years (White)</b>
<b>Ghost</b>	<b>30 Years (Rogean)</b>
<b>Elbow</b>	<b>32-70 years (Rogean)</b>
<b>Highwood</b>	<b>27 years (Rogean)</b>
<b>Porcupine Hills</b>	<b>16-22 years (Rogean)</b>
<b>Castle Watershed</b>	<b>9-31 years (Rogean)</b>

## 5.0 The Montane Sub Eco-Region Today

In part due to fire suppression but mostly fire exclusion (not intentionally putting fire on to the landscape), the vegetation on our landscapes has changed. Recent studies using oblique historic images and modern retakes have demonstrated that since the turn of the last century in the Montane Sub Eco-Region, 41% of the meadows, grasslands (MG) and open canopy woodlands (WD) have converted over to closed forest canopies.

Table 2: Visible Area Vegetation Change

Vegetation Succession Direction	Total Landscape	Natural Subregion								
		Alpine (%)			Subalpine (%)			Montane (%)		
		All	MG	WD	All	MG	WD	All	MG	WD
<b>Reverse</b>	8.7	4.2	9.8	10.3	9.3	1.7	8.1	10.2	1.8	12.1
<b>Same</b>	63.4	70.1	35.7	13.8	64.7	19.6	11.3	48.3	58.2	8.9
<b>Forward</b>	27.8	25.7	54.5	75.9	26.0	78.7	80.5	41.6	40.0	79.0

These values are likely low for the following reasons:

1. The closed-canopy coniferous forest category did not include changes in species composition or age class.
2. The meadow and grassland categories did not differentiate between true grasslands and heavily grazed agricultural land, crop land, and human maintained clearings.
3. The mixed wood category encompassed considerable variation in the ratio of deciduous and coniferous trees.
4. Oblique image classification methods tend to under represent open canopy forests and small clearings.

There are numerous ecological impacts to the exclusion of fire to these landscapes. Some would include:

1. Reductions of populations of Elk and other ungulates resulting from grass to forest conversion, which represents a loss of habitat.
2. The increase of forest cover also increases predator hiding cover which increases the success of their hunt or kill ratio.
3. Numerous species adapted to the human use of fire over millennia. Many of those same species are now threatened, endangered, at risk, or even extinct as a direct result of habitat loss. 80% of the species at risk in Alberta are found in the grassland regions.



*Mesa Butte 1916, looking SW (Courtesy Mountain Legacy Project)*



*Mesa Butte 2018, looking SW (Courtesy Mountain Legacy Project)*

Another trend to consider is that closed canopy vegetation is also in a much more advanced successional state today than it would have been historically. As an example, young Aspen stands have evolved to mature closed conifer stands as part of a successional relationship. White Spruce is much more shade tolerant species. As Aspen matures, it acts as a nurse crop allowing for the establishment of White Spruce and other shade tolerant species. Forest encroachment is another identified issue. Grassland ecosystems are converting over to closed forest canopies due to the spread of forest species even in much lower elevations and drier precipitation regimes. The collective age of the closed canopy forest cover is considerably older than historic levels, again due to the decreased disturbance frequency

Historically, prior to European settlement, Indigenous Peoples used low severity fire coupled with bison herbivory to keep the grasslands healthy and free of woody plant ingress. The more easterly, southerly, and westerly aspects were burnt more frequently to maintain a more open ecosystem and improved the habitat for Bison, Elk, Sharp Tail Grouse, etc., species that were important food sources.

*References and suggested reading:*

***Fire History Study Kananaskis District, Alberta 2005 Field Results*** M.P. Rogeau  
***Forest closure and encroachment at the grassland interface: a century-scale analysis using oblique repeat photography*** 2019 Chris Stockdale, Ellen MacDonald, Eric Higgs

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## 6.0 Current Forest Condition

Within the Square Butte Ranch, the mature forested sites are mostly found on north easterly to northerly aspects. Historically, Indigenous burning practises resulted in the more easterly, southerly, and westerly aspects being burnt more frequently in effort to maintain more open ecosystems and improved the habitat for Bison, Elk, Sharp Tail Grouse, etc., species that were important food sources. These aspects burnt more frequently due to timing of the burns. Most burning was done in early spring when the snows receded, grasses were cured and weather conditions were ideal. The fine fuels (cured grasses, brush, etc.) burn exceptionally well with light drying while the soils continue to hold moisture. This results in sometimes a very high intensity fire but with lower severity impacts. The seed bank and plant rhizomes remain intact in the soils after burning which also creates an excellent seed bed.

The northerly aspects were mostly tree covered with generally younger and often more open forest cover. These aspects did not burn as frequently due to less solar exposure. This also results in higher snow reception within the trees on the north facing aspects and the subsequent snow melt is slower leading to a higher moisture regime. North facing aspects also tend to have more springs, etc. which adds to the increased moisture regime. These conditions result in the northerly aspects burning less frequently than other aspects. Regardless, they still burnt more frequently than pre-European settlement keeping the forest cover in younger seral stages.



Square Butte Ranch Area 2018 (Courtesy Mountain Legacy Project)

Today, most of the mature coniferous forest cover on the Square Butte Ranch is found on the northerly aspects. It is primarily mature to over-mature White Spruce with older Poplar scattered throughout the stands. The Poplar was the pioneer species on these sites. A noted exception being the Lodgepole Pine sites found on the upper elevations which can extend to some of the southerly and westerly aspects.

The northerly aspects and the retarded drainage areas below the slopes have a higher moisture regime. The sites are moist and nutrient rich due in part to the accumulated organic matter. While no soil pits were dug, the soils are likely gleysolic which are commonly associated with these sites. Horsetails were noted forming a blanket over the forest floor, Cow Parsnip was also prevalent. Both species are indicators of poorly drained nutrient rich soils.

The extensive blowdown or wind throw that occurred on the Square Butte Ranch earlier this year was a result of a combination of the following factors:

1. White Spruce is usually characterized as being shallow rooted with the root systems spread over a larger plate-like asymmetrical area. On moist sites, often with retarded drainage, the root system is restricted in depth. In drier soils, the tree will develop sinker roots or even tap roots as deep as 300 centimetres. On the sites investigated, soil moisture is clearly restricting root depth.
2. While no soil pits were dug, it was evident from the trees that tipped over, that the soils below are poorly drained and clay based. Saturated soils do not support trees well. The rocking motion of the tree from the wind causes the root plate to lift and settle. This results in the saturated soils being mixed to almost a porridge like consistency in extreme cases.
3. The stands investigated had, for the most part, transitioned to mature, dominant White Spruce. Post-fire or disturbance, the early established forest often consists of Aspen or Balsam Poplar. These species grow in clones, often establishing from existing root structures post disturbance when the root systems are exposed to sunlight. As the deciduous species develop full crown closure, White Spruce (being shade tolerant) establishes underneath the closed canopy. Over time, the Spruce grows taller than the Poplar which starts to decay with age and shading. As the Spruce trees mature, the large canopy exposure makes them more prone to wind throw, in particular with shallow root systems on moist sites with clay based soils.
4. Older blowdown was evident on several sites. White Spruce forests are dependant upon each other for support. As individual trees are blown over, the neighbouring trees are exposed to increased wind velocities. Being more open and exposed to increased winds, the neighbouring trees tend to sway more which weakens the ability of the root system to support the tree.
5. The wind events experienced earlier this year were both sustained and gusty with shifting directions. Topography also likely played a role by funnelling the winds and increasing wind speeds at stand level.

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## 7.0 Spruce Budworm

In addition to the damage caused by the wind events earlier this year, damage from Spruce Budworm is also evident. Spruce Budworm infestations have been on the increase regionally for the last several years.

Spruce Budworm is one of the most destructive foliage insects to be found in western Canada. The species causes damage in the caterpillar stage, eating the new annual growth. In higher levels of infestation all of the new growth can be consumed. The insect lives in short one year cycles with the larvae overwintering and hatching in the spring just when the conifers are budding out with new growth. The caterpillars feed on the new growth through the spring and summer. In the adult stage, they become moths, mate and die leaving the larvae to overwinter for the next season.

Spruce Budworm populations also have cycles. Freezing temperatures in the spring can kill larvae as well as the new buds they feed on. Cold wet weather can slow larval activity, and over longer outbreak periods they can starve themselves after they have defoliated the trees. If they run out of food before they mature, there are less adults to mate and lay eggs for the following year.

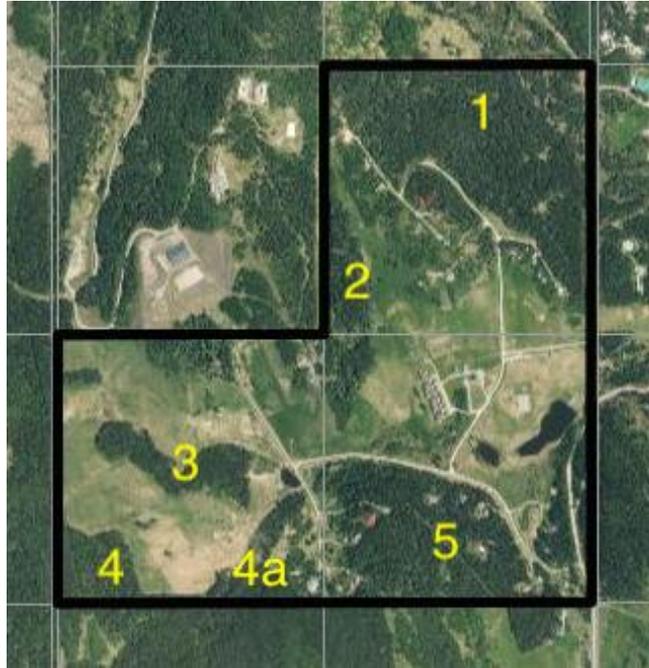
Generally, one year of infestation will not kill the trees but after several years of severe damage and defoliation, tree mortality will increase dramatically. When coniferous trees lose their needles, they lose their source of food energy. After using stored reserves, trees stop sending food and water to the branches causing them to die back. This stresses the trees, leaving them more vulnerable to attack from diseases and other insect pests.

The most frequently used treatment for Spruce Budworm is to spray the trees with a naturally occurring bacterium, *Bacillus Thuringiensis*, commonly known as BT. Timing for the spray is critical, right after the bud cap has dropped off when new growth begins to appear.

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## 8.0 Assessment and Recommendations

Extensive blowdown and wind damage occurred within 5 areas of the Square Butte Ranch.



**Area 1 - Fisher Creek Area 73.6 Acres (29.8 Ha)** - This site slopes downwards from the residential access road towards the creek. The toe of the slope and the poorly drained areas have extensive blow down throughout the stands, in particular on the poorly drained sites. Age of the stand, retarded drainage in nutrient rich clay soils are factors in the extent of the blowdown. While not as extensive, there is damage in areas along on the slopes below the road. Lodgepole pine was noted on the drier sites near the residences. Lodgepole pine has a tap root which goes deeper into the well drained soils. Much less blowdown occurred in the pine but there was evidence of breakage.

All of the blow down within this area should be salvaged and the remainder harvested. If salvage only were to occur, there would likely be more blow down in the future which would require maintenance. There are two smaller areas on the slopes closer to the road which had less blow down within them. These could be left, but further blow down will likely occur due to the disturbance in the immediate vicinity, and a return to the stands to reduce the fire risk will be needed.

**Area 2 - Ravine/Townhouse Pasture Areas - 21 Acres (8.53 Ha)** - This area is along the west edge of the property butting against another privately owned property. Blowdown has occurred from the northerly tip down through to the south end. Portions of it are poorly drained. Due to the extent of the damage, the narrow strip will not be

wind firm enough to withstand further damage. The damaged trees should be salvaged and the remaining merchantable trees should be harvested due to the increased risk of wind throw.

**Area 3 - Creek Area West Pasture - 12.1 Acres (4.9 Ha)** - There is a small drainage that runs through this area, it has a history of being unstable. Clean up of the previous blowdown has resulted in piles of debris being left behind. Recommend salvage and harvesting this site. Care must be taken along the drainage to minimize impacts. Leaving some of the younger parts of the stand intact for thermal cover for the horses would be valuable if they are wind firm.

**Area 4 - South West corner area - 10.5 Acres (4.3 Ha)** - Portions of this block were damaged by wind throw. Salvaging the damaged trees and harvesting the remainder will reset this site for new growth.

**Area 4A - Sherbut Residence Area - 8.3 Acres (3.3 Ha) and Area 5 - Ranch Road (SouthEast) Residential 46 Acres (18.6 Ha)** - Both of these areas have residences embedded within the forested areas. The blowdown must be salvaged to reduce the fuel loading near the residences. At least parts of the remaining stands should be harvested to bring them to more wind firm boundaries. Due to the close nature of the residences, it would be important to work closer with the owners to come up with a more detailed harvest plan that meets their needs and concerns.

Residents of Square Butte Ranch undoubtedly value the aesthetic and intrinsic values of the forested areas within the ranch. The extensive wind throw as well as recent Spruce Budworm attacks have damaged these forest areas considerably. Trees and forests are constantly evolving with time and age. The recently damaged areas can be restored and renewed so that these areas can continue to contribute to the lifestyle that the residents desire. With proper management and maintenance, the recreational value to residents should increase over time.

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## 9.0 Debris Disposal

Post-salvage and harvest debris will be piled for disposal at a later date. These debris piles will consist of limbs, tops, dead trees, etc. which will be picked up and piled with either an excavator or the harvesting equipment. It is critical to ensure that the debris piles are clean and composed of woody debris only. Mixing dirt into the piles contributes to higher costs of disposal later.

Several options are available for disposing of the debris. Regardless of which option is chosen, debris disposal must be completed to reduce the fuel loading and fire risk that the debris poses to the community.

1. Burning - Burning the piles will likely be the most economical choice. Timing of burning is critical and smoke management must be a consideration. If burning during the winter period, there is the potential for an inversion which will cause the smoke to accumulate in lower areas, this may be a concern to both residents and neighbouring properties. Burning in wetter periods during the “green” season is an alternative to winter burning but must be monitored to ensure containment. The “green” season refers to late spring when vegetation is at its most lush period and is not as flammable. This could avoid concerns related to smoke issues and inversions.

Piles must be “clean”, woody debris only. If dirt is mixed into the piles, there is a potential for a holdover fire rather than a short duration clean burn with extinguishment to follow. In addition, there will be much more smoke and smouldering which creates smoke management issues.

2. Mulching - This involves chipping or grinding the piles into small material using specialized equipment. There are some local contractors that can provide this service. Burning is not involved so smoke management issues are no longer a concern. The equipment can go over the all of the disturbed areas leaving them more aesthetically pleasing and it can be used along trails to reduce debris and open them up or restore them. The downside is that in some cases, there can be quite a bit of debris left behind.
3. Off site disposal - This would be an expensive alternative, not likely cost effective. It would involve loading the debris and hauling it away for disposal elsewhere.

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## 10.0 Smoke Management - Issues and Considerations

Planning for the burning of woody debris accumulations must include consideration for smoke management. Smoke can have a negative impact on the surrounding region and properties. Some considerations to include in burn planning would include:

1. Wind speed, mixing height, fuel loads, and fuel conditions all impact smoke management.
2. Moist or green fuels produce much more smoke.
3. Ground fuels in organic soils also produce more smoke due to moisture content and smouldering.
4. Smouldering releases more fine particulates into the atmosphere.
5. Hot fires create better lift for the smoke to mix and dissipate.
6. Inversions, particularly during the winter months, hold smoke closer to the ground for longer periods.
7. Green season burning is potentially an option. Burning during late spring/early summer can be done safely and securely if properly managed and monitored. Clean dry piles with no dirt or debris to create holdover situations burn quickly, usually within hours, and can be quickly extinguished post burn. If the piles have green vegetation surrounding them with minimal fuels that will allow spread to occur, this is a good option for smoke management.
8. Burning permits are required for all burning the Foothills County. There is an online burn permit system which enables property owners to choose from one of three permit options.
  1. Class 1 Burn Permit – For piles under 4 meters in diameter. Once the property owner commits to taking ownership of any risks involved the system will issue him a permit for the date and time he wish's to burn.
  2. Class 2 Burn Permit – For piles over 4 meter in diameter. **This would apply to large debris disposal and controlled burns.** Once the property owner commits to taking ownership of any risks involved the system will email Foothills Fire to book a site inspection. If the site is acceptable, a permit would be issued specifically for the date and time burning was to occur.
  3. Fire Works Permit – This permit is for commercial and store bought fire works. Once the property owner commits to taking ownership of any risks involved the system will send Foothills Fire an approval request which is done on line.

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## 11.0 Post Harvest Reforestation and Weed Management

These sites for the most part, are a Poplar/Spruce biome or community. They are rich in biodiversity which changes over time through forest succession. The health and vigor of these communities is usually maintained through disturbance albeit fire, environmental disturbances (wind throw), harvesting, etc. The logged and salvaged areas will reforest and evolve with time on their own through natural succession.

Post disturbance, the forest floor is much more exposed to sunlight. Previously, it was shaded heavily by the mature White Spruce over-story. Poplar is an early successional species. It grows in clones, all of the trees within the clone share the same genetic traits. When Poplar root systems are exposed to sunlight, they respond by producing shoots or root suckers. These grow quickly and within a few years will fill in the previously disturbed area. As the Poplar grows and matures, it provides shade, which enables White Spruce to establish. Over time, White Spruce matures, becomes the dominant species, provides considerably more shade which supports other species. Biodiversity is not just spacial, it evolves and changes temporarily as well.

Post-disturbance, regardless of whether the disturbance is resultant from mechanical means (logging equipment, etc.) or through natural causes (wind throw) can increase invasive weed populations. Soils exposed through disturbance, provide the opportunity for invasive and potentially noxious vegetative species to establish on these sites. Some noxious species such as Scentless Chamomile grow well in rich moist soils and their seeds are able to remain dormant in the soil for long periods of time.

Any equipment brought onto the ranch should have been cleaned and steamed to reduce the potential for seed introduction. This is a common industry practise but should be emphasized with any contractors.

Seeding of disturbed soils with an appropriate seed mix is recommended. Establishing a healthy vegetative cover of preferred species will inhibit invasive species from establishing on the disturbed soils.

Monitoring followed with spot spraying with a product specific to the weed species is recommended. An alternative to spot spraying is to remove the plants by hand, prior to seed dispersal, followed with the disposal of the plants.

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## 12.0 FireSmart

The Square Butte Ranch is located within the “Wildland Urban Interface”, meaning that this is an urban development located within Wildland or forested environs. As such, the risks to the community are no different than those in the forested regions, specifically wildfire. The Square Butte Ranch should be taking steps to reduce the risk of wildfire to the development and community.

The FireSmart program was developed to aid municipalities, communities, and private home owners with tools that they can use to reduce the risk of wildfire to their properties and developments.

The FireSmart Program has 3 distinct planning zones which all have different impacts, treatments and stewardship.

Zone 1 - This is the most important zone, 0-10 metres from the home/buildings. This zone is generally the responsibility of the homeowner. A minimum of 1.5 meters immediately adjacent to the structure should be a non-combustible surface. The remaining area up to 10 metres from the structure is a fire resistant zone, free of all materials that could easily ignite from a wildfire.

Zone 2 - 10-30 metres from the home/buildings. Cleanup of the dead and down trees/shrubs, thin and prune the conifer trees, keep dry grasses mowed, and remove all fuel accumulations to reduce surface fuels and potential fire intensity. This zone is often the responsibility of the homeowner and/or in this case the condominium association.

Zone 3 - 30-100 metres from the home/buildings. This zone is likely the responsibility of the Condominium Association. Thinning, pruning, as well as the cleanup and removal of the dead and down trees aids in reducing fire intensity and keeping a wild fire from “crowning”, burning at its most intensity in the tops of the trees. Sometimes a fire break is located within Zone 3 which would allow fire crews easier access into the area for fire suppression. Fire Breaks can be multi-purpose, as an example, a riding trail for recreational use.

FireSmart is a comprehensive program designed to reduce the risk of wildfire to your homes and property. It is strongly recommended that the Square Butte Ranch take steps to develop a Fire Smart plan for the community. The recommendations within it will have responsibilities for both the owners and the Condominium Association to reduce the risk of wildfire to the community. Square Butte Ranch could work towards obtaining a FireSmart Community designation which would not only aid in reducing the risk of wildfire losses but also enhance the communities value.

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## 13.0 Summary

The extensive damage to the forested areas within the ranch can be restored to a healthy functioning forest eco-system. While some of the damage may seem to be insurmountable, healthy forests need disturbance for renewal. The extensive wind throw and potential for further mortality from Spruce Budworm, Mountain Pine Beetle, etc. are indicators of the need for good woodlot planning and management. With proper application, this will ensure that these forest areas will continue to provide residents with recreational use, aesthetics, habitat, etc. for years to come.

Living within a forest community provides both its benefits as well as its risks. Both can and should be managed. While the benefits are intrinsic and may vary from person to person, the risk or threat of wildfire is very real. The impacts of wildfire are devastating both at an individual level and at the community level. The risk of loss or impacts from wildfire can be reduced, there is always a potential of loss. Managing and reducing the risk of loss can be done using the FireSmart program. Within it, are steps that individuals as well as the community as a whole can take to reduce the risk of wildfire to your community.

The devastation caused by the wind events to the community are considerable but can also become an opportunity. If the right choices are made, the Square Butte Ranch will recover and can serve as a model for other communities within Foothills County in respect to ecological renewal and community risk reduction.