C2014-0888
ATTACHMENT 2

TREE RECOVERY OPERATIONS

Calgary Tree Disaster 2014 Recovery Framework

Contents

Executive summary

In September 2014, Calgary experienced an extreme, late summer snowstorm that caused widespread damage to trees in communities across the city. The Calgary Tree Disaster 2014 Recovery Framework (the Framework) has been developed in order to document the activities to be undertaken by Parks in order to recover from the September 2014 Tree Disaster event including a summary of the immediate response, and the plan for short and long-term recovery and restoration, and building resiliency in Calgary's urban forest.

The Framework is organized into the following sections:

- Event context
- Weather conditions
- Event timeline including key dates
- Summary of emergency response actions and event impacts
- An overview of the recovery mission and priorities
- Key definitions
- Resiliency
- Charts outlining the four main focus areas of the recovery (Urban Forest Health and Resiliency, Citizens and Their Communities, Parks Services and Processes, and Funding) and related objectives, deliverables, and timelines for each
- A schedule for reporting progress of recovery

Context

By definition, a city's "urban forest" is comprised of all trees and associated vegetative understory including all trees and shrubs intentionally planted, naturally occurring or accidently seeded. Trees found in parks, river valleys, streets, roadways and private lands are all part of the urban forest. Studies show that cities and communities are better because of trees: the urban forest is a major indicator of overall urban ecological health, creates a sense of safety and contributes to higher levels of neighbourhood socialization, and intercepts water runoff and adds to property value in addition to other economic benefits.

The September 2014 Tree Disaster had a major impact on this critical City asset; trees of varying species and sizes were affected across all communities in The City. It is estimated that one-half of the 500,000 public trees located in parks and boulevards will require care and maintenance. Public trees in natural area parks and private trees in residential areas are not included in this number.

This tree damage led to public safety and property protection issues, power outages due to downed lines, and record-breaking spikes in citizen calls to 911 and 311. The scale of damage, service impacts and need to assist thousands of citizens required a coordinated municipal emergency response and the Emergency Operations Centre (EOC) was activated on September 9, 2014. A comprehensive disaster recovery plan is required to ensure long-term resiliency for this critical piece of our City's fabric.

Weather conditions

The City received 28.2 cm of snow between September 8-10, 2014; an extraordinary amount when the average snowfall in September is 4 cm. This 3 day event was the largest accumulation of snow prior to the September 22 equinox experienced in Calgary in the past 130 years. To date, the only comparable devastating weather event identified is the eastern Canada ice storm of 1998.

This extreme snowfall occurred before deciduous trees had shed their leaves, resulting in significant snow accumulation on branches. The load snapped branches on trees and shrubs of all sizes, resulting in wide-spread tree debris and thousands of tree hazards including broken and hanging branches, and fallen trees.

Event timeline

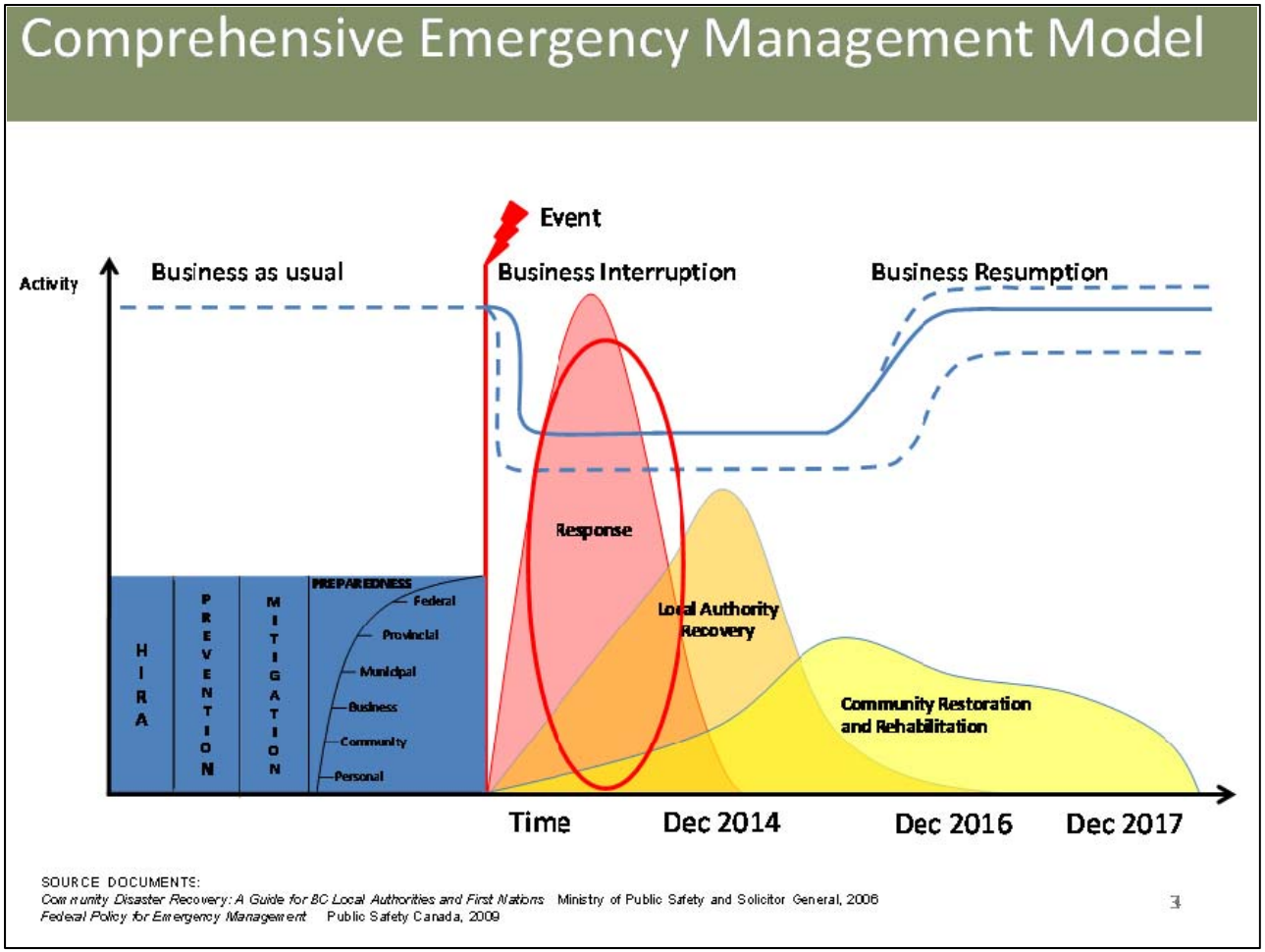
Beginning September 8, 2014, internal city crews, contractors and external partners worked seven days a week to remove hazards and debris. The EOC was activated on September 9, 2014 to organize the massive efforts required to deal with citywide damages and disruptions. Debris removal was required in all 227 Calgary communities; this work was completed October 17, 2014.

The EOC was de-activated on September 17, 2014 and the following morning a Tactical Operations Centre (TOC), led by The City of Calgary Parks, began coordinating the continued response to mitigate tree hazards and prioritize tree debris removal and begin to plan for longer-term response and consider recovery needs for communities.

Investment in emergency preparedness as well as lessons learned from 2013 flood positioned City staff with the skills and knowledge necessary to respond to this event. Finally, the EOC once again proved invaluable as it was the central location from which the City managed this event.

Comprehensive emergency management model

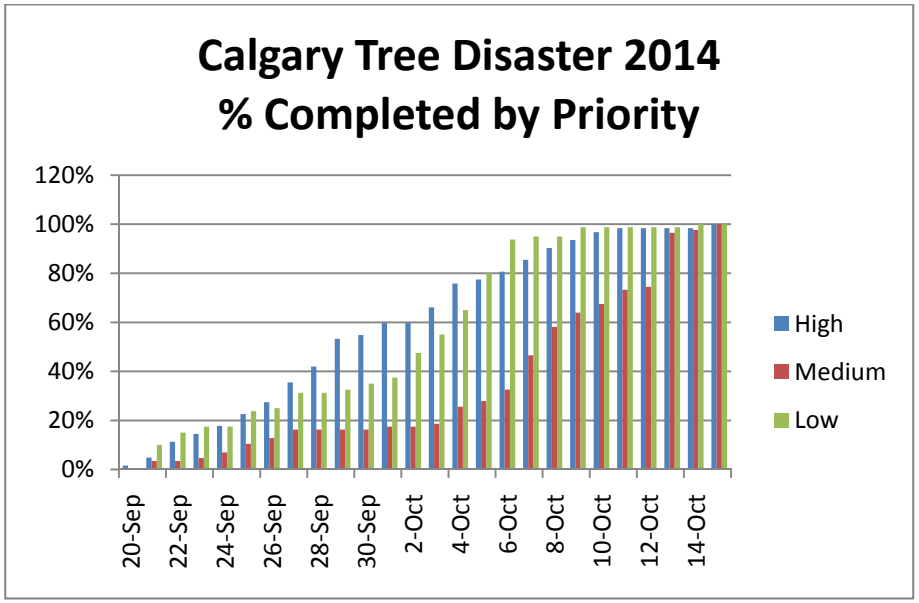
The Calgary Emergency Management Agency (CEMA) has adopted a comprehensive emergency management model that provided strategic guidance preparing for and responding to the tree disaster event. This model illustrates how the relationship between pre-event activities (risk assessment, prevention, mitigation and preparedness) and post- event activities (response, recovery and rehabilitation) contributes to the speed at which the corporation can return to normal business.

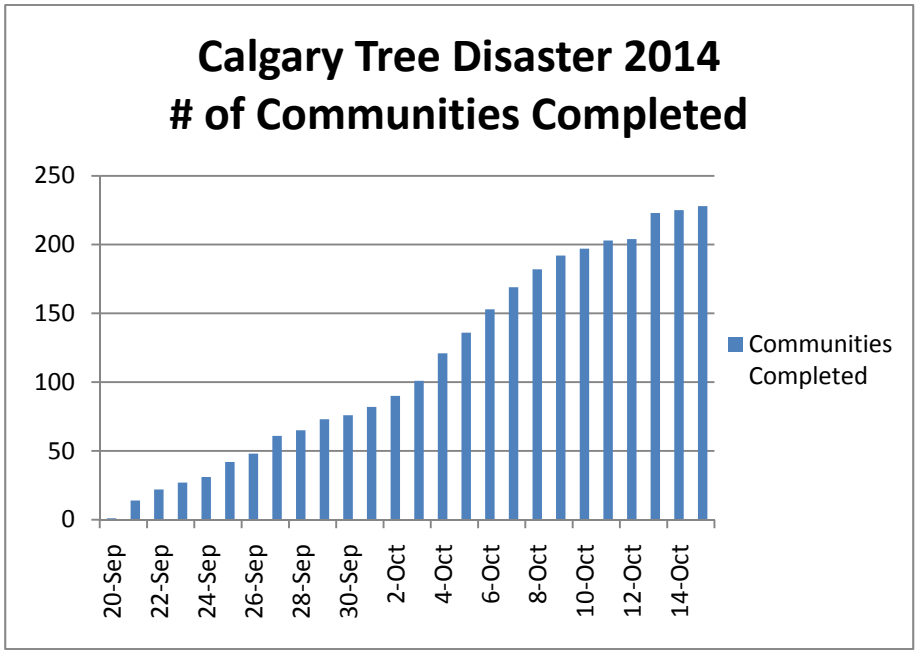


Response

The early response phase focused on the immediate assessment and mitigation of potential tree hazards that posed a risk to life and property. The successful response to this event required not only the mobilization of internal staff members across the corporation but also Civic Partners, Canada Taskforce 2 (CANTF2), four urban forestry crews from the City of Edmonton, private contractors, and wildfire crews (sawyers) from Alberta Environment and Sustainable Resources Development (AESRD). Up to 600 people contributed during the height of the response effort. From September 9-17, 2014, the response was coordinated by the Calgary Emergency Management Agency (CEMA) in the municipal Emergency Operations Centre (EOC). The EOC was a critical resource that was heavily relied upon during this event. The EOC was de-activated on September 17, 2014 and a Tactical Operations Centre (TOC) was set up with The City of Calgary Parks as the lead Business Unit.

The TOC continues to operate and lead the snowstorm response in terms of tree hazard mitigation and tree debris removal. The initial response work was prioritized based on public safety risk, amount of debris and scale of damage by community, followed by high use parks to allow events such as weddings, CIBC Race for the Cure, and Terry Fox runs to occur, and then smaller community parks. Several other City business units and AESRD wildfire management remain involved. The response phase is to be complete by Q1 2015.

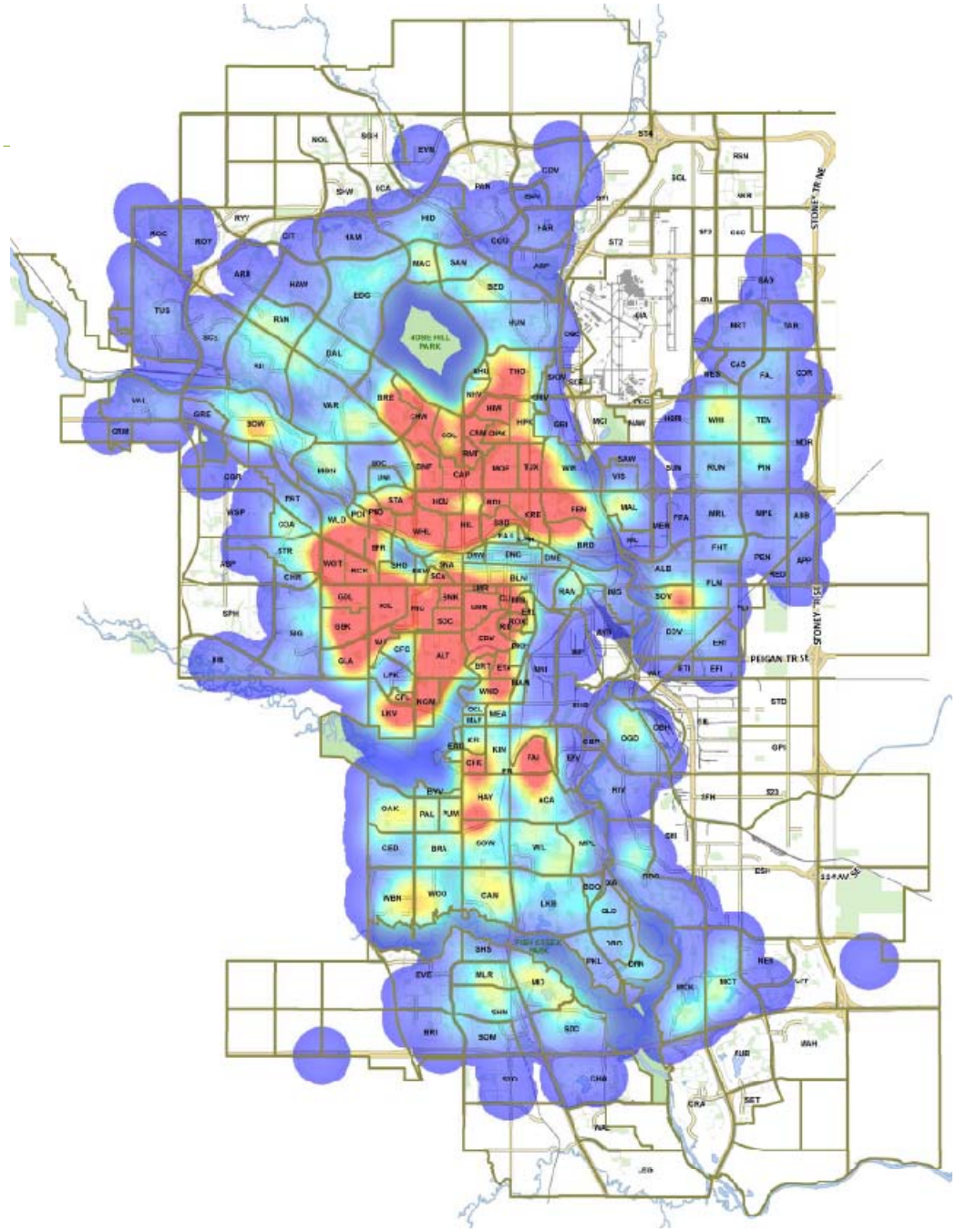




Impact

The snowstorm caused power outages, property damage, and widespread tree damage across the city. Many parks and pathways were closed until tree hazards could be assessed. Some of the specific impacts include:

- All 227 communities in The City of Calgary were impacted
- 74,000 ENMAX customers experienced a power outage with 2000 customers going several days without power
- 311 received more than 27,000 calls in the first 72 hours. This is the largest number of calls ever received for a single event and surpasses calls from the 2013 flood
- 911 received 7000 calls, the highest number of calls in a single day
- Over 9500 “tree emergency” calls received; this is almost 5 times the normal yearly total of 2000
- Over 100 traffic signals were out and 3 LRT stations had power outages
- 19,000 tonnes (19 million kilograms) of tree debris was collected which translates into 25,000 loads to the landfill by October 17, 2014
- 32 Leaf and Pumpkin sites were opened 2 weeks earlier than usual to accommodate community tree debris and kept open till November 9, 2014



Tree emergency calls to 311:
Red = high volume, yellow = medium volume, blue = low volume

Recovery

Research indicates that successful disaster recovery is realized when a holistic, community-based approach addresses issues in the built, economic, natural, and social environments.

Alternative:	Cost	Work Program	Benefits	Risks
1. **Business as usual** (no new budget allocated)	**$11.2 million** redirected from Parks' proposed 2015-2018 operating budget	• Prune ¼ of damaged trees over 4 years (62,000 trees) • Impact to standard UF services such as tree-planting, non-emergency tree work, service requests and maintenance	• No additional financial cost to City	• Trees fall and cause damage or injury to people or property • Risk of liability and potential legal claims • Urban forest does not recover • Slow pace of recovery leads to higher risk of tree death and disease • Loss of aesthetics, environmental and social benefits
2. **Recovery only** (corrective pruning)	**$35.0 million** comprised of: • $23.9 million in one-time funding • $0.7 million in capital • $10.4 million redirected from Parks' proposed 2015-2018 operating budget	• Corrective pruning of 100% of damaged public trees over 4 years (250,000 trees) • Tree asset management system put in place	• Public trees pruned properly to mitigate potential hazards and protect trees from premature death or disease • Asset management system for public trees in place to lower liability risks and optimize future tree work planning	• Private trees not considered as public outreach and education is limited • Public tree re-planting does not occur • Urban forest recovers slowly • Slow pace of recovery leads to higher risk of tree death and disease
3. **Recovery, Restoration + Resiliency** (corrective pruning, re-planting and community outreach)	**$47.4 million** comprised of: • $35.5 million in one-time operating • $0.7 million in capital • $11.2 million redirected from Parks' proposed 2015-2018 operating budget	• Corrective pruning of 100% of damaged public trees over 4 years (250,000 trees • Tree asset management system put in place • Community-based tree removal and replanting program (re-plant 6500 trees) • Community education and outreach • Staff training and equipment to build resiliency	• Public trees pruned properly to mitigate potential hazards and protect trees from premature death or disease • Asset management system for public trees in place • Public education and outreach occurs • Private tree recovery rates improved with public outreach and education • Removal and re-planting of lost trees occurs	• Higher immediate cost

Recovery *continued*

Calgary Tree Disaster 2014: Action Plan Budget Request										
	Total Required ($000)	Parks Capital Budget Request (Redirect)	Operating Request (FSR)				Parks Operating Funding from Action Plan 2015-18 (redirect)			
Recovery	**$35,000**	**$700**				**$23,900**				**$10,400**
2015-2018 Breakdown		*2015*	*2015*	*2016*	*2017*	*2018*	*2015*	*2016*	*2017*	*2018*
TOC Office	$1,300		$1,300							
Corrective Pruning	$28,100	$500	$7,000	$5,300	$5,300	$0	$2,500	$2,500	$2,500	$2,500
Asset Management	$3,600	$200	$1,000	$1,000	$1,000	$0	$100	$100	$100	$100
Cemeteries	$ 500		$500							
Pathways	$ 500		$500							
Natural Areas	$1,000		$400	$300	$300	$0				
Restoration	**$12,400**	**$0**				**$11,600**				**$800**
Tree Removal and Planting	$8,000			$4,000	$4,000					
Citizen Outreach	$4,400		$1,200	$1,200	$1,200		$200	$200	$200	$200
Total	**$47,400**	**$700**				**$35,500**				**$11,200**

Recovery *continued*

The Tactical Operations Centre (TOC) will provide citizen centric service that will focus on restoration and re-planting of the urban forest, optimize resource and process efficiencies, manage financial impacts, and align cross-departmental interests. The TOC will focus on short and long term recovery objectives following the impacts of the Calgary Tree Disaster 2014. This framework details the approach that will guide and coordinate the work undertaken by the TOC. Specifically, the framework:

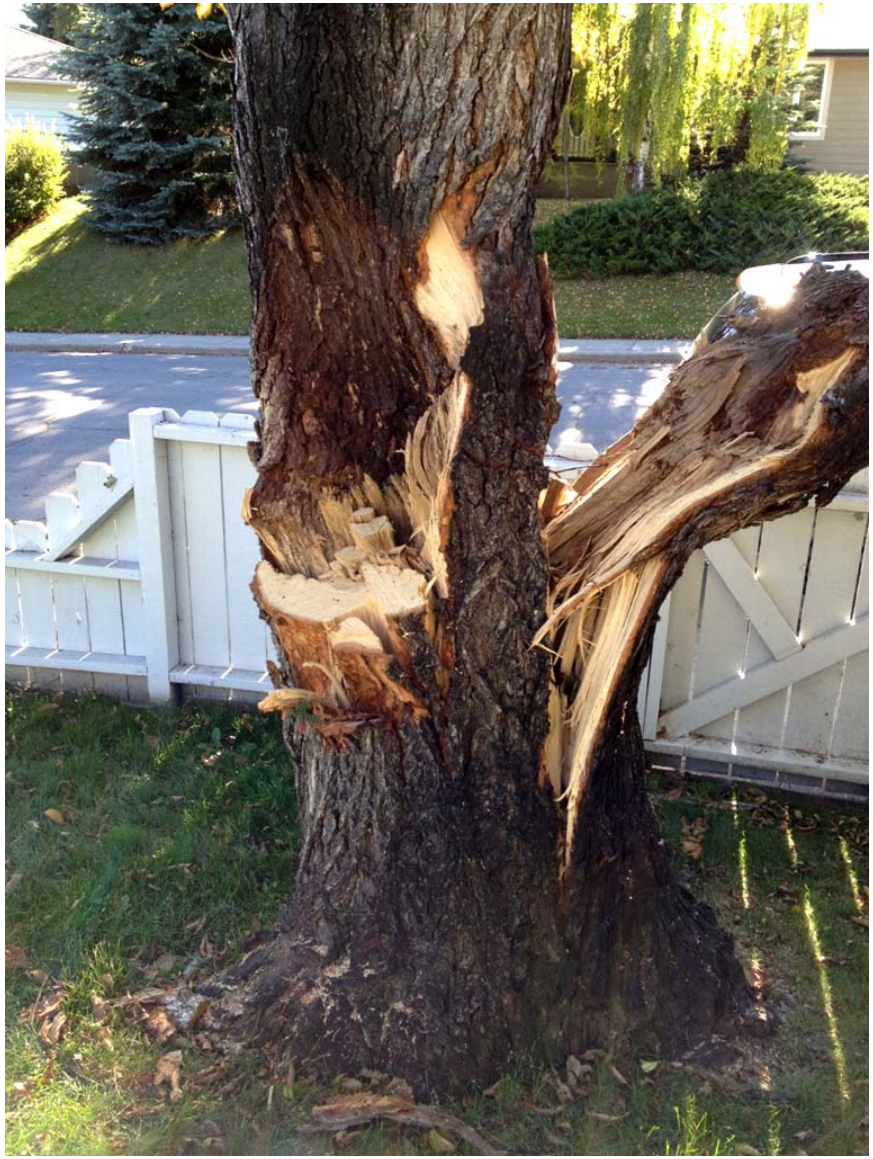
- Establishes principles that will guide the recovery work to be undertaken by the TOC;
- Provides key definitions;
- Identifies the mission and priorities of the taskforce;
- Identifies four key result areas and associated objectives and deliverables;
- Outlines a 4 year workplan that can be integrated into daily Parks operations; and
- Provides guidelines for monitoring and reporting on recovery progress.

Taking into consideration the dynamic nature of recovery, Council policy and priorities, the 2013 flood event recovery framework, a review of relevant literature, and other recent international disaster events, the TOC will focus on recovery in the following four identified key result areas:

- Citizens & Their Communities;
- Urban Forest Health and Resiliency;
- Parks Services and Processes; and
- Funding.

Objectives and short-term and long-term deliverables for the recovery process will be summarized for each key result area.

Recovery from the event will take many years but The City is well-positioned to make informed, community-centric decisions that will lead to successful restoration and recovery and increased resiliency of Calgary's urban forest and improved capacity for future events.



Definitions

Urban Forest: all trees and associated vegetative understory in a city, including all trees and shrubs intentionally planted, naturally occurring or accidently seeded. Trees found in parks, river valleys, streets, roadways and commercial and private lands are all part of the urban forest. The City of Calgary Parks is responsible for all public trees that are located on City-owned land such as parks, environmental reserve and street right of ways.

Recovery: is the focus on returning the disaster's impact on communities to a sense of normalcy and a degree of stability. The recovery phase of a disaster can be broken into two phases. The short-term phase typically lasts from six months to at least one year and involves delivering immediate services. The long-term phase, which can range up to decades, requires thoughtful strategic planning and action to address more serious or permanent impacts of a disaster. This phase of disaster management is complex and involves many stakeholders.

Restoration: is the thoughtful and planned approach to reestablishing the ecological health of the urban forest ecosystem. The goal of restoration is to return the urban forest to an ecologically sustainable state for the community. The restored urban forest will contribute positively to the community instead of being a drain on its resources

Re-planting: trees that were assessed to be beyond pruning repair and were removed now require replanting to ensure no loss of tree canopy cover and associated benefits.

Assessment: completed by qualified and experienced Parks staff. The assessment process entails the prioritization of communities based on impact of damage (high, medium, low) to the trees as observed in the field. Limited visual assessments are completed by Parks staff where obvious defects were noted either as a walk-by or drive-by. Assessments are completed firstly along busy streets, frequently used Parks, and specific locations where large events are held.

Priority 1(P1) trees: high priority fallen trees or trees with hanging limbs or other damage that could pose a risk to life and/or property. These types of concerns may fail during normal weather conditions.

Priority 2 (P2) trees: trees that require less urgent attention including trees that require corrective pruning, removal or limbs that do not pose a risk to people or property but if left unaddressed can create future compromised trees and are susceptible to decay, pests and disease.

Corrective Pruning: corrective pruning is required for trees left with improper pruning cuts. These could include branches that were torn at the trunk of the tree or entire branches that must be removed. Corrective pruning will encourage the tree to "seal" itself off from wounds and limit impact from pests, diseases and decay.

Structure Pruning: A type of pruning that improves tree structure, creating a healthier and stronger tree. Important for damaged ash and elm trees that are known for structural problems such as weak branch attachments. Structure pruning is more cost effective when a tree is young as it has more resources to respond to pruning events. Larger trees with poor form can also be pruned in a manner to help create a better structure through a process called "sub domination". This is where competing and/or conflicting tree "leaders" are pruned to establish a central leader.

Resiliency

There are many reasons for a municipality to prioritize resilience as part of its sustainable development planning agenda. As the UN's How to Make Cities More Resilient handbook (2012) notes, "reducing disaster risk can be a legacy opportunity—paying attention to protection will improve environmental, social and economic conditions, including combating the future variables of climate change, and leave the community more prosperous and secure than before".

Opportunities to develop and sustain long-term resiliency must be considered throughout all stages and components of recovery, in order to prepare The City for the next event. Parks and the TOC has committed to developing a set of key recommendations for urban forestry that will contribute to long-term resiliency for Calgary.

Guiding principles

Parks and the Tactical Operations Centre have agreed on a set of principles that will guide its recovery efforts from the Calgary Tree Disaster 2014. Successful recovery will:

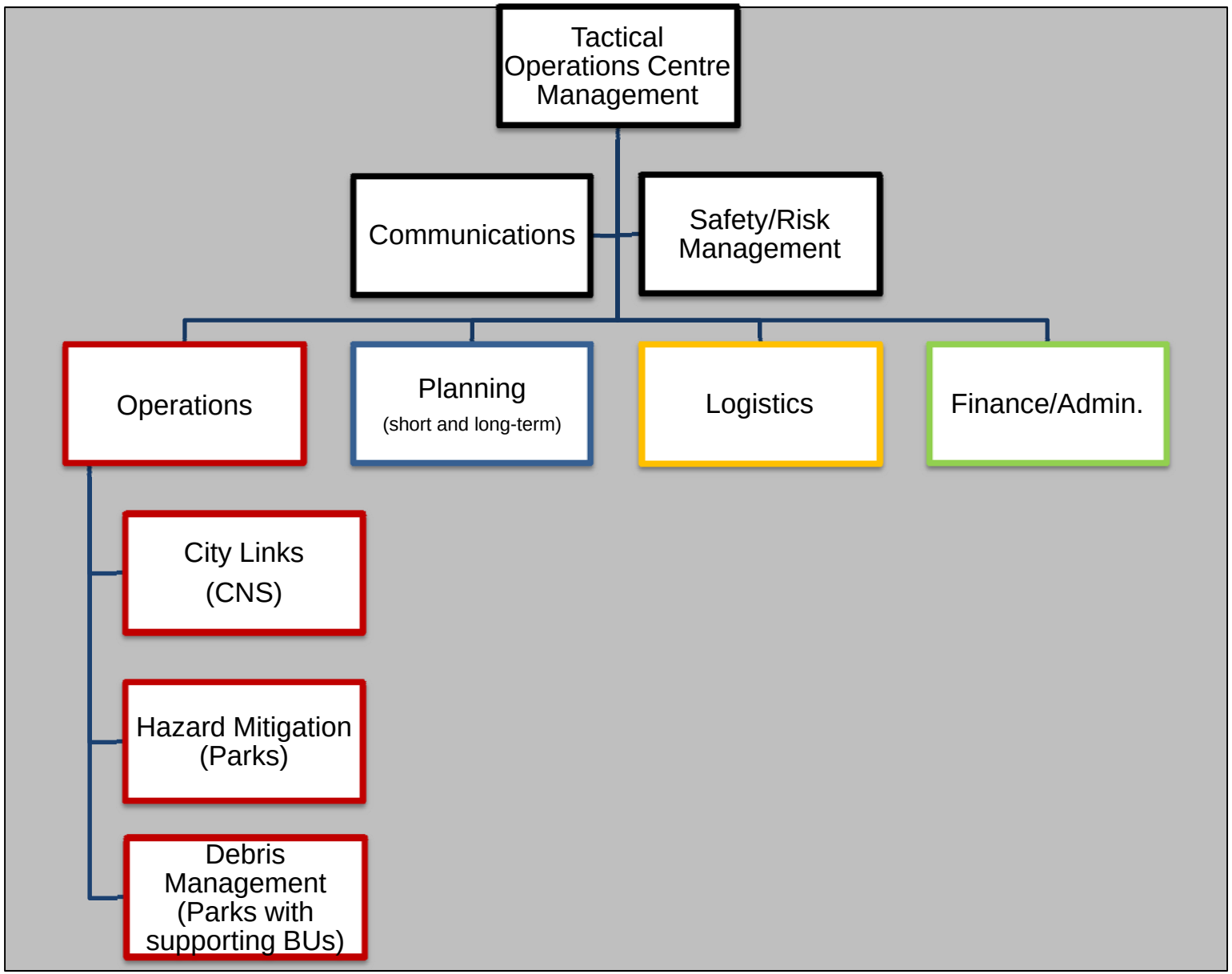
- Be based on an understanding of the community context
- Acknowledge the complex and dynamic nature of emergencies and communities
- Focus on engaging and educating communities
- Require a planned, coordinated and adaptive approach based on continuing assessment of impacts and needs
- Be built on open communication with affected communities and other stakeholders
- Recognize, support and build on community, individual and organizational capacity
- Consider the social, economic, environmental and smart growth impacts (as outlined in the City's Triple Bottom Line policy framework)

(Guiding Principles are based on the Government of Australia's 'National Principles for Disaster Recovery' and The City of Calgary's 'Triple Bottom Line Policy Framework')

Mission

Parks and the Tactical Operations Centre will provide leadership, within The City of Calgary and the Calgary community, to identify and resource tree disaster recovery activities, and support the delivery of recovery, restoration and resilience of The City's urban forest in alignment with the 2015-2018 Action Plan.

Tactical Operations Centre structure



Urban forest health and resiliency

Supports Council Outcome H5: *Protect and enhance our urban forest and natural landscape throughout Calgary.*

Key result area: Urban forest health and resiliency

Focus	The Urban Forest Health and Resiliency key result area has been initiated to ensure there is a coordinated and comprehensive effort to assess impacts to public trees within boulevards, parks, natural areas and other City-owned properties. Use of restoration and structural pruning, tree removal and re-planting techniques and strategies that will consider specific community needs and ensure the long-term health, sustainability and resiliency of Calgary's urban forest.
Objectives	Asset Management: • Identify, assess, and prioritize all damaged public trees within the City (boulevard, parks, natural areas and other city-owned land) • Define criteria to be used for tree assessment and priority setting in order to inform Action Plan 2015-2018 and future budget adjustments, and internal and external communications Tree Inventory: • The existing Urban Forestry tree inventory will be updated as accurate information on individual trees will also help plan and prioritize the restoration work needed and build a benchmark for monitoring tree health. The tree inventory will document all pruning, removal and re-planting going forward Pruning: • Apply techniques based on individual tree needs including restoration pruning to repair improper cuts or branch tearing that may have occurred during the response phase and structure pruning that improves overall tree structure to improve survival rates, sustain overall tree health and build resiliency to future events Re-planting and Removal: • Timing, design and species are tree-planting considerations that vary from community to community. Urban Forestry will Adapt the NeighbourWoods program and work with communities to build re-planting plans that will ensure resilience of the urban forest and meet individual community needs
2015/2016 Deliverables	• Tree Inventory Project – build digital inventory using lidar imagery, existing data, and field surveys for benchmarking and monitoring of tree health • Public Tree Assessment Plan - Assess public trees in boulevards, parks, pathways, and cemeteries, and on non-parks City land such as golf courses and recreation sites • Community Tree Pruning Plan - prioritize boulevard trees, parks and natural areas by community area • 3-year Community Tree Disaster Re-Planting Plan (Adapt Neighbourwoods Program) including public engagement and communications (City website, maps, community associations, workshops) • Hire FTEs to assist with tree assessment and recovery – arborists, experts, and additional UF staff • Begin tree re-planting and removal program • Maintenance plan for pruned and new trees - watering, monitoring, regular maintenance
2017/2018 Deliverables	• Long-term resiliency recommendations and lessons learned • Progress reporting to Council on a regular basis • Track and report on lessons learned • Re-planting and removal program continues

Citizens and their communities

Supports Council Outcome H6: *Continue to build public awareness and understanding of our shared responsibility to conserve and protect the environment.*

Key result area: Citizens and their communities

Focus	The Citizens and Their Communities key result area focuses on the education and support of individuals and communities as they recover and learn from the tree disaster event, including how to best care for and maintain private trees to build resiliency for future events.
Objectives	• Contribute to community resilience and wellbeing by ensuring that impacted community residents have been actively engaged and heard throughout urban forest restoration process • Partner with Parks Environmental Education and Initiatives to educate the public on the benefits of regular tree care • Reach out to wide range of citizens (elderly, schoolchildren) with varying types of engagement tools (open houses, online workshops, social media) • Explore opportunities to partner with and leverage funds from corporations that will benefit citizens and private trees
2015/2016 Deliverables	• Corporate Donations Strategy to be developed by Environmental Education and Initiatives • Produce Public Education Package and Plan including tree care modules, open houses, workshops, and communications plan • Private Tree Pruning and Re-planting Strategy • Plan a tree celebration event (Arbour Day)
2017/2018 Deliverables	• Long-term education programs to be developed for citizens • Explore opportunities for Plant-a-Tree program • Research and promote Urban Forest Foundation model for Calgary

Parks services and processes

Supports Council Outcome P5: *Seek out partnerships with other governments and community partners to achieve community well-being;* and Outcome N3: *Enhance the City's capacity and resiliency to prepare for and respond to pandemics, natural disasters and emergency situations.*

Key result area: Parks services and processes

Focus	The Parks Services and Processes key result area focuses on ensuring that Urban Forestry service levels continue to meet the needs of Calgarians while exploring ways to strengthen internal processes and build organizational capacity to improve urban forest health, serve citizens, and increase preparedness for future disaster events.
Objectives	• Adjust work plans while maintaining a high level of regular Urban Forestry service delivery during tree disaster recovery • Enhance Parks and Urban Forestry preparedness levels and ability to respond to future natural disasters • Optimize resources and find efficiencies • Align cross-departmental interests • Track and share lessons learned
2015/2016 Deliverables	• Build partnerships - University of Calgary, neighbouring municipalities, and Enmax (Ongoing) • Collaborate with CEMA to integrate Parks-specific disaster planning • Tree Disaster Reporting Dashboard • Expand Urban Forestry equipment inventory – 4 aerial trucks, pruning tools • Increase Technical support for Inventory work including hand-held GIS systems and IT services • Collaborate with other BUs to find efficiencies/opportunities to share/re-use equipment (ie: Waste and Recycling) • Hire TOC Support staff for assistance with recovery - finance, communications, IT, and information and data management • Administrative costs for TOC
2017/2018 Deliverables	• Review best practices in disaster recovery specific to urban forest (Toronto, Vancouver, etc) • 5-10 year Urban Forestry Management Plan • Review cumulative impacts of recent disasters and weather conditions (flood 2013, snow 2014, frost cycle, Chinook cycle) • Develop set of key resiliency recommendations for urban forestry

Funding

Supports Council Outcome W2: *Be as efficient and effective as possible, reducing costs and focusing on value-for-money.*

Key result area: Funding

Focus	The Financial key result area focuses on tracking expenditures, reporting costs, securing recovery funding, and bringing forward budget adjustments related to the tree disaster.
Objectives	• Manage financial impacts of the Calgary Tree Disaster 2014 event • Identify funding sources • Communicate and manage the process and documentation for funding approval • Transition funding applications and their status to the appropriate corporate entity for operational sustainment • Ensure funding received against capital recovery/improvement projects has been approved in the 2015-2018 and future budget adjustments
2015/16 Deliverables	• Manage Tree Disaster response costs • 2014 Request For Expenditures Approved for Immediate/Urgent Projects • 2014 Budget Revisions through 2015-2018 Action Plan discussions (November 2014) • 2015 Budget Adjustments (November 2015) • Recovery of Emergency Event (ongoing) • Manage DRP application + funds (ongoing) • Explore alternate funding sources (Municipal staffing grant and other provincial assistance programs, Fuel Tax, corporate donations, foundation model) • Hire Finance support staff
2017/2018 Deliverables	• Future budget adjustments

Monitoring and reporting

The Tactical Operations Centre will establish a process to manage the collection, tracking, storing, and reporting of all tree disaster-related information. The TOC commits to reporting to Council regularly and internal monitoring and reporting on recovery deliverables will occur more frequently as determined by Parks and TOC leads.

An example of unseen damage from initial drive by.