

2010

The Saturna Island Community Wildfire Protection Plan



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EXECUTIVE SUMMARY

This Community Wildfire Protection Plan (CWPP) is intended to detail how wildfire risk (the potential for damage from wildfire) will be reduced on Saturna Island. The plan provides a foundation for future collaboration, details risk assessment results, and produces an action plan for reducing wildfire risk.

Agencies collaborating on this plan included the Saturna Island Fire Department, the Capital Regional District, Parks Canada, the Islands Trust, and the Ministry of Forests and Range. The risk assessment found the highest risk areas to be centered on residential developments with evacuation problems due to very high human-caused ignition rates, and high wildfire consequences. During typical summer drought conditions, expected fire intensities were found to be low with no crowning potential. However, when outflow conditions (interior air mass moving onto coastal areas) meet with moderate to high winds and drought conditions, all fuel types except deciduous stands were predicted to sustain crown fires. Five wildfire mitigation management objectives were evaluated:

1. FireSmarting residential homes in evacuation problem areas.
2. Fuel treatment in evacuation problem areas.
3. A 50% reduction in fire ignitions.
4. Building high-volume water stations in high risk areas.

Reducing ignitions proved to be the most effective management objective, reducing total wildfire risk by approximately 50%. FireSmarting reduced wildfire risk by approximately 35% and building high-volume water hookups reduced risk by 30%. Fuel treatments in evacuation problem areas did not reduce wildfire risk. These results guide the wildfire risk mitigation action plan detailed on page 20.

TABLE OF CONTENTS

Executive Summary.....	2
List of figures.....	3
Introduction.....	4
Plan Purpose.....	4
CWPP Process.....	4
Need for a Plan.....	5
Work To Date.....	5
CWPP Study Area Description.....	6
Risk Assessment Method.....	8
Evaluating Risk Mitigation Management Objectives.....	9
Risk Assessment Findings.....	10
Wildfire Risk.....	10
Expected Fire Behavior.....	12
Wildfire Probability.....	12
Wildfire Consequences.....	17
Evaluation of Wildfire Risk Mitigation Objectives.....	19
Saturna Island Risk Mitigation Action Plan.....	20
Fuel Treatment Recommendations in the Action Plan.....	20
References.....	23
Appendix A: Southern Gulf Islands Risk Assessment research project.....	24

LIST OF FIGURES

Figure 1 - North and South Pender Island <i>a)</i> are located in the southern Gulf Islands between the mainland and Vancouver Island <i>b)</i>	6
Figure 2 - The wildfire risk assessment model used.....	9
Figure 3 - Wildfire Risk on Saturna Island.....	11
Figure 4 - Wildfire Probability on Saturna Island.....	13
Figure 5 - Ignition Probability (relative) on Saturna Island.....	15
Figure 6 - Fire Escape Probability (relative) on Saturna Island.....	16
Figure 7 - Wildfire Consequences on Saturna Island.....	18

INTRODUCTION

PLAN PURPOSE

This Community Wildfire Protection Plan (CWPP) is intended to detail how wildfire risk (the potential for damage from wildfire) will be reduced on Saturna Island. To do this, this CWPP will:

- Provide a foundation for future collaboration on wildfire risk mitigation efforts on Saturna Island.
- Assess wildfire risk on Saturna Island, identifying where risk is highest, why, and what the most effective strategies for reducing risk are.
- Produce an Action Plan for reducing risk on Saturna Island.

CWPP PROCESS

A community wildfire protection plan can only be considered successful if it builds a community's capacity to reduce wildfire risk. In practical terms, this means building collaboration and knowledge among fire management stakeholders and commitment to implementing risk mitigation activities. A CWPP Working Group was formed to develop CWPPs for both Saturna and the Pender Islands. The group drew upon fire management perspectives from all levels of government and possessed expertise ranging from building codes to fire behavior prediction. The group was comprised of the following fire management stakeholders:

- Capital Regional District, Protective Services
- Pender Island Fire Rescue
- Saturna Island Fire Rescue
- Gulf Islands National Park Reserve
- Ministry of Forests and Range, Wildfire Management Branch
- Capital Regional District, Regional Parks
- Islands Trust, Planning
- Capital Regional District, Building Inspection

The CWPP Working Group convened on 4 occasions over a seven month period and oversaw the completion of a Wildfire Risk Assessment for each island (Saturna and the Pender Islands), the evaluation of risk mitigation management objectives for each island, and the development of a CWPP Action Plan for each island. The Working Group drew upon a new Southern Gulf Islands Wildfire Risk Assessment model developed by Simon Fraser University. The risk model incorporated expertise ranging from fire behavior specialists from Ministry of Forests and Range

to choice modeling experts from SFU. Southern Gulf Islands Risk Assessment research project membership is listed in Appendix A.

NEED FOR A PLAN

There is an average of 10 fire ignitions on Saturna Island annually. For several decades the Saturna Island Volunteer Fire Department has successfully suppressed all ignitions. Despite this success, the probability of a wildfire on Saturna Island continues to rise because of increasingly dry conditions, residential development, and increasing numbers of island visitors. Concurrent with increasing wildfire probability are increasing wildfire consequences. Property values, the number of residents and visitors, and the importance of remnant natural and cultural areas are all increasing.

Where it may not be possible to prevent or suppress all fires on Saturna Island, a risk assessment and CWPP guides the allocation of fire prevention, suppression, and asset protection resources so as to minimize expected wildfire damages. The risk assessment predicts where forest fires are likely to do the most damage and explains why. A risk assessment can also be used to evaluate the relative effectiveness of proposed forest fire risk mitigation objectives by simulating management actions in the model and then comparing the resulting changes in risk levels.

WORK TO DATE

There has been considerable progress towards mitigating wildfire risk on Saturna Island. Whereas many other jurisdictions are looking to begin a program of risk mitigation with the adoption of a CWPP, leadership from Saturna Fire Department and local CRD services such as building inspection and SGI emergency programs have already initiated many effective strategies to reduce the danger of wildfire. These include:

- The soon to be constructed Emergency Services Building #2 in the East Point area.
- Improved building bylaws regulating emergency access and water supply for fire fighting.
- A comprehensive neighbourhood emergency program which will increase communication within the community during a wildfire event.
- A well developed emergency management program to coordinate resources and support emergency response.
- A well-trained structural fire department with interface training.

- Annual emergency exercises (on all Southern Gulf Islands) bringing together multiple agencies involved with emergency response.
- Communication exercises for ensuring multi agency communication are preplanned.
- Public education efforts by the fire departments at BC Ferries terminals and other venues.

These efforts have reduced wildfire risk on Saturna Island and provide a strong foundation from which to continue mitigating wildfire risk by implementing the Saturna Island CWPP Action Plan described on page 20.

CWPP STUDY AREA DESCRIPTION

Saturna Island is located in the Southern Gulf Islands in the Strait of Georgia between the cities of Vancouver and Victoria (Figure 1). It is just over 32 km² in size and characterized by steep terrain with many parts of the island having no road access. Saturna Island is in the Coastal Douglas-fir biogeoclimatic zone, characterized by a Mediterranean climate regime with mild winters and dry, hot summers, and Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) forests. Forests are usually Douglas-fir leading and may contain Arbutus (*Arbutus menziesii*), Grand fir (*Abies grandis*), western redcedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), Rocky Mountain juniper (*Juniperus scopulorum*), bigleaf maple (*Acer macrophyllum*), or red alder (*Alnus rubra*). The Gulf Islands National Park Reserve holds several large parkland properties on the island.

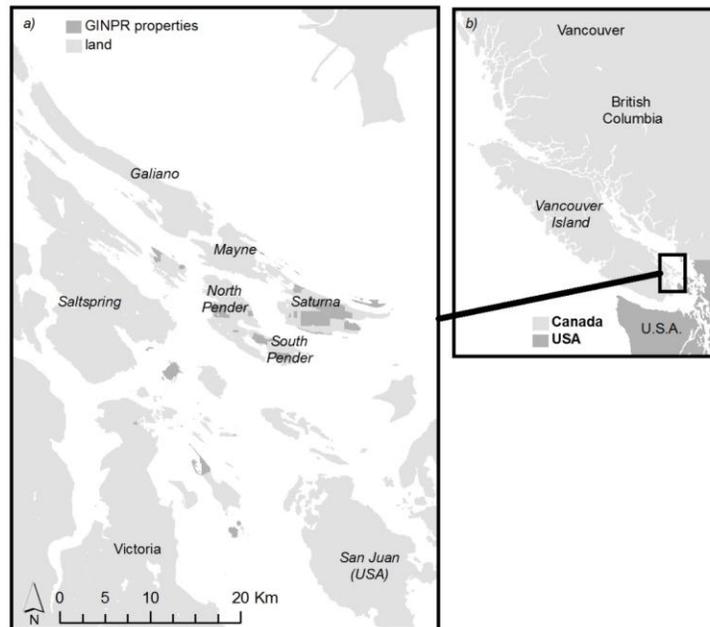


Figure 1 - Saturna Island a) is located in the southern Gulf Islands between the mainland and Vancouver Island b).

Local fire managers are most concerned about human-caused fires, often originating from roads or residential development, moving into the surrounding forests. The worst-case scenario is that the fire front will grow within the forest and then move into a residential area. Saturna's steep slopes and limited road access makes for high local fire hall response times (<30min) in many parts of the island. These longer local fire hall response times are balanced by the ability of Provincial fire fighters to respond within 40 minutes. Human-caused ignitions in the form of escaped campfires, backyard burns, house fires, and downed power lines are far more common than lightning ignitions and are concentrated around residential areas or secluded beaches like Fiddlers Cove. With many single-road-access rural developments in a matrix of forest land that hosts a variety of endangered species, archaeological sites, and national park facilities, Saturna Island hosts a complex landscape of values at risk. Rural development, fire suppression, agriculture, and small-scale forestry have transformed forests and forest fuels such that historical fire regimes and fire behaviour are likely very dissimilar to present conditions.

Saturna Island has a unique local government structure where jurisdiction falls to both the Islands Trust and the Capital Regional District. In B.C. the role of local government in rural areas falls to regional districts. Saturna Island is represented by the Southern Gulf Islands Electoral Area of the Capital Regional District (CRD). In addition to the CRD, jurisdiction for land use regulation (Part 26 of the *Local Government Act*) is granted to Local Trust Committees under the *Islands Trust Act*. Each Local Trust Area has its own Official Community Plan and Land Use Bylaws that establish the policies and regulations for land use and development (zoning), including minimum lot sizes, density, setbacks for buildings and structures, maximum lot coverage and development permit areas. Thus, the land use authority of the Islands Trust and Local Trust Committees only extends to the exterior of buildings (siting, size and dimensions) and the permitted uses for any building or structure. The authority for building construction and code requirements is under the authority of the CRD Building Inspection Services. Subdivision authority, including road requirements, is through the Ministry of Transportation and Infrastructure. Land use bylaws include subdivision regulations which are addressed through a referral process. The regulations may address a number of issues, including lot size, lot configuration (road frontage, depth to width ratio, panhandle), proof of potable water, septic capacity, drainage, road design and parkland dedication.

There are three major regulatory tools that are relevant to mitigating wildfire risk in the Gulf Islands.

- Part 26 of the *Local Government Act* allows for the creation of Development Permit Areas for protection from hazardous conditions, such as high wildfire risk locations that could require, among other things, FireSmart landscaping.
- Zoning regulations may regulate landscaping to prevent hazardous conditions.
- The CRD Building Regulations Bylaw (Capital Regional District Bylaw No. 4) which regulates building materials and construction standards, and could be used to require FireSmart construction standards and items such as interior sprinkler systems.

RISK ASSESSMENT METHOD

The Southern Gulf Islands Risk Assessment Model was used to complete Saturna Island risk assessment. In this model, Wildfire Risk is equal to Wildfire Probability x Wildfire Consequences. Wildfire Probability is expressed as the product of Ignition Probability and Escape Probability. Ignition Probability and Escape Probability are expressed as relative probabilities, illustrating changes in relative event probability across the landscape rather than absolute probabilities of events. The term risk element is used to refer to factors that contribute to the evaluation of Wildfire Risk, such as fuel type, slope, or the presence of residential homes. In practice, risk elements are used as input data to the wildfire risk assessment model, providing the data needed to calculate Ignition Probability, Escape Probability, and Wildfire Consequences. Figure 2 shows the structure of the wildfire risk assessment model, listing the risk elements used to model Ignition Probability, Escape Probability, and Wildfire Consequences. It also illustrates how these probabilities and consequences are combined to produce Wildfire Probability and Wildfire Risk. The document *Southern Gulf Islands Risk Assessment Model: Methods*, available upon request from Fireweed Consulting, contains a detailed description of the risk assessment method used.

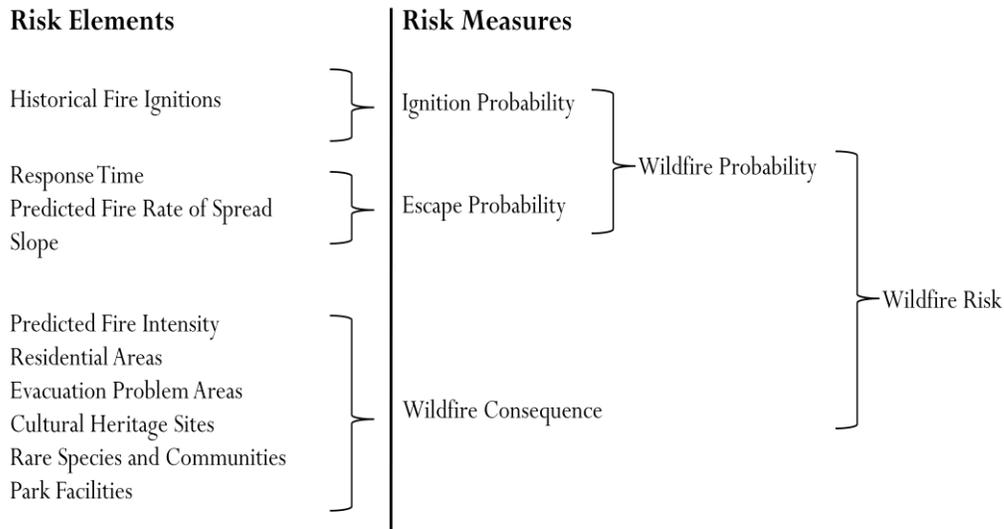


Figure 2 - The wildfire risk assessment model used.

EVALUATING RISK MITIGATION MANAGEMENT OBJECTIVES

Many risk mitigation objectives were considered however the Working Group felt it would be most effective to focus on four objectives deemed most likely to mitigate risks. The completed wildfire risk assessment was used to evaluate the effectiveness of these four risk mitigation objectives at reducing total Wildfire Risk. The risk mitigation objectives selected were thought to be realistic, albeit ambitious, approximations of mitigation options being considered. Although improving evacuation in evacuation problem areas was expected by the group to be effective at risk mitigation, it was not selected because the rugged terrain on Saturna makes road building prohibitively expensive. The four wildfire mitigation management objectives evaluated were:

1. FireSmarting (Province of British Columbia 2005) residential homes in evacuation problem areas.
2. Fuel treatment in evacuation problem areas.
3. A 50% reduction in fire ignitions.
4. Building high volume water supply stations in all high wildfire risk areas.

Each mitigation objective was evaluated by revising risk element maps so they simulated the proposed mitigation objective and then running the risk model, producing new risk maps. The fuel treatment objective assumed that all forests in evacuation problem areas were thinned to the FBP C7 fuel type (ie. the fuel type

map was revised). The C7 fuel type is a Ponderosa Pine – Douglas-fir multi-aged stand with an open canopy and high height to live crown distance (Canadian Forest Service 2007) and best matches the fuel characteristics of potential fuel treatments. We chose to locate the fuel treatments in evacuation problem areas because they hosted the highest consequence levels according to the consequence maps.

The FireSmart objective assumed that all developed residential buildings and surrounding properties in evacuation problem areas were treated to BC FireSmart standards (Province of British Columbia 2005). Thus, treated houses were assumed to have non-flammable roofing and siding and no flammable material adjacent to the house (ie. removal of the forest fuels surrounding the residence). FireSmarted locations were assumed to have reduced damage to houses and potential for loss of life. The reduced ignitions objective assumed a 50% reduction in fire ignitions across the study area. The high volume water station management objective assumed Escape Probability decreased by 0.25 to a minimum probability of 0.05 at all locations hosting a high volume station. All high risk areas (ie. locations with a Wildfire Risk ≥ 3) received a high volume station. Total Wildfire Risk associated with each mitigation objective was derived by adding up the Wildfire Risk for each 25 meter by 25 meter raster cell in the study area.

RISK ASSESSMENT FINDINGS

WILDFIRE RISK

Risk assessment results show that it is people who are both the problem and the solution to risk and risk mitigation on Saturna Island. It is people and their influence on wildfire ignition and wildfire consequences that drive the distribution of wildfire risk. Wildfire risk is highest in the East Point area because of poor evacuation potential and the potential for loss of life during a wildfire (Figure 3). Wildfire risk is also very high in Fiddlers Cove where several fires have been lit by campers and suppression is difficult due to steep slopes. The Thompson Park area also has high wildfire risk due to frequent historical ignitions, residential development, and poor road access resulting in longer response times and poor evacuation potential.

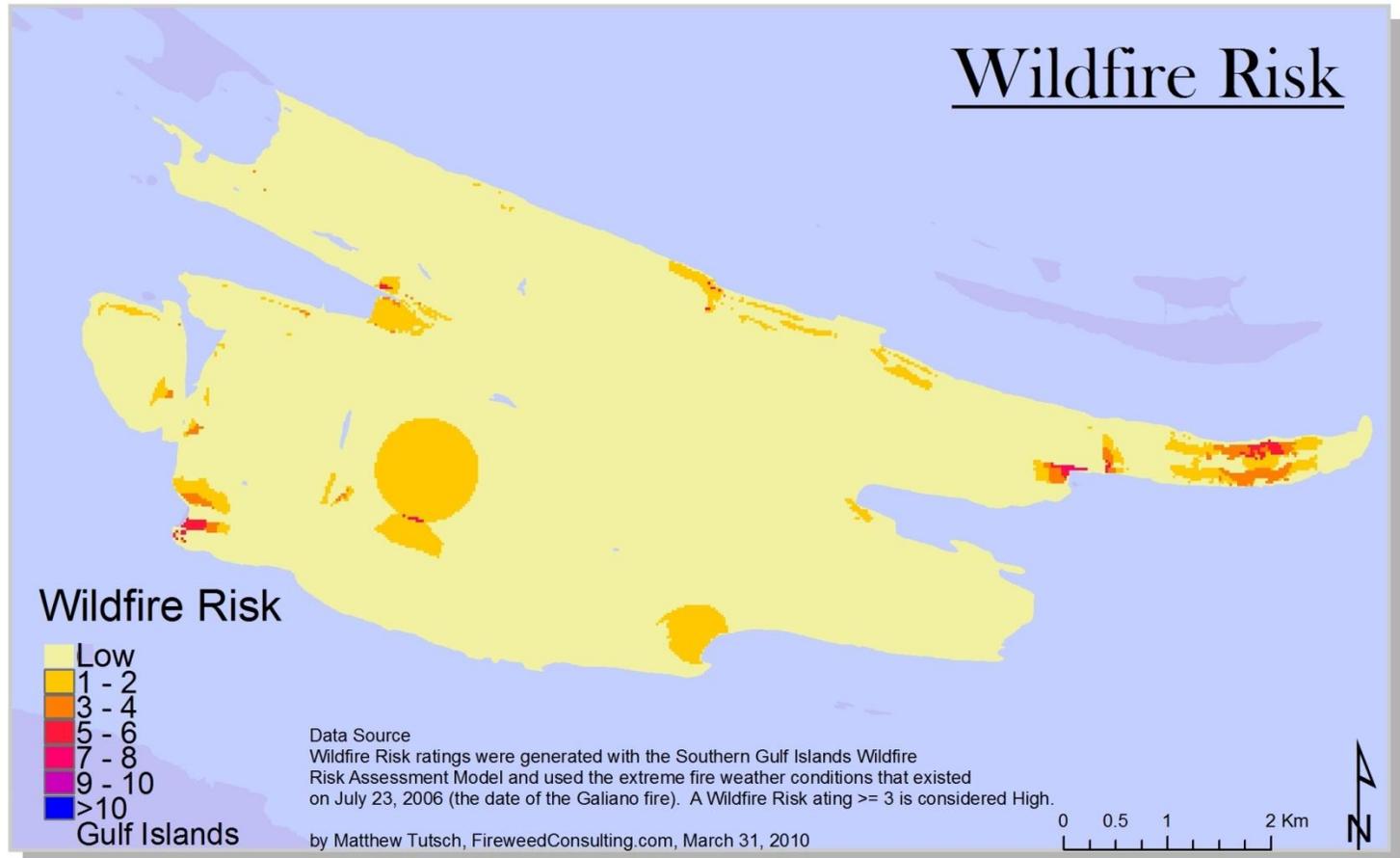


Figure 3 - Wildfire Risk on Saturna Island

EXPECTED FIRE BEHAVIOR

When the low relative humidity associated with outflow conditions (interior air mass moving onto coastal areas) meets with moderate to high winds and drought conditions, all fuel types except deciduous stands were predicted to sustain crown fires. However, during typical summer drought conditions (90th percentile fire weather conditions), expected fire intensities were found to be generally low with no crowning potential. In some specific 90th percentile cases, typically involving alignment of slope, wind and the presence of adequate fine fuels, torching and intermittent crown fires are possible but would be topographically limited.

WILDFIRE PROBABILITY

Wildfire Probability is highest where steeper terrain and longer fire hall response times overlap with a history of human-caused ignitions (Figure 4). Such areas include Fiddlers Cove, Narvaez Bay, the Thompson Park area and Mount Warburton Pike. Wildfire probability is calculated as the product of Ignition Probability and Escape Probability and should be considered a relative probability rather than an absolute probability.

Probability of Wildfire

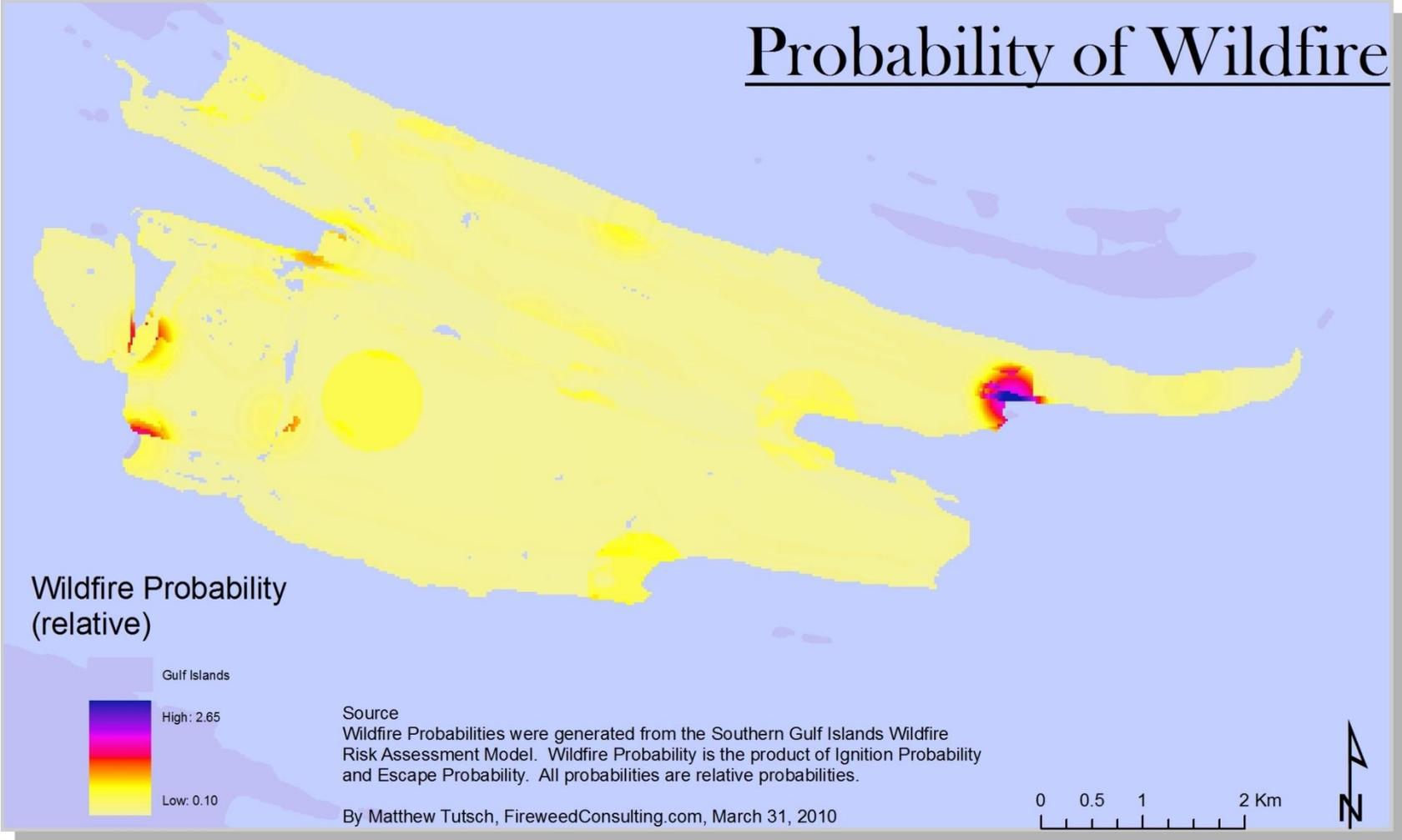


Figure 4 - Wildfire Probability on Saturna Island

Historical ignition densities were used as a surrogate measure of Ignition Probability and ranged from 0.10 to 2.65 ignitions/year (Figure 5). All Ignition Probabilities are considered relative probabilities. Higher Ignition Probabilities were clustered around camping or residential areas with a history of human-caused ignitions. The areas with the highest Ignition Probability are the Fiddlers Cove, Narvaez Bay, Bruce Bight, Thompson Park, Saturna Lodge, and Fiddlers Cove areas. There were very few lightning-caused ignitions.

Escape Probability values ranged from 0.05 to 1.00 (Figure 6). Higher Escape Probability values were associated with high response times, steeper terrain, and more rapid rates of spread. Saturna's steep slopes and lack of road access to many areas result in longer response times (>30minutes) and results in high fire escape probabilities (Eg. Mount Fisher and the North side of Narvaez Bay). Changes in fuel type had minimal impact on Escape Probabilities as predicted rates of spread were consistently high due to the extreme fire weather conditions used.

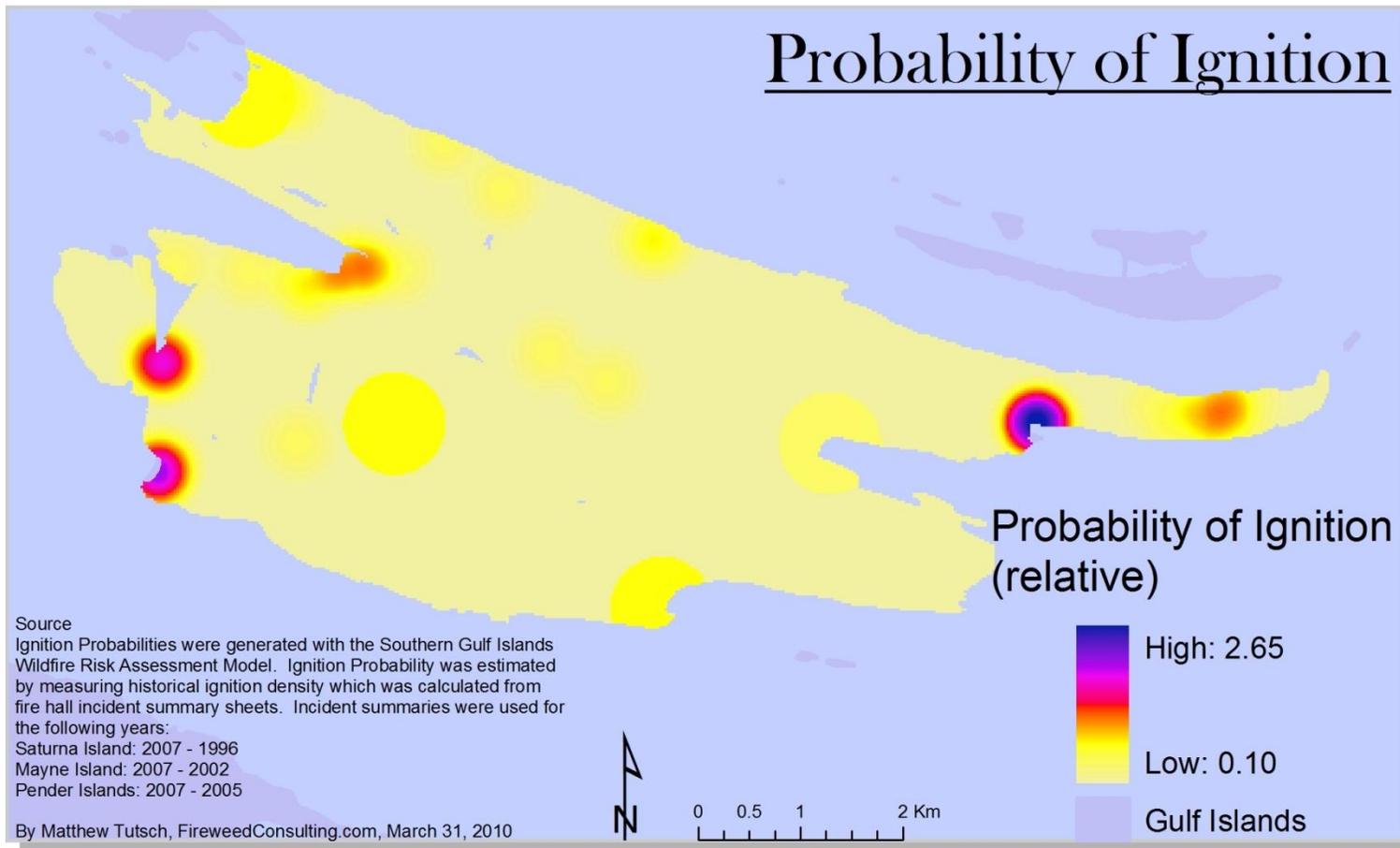
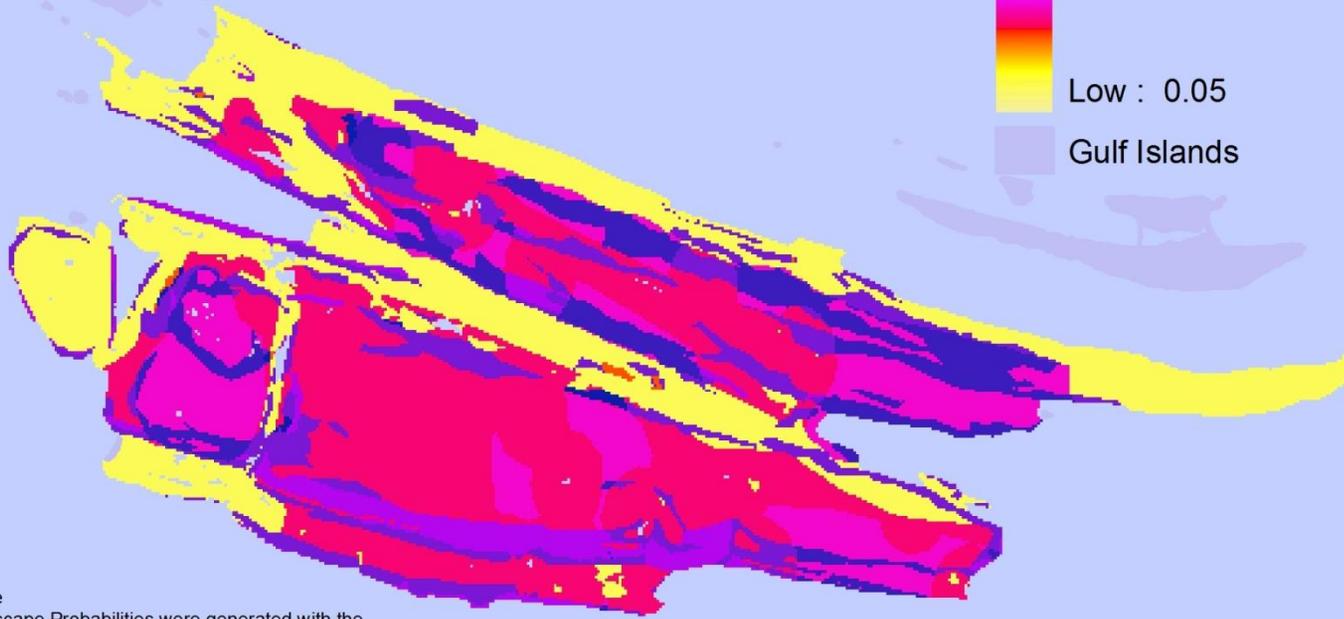


Figure 5 - Ignition Probability (relative) on Saturna Island

Probability of Fire Escape

Probability of Fire Escape
(relative)



Source
Fire Escape Probabilities were generated with the Southern Gulf Islands Wildfire Risk Assessment Model. Local fire chiefs were asked to predict the probability of escape given a variety of response times, fire rates of spread, and site slopes. The model predicts an escape probability within 10% of the fire chief's average predicted escape 95% of the time. Fire escape was defined as a fire not being under control within 4 hours or escapes the property/location of origin or structure.

By Matthew Tutsch, FireweedConsulting.com, March 31, 2010

0 0.5 1 2 Km



Figure 6 - Fire Escape Probability (relative) on Saturna Island

WILDFIRE CONSEQUENCES

The Wildfire Consequences map (Figure 7) shows a complex distribution of consequences with the highest consequence areas hosting multiple Wildfire Consequences. Wildfire Consequence values are highest in residential areas with problematic evacuation such as the East Point and the Thompson Park areas. In both of these areas, a wildfire could cut off road access and result in the loss of life, homes, and endangered species. Wildfire Consequence values are second highest in residential areas without evacuation problems (eg. Lyall Harbour) and third highest in areas known to host endangered species (eg. Mount Warburton Pike). The wildfire risk is particularly high on Mount Warburton Pike because a fire could move quickly up the steep south slope of the mountain threatening GINPR visitor safety and damaging endangered species.

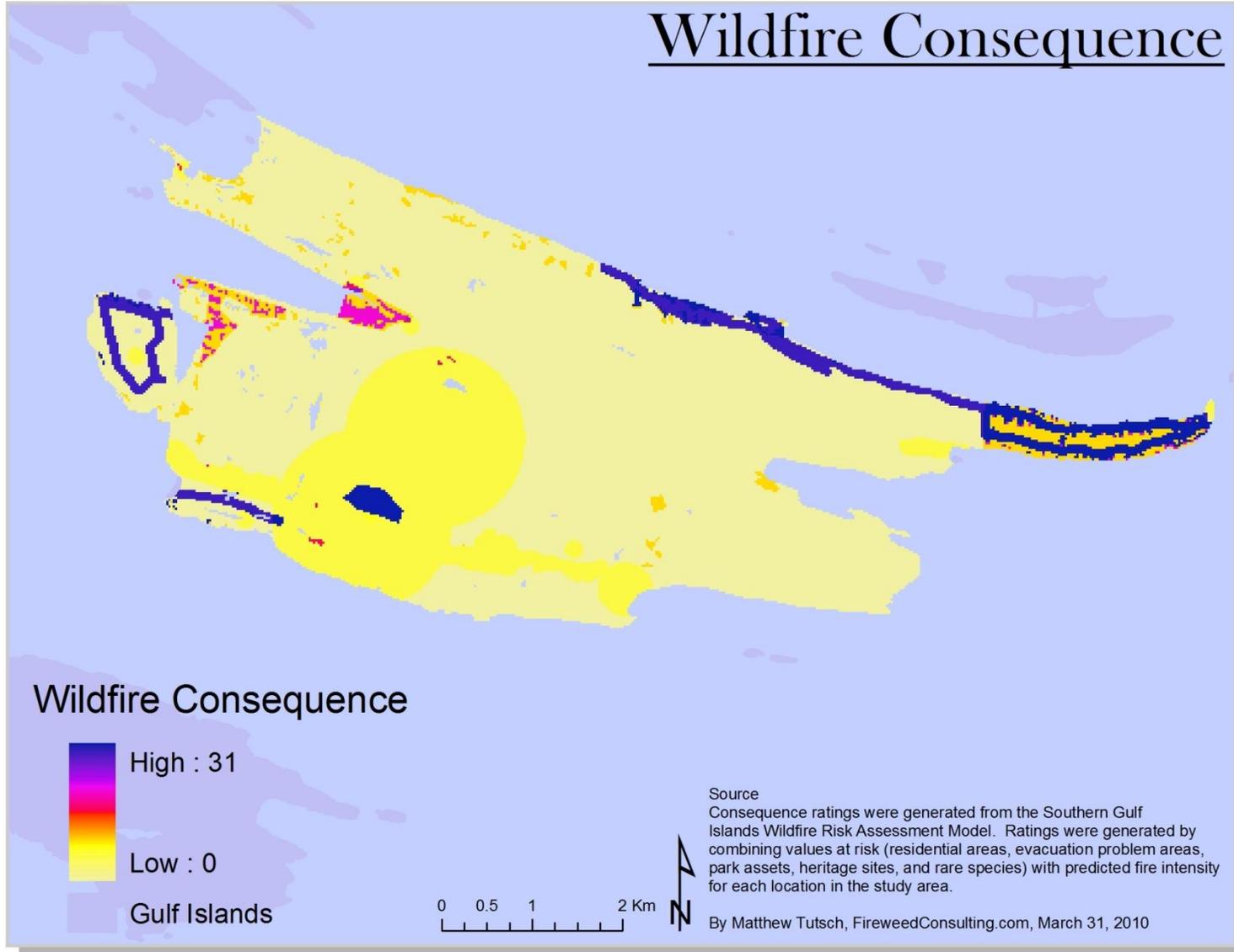


Figure 7 - Wildfire Consequences on Saturna Island

EVALUATION OF WILDFIRE RISK MITIGATION OBJECTIVES

Reducing ignitions by 50% proved to be the most effective management objective, reducing total risk by approximately 50% across Saturna Island (Figure 8).

FireSmarting residential areas in evacuation problem zones was the second most effective management objective for reducing wildfire risk, reducing Wildfire Consequence in the highest risk areas (East Point, Lyall harbour, and the Thompson Park area). Building high-volume water stations in high risk areas reduced risk by approximately 30%. The Fuel Treatment management objective had no impact on total risk as treated stands were still predicted to have fire intensities well over 10,000 KW/min. These very high fire intensities are a product of the outflow weather conditions chosen for the wildfire risk assessment.

Risk Mitigation Strategy Evaluation Results - Saturna Island

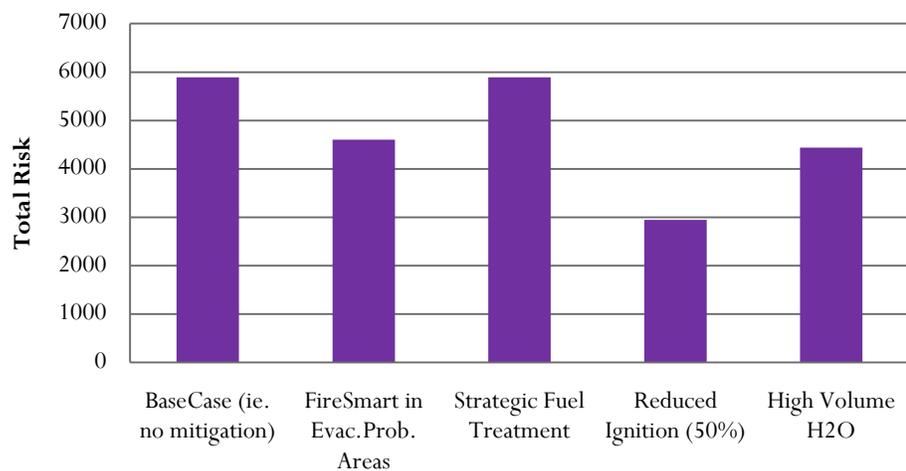


Figure 8 - Total wildfire risk on Saturna Island resulting from the base case scenario (ie. No management) and each of the proposed mitigation objectives. Total wildfire risk associated with each mitigation objective was derived by adding up the wildfire risk for each 25 meter by 25 meter raster cell in the study area.

SATURNA ISLAND RISK MITIGATION ACTION PLAN

The Saturna Island Risk Mitigation Action Plan (Table 1) targets a 50% reduction of wildfire risk on Saturna Island (as measured by the Southern Gulf Islands Wildfire Risk Assessment Model) as the action plan's goal. The Working Group reviewed the results of the above evaluation and chose to focus the action plan on the three most effective risk mitigation management objectives. In order of effectiveness, these were:

1. Reducing ignition by 50%.
2. FireSmarting homes in evacuation problem areas.
3. Building high volume water stations in high risk areas.

Forest fuel treatments were not recommended in the action plan because the evaluation found them to be the least effective risk mitigation management objective. The Working Group made the first objective in the action plan the establishment of local leadership on risk mitigation initiatives through the creation of a CWPP advisory committee. This was because the Working Group recognized that leadership in the implementation of the Saturna Island CWPP was essential to the plan's success. The Action Plan's recommendations relate to reducing ignitions and FireSmarting took the form of both public education (ie. multimedia tools, education programs, and FireSmart demonstration sites) and legislation (ie. Wildfire risk development permit areas, building permit bylaw amendments requiring FireSmart building standards, FireSmart landscaping, sprinkler systems, vehicle access, and water supply).

FUEL TREATMENT RECOMMENDATIONS IN THE ACTION PLAN

Strategic landscape-level forest fuel treatments were not recommended in the action plan because the evaluation found them to be the least efficient risk mitigation management objective and they were perceived as costly to implement and maintain. In contrast, the evaluation found FireSmart-related fuel treatments located adjacent to residential structures to be very effective at mitigating risk. Thus, the Working Group chose to focus the Action Plan's fuel treatment-related recommendations on the implementation of FireSmart landscaping surrounding residences. These recommendations take the form of requiring FireSmarting landscaping for new homes or additions and promoting voluntary adherence to FireSmart landscape standards among existing home owners through public education efforts (multimedia tools, FireSmart demonstration sites, and education programs).

Table 1- Saturna Island CWPP Risk Mitigation Action Plan

Action Plan Goal – A 50% reduction of wildfire risk on Saturna Island (as measured by the Southern Gulf Islands Wildfire Risk Assessment Model).		
Objective	Sub-objective	Action
To establish local leadership for addressing and mitigating wildfire risk on Saturna Island.		Create and formalize a Saturna Island CWPP Advisory Committee to oversee implementation, identify and coordinate funding opportunities, and revise the Saturna Island CWPP as needed.
To reduce Human Ignitions by 50%.		
	To reduce the number of cigarette, campfire, and backyard burn – caused wildfire ignitions.	Continue the successful BC Ferries education program and enhance the effectiveness of messaging by creating a multimedia public education product targeted at local audiences that can be distributed via Youtube, social networking websites, email links, BC Ferries televisions, Shaw Cable, and Saturday market booths.
		Expand the existing public education program in schools, public markets, and community events. Use the same messaging and communication tools as the BC Ferries education program.
		Continue outdoor burning control measures through effective signage, messaging and permitting measures.
		Post “number of fires this year” sign next to Fire Danger sign at the main firehall.
	To reduce the number of chimney fires.	Improve awareness of chimney fire hazard and proper chimney maintenance through website information on: the number of Saturna chimney fires per year, proper chimney maintenance, and chimney sweep certification.
	To reduce downed power lines.	Work with BC Hydro to improve danger tree removal and downed line response action plans
To FireSmart Homes in Evacuation Problem Areas.		

	Ensure all new homes or additions have interior sprinkler systems.	Establish wildfire risk Development Permit Areas and/or amend CRD Building Permit Bylaws.
	Ensure all new homes or additions are constructed to FireSmart landscaping standards.	Establish wildfire risk Development Permit Areas and/or amend CRD Building Permit Bylaws.
	Ensure all new homes or additions are constructed with adequate water supply for fire fighting.	Establish wildfire risk Development Permit Areas and/or amend CRD Building Permit Bylaws.
	Ensure all new homes or additions constructed in high risk areas have exterior sprinkler systems.	Establish wildfire risk Development Permit Areas and/or amend CRD Building Permit Bylaws.
	Ensure all new homes or additions have adequate access for emergency vehicles.	Establish wildfire risk Development Permit Areas and/or amend CRD Building Permit Bylaws
	Ensure all new subdivisions are created in conformance with NFPA standards for rural areas including NFPA 1141 and NFPA 1142.	Ensure OCP and land use bylaws facilitate provisions to regulate requirements for fire protection infrastructure.
	Promote voluntary adherence among home owners to FireSmart standards.	Create a multimedia public education product targeted at local audiences that can be distributed via Youtube, social networking websites, email links, BC Ferries televisions, Shaw Cable, and Saturday market booths.
	Build awareness of FireSmart development standards.	Develop and maintain FireSmart demonstration sites.
To build high volume water supply stations.		
	Build high volume water supply stations in high risk areas with existing water supplies.	Identify high risk areas with adequate water supply.
		Obtain water use and water access agreements with landowners.
		Purchase and install water supply systems.
	Build high volume water supply stations in lower risk areas with existing water supplies. These stations would service higher risk areas with limited water supply.	Identify lower risk areas with adequate water supply.
		Obtain water use and water access agreements with landowners.
		Purchase and install water supply systems.

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APPENDIX A: SOUTHERN GULF ISLANDS RISK ASSESSMENT RESEARCH PROJECT

The southern gulf islands risk assessment research project was undertaken by Matthew Tutsch from 2006 to 2009 as part of the requirements of a Master in Resource Environmental Management and Simon Fraser University. Risk Assessment methods and results will be published in two academic peer reviewed journals. The project was funded by the Gulf Islands National Park Reserve as part of the park's fire management planning process. The following is a list of individuals that contributed expertise to the project.

Predicted Fire Behavior for the southern Gulf Islands

Nathalie Lavoie, Fire Behavior Specialist, Ministry of Forests and Range
Bryan Bowman, Fire Behavior Specialist, Ministry of Forests and Range
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Richard McKay, Fire Behavior Specialist, Ministry of Forests and Range
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Jean Walters, Fire Behavior Specialist, Ministry of Forests and Range
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Steve Levitt, Fire Behavior Specialist, Ministry of Forests and Range
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Wildfire Consequences Modeling Survey

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Jeff Francis, Mayne Island Fire Rescue
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Steve Taylor, Canadian Forest Service
Brad Hawkes, Canadian Forest Service
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Robert Walker, Fire Management Specialist, Gulf Islands National Park Reserve
Mike Etches, Fire Management Specialist, Parks Canada
Glen Poffenroth, Fire Management Branch, Ministry of Forests and Range
Todd Shannon, Visitor Management, Gulf Islands National Park Reserve
Richard Lamy, Park Warden, Gulf Islands National Park Reserve
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Wildfire Escape Modeling Survey

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Tom Darby, North Galiano Fire Department
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Jeff Francis, Mayne Island Fire Rescue
Enfield, Salt Spring Island Fire-rescue
Charlie Boyte, Pender Island Fire and Rescue
John Wiznuk, Saturna Island Fire Department
Mike Dine, Pender Island Fire and Rescue
Robert Walker, Gulf Islands National Park Reserve

Southern Gulf Islands Wildfire Risk Model Development

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